



- HSS: square end mills  
finishing cutters  
roughing cutters  
radius cutters
- Solid carbide:- end mills, universal  
- end mills RockTec 52  
and 65  
- end mills, ALU  
- roughing cutters  
- deburring tools  
- profiling cutters
- Broaches

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16.3 – 16.122



- Saw blades in HSS/solid carbide
- Shell end mills
- Profiling cutters with hole
- Indexable  
inserts for:- end mills  
- Face/angular milling  
cutters  
- Chamfer cutters  
- Disc milling cutters  
- Core drills
- Indexable milling inserts

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17.1 – 17.76

## Our suppliers for MILLING TOOLS:

**ATORN®**

**HHW**

**CUTTING SOLUTIONS BY  
CERATIZIT**

**Dümmel®**  
WERKZEUGFABRIK

### Info

### Coatings for machining tools

#### Advantages:

- Longer service life
- Higher productivity
- Fewer tool changes

- High-speed machining
- Hard machining
- No emulsion due to dry machining
- Lower tool costs

| Coating                              | ZrN          | TiN         | TiCN      | TiAlN       | Alcrona   | Hardlube    | Rocktec 52 | Rocktec 65      | Ultra-N         | Ultra Npro | Ultra MS  | Ultra DC |
|--------------------------------------|--------------|-------------|-----------|-------------|-----------|-------------|------------|-----------------|-----------------|------------|-----------|----------|
| Micro-hardness (HV 0.05)             | 2,800        | 2,300       | 3,000     | 3,300       | 3,200     | 3,000       | 3,300      | 3,600           | 3,100           | 6,000      | 3,200     | 10,000   |
| Friction coefficient vs. steel (dry) | –            | 0.4         | 0.4       | 0.30 - 0.35 | 0.35      | 0.15 - 0.20 | 0.4        | 0.4             | –               | –          | 0.35      | –        |
| Max. application temperature (°C)    | 1,100        | 600         | 400       | 900         | 1,100     | 800         | 900        | 1,200           | 900             | 550        | 1,100     | 700      |
| Coating colour                       | Light yellow | Gold-yellow | Blue-grey | Purple-grey | Blue-grey | Dark grey   | Grey-blue  | Copper-coloured | Brownish silver | Rainbow    | Blue-grey | Grey     |

|                              |   |   |   |   |   |   |   |   |   |   |   |   |
|------------------------------|---|---|---|---|---|---|---|---|---|---|---|---|
| Al alloy                     | ○ |   |   |   | ○ |   |   |   | ○ | ○ |   |   |
| Copper                       | ○ |   |   |   |   |   |   |   | ○ | ○ |   |   |
| Non-ferrous metals           | ○ |   |   |   |   |   |   |   | ○ | ○ |   |   |
| Plastic                      |   |   |   |   | ○ |   |   |   | ○ | ○ |   |   |
| CFK                          |   |   |   |   |   |   |   |   |   |   |   | ○ |
| GFK                          |   |   |   |   |   |   |   |   |   | ○ |   | ○ |
| Graphite                     |   |   |   |   |   |   |   |   |   |   |   | ○ |
| Low alloy steels             |   | ○ | ○ | ○ | ○ | ○ | ○ |   |   |   | ○ |   |
| High-alloy steels            |   | ○ | ○ | ○ | ○ | ○ | ○ | ○ |   |   | ○ |   |
| Tempered steels up to 52 HRC |   |   |   | ○ |   |   | ○ | ○ |   |   |   |   |
| Tempered steels up to 65 HRC |   |   |   | ○ |   |   |   | ○ |   |   |   |   |
| Stainless steels             |   |   | ○ | ○ |   | ○ |   |   |   |   | ○ |   |
| Cast iron                    |   |   | ○ | ○ |   |   |   |   |   |   |   |   |
| Titanium alloy               |   |   |   | ○ |   | ○ |   |   |   |   | ○ |   |
| Super alloy                  |   |   |   | ○ |   | ○ |   |   |   |   | ○ |   |

# Info

## Overview of HSS-E and PM (powder steel) cutters (I)

| Brand                   | 16010                                                                             | 16020                                                                             | 16022                                                                             | 16030                                                                             | 16032                                                                             | 16060                                                                             | 16062                                                                              | 16073                                                                               | 16074                                                                               | 16094                                                                               | 16096                                                                               |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Article number          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
|                         |  |  |  |  |  |  |  |  |  |  |  |
| Standard/DIN            | Factory standard                                                                  | Factory standard                                                                  | Factory standard                                                                  | Factory standard                                                                  | Factory standard                                                                  | 327D                                                                              | 327D                                                                               | 327D                                                                                | 327D                                                                                | 844B                                                                                | 844B                                                                                |
| Number of cutting edges | 1                                                                                 | 3                                                                                 | 3                                                                                 | 3                                                                                 | 3                                                                                 | 2                                                                                 | 2                                                                                  | 2                                                                                   | 2                                                                                   | 3                                                                                   | 3                                                                                   |
| Diameter range mm       | 3 - 10                                                                            | 1 - 20                                                                            | 1 - 12                                                                            | 2 - 10                                                                            | 2 - 8                                                                             | 1 - 40                                                                            | 1 - 25                                                                             | 2.5 - 25                                                                            | 2.5 - 20                                                                            | 1.5 - 30                                                                            | 1.5 - 30                                                                            |
| Cutting material        | HSS-E                                                                             | HSS-E                                                                             | HSS-E                                                                             | HSS-E                                                                             | HSS-E                                                                             | HSS-E                                                                             | HSS-E                                                                              | HSS-E                                                                               | HSS-E                                                                               | HSS-E                                                                               | HSS-E                                                                               |
| Coating                 | Co5                                                                               | -                                                                                 | TiAIN                                                                             | -                                                                                 | TiAIN                                                                             | -                                                                                 | TiAIN                                                                              | -                                                                                   | TiAIN                                                                               | -                                                                                   | TiAIN                                                                               |
| Version                 | Short                                                                             | Short                                                                             | Short                                                                             | Long                                                                              | Long                                                                              | Short                                                                             | Short                                                                              | Long                                                                                | Long                                                                                | Short                                                                               | Short                                                                               |
| Type / Profile          | -                                                                                 | N                                                                                 | N                                                                                 | N                                                                                 | N                                                                                 | N                                                                                 | N                                                                                  | N                                                                                   | N                                                                                   | N                                                                                   | N                                                                                   |
| Catalogue page          | 16.21                                                                             | 16.22                                                                             | 16.22                                                                             | 16.22                                                                             | 16.22                                                                             | 16.23                                                                             | 16.23                                                                              | 16.23                                                                               | 16.23                                                                               | 16.24                                                                               | 16.24                                                                               |

| Recommended application | ● = well-suited ○ = limited suitability |   |   |   |   |   |   |   |   |   |   |
|-------------------------|-----------------------------------------|---|---|---|---|---|---|---|---|---|---|
| Aluminium < 10% Si      | ●                                       | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Aluminium > 10% Si      | ●                                       | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Copper                  |                                         | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Plastics                |                                         | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Graphite                |                                         |   |   |   |   |   |   |   |   |   |   |
| Steel < 520 N           |                                         | ● | ● | ● | ● | ● | ● | ● |   | ● | ● |
| Steel < 750 N           |                                         | ● | ● | ● | ● | ● | ● | ● |   | ● | ● |
| Steel < 900 N           |                                         | ● | ● | ● | ● | ● | ● | ● |   | ● | ● |
| Steel < 1100 N          |                                         |   | ● | ● | ● | ● | ● | ● |   | ● | ● |
| Steel < 1200 N          |                                         |   | ● |   | ● |   | ● |   |   |   | ● |
| Steel < 1400 N          |                                         |   |   |   |   |   |   |   |   |   |   |
| Hardox                  |                                         |   |   |   |   |   |   |   |   |   |   |
| < 50 HRC                |                                         |   |   |   |   |   |   |   |   |   |   |
| < 60 HRC                |                                         |   |   |   |   |   |   |   |   |   |   |
| < 67 HRC                |                                         |   |   |   |   |   |   |   |   |   |   |
| GG                      |                                         | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| GGG                     |                                         | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| VA < 900 N              |                                         | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| VA > 900 N              |                                         | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Titanium                |                                         |   |   |   |   |   |   |   |   |   |   |
| Titanium alloy          |                                         |   |   |   |   |   |   |   |   |   |   |
| Nickel base             |                                         |   |   |   |   |   |   |   |   |   |   |

| Brand                   | 16100                                                                               | 16104                                                                               | 16105                                                                               | 16120                                                                               | 16122                                                                               | 16131                                                                               | 16128                                                                                | 16129                                                                                 | 16133                                                                                 | 16134                                                                                 | 16150                                                                                 |
|-------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| Article number          |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                      |                                                                                       |                                                                                       |                                                                                       |                                                                                       |
|                         |  |  |  |  |  |  |  |  |  |  |  |
| Standard/DIN            | 844B                                                                                | 844B                                                                                | 844B                                                                                | 844B                                                                                | 844B                                                                                | 844B                                                                                | 844B                                                                                 | 844B                                                                                  | Factory standard                                                                      | Factory standard                                                                      | 844B                                                                                  |
| Number of cutting edges | 3                                                                                   | 3                                                                                   | 3                                                                                   | 4 - 6                                                                               | 4 - 6                                                                               | 4 - 6                                                                               | 4 - 6                                                                                | 4 - 5                                                                                 | 4 - 6                                                                                 | 4 - 6                                                                                 | 6 - 8                                                                                 |
| Diameter range mm       | 4 - 20                                                                              | 2 - 20                                                                              | 2 - 20                                                                              | 2 - 40                                                                              | 2 - 32                                                                              | 5 - 30                                                                              | 2 - 32                                                                               | 2 - 25                                                                                | 6 - 25                                                                                | 6 - 25                                                                                | 30 - 50                                                                               |
| Cutting material        | HSS-E-PM                                                                            | HSS-E                                                                               | HSS-E                                                                               | HSS-E                                                                               | HSS-E                                                                               | HSS-E-PM                                                                            | HSS-E                                                                                | HSS-E                                                                                 | HSS-E                                                                                 | HSS-E                                                                                 | HSS-E                                                                                 |
| Coating                 | TiAIN                                                                               | -                                                                                   | TiAIN                                                                               | -                                                                                   | TiAIN                                                                               | TiAIN                                                                               | -                                                                                    | TiAIN                                                                                 | -                                                                                     | TiAIN                                                                                 | -                                                                                     |
| Version                 | Short                                                                               | Long                                                                                | Long                                                                                | Short                                                                               | Short                                                                               | Short                                                                               | Long                                                                                 | Long                                                                                  | Overlong                                                                              | Overlong                                                                              | Short                                                                                 |
| Type / Profile          | N                                                                                   | N                                                                                   | N                                                                                   | N                                                                                   | N                                                                                   | N                                                                                   | N                                                                                    | N                                                                                     | N                                                                                     | N                                                                                     | N                                                                                     |
| Catalogue page          | 16.24                                                                               | 16.25                                                                               | 16.25                                                                               | 16.26                                                                               | 16.26                                                                               | 16.26                                                                               | 16.27                                                                                | 16.27                                                                                 | 16.28                                                                                 | 16.28                                                                                 | 16.28                                                                                 |

| Recommended application | ● = well-suited ○ = limited suitability |   |   |   |   |   |   |   |   |   |   |
|-------------------------|-----------------------------------------|---|---|---|---|---|---|---|---|---|---|
| Aluminium < 10% Si      | ○                                       | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Aluminium > 10% Si      | ○                                       | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Copper                  | ○                                       | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Plastics                |                                         | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Graphite                |                                         |   |   |   |   |   |   |   |   |   |   |
| Steel < 520 N           | ●                                       | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Steel < 750 N           | ●                                       | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Steel < 900 N           | ●                                       | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Steel < 1100 N          |                                         |   | ● | ● | ● | ● | ● | ● |   | ● | ● |
| Steel < 1200 N          |                                         |   | ● | ● | ● | ● | ● | ● |   | ● | ● |
| Steel < 1400 N          |                                         |   |   | ● |   | ● |   |   |   |   |   |
| Hardox                  |                                         |   |   |   |   |   |   |   |   |   |   |
| < 50 HRC                |                                         |   |   |   |   |   |   |   |   |   |   |
| < 60 HRC                |                                         |   |   |   |   |   |   |   |   |   |   |
| < 67 HRC                |                                         |   |   |   |   |   |   |   |   |   |   |
| GG                      | ●                                       | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| GGG                     | ●                                       | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| VA < 900 N              | ○                                       | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| VA > 900 N              | ○                                       | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Titanium                | ○                                       |   |   |   |   | ○ |   |   |   |   |   |
| Titanium alloy          | ○                                       |   |   |   |   | ○ |   |   |   |   |   |
| Nickel base             | ○                                       |   |   |   |   | ○ |   |   |   |   |   |

| Brand                   | HW                                                                                | HW                                                                                | HW                                                                                | HW                                                                                | ATORN                                                                             | ATORN                                                                             | ATORN                                                                              | ATORN                                                                               | HW                                                                                  | HW                                                                                  | HW                                                                                  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Article number          | 16153                                                                             | 16158                                                                             | 16161                                                                             | 16170                                                                             | 16176                                                                             | 16177                                                                             | 16183                                                                              | 16185                                                                               | 16195                                                                               | 16198                                                                               | 16200                                                                               |
|                         |  |  |  |  |  |  |  |  |  |  |  |
| Standard/DIN            | 844B                                                                              | 844B                                                                              | 844B                                                                              | Factory standard                                                                  | Factory standard                                                                  | Factory standard                                                                  | 844B                                                                               | 844B                                                                                | 844B                                                                                | 844B                                                                                | 844B                                                                                |
| Number of cutting edges | 2                                                                                 | 3                                                                                 | 3                                                                                 | 2                                                                                 | 2                                                                                 | 2                                                                                 | 3                                                                                  | 3                                                                                   | 4 - 6                                                                               | 4 - 6                                                                               | 4 - 6                                                                               |
| Diameter range mm       | 2 - 22                                                                            | 3 - 20                                                                            | 3 - 20                                                                            | 2 - 20                                                                            | 2 - 30                                                                            | 2 - 20                                                                            | 6 - 25                                                                             | 6 - 25                                                                              | 10 - 40                                                                             | 10 - 40                                                                             | 8 - 36                                                                              |
| Cutting material        | HSS-E                                                                             | HSS-E                                                                             | HSS-E                                                                             | HSS-E                                                                             | HSS-E                                                                             | HSS-E                                                                             | HSS-E                                                                              | HSS-E                                                                               | HSS-E                                                                               | HSS-E                                                                               | HSS-E                                                                               |
| Coating                 | -                                                                                 | -                                                                                 | -                                                                                 | -                                                                                 | -                                                                                 | TiAlN                                                                             | -                                                                                  | TiAlN                                                                               | -                                                                                   | TiAlN                                                                               | -                                                                                   |
| Version                 | Short                                                                             | Short                                                                             | Long                                                                              | Short                                                                             | Long                                                                              | Long                                                                              | Short                                                                              | Short                                                                               | Short                                                                               | Short                                                                               | Long                                                                                |
| Type / Profile          | W                                                                                 | W                                                                                 | -                                                                                 | -                                                                                 | -                                                                                 | -                                                                                 | NR                                                                                 | NR                                                                                  | NR                                                                                  | NR                                                                                  | NR                                                                                  |
| Catalogue page          | 16.28                                                                             | 16.29                                                                             | 16.29                                                                             | 16.29                                                                             | 16.30                                                                             | 16.30                                                                             | 16.30                                                                              | 16.30                                                                               | 16.31                                                                               | 16.31                                                                               | 16.31                                                                               |

| Recommended application | ● = well-suited ○ = limited suitability |   |   |   |   |   |   |   |   |   |   |
|-------------------------|-----------------------------------------|---|---|---|---|---|---|---|---|---|---|
| Aluminium < 10% Si      | ●                                       | ● | ● | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Aluminium > 10% Si      | ○                                       | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Copper                  | ●                                       | ● | ● | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Plastics                | ○                                       | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Graphite                | ○                                       | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Steel < 520 N           | ○                                       | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Steel < 750 N           | ○                                       | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Steel < 900 N           | ○                                       | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Steel < 1100 N          | ○                                       | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Steel < 1200 N          | ○                                       | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Steel < 1400 N          | ○                                       | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Hardox                  | ○                                       | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| < 50 HRC                | ○                                       | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| < 60 HRC                | ○                                       | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| < 67 HRC                | ○                                       | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| GG                      | ○                                       | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| GGG                     | ○                                       | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| VA < 900 N              | ○                                       | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| VA > 900 N              | ○                                       | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Titanium                | ○                                       | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Titanium alloy          | ○                                       | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Nickel base             | ○                                       | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |

| Brand                   | HW                                                                                  | HW                                                                                  | HW                                                                                  | HW                                                                                  | HW                                                                                  | HW                                                                                  | HW                                                                                   | ATORN                                                                                 | HW                                                                                    | HW                                                                                    | HW                                                                                    |
|-------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| Article number          | 16209                                                                               | 16205                                                                               | 16220                                                                               | 16223                                                                               | 16260                                                                               | 16262                                                                               | 16268                                                                                | 16270                                                                                 | 16277                                                                                 | 16278                                                                                 | 16281                                                                                 |
|                         |  |  |  |  |  |  |  |  |  |  |  |
| Standard/DIN            | Factory standard                                                                    | Factory standard                                                                    | 844B                                                                                | 844B                                                                                | 844B                                                                                | 844B                                                                                | 844B                                                                                 | 844B                                                                                  | 844B                                                                                  | 844B                                                                                  | 844B                                                                                  |
| Number of cutting edges | 4 - 5                                                                               | 6 - 8                                                                               | 3                                                                                   | 3                                                                                   | 4 - 6                                                                               | 4 - 6                                                                               | 4 - 6                                                                                | 3 - 6                                                                                 | 3 - 5                                                                                 | 3 - 6                                                                                 | 3 - 4                                                                                 |
| Diameter range mm       | 6 - 25                                                                              | 30 - 50                                                                             | 6 - 30                                                                              | 6 - 40                                                                              | 6 - 25                                                                              | 6 - 25                                                                              | 6 - 30                                                                               | 4 - 25                                                                                | 6 - 25                                                                                | 6 - 30                                                                                | 6 - 25                                                                                |
| Cutting material        | HSS-E                                                                               | HSS-E                                                                               | HSS-E                                                                               | HSS-E                                                                               | HSS-E                                                                               | HSS-E                                                                               | HSS-E-PM                                                                             | HSS-E-PM                                                                              | HSS-E                                                                                 | HSS-E                                                                                 | HSS-E                                                                                 |
| Coating                 | TiAlN                                                                               | -                                                                                   | -                                                                                   | TiAlN                                                                               | -                                                                                   | TiAlN                                                                               | TiAlN                                                                                | TiAlN                                                                                 | -                                                                                     | TiAlN                                                                                 | TiAlN                                                                                 |
| Version                 | Overlong                                                                            | Short                                                                               | Short                                                                               | Short                                                                               | Short                                                                               | Short                                                                               | Short                                                                                | Short                                                                                 | Long                                                                                  | Long                                                                                  | Short                                                                                 |
| Type / Profile          | NR                                                                                  | NR                                                                                  | NF                                                                                  | NF                                                                                  | HR                                                                                  | HR                                                                                  | HR                                                                                   | HPC                                                                                   | HR                                                                                    | HR                                                                                    | HR                                                                                    |
| Catalogue page          | 16.32                                                                               | 16.32                                                                               | 16.32                                                                               | 16.32                                                                               | 16.33                                                                               | 16.33                                                                               | 16.33                                                                                | 16.33                                                                                 | 16.34                                                                                 | 16.34                                                                                 | 16.34                                                                                 |

| Recommended application | ● = well-suited ○ = limited suitability |   |   |   |   |   |   |   |   |   |   |
|-------------------------|-----------------------------------------|---|---|---|---|---|---|---|---|---|---|
| Aluminium < 10% Si      | ○                                       | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Aluminium > 10% Si      | ○                                       | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Copper                  | ○                                       | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Plastic                 | ○                                       | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Graphite                | ○                                       | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Steel < 520 N           | ○                                       | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Steel < 750 N           | ○                                       | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Steel < 900 N           | ○                                       | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Steel < 1100 N          | ○                                       | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Steel < 1200 N          | ○                                       | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Steel < 1400 N          | ○                                       | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Hardox                  | ○                                       | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| < 50 HRC                | ○                                       | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| < 60 HRC                | ○                                       | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| < 67 HRC                | ○                                       | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| GG                      | ○                                       | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| GGG                     | ○                                       | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| VA < 900 N              | ○                                       | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| VA > 900 N              | ○                                       | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Titanium                | ○                                       | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Titanium alloy          | ○                                       | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Nickel base             | ○                                       | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |

| Brand                                                           | HHW                                                                               | HHW                                                                               | HHW                                                                               | HHW                                                                               | HHW                                                                               | HHW                                                                               | HHW                                                                                |
|-----------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
| Article number                                                  | 16370                                                                             | 16375                                                                             | 16380                                                                             | 16381                                                                             | 16382                                                                             | 16383                                                                             | 16385                                                                              |
|                                                                 |  |  |  |  |  |  |  |
| Standard/DIN                                                    | 851                                                                               | 850D                                                                              | 1833C                                                                             | 1833C                                                                             | 1833D                                                                             | 1833D                                                                             | 6518B                                                                              |
| Number of cutting edges                                         | 6 - 8                                                                             | 6 - 12                                                                            | 10 - 12                                                                           | 10 - 12                                                                           | 10 - 12                                                                           | 10 - 12                                                                           | 4                                                                                  |
| Diameter range mm                                               | 6 - 22                                                                            | 10.5 - 45.5                                                                       | 16 - 32                                                                           | 16 - 32                                                                           | 16 - 32                                                                           | 16 - 32                                                                           | 1 - 20                                                                             |
| Cutting material                                                | HSS-E                                                                             | HSS-E                                                                             | HSS-E                                                                             | HSS-E                                                                             | HSS-E                                                                             | HSS-E                                                                             | HSS-E                                                                              |
| Coating                                                         | -                                                                                 | -                                                                                 | -                                                                                 | -                                                                                 | -                                                                                 | -                                                                                 | -                                                                                  |
| Version                                                         | Short                                                                             | Short                                                                             | Short                                                                             | Short                                                                             | Short                                                                             | Short                                                                             | Short                                                                              |
| Type / Profile                                                  | N                                                                                 | N                                                                                 | H                                                                                 | H                                                                                 | H                                                                                 | H                                                                                 | N                                                                                  |
| Catalogue page                                                  | 16.35                                                                             | 16.35                                                                             | 16.36                                                                             | 16.36                                                                             | 16.36                                                                             | 16.36                                                                             | 16.36                                                                              |
| Recommended application ● = well-suited ○ = limited suitability |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |
| Aluminium < 10% Si                                              | ○                                                                                 | ○                                                                                 | ○                                                                                 | ○                                                                                 | ○                                                                                 | ○                                                                                 | ○                                                                                  |
| Aluminium > 10% Si                                              | ○                                                                                 | ○                                                                                 | ○                                                                                 | ○                                                                                 | ○                                                                                 | ○                                                                                 | ○                                                                                  |
| Copper                                                          | ○                                                                                 | ○                                                                                 | ○                                                                                 | ○                                                                                 | ○                                                                                 | ○                                                                                 | ○                                                                                  |
| Plastic                                                         | ○                                                                                 | ○                                                                                 | ○                                                                                 | ○                                                                                 | ○                                                                                 | ○                                                                                 | ○                                                                                  |
| Graphite                                                        |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |
| Steel < 520 N                                                   | ●                                                                                 | ●                                                                                 | ●                                                                                 | ●                                                                                 | ●                                                                                 | ●                                                                                 | ●                                                                                  |
| Steel < 750 N                                                   | ●                                                                                 | ●                                                                                 | ●                                                                                 | ●                                                                                 | ●                                                                                 | ●                                                                                 | ●                                                                                  |
| Steel < 900 N                                                   | ●                                                                                 | ●                                                                                 | ●                                                                                 | ●                                                                                 | ●                                                                                 | ●                                                                                 | ●                                                                                  |
| Steel < 1100 N                                                  | ●                                                                                 | ●                                                                                 | ●                                                                                 | ●                                                                                 | ●                                                                                 | ●                                                                                 | ●                                                                                  |
| Steel < 1200 N                                                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |
| Steel < 1400 N                                                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |
| Hardox                                                          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |
| < 50 HRC                                                        |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |
| < 60 HRC                                                        |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |
| < 67 HRC                                                        |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |
| GG                                                              | ○                                                                                 | ○                                                                                 | ○                                                                                 | ○                                                                                 | ○                                                                                 | ○                                                                                 | ○                                                                                  |
| GGG                                                             | ○                                                                                 | ○                                                                                 | ○                                                                                 | ○                                                                                 | ○                                                                                 | ○                                                                                 | ○                                                                                  |
| VA < 900 N                                                      | ○                                                                                 | ○                                                                                 | ○                                                                                 | ○                                                                                 | ○                                                                                 | ○                                                                                 | ○                                                                                  |
| VA > 900 N                                                      | ○                                                                                 | ○                                                                                 | ○                                                                                 | ○                                                                                 | ○                                                                                 | ○                                                                                 | ○                                                                                  |
| Titanium                                                        |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |
| Titanium alloy                                                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |
| Nickel base                                                     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |

| Brand                   | HW     | HW       | HW     | HW     | ATORN       | HW     | HW     | HW     | ATORN       | ATORN       | HW     | ATORN       | ATORN       |
|-------------------------|--------|----------|--------|--------|-------------|--------|--------|--------|-------------|-------------|--------|-------------|-------------|
| Article number          | 16500  | 16502    | 16505  | 16507  | 16603       | 16517  | 16522  | 16524  | 16605       | 16607       | 16532  | 16606       | 16612       |
|                         |        |          |        |        |             |        |        |        |             |             |        |             |             |
| Number of cutting edges | 3      | 3        | 2      | 2      | 2           | 2      | 3      | 3      | 3           | 3           | 3      | 3           | 3           |
| Diameter range mm       | 2 - 18 | 1.5 - 12 | 2 - 20 | 2 - 20 | 0.25 - 20   | 3 - 20 | 2 - 20 | 2 - 20 | 2 - 20      | 2 - 20      | 3 - 20 | 2.8 - 20    | 3.5 - 20    |
| Cutting material        | VHM    | VHM      | VHM    | VHM    | VHM         | VHM    | VHM    | VHM    | VHM         | VHM         | VHM    | VHM         | VHM         |
| Coating                 | -      | TiAlN    | -      | TiAlN  | TiAlN-Ultra | TiAlN  | -      | TiAlN  | TiAlN-Ultra | TiAlN-Ultra | TiAlN  | TiAlN-Ultra | TiAlN-Ultra |
| Version                 | Mini   | Mini     | Short  | Short  | Short       | Short  | Short  | Short  | Extra short | Short       | Short  | Short       | Long        |
| Type / Profile          | N      | N        | N      | N      | N           | N      | N      | N      | N           | N           | N      | N           | N           |
| Catalogue page          | 16.37  | 16.37    | 16.37  | 16.37  | 16.38       | 16.38  | 16.39  | 16.39  | 16.39       | 16.40       | 16.40  | 16.41       | 16.42       |

## Recommended application

● = well-suited ○ = limited suitability

|                   |   |   |   |   |   |   |   |   |   |   |   |   |   |
|-------------------|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Aluminium < 8% Si | ● | ● | ● | ● | ○ |   |   |   | ○ | ○ |   | ○ | ○ |
| Aluminium > 8% Si | ○ | ○ | ○ | ○ | ● |   |   |   | ● | ● |   | ● | ● |
| Copper            | ○ | ○ | ○ | ○ | ● |   |   |   | ● | ● |   | ● | ● |
| Plastics          | ● | ○ | ○ | ○ | ○ |   |   |   |   |   |   |   |   |
| Graphite          |   |   |   |   |   |   |   |   |   |   |   |   |   |
| Steel < 520 N     | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |   | ● | ● |
| Steel < 750 N     | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |   | ● | ● |
| Steel < 900 N     | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |   | ● | ● |
| Steel < 1100 N    | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |   | ● | ● |
| Steel < 1200 N    | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |   | ● | ● |
| Steel < 1400 N    | ● | ● | ● | ● | ● | ● | ● | ● |   |   | ● | ● | ● |
| Hardox            |   |   |   |   |   |   |   |   |   |   |   |   |   |
| < 50 HRC          |   |   |   |   |   |   |   |   |   |   |   |   |   |
| < 60 HRC          |   |   |   |   |   |   |   |   |   |   |   |   |   |
| < 67 HRC          |   |   |   |   |   |   |   |   |   |   |   |   |   |
| GG                | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| GGG               | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| VA < 900 N        | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| VA > 900 N        | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Titanium          |   |   |   |   | ○ |   |   |   | ○ | ○ |   | ○ | ○ |
| Titanium alloy    |   |   |   |   | ○ |   |   |   | ○ | ○ |   | ○ | ○ |
| Nickel base       |   |   |   |   | ○ |   |   |   | ○ | ○ |   | ○ | ○ |

| Brand                   | ATORN       | HW       | HW     | HW     | HW     | HW     | ATORN       | HW     | HW     | HW       | HW       |
|-------------------------|-------------|----------|--------|--------|--------|--------|-------------|--------|--------|----------|----------|
| Article number          | 16618       | 16552    | 16537  | 16539  | 16542  | 16543  | 16610       | 16545  | 16547  | 16548    | 16549    |
|                         |             |          |        |        |        |        |             |        |        |          |          |
| Number of cutting edges | 4           | 4        | 4      | 4      | 4      | 4      | 4           | 4      | 4      | 4        | 4        |
| Diameter range mm       | 2 - 20      | 5.7 - 20 | 2 - 20 | 2 - 20 | 4 - 16 | 4 - 20 | 2 - 20      | 3 - 20 | 3 - 20 | 3 - 12   | 3 - 12   |
| Cutting material        | VHM         | VHM      | VHM    | VHM    | VHM    | VHM    | VHM         | VHM    | VHM    | VHM      | VHM      |
| Coating                 | TiAlN-Ultra | AlCrN    | -      | TiAlN  | -      | TiAlN  | TiAlN-Ultra | -      | TiAlN  | -        | TiAlN    |
| Version                 | Short       | Short    | Short  | Short  | Short  | Short  | Short       | Short  | Short  | Overlong | Overlong |
| Type / Profile          | N           | HPC      | N      | N      | N      | N      | HPC         | N      | N      | N        | N        |
| Catalogue page          | 16.43       | 16.43    | 16.44  | 16.44  | 16.44  | 16.44  | 16.45       | 16.45  | 16.45  | 16.46    | 16.46    |

## Recommended application

● = well-suited ○ = limited suitability

|                   |   |   |   |   |   |   |   |   |   |   |   |
|-------------------|---|---|---|---|---|---|---|---|---|---|---|
| Aluminium < 8% Si | ○ |   | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Aluminium > 8% Si | ● |   | ○ | ○ | ○ | ○ | ● | ○ | ○ | ○ | ○ |
| Copper            | ○ |   | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Plastics          |   |   | ○ | ○ | ○ | ○ |   | ○ | ○ | ○ | ○ |
| Graphite          |   |   |   |   |   |   |   |   |   |   |   |
| Steel < 520 N     | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Steel < 750 N     | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Steel < 900 N     | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Steel < 1100 N    | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Steel < 1200 N    | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Steel < 1400 N    |   | ● |   | ● |   | ● |   |   | ● |   | ● |
| Hardox            |   |   |   |   |   |   |   |   |   |   |   |
| < 50 HRC          |   |   |   |   |   |   |   |   |   |   |   |
| < 60 HRC          |   |   |   |   |   |   |   |   |   |   |   |
| < 67 HRC          |   |   |   |   |   |   |   |   |   |   |   |
| GG                | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| GGG               | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| VA < 900 N        | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| VA > 900 N        | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Titanium          | ○ | ○ |   |   |   |   | ○ |   | ○ |   | ○ |
| Titanium alloy    | ○ | ○ |   |   |   |   | ○ |   | ○ |   | ○ |
| Nickel base       | ○ | ○ |   |   |   |   | ○ |   | ○ |   | ○ |

| Brand                   | ATORN®    | ATORN®    | HW           | HW           | HW           | HW        | HW        | HW            | ATORN®      | HW         | HW     |
|-------------------------|-----------|-----------|--------------|--------------|--------------|-----------|-----------|---------------|-------------|------------|--------|
| Article number          | 16527 1.. | 16527 2.. | 16592<br>NEW | 16593<br>NEW | 16594<br>NEW | 16534 1.. | 16534 3.. | 16536         | 16627       | 16538      | 16540  |
|                         |           |           |              |              |              |           |           |               |             |            |        |
| Number of cutting edges | 4         | 4         | 4            | 4            | 4            | 4         | 4         | 4             | 4           | 4          | 4      |
| Diameter range mm       | 1 - 20    | 1 - 20    | 3 - 20       | 3 - 20       | 6 - 20       | 3 - 20    | 4 - 20    | 4 - 20        | 3 - 20      | 6 - 20     | 4 - 20 |
| Cutting material        | VHM       | VHM       | VHM          | VHM          | VHM          | VHM       | VHM       | VHM           | VHM         | VHM        | VHM    |
| Coating                 | TiAlN     | TiAlN     | Varocon      | Varocon      | Varocon      | TiAlN     | TiAlN     | TiAlN         | TiAlN Ultra | TiAlN      | TiAlN  |
| Version                 | Short     | Short     | Short        | Long         | Overlong     | Long      | Long      | Long/released | Short       | Long m. IK | Long   |
| Type / Profile          | HPC       | HPC       | HPC          | HPC          | HPC          | HPC       | HPC       | HPC           | HPC         | HPC        | HPC    |
| Catalogue page          | 16.46     | 16.46     | 16.47        | 16.47        | 16.47        | 16.48     | 16.48     | 16.49         | 16.49       | 16.50      | 16.50  |

## Recommended application

● = well-suited ○ = limited suitability

|                   |   |   |   |   |   |   |   |   |   |   |   |
|-------------------|---|---|---|---|---|---|---|---|---|---|---|
| Aluminium < 8% Si |   |   |   |   |   |   |   |   |   |   |   |
| Aluminium > 8% Si |   |   |   |   |   |   |   |   |   |   |   |
| Copper            |   |   |   |   |   |   |   |   |   |   |   |
| Plastics          |   |   |   |   |   |   |   |   |   |   |   |
| Graphite          |   |   |   |   |   |   |   |   |   |   |   |
| Steel < 520 N     | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Steel < 750 N     | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Steel < 900 N     | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Steel < 1100 N    | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Steel < 1200 N    | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Steel < 1400 N    | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Hardox            |   |   |   |   |   |   |   |   |   |   |   |
| < 50 HRC          |   |   |   |   |   |   |   |   |   |   |   |
| < 60 HRC          |   |   |   |   |   |   |   |   |   |   |   |
| < 67 HRC          |   |   |   |   |   |   |   |   |   |   |   |
| GG                | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |   |
| GGG               | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |   |
| VA < 900 N        |   |   |   |   |   | ○ | ○ | ○ |   | ○ | ○ |
| VA > 900 N        |   |   |   |   |   | ○ | ○ | ○ |   | ○ | ○ |
| Titanium          |   |   |   |   |   |   |   |   |   |   |   |
| Titanium alloy    |   |   |   |   |   |   |   |   |   |   |   |
| Nickel base       |   |   |   |   |   |   |   |   |   |   |   |

| Brand                   | HW     | HW       | ATORN®      | ATORN®      | ATORN®      | ATORN®      | HW     | HW     | ATORN®      | ATORN®      | ATORN®      |
|-------------------------|--------|----------|-------------|-------------|-------------|-------------|--------|--------|-------------|-------------|-------------|
| Article number          | 16554  | 16555    | 16640       | 16616 2..   | 16616 3..   | 16616 4..   | 16551  | 16553  | 16642       | 16643       | 16646 1..   |
|                         |        |          |             |             |             |             |        |        |             |             |             |
| Number of cutting edges | 4      | 4        | 4           | 6 - 8       | 6 - 8       | 6 - 8       | 6 - 8  | 6 - 8  | 2           | 4           | 4           |
| Diameter range mm       | 5 - 20 | 5 - 25   | 3 - 20      | 4 - 20      | 6 - 20      | 6 - 20      | 6 - 20 | 6 - 20 | 3 - 20      | 6 - 16      | 6 - 16      |
| Cutting material        | VHM    | VHM      | VHM         | VHM         | VHM         | VHM         | VHM    | VHM    | VHM         | VHM         | VHM         |
| Coating                 | TiAlN  | TiAlN    | TiAlN-Ultra | TiAlN-Ultra | TiAlN-Ultra | TiAlN-Ultra | TiAlN  | TiAlN  | TiAlN-Ultra | TiAlN-Ultra | TiAlN-Ultra |
| Version                 | Long   | Overlong | Short       | Short       | Long        | Overlong    | Short  | Long   | Long        | Short       | Long        |
| Type / Profile          | HPC    | HPC      | HSC         | N           | N           | N           | N      | N      | N           | NR          | N           |
| Catalogue page          | 16.51  | 16.51    | 16.52       | 16.53       | 16.53       | 16.53       | 16.53  | 16.54  | 16.54       | 16.54       | 16.55       |

## Recommended application

● = well-suited ○ = limited suitability

|                    |   |   |   |   |   |   |   |   |   |   |   |
|--------------------|---|---|---|---|---|---|---|---|---|---|---|
| Aluminium < 10% Si | ○ | ○ |   | ○ | ○ | ○ |   |   | ○ |   | ● |
| Aluminium > 10% Si | ○ | ○ |   | ○ | ○ | ○ |   |   | ○ |   | ● |
| Copper             | ○ | ○ | ● | ● | ● | ● |   |   | ● |   | ● |
| Plastics           |   |   |   |   |   |   |   |   | ● |   | ● |
| Graphite           |   |   |   |   |   |   |   |   |   |   |   |
| Steel < 520 N      | ● | ● | ● | ● | ● | ● | ● | ● | ○ | ● | ● |
| Steel < 750 N      | ● | ● | ● | ● | ● | ● | ● | ● | ○ | ● | ● |
| Steel < 900 N      | ● | ● | ● | ● | ● | ● | ● | ● | ○ | ● | ● |
| Steel < 1100 N     | ● | ● | ● | ● | ● | ● | ● | ● | ○ | ● | ● |
| Steel < 1200 N     | ● | ● | ● | ● | ● | ● | ● | ● | ○ | ● | ● |
| Steel < 1400 N     | ● | ● | ● | ● | ● | ● | ● | ● | ○ | ● | ● |
| Hardox             |   |   |   |   |   |   |   |   |   |   |   |
| < 50 HRC           |   |   |   |   |   |   |   |   |   |   |   |
| < 60 HRC           |   |   |   |   |   |   |   |   |   |   |   |
| < 67 HRC           |   |   |   |   |   |   |   |   |   |   |   |
| GG                 | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| GGG                | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| VA < 900N          | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |   | ○ |
| VA > 900N          | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |   | ○ |
| Titanium           | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Titanium alloy     | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Nickel base        | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |

| Brand                   | ATORN®                                    | HHW    | HHW       | HHW           | HHW    | ATORN®      | HHW    | HHW    | HHW        | HHW    | HHW    | HHW    |
|-------------------------|-------------------------------------------|--------|-----------|---------------|--------|-------------|--------|--------|------------|--------|--------|--------|
| Article number          | 16646 2..                                 | 16557  | 16559 201 | 16559 202-208 | 16561  | 16628       | 16565  | 16567  | 16569      | 16650  | 16651  | 16629  |
|                         |                                           |        |           |               |        |             |        |        |            |        |        |        |
| Number of cutting edges | 4                                         | 2      | 2         | 2             | 4      | 3-4         | 4      | 4      | 4          | 3-6    | 3-6    | 3-4    |
| Diameter range mm       | 6 - 12                                    | 3 - 20 | 2         | 3 - 20        | 3 - 20 | 4 - 20      | 5 - 20 | 3 - 16 | 6 - 20     | 4 - 25 | 4 - 25 | 6 - 20 |
| Cutting material        | VHM                                       | VHM    | VHM       | VHM           | VHM    | VHM         | VHM    | VHM    | VHM        | VHM    | VHM    | VHM    |
| Coating                 | TiAlN-Ultra                               | TiAlN  | TiAlN     | TiAlN         | TiAlN  | TiAlN-Ultra | TiAlN  | TiAlN  | TiAlN      | TiAlN  | TiAlN  | TiAlN  |
| Version                 | Overlong                                  | Short  | Long      | Long          | Short  | Short       | Short  | Long   | Long m. IK | Short  | Short  | Long   |
| Type / Profile          | N                                         | -      | -         | -             | -      | NR          | NF     | HR     | HR         | HR     | HR     | HR     |
| Catalogue page          | 16.55                                     | 16.55  | 16.55     | 16.55         | 16.56  | 16.56       | 16.57  | 16.57  | 16.57      | 16.58  | 16.58  | 16.58  |
| Recommended application | ● = well-suited   ○ = limited suitability |        |           |               |        |             |        |        |            |        |        |        |
| Aluminium < 8% Si       | ●                                         |        |           |               |        | ●           |        |        |            |        |        |        |
| Aluminium > 8% Si       | ●                                         |        |           |               |        | ●           |        |        |            |        |        |        |
| Copper                  | ●                                         |        |           |               |        | ●           |        |        |            |        |        |        |
| Plastics                | ●                                         |        |           |               |        |             |        |        |            |        |        |        |
| Graphite                |                                           |        |           |               |        |             |        |        |            |        |        |        |
| Steel < 520 N           | ●                                         | ●      | ●         | ●             | ●      | ○           | ●      | ●      | ●          | ●      | ●      | ●      |
| Steel < 750 N           | ●                                         | ●      | ●         | ●             | ●      | ○           | ●      | ●      | ●          | ●      | ●      | ●      |
| Steel < 900 N           | ●                                         | ●      | ●         | ●             | ●      | ●           | ●      | ●      | ●          | ●      | ●      | ●      |
| Steel < 1100 N          | ●                                         | ●      | ●         | ●             | ●      | ●           | ●      | ●      | ●          | ●      | ●      | ●      |
| Steel < 1200 N          | ●                                         | ●      | ●         | ●             | ●      | ●           | ●      | ●      | ●          | ●      | ●      | ●      |
| Steel < 1400 N          |                                           | ●      | ●         | ●             | ●      | ●           | ●      | ●      | ●          | ●      | ●      | ●      |
| Hardox                  |                                           |        |           |               |        |             |        |        |            |        |        |        |
| < 50 HRC                |                                           |        |           |               |        |             |        |        |            | ●      | ●      |        |
| < 60 HRC                |                                           |        |           |               |        |             |        |        |            |        |        |        |
| < 67 HRC                |                                           |        |           |               |        |             |        |        |            |        |        |        |
| GG                      | ●                                         | ●      | ●         | ●             | ●      | ○           | ●      | ●      | ●          | ●      | ●      | ●      |
| G GG                    | ●                                         | ●      | ●         | ●             | ●      | ○           | ●      | ●      | ●          | ●      | ●      | ●      |
| VA < 900 N              | ●                                         | ●      | ○         | ○             | ○      | ●           | ○      | ●      | ○          | ○      | ○      | ○      |
| VA > 900 N              | ○                                         | ○      | ○         | ○             | ○      | ●           | ○      | ○      | ○          | ○      | ○      | ○      |
| Titanium                | ○                                         |        |           |               |        | ○           |        |        |            |        |        |        |
| Titanium alloy          | ○                                         |        |           |               |        | ○           |        |        |            |        |        |        |
| Nickel base             | ○                                         |        |           |               |        | ○           |        |        |            |        |        |        |

| Brand                   | HHW                                                                               | HHW                                                                               | ATORN                                                                             | ATORN                                                                             | ATORN                                                                             | HHW                                                                               | HHW                                                                                | HHW                                                                                 | HHW                                                                                 | HHW                                                                                 | HHW                                                                                 |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Article number          | 16580                                                                             | 16575                                                                             | 16570                                                                             | 16571                                                                             | 16573                                                                             | 16583                                                                             | 16660                                                                              | 16661                                                                               | 16662 1..                                                                           | 16662 2..                                                                           | 16662 3..                                                                           |
|                         |  |  |  |  |  |  |  |  |  |  |  |
| Number of cutting edges | 2                                                                                 | 1                                                                                 | 4 - 6                                                                             | 4 - 6                                                                             | 4 - 6                                                                             | 4                                                                                 | 6 - 10                                                                             | 6                                                                                   | 6 - 9                                                                               | 6 - 9                                                                               | 6 - 9                                                                               |
| Diameter range mm       | 3 - 20                                                                            | 3 - 6                                                                             | 4 - 20                                                                            | 4 - 20                                                                            | 4 - 16                                                                            | 4 - 16                                                                            | 10.5 - 45.5                                                                        | 12.5 - 32                                                                           | 16 - 38                                                                             | 16 - 38                                                                             | 16 - 38                                                                             |
| Cutting material        | VHM                                                                               | VHM                                                                               | VHM                                                                               | VHM                                                                               | VHM                                                                               | VHM                                                                               | VHM                                                                                | VHM                                                                                 | VHM                                                                                 | VHM                                                                                 | VHM                                                                                 |
| Coating                 | -                                                                                 | TiAlN                                                                             | -                                                                                 | TiAlN                                                                             | TiAlN                                                                             | TiAlN                                                                             | Alcrona                                                                            | Alcrona                                                                             | Alcrona                                                                             | Alcrona                                                                             | Alcrona                                                                             |
| Version                 | Short                                                                             | Short                                                                             | Short                                                                             | Short                                                                             | Short                                                                             | Long                                                                              | -                                                                                  | -                                                                                   | -                                                                                   | -                                                                                   | -                                                                                   |
| Type / Profile          | N                                                                                 | N                                                                                 | 90° deburrer                                                                      | 90° deburrer                                                                      | 60° deburrer                                                                      | Deburrer                                                                          | Slotted                                                                            | N/NF                                                                                | Angle                                                                               | DIN 1833C                                                                           | DIN 1833D                                                                           |
| Catalogue page          | 16.85                                                                             | 16.86                                                                             | 16.86                                                                             | 16.86                                                                             | 16.86                                                                             | 16.87                                                                             | 16.87                                                                              | 16.88                                                                               | 16.88                                                                               | 16.88                                                                               | 16.88                                                                               |

## Recommended application

● = well-suited ○ = limited suitability

|                   |   |   |   |   |   |   |   |   |   |   |   |
|-------------------|---|---|---|---|---|---|---|---|---|---|---|
| Aluminium < 8% Si | ● | ● | ● | ○ | ○ | ○ |   |   |   |   |   |
| Aluminium > 8% Si | ● | ● | ● | ○ | ○ | ○ |   |   |   |   |   |
| Copper            | ● | ● | ● | ○ | ○ | ○ |   |   |   |   |   |
| Plastics          | ● | ● | ● | ○ | ○ | ○ |   |   |   |   |   |
| Graphite          |   |   |   |   |   |   |   |   |   |   |   |
| Steel < 520 N     | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Steel < 750 N     | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Steel < 900 N     | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Steel < 1100 N    | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Steel < 1200 N    | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Steel < 1400 N    |   |   |   | ● | ● | ● |   |   |   |   |   |
| Hardox            |   |   |   |   |   |   |   |   |   |   |   |
| < 50 HRC          |   |   |   |   |   |   |   |   |   |   |   |
| < 60 HRC          |   |   |   |   |   |   |   |   |   |   |   |
| < 67 HRC          |   |   |   |   |   |   |   |   |   |   |   |
| GG                | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| GGG               | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| VA < 900 N        | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| VA > 900 N        | ○ | ○ | ○ | ○ | ○ | ○ |   |   |   |   |   |
| Titanium          |   | ○ | ○ | ○ | ○ |   |   |   |   |   |   |
| Titanium alloy    |   | ○ | ○ | ○ | ○ |   |   |   |   |   |   |
| Nickel base       |   | ○ | ○ | ○ | ○ |   |   |   |   |   |   |

| Brand                   | HHW                                                                                 | HHW                                                                                 |
|-------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Article number          | 16662 4..                                                                           | 16658                                                                               |
|                         |  |  |
| Number of cutting edges | 6 - 9                                                                               | 4                                                                                   |
| Diameter range mm       | 16 - 38                                                                             | R 0.2 - 6.0                                                                         |
| Cutting material        | VHM                                                                                 | VHM                                                                                 |
| Coating                 | Alcrona                                                                             | TiAlN                                                                               |
| Version                 | 60°                                                                                 | Short                                                                               |
| Type / Profile          | DIN 1833D                                                                           | -                                                                                   |
| Catalogue page          | 16.88                                                                               | 16.89                                                                               |

## Recommended application

● = well-suited ○ = limited suitability

|                   |   |   |
|-------------------|---|---|
| Aluminium < 8% Si |   | ● |
| Aluminium > 8% Si |   | ● |
| Copper            |   | ● |
| Plastics          |   | ● |
| Graphite          |   |   |
| Steel < 520 N     | ● | ● |
| Steel < 750 N     | ● | ● |
| Steel < 900 N     | ● | ● |
| Steel < 1100 N    | ● | ● |
| Steel < 1200 N    | ● | ● |
| Steel < 1400 N    |   |   |
| Hardox            |   |   |
| < 50 HRC          |   |   |
| < 60 HRC          |   |   |
| < 67 HRC          |   |   |
| GG                | ● | ● |
| GGG               | ● | ● |
| VA < 900 N        | ○ | ○ |
| VA > 900 N        |   | ○ |
| Titanium          |   |   |
| Titanium alloy    |   |   |
| Nickel base       |   |   |

| Brand                   | ATORN®                                                                            | ATORN®                                                                            | ATORN®                                                                            | ATORN®                                                                            | ATORN®                                                                            | ATORN®                                                                            | ATORN®                                                                             | ATORN®                                                                              | ATORN®                                                                              | ATORN®                                                                              |                                                                                     |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Article number          | 16800                                                                             | 16801                                                                             | 16802                                                                             | 16805                                                                             | 16806                                                                             | 16810                                                                             | 16812                                                                              | 16813                                                                               | 16626                                                                               | 16816                                                                               | 16817                                                                               |
|                         |  |  |  |  |  |  |  |  |  |  |  |
| Number of cutting edges | 2                                                                                 | 2                                                                                 | 2                                                                                 | 2                                                                                 | 2                                                                                 | 4                                                                                 | 4                                                                                  | 4                                                                                   | 4                                                                                   | 4                                                                                   | 4                                                                                   |
| Diameter range mm       | 0.1 - 0.9                                                                         | 0.2 - 3                                                                           | 0.2 - 3                                                                           | 0.2 - 0.9                                                                         | 0.2 - 3                                                                           | 3 - 20                                                                            | 3 - 20                                                                             | 3 - 25                                                                              | 4 - 20                                                                              | 3 - 20                                                                              | 3 - 16                                                                              |
| Cutting material        | VHM                                                                               | VHM                                                                               | VHM                                                                               | VHM                                                                               | VHM                                                                               | VHM                                                                               | VHM                                                                                | VHM                                                                                 | VHM                                                                                 | VHM                                                                                 | VHM                                                                                 |
| RockTec coating         | 52/65                                                                             | 52/65                                                                             | 52/65                                                                             | 52/65                                                                             | 52/65                                                                             | 52/65                                                                             | 52/65                                                                              | 52/65                                                                               | 65                                                                                  | 52/65                                                                               | 52/65                                                                               |
| Version                 | Short                                                                             | Long                                                                              | Long                                                                              | Short                                                                             | Long                                                                              | Short                                                                             | Long                                                                               | Overlong                                                                            | Short                                                                               | Short                                                                               | Short                                                                               |
| Type / Profile          | Mini shank                                                                        | Mini shank                                                                        | Mini torus                                                                        | Mini radius                                                                       | Mini radius                                                                       | Shank                                                                             | Shank                                                                              | Shank                                                                               | Shank                                                                               | Torus                                                                               | Torus                                                                               |
| Catalogue page          | 16.59                                                                             | 16.60                                                                             | 16.61                                                                             | 16.62                                                                             | 16.63                                                                             | 16.64                                                                             | 16.66                                                                              | 16.67                                                                               | 16.68                                                                               | 16.69                                                                               | 16.70                                                                               |

## Recommended application

● = well-suited ○ = limited suitability

|                   |   |   |   |   |   |   |   |   |   |   |   |
|-------------------|---|---|---|---|---|---|---|---|---|---|---|
| Aluminium < 8% Si |   |   |   |   |   |   |   |   |   |   |   |
| Aluminium > 8% Si |   |   |   |   |   |   |   |   |   |   |   |
| Copper            |   |   |   |   |   |   |   |   |   |   |   |
| Plastics          |   |   |   |   |   |   |   |   |   |   |   |
| Graphite          |   |   |   |   |   |   |   |   |   |   |   |
| Steel < 520 N     |   |   |   |   |   |   |   |   |   |   |   |
| Steel < 750 N     | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Steel < 900 N     | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Steel < 1100 N    | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Steel < 1200 N    | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Steel < 1400 N    | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Hardox            |   |   |   |   |   |   |   |   |   |   |   |
| < 50 HRC          | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| < 60 HRC          | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| < 67 HRC          | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| GG                |   |   |   |   |   |   |   |   |   |   |   |
| GGG               |   |   |   |   |   |   |   |   |   |   |   |
| VA < 900 N        |   |   |   |   |   |   |   |   |   |   |   |
| VA > 900 N        |   |   |   |   |   |   |   |   |   |   |   |
| Titanium          |   |   |   |   |   |   |   |   |   |   |   |
| Titanium alloy    |   |   |   |   |   |   |   |   |   |   |   |
| Nickel base       |   |   |   |   |   |   |   |   |   |   |   |

| Brand                   | ATORN®                                                                              | ATORN®                                                                              | ATORN®                                                                              | ATORN®                                                                              | ATORN®                                                                              | ATORN®                                                                              | ATORN®                                                                               | ATORN®                                                                                | ATORN®                                                                                | ATORN®                                                                                |
|-------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| Article number          | 16818                                                                               | 16819                                                                               | 16824                                                                               | 16825                                                                               | 16827                                                                               | 16828                                                                               | 16829                                                                                | 16830                                                                                 | 16831                                                                                 | 16832                                                                                 |
|                         |  |  |  |  |  |  |  |  |  |  |
| Number of cutting edges | 4                                                                                   | 4                                                                                   | 6-8                                                                                 | 6-8                                                                                 | 2                                                                                   | 2                                                                                   | 2                                                                                    | 4                                                                                     | 4                                                                                     | 4-6                                                                                   |
| Diameter range mm       | 3 - 16                                                                              | 3 - 16                                                                              | 3 - 20                                                                              | 3 - 20                                                                              | 2 - 20                                                                              | 2 - 20                                                                              | 2 - 20                                                                               | 3 - 20                                                                                | 3 - 20                                                                                | 4 - 12                                                                                |
| Cutting material        | VHM                                                                                 | VHM                                                                                 | VHM                                                                                 | VHM                                                                                 | VHM                                                                                 | VHM                                                                                 | VHM                                                                                  | VHM                                                                                   | VHM                                                                                   | VHM                                                                                   |
| RockTec coating         | 52/65                                                                               | 52/65                                                                               | 52/65                                                                               | 52/65                                                                               | 52/65                                                                               | 52/65                                                                               | 52/65                                                                                | 52/65                                                                                 | 52/65                                                                                 | 65                                                                                    |
| Version                 | Long                                                                                | Overlong                                                                            | Short                                                                               | Long                                                                                | Short                                                                               | Long                                                                                | Overlong                                                                             | Short                                                                                 | Long                                                                                  | Extra short                                                                           |
| Type / Profile          | Torus                                                                               | Torus                                                                               | Multi-tooth                                                                         | Multi-tooth                                                                         | Radius                                                                              | Radius                                                                              | Radius                                                                               | Radius                                                                                | Radius                                                                                | High feed                                                                             |
| Catalogue page          | 16.71                                                                               | 16.71                                                                               | 16.72                                                                               | 16.72                                                                               | 16.73                                                                               | 16.73                                                                               | 16.74                                                                                | 16.76                                                                                 | 16.76                                                                                 | 16.77                                                                                 |

## Recommended application

● = well-suited ○ = limited suitability

|                   |   |   |   |   |   |   |   |   |   |   |
|-------------------|---|---|---|---|---|---|---|---|---|---|
| Aluminium < 8% Si |   |   |   |   |   |   |   |   |   |   |
| Aluminium > 8% Si |   |   |   |   |   |   |   |   |   |   |
| Copper            |   |   |   |   |   |   |   |   |   |   |
| Plastics          |   |   |   |   |   |   |   |   |   |   |
| Graphite          |   |   |   |   |   |   |   |   |   |   |
| Steel < 520 N     |   |   |   |   |   |   |   |   |   |   |
| Steel < 750 N     | ● | ● | ● | ● | ● | ● | ● | ● | ● |   |
| Steel < 900 N     | ● | ● | ● | ● | ● | ● | ● | ● | ● |   |
| Steel < 1100 N    | ● | ● | ● | ● | ● | ● | ● | ● | ● |   |
| Steel < 1200 N    | ● | ● | ● | ● | ● | ● | ● | ● | ● |   |
| Steel < 1400 N    | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Hardox            |   |   |   |   |   |   |   |   |   |   |
| < 50 HRC          | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| < 60 HRC          | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| < 67 HRC          | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| GG                |   |   |   |   |   |   |   |   |   |   |
| GGG               |   |   |   |   |   |   |   |   |   |   |
| VA < 900 N        |   |   |   |   |   |   |   |   |   |   |
| VA > 900 N        |   |   |   |   |   |   |   |   |   |   |
| Titanium          |   |   |   |   |   |   |   |   |   |   |
| Titanium alloy    |   |   |   |   |   |   |   |   |   |   |
| Nickel base       |   |   |   |   |   |   |   |   |   |   |

| Brand                   | HHW                                                                               | HHW                                                                               | HHW                                                                               | HHW                                                                               | HHW                                                                               | HHW                                                                               | HHW                                                                                | HHW                                                                                 |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Article number          | 16601                                                                             | 16604                                                                             | 16609                                                                             | 16613                                                                             | 16619                                                                             | 16621                                                                             | 16625                                                                              | 16637                                                                               |
|                         |  |  |  |  |  |  |  |  |
| Number of cutting edges | 2                                                                                 | 2                                                                                 | 4                                                                                 | 4                                                                                 | 6                                                                                 | 2                                                                                 | 4                                                                                  | 4                                                                                   |
| Diameter range mm       | 3 - 25                                                                            | 3 - 25                                                                            | 3 - 25                                                                            | 3 - 20                                                                            | 6 - 25                                                                            | 2 - 20                                                                            | 2 - 20                                                                             | 6 - 12                                                                              |
| Cutting material        | VHM                                                                               | VHM                                                                               | VHM                                                                               | VHM                                                                               | VHM                                                                               | VHM                                                                               | VHM                                                                                | VHM                                                                                 |
| Coating                 | TiAlN                                                                             | TiAlN                                                                             | TiAlN                                                                             | TiAlN                                                                             | TiAlN                                                                             | TiAlN                                                                             | TiAlN                                                                              | TiAlN                                                                               |
| Version                 | Short                                                                             | Long                                                                              | Short                                                                             | Long                                                                              | Overlong                                                                          | Long                                                                              | Long                                                                               | Long                                                                                |
| Type / Profile          | HSC                                                                               | HSC                                                                               | HSC                                                                               | HSC                                                                               | HSC                                                                               | HSC                                                                               | HSC                                                                                | HSC                                                                                 |
| Catalogue page          | 16.64                                                                             | 16.64                                                                             | 16.65                                                                             | 16.65                                                                             | 16.66                                                                             | 16.74                                                                             | 16.75                                                                              | 16.70                                                                               |

## Recommended application

● = well-suited ○ = limited suitability

|                   |   |   |   |   |   |   |   |   |
|-------------------|---|---|---|---|---|---|---|---|
| Aluminium < 8% Si |   |   |   |   |   |   |   |   |
| Aluminium > 8% Si |   |   |   |   |   |   |   |   |
| Copper            |   |   |   |   |   |   |   |   |
| Plastics          |   |   |   |   |   |   |   |   |
| Graphite          |   |   |   |   |   |   |   |   |
| Steel < 520 N     |   |   |   |   |   |   |   |   |
| Steel < 750 N     | ● |   |   |   |   |   |   |   |
| Steel < 900 N     | ● |   |   |   |   |   |   |   |
| Steel < 1100 N    | ● | ● | ● | ● | ● | ● | ● | ● |
| Steel < 1200 N    | ● | ● | ● | ● | ● | ● | ● | ● |
| Steel < 1400 N    | ● | ● | ● | ● | ● | ● | ● | ● |
| Hardox            |   |   |   |   |   |   |   |   |
| < 50 HRC          | ● | ● | ● | ● | ● | ● | ● | ● |
| < 60 HRC          | ● | ● | ● | ● | ● | ● | ● | ● |
| < 67 HRC          |   |   |   |   |   |   |   |   |
| GG                |   |   |   |   |   |   |   |   |
| GGG               |   |   |   |   |   |   |   |   |
| VA < 900 N        |   |   |   |   |   |   |   |   |
| VA > 900 N        |   |   |   |   |   |   |   |   |
| Titanium          |   |   |   |   |   |   |   |   |
| Titanium alloy    |   |   |   |   |   |   |   |   |
| Nickel base       |   |   |   |   |   |   |   |   |

# Info

## Overview of MS milling cutters (I)

| Brand                   | ATORN®                                                                            | ATORN®                                                                            | ATORN®                                                                            | ATORN®                                                                            | ATORN®                                                                            | ATORN®                                                                            | ATORN®                                                                              | ATORN®                                                                              | ATORN®                                                                              | ATORN®                                                                              | ATORN®                                                                              |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Article number          | 16400                                                                             | 16401                                                                             | 16402                                                                             | 16403 1..                                                                         | 16403 2..                                                                         | 16405 1..                                                                         | 16405 2..                                                                           | 16407 1..                                                                           | 16407 2..                                                                           | 16544 1..                                                                           | 16544 2..                                                                           |
|                         |  |  |  |  |  |  |  |  |  |  |  |
| Number of cutting edges | 2                                                                                 | 2                                                                                 | 2                                                                                 | 3                                                                                 | 3                                                                                 | 2                                                                                 | 2                                                                                   | 2                                                                                   | 2                                                                                   | 4                                                                                   | 4                                                                                   |
| Diameter range mm       | 0.5 - 4                                                                           | 0.5 - 4                                                                           | 0.5 - 4                                                                           | 3 - 20                                                                            | 3 - 20                                                                            | 3 - 20                                                                            | 3 - 20                                                                              | 3 - 20                                                                              | 3 - 20                                                                              | 4 - 20                                                                              | 4 - 20                                                                              |
| Cutting material        | VHM                                                                               | VHM                                                                               | VHM                                                                               | VHM                                                                               | VHM                                                                               | VHM                                                                               | VHM                                                                                 | VHM                                                                                 | VHM                                                                                 | VHM                                                                                 | VHM                                                                                 |
| Coating                 | AlCrN                                                                             | AlCrN                                                                             | AlCrN                                                                             | AlCrN                                                                             | AlCrN                                                                             | AlCrN                                                                             | AlCrN                                                                               | AlCrN                                                                               | AlCrN                                                                               | AlCrN                                                                               | AlCrN                                                                               |
| Version                 | Mini                                                                              | Mini                                                                              | Mini                                                                              | Short                                                                             | Short                                                                             | Short                                                                             | Short                                                                               | Long                                                                                | Long                                                                                | Short                                                                               | Short                                                                               |
| Type / Profile          | HPC                                                                               | HPC                                                                               | HPC                                                                               | HPC                                                                               | HPC                                                                               | HPC                                                                               | HPC                                                                                 | HPC                                                                                 | HPC                                                                                 | HPC                                                                                 | HPC                                                                                 |
| Catalogue page          | 16.78                                                                             | 16.79                                                                             | 16.80                                                                             | 16.80                                                                             | 16.80                                                                             | 16.81                                                                             | 16.81                                                                               | 16.81                                                                               | 16.81                                                                               | 16.82                                                                               | 16.82                                                                               |

### Recommended application

● = well-suited ○ = limited suitability

|                   |   |   |   |   |   |   |   |   |   |   |   |
|-------------------|---|---|---|---|---|---|---|---|---|---|---|
| Aluminium < 8% Si |   |   |   |   |   |   |   |   |   |   |   |
| Aluminium > 8% Si |   |   |   |   |   |   |   |   |   |   |   |
| Copper            |   |   |   |   |   |   |   |   |   |   |   |
| Plastic           |   |   |   |   |   |   |   |   |   |   |   |
| Graphite          |   |   |   |   |   |   |   |   |   |   |   |
| Steel < 520 N     |   |   |   |   |   |   |   |   |   |   |   |
| Steel < 750 N     |   |   |   |   |   |   |   |   |   |   |   |
| Steel < 900 N     | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Steel < 1100 N    | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Steel < 1200 N    | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Steel < 1400 N    | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Hardox            |   |   |   |   |   |   |   |   |   |   |   |
| < 50 HRC          |   |   |   |   |   |   |   |   |   |   |   |
| < 60 HRC          |   |   |   |   |   |   |   |   |   |   |   |
| < 67 HRC          |   |   |   |   |   |   |   |   |   |   |   |
| GG                |   |   |   |   |   |   |   |   |   |   |   |
| GGG               |   |   |   |   |   |   |   |   |   |   |   |
| VA < 900 N        | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| VA > 900 N        | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Titanium          | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Titanium alloy    | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Nickel base       | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |

| Brand                   | ATORN®    | ATORN®    | HHW    | HHW    |
|-------------------------|-----------|-----------|--------|--------|
| Article number          | 16550 3.. | 16550 4.. | 16525  | 16526  |
|                         |           |           |        |        |
| Number of cutting edges | 4         | 4         | 4      | 4      |
| Diameter range mm       | 4 - 20    | 4 - 20    | 3 - 20 | 3 - 20 |
| Cutting material        | VHM       | VHM       | VHM    | VHM    |
| Coating                 | AlCrN     | AlCrN     | Duocon | Duocon |
| Version                 | Short     | Short     | Short  | Long   |
| Type / Profile          | HPC       | HPC       | HPC    | HPC    |
| Catalogue page          | 16.82     | 16.82     | 16.84  | 16.84  |

### Recommended application

● = well-suited ○ = limited suitability

|                   |   |   |   |   |
|-------------------|---|---|---|---|
| Aluminium < 8% Si |   |   |   |   |
| Aluminium > 8% Si |   |   |   |   |
| Copper            |   |   |   |   |
| Plastic           |   |   |   |   |
| Graphite          |   |   |   |   |
| Steel < 520 N     |   |   |   |   |
| Steel < 750 N     |   |   |   |   |
| Steel < 900 N     | ○ | ○ |   |   |
| Steel < 1100 N    | ○ | ○ |   |   |
| Steel < 1200 N    | ○ | ○ |   |   |
| Steel < 1400 N    | ○ | ○ |   |   |
| Hardox            |   |   |   |   |
| < 50 HRC          |   |   |   |   |
| < 60 HRC          |   |   |   |   |
| < 67 HRC          |   |   |   |   |
| GG                |   |   |   |   |
| GGG               |   |   |   |   |
| VA < 900 N        | ● | ● | ● | ● |
| VA > 900 N        | ● | ● | ● | ● |
| Titanium          | ● | ● |   |   |
| Titanium alloy    | ● | ● |   |   |
| Nickel base       | ● | ● |   |   |

| Brand                   | ATORN®                                                                            | ATORN®                                                                            | ATORN®                                                                            | ATORN®                                                                            | ATORN®                                                                            | ATORN®                                                                            | ATORN®                                                                              | ATORN®                                                                              | ATORN®                                                                              | ATORN®                                                                              |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Article number          | 16710                                                                             | 16711                                                                             | 16712                                                                             | 16715                                                                             | 16717                                                                             | 16718                                                                             | 16719                                                                               | 16722                                                                               | 16724                                                                               | 16725                                                                               |
|                         |  |  |  |  |  |  |  |  |  |  |
| Number of cutting edges | 2                                                                                 | 2                                                                                 | 2                                                                                 | 1                                                                                 | 2                                                                                 | 2                                                                                 | 2                                                                                   | 3                                                                                   | 3                                                                                   | 3                                                                                   |
| Diameter range mm       | 0.5 - 2.5                                                                         | 0.5 - 2.5                                                                         | 0.5 - 2.5                                                                         | 1.5 - 16                                                                          | 3 - 20                                                                            | 3 - 16                                                                            | 3 - 16                                                                              | 3 - 20                                                                              | 3 - 20                                                                              | 3 - 20                                                                              |
| Cutting material        | VHM                                                                               | VHM                                                                               | VHM                                                                               | VHM                                                                               | VHM                                                                               | VHM                                                                               | VHM                                                                                 | VHM                                                                                 | VHM                                                                                 | VHM                                                                                 |
| Coating                 | ZrCN Ultra-N                                                                      | ZrCN Ultra-N                                                                      | ZrCN Ultra-N                                                                      | Polished                                                                          | Polished                                                                          | ZrCN Ultra-N                                                                      | ZrCN Ultra-N                                                                        | Polished                                                                            | Polished                                                                            | Polished                                                                            |
| Version                 | Mini                                                                              | Mini                                                                              | Mini                                                                              | Short                                                                             | Short                                                                             | Short                                                                             | Short                                                                               | Short                                                                               | Short                                                                               | Short                                                                               |
| Type / Profile          | HSC                                                                               | HSC                                                                               | HSC                                                                               | HSC                                                                               | HSC                                                                               | HSC                                                                               | HSC                                                                                 | HSC                                                                                 | HSC                                                                                 | HSC                                                                                 |
| Catalogue page          | 16.89                                                                             | 16.90                                                                             | 16.90                                                                             | 16.90                                                                             | 16.91                                                                             | 16.91                                                                             | 16.91                                                                               | 16.91                                                                               | 16.91                                                                               | 16.92                                                                               |

## Recommended application

● = well-suited ○ = limited suitability

|                   |   |   |   |   |   |   |   |   |   |   |
|-------------------|---|---|---|---|---|---|---|---|---|---|
| Aluminium < 8% Si | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Aluminium > 8% Si | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Copper            | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Plastic           | ○ | ○ | ○ | ● | ● | ○ | ○ | ● | ● | ● |
| Graphite          |   |   |   |   |   |   |   |   |   |   |
| Steel < 520 N     |   |   |   |   |   |   |   |   |   |   |
| Steel < 750 N     |   |   |   |   |   |   |   |   |   |   |
| Steel < 900 N     |   |   |   |   |   |   |   |   |   |   |
| Steel < 1100 N    |   |   |   |   |   |   |   |   |   |   |
| Steel < 1200 N    |   |   |   |   |   |   |   |   |   |   |
| Steel < 1400 N    |   |   |   |   |   |   |   |   |   |   |
| Hardox            |   |   |   |   |   |   |   |   |   |   |
| < 50 HRC          |   |   |   |   |   |   |   |   |   |   |
| < 60 HRC          |   |   |   |   |   |   |   |   |   |   |
| < 67 HRC          |   |   |   |   |   |   |   |   |   |   |
| GG                |   |   |   |   |   |   |   |   |   |   |
| GGG               |   |   |   |   |   |   |   |   |   |   |
| VA < 900 N        |   |   |   |   |   |   |   |   |   |   |
| VA > 900 N        |   |   |   |   |   |   |   |   |   |   |
| Titanium          |   |   |   |   |   |   |   |   |   |   |
| Titanium alloy    |   |   |   |   |   |   |   |   |   |   |
| Nickel base       |   |   |   |   |   |   |   |   |   |   |

| Brand                   | ATORN®                                                                              | ATORN®                                                                              | ATORN®                                                                              | ATORN®                                                                              | ATORN®                                                                              | ATORN®                                                                              | H-W                                                                                   | ATORN®                                                                                | ATORN®                                                                                | ATORN®                                                                                |
|-------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| Article number          | 16726                                                                               | 16727                                                                               | 16728                                                                               | 16729                                                                               | 16730                                                                               | 16731                                                                               | 16758                                                                                 | 16732                                                                                 | 16734                                                                                 | 16735                                                                                 |
|                         |  |  |  |  |  |  |  |  |  |  |
| Number of cutting edges | 3                                                                                   | 3                                                                                   | 3                                                                                   | 3                                                                                   | 3                                                                                   | 3                                                                                   | 3                                                                                     | 3                                                                                     | 3                                                                                     | 3                                                                                     |
| Diameter range mm       | 3 - 20                                                                              | 3 - 20                                                                              | 3 - 20                                                                              | 3 - 20                                                                              | 3 - 20                                                                              | 3 - 20                                                                              | 3 - 25                                                                                | 6 - 20                                                                                | 6 - 20                                                                                | 6 - 20                                                                                |
| Cutting material        | VHM                                                                                 | VHM                                                                                 | VHM                                                                                 | VHM                                                                                 | VHM                                                                                 | VHM                                                                                 | VHM                                                                                   | VHM                                                                                   | VHM                                                                                   | VHM                                                                                   |
| Coating                 | ZrCN Ultra-N                                                                        | ZrCN Ultra-N                                                                        | ZrCN Ultra-N                                                                        | Polished                                                                            | ZrCN Ultra-N                                                                        | ZrCN Ultra-N                                                                        | ZrN                                                                                   | ZrCN Ultra-N                                                                          | ZrCN Ultra-N                                                                          | ZrCN Ultra-N                                                                          |
| Version                 | Short                                                                               | Short                                                                               | Short                                                                               | Long                                                                                | Long                                                                                | Long                                                                                | Short/long                                                                            | Short                                                                                 | Short                                                                                 | Short                                                                                 |
| Type / Profile          | HPC                                                                                 | HPC                                                                                 | HPC                                                                                 | HSC                                                                                 | HPC                                                                                 | HPC                                                                                 | HPC                                                                                   | HPC                                                                                   | HPC                                                                                   | HPC                                                                                   |
| Catalogue page          | 16.92                                                                               | 16.92                                                                               | 16.92                                                                               | 16.93                                                                               | 16.93                                                                               | 16.93                                                                               | 16.94                                                                                 | 16.94                                                                                 | 16.94                                                                                 | 16.95                                                                                 |

## Recommended application

● = well-suited ○ = limited suitability

|                   |   |   |   |   |   |   |   |   |   |   |
|-------------------|---|---|---|---|---|---|---|---|---|---|
| Aluminium < 8% Si | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Aluminium > 8% Si | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Copper            | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Plastic           | ○ | ○ | ○ | ● | ○ | ● | ○ | ○ | ○ | ○ |
| Graphite          |   |   |   |   |   |   |   |   |   |   |
| Steel < 520 N     |   |   |   |   |   |   |   |   |   |   |
| Steel < 750 N     |   |   |   |   |   |   |   |   |   |   |
| Steel < 900 N     |   |   |   |   |   |   |   |   |   |   |
| Steel < 1100 N    |   |   |   |   |   |   |   |   |   |   |
| Steel < 1200 N    |   |   |   |   |   |   |   |   |   |   |
| Steel < 1400 N    |   |   |   |   |   |   |   |   |   |   |
| Hardox            |   |   |   |   |   |   |   |   |   |   |
| < 50 HRC          |   |   |   |   |   |   |   |   |   |   |
| < 60 HRC          |   |   |   |   |   |   |   |   |   |   |
| < 67 HRC          |   |   |   |   |   |   |   |   |   |   |
| GG                |   |   |   |   |   |   |   |   |   |   |
| GGG               |   |   |   |   |   |   |   |   |   |   |
| VA < 900 N        |   |   |   |   |   |   |   |   |   |   |
| VA > 900 N        |   |   |   |   |   |   |   |   |   |   |
| Titanium          |   |   |   |   |   |   |   |   |   |   |
| Titanium alloy    |   |   |   |   |   |   |   |   |   |   |
| Nickel base       |   |   |   |   |   |   |   |   |   |   |

| Brand                   | ATORN®                                                                            |                                                                                   | ATORN®                                                                            |                                                                                   | ATORN®                                                                            |                                                                                   | ATORN®                                                                              |                                                                                     | ATORN®                                                                              |                                                                                     |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Article number          | 16564                                                                             | 16737                                                                             | 16738                                                                             | 16739                                                                             | 16740                                                                             | 16741                                                                             | 16742                                                                               | 16745                                                                               | 16746                                                                               | 16747                                                                               |
|                         |  |  |  |  |  |  |  |  |  |  |
| Number of cutting edges | 3                                                                                 | 4                                                                                 | 4                                                                                 | 4                                                                                 | 4                                                                                 | 4                                                                                 | 4                                                                                   | 2                                                                                   | 2                                                                                   | 2                                                                                   |
| Diameter range mm       | 6 - 20                                                                            | 3 - 20                                                                            | 3 - 20                                                                            | 4 - 16                                                                            | 6 - 16                                                                            | 3 - 20                                                                            | 4 - 20                                                                              | 3 - 16                                                                              | 3 - 16                                                                              | 6 - 16                                                                              |
| Cutting material        | VHM                                                                               | VHM                                                                               | VHM                                                                               | VHM                                                                               | VHM                                                                               | VHM                                                                               | VHM                                                                                 | VHM                                                                                 | VHM                                                                                 | VHM                                                                                 |
| Coating                 | CALIDAZ                                                                           | ZrCN Ultra-N                                                                      | ZrCN Ultra-N                                                                      | ZrCN Ultra-N                                                                      | ZrCN Ultra-N                                                                      | ZrCN Ultra-N                                                                      | ZrCN Ultra-N                                                                        | ZrCN Ultra-N                                                                        | ZrCN Ultra-N                                                                        | ZrCN Ultra-N                                                                        |
| Version                 | Short                                                                             | Short                                                                             | Short                                                                             | Long                                                                              | Overlong                                                                          | Short                                                                             | Long                                                                                | Short                                                                               | Long                                                                                | Overlong                                                                            |
| Type / Profile          | HPC                                                                               | HPC                                                                               | HPC                                                                               | HPC                                                                               | HPC                                                                               | HPC                                                                               | HPC                                                                                 | -                                                                                   | -                                                                                   | -                                                                                   |
| Catalogue page          | 16.95                                                                             | 16.95                                                                             | 16.95                                                                             | 16.96                                                                             | 16.96                                                                             | 16.96                                                                             | 16.96                                                                               | 16.97                                                                               | 16.97                                                                               | 16.98                                                                               |
| Recommended application | ● = well-suited   ○ = limited suitability                                         |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Aluminium < 8% Si       | ●                                                                                 | ●                                                                                 | ●                                                                                 | ●                                                                                 | ●                                                                                 | ●                                                                                 | ●                                                                                   | ●                                                                                   | ●                                                                                   | ●                                                                                   |
| Aluminium > 8% Si       | ●                                                                                 | ●                                                                                 | ●                                                                                 | ●                                                                                 | ●                                                                                 | ●                                                                                 | ●                                                                                   | ●                                                                                   | ●                                                                                   | ●                                                                                   |
| Copper                  | ●                                                                                 | ●                                                                                 | ●                                                                                 | ●                                                                                 | ●                                                                                 | ●                                                                                 | ●                                                                                   | ●                                                                                   | ●                                                                                   | ●                                                                                   |
| Plastic                 |                                                                                   | ○                                                                                 | ○                                                                                 | ○                                                                                 | ○                                                                                 | ○                                                                                 | ○                                                                                   | ○                                                                                   | ○                                                                                   | ○                                                                                   |
| Graphite                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Steel < 520 N           |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Steel < 750 N           |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Steel < 900 N           |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Steel < 1100 N          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Steel < 1200 N          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Steel < 1400 N          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Hardox                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| < 50 HRC                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| < 60 HRC                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| < 67 HRC                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| GG                      | ●                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| GGG                     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| VA < 900 N              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| VA > 900 N              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Titanium                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Titanium alloy          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Nickel base             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

| Brand                   | ATORN®                                                                              | ATORN®                                                                              | ATORN®                                                                              | ATORN®                                                                              | ATORN®                                                                              |
|-------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Article number          | 16748                                                                               | 16749                                                                               | 16755                                                                               | 16756                                                                               | 16757                                                                               |
|                         |  |  |  |  |  |
| Number of cutting edges | 3                                                                                   | 3                                                                                   | 2                                                                                   | 2                                                                                   | 2                                                                                   |
| Diameter range mm       | 5 - 20                                                                              | 5 - 20                                                                              | 3 - 16                                                                              | 3 - 16                                                                              | 3 - 12                                                                              |
| Cutting material        | VHM                                                                                 | VHM                                                                                 | VHM                                                                                 | VHM                                                                                 | VHM                                                                                 |
| Coating                 | ZrCN Ultra-N                                                                        | ZrCN Ultra-N                                                                        | ZrCN Ultra-N                                                                        | ZrCN Ultra-N                                                                        | ZrCN Ultra-N                                                                        |
| Version                 | Short                                                                               | Short                                                                               | Short                                                                               | Long                                                                                | Overlong                                                                            |
| Type / Profile          | HPC                                                                                 | HPC                                                                                 | -                                                                                   | -                                                                                   | HPC                                                                                 |
| Catalogue page          | 16.98                                                                               | 16.98                                                                               | 16.99                                                                               | 16.99                                                                               | 16.99                                                                               |
| Recommended application | ● = well-suited ○ = limited suitability                                             |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Aluminium < 8% Si       | ●                                                                                   | ●                                                                                   | ●                                                                                   | ●                                                                                   | ●                                                                                   |
| Aluminium > 8% Si       | ●                                                                                   | ●                                                                                   | ●                                                                                   | ●                                                                                   | ●                                                                                   |
| Copper                  | ●                                                                                   | ●                                                                                   | ●                                                                                   | ●                                                                                   | ●                                                                                   |
| Plastic                 | ○                                                                                   | ○                                                                                   | ○                                                                                   | ○                                                                                   | ○                                                                                   |
| Graphite                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Steel < 520 N           |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Steel < 750 N           |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Steel < 900 N           |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Steel < 1100 N          |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Steel < 1200 N          |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Steel < 1400 N          |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Hardox                  |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| < 50 HRC                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| < 60 HRC                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| < 67 HRC                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| GG                      |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| GGG                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| VA < 900 N              |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| VA > 900 N              |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Titanium                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Titanium alloy          |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Nickel base             |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |



| Brand                   | ATORN®                                                                            | ATORN®                                                                            | ATORN®                                                                            | ATORN®                                                                            | ATORN®                                                                            | ATORN®                                                                            | ATORN®                                                                              | ATORN®                                                                              | ATORN®                                                                              | ATORN®                                                                              |
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| Article number          | 16886                                                                             | 16887                                                                             | 16888                                                                             | 16889                                                                             | 16890                                                                             | 16891                                                                             | 16892                                                                               | 16893                                                                               | 16894                                                                               | 16895                                                                               |
|                         |  |  |  |  |  |  |  |  |  |  |
| Number of cutting edges | 1                                                                                 | 2 - 4                                                                             | 2                                                                                 | 3                                                                                 | 3                                                                                 | 3                                                                                 | 4                                                                                   | 2                                                                                   | 2                                                                                   | 3                                                                                   |
| Diameter range mm       | 1 - 12                                                                            | 3 - 20                                                                            | 3 - 20                                                                            | 4 - 20                                                                            | 6 - 20                                                                            | 3 - 20                                                                            | 3 - 20                                                                              | 3 - 16                                                                              | 3 - 16                                                                              | 6 - 20                                                                              |
| Cutting material        | VHM                                                                               | VHM                                                                               | VHM                                                                               | VHM                                                                               | VHM                                                                               | VHM                                                                               | VHM                                                                                 | VHM                                                                                 | VHM                                                                                 | VHM                                                                                 |
| Coating                 | Ultra Npro                                                                        | Ultra Npro                                                                        | Ultra Npro                                                                        | Ultra Npro                                                                        | Ultra Npro                                                                        | Ultra Npro                                                                        | Ultra Npro                                                                          | Ultra Npro                                                                          | Ultra Npro                                                                          | Ultra Npro                                                                          |
| Version                 | Medium                                                                            | Medium                                                                            | Medium                                                                            | Long                                                                              | Long                                                                              | Short                                                                             | Medium                                                                              | Short                                                                               | Long                                                                                | Long                                                                                |
| Type / Profile          | WF                                                                                | WF                                                                                | WF                                                                                | WF                                                                                | WF                                                                                | WF                                                                                | WF                                                                                  | WF                                                                                  | WF                                                                                  | T                                                                                   |
| Catalogue page          | 16.100                                                                            | 16.100                                                                            | 16.101                                                                            | 16.102                                                                            | 16.102                                                                            | 16.101                                                                            | 16.104                                                                              | 16.104                                                                              | 16.105                                                                              | 16.105                                                                              |
| Recommended application | ● = well-suited   ○ = limited suitability                                         |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Aluminium < 8% Si       | ●                                                                                 | ●                                                                                 | ●                                                                                 | ●                                                                                 | ●                                                                                 | ●                                                                                 | ●                                                                                   | ●                                                                                   | ●                                                                                   | ●                                                                                   |
| Aluminium > 8% Si       | ●                                                                                 | ●                                                                                 | ●                                                                                 | ●                                                                                 | ●                                                                                 | ●                                                                                 | ●                                                                                   | ●                                                                                   | ●                                                                                   | ●                                                                                   |
| Copper alloy Bronze     | ●                                                                                 | ●                                                                                 | ●                                                                                 | ●                                                                                 | ●                                                                                 | ●                                                                                 | ●                                                                                   | ●                                                                                   | ●                                                                                   | ●                                                                                   |
| Copper alloy Brass      | ●                                                                                 | ●                                                                                 | ●                                                                                 | ●                                                                                 | ●                                                                                 | ●                                                                                 | ●                                                                                   | ●                                                                                   | ●                                                                                   | ●                                                                                   |
| Graphite                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Duro                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Thermo                  | ○                                                                                 | ○                                                                                 | ○                                                                                 | ○                                                                                 | ○                                                                                 | ○                                                                                 | ○                                                                                   | ○                                                                                   | ○                                                                                   | ○                                                                                   |
| GFK                     | ○                                                                                 | ○                                                                                 | ○                                                                                 | ○                                                                                 | ○                                                                                 | ○                                                                                 |                                                                                     | ○                                                                                   | ○                                                                                   | ○                                                                                   |
| CFK                     | ○                                                                                 | ○                                                                                 | ○                                                                                 | ○                                                                                 | ○                                                                                 | ○                                                                                 |                                                                                     | ○                                                                                   | ○                                                                                   | ○                                                                                   |
| Aramid                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Composite ceramic       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Fibre plast             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Honeycomb               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| < 60 HRC                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| < 67 HRC                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| GG                      |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| GGG                     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| VA < 900 N              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| VA > 900 N              |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Titanium                |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Titanium alloy          |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Nickel base             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

| Brand                   | ATORN®                                                                              | ATORN®                                                                              | ATORN®                                                                              | ATORN®                                                                              | ATORN®                                                                              |
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| Article number          | 16896                                                                               | 16897                                                                               | 16898 1..                                                                           | 16898 2..                                                                           | 16899                                                                               |
|                         |  |  |  |  |  |
| Number of cutting edges | 2                                                                                   | 2                                                                                   | 3                                                                                   | 3                                                                                   | 3                                                                                   |
| Diameter range mm       | 3 - 16                                                                              | 3 - 16                                                                              | 6 - 20                                                                              | 6 - 20                                                                              | 6 - 20                                                                              |
| Cutting material        | VHM                                                                                 | VHM                                                                                 | VHM                                                                                 | VHM                                                                                 | VHM                                                                                 |
| Coating                 | Ultra Npro                                                                          | Ultra Npro                                                                          | Ultra Npro                                                                          | Ultra Npro                                                                          | Ultra Npro                                                                          |
| Version                 | Medium                                                                              | Long                                                                                | Medium                                                                              | Medium                                                                              | Long                                                                                |
| Type / Profile          | WF                                                                                  | WF                                                                                  | WR                                                                                  | WR                                                                                  | T                                                                                   |
| Catalogue page          | 16.106                                                                              | 16.106                                                                              | 16.103                                                                              | 16.103                                                                              | 16.103                                                                              |
| Recommended application | ● = well-suited ○ = limited suitability                                             |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Aluminium < 8% Si       | ●                                                                                   | ●                                                                                   | ●                                                                                   | ●                                                                                   | ●                                                                                   |
| Aluminium > 8% Si       | ●                                                                                   | ●                                                                                   | ●                                                                                   | ●                                                                                   | ●                                                                                   |
| Copper alloy Bronze     | ●                                                                                   | ●                                                                                   | ●                                                                                   | ●                                                                                   | ●                                                                                   |
| Copper alloy Brass      | ●                                                                                   | ●                                                                                   | ●                                                                                   | ●                                                                                   | ●                                                                                   |
| Graphite                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Duro                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Thermo                  | ○                                                                                   | ○                                                                                   | ○                                                                                   | ○                                                                                   | ○                                                                                   |
| GFK                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     | ○                                                                                   |
| CFK                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     | ○                                                                                   |
| Aramid                  |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Composite ceramic       |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Fibre plast             |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Honeycomb               |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| < 60 HRC                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| < 67 HRC                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| GG                      |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| GGG                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| VA < 900 N              |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| VA > 900 N              |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Titanium                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Titanium alloy          |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Nickel base             |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

| Brand                   | ATORN®                                                                            | ATORN®                                                                            | ATORN®                                                                            | ATORN®                                                                            | ATORN®                                                                            | ATORN®                                                                            | ATORN®                                                                              | ATORN®                                                                              | ATORN®                                                                              |                                                                                     |
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| Article number          | 16909 101-104                                                                     | 16909 105-108                                                                     | 16909 109-112                                                                     | 16911 103-108                                                                     | 16911 111-118                                                                     | 16912                                                                             | 16913                                                                               | 16914                                                                               | 16915                                                                               | 16916                                                                               |
|                         |  |  |  |  |  |  |  |  |  |  |
| Number of cutting edges | -                                                                                 | -                                                                                 | -                                                                                 | 5                                                                                 | 6                                                                                 | -                                                                                 | -                                                                                   | -                                                                                   | -                                                                                   | 2                                                                                   |
| Diameter range mm       | 6 - 12                                                                            | 6 - 12                                                                            | 6 - 12                                                                            | 4 - 12                                                                            | 4 - 12                                                                            | 4 - 12                                                                            | 4 - 12                                                                              | 4 - 12                                                                              | 6 - 20                                                                              | 4 - 12                                                                              |
| Cutting material        | VHM                                                                               | VHM                                                                               | VHM                                                                               | VHM                                                                               | VHM                                                                               | VHM                                                                               | VHM                                                                                 | VHM                                                                                 | VHM                                                                                 | VHM                                                                                 |
| Coating                 | Dia. HC                                                                           | Dia. HC                                                                           | Dia. HC                                                                           | Dia. HC                                                                           | Dia. HC                                                                           | -                                                                                 | -                                                                                   | -                                                                                   | -                                                                                   | -                                                                                   |
| Version                 | Short                                                                             | Medium                                                                            | Long                                                                              | Medium                                                                            | Medium                                                                            | Medium                                                                            | Medium                                                                              | Medium                                                                              | Medium                                                                              | Medium                                                                              |
| Type / Profile          | W                                                                                 | W                                                                                 | W                                                                                 | W                                                                                 | W                                                                                 | WF                                                                                | WN                                                                                  | WR                                                                                  | WN                                                                                  | WF                                                                                  |
| Catalogue page          | 16.110                                                                            | 16.110                                                                            | 16.110                                                                            | 16.110                                                                            | 16.110                                                                            | 16.111                                                                            | 16.111                                                                              | 16.111                                                                              | 16.111                                                                              | 16.112                                                                              |

## Recommended application

● = well-suited ○ = limited suitability

|                     |   |   |   |   |   |   |   |   |   |   |
|---------------------|---|---|---|---|---|---|---|---|---|---|
| Aluminium < 8% Si   |   |   |   |   |   |   |   |   |   |   |
| Aluminium > 8% Si   |   |   |   |   |   |   |   |   |   |   |
| Copper alloy Bronze |   |   |   |   |   |   |   |   |   |   |
| Copper alloy Brass  |   |   |   |   |   |   |   |   |   |   |
| Graphite            |   |   |   |   |   |   |   |   |   |   |
| Duro                |   |   |   |   |   |   |   |   |   |   |
| Thermo              |   |   |   |   |   |   |   |   |   |   |
| GFK                 | ● | ● | ● | ● | ● | ● | ● | ● |   | ● |
| CFK                 | ● | ● | ● | ● | ● | ● | ● | ● |   | ● |
| Aramid              |   |   |   | ● | ● | ● | ● | ● |   | ● |
| Composite ceramic   |   |   |   |   |   |   |   |   |   |   |
| Fibre plast         | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |   | ○ |
| Honeycomb           |   |   |   |   |   |   |   |   | ● |   |
| < 60 HRC            |   |   |   |   |   |   |   |   |   |   |
| < 67 HRC            |   |   |   |   |   |   |   |   |   |   |
| GG                  |   |   |   |   |   |   |   |   |   |   |
| GGG                 |   |   |   |   |   |   |   |   |   |   |
| VA < 900 N          |   |   |   |   |   |   |   |   |   |   |
| VA > 900 N          |   |   |   |   |   |   |   |   |   |   |
| Titanium            |   |   |   |   |   |   |   |   |   |   |
| Titanium alloy      |   |   |   |   |   |   |   |   |   |   |
| Nickel base         |   |   |   |   |   |   |   |   |   |   |

| Brand                   | ATORN®                                                                              | ATORN®                                                                              | ATORN®                                                                              | ATORN®                                                                              | ATORN®                                                                              | ATORN®                                                                              | ATORN®                                                                                | ATORN®                                                                                | ATORN®                                                                                | ATORN®                                                                                |
|-------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| Article number          | 16917                                                                               | 16918                                                                               | 16919                                                                               | 16920                                                                               | 16921                                                                               | 16925                                                                               | 16926                                                                                 | 16927                                                                                 | 16928                                                                                 | 16933                                                                                 |
|                         |  |  |  |  |  |  |  |  |  |  |
| Number of cutting edges | 2                                                                                   | 2                                                                                   | 2                                                                                   | 2                                                                                   | 2                                                                                   | -                                                                                   | -                                                                                     | -                                                                                     | -                                                                                     | -                                                                                     |
| Diameter range mm       | 4 - 12                                                                              | 4 - 12                                                                              | 4 - 12                                                                              | 4 - 12                                                                              | 4 - 12                                                                              | 4 - 12                                                                              | 4 - 12                                                                                | 4 - 12                                                                                | 4 - 12                                                                                | 4 - 12                                                                                |
| Cutting material        | VHM                                                                                 | VHM                                                                                 | VHM                                                                                 | VHM                                                                                 | VHM                                                                                 | VHM                                                                                 | VHM                                                                                   | VHM                                                                                   | VHM                                                                                   | VHM                                                                                   |
| Coating                 | -                                                                                   | -                                                                                   | Dia. HC                                                                             | Dia. HC                                                                             | Dia. HC                                                                             | Dia. HC                                                                             | -                                                                                     | -                                                                                     | -                                                                                     | -                                                                                     |
| Version                 | Medium                                                                              | Medium                                                                              | Medium                                                                              | Medium                                                                              | Medium                                                                              | Medium                                                                              | Medium                                                                                | Medium                                                                                | Medium                                                                                | Medium                                                                                |
| Type / Profile          | WN                                                                                  | WR                                                                                  | WF                                                                                  | WN                                                                                  | WR                                                                                  | WN                                                                                  | WF                                                                                    | WN                                                                                    | WR                                                                                    | WN                                                                                    |
| Catalogue page          | 16.112                                                                              | 16.112                                                                              | 16.112                                                                              | 16.112                                                                              | 16.112                                                                              | 16.112                                                                              | 16.113                                                                                | 16.113                                                                                | 16.113                                                                                | 16.113                                                                                |

## Recommended application

● = well-suited ○ = limited suitability

|                     |   |   |   |   |   |   |   |   |   |   |
|---------------------|---|---|---|---|---|---|---|---|---|---|
| Aluminium < 8% Si   |   |   |   |   |   |   |   |   |   |   |
| Aluminium > 8% Si   |   |   |   |   |   |   |   |   |   |   |
| Copper alloy Bronze |   |   |   |   |   |   |   |   |   |   |
| Copper alloy Brass  |   |   |   |   |   |   |   |   |   |   |
| Graphite            |   |   |   |   |   |   |   |   |   |   |
| Duro                |   |   |   |   |   |   |   |   |   |   |
| Thermo              |   |   |   |   |   |   |   |   |   |   |
| GFK                 | ● | ● | ● | ● | ● | ● | ● | ● | ● |   |
| CFK                 | ● | ● | ● | ● | ● | ● | ● | ● | ● |   |
| Aramid              | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Composite ceramic   |   |   |   |   |   |   |   |   |   |   |
| Fibre plast         | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |   |
| Honeycomb           |   |   |   |   |   |   | ○ | ○ | ○ |   |
| < 60 HRC            |   |   |   |   |   |   |   |   |   |   |
| < 67 HRC            |   |   |   |   |   |   |   |   |   |   |
| GG                  |   |   |   |   |   |   |   |   |   |   |
| GGG                 |   |   |   |   |   |   |   |   |   |   |
| VA < 900 N          |   |   |   |   |   |   |   |   |   |   |
| VA > 900 N          |   |   |   |   |   |   |   |   |   |   |
| Titanium            |   |   |   |   |   |   |   |   |   |   |
| Titanium alloy      |   |   |   |   |   |   |   |   |   |   |
| Nickel base         |   |   |   |   |   |   |   |   |   |   |



| Brand                   | HHW                                                                               | ATORN®                                                                            | ATORN®                                                                            | ATORN®                                                                            |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| Article number          | 16702                                                                             | 16703                                                                             | 16704                                                                             | 16705                                                                             |
|                         |  |  |  |  |
| Number of cutting edges | 2 - 3                                                                             | 4                                                                                 | 2                                                                                 | 2                                                                                 |
| Diameter range mm       | 2 - 12                                                                            | 4 - 16                                                                            | 0.2 - 12                                                                          | 0.2 - 12                                                                          |
| Cutting material        | VHM                                                                               | VHM                                                                               | VHM                                                                               | VHM                                                                               |
| Coating                 | Diamond                                                                           | Diamond                                                                           | Diamond                                                                           | Diamond                                                                           |
| Version                 | Long/overlong                                                                     | Short/long                                                                        | Short/long                                                                        | Short/long                                                                        |
| Type / Profile          | GFK                                                                               | GFK                                                                               | GFK                                                                               | GFK                                                                               |
| Catalogue page          | 16.107                                                                            | 16.107                                                                            | 16.108                                                                            | 16.109                                                                            |

## Recommended application

|                   |   |   |   |   |
|-------------------|---|---|---|---|
| Aluminium < 8% Si |   |   |   |   |
| Aluminium > 8% Si |   |   |   |   |
| Copper            |   |   |   |   |
| Plastic           | ● | ● | ● | ● |
| Graphite          | ● | ● | ● | ● |
| Steel < 520 N     |   |   |   |   |
| Steel < 750 N     |   |   |   |   |
| Steel < 900 N     |   |   |   |   |
| Steel < 1100 N    |   |   |   |   |
| Steel < 1200 N    |   |   |   |   |
| Steel < 1400 N    |   |   |   |   |
| Hardox            |   |   |   |   |
| < 50 HRC          |   |   |   |   |
| < 60 HRC          |   |   |   |   |
| < 67 HRC          |   |   |   |   |
| GG                |   |   |   |   |
| GGG               |   |   |   |   |
| VA < 900 N        |   |   |   |   |
| VA > 900 N        |   |   |   |   |
| Titanium          |   |   |   |   |
| Titanium alloy    |   |   |   |   |
| Nickel base       |   |   |   |   |

| Brand                   | ATORN®                                                                            | ATORN®                                                                            | ATORN®                                                                            | ATORN®                                                                            | ATORN®                                                                            | ATORN®                                                                            | ATORN®                                                                             | ATORN®                                                                              | ATORN®                                                                              | ATORN®                                                                              | ATORN®                                                                              |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Article number          | 16763                                                                             | 16764                                                                             | 16765                                                                             | 16766                                                                             | 16767                                                                             | 16768                                                                             | 16769                                                                              | 16770                                                                               | 16771                                                                               | 16772                                                                               | 16773                                                                               |
|                         |  |  |  |  |  |  |  |  |  |  |  |
| Number of cutting edges | 4                                                                                 | 4-6                                                                               | 4-5                                                                               | 3                                                                                 | 2                                                                                 | 3                                                                                 | 4                                                                                  | 6-8                                                                                 | 4                                                                                   | 2                                                                                   | 2                                                                                   |
| Diameter range mm       | 10 - 20                                                                           | 10 - 20                                                                           | 10 - 20                                                                           | 10 - 20                                                                           | 10 - 20                                                                           | 10 - 20                                                                           | 10 - 20                                                                            | 10 - 20                                                                             | 10 - 20                                                                             | 10 - 20                                                                             | 10 - 20                                                                             |
| Cutting material        | VHM                                                                               | VHM                                                                               | VHM                                                                               | VHM                                                                               | VHM                                                                               | VHM                                                                               | VHM                                                                                | VHM                                                                                 | VHM                                                                                 | VHM                                                                                 | VHM                                                                                 |
| Coating                 | TiAlN                                                                             | AlTiN                                                                             | AlTiN                                                                             | ZrN                                                                               | TiAlN                                                                             | TiAlN                                                                             | TiAlN                                                                              | TiAlN                                                                               | Naco-blue                                                                           | AlTiN                                                                               | Naco-blue                                                                           |
| Version                 | -                                                                                 | -                                                                                 | -                                                                                 | -                                                                                 | -                                                                                 | -                                                                                 | -                                                                                  | -                                                                                   | -                                                                                   | -                                                                                   | -                                                                                   |
| Type / Profile          | HPC                                                                               | NRf-MTC                                                                           | NR-MTC                                                                            | HPC                                                                               | -                                                                                 | -                                                                                 | -                                                                                  | -                                                                                   | HPC/HSC                                                                             | HSC                                                                                 | HPC/HSC                                                                             |
| Catalogue page          | 16.115                                                                            | 16.115                                                                            | 16.115                                                                            | 16.116                                                                            | 16.116                                                                            | 16.116                                                                            | 16.116                                                                             | 16.117                                                                              | 16.117                                                                              | 16.117                                                                              | 16.118                                                                              |

## Recommended application

● = well-suited ○ = limited suitability

|                    |   |   |   |   |   |   |   |   |   |   |   |
|--------------------|---|---|---|---|---|---|---|---|---|---|---|
| Aluminium < 10% Si |   |   |   | ● | ● | ● | ● |   |   |   |   |
| Aluminium > 10% Si |   |   |   | ● | ● | ● | ● | ○ |   |   |   |
| Copper             |   |   |   | ● | ● | ● | ● |   |   |   |   |
| Plastic            |   |   |   | ● | ● | ● | ● |   |   |   |   |
| Graphite           |   |   |   |   |   |   |   |   |   |   |   |
| Steel < 520 N      | ● | ● | ● |   | ● | ● | ● | ● | ● | ● | ● |
| Steel < 750 N      | ● | ● | ● |   | ● | ● | ● | ● | ● | ● | ● |
| Steel < 900 N      | ● | ● | ● |   | ● | ● | ● | ● | ● | ● | ● |
| Steel < 1100 N     | ● | ● | ● |   | ● | ● | ● | ● | ● | ● | ● |
| Steel < 1200 N     | ● | ● | ● |   | ● | ● | ● | ● | ● | ● | ● |
| Steel < 1400 N     | ● | ● | ● |   | ● | ● | ● | ● | ● | ● | ● |
| Hardox             |   |   |   |   |   |   |   |   |   |   |   |
| < 50 HRC           |   |   |   |   |   |   |   |   |   | ● | ● |
| < 60 HRC           |   |   |   |   |   |   |   |   |   | ● | ● |
| < 67HRC            |   |   |   |   |   |   |   |   |   |   |   |
| GG                 | ● | ○ | ● |   | ● | ● | ● | ● |   |   |   |
| GGG                | ● | ○ | ● |   | ● | ● | ● | ● |   |   |   |
| VA < 900 N         | ○ | ○ | ○ |   | ○ | ○ | ○ | ○ |   |   |   |
| VA > 900 N         |   | ○ |   |   |   |   |   |   |   |   |   |
| Titanium           |   |   |   |   |   |   |   |   |   |   |   |
| Titanium alloy     |   |   |   |   |   |   |   |   |   |   |   |
| Nickel base        |   |   |   |   |   |   |   |   |   |   |   |

| Brand                   | ATORN®                                                                              | ATORN®                                                                              | ATORN®                                                                              | ATORN®                                                                              | ATORN®                                                                              |
|-------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Article number          | 16774                                                                               | 16775                                                                               | 16776                                                                               | 16777                                                                               | 16778                                                                               |
|                         |  |  |  |  |  |
| Number of cutting edges | 4                                                                                   | 2                                                                                   | 2                                                                                   | 6                                                                                   | 4                                                                                   |
| Diameter range mm       | 10 - 20                                                                             | 10 - 20                                                                             | 10 - 20                                                                             | 10 - 20                                                                             | 10 - 20                                                                             |
| Cutting material        | VHM                                                                                 | VHM                                                                                 | VHM                                                                                 | VHM                                                                                 | VHM                                                                                 |
| Coating                 | TiAlN                                                                               | AlTiN                                                                               | TiAlN                                                                               | TiAlN                                                                               | TiAlN                                                                               |
| Version                 | -                                                                                   | -                                                                                   | -                                                                                   | -                                                                                   | -                                                                                   |
| Type / Profile          | -                                                                                   | HSC                                                                                 | -                                                                                   | -                                                                                   | -                                                                                   |
| Catalogue page          | 16.118                                                                              | 16.118                                                                              | 16.118                                                                              | 16.119                                                                              | 16.119                                                                              |

## Recommended application

● = well-suited ○ = limited suitability

|                    |   |   |   |   |   |
|--------------------|---|---|---|---|---|
| Aluminium < 10% Si |   |   | ● | ● | ● |
| Aluminium > 10% Si |   |   | ● | ● | ● |
| Copper             | ○ |   | ● | ● | ● |
| Plastic            |   |   |   |   |   |
| Graphite           |   |   |   |   |   |
| Steel < 520 N      | ● | ● | ● | ● | ● |
| Steel < 750 N      | ● | ● | ● | ● | ● |
| Steel < 900 N      | ● | ● | ● | ● | ● |
| Steel < 110 N      | ● | ● | ● | ● | ● |
| Steel < 1200 N     | ● | ● | ● | ● | ● |
| Steel < 1400 N     | ● | ● | ● | ● | ● |
| Hardox             |   |   |   |   |   |
| < 50 HRC           |   | ● |   |   |   |
| < 60 HRC           |   | ● |   |   |   |
| < 67 HRC           |   |   |   |   |   |
| GG                 | ● |   | ● |   |   |
| GGG                | ● |   | ● |   |   |
| VA < 900 N         | ○ |   | ○ | ○ | ○ |
| VA > 900 N         |   |   |   | ○ | ○ |
| Titanium           |   |   |   |   |   |
| Titanium alloy     |   |   |   |   |   |
| Nickel base        |   |   |   |   |   |

| Brand                   |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Article number          | 16655                                                                             | 16664                                                                             | 16556 1..                                                                         | 16556 2..                                                                         | 16556 3..                                                                         | 16591 1..                                                                         | 16591 2..                                                                          | 16533                                                                               | 16534 2..                                                                           | 16535 2..                                                                           | 16535 3..                                                                           |
|                         |  |  |  |  |  |  |  |  |  |  |  |
| Number of cutting edges | 2                                                                                 | 5                                                                                 | 4                                                                                 | 4                                                                                 | 4                                                                                 | 4                                                                                 | 4                                                                                  | 4                                                                                   | 4                                                                                   | 3                                                                                   | 3                                                                                   |
| Diameter range mm       | 3 - 12                                                                            | 6 - 20                                                                            | 4 - 20                                                                            | 4 - 20                                                                            | 4 - 20                                                                            | 3 - 25                                                                            | 3 - 25                                                                             | 3 - 20                                                                              | 4 - 20                                                                              | 3 - 20                                                                              | 3 - 20                                                                              |
| Cutting material        | VHM                                                                               | VHM                                                                               | VHM                                                                               | VHM                                                                               | VHM                                                                               | VHM                                                                               | VHM                                                                                | VHM                                                                                 | VHM                                                                                 | VHM                                                                                 | VHM                                                                                 |
| Coating                 | TiAlN                                                                             | AlCrN                                                                             | TiAlN                                                                             | TiAlN                                                                             | TiAlN                                                                             | Multilay HPC <sup>3</sup>                                                         | Multilay HPC <sup>3</sup>                                                          | TiAlN                                                                               | Nacro                                                                               | TiAlN                                                                               | TiAlN                                                                               |
| Version                 | Overlong                                                                          | Extra long                                                                        | Short                                                                             | Short                                                                             | Short                                                                             | Short                                                                             | Short                                                                              | Short                                                                               | Long                                                                                | Short                                                                               | Short                                                                               |
| Type / Profile          | H                                                                                 | Trochoidal                                                                        | HPC                                                                               | HPC                                                                               | HPC                                                                               | HPC                                                                               | HPC                                                                                | HPC                                                                                 | HPC/VA                                                                              | HPC                                                                                 | HPC                                                                                 |
| Catalogue page          | 16.75                                                                             | 16.77                                                                             | 16.83                                                                             | 16.83                                                                             | 16.83                                                                             | 16.52                                                                             | 16.52                                                                              | 16.48                                                                               | 16.48                                                                               | 16.42                                                                               | 16.42                                                                               |

## Recommended application

● = well-suited ○ = limited suitability

|                    |   |   |   |   |   |   |   |   |   |   |   |
|--------------------|---|---|---|---|---|---|---|---|---|---|---|
| Aluminium < 10% Si |   |   | ○ | ○ | ○ |   |   |   | ○ |   |   |
| Aluminium > 10% Si |   |   |   |   |   |   |   |   | ○ |   |   |
| Copper             |   |   | ○ | ○ | ○ |   |   |   | ○ |   |   |
| Plastic            |   |   |   |   |   |   |   |   |   |   |   |
| Graphite           |   |   |   |   |   |   |   |   |   |   |   |
| Steel < 520 N      | ● | ● |   |   |   | ● | ● | ● |   | ● | ● |
| Steel < 750 N      | ● | ● |   |   |   | ● | ● | ● |   | ● | ● |
| Steel < 900 N      | ● | ● |   |   |   | ● | ● | ● |   | ● | ● |
| Steel < 1100 N     | ● | ● |   |   |   | ● | ● | ● | ● | ● | ● |
| Steel < 1200 N     | ● | ● |   |   |   | ● | ● | ● | ● | ● | ● |
| Steel < 1400 N     | ● | ● |   |   |   | ● | ● | ● | ● | ● | ● |
| Hardox             |   |   |   |   |   |   |   |   |   |   |   |
| < 50 HRC           | ○ | ○ |   |   |   |   |   |   |   |   |   |
| < 60 HRC           | ○ | ○ |   |   |   |   |   |   |   |   |   |
| < 67 HRC           | ○ | ○ |   |   |   |   |   |   |   |   |   |
| GG                 |   |   |   |   |   | ● | ● | ● |   |   |   |
| GGG                |   |   |   |   |   | ● | ● | ● |   |   |   |
| VA < 900 N         | ● |   | ● | ● | ● | ○ | ○ | ○ | ● | ○ | ○ |
| VA > 900 N         | ● |   | ● | ● | ● |   |   | ○ | ● | ○ | ○ |
| Titanium           |   |   | ○ | ○ | ○ |   |   |   | ○ |   |   |
| Titanium alloy     |   |   | ○ | ○ | ○ |   |   |   | ○ |   |   |
| Nickel base        |   |   | ○ | ○ | ○ |   |   |   | ○ |   |   |

| Brand                   |  |  |
|-------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Article number          | 16665                                                                               | 16630                                                                               |
|                         |  |  |
| Number of cutting edges | 5                                                                                   | 4 - 6                                                                               |
| Diameter range mm       | 6 - 20                                                                              | 6 - 20                                                                              |
| Cutting material        | VHM                                                                                 | VHM                                                                                 |
| Coating                 | AlCrN                                                                               | TiAlN-Ultra                                                                         |
| Version                 | Overlong                                                                            | Short                                                                               |
| Type / Profile          | Trochoidal                                                                          | NR                                                                                  |
| Catalogue page          | 16.78                                                                               | 16.85                                                                               |

## Recommended application

● = well-suited ○ = limited suitability

|                    |   |   |
|--------------------|---|---|
| Aluminium < 10% Si |   | ● |
| Aluminium > 10% Si |   | ● |
| Copper             |   | ● |
| Plastic            |   |   |
| Graphite           |   |   |
| Steel < 520 N      |   | ○ |
| Steel < 750 N      |   | ○ |
| Steel < 900 N      |   | ○ |
| Steel < 1100 N     |   | ○ |
| Steel < 1200 N     |   | ○ |
| Steel < 1400 N     |   | ○ |
| Hardox             |   |   |
| < 50 HRC           |   |   |
| < 60 HRC           |   |   |
| < 67 HRC           |   |   |
| GG                 |   | ○ |
| GGG                |   | ○ |
| VA < 900 N         | ● | ● |
| VA > 900 N         | ● | ● |
| Titanium           | ● | ● |
| Titanium alloy     | ● | ● |
| Nickel base        | ● | ● |

**83943 - 83944 SystemBoard (modular system)****Design**

- Individual configuration with replaceable inserts (Ø 3–40 mm)
- Frames are ideal for stacking, suitable for storage boxes, order picking boxes and transport cases
- Tough and highly impact-resistant, offering reliable protection against damage
- Good heat distortion resistance (up to 120 °C)
- Resistant to solvents, oils and greases

**Applications**

Ideal for sorting, arranging and storing. Process optimisation, automation possible with precise positioning. Order-related filling for internal logistics processes or further external processing (e.g. cleaning, coating and transport processes). Space-saving storage and provision of tools, turned parts or technical components.

**Quality**

Polyamide (PA6).

**83943 101****Frame****Applications**

To accommodate cutting inserts, see art. no. 83944.

**Note:**

Optional handles, see art. no. 83943 201.

**83943 201****Handle****Applications**

For frames, see art. no. 83943 101.

**83944****Cutting inserts****Design**

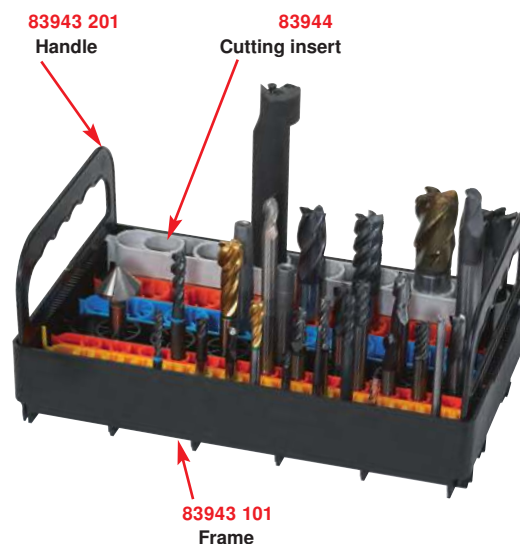
- Height can be adjusted (25 or 40 mm) via a simple twist

**Applications**

For frames, see art. no. 83943 101.

**Note:**

Ø 3/4, 3/8, 1/2, 1/4 inch deliverable on request.

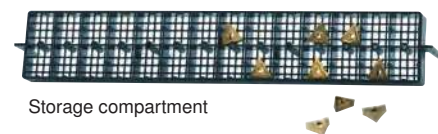


| Design          | L x W x H<br>mm | Carrying weight<br>max. kg | Colour | 83943 | ... |
|-----------------|-----------------|----------------------------|--------|-------|-----|
| Frame with base | 300 x 185 x 57  | -                          | black  |       | 101 |
| Handle          | -               | 8                          | black  |       | 201 |

| Hole Ø<br>mm | Number of holes<br>per cutting insert | Max. number of cutting<br>inserts per frame | 83944 | ... |
|--------------|---------------------------------------|---------------------------------------------|-------|-----|
| 3            | 13                                    | 12                                          |       | 101 |
| 4            | 13                                    | 12                                          |       | 102 |
| 5            | 13                                    | 12                                          |       | 103 |
| 6            | 13                                    | 12                                          |       | 104 |
| 7            | 13                                    | 12                                          |       | 105 |
| 8            | 13                                    | 12                                          |       | 106 |
| 9            | 13                                    | 12                                          |       | 107 |
| 10           | 13                                    | 12                                          |       | 108 |
| 11           | 13                                    | 12                                          |       | 109 |
| 12           | 13                                    | 12                                          |       | 110 |
| 13           | 7                                     | 6                                           |       | 111 |
| 14           | 7                                     | 6                                           |       | 112 |
| 15           | 7                                     | 6                                           |       | 113 |
| 16           | 7                                     | 6                                           |       | 114 |
| 17           | 7                                     | 6                                           |       | 115 |
| 18           | 7                                     | 6                                           |       | 116 |

| Hole Ø<br>mm | Number of holes<br>per cutting insert | Max. number of cutting<br>inserts per frame | 83944 | ... |
|--------------|---------------------------------------|---------------------------------------------|-------|-----|
| 19           | 7                                     | 6                                           |       | 117 |
| 20           | 7                                     | 6                                           |       | 118 |
| 21           | 7                                     | 6                                           |       | 119 |
| 22           | 7                                     | 6                                           |       | 120 |
| 23           | 7                                     | 6                                           |       | 121 |
| 24           | 7                                     | 6                                           |       | 122 |
| 25           | 7                                     | 6                                           |       | 123 |
| 26           | 7                                     | 6                                           |       | 124 |
| 28           | 5                                     | 4                                           |       | 125 |
| 30           | 5                                     | 4                                           |       | 126 |
| 32           | 5                                     | 4                                           |       | 127 |
| 34           | 5                                     | 4                                           |       | 128 |
| 36           | 5                                     | 4                                           |       | 129 |
| 38           | 5                                     | 4                                           |       | 130 |
| 40           | 5                                     | 4                                           |       | 131 |

83944 132



Storage compartment

| Storage compartment<br>L x W mm | Guide height<br>mm | Number of storage compartments<br>per cutting insert | Max. number of cutting<br>inserts per frame | 83944 | ... |
|---------------------------------|--------------------|------------------------------------------------------|---------------------------------------------|-------|-----|
| 17 x 17                         | 8.5                | 28                                                   | 4                                           |       | 132 |

**Design**

- Plate bodies made of red injection-moulded plastic
- **Robust, handy, sits well**
- Tools with a short clamping shank are positioned far enough out of the location hole to be **easy to remove**
- All shank bores have an open area underneath, meaning **no blockages, e.g. by chips**
- Slightly conical hole guide for easy handling of the end mill
- Delivered **without** cutter

**16005 101****Design**

- **Square** (182 x 182 x 30 mm)
- **With 7 different shank mount holes** to accommodate **77 different** end mills

**16005 102-108****Design**

- **Rectangular** (140 x 70 x 30 mm)
- Each with **thesame shank holes** to each accommodate **a certain shank diameter**

**Applications**

The various mounting plates can be joined together in modules to form a plate system. Each plate body has dovetail shaped couplings **on the side walls**. They form an invisible connection so that combinations appear as one unit.

16005 101



16005 102-108



| Shank mounting hole mm | End mill capacity piece | 16005 | ... |
|------------------------|-------------------------|-------|-----|
| 6-25                   | 77                      |       | 101 |
| 6                      | 72                      |       | 102 |
| 8                      | 50                      |       | 103 |
| 10                     | 32                      |       | 104 |
| 12                     | 21                      |       | 105 |
| 16                     | 18                      |       | 106 |
| 20                     | 10                      |       | 107 |
| 25                     | 8                       |       | 108 |

**Design**

- Straight shank
- With only **one cutting edge**
- For cutting on periphery and end face

**Applications**

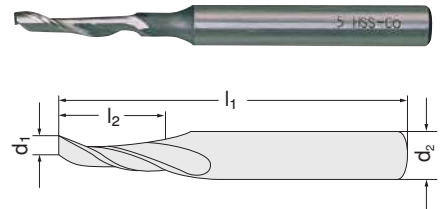
For milling slots on aluminium doors and windows on high-speed milling machines.

**Quality**

HSS-E (Co5).



16010



| d <sub>1</sub> js14 mm | l <sub>2</sub> mm | l <sub>1</sub> mm | d <sub>2</sub> h6 mm | 16010 | ... |
|------------------------|-------------------|-------------------|----------------------|-------|-----|
| 3.0                    | 12                | 60                | 8                    |       | 101 |
| 4.0                    | 12                | 60                | 8                    |       | 102 |
| 5.0                    | 13                | 60                | 8                    |       | 103 |
| L 5.0                  | 16                | 80                | 8                    |       | 107 |

| d <sub>1</sub> js14 mm | l <sub>2</sub> mm | l <sub>1</sub> mm | d <sub>2</sub> h6 mm | 16010 | ... |
|------------------------|-------------------|-------------------|----------------------|-------|-----|
| 6.0                    | 16                | 60                | 8                    |       | 104 |
| 8.0                    | 16                | 80                | 8                    |       | 105 |
| L 8.0                  | 30                | 100               | 8                    |       | 108 |
| 10.0                   | 15                | 80                | 10                   |       | 106 |

| Al<10%Si | Al>10%Si | Cu | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|----------|----------|----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| 70       | 60       | 60 | 50      | 40      | 30      | -        | -        | -        | -      | -      | -      | -      | -       | -       | -        | -     | -       |

# Mini cutters | Square end mills

16020 - 16022

## Mini cutters

**ATORN®**

### Design

Short, right cutting, right-hand twist 30°,  
3 cutting edges, centre cutting, straight shank  
with driving surface in accordance with DIN 1835 B.

### Note:

Re-grinding of cutters with a small cutting-edge  
diameter is uneconomical. It is therefore more  
economical to use mini cutters up to the wear limit  
and then throw them away. You repeatedly use  
brand-new cutters and reduce the risk of having to  
scrap finished pieces.

16020  
Quality  
HSS-E (Co8).

16022  
Quality  
HSS-E (Co8)/TiAlN-coated.

Z3



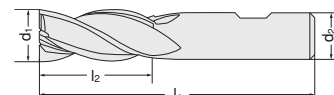
HSS-E

16020



HSS-E  
TiAlN

16022



| d <sub>1</sub> d <sub>10</sub><br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h <sub>6</sub><br>mm | HSS-E |     |       | HSS-E/TiAlN |       |     |
|--------------------------------------|----------------------|----------------------|-------------------------------------|-------|-----|-------|-------------|-------|-----|
|                                      |                      |                      |                                     | 16020 | ... | 16022 | ...         | 16022 | ... |
| 1.0                                  | 2                    | 34                   | 6                                   |       |     | 201   |             | 201   |     |
| 1.5                                  | 3                    | 34                   | 6                                   |       |     | 202   |             | 202   |     |
| 1.8                                  | 3                    | 34                   | 6                                   |       |     | 203   |             | 203   |     |
| 2.0                                  | 4                    | 35                   | 6                                   |       |     | 204   |             | 204   |     |
| 2.5                                  | 5                    | 36                   | 6                                   |       |     | 206   |             | 206   |     |
| 2.8                                  | 5                    | 36                   | 6                                   |       |     | 207   |             | 207   |     |
| 3.0                                  | 5                    | 36                   | 6                                   |       |     | 208   |             | 208   |     |
| 3.5                                  | 6                    | 37                   | 6                                   |       |     | 210   |             | 210   |     |
| 3.8                                  | 7                    | 38                   | 6                                   |       |     |       |             | 211   |     |
| 4.0                                  | 7                    | 38                   | 6                                   |       |     | 212   |             | 212   |     |
| 4.5                                  | 7                    | 38                   | 6                                   |       |     | 214   |             | 214   |     |
| 4.8                                  | 8                    | 39                   | 6                                   |       |     | 215   |             | 215   |     |
| 5.0                                  | 8                    | 39                   | 6                                   |       |     | 216   |             | 216   |     |
| 5.5                                  | 8                    | 39                   | 6                                   |       |     | 217   |             | 217   |     |

| d <sub>1</sub> d <sub>10</sub><br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h <sub>6</sub><br>mm | HSS-E |     |       | HSS-E/TiAlN |       |     |
|--------------------------------------|----------------------|----------------------|-------------------------------------|-------|-----|-------|-------------|-------|-----|
|                                      |                      |                      |                                     | 16020 | ... | 16022 | ...         | 16022 | ... |
| 5.75                                 | 8                    | 39                   | 6                                   |       |     |       |             |       | 218 |
| 6.0                                  | 8                    | 39                   | 6                                   |       |     | 219   |             | 219   |     |
| 6.5                                  | 10                   | 42                   | 8                                   |       |     |       |             |       | 220 |
| 7.0                                  | 10                   | 42                   | 8                                   |       |     |       |             |       | 221 |
| 7.5                                  | 10                   | 42                   | 8                                   |       |     |       |             |       | 222 |
| 8.0                                  | 11                   | 43                   | 8                                   |       |     | 223   |             | 223   |     |
| 8.5                                  | 11                   | 48                   | 10                                  |       |     | 224   |             | 224   |     |
| 9.0                                  | 11                   | 48                   | 10                                  |       |     | 225   |             | 225   |     |
| 9.5                                  | 11                   | 48                   | 10                                  |       |     | 226   |             | 226   |     |
| 10.0                                 | 13                   | 50                   | 10                                  |       |     | 227   |             | 227   |     |
| 12.0                                 | 16                   | 58                   | 12                                  |       |     | 228   |             | 228   |     |
| 16.0                                 | 19                   | 64                   | 16                                  |       |     | 229   |             |       |     |
| 20.0                                 | 22                   | 78                   | 20                                  |       |     | 230   |             |       |     |

| Al<10%Si | Al>10%Si | Cu | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|----------|----------|----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| 16020    |          |    |         |         |         |          |          |          |        |        |        |        |         |         |          |       |         |
| 70       | 60       | 60 | 50      | 40      | 40      | 30       | 20       | -        | -      | -      | -      | -      | 20      | 15      | 10       | 40    | -       |
| 16022    |          |    |         |         |         |          |          |          |        |        |        |        |         |         |          |       |         |
| 100      | 90       | 90 | 80      | 65      | 65      | 45       | 30       | -        | -      | -      | -      | -      | 30      | 20      | 15       | 65    | -       |

16030 - 16032

## Mini cutters

**ATORN®**

### Design

Long, right cutting, right-hand twist 30°,  
3 cutting edges, centre cutting, straight shank  
with driving surface in accordance with DIN 1835 B.

### Note:

Re-grinding of cutters with a small cutting-edge  
diameter is uneconomical. It is therefore more  
economical to use mini cutters up to the wear limit  
and then throw them away. You repeatedly use  
brand-new cutters and reduce the risk of having to  
scrap finished pieces.

16030  
Quality  
HSS-E (Co8).

16032  
Quality  
HSS-E (Co8)/TiAlN-coated.

Z3



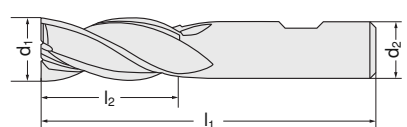
HSS-E

16030



HSS-E  
TiAlN

16032



| d <sub>1</sub> d <sub>10</sub><br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h <sub>6</sub><br>mm | HSS-E |     |       | HSS-E/TiAlN |       |     |
|--------------------------------------|----------------------|----------------------|-------------------------------------|-------|-----|-------|-------------|-------|-----|
|                                      |                      |                      |                                     | 16030 | ... | 16032 | ...         | 16032 | ... |
| 2.0                                  | 7                    | 38                   | 6                                   |       |     | 201   |             | 201   |     |
| 2.5                                  | 8                    | 39                   | 6                                   |       |     | 202   |             | 202   |     |
| 3.0                                  | 8                    | 39                   | 6                                   |       |     | 203   |             | 203   |     |
| 3.5                                  | 10                   | 41                   | 6                                   |       |     | 204   |             | 204   |     |
| 4.0                                  | 11                   | 42                   | 6                                   |       |     | 205   |             | 205   |     |
| 4.5                                  | 11                   | 42                   | 6                                   |       |     | 206   |             | 206   |     |

| d <sub>1</sub> d <sub>10</sub><br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h <sub>6</sub><br>mm | HSS-E |     |       | HSS-E/TiAlN |       |     |
|--------------------------------------|----------------------|----------------------|-------------------------------------|-------|-----|-------|-------------|-------|-----|
|                                      |                      |                      |                                     | 16030 | ... | 16032 | ...         | 16032 | ... |
| 5.0                                  | 13                   | 44                   | 6                                   |       |     | 207   |             | 207   |     |
| 5.5                                  | 13                   | 44                   | 6                                   |       |     | 208   |             |       |     |
| 6.0                                  | 13                   | 44                   | 6                                   |       |     | 209   |             | 209   |     |
| 6.5                                  | 16                   | 48                   | 8                                   |       |     | 210   |             |       |     |
| 8.0                                  | 19                   | 51                   | 8                                   |       |     | 212   |             | 212   |     |
| 10.0                                 | 22                   | 59                   | 10                                  |       |     | 215   |             |       |     |

| Al<10%Si | Al>10%Si | Cu | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|----------|----------|----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| 16030    |          |    |         |         |         |          |          |          |        |        |        |        |         |         |          |       |         |
| 70       | 60       | 60 | 50      | 40      | 40      | 30       | 20       | -        | -      | -      | -      | -      | 20      | 15      | 10       | 40    | -       |
| 16032    |          |    |         |         |         |          |          |          |        |        |        |        |         |         |          |       |         |
| 100      | 90       | 90 | 80      | 65      | 65      | 45       | 30       | -        | -      | -      | -      | -      | 30      | 20      | -        | 65    | -       |

## 16060 - 16062

## Square end mills

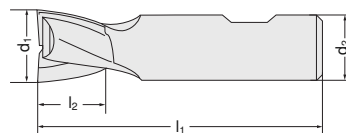
Z 2

**ATORN®**

## Design

Short, right cutting, straight shank with driving surface in accordance with DIN 1835 B. Right-hand twist approx. 30°, 2 cutting edges, centre cutting.

16062  
HSS-E (Co8)/TiAlN-coated.



HSS-E



16060

HSS-E  
TiAlN

16062

16060

HSS-E (Co8).

| d1 e8<br>mm | l2<br>mm | l1<br>mm | d2 h6<br>mm | d3<br>mm | HSS-E<br>16060 | ... | HSS-E/TiAlN<br>16062 | ... |
|-------------|----------|----------|-------------|----------|----------------|-----|----------------------|-----|
| 1.0         | 2.5      | 47       | 6           | -        |                | 201 |                      | 201 |
| 1.5         | 3        | 47       | 6           | -        |                | 202 |                      | 202 |
| 2.0         | 4        | 48       | 6           | -        |                | 203 |                      | 203 |
| 2.5         | 5        | 49       | 6           | -        |                | 204 |                      | 204 |
| 2.8         | 5        | 49       | 6           | -        |                | 205 |                      | 205 |
| 3.0         | 5        | 49       | 6           | -        |                | 206 |                      | 206 |
| 3.5         | 6        | 50       | 6           | -        |                | 207 |                      | 207 |
| 3.8         | 7        | 51       | 6           | -        |                |     |                      | 208 |
| 4.0         | 7        | 51       | 6           | -        |                | 209 |                      | 209 |
| 4.5         | 7        | 51       | 6           | -        |                | 210 |                      | 210 |
| 4.8         | 8        | 52       | 6           | -        |                | 211 |                      | 211 |
| 5.0         | 8        | 52       | 6           | -        |                | 212 |                      | 212 |
| 5.5         | 8        | 52       | 6           | -        |                | 213 |                      | 213 |
| 5.75        | 8        | 52       | 6           | -        |                | 214 |                      | 214 |
| 6.0         | 8        | 52       | 6           | 5.5      |                | 215 |                      | 215 |
| 6.5         | 10       | 60       | 10          | -        |                | 216 |                      | 216 |
| 7.0         | 10       | 60       | 10          | -        |                | 218 |                      | 218 |
| 7.5         | 10       | 60       | 10          | -        |                | 219 |                      | 219 |
| 7.75        | 11       | 61       | 10          | -        |                | 220 |                      | 220 |
| 8.0         | 11       | 61       | 10          | 7.5      |                | 221 |                      | 221 |
| 8.5         | 11       | 61       | 10          | -        |                | 222 |                      | 222 |
| 9.0         | 11       | 61       | 10          | -        |                | 224 |                      | 224 |

| d1 e8<br>mm | l2<br>mm | l1<br>mm | d2 h6<br>mm | d3<br>mm | HSS-E<br>16060 | ... | HSS-E/TiAlN<br>16062 | ... |
|-------------|----------|----------|-------------|----------|----------------|-----|----------------------|-----|
| 9.5         | 11       | 61       | 10          | -        |                | 225 |                      | 225 |
| 9.7         | 13       | 63       | 10          | -        |                |     |                      | 226 |
| 10.0        | 13       | 63       | 10          | 9.0      |                | 227 |                      | 227 |
| 11.0        | 13       | 70       | 12          | -        |                | 228 |                      | 228 |
| 11.7        | 16       | 73       | 12          | -        |                | 229 |                      | 229 |
| 12.0        | 16       | 73       | 12          | 11.0     |                | 230 |                      | 230 |
| 13.0        | 16       | 73       | 12          | -        |                | 231 |                      | 231 |
| 14.0        | 16       | 73       | 12          | -        |                | 233 |                      | 233 |
| 15.0        | 16       | 73       | 12          | -        |                | 234 |                      | 234 |
| 16.0        | 19       | 79       | 16          | 15.0     |                | 236 |                      | 236 |
| 17.0        | 19       | 79       | 16          | -        |                | 237 |                      | 237 |
| 18.0        | 19       | 79       | 16          | -        |                | 239 |                      | 239 |
| 19.0        | 19       | 79       | 16          | -        |                | 240 |                      | 240 |
| 20.0        | 22       | 88       | 20          | 19.0     |                | 242 |                      | 242 |
| 22.0        | 22       | 88       | 20          | -        |                | 243 |                      | 243 |
| 25.0        | 26       | 102      | 25          | 24.0     |                | 245 |                      | 245 |
| 26.0        | 26       | 102      | 25          | -        |                | 246 |                      | 246 |
| 28.0        | 26       | 102      | 25          | -        |                | 247 |                      | 247 |
| 30.0        | 26       | 102      | 25          | -        |                | 248 |                      | 248 |
| 32.0        | 32       | 112      | 32          | 31.0     |                | 249 |                      | 249 |
| 36.0        | 32       | 112      | 32          | -        |                | 251 |                      | 251 |
| 40.0        | 38       | 130      | 40          | 39.0     |                | 252 |                      | 252 |

| Al<10% Si | Al>10% Si | Cu | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <50HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|-----------|-----------|----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| 16060     | 70        | 60 | 60      | 50      | 50      | 50       | 30       | 20       | -      | -      | -      | -      | 20      | 15      | 10       | 40    | -       |
| 16062     | 100       | 90 | 90      | 80      | 65      | 65       | 45       | 30       | -      | -      | -      | -      | 30      | 20      | -        | 65    | -       |

## 16073 - 16074

## Square end mills

Z 2

**ATORN®**

## Design

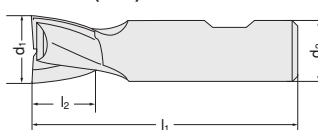
Long, right cutting, right-hand twist approx. 30°, 2 cutting edges, from 4.0 mm Ø centre cutting. With eccentric relief grinding, over Ø 10.0 mm produced with double relief grinding. Straight shank with driving surface in accordance with DIN 1835 B.

## Advantage:

No circular grinding chamfer, therefore better support and clear cut.

16073  
HSS-E (Co8).

16074  
HSS-E (Co8)/TiAlN-coated.



HSS-E



16073

HSS-E  
TiAlN

16074

| d1 e8<br>mm | l2<br>mm | l1<br>mm | d2 h6<br>mm | HSS-E<br>16073 | ... | HSS-E/TiAlN<br>16074 | ... |
|-------------|----------|----------|-------------|----------------|-----|----------------------|-----|
| 2.5         | 8        | 56       | 6           |                | 201 |                      | 201 |
| 3.0         | 8        | 56       | 6           |                | 202 |                      | 202 |
| 3.5         | 10       | 59       | 6           |                | 203 |                      | 203 |
| 4.0         | 11       | 63       | 6           |                | 204 |                      | 204 |
| 4.5         | 11       | 63       | 6           |                | 205 |                      | 205 |
| 5.0         | 13       | 68       | 6           |                | 206 |                      | 206 |
| 5.5         | 13       | 68       | 6           |                | 207 |                      | 207 |
| 6.0         | 13       | 68       | 6           |                | 208 |                      | 208 |
| 6.5         | 16       | 80       | 10          |                | 209 |                      | 209 |
| 7.0         | 16       | 80       | 10          |                | 210 |                      | 210 |

| d1 e8<br>mm | l2<br>mm | l1<br>mm | d2 h6<br>mm | HSS-E<br>16073 | ... | HSS-E/TiAlN<br>16074 | ... |
|-------------|----------|----------|-------------|----------------|-----|----------------------|-----|
| 8.0         | 19       | 88       | 10          |                | 211 |                      | 211 |
| 10.0        | 22       | 95       | 10          |                | 214 |                      | 214 |
| 12.0        | 26       | 110      | 12          |                | 215 |                      | 215 |
| 14.0        | 26       | 110      | 12          |                | 216 |                      | 216 |
| 16.0        | 32       | 123      | 16          |                | 217 |                      | 217 |
| 18.0        | 32       | 123      | 16          |                | 218 |                      | 218 |
| 20.0        | 38       | 141      | 20          |                | 219 |                      | 219 |
| 22.0        | 38       | 141      | 20          |                | 220 |                      | 220 |
| 24.0        | 45       | 166      | 25          |                | 221 |                      | 221 |
| 25.0        | 45       | 166      | 25          |                | 222 |                      | 222 |

| Al<10% Si | Al>10% Si | Cu | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|-----------|-----------|----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| 16073     | 70        | 60 | 60      | 50      | 40      | 40       | 30       | 20       | -      | -      | -      | -      | 20      | 15      | 10       | 40    | -       |
| 16074     | 100       | 90 | 90      | 80      | 65      | 65       | 45       | 30       | -      | -      | -      | -      | 30      | 20      | -        | 65    | -       |

## Square end mills

16094 - 16100

### Square end mills

Z 3



DIN 844B

N



#### Design

- Short
- Right cutting
- Right-hand twist approx. 30°
- 3 cutting edges
- Centre cutting
- Straight shank with driving surface in accordance with DIN 1835 B

#### Advantage:

No circular grinding chamfer, therefore better support and clear cut.

16094

**ATORN®**

Quality  
HSS-E (Co8).

16096

**ATORN®**

Quality  
HSS-E (Co8)/TiAlN-coated.

16100

**HHW**

#### Applications

Also suitable for dry machining.

Quality  
HSS-E powder steel/TiAlN-coated.

HSS-E



16094

HSS-E  
TiAlN

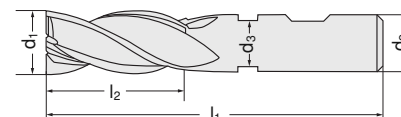


16096

HSS-E-PM  
TiAlN



16100



| d <sub>1</sub> e8<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | d <sub>3</sub><br>mm | HSS-E |     | HSS-E/TiAlN |     | HSS-E-PM/TiAlN |     |
|-------------------------|----------------------|----------------------|-------------------------|----------------------|-------|-----|-------------|-----|----------------|-----|
|                         |                      |                      |                         |                      | 16094 | ... | 16096       | ... | 16100          | ... |
| 1.5                     | 7                    | 51                   | 6                       | -                    |       | 101 |             | 101 |                |     |
| 2.0                     | 7                    | 51                   | 6                       | -                    |       | 102 |             | 102 |                |     |
| 2.5                     | 8                    | 52                   | 6                       | -                    |       | 103 |             | 103 |                |     |
| 3.0                     | 8                    | 52                   | 6                       | -                    |       | 104 |             | 104 |                |     |
| 3.5                     | 10                   | 54                   | 6                       | -                    |       | 105 |             | 105 |                |     |
| 4.0                     | 11                   | 55                   | 6                       | -                    |       | 106 |             | 106 |                | 201 |
| 4.5                     | 11                   | 55                   | 6                       | -                    |       | 107 |             | 107 |                |     |
| 5.0                     | 13                   | 57                   | 6                       | -                    |       | 108 |             | 108 |                | 202 |
| 5.5                     | 13                   | 57                   | 6                       | -                    |       | 109 |             | 109 |                |     |
| 6.0                     | 13                   | 57                   | 6                       | 5.5                  |       | 110 |             | 110 |                | 203 |
| 6.5                     | 16                   | 66                   | 10                      | -                    |       | 111 |             | 111 |                |     |
| 7.0                     | 16                   | 66                   | 10                      | -                    |       | 112 |             | 112 |                | 204 |
| 7.5                     | 16                   | 66                   | 10                      | -                    |       | 113 |             | 113 |                |     |
| 8.0                     | 19                   | 69                   | 10                      | 7.5                  |       | 114 |             | 114 |                | 205 |
| 8.5                     | 19                   | 69                   | 10                      | -                    |       | 115 |             | 115 |                |     |
| 9.0                     | 19                   | 69                   | 10                      | -                    |       | 116 |             | 116 |                |     |
| 10.0                    | 22                   | 72                   | 10                      | 9.0                  |       | 117 |             | 117 |                | 206 |
| 12.0                    | 26                   | 83                   | 12                      | 11.0                 |       | 118 |             | 118 |                | 207 |
| 14.0                    | 26                   | 83                   | 12                      | -                    |       | 119 |             | 119 |                | 208 |
| 16.0                    | 32                   | 92                   | 16                      | 15.0                 |       | 120 |             | 120 |                | 209 |
| 18.0                    | 32                   | 92                   | 16                      | -                    |       | 121 |             | 121 |                | 210 |
| 20.0                    | 38                   | 104                  | 20                      | 19.0                 |       | 122 |             | 122 |                | 211 |
| 22.0                    | 38                   | 104                  | 20                      | -                    |       | 123 |             | 123 |                |     |
| 25.0                    | 45                   | 121                  | 25                      | 24.0                 |       | 124 |             | 124 |                |     |
| 28.0                    | 45                   | 121                  | 25                      | -                    |       | 125 |             | 125 |                |     |
| 30.0                    | 45                   | 121                  | 25                      | -                    |       | 126 |             | 126 |                |     |

| Al<10% Si    | Al>10% Si | Cu     | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <50HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|--------------|-----------|--------|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| <b>16094</b> |           |        |         |         |         |          |          |          |        |        |        |        |         |         |          |       |         |
| 70           | 60        | 60     | 50      | 40      | 40      | 30       | 20       | -        | -      | -      | -      | -      | 20      | 15      | 10       | 4     | -       |
| <b>16096</b> |           |        |         |         |         |          |          |          |        |        |        |        |         |         |          |       |         |
| 100          | 90        | 90     | 80      | 65      | 65      | 45       | 30       | -        | -      | -      | -      | -      | 30      | 20      | -        | 65    | -       |
| <b>16100</b> |           |        |         |         |         |          |          |          |        |        |        |        |         |         |          |       |         |
| 140-250      | 120-140   | 90-120 | 80-90   | 70-80   | 55-65   | 50-60    | 40-50    | -        | -      | -      | -      | -      | 40-45   | 35-40   | -        | 80-90 | 80-120  |



**ATORN®****Design**

- Long
- Right cutting
- Right-hand twist approx. 30°
- **3 cutting edges, centre cutting**
- Straight shank with driving surface in accordance with DIN 1835 B

**16104**  
Quality  
HSS-E (Co8).

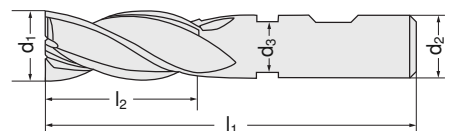
**16105**  
Quality  
HSS-E (Co8)/TiAlN-coated.

HSS-E

16104

HSS-E  
TiAlN

16105



| d <sub>1</sub> h10<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | d <sub>3</sub><br>mm | HSS-E<br>16104 | ... | HSS-E/TiAlN<br>16105 | ... |
|--------------------------|----------------------|----------------------|-------------------------|----------------------|----------------|-----|----------------------|-----|
| 2.0                      | 10                   | 54                   | 6                       | -                    |                | 101 |                      | 101 |
| 3.0                      | 12                   | 56                   | 6                       | -                    |                | 103 |                      | 103 |
| 3.5                      | 15                   | 59                   | 6                       | -                    |                | 104 |                      |     |
| 4.0                      | 19                   | 63                   | 6                       | -                    |                | 105 |                      | 105 |
| 4.5                      | 19                   | 63                   | 6                       | -                    |                | 106 |                      |     |
| 5.0                      | 24                   | 68                   | 6                       | -                    |                | 107 |                      | 107 |
| 5.5                      | 24                   | 68                   | 6                       | -                    |                | 108 |                      | 108 |
| 6.0                      | 24                   | 68                   | 6                       | 5,5                  |                | 109 |                      | 109 |
| 7.0                      | 30                   | 80                   | 10                      | -                    |                | 110 |                      | 110 |
| 8.0                      | 38                   | 88                   | 10                      | 7,5                  |                | 112 |                      | 112 |
| 10,0                     | 45                   | 95                   | 10                      | 9,0                  |                | 114 |                      | 114 |
| 12,0                     | 53                   | 110                  | 12                      | 11,0                 |                | 116 |                      | 116 |
| 14.0                     | 53                   | 110                  | 12                      | -                    |                | 118 |                      |     |
| 16.0                     | 63                   | 123                  | 16                      | 15,0                 |                | 120 |                      | 120 |
| 18.0                     | 63                   | 123                  | 16                      | -                    |                | 122 |                      |     |
| 20.0                     | 75                   | 141                  | 20                      | 19,0                 |                | 125 |                      | 125 |

| Al<10%Si | Al>10%Si | Cu | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|----------|----------|----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| 16104    |          |    |         |         |         |          |          |          |        |        |        |        |         |         |          |       |         |
| 70       | 60       | 60 | 50      | 40      | 40      | 30       | 20       | -        | -      | -      | -      | -      | 20      | 15      | 10       | 40    | -       |
| 16105    |          |    |         |         |         |          |          |          |        |        |        |        |         |         |          |       |         |
| 100      | 90       | 90 | 80      | 65      | 65      | 45       | 30       | -        | -      | -      | -      | -      | 30      | 20      | -        | 65    | -       |

**Info****The HHW colour guidance system**

With the **HHW** colour guidance system you can see at first glance which materials the tool is suitable for. In most catalogue sections, the **HHW** also informs you about the application data for the corresponding tool. The **HHW** colour guidance system is logically structured according to the steel key. This means that you can select the appropriate tools in advance of the machining process, saving you time and money.

| St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA-steel<900N | VA-steel>900N | Ti alloys | GG(G)  | plastics |
|----------|----------|--------|--------|--------|--------|---------------|---------------|-----------|--------|----------|
| 40-50    | 35-40    | -      | -      | -      | -      | 35-45         | 35-45         | -         | 80-120 | -        |

Use  
HM grade  
Coating

| Designation | W <sup>±0,1</sup><br>mm | R <sup>±0,05</sup><br>mm |           |     |
|-------------|-------------------------|--------------------------|-----------|-----|
| GTN-2       | 2,2                     | 0,16                     | 10 pieces | 113 |
| GTN-3       | 3,1                     | 0,20                     | 10 pieces | 114 |

**P M K**  
H 42  
coated

18674 ...



## End mills

16120 - 16131

### End mills

#### Design

- Short
- Right cutting
- Right-hand twist approx. 35°
- **4-6 cutting edges, centre cutting**
- Straight shank with driving surface in accordance with DIN 1835 B

16120

**ATORN®**

#### Design

- Cutting tolerance h10

#### Quality

HSS-E (Co8).



HSS-E



16120

16122

**ATORN®**

#### Design

- Cutting tolerance h10

#### Quality

HSS-E (Co8)/TiAlN-coated.

HSS-E  
TiAlN



16122

16131

**HHW**

#### Design

- Cutting tolerance k10

#### Applications

Also suitable for dry machining.

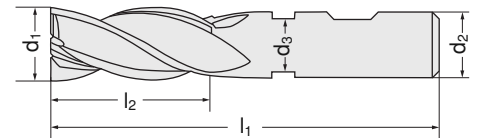
#### Quality

HSS-E-PM/TiAlN-coated.

HSS-E-PM  
TiAlN



16131



| d <sub>1</sub><br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | d <sub>3</sub><br>mm | Z | HSS-E |     | HSS-E/TiAlN |     | HSS-E-PM/TiAlN |     |
|----------------------|----------------------|----------------------|-------------------------|----------------------|---|-------|-----|-------------|-----|----------------|-----|
|                      |                      |                      |                         |                      |   | 16120 | ... | 16122       | ... | 16131          | ... |
| 2.0                  | 7                    | 51                   | 6                       | -                    | 4 |       |     | 102         |     | 102            |     |
| 2.5                  | 8                    | 52                   | 6                       | -                    | 4 |       |     | 103         |     |                |     |
| 3.0                  | 8                    | 52                   | 6                       | -                    | 4 |       |     | 104         |     | 104            |     |
| 3.5                  | 10                   | 54                   | 6                       | -                    | 4 |       |     | 105         |     |                |     |
| 4.0                  | 11                   | 55                   | 6                       | -                    | 4 |       |     | 106         |     | 106            |     |
| 4.5                  | 11                   | 55                   | 6                       | -                    | 4 |       |     | 107         |     |                |     |
| 5.0                  | 13                   | 57                   | 6                       | -                    | 4 |       |     | 108         |     | 108            |     |
| 6.0                  | 13                   | 57                   | 6                       | 5.5                  | 4 |       |     | 110         |     | 110            | 302 |
| 7.0                  | 16                   | 66                   | 10                      | -                    | 4 |       |     | 112         |     | 112            |     |
| 8.0                  | 19                   | 69                   | 10                      | 7.5                  | 4 |       |     | 113         |     | 113            | 304 |
| 9.0                  | 19                   | 69                   | 10                      | -                    | 4 |       |     | 114         |     | 114            |     |
| 10.0                 | 22                   | 72                   | 10                      | 9.0                  | 4 |       |     | 115         |     | 115            | 305 |
| 11.0                 | 22                   | 79                   | 12                      | -                    | 4 |       |     | 116         |     | 116            |     |
| 12.0                 | 26                   | 83                   | 12                      | 11.0                 | 4 |       |     | 117         |     | 117            | 306 |
| 13.0                 | 26                   | 83                   | 12                      | -                    | 4 |       |     | 118         |     | 118            |     |
| 14.0                 | 26                   | 83                   | 12                      | -                    | 4 |       |     | 119         |     | 119            | 307 |
| 15.0                 | 26                   | 83                   | 12                      | -                    | 4 |       |     | 120         |     | 120            |     |
| 16.0                 | 32                   | 92                   | 16                      | 15.0                 | 4 |       |     | 121         |     | 121            | 308 |
| 18.0                 | 32                   | 92                   | 16                      | -                    | 4 |       |     | 123         |     | 123            | 309 |
| 19.0                 | 32                   | 92                   | 16                      | -                    | 4 |       |     | 124         |     | 124            |     |
| 20.0                 | 38                   | 104                  | 20                      | 19.0                 | 4 |       |     | 125         |     | 125            | 310 |
| 22.0                 | 38                   | 104                  | 20                      | -                    | 5 |       |     | 127         |     | 127            |     |
| 24.0                 | 45                   | 121                  | 25                      | -                    | 5 |       |     | 129         |     | 129            |     |
| 25.0                 | 45                   | 121                  | 25                      | 24.0                 | 5 |       |     | 130         |     | 130            | 312 |
| 28.0                 | 45                   | 121                  | 25                      | -                    | 6 |       |     | 132         |     | 132            |     |
| 30.0                 | 45                   | 121                  | 25                      | -                    | 6 |       |     | 133         |     | 133            | 314 |
| 32.0                 | 53                   | 133                  | 32                      | 31.0                 | 6 |       |     | 134         |     | 134            |     |
| 40.0                 | 63                   | 155                  | 40                      | 39.0                 | 6 |       |     | 138         |     |                |     |

| Al<10%Si     | Al>10%Si | Cu     | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|--------------|----------|--------|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| <b>16120</b> |          |        |         |         |         |          |          |          |        |        |        |        |         |         |          |       |         |
| 70-120       | 40-70    | 40-70  | 28-32   | 25-30   | 18-25   | 16-22    | 12-18    | -        | -      | -      | -      | -      | 5-15    | 3-12    | 3-12     | 30-50 | 50-70   |
| <b>16122</b> |          |        |         |         |         |          |          |          |        |        |        |        |         |         |          |       |         |
| 70-200       | 40-150   | 40-150 | 75-85   | 45-55   | 40-60   | 20-50    | 12-40    | -        | -      | -      | -      | -      | 5-28    | 3-25    | -        | 40-70 | 80-10   |
| <b>16131</b> |          |        |         |         |         |          |          |          |        |        |        |        |         |         |          |       |         |
| 140-250      | 120-140  | 90-120 | 80-90   | 70-80   | 55-65   | 50-60    | 40-50    | -        | -      | -      | -      | -      | 40-45   | 35-40   | -        | 80-90 | 80-120  |

**ATORN®****Design**

- Long
- Right cutting
- Right-hand twist approx. 30°
- **4-6 cutting edges, centre cutting**
- Straight shank with driving surface in accordance with DIN 1835 B
- From 25 mm shank diameter with 2 driving surfaces

**16128**  
Quality  
HSS-E (Co8).

**16129**  
Quality  
HSS-E (Co8)/TiAlN-coated.

Z 4-6



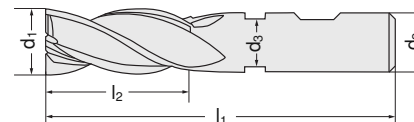
HSS-E

HSS-E  
TiAlN

16128



16129



| d <sub>1</sub> h10<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | d <sub>3</sub><br>mm | Z | HSS-E |     | HSS-E/TiAlN |     |
|--------------------------|----------------------|----------------------|-------------------------|----------------------|---|-------|-----|-------------|-----|
|                          |                      |                      |                         |                      |   | 16128 | ... | 16129       | ... |
| 2.0                      | 10                   | 54                   | 6                       | -                    | 4 | 201   |     | 201         |     |
| 3.0                      | 12                   | 56                   | 6                       | -                    | 4 | 203   |     | 203         |     |
| 3.5                      | 15                   | 59                   | 6                       | -                    | 4 | 204   |     | 204         |     |
| 4.0                      | 19                   | 63                   | 6                       | -                    | 4 | 205   |     | 205         |     |
| 4.5                      | 19                   | 63                   | 6                       | -                    | 4 | 206   |     | 206         |     |
| 5.0                      | 24                   | 68                   | 6                       | -                    | 4 | 207   |     | 207         |     |
| 5.5                      | 24                   | 68                   | 6                       | -                    | 4 | 208   |     | 208         |     |
| 6.0                      | 24                   | 68                   | 6                       | 5.5                  | 4 | 209   |     | 209         |     |
| 7.0                      | 30                   | 80                   | 10                      | -                    | 4 | 210   |     | 210         |     |
| 8.0                      | 38                   | 88                   | 10                      | 7.5                  | 4 | 211   |     | 211         |     |
| 9.0                      | 38                   | 88                   | 10                      | -                    | 4 | 212   |     | 212         |     |
| 10.0                     | 45                   | 95                   | 10                      | 9.0                  | 4 | 213   |     | 213         |     |

| d <sub>1</sub> h10<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | d <sub>3</sub><br>mm | Z | HSS-E |     | HSS-E/TiAlN |     |
|--------------------------|----------------------|----------------------|-------------------------|----------------------|---|-------|-----|-------------|-----|
|                          |                      |                      |                         |                      |   | 16128 | ... | 16129       | ... |
| 11.0                     | 45                   | 102                  | 12                      | -                    | 4 | 214   |     | 214         |     |
| 12.0                     | 53                   | 110                  | 12                      | 11.0                 | 4 | 215   |     | 215         |     |
| 14.0                     | 53                   | 110                  | 12                      | -                    | 4 | 217   |     | 217         |     |
| 16.0                     | 63                   | 123                  | 16                      | 15.0                 | 4 | 219   |     | 219         |     |
| 18.0                     | 63                   | 123                  | 16                      | -                    | 4 | 221   |     | 221         |     |
| 20.0                     | 75                   | 141                  | 20                      | 19.0                 | 4 | 223   |     | 223         |     |
| 22.0                     | 75                   | 141                  | 20                      | -                    | 5 | 224   |     | 224         |     |
| 25.0                     | 90                   | 166                  | 25                      | 24.0                 | 5 | 226   |     | 226         |     |
| 28.0                     | 90                   | 166                  | 25                      | -                    | 6 | 228   |     |             |     |
| 30.0                     | 90                   | 166                  | 25                      | -                    | 6 | 229   |     |             |     |
| 32.0                     | 106                  | 186                  | 32                      | 31.0                 | 6 | 230   |     |             |     |

| Al<10%Si | Al>10%Si | Cu | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|----------|----------|----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| 16128    |          |    |         |         |         |          |          |          |        |        |        |        |         |         |          |       |         |
| 70       | 60       | 60 | 50      | 40      | 40      | 30       | 20       | -        | -      | -      | -      | -      | 20      | 15      | 10       | 40    | -       |
| 16129    |          |    |         |         |         |          |          |          |        |        |        |        |         |         |          |       |         |
| 100      | 90       | 90 | 80      | 65      | 65      | 45       | 30       | -        | -      | -      | -      | -      | 30      | 20      | -        | 65    | -       |

## 16133 - 16134

## End mills



## Design

- Extra long
- Straight face
- Right cutting, right-hand twist approx. 30°
- Straight shank with driving surface in accordance with 1835 B

16133  
Quality  
HSS-E (Co5).

16134  
Quality  
HSS-E (Co5)/TiAlN-coated.



HSS-E

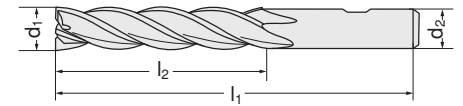
16133

HSS-E  
TiAlN

16134



| d <sub>1</sub> k10<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h <sub>6</sub><br>mm | Z | HSS-E |     | HSS-E/TiAlN |     |
|--------------------------|----------------------|----------------------|-------------------------------------|---|-------|-----|-------------|-----|
|                          |                      |                      |                                     |   | 16133 | ... | 16134       | ... |
| 6.0                      | 40                   | 100                  | 6                                   | 4 |       | 206 |             | 206 |
| 8.0                      | 65                   | 115                  | 10                                  | 4 |       | 208 |             | 208 |
| 10.0                     | 65                   | 115                  | 10                                  | 4 |       | 210 |             | 210 |
| 12.0                     | 75                   | 132                  | 12                                  | 4 |       | 212 |             | 212 |
| 16.0                     | 100                  | 160                  | 16                                  | 4 |       | 216 |             | 216 |
| 20.0                     | 125                  | 191                  | 20                                  | 4 |       | 220 |             | 220 |
| 25.0                     | 140                  | 216                  | 25                                  | 4 |       | 225 |             | 225 |



| Al<10%Si | Al>10%Si | Cu    | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|----------|----------|-------|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| 16133    |          |       |         |         |         |          |          |          |        |        |        |        |         |         |          |       |         |
| 40-120   | 40-90    | 40-90 | 45-50   | 30-35   | 25-38   | 15-30    | 10-25    | -        | -      | -      | -      | -      | 5-18    | 3-15    | -        | 24-40 | 50-60   |
| 16134    |          |       |         |         |         |          |          |          |        |        |        |        |         |         |          |       |         |
| 110      | 85       | 90    | 65      | 55      | 50      | 36       | 28       | 22       | -      | -      | -      | -      | 18      | 13      | -        | 38    | -       |

## 16150

## End mills



## Design

Short, 6-8 cutting edges. With eccentric relief grinding. Straight shank with driving surface in accordance with DIN 1835 B. Multi-flute cutters, free in the middle on face side. Right-hand spiral 30°.

Applications  
For normal to solid materials.

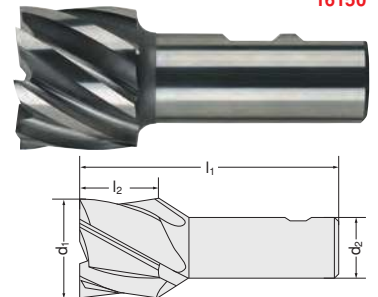
Quality  
HSS-E (Co8).



16150

| d <sub>1</sub> k10<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h <sub>6</sub><br>mm | Z | 16150 | ... |
|--------------------------|----------------------|----------------------|-------------------------------------|---|-------|-----|
| 30.0                     | 30                   | 90                   | 20                                  | 6 |       | 101 |
| 35.0                     | 30                   | 90                   | 20                                  | 6 |       | 102 |
| 40.0                     | 32                   | 95                   | 25                                  | 8 |       | 103 |
| 50.0                     | 36                   | 100                  | 32                                  | 8 |       | 104 |

| Al<10%Si | Al>10%Si | Cu    | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|----------|----------|-------|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| 70-120   | 40-70    | 40-70 | 28-32   | 25-30   | 18-25   | 16-22    | 12-18    | -        | -      | -      | -      | -      | 5-15    | 3-12    | 3-12     | 30-50 | 50-70   |



## 16153

## End mills



## Design

- Short
- Right cutting, right-hand twist approx. 42°
- 2 cutting edges, centre cutting
- Straight shank with driving surface in accordance with DIN 1835 B

Applications  
For soft to tough, long-chipping materials such as aluminium and copper alloys.

Quality  
HSS-E (Co8).



16153

| d <sub>1</sub> e8<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h <sub>6</sub><br>mm | 16153 | ... |
|-------------------------|----------------------|----------------------|-------------------------------------|-------|-----|
| 2.0                     | 7.0                  | 51                   | 6                                   |       | 101 |
| 2.5                     | 8.0                  | 52                   | 6                                   |       | 102 |
| 3.0                     | 8.0                  | 52                   | 6                                   |       | 103 |
| 4.0                     | 11.0                 | 55                   | 6                                   |       | 105 |
| 5.0                     | 13.0                 | 57                   | 6                                   |       | 107 |
| 5.5                     | 13.0                 | 57                   | 6                                   |       | 108 |
| 6.0                     | 13.0                 | 57                   | 6                                   |       | 109 |
| 7.0                     | 16.0                 | 66                   | 10                                  |       | 111 |

| d <sub>1</sub> e8<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h <sub>6</sub><br>mm | 16153 | ... |
|-------------------------|----------------------|----------------------|-------------------------------------|-------|-----|
| 8.0                     | 19.0                 | 69                   | 10                                  |       | 113 |
| 9.0                     | 19.0                 | 69                   | 10                                  |       | 115 |
| 10.0                    | 22.0                 | 72                   | 10                                  |       | 116 |
| 12.0                    | 26.0                 | 83                   | 12                                  |       | 117 |
| 16.0                    | 32.0                 | 92                   | 16                                  |       | 119 |
| 18.0                    | 32.0                 | 92                   | 16                                  |       | 120 |
| 20.0                    | 38.0                 | 104                  | 20                                  |       | 121 |
| 22.0                    | 38.0                 | 104                  | 20                                  |       | 122 |

| Al<10%Si | Al>10%Si | Cu | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|----------|----------|----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| 70       | 60       | 60 | -       | -       | -       | -        | -        | -        | -      | -      | -      | -      | -       | -       | -        | -     | -       |



# 16158 - 16161

## End mills



### Design

- Right cutting
- Right-hand twist approx. 35°
- **3 cutting edges**
- **Centre cutting**
- With eccentric relief grinding
- **With released straight shank** with driving surface in accordance with DIN 1835 B

**16158**  
Short version.

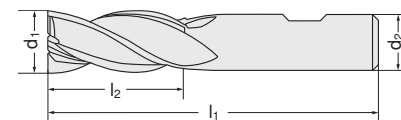
**16161**  
Long version.



**16158**



**16161**



### Applications

For soft to tough, long-chipping materials such as aluminium and copper alloys.

### Quality

HSS-E (Co8).

|                   |                   | Short          |                | Long           |                | Short |     | Long  |     |
|-------------------|-------------------|----------------|----------------|----------------|----------------|-------|-----|-------|-----|
| d <sub>1</sub> e8 | d <sub>2</sub> h6 | l <sub>2</sub> | l <sub>1</sub> | l <sub>2</sub> | l <sub>1</sub> | 16158 | ... | 16161 | ... |
| 3.0               | 6                 | 8              | 52             | 12             | 56             |       | 201 |       | 201 |
| 4.0               | 6                 | 11             | 55             | 19             | 63             |       | 202 |       | 202 |
| 5.0               | 6                 | 13             | 57             | 24             | 68             |       | 203 |       | 203 |
| 6.0               | 6                 | 13             | 57             | 24             | 68             |       | 204 |       | 204 |
| 8.0               | 10                | 19             | 69             | 38             | 88             |       | 205 |       | 205 |
| 10.0              | 10                | 22             | 72             | 45             | 95             |       | 206 |       | 206 |
| 12.0              | 12                | 26             | 83             | 53             | 110            |       | 207 |       | 207 |
| 14.0              | 12                | 26             | 83             | 53             | 110            |       | 208 |       | 208 |
| 16.0              | 16                | 32             | 92             | 63             | 123            |       | 210 |       | 209 |
| 18.0              | 16                | 32             | 92             | 63             | 123            |       | 211 |       | 210 |
| 20.0              | 20                | 38             | 104            | 75             | 141            |       | 212 |       | 211 |

|          |          |       |         |         |         |          |          |          |        |        |        |        |         |         |          |       |         |
|----------|----------|-------|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| Al<10%Si | Al>10%Si | Cu    | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
| 60-70    | 50-60    | 50-60 | -       | -       | -       | -        | -        | -        | -      | -      | -      | -      | -       | -       | -        | -     | 60-100  |

# 16170

## Radius cutter



### Design

- **Short**
- With face radius
- Right cutting
- Right-hand twist up to 6.0 mm Ø 40°, from 8.0 mm Ø 30°
- **2 cutting edges**
- **Centre cutting**
- Radius tolerance +/- 0.04 mm
- Straight shank with driving surface in accordance with DIN 1835 B

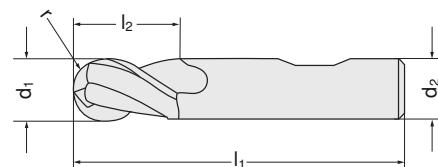
### Advantage:

No circular grinding chamfer, therefore better support and clear cut.

### Quality

HSS-E (Co8).

**16170**



| d <sub>1</sub> h10 | Radius | l <sub>2</sub> | l <sub>1</sub> | d <sub>2</sub> h6 | 16170 | ... |
|--------------------|--------|----------------|----------------|-------------------|-------|-----|
| 2.0                | 1.0    | 4              | 48             | 6                 |       | 201 |
| 3.0                | 1.5    | 5              | 49             | 6                 |       | 202 |
| 4.0                | 2.0    | 7              | 51             | 6                 |       | 203 |
| 5.0                | 2.5    | 8              | 52             | 6                 |       | 204 |
| 6.0                | 3.0    | 8              | 52             | 6                 |       | 205 |
| 8.0                | 4.0    | 11             | 61             | 10                |       | 206 |
| 10.0               | 5.0    | 13             | 63             | 10                |       | 207 |
| 12.0               | 6.0    | 16             | 73             | 12                |       | 208 |
| 16.0               | 8.0    | 19             | 79             | 16                |       | 210 |
| 20.0               | 10.0   | 22             | 88             | 20                |       | 212 |

|          |          |       |         |         |         |          |          |          |        |        |        |        |         |         |          |       |         |
|----------|----------|-------|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| Al<10%Si | Al>10%Si | Cu    | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
| 70-120   | 40-70    | 40-70 | 28-32   | 25-30   | 18-25   | 16-22    | 12-18    | -        | -      | -      | -      | -      | 5-15    | 3-12    | 3-12     | 30-50 | 50-70   |

## 16176 - 16177

## Radius cutter

Z 2


**ATORN®**

## Design

- Long
- With face radius
- Right cutting
- Right-hand twist approx. 30°
- 2 cutting edges
- Centre cutting
- Radius tolerance +/- 0.04 mm
- Straight shank with driving surface in accordance with DIN 1835 B

16176  
Quality  
HSS-E (Co8).

16177  
Quality  
HSS-E (Co8)/TiAlN-coated.

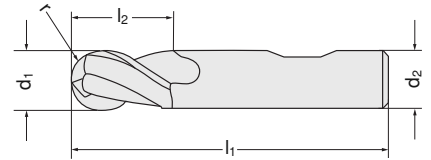
HSS-E



16176

HSS-E  
TiAlN


16177



| d <sub>1</sub> e8<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | HSS-E |     | HSS-E/TiAlN |     |
|-------------------------|----------------------|----------------------|-------------------------|-------|-----|-------------|-----|
|                         |                      |                      |                         | 16176 | ... | 16177       | ... |
| 2.0                     | 10                   | 54                   | 6                       |       | 201 |             | 201 |
| 3.0                     | 12                   | 56                   | 6                       |       | 202 |             | 202 |
| 4.0                     | 19                   | 63                   | 6                       |       | 203 |             | 203 |
| 5.0                     | 24                   | 68                   | 6                       |       | 204 |             | 204 |
| 6.0                     | 24                   | 68                   | 6                       |       | 205 |             | 205 |
| 8.0                     | 38                   | 88                   | 10                      |       | 207 |             | 207 |
| 10.0                    | 45                   | 95                   | 10                      |       | 209 |             | 209 |

| d <sub>1</sub> e8<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | HSS-E |     | HSS-E/TiAlN |     |
|-------------------------|----------------------|----------------------|-------------------------|-------|-----|-------------|-----|
|                         |                      |                      |                         | 16176 | ... | 16177       | ... |
| 12.0                    | 53                   | 110                  | 12                      |       | 211 |             | 211 |
| 16.0                    | 63                   | 123                  | 16                      |       | 215 |             | 215 |
| 18.0                    | 69                   | 123                  | 16                      |       | 217 |             | 217 |
| 20.0                    | 75                   | 141                  | 20                      |       | 219 |             | 219 |
| 25.0                    | 90                   | 166                  | 25                      |       | 222 |             | 222 |
| 30.0                    | 90                   | 166                  | 25                      |       | 225 |             | 225 |

| Al<10%Si | Al>10%Si | Cu | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|----------|----------|----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| 16176    |          |    |         |         |         |          |          |          |        |        |        |        |         |         |          |       |         |
| 70       | 60       | 60 | 50      | 40      | 40      | 30       | 20       | -        | -      | -      | -      | -      | 20      | 15      | -        | 40    | -       |
| 16177    |          |    |         |         |         |          |          |          |        |        |        |        |         |         |          |       |         |
| 100      | 90       | 90 | 80      | 65      | 65      | 45       | 30       | -        | -      | -      | -      | -      | 30      | 20      | -        | 65    | -       |

## 16183 - 16185

## Shank roughing cutter

Z 3


**ATORN®**

## Design

- Short
- 3 cutting edges
- Centre cutting
- Right-hand twist approx. 30°
- Straight shank with driving surface in accordance with DIN 1835 B

16183  
Quality  
HSS-E (Co8).

16185  
Quality  
HSS-E (Co8)/TiAlN-coated.

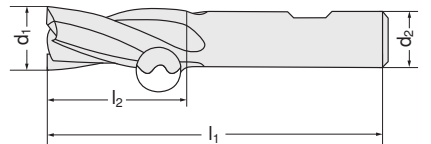
HSS-E



16183

HSS-E  
TiAlN


16185



| d <sub>1</sub> js14<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | HSS-E |     | HSS-E/TiAlN |     |
|---------------------------|----------------------|----------------------|-------------------------|-------|-----|-------------|-----|
|                           |                      |                      |                         | 16183 | ... | 16185       | ... |
| 6.0                       | 13                   | 57                   | 6                       |       | 201 |             | 201 |
| 7.0                       | 16                   | 66                   | 10                      |       | 202 |             | 202 |
| 8.0                       | 19                   | 69                   | 10                      |       | 203 |             | 203 |
| 9.0                       | 19                   | 69                   | 10                      |       | 204 |             | 204 |
| 10.0                      | 22                   | 72                   | 10                      |       | 205 |             | 205 |
| 12.0                      | 26                   | 83                   | 12                      |       | 206 |             | 206 |

| d <sub>1</sub> js14<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | HSS-E |     | HSS-E/TiAlN |     |
|---------------------------|----------------------|----------------------|-------------------------|-------|-----|-------------|-----|
|                           |                      |                      |                         | 16183 | ... | 16185       | ... |
| 14.0                      | 26                   | 83                   | 12                      |       | 207 |             | 207 |
| 16.0                      | 32                   | 92                   | 16                      |       | 208 |             | 208 |
| 18.0                      | 32                   | 92                   | 16                      |       | 209 |             | 209 |
| 20.0                      | 38                   | 104                  | 20                      |       | 210 |             | 210 |
| 25.0                      | 45                   | 121                  | 25                      |       | 212 |             | 212 |

| Al<10%Si | Al>10%Si | Cu | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|----------|----------|----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| 16183    |          |    |         |         |         |          |          |          |        |        |        |        |         |         |          |       |         |
| 70       | 60       | 60 | 50      | 40      | 40      | 30       | 20       | -        | -      | -      | -      | -      | 20      | 15      | 10       | 40    | -       |
| 16185    |          |    |         |         |         |          |          |          |        |        |        |        |         |         |          |       |         |
| 100      | 90       | 90 | 80      | 65      | 65      | 45       | 30       | -        | -      | -      | -      | -      | 30      | 20      | -        | 65    | -       |

# 16195 - 16198

## Shank roughing cutter



### Design

- Short
- Right cutting
- Right-hand twist approx. 30°
- **4-6 cutting edges**
- **Centre cutting up to Ø 20 mm**, also free in the middle
- Straight shank with driving surface in accordance with DIN 1835 B
- With eccentric relief grinding

16195  
Quality  
HSS-E (Co8).

16198  
Quality  
HSS-E (Co8)/TiAlN-coated.



HSS-E

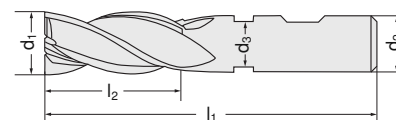


16195

HSS-E  
TiAlN



16198



| d <sub>1</sub> js14<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | d <sub>3</sub><br>mm | Z | HSS-E |     | HSS-E/TiAlN |     |
|---------------------------|----------------------|----------------------|-------------------------|----------------------|---|-------|-----|-------------|-----|
|                           |                      |                      |                         |                      |   | 16195 | ... | 16198       | ... |
| 10.0                      | 22                   | 72                   | 10                      | 9.0                  | 4 |       |     | 105         | 105 |
| 11.0                      | 22                   | 79                   | 12                      | -                    | 4 |       |     | 106         | 106 |
| 12.0                      | 26                   | 83                   | 12                      | 11.0                 | 4 |       |     | 107         | 107 |
| 13.0                      | 26                   | 83                   | 12                      | -                    | 4 |       |     | 108         | 108 |
| 14.0                      | 26                   | 83                   | 12                      | -                    | 4 |       |     | 109         | 109 |
| 15.0                      | 26                   | 83                   | 12                      | -                    | 4 |       |     | 110         | 110 |
| 16.0                      | 32                   | 92                   | 16                      | 15.0                 | 4 |       |     | 111         | 111 |
| 17.0                      | 32                   | 92                   | 16                      | -                    | 4 |       |     | 112         | 112 |
| 18.0                      | 32                   | 92                   | 16                      | -                    | 4 |       |     | 113         | 113 |
| 20.0                      | 38                   | 104                  | 20                      | 19.0                 | 4 |       |     | 116         | 116 |

| d <sub>1</sub> js14<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | d <sub>3</sub><br>mm | Z | HSS-E |     | HSS-E/TiAlN |     |
|---------------------------|----------------------|----------------------|-------------------------|----------------------|---|-------|-----|-------------|-----|
|                           |                      |                      |                         |                      |   | 16195 | ... | 16198       | ... |
| 22.0                      | 38                   | 104                  | 20                      | -                    | 5 |       |     | 117         | 117 |
| 24.0                      | 45                   | 121                  | 25                      | -                    | 5 |       |     | 119         |     |
| 25.0                      | 45                   | 121                  | 25                      | 24.0                 | 5 |       |     | 120         | 120 |
| 26.0                      | 45                   | 121                  | 25                      | -                    | 6 |       |     | 121         | 121 |
| 28.0                      | 45                   | 121                  | 25                      | -                    | 6 |       |     | 122         | 122 |
| 30.0                      | 45                   | 121                  | 25                      | -                    | 6 |       |     | 123         | 123 |
| 32.0                      | 53                   | 133                  | 32                      | 31.0                 | 6 |       |     | 124         | 124 |
| 36.0                      | 53                   | 133                  | 32                      | -                    | 6 |       |     | 126         | 126 |
| 40.0                      | 63                   | 155                  | 40                      | 39.0                 | 6 |       |     | 129         | 129 |

| Al<10%Si | Al>10%Si | Cu | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|----------|----------|----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| 16195    |          |    |         |         |         |          |          |          |        |        |        |        |         |         |          |       |         |
| 70       | 60       | 60 | 50      | 40      | 40      | 30       | 20       | -        | -      | -      | -      | -      | 20      | 15      | 10       | 40    | -       |
| 16198    |          |    |         |         |         |          |          |          |        |        |        |        |         |         |          |       |         |
| 100      | 90       | 90 | 80      | 65      | 65      | 45       | 30       | -        | -      | -      | -      | -      | 30      | 20      | -        | 65    | -       |

# 16200

## Shank roughing cutter



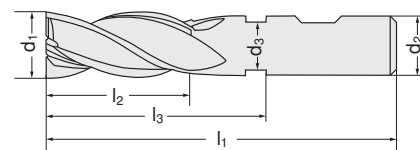
### Design

- Long
- Right cutting
- With roughing teeth
- Right-hand twist approx. 30°
- **4-6 cutting edges**
- **Centre cutting up to Ø 32 mm**
- Straight shank with driving surface in accordance with DIN 1835 B
- With eccentric relief grinding, over Ø 10.0 mm with double relief grinding

Quality  
HSS-E (Co5).



16200



| d <sub>1</sub> k12<br>mm | l <sub>2</sub><br>mm | l <sub>3</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | d <sub>3</sub><br>mm | Z | 16200 | ... |
|--------------------------|----------------------|----------------------|----------------------|-------------------------|----------------------|---|-------|-----|
| 8.0                      | 38                   | 48                   | 88                   | 10                      | 7.5                  | 4 |       | 100 |
| 10.0                     | 45                   | 55                   | 95                   | 10                      | 9.5                  | 4 |       | 101 |
| 12.0                     | 53                   | 65                   | 110                  | 12                      | 11.5                 | 4 |       | 102 |
| 14.0                     | 53                   | 65                   | 110                  | 12                      | 11.5                 | 4 |       | 103 |
| 16.0                     | 63                   | 75                   | 123                  | 16                      | 15.5                 | 4 |       | 105 |
| 18.0                     | 63                   | 75                   | 123                  | 16                      | 15.5                 | 4 |       | 106 |

| d <sub>1</sub> k12<br>mm | l <sub>2</sub><br>mm | l <sub>3</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | d <sub>3</sub><br>mm | Z | 16200 | ... |
|--------------------------|----------------------|----------------------|----------------------|-------------------------|----------------------|---|-------|-----|
| 20.0                     | 75                   | 91                   | 141                  | 20                      | 19.5                 | 4 |       | 107 |
| 25.0                     | 90                   | 110                  | 166                  | 25                      | 24.5                 | 4 |       | 110 |
| 30.0                     | 90                   | 110                  | 166                  | 25                      | 24.5                 | 6 |       | 113 |
| 32.0                     | 106                  | 126                  | 186                  | 32                      | 31.5                 | 6 |       | 114 |
| 36.0                     | 106                  | 126                  | 186                  | 32                      | 31.5                 | 6 |       | 115 |

| Al<10%Si | Al>10%Si | Cu    | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|----------|----------|-------|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| 40-120   | 40-90    | 40-90 | 45-50   | 30-35   | 25-38   | 15-30    | 10-25    | -        | -      | -      | -      | -      | 5-18    | 3-15    | 3-15     | 24-40 | 50-60   |

# Shank roughing cutters | Shank roughing finishing cutters

16209

## Shank roughing cutter



### Design

- Extra-long
- Right cutting
- Right-hand twist approx. 30°
- 4-5 cutting edges
- Straight shank with driving surface in accordance with DIN 1835 B

Quality  
HSS-E/TiAlN.

HSS-E  
TiAlN

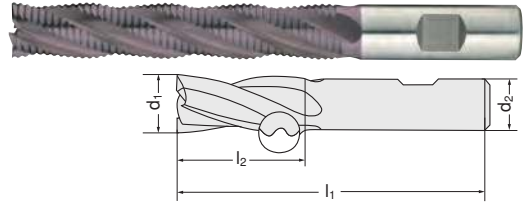
Z 4-5



NR



16209



| d <sub>1</sub><br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub><br>mm | Z | 16209 | ... |
|----------------------|----------------------|----------------------|----------------------|---|-------|-----|
| 6.0                  | 40                   | 100                  | 6                    | 4 |       | 106 |
| 8.0                  | 65                   | 115                  | 8                    | 4 |       | 108 |
| 10.0                 | 65                   | 115                  | 10                   | 4 |       | 110 |
| 12.0                 | 75                   | 132                  | 12                   | 4 |       | 112 |

| d <sub>1</sub><br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub><br>mm | Z | 16209 | ... |
|----------------------|----------------------|----------------------|----------------------|---|-------|-----|
| 16.0                 | 100                  | 160                  | 16                   | 4 |       | 116 |
| 20.0                 | 125                  | 191                  | 20                   | 4 |       | 120 |
| 25.0                 | 125                  | 201                  | 25                   | 5 |       | 125 |

| Al<10%Si | Al>10%Si | Cu     | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|----------|----------|--------|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| 70-200   | 40-150   | 40-150 | 75-85   | 45-55   | 40-60   | 20-50    | 12-40    | -        | -      | -      | -      | -      | 5-28    | 3-25    | -        | 40-70 | 80-100  |

16205

## Shank roughing cutter



### Design

Short, 6-8 cutting edges, straight shank with driving surface in accordance with DIN 1835 B. Relief ground cord profile, right-hand spiral 35°. Roughing teeth.

Quality  
HSS-E (Co5).

HSS-E

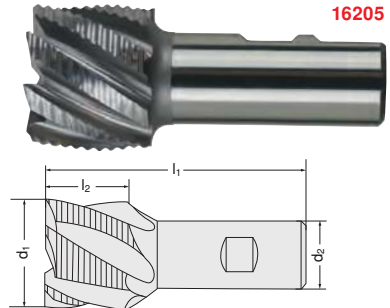
Z 6-8



NR



16205



| d <sub>1</sub> k12<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | Z | 16205 | ... |
|--------------------------|----------------------|----------------------|-------------------------|---|-------|-----|
| 30.0                     | 30                   | 90                   | 20                      | 6 |       | 101 |
| 35.0                     | 30                   | 90                   | 20                      | 6 |       | 102 |
| 40.0                     | 32                   | 95                   | 25                      | 8 |       | 103 |
| 50.0                     | 36                   | 100                  | 32                      | 8 |       | 104 |

| Al<10%Si | Al>10%Si | Cu    | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|----------|----------|-------|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| 70-120   | 40-70    | 40-70 | 28-32   | 25-30   | 18-25   | 16-22    | 12-18    | -        | -      | -      | -      | -      | 5-15    | 3-12    | 3-12     | 30-50 | 50-70   |

16220 - 16223

## Shank roughing finishing cutters



### Design

- Short
- 3 cutting edges
- Right cutting
- Centre cutting
- Right-hand twist approx. 30°
- Straight shank with driving surface in accordance with DIN 1835 B
- With eccentric relief grinding, over Ø 10.0 mm with double relief grinding

16220  
Quality  
HSS-E (Co8).

16223  
Quality  
HSS-E (Co8)/TiAlN-coated.

Z 3



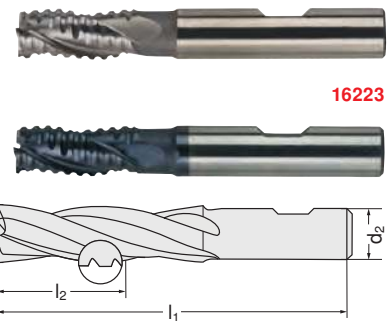
DIN 844B

NF



16220

16223



| d <sub>1</sub> js14<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | HSS-E<br>16220 | ... | HSS-E/TiAlN<br>16223 | ... |
|---------------------------|----------------------|----------------------|-------------------------|----------------|-----|----------------------|-----|
| 6.0                       | 13                   | 57                   | 6                       |                | 101 |                      | 101 |
| 8.0                       | 19                   | 69                   | 10                      |                | 102 |                      | 102 |
| 10.0                      | 22                   | 72                   | 10                      |                | 103 |                      | 103 |
| 12.0                      | 26                   | 83                   | 12                      |                | 104 |                      | 104 |
| 14.0                      | 26                   | 83                   | 12                      |                | 105 |                      | 105 |
| 16.0                      | 32                   | 92                   | 16                      |                | 106 |                      | 106 |
| 18.0                      | 32                   | 92                   | 16                      |                | 107 |                      | 107 |
| 20.0                      | 38                   | 104                  | 20                      |                | 108 |                      | 108 |

| d <sub>1</sub> js14<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | HSS-E<br>16220 | ... | HSS-E/TiAlN<br>16223 | ... |
|---------------------------|----------------------|----------------------|-------------------------|----------------|-----|----------------------|-----|
| 22.0                      | 38                   | 104                  | 20                      |                |     |                      | 109 |
| 25.0                      | 45                   | 121                  | 25                      |                | 110 |                      | 110 |
| 28.0                      | 45                   | 121                  | 25                      |                |     |                      | 111 |
| 30.0                      | 45                   | 121                  | 25                      |                | 112 |                      | 112 |
| 32.0                      | 53                   | 133                  | 32                      |                |     |                      | 113 |
| 36.0                      | 53                   | 133                  | 32                      |                |     |                      | 114 |
| 40.0                      | 63                   | 155                  | 32                      |                |     |                      | 115 |

| Al<10%Si | Al>10%Si | Cu | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|----------|----------|----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| 16220    | 70       | 60 | 60      | 50      | 40      | 40       | 30       | 20       | -      | -      | -      | -      | 20      | 15      | 10       | 40    | -       |
| 16223    | 100      | 90 | 90      | 80      | 65      | 65       | 45       | 30       | -      | -      | -      | -      | 30      | 20      | 15       | 65    | -       |



# 16260 - 16268

## Shank roughing cutter



### Design

- Short
- 4-6 cutting edges
- With eccentric relief grinding
- With released straight shank with driving surface in accordance with DIN 1835 B
- Fine roughing profile
- Right cutting with centre cutting
- Right-hand twist approx. 35°

### 16260

#### Design

- Cutting tolerance js14

#### Quality

HSS-E (Co8).

### 16262

#### Design

- Cutting tolerance js14

#### Quality

HSS-E (Co8)/TiAlN-coated.

### 16268

#### Design

- Cutting tolerance k12

#### Applications

Also suitable for dry machining.

#### Quality

HSS-E-PM/TiAlN-coated.



HSS-E



16260

HSS-E  
TiAlN

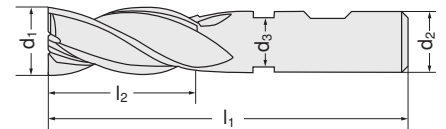


16262

HSS-E-PM  
TiAlN



16268



| d <sub>1</sub><br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | d <sub>3</sub><br>mm | Z | HSS-E<br>16260 | HSS-E/TiAlN<br>16262 | HSS-E-PM/TiAlN<br>16268 |
|----------------------|----------------------|----------------------|-------------------------|----------------------|---|----------------|----------------------|-------------------------|
|                      |                      |                      |                         |                      |   | ...            | ...                  | ...                     |
| 6.0                  | 13                   | 57                   | 6                       | 5.5                  | 4 | 101            | 101                  | 101                     |
| 8.0                  | 19                   | 69                   | 10                      | 7.5                  | 4 | 102            | 102                  | 102                     |
| 10.0                 | 22                   | 72                   | 10                      | 9.0                  | 4 | 103            | 103                  | 103                     |
| 12.0                 | 26                   | 83                   | 12                      | 11.0                 | 4 | 104            | 104                  | 104                     |
| 14.0                 | 26                   | 83                   | 12                      | -                    | 4 | 105            | 105                  | 105                     |
| 16.0                 | 32                   | 92                   | 16                      | 15.0                 | 4 | 106            | 106                  | 106                     |
| 18.0                 | 32                   | 92                   | 16                      | -                    | 4 | 107            | 107                  | 107                     |
| 20.0                 | 38                   | 104                  | 20                      | 19.0                 | 4 | 108            | 108                  | 108                     |
| 25.0                 | 45                   | 121                  | 25                      | 24.0                 | 5 | 109            | 109                  | 109                     |
| 30.0                 | 45                   | 121                  | 25                      | -                    | 6 |                |                      | 110                     |

| Al<10%Si | Al>10%Si | Cu     | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|----------|----------|--------|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| 16260    |          |        |         |         |         |          |          |          |        |        |        |        |         |         |          |       |         |
| 70-120   | 40-70    | 40-70  | 28-32   | 25-30   | 18-25   | 16-22    | 12-18    | -        | -      | -      | -      | -      | 5-15    | 3-12    | 3-12     | 30-50 | 50-70   |
| 16262    |          |        |         |         |         |          |          |          |        |        |        |        |         |         |          |       |         |
| 70-200   | 40-150   | 40-150 | 75-85   | 45-55   | 40-60   | 20-50    | 12-40    | -        | -      | -      | -      | -      | 5-28    | 3-25    | 3-25     | 40-70 | 80-100  |
| 16268    |          |        |         |         |         |          |          |          |        |        |        |        |         |         |          |       |         |
| 140-250  | 120-140  | 90-120 | 80-90   | 70-80   | 55-65   | 50-60    | 40-50    | -        | -      | -      | -      | -      | 40-45   | 35-40   | -        | 60-90 | 80-120  |

# 16270

## Shank roughing cutter



### Design

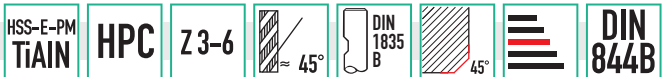
- With high-performance roughing teeth

### Applications

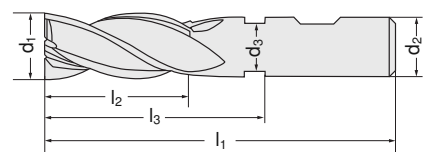
For roughing with the most stringent demands of the service life.

### Quality

HSS-E-PM/TiAlN-coated.



16270



| d <sub>1</sub> k12<br>mm | l <sub>2</sub><br>mm | l <sub>3</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | d <sub>3</sub><br>mm | Z | 16270 | ... |
|--------------------------|----------------------|----------------------|----------------------|-------------------------|----------------------|---|-------|-----|
| 4.0                      | 11                   | -                    | 55                   | 6                       | -                    | 3 |       | 204 |
| 5.0                      | 13                   | 21                   | 57                   | 6                       | 4.8                  | 4 |       | 205 |
| 6.0                      | 16                   | 21                   | 57                   | 6                       | 5.5                  | 4 |       | 206 |
| 8.0                      | 16                   | 27                   | 63                   | 8                       | 7.5                  | 4 |       | 208 |
| 10.0                     | 22                   | 32                   | 72                   | 10                      | 9.5                  | 4 |       | 210 |
| 12.0                     | 25                   | 38                   | 83                   | 12                      | 11.5                 | 4 |       | 212 |
| 16.0                     | 32                   | 44                   | 92                   | 16                      | 15.5                 | 5 |       | 216 |
| 20.0                     | 38                   | 54                   | 104                  | 20                      | 19.5                 | 6 |       | 220 |
| 25.0                     | 45                   | 65                   | 121                  | 25                      | 24.5                 | 6 |       | 225 |

| Al<10%Si | Al>10%Si | Cu    | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1300N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|----------|----------|-------|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| 200-450  | 120-140  | 60-80 | 80-90   | 70-80   | 50-70   | 40-50    | 30-40    | 30-35    | -      | -      | -      | -      | 40-45   | 40-45   | 16-30    | -     | -       |

## 16277 - 16278

## Shank roughing cutter



## Design

Long, 3–6 cutting edges, centre cutting up to Ø 20 mm, also free in the middle. Straight shank with driving surface in accordance with DIN 1835 B, fine roughing profile, right-hand spiral 30°.

16277

Quality

HSS-E (Co8).

16278

Quality

HSS-E (Co8)/TiAlN-coated.



Z 3-6



DIN 844B

HR

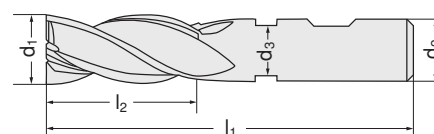


HSS-E

16277

HSS-E  
TiAlN

16278



| d <sub>1</sub> js14<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | d <sub>3</sub><br>mm | Z | HSS-E<br>16277 | ... | HSS-E/TiAlN<br>16278 | ... |
|---------------------------|----------------------|----------------------|-------------------------|----------------------|---|----------------|-----|----------------------|-----|
| 6.0                       | 24                   | 68                   | 6                       | 5.5                  | 3 |                | 101 |                      | 101 |
| 8.0                       | 38                   | 88                   | 10                      | 7.5                  | 3 |                | 102 |                      | 102 |
| 10.0                      | 45                   | 95                   | 10                      | 9.0                  | 4 |                | 103 |                      | 103 |
| 12.0                      | 53                   | 110                  | 12                      | 11.0                 | 4 |                | 104 |                      | 104 |
| 14.0                      | 53                   | 110                  | 12                      | -                    | 4 |                | 105 |                      | 105 |
| 16.0                      | 63                   | 123                  | 16                      | 15.0                 | 4 |                | 106 |                      | 106 |
| 18.0                      | 63                   | 123                  | 16                      | -                    | 4 |                |     |                      | 107 |
| 20.0                      | 75                   | 141                  | 20                      | 19.0                 | 4 |                | 108 |                      | 108 |
| 22.0                      | 75                   | 141                  | 20                      | -                    | 5 |                | 109 |                      | 109 |
| 25.0                      | 90                   | 166                  | 25                      | 24.0                 | 5 |                | 110 |                      | 110 |
| 28.0                      | 90                   | 166                  | 25                      | -                    | 6 |                |     |                      | 111 |
| 30.0                      | 90                   | 166                  | 25                      | -                    | 6 |                |     |                      | 112 |

| Al<10%Si | Al>10%Si | Cu     | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|----------|----------|--------|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| 16277    |          |        |         |         |         |          |          |          |        |        |        |        |         |         |          |       |         |
| 70-120   | 40-70    | 40-70  | 28-32   | 25-30   | 18-25   | 16-22    | 12-18    | -        | -      | -      | -      | -      | 5-15    | 3-12    | 3-12     | -     | -       |
| 16278    |          |        |         |         |         |          |          |          |        |        |        |        |         |         |          |       |         |
| 70-200   | 40-150   | 40-150 | 75-85   | 45-55   | 40-60   | 20-50    | 12-40    | -        | -      | -      | -      | -      | 5-28    | 3-25    | -        | 40-70 | 80-100  |

## 16281

## Radius roughing cutter



## Design

Short, 3–4 cutting edges, centre cutting. Straight shank with driving surface in accordance with DIN 1835 B, fine roughing profile, right-hand spiral 35°.

Quality

HSS-E (Co8)/TiAlN-coated.



Z 3-4

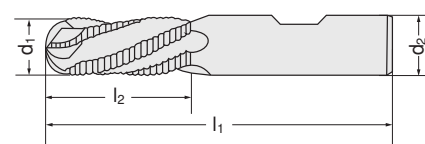


DIN 844B

HR



16281



| d <sub>1</sub> js14<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | Z | 16281 | ... |
|---------------------------|----------------------|----------------------|-------------------------|---|-------|-----|
| 6.0                       | 13                   | 57                   | 6                       | 3 |       | 101 |
| 8.0                       | 19                   | 69                   | 10                      | 3 |       | 102 |
| 10.0                      | 22                   | 72                   | 10                      | 3 |       | 103 |
| 12.0                      | 26                   | 83                   | 12                      | 4 |       | 104 |
| 16.0                      | 32                   | 92                   | 16                      | 4 |       | 105 |
| 20.0                      | 38                   | 104                  | 20                      | 4 |       | 106 |
| 25.0                      | 45                   | 121                  | 25                      | 4 |       | 107 |

| Al<10%Si | Al>10%Si | Cu | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|----------|----------|----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| 100      | 90       | 90 | 80      | 65      | 65      | 45       | 30       | -        | -      | -      | -      | -      | 30      | 20      | 15       | 65    | -       |



16370

## T-slot cutter

HSS-E

Z 6-8



DIN 851

N



## Design

## - Type N

## - 6-8 cutting edges

- Right cutting

- Cross-toothed

- For cutting on periphery and end face

- Straight shank with driving surface

in accordance with DIN 1835 B

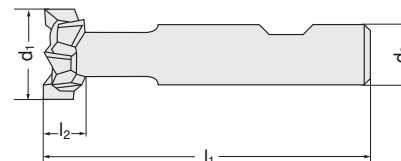
## Applications

For cutting T-slots in accordance with DIN 650.

## Quality

HSS-E (Co5).

16370



| For T-slots<br>nominal dimension | d <sub>1</sub> d11<br>mm | l <sub>2</sub> d11<br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | Z  | 16370 | ... |
|----------------------------------|--------------------------|--------------------------|----------------------|-------------------------|----|-------|-----|
| 6.0                              | 12.5                     | 6                        | 57                   | 10                      | 6  |       | 201 |
| 8.0                              | 16.0                     | 8                        | 62                   | 10                      | 6  |       | 202 |
| 10.0                             | 18.0                     | 8                        | 70                   | 12                      | 6  |       | 203 |
| 10.0                             | 19.0                     | 9                        | 71                   | 12                      | 6  |       | 204 |
| 12.0                             | 21.0                     | 9                        | 74                   | 12                      | 6  |       | 205 |
| 12.0                             | 22.0                     | 10                       | 75                   | 12                      | 6  |       | 206 |
| 14.0                             | 25.0                     | 11                       | 82                   | 16                      | 8  |       | 207 |
| 16.0                             | 28.0                     | 12                       | 85                   | 16                      | 8  |       | 208 |
| 18.0                             | 32.0                     | 14                       | 90                   | 16                      | 8  |       | 209 |
| 20.0                             | 36.0                     | 16                       | 103                  | 25                      | 8  |       | 210 |
| 22.0                             | 40.0                     | 18                       | 108                  | 25                      | 10 |       | 211 |

| Al<10%Si | Al>10%Si | Cu    | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|----------|----------|-------|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| 75-150   | 30-75    | 30-45 | 40-45   | 30-35   | 28-30   | 25-28    | -        | -        | -      | -      | -      | -      | 20-23   | 18-20   | 10-20    | 22-35 | 60-120  |

16375

## Keyway cutters

HSS-E

Z 6-12



DIN 850D

N



## Design

## - 6-12 cutting edges

- Right cutting

- Cross-toothed

- For cutting on periphery

- Straight shank with driving surface

in accordance with DIN 1835 B

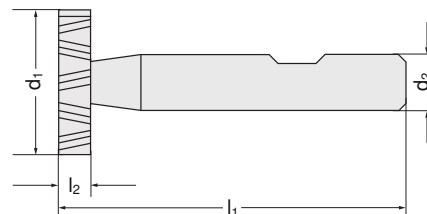
## Applications

For cutting grooves for disc springs in accordance with DIN 6888.

## Quality

HSS-E (Co5).

16375



| d <sub>1</sub> h12 x l <sub>2</sub> e8<br>mm | for disc springs<br>width x height mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | Z  | 16375 | ... |
|----------------------------------------------|---------------------------------------|----------------------|-------------------------|----|-------|-----|
| 10.5 x 2.0                                   | 2.0 x 3.7                             | 50                   | 6                       | 8  |       | 104 |
| 10.5 x 2.5                                   | 2.5 x 3.7                             | 50                   | 6                       | 8  |       | 105 |
| 10.5 x 3.0                                   | 3.0 x 3.7                             | 50                   | 6                       | 6  |       | 106 |
| 13.5 x 3.0                                   | 3.0 x 5.0                             | 56                   | 10                      | 6  |       | 107 |
| *13.5 x 2.0                                  | -                                     | 56                   | 10                      | 6  |       | 125 |
| 13.5 x 4.0                                   | 4.0 x 5.0                             | 56                   | 10                      | 6  |       | 108 |
| 16.5 x 3.0                                   | 3.0 x 6.5                             | 56                   | 10                      | 6  |       | 109 |
| 16.5 x 4.0                                   | 4.0 x 6.5                             | 56                   | 10                      | 6  |       | 110 |
| 16.5 x 5.0                                   | 5.0 x 6.5                             | 56                   | 10                      | 6  |       | 111 |
| 19.5 x 4.0                                   | 4.0 x 7.5                             | 63                   | 10                      | 8  |       | 112 |
| *19.5 x 3.0                                  | -                                     | 63                   | 10                      | 8  |       | 126 |
| 19.5 x 5.0                                   | 5.0 x 7.5                             | 63                   | 10                      | 8  |       | 113 |
| 19.5 x 6.0                                   | 6.0 x 7.5                             | 63                   | 10                      | 8  |       | 114 |
| 22.5 x 5.0                                   | 5.0 x 9.0                             | 63                   | 10                      | 8  |       | 115 |
| *22.5 x 4.0                                  | -                                     | 63                   | 10                      | 8  |       | 127 |
| 22.5 x 6.0                                   | 6.0 x 9.0                             | 63                   | 10                      | 8  |       | 116 |
| 22.5 x 8.0                                   | 8.0 x 9.0                             | 63                   | 10                      | 8  |       | 117 |
| 25.5 x 6.0                                   | 6.0 x 10.0                            | 63                   | 10                      | 10 |       | 118 |
| *25.5 x 5.0                                  | -                                     | 63                   | 10                      | 10 |       | 128 |
| 28.5 x 6.0                                   | 6.0 x 11.0                            | 63                   | 10                      | 10 |       | 119 |
| 28.5 x 8.0                                   | 8.0 x 11.0                            | 63                   | 10                      | 10 |       | 120 |
| 28.5 x 10.0                                  | 10.0 x 11.0                           | 71                   | 12                      | 10 |       | 121 |
| 32.5 x 8.0                                   | 8.0 x 13.0                            | 71                   | 12                      | 12 |       | 122 |
| *32.5 x 6.0                                  | -                                     | 71                   | 12                      | 10 |       | 129 |
| 32.5 x 10.0                                  | 10.0 x 13.0                           | 71                   | 12                      | 12 |       | 123 |
| *38.5 x 8.0                                  | -                                     | 71                   | 12                      | 10 |       | 130 |
| 45.5 x 10.0                                  | 10.0 x 16.0                           | 71                   | 12                      | 12 |       | 124 |

\* Not DIN 850

| Al<10%Si | Al>10%Si | Cu    | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|----------|----------|-------|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| 75-150   | 30-75    | 30-45 | 40-45   | 30-35   | 28-30   | 25-28    | -        | -        | -      | -      | -      | -      | 20-23   | 18-20   | 10-20    | 22-35 | 60-120  |

## 16380 - 16383

## Angle cutters



## Design

- Straight shank with driving surface in accordance with DIN 1835 B
- Right cutting
- **10-12 cutting edges**
- Angle tolerance  $\pm 30^\circ$

## Applications

For cutting angle grooves (slide guideways etc.).

## Quality

HSS-E (Co5).

## 16380

## Design

- **Shape C**
- Cutting edge tapering in the direction of the shank
- For cutting on periphery and end face
- $\alpha = 45^\circ$

DIN 1833C



16380

## 16381

## Design

- **Shape C**
- Cutting edge tapering in the direction of the shank
- For cutting on periphery and end face
- $\alpha = 60^\circ$

DIN 1833C



16381

## 16382

## Design

- **Shape D**
- Cutting edge tapering in the direction of the end face
- Only cuts on periphery
- $\alpha = 45^\circ$

DIN 1833D



16382

## 16383

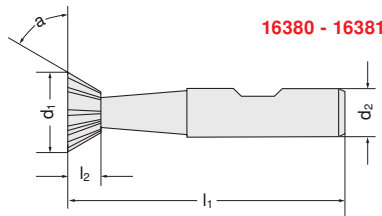
## Design

- **Shape D**
- Cutting edge tapering in the direction of the end face
- Only cuts on periphery
- $\alpha = 60^\circ$

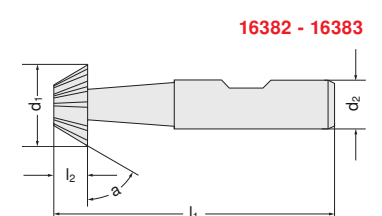
DIN 1833D



16383



16380 - 16381



16382 - 16383

| 45°                  |                      | 60°                  |                      | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | Z | 45° / C |     | 60° / C |     | 45° / D |     | 60° / D |     |
|----------------------|----------------------|----------------------|----------------------|----------------------|-------------------------|---|---------|-----|---------|-----|---------|-----|---------|-----|
| d <sub>1</sub><br>mm | l <sub>2</sub><br>mm | d <sub>1</sub><br>mm | l <sub>2</sub><br>mm |                      |                         |   | 16380   | ... | 16381   | ... | 16382   | ... | 16383   | ... |
| 16.0                 | 4.0                  | 6.3                  | 60                   | 12                   | 10                      |   | 101     |     | 101     |     | 101     |     | 101     |     |
| 20.0                 | 5.0                  | 8.0                  | 63                   | 12                   | 10                      |   | 102     |     | 102     |     | 102     |     | 102     |     |
| 25.0                 | 6.3                  | 10.0                 | 67                   | 12                   | 10                      |   | 103     |     | 103     |     | 103     |     | 103     |     |
| 32.0                 | 8.0                  | 12.5                 | 71                   | 16                   | 12                      |   | 104     |     | 104     |     | 104     |     | 104     |     |

| Al<10%Si | Al>10%Si | Cu    | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|----------|----------|-------|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| 75-150   | 30-75    | 30-45 | 40-45   | 30-35   | 28-30   | 25-28    | -        | -        | -      | -      | -      | -      | 20-23   | 18-20   | 10-20    | 22-35 | 60-120  |

## 16385

## Radius cutter



## Design

- **Concave** (quarter circle cutter)
- Straight shank with driving surface in accordance with DIN 1835 B
- Right cutting
- **4 cutting edges**

## Applications

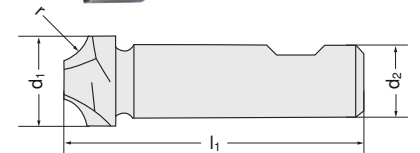
For materials up to approx. 1000 N/mm<sup>2</sup> strength.

## Quality

HSS-E (Co5).



16385



| r h11<br>mm | d <sub>1</sub><br>mm | d <sub>3</sub> js14<br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | Z | 16385 | ... |
|-------------|----------------------|---------------------------|----------------------|-------------------------|---|-------|-----|
| 1.0         | 8                    | 6                         | 60                   | 10                      | 4 | 101   |     |
| 1.5         | 10                   | 6                         | 60                   | 10                      | 4 | 103   |     |
| 2.0         | 10                   | 6                         | 60                   | 10                      | 4 | 105   |     |
| 2.5         | 10                   | 6                         | 60                   | 10                      | 4 | 106   |     |
| 3.0         | 12                   | 6                         | 60                   | 12                      | 4 | 107   |     |
| 3.5         | 14                   | 6                         | 60                   | 12                      | 4 | 109   |     |
| 4.0         | 14                   | 6                         | 60                   | 12                      | 4 | 110   |     |
| 4.5         | 16                   | 6                         | 60                   | 12                      | 4 | 111   |     |
| 5.0         | 16                   | 6                         | 60                   | 12                      | 4 | 112   |     |

| r h11<br>mm | d <sub>1</sub><br>mm | d <sub>3</sub> js14<br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | Z | 16385 | ... |
|-------------|----------------------|---------------------------|----------------------|-------------------------|---|-------|-----|
| 6.0         | 21                   | 8                         | 67                   | 16                      | 4 | 114   |     |
| 8.0         | 24                   | 8                         | 71                   | 16                      | 4 | 118   |     |
| 10.0        | 28                   | 8                         | 85                   | 25                      | 4 | 119   |     |
| 12.0        | 35                   | 10                        | 90                   | 25                      | 4 | 121   |     |
| 14.0        | 42                   | 16                        | 100                  | 25                      | 4 | 124   |     |
| 16.0        | 48                   | 16                        | 100                  | 25                      | 4 | 126   |     |
| 18.0        | 54                   | 16                        | 112                  | 32                      | 4 | 127   |     |
| 20.0        | 58                   | 16                        | 112                  | 32                      | 4 | 128   |     |

| Al<10%Si | Al>10%Si | Cu    | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|----------|----------|-------|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| 75-150   | 30-75    | 30-45 | 40-45   | 30-35   | 28-30   | 25-28    | -        | -        | -      | -      | -      | -      | 20-23   | 18-20   | 10-20    | 22-35 | 60-120  |

# 16500 - 16502

## Solid carbide mini cutter

N

Z3



**HHW**

### Design

#### - Short

- Right cutting

- **3 cutting edges**

- Right-hand twist approx. 30°

- **Centre cutting**

- Eccentric relief grinding

- Straight shank with driving surface similar to

DIN 6535 HB

16500

Quality

Universal carbide ultra-fine grain (P20 - K40).

16502

Quality

Universal carbide ultra-fine grain (P20 - K40)

TiAlN-coated.

VHM



16500

VHM  
TiAlN



16502

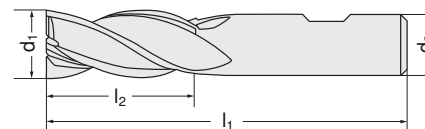
### Note:

Re-grinding of cutters with a small cutting-edge diameter is uneconomical.

It is therefore more economical to use cutters up to the wear limit and then throw them away.

You repeatedly use brand-new cutters and reduce the risk of having to scrap finished pieces.

**NEW**



| Solid carbide           |                      |                      |                         | Solid carbide/TiAlN |     |       |     |
|-------------------------|----------------------|----------------------|-------------------------|---------------------|-----|-------|-----|
| d <sub>1</sub> e8<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | 16500               | ... | 16502 | ... |
| 1.5                     | 4                    | 35                   | 6                       |                     |     |       | 100 |
| 2.0                     | 4                    | 35                   | 6                       | 101                 |     | 101   |     |
| 2.5                     | 4                    | 35                   | 6                       | 113                 |     | 113   |     |
| 3.0                     | 5                    | 36                   | 6                       | 102                 |     | 102   |     |
| 3.5                     | 5                    | 36                   | 6                       | 114                 |     | 114   |     |
| 4.0                     | 7                    | 38                   | 6                       | 103                 |     | 103   |     |
| 4.5                     | 7                    | 38                   | 6                       |                     |     |       | 115 |
| 5.0                     | 8                    | 39                   | 6                       | 104                 |     | 104   |     |

| Solid carbide           |                      |                      |                         | Solid carbide/TiAlN |     |       |     |
|-------------------------|----------------------|----------------------|-------------------------|---------------------|-----|-------|-----|
| d <sub>1</sub> e8<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | 16500               | ... | 16502 | ... |
| 5.5                     | 8                    | 39                   | 6                       |                     |     |       | 116 |
| 6.0                     | 8                    | 39                   | 6                       | 105                 |     | 105   |     |
| 8.0                     | 11                   | 43                   | 8                       | 106                 |     | 106   |     |
| 10.0                    | 13                   | 50                   | 10                      | 107                 |     | 107   |     |
| 12.0                    | 15                   | 55                   | 12                      | 108                 |     | 108   |     |
| 16.0                    | 18                   | 62                   | 16                      | 110                 |     |       |     |
| 18.0                    | 20                   | 70                   | 18                      | 111                 |     |       |     |

| Al<10%Si | Al>10%Si | Cu      | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G)  | Plastic |
|----------|----------|---------|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|--------|---------|
| 16500    |          |         |         |         |         |          |          |          |        |        |        |        |         |         |          |        |         |
| 200-300  | 160-240  | 140-200 | 70-100  | 75-90   | 60-75   | 55-70    | 50-60    | -        | -      | -      | -      | -      | 40-60   | 30-40   | -        | 70-120 | -       |
| 16502    |          |         |         |         |         |          |          |          |        |        |        |        |         |         |          |        |         |
| 250-280  | 220-250  | 220-250 | 150-180 | 140-170 | 120-130 | 80-100   | 80-90    | 70-80    | -      | -      | -      | -      | 50-60   | 40-50   | -        | 90-150 | 200-220 |

# 16505 - 16507

## Solid carbide square end mill

N

Z2



**HHW**

### Design

#### - Short

- Right cutting

- **2 cutting edges**

- Right-hand twist approx. 30°

- **Centre cutting**

- With smooth straight shank in accordance with

DIN 6535 HA

16505

Quality

Universal carbide ultra-fine grain (P 20 - K 40).

16507

Quality

Universal carbide ultra-fine grain (P 20 - K 40) TiAlN-coated.

VHM

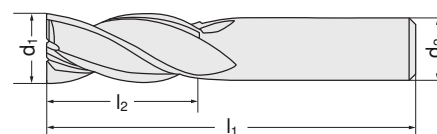


16505

VHM  
TiAlN



16507



| Solid carbide            |                      |                      |                         | Solid carbide/TiAlN |     |       |     |
|--------------------------|----------------------|----------------------|-------------------------|---------------------|-----|-------|-----|
| d <sub>1</sub> h10<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | 16505               | ... | 16507 | ... |
| 2.0                      | 8                    | 32                   | 2.0                     | 101                 |     | 101   |     |
| 2.5                      | 8                    | 32                   | 2.5                     | 102                 |     | 102   |     |
| 3.0                      | 12                   | 32                   | 3.0                     | 103                 |     | 103   |     |
| 3.5                      | 12                   | 32                   | 3.5                     | 104                 |     | 104   |     |
| 4.0                      | 12                   | 40                   | 4.0                     | 105                 |     | 105   |     |
| 4.5                      | 14                   | 50                   | 4.5                     | 106                 |     | 106   |     |
| 5.0                      | 14                   | 50                   | 5.0                     | 107                 |     | 107   |     |
| 5.5                      | 16                   | 50                   | 5.5                     | 108                 |     | 108   |     |
| 6.0                      | 16                   | 50                   | 6.0                     | 109                 |     | 109   |     |

| Solid carbide            |                      |                      |                         | Solid carbide/TiAlN |     |       |     |
|--------------------------|----------------------|----------------------|-------------------------|---------------------|-----|-------|-----|
| d <sub>1</sub> h10<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | 16505               | ... | 16507 | ... |
| 7.0                      | 20                   | 60                   | 7.0                     | 110                 |     | 110   |     |
| 8.0                      | 20                   | 60                   | 8.0                     | 111                 |     | 111   |     |
| 9.0                      | 20                   | 60                   | 9.0                     | 112                 |     | 112   |     |
| 10.0                     | 22                   | 70                   | 10.0                    | 113                 |     | 113   |     |
| 12.0                     | 22                   | 70                   | 12.0                    | 114                 |     | 114   |     |
| 14.0                     | 25                   | 75                   | 14.0                    | 115                 |     | 115   |     |
| 16.0                     | 25                   | 75                   | 16.0                    | 116                 |     | 116   |     |
| 20.0                     | 32                   | 100                  | 20.0                    | 117                 |     | 117   |     |

| Al<10%Si | Al>10%Si | Cu  | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|----------|----------|-----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| 16505    |          |     |         |         |         |          |          |          |        |        |        |        |         |         |          |       |         |
| 180      | 160      | 140 | 120     | 100     | 90      | 80       | 70       | 60       | -      | -      | -      | -      | 80      | 60      | -        | 85    | -       |
| 16507    |          |     |         |         |         |          |          |          |        |        |        |        |         |         |          |       |         |
| 230      | 200      | 180 | 150     | 130     | 120     | 100      | 90       | 80       | -      | -      | -      | -      | 105     | 80      | -        | 110   | -       |

# Solid carbide long hole milling cutters | Solid carbide square end mills

16603

## Solid carbide long hole milling cutter

TiAlN  
Ultra

N

Z2



**ATORN®**

### Design

- 2 cutting edges
- With centre cutting
- Radial relief
- With edge protection chamfer and clearance

### Applications

Universal use for plunge and groove milling.

### Quality

Solid carbide ultra-fine grain/TiAlN ultra-coated.

16603 099-116

### Design

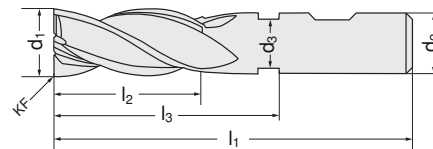
With smooth straight shank in accordance with DIN 6535 HA.

16603 117-144

### Design

With clamping surface in accordance with DIN 6535 HB.

16603 117-144



| d1 e8<br>mm | d2 h5<br>mm | d3<br>mm | l1<br>mm | l3<br>mm | l2<br>mm | KF<br>mm | 16603 | ... |
|-------------|-------------|----------|----------|----------|----------|----------|-------|-----|
| 0.25        | 3           | -        | 38       | -        | 0.5      | 0.1      | 099   |     |
| 0.35        | 3           | -        | 38       | -        | 1.0      | 0.1      | 100   |     |
| 0.3         | 3           | -        | 38       | -        | 1.0      | 0.1      | 101   |     |
| 0.5         | 3           | -        | 38       | -        | 1.5      | 0.1      | 103   |     |
| 0.8         | 3           | -        | 38       | -        | 2.0      | 0.1      | 106   |     |
| 1.0         | 3           | -        | 50       | -        | 3.0      | 0.1      | 108   |     |
| 1.2         | 3           | -        | 50       | -        | 4.0      | 0.1      | 110   |     |
| 1.4         | 3           | -        | 50       | -        | 4.0      | 0.1      | 111   |     |
| 1.5         | 3           | -        | 50       | -        | 4.0      | 0.1      | 112   |     |
| 1.6         | 3           | -        | 50       | -        | 4.0      | 0.1      | 113   |     |
| 2.0         | 3           | -        | 50       | -        | 5.0      | 0.1      | 115   |     |
| 2.5         | 3           | -        | 50       | -        | 6.0      | 0.1      | 116   |     |
| 2.8         | 6           | 2.6      | 57       | 15       | 8.0      | 0.1      | 117   |     |
| 3.0         | 6           | 2.8      | 57       | 15       | 8.0      | 0.1      | 118   |     |
| 3.8         | 6           | 3.6      | 57       | 15       | 11.0     | 0.1      | 119   |     |
| 4.0         | 6           | 3.8      | 57       | 15       | 11.0     | 0.1      | 120   |     |
| 4.8         | 6           | 4.6      | 57       | 21       | 13       | 0.1      | 121   |     |
| 5.0         | 6           | 4.8      | 57       | 21       | 13       | 0.1      | 122   |     |

| d1 e8<br>mm | d2 h5<br>mm | d3<br>mm | l1<br>mm | l3<br>mm | l2<br>mm | KF<br>mm | 16603 | ... |
|-------------|-------------|----------|----------|----------|----------|----------|-------|-----|
| 5.8         | 6           | 5.6      | 57       | 21       | 13       | 0.1      | 123   |     |
| 6.0         | 6           | 5.8      | 57       | 21       | 13       | 0.1      | 124   |     |
| 6.8         | 8           | 6.6      | 63       | 27       | 16       | 0.1      | 125   |     |
| 7.0         | 8           | 6.8      | 63       | 27       | 16       | 0.1      | 126   |     |
| 7.8         | 8           | 7.5      | 63       | 27       | 19       | 0.1      | 127   |     |
| 8.0         | 8           | 7.7      | 63       | 27       | 19       | 0.1      | 128   |     |
| 9.0         | 10          | 8.8      | 72       | 32       | 19       | 0.1      | 130   |     |
| 9.7         | 10          | 9.5      | 72       | 32       | 22       | 0.1      | 131   |     |
| 10.0        | 10          | 9.8      | 72       | 32       | 22       | 0.1      | 132   |     |
| 11.0        | 12          | 10.8     | 83       | 38       | 26       | 0.1      | 134   |     |
| 11.7        | 12          | 11.5     | 83       | 38       | 26       | 0.1      | 135   |     |
| 12.0        | 12          | 11.8     | 83       | 38       | 26       | 0.1      | 136   |     |
| 13.7        | 14          | 13.5     | 83       | 38       | 26       | 0.1      | 137   |     |
| 14.0        | 14          | 13.8     | 83       | 38       | 26       | 0.1      | 138   |     |
| 16.0        | 16          | 15.7     | 92       | 44       | 32       | 0.1      | 140   |     |
| 18.0        | 18          | 17.7     | 92       | 44       | 32       | 0.1      | 142   |     |
| 20.0        | 20          | 19.7     | 104      | 54       | 38       | 0.1      | 144   |     |

| Al<10%Si | Al>10%Si | Cu      | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <50HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G)  | Plastic |
|----------|----------|---------|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|--------|---------|
| 400-500  | 150-200  | 100-130 | 70-100  | 70-100  | 70-80   | 40-50    | 30-60    | -        | -      | -      | -      | -      | 50-60   | 40-50   | 35-50    | 80-120 | -       |

16517

## Solid carbide square end mill

VHM  
TiAlN

N

Z2



**HHW**

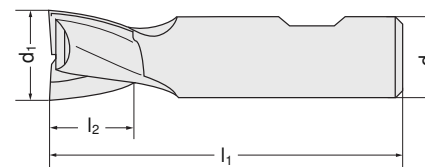
### Design

- Long
- Right cutting
- 2 cutting edges
- Right-hand twist approx. 30°
- Spiral-fluted
- Centre cutting
- With clamping surface in accordance with DIN 6535 HB

### Quality

Universal carbide ultra-fine grain (P 20 - K 40)  
TiAlN-coated.

16517



| d1 h10<br>mm | l2<br>mm | l1<br>mm | d2 h6<br>mm | 16517 | ... |
|--------------|----------|----------|-------------|-------|-----|
| 3.0          | 7        | 57       | 6           | 101   |     |
| 3.5          | 7        | 57       | 6           | 102   |     |
| 4.0          | 8        | 57       | 6           | 103   |     |
| 4.5          | 8        | 57       | 6           | 104   |     |
| 5.0          | 10       | 57       | 6           | 105   |     |
| 6.0          | 10       | 57       | 6           | 106   |     |

| d1 h10<br>mm | l2<br>mm | l1<br>mm | d2 h6<br>mm | 16517 | ... |
|--------------|----------|----------|-------------|-------|-----|
| 8.0          | 16       | 63       | 8           | 108   |     |
| 10.0         | 19       | 72       | 10          | 110   |     |
| 12.0         | 22       | 83       | 12          | 111   |     |
| 16.0         | 26       | 92       | 16          | 113   |     |
| 20.0         | 32       | 104      | 20          | 115   |     |

| Al<10%Si | Al>10%Si | Cu | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|----------|----------|----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| -        | -        | -  | 100     | 80      | 80      | 65       | 50       | 50       | -      | -      | -      | -      | 65      | 50      | -        | -     | -       |

# 16522 - 16524

## Solid carbide square end mill

**HHW**

### Design

#### - Short

- Right cutting

- **3 cutting edges**

- Right-hand twist approx. 30°

- Spiral-fluted

- **Centre cutting**

- With smooth straight shank in accordance with DIN 6535 HA

16522

Quality

Universal carbide ultra-fine grain  
(P 20 - K 40)

16524

Quality

Universal carbide ultra-fine grain  
(P 20 - K 40) TiAlN-coated.

N

Z3



VHM

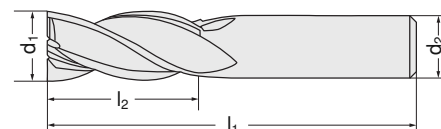


16522

VHM  
TiAlN



16524



| d <sub>1</sub> h10<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | Solid carbide |     | Solid carbide/TiAlN |     |
|--------------------------|----------------------|----------------------|-------------------------|---------------|-----|---------------------|-----|
|                          |                      |                      |                         | 16522         | ... | 16524               | ... |
| 2.0                      | 8                    | 32                   | 2                       |               | 101 |                     | 101 |
| 3.0                      | 12                   | 32                   | 3                       |               | 102 |                     | 102 |
| 4.0                      | 12                   | 40                   | 4                       |               | 103 |                     | 103 |
| 5.0                      | 14                   | 50                   | 5                       |               | 104 |                     | 104 |
| 6.0                      | 16                   | 50                   | 6                       |               | 105 |                     | 105 |
| 7.0                      | 20                   | 60                   | 7                       |               | 106 |                     | 106 |
| 8.0                      | 20                   | 60                   | 8                       |               | 107 |                     | 107 |

| d <sub>1</sub> h10<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | Solid carbide |     | Solid carbide/TiAlN |     |
|--------------------------|----------------------|----------------------|-------------------------|---------------|-----|---------------------|-----|
|                          |                      |                      |                         | 16522         | ... | 16524               | ... |
| 9.0                      | 20                   | 60                   | 9                       |               | 108 |                     | 108 |
| 10.0                     | 22                   | 70                   | 10                      |               | 109 |                     | 109 |
| 12.0                     | 22                   | 70                   | 12                      |               | 110 |                     | 110 |
| 14.0                     | 25                   | 75                   | 14                      |               | 111 |                     | 111 |
| 16.0                     | 25                   | 75                   | 16                      |               | 112 |                     | 112 |
| 20.0                     | 32                   | 100                  | 20                      |               | 113 |                     | 113 |

| Al<10%Si | Al>10%Si | Cu | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|----------|----------|----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| 16522    | -        | -  | 120     | 100     | 90      | 80       | 70       | 60       | -      | -      | -      | -      | -       | -       | -        | 85    | -       |
| 16524    | -        | -  | 150     | 130     | 120     | 100      | 90       | 80       | -      | -      | -      | -      | 105     | 80      | -        | 110   | -       |

# 16605

## Solid carbide square end mill

**ATORN®**

### Design

- With clearance and edge protection chamfer

- With centre cutting

- 3 cutting edges

### Applications

Universal application for plunge and groove milling, as well as for face and circumferential milling.

### Quality

Solid carbide ultra-fine grain/TiAlN ultra-coated.

TiAlN  
Ultra

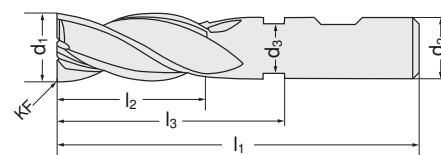
N

Z3



| d <sub>1</sub> h9<br>mm | d <sub>2</sub><br>mm | d <sub>3</sub><br>mm | l <sub>1</sub><br>mm | l <sub>3</sub><br>mm | l <sub>2</sub><br>mm | KF<br>mm | Z | 16605 | ... |
|-------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------|---|-------|-----|
| 2.0                     | 6                    | -                    | 50                   | -                    | 5                    | 0.05     | 3 |       | 100 |
| 3.0                     | 6                    | 2.9                  | 50                   | 12                   | 5                    | 0.1      | 3 |       | 101 |
| 3.5                     | 6                    | 3.4                  | 50                   | 13                   | 6                    | 0.1      | 3 |       | 102 |
| 4.0                     | 6                    | 3.9                  | 50                   | 15                   | 8                    | 0.1      | 3 |       | 103 |
| 4.5                     | 6                    | 4.4                  | 54                   | 15                   | 8                    | 0.1      | 3 |       | 104 |
| 5.0                     | 6                    | 4.9                  | 54                   | 16                   | 9                    | 0.1      | 3 |       | 105 |
| 5.5                     | 6                    | 5.4                  | 54                   | 17                   | 10                   | 0.1      | 3 |       | 106 |
| 6.0                     | 6                    | 5.9                  | 54                   | 17                   | 10                   | 0.1      | 3 |       | 107 |
| 6.5                     | 8                    | 6.3                  | 54                   | 19                   | 11                   | 0.1      | 3 |       | 108 |
| 7.0                     | 8                    | 6.8                  | 58                   | 19                   | 11                   | 0.1      | 3 |       | 109 |
| 8.0                     | 8                    | 7.8                  | 58                   | 20                   | 12                   | 0.2      | 3 |       | 110 |
| 9.0                     | 10                   | 8.8                  | 66                   | 23                   | 13                   | 0.2      | 3 |       | 111 |
| 10.0                    | 10                   | 9.7                  | 66                   | 24                   | 14                   | 0.2      | 3 |       | 112 |
| 12.0                    | 12                   | 11.7                 | 73                   | 26                   | 16                   | 0.2      | 3 |       | 113 |
| 14.0                    | 14                   | 13.7                 | 75                   | 28                   | 18                   | 0.2      | 3 |       | 114 |
| 16.0                    | 16                   | 15.5                 | 82                   | 32                   | 22                   | 0.2      | 3 |       | 115 |
| 18.0                    | 18                   | 17.5                 | 84                   | 34                   | 24                   | 0.2      | 3 |       | 116 |
| 20.0                    | 20                   | 19.5                 | 92                   | 40                   | 26                   | 0.2      | 3 |       | 117 |

| Al<10%Si | Al>10%Si | Cu      | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1300N | <50HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G)  | Plastic |
|----------|----------|---------|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|--------|---------|
| 400-500  | 150-200  | 100-130 | 70-100  | 70-100  | 70-80   | 40-50    | 30-60    | -        | -      | -      | -      | -      | 50-60   | 40-50   | 35-50    | 80-120 | -       |



16605

# Solid carbide square end mill

16607

## Solid carbide square end mill

TiAlN  
Ultra

N

Z3



**ATORN®**

Quality

Solid carbide ultra-fine grain/TiAlN ultra-coated.

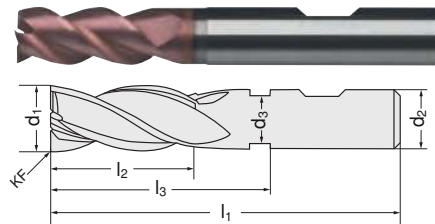
16607

### Design

- With centre cutting
- With edge protection chamfer and clearance

### Applications

Universal application for plunge and groove cutters, as well as for face and circumferential milling.



| d1 e8<br>mm | d2 h5<br>mm | d3<br>mm | l1<br>mm | l3<br>mm | l2<br>mm | KF<br>mm | 16607 | ... |
|-------------|-------------|----------|----------|----------|----------|----------|-------|-----|
| 2.0         | 6           | -        | 57       | -        | 8        | 0.05     | 100   |     |
| 3.0         | 6           | 2.8      | 57       | 15       | 8        | 0.05     | 101   |     |
| 3.5         | 6           | 3.3      | 57       | 15       | 11       | 0.05     | 102   |     |
| 4.0         | 6           | 3.8      | 57       | 15       | 11       | 0.1      | 103   |     |
| 4.5         | 6           | 4.3      | 57       | 21       | 13       | 0.1      | 104   |     |
| 5.0         | 6           | 4.8      | 57       | 21       | 13       | 0.1      | 105   |     |
| 5.5         | 6           | 5.3      | 57       | 21       | 13       | 0.1      | 106   |     |
| 6.0         | 6           | 5.8      | 57       | 21       | 13       | 0.1      | 107   |     |
| 6.5         | 8           | 6.3      | 63       | 27       | 16       | 0.1      | 108   |     |
| 7.0         | 8           | 6.8      | 63       | 27       | 16       | 0.1      | 109   |     |
| 7.5         | 8           | 7.3      | 63       | 27       | 19       | 0.2      | 110   |     |

| d1 e8<br>mm | d2 h5<br>mm | d3<br>mm | l1<br>mm | l3<br>mm | l2<br>mm | KF<br>mm | 16607 | ... |
|-------------|-------------|----------|----------|----------|----------|----------|-------|-----|
| 8.0         | 8           | 7.7      | 63       | 27       | 19       | 0.2      | 111   |     |
| 8.5         | 10          | 8.3      | 72       | 32       | 19       | 0.2      | 112   |     |
| 9.0         | 10          | 8.8      | 72       | 32       | 19       | 0.2      | 113   |     |
| 9.5         | 10          | 9.3      | 72       | 32       | 22       | 0.2      | 114   |     |
| 10.0        | 10          | 9.8      | 72       | 32       | 22       | 0.2      | 115   |     |
| 11.0        | 12          | 10.8     | 83       | 32       | 26       | 0.2      | 116   |     |
| 12.0        | 12          | 11.8     | 83       | 38       | 26       | 0.2      | 117   |     |
| 14.0        | 14          | 13.8     | 83       | 38       | 26       | 0.2      | 118   |     |
| 16.0        | 16          | 15.7     | 92       | 44       | 32       | 0.2      | 119   |     |
| 18.0        | 18          | 17.7     | 92       | 44       | 32       | 0.2      | 120   |     |
| 20.0        | 20          | 19.7     | 104      | 54       | 38       | 0.2      | 121   |     |

| Al<10%Si | Al>10%Si | Cu      | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <50HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G)  | Plastic |
|----------|----------|---------|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|--------|---------|
| 400-500  | 150-200  | 100-130 | 70-100  | 70-100  | 70-80   | 40-50    | 30-60    | -        | -      | -      | -      | -      | 50-60   | 40-50   | 35-50    | 80-120 | -       |

16532

## Solid carbide square end mill

VHM  
TiAlN

N

Z3



**HHW**

### Design

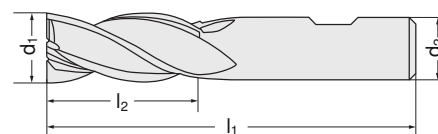
- Long
- Right cutting
- 3 cutting edges
- Right-hand twist approx. 45°
- Spiral-fluted
- Centre cutting
- Straight shank with driving surface in accordance with DIN 6535 HB

Quality

Universal carbide ultra-fine grain (P 20 - K 40)

TiAlN-coated.

16532



| d1 h10<br>mm | l2<br>mm | l1<br>mm | d2 h6<br>mm | 16532 | ... |
|--------------|----------|----------|-------------|-------|-----|
| 3.0          | 7        | 57       | 6           | 101   |     |
| 3.5          | 7        | 57       | 6           | 102   |     |
| 4.0          | 8        | 57       | 6           | 103   |     |
| 4.5          | 8        | 57       | 6           | 104   |     |
| 5.0          | 10       | 57       | 6           | 105   |     |
| 6.0          | 10       | 57       | 6           | 106   |     |
| 7.0          | 13       | 63       | 8           | 107   |     |
| 8.0          | 16       | 63       | 8           | 108   |     |

| d1 h10<br>mm | l2<br>mm | l1<br>mm | d2 h6<br>mm | 16532 | ... |
|--------------|----------|----------|-------------|-------|-----|
| 9.0          | 16       | 72       | 10          | 109   |     |
| 10.0         | 19       | 72       | 10          | 110   |     |
| 12.0         | 22       | 83       | 12          | 111   |     |
| 14.0         | 22       | 83       | 14          | 112   |     |
| 16.0         | 26       | 92       | 16          | 113   |     |
| 18.0         | 26       | 92       | 18          | 114   |     |
| 20.0         | 32       | 104      | 20          | 115   |     |

| Al<10%Si | Al>10%Si | Cu  | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|----------|----------|-----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| 230      | 200      | 180 | 150     | 130     | 120     | 100      | 90       | 80       | -      | -      | -      | -      | 105     | 80      | 40       | 110   | -       |

**ATORN®****Design**

- With clearance and edge protection chamfer
- With centre cutting
- 3 cutting edges

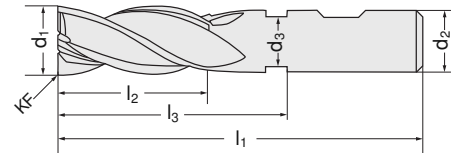
**Applications**

Universal application for plunge and groove milling, as well as for face and circumferential milling.

**Quality**

Solid carbide ultra-fine grain/TiAlN ultra-coated.

16606



| d <sub>1</sub> h9<br>mm | d <sub>2</sub><br>mm | d <sub>3</sub><br>mm | l <sub>1</sub><br>mm | l <sub>3</sub><br>mm | l <sub>2</sub><br>mm | KF<br>mm | Z | 16606 | ... |
|-------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------|---|-------|-----|
| 2.8                     | 6                    | 2.6                  | 57                   | 15                   | 8                    | 0.05     | 3 |       | 101 |
| 3.0                     | 6                    | 2.8                  | 57                   | 15                   | 8                    | 0.1      | 3 |       | 102 |
| 3.8                     | 6                    | 3.6                  | 57                   | 15                   | 11                   | 0.1      | 3 |       | 103 |
| 4.0                     | 6                    | 3.8                  | 57                   | 15                   | 11                   | 0.1      | 3 |       | 104 |
| 4.8                     | 6                    | 4.6                  | 57                   | 19                   | 13                   | 0.1      | 3 |       | 105 |
| 5.0                     | 6                    | 4.8                  | 57                   | 19                   | 13                   | 0.1      | 3 |       | 106 |
| 5.8                     | 6                    | 5.6                  | 57                   | 29                   | 13                   | 0.1      | 3 |       | 107 |
| 6.0                     | 6                    | 5.8                  | 57                   | 19                   | 13                   | 0.1      | 3 |       | 108 |
| 6.8                     | 8                    | 6.6                  | 63                   | 25                   | 16                   | 0.1      | 3 |       | 109 |
| 7.0                     | 8                    | 6.8                  | 63                   | 25                   | 16                   | 0.1      | 3 |       | 110 |
| 7.8                     | 8                    | 7.6                  | 63                   | 25                   | 19                   | 0.1      | 3 |       | 111 |
| 8.0                     | 8                    | 7.8                  | 63                   | 30                   | 19                   | 0.1      | 3 |       | 112 |
| 8.7                     | 10                   | 8.5                  | 72                   | 30                   | 19                   | 0.1      | 3 |       | 113 |
| 9.0                     | 10                   | 8.8                  | 72                   | 30                   | 19                   | 0.1      | 3 |       | 114 |
| 9.7                     | 10                   | 9.5                  | 72                   | 30                   | 22                   | 0.1      | 3 |       | 115 |
| 10.0                    | 10                   | 9.8                  | 72                   | 30                   | 23                   | 0.1      | 3 |       | 116 |
| 10.7                    | 10                   | 10.5                 | 83                   | 36                   | 26                   | 0.1      | 3 |       | 117 |
| 11.0                    | 12                   | 10.8                 | 83                   | 36                   | 26                   | 0.1      | 3 |       | 118 |
| 11.7                    | 12                   | 11.5                 | 83                   | 36                   | 26                   | 0.1      | 3 |       | 119 |
| 12.0                    | 12                   | 11.8                 | 83                   | 36                   | 26                   | 0.1      | 3 |       | 120 |
| 13.7                    | 14                   | 13.5                 | 83                   | 36                   | 26                   | 0.1      | 3 |       | 121 |
| 14.0                    | 14                   | 13.8                 | 83                   | 36                   | 26                   | 0.1      | 3 |       | 122 |
| 15.7                    | 16                   | 15.4                 | 92                   | 42                   | 32                   | 0.1      | 3 |       | 123 |
| 16.0                    | 16                   | 15.7                 | 92                   | 42                   | 32                   | 0.1      | 3 |       | 124 |
| 17.7                    | 18                   | 17.4                 | 92                   | 42                   | 32                   | 0.1      | 3 |       | 125 |
| 18.0                    | 18                   | 17.7                 | 92                   | 42                   | 32                   | 0.1      | 3 |       | 126 |
| 19.7                    | 20                   | 19.4                 | 104                  | 52                   | 38                   | 0.1      | 3 |       | 127 |
| 20.0                    | 20                   | 19.7                 | 104                  | 52                   | 38                   | 0.1      | 3 |       | 128 |

| Al<10%Si | Al>10%Si | Cu      | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1300N | <50HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G)  | Plastic |
|----------|----------|---------|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|--------|---------|
| 400-500  | 150-200  | 100-130 | 70-100  | 70-100  | 70-80   | 40-50    | 30-60    | -        | -      | -      | -      | -      | 50-60   | 40-50   | 35-50    | 80-120 | -       |

16612

## Solid carbide square end mill

TiAlN  
Ultra

N

Z3

45°

DIN  
6535  
HB**ATORN®**

## Design

- With clearance and edge protection chamfer
- With centre cutting
- 3 cutting edges

## Applications

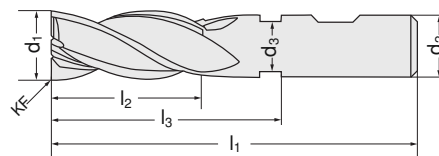
Universal application for plunge and groove milling,  
as well as for face and circumferential milling.

## Quality

Solid carbide ultra-fine grain/TiAlN ultra-coated.



16612



| d <sub>1</sub> h9<br>mm | d <sub>2</sub><br>mm | l <sub>1</sub><br>mm | l <sub>2</sub><br>mm | KF<br>mm | Z | 16612 | ... |
|-------------------------|----------------------|----------------------|----------------------|----------|---|-------|-----|
| 3.5                     | 6                    | 59                   | 15                   | 0.05     | 3 |       | 101 |
| 4.0                     | 6                    | 63                   | 19                   | 0.1      | 3 |       | 102 |
| 4.5                     | 6                    | 63                   | 19                   | 0.1      | 3 |       | 103 |
| 5.0                     | 6                    | 68                   | 24                   | 0.1      | 3 |       | 104 |
| 5.5                     | 6                    | 68                   | 24                   | 0.1      | 3 |       | 105 |
| 6.0                     | 6                    | 68                   | 24                   | 0.1      | 3 |       | 106 |
| 6.5                     | 8                    | 80                   | 30                   | 0.1      | 3 |       | 107 |
| 7.0                     | 8                    | 80                   | 30                   | 0.1      | 3 |       | 108 |
| 7.5                     | 8                    | 80                   | 30                   | 0.1      | 3 |       | 109 |
| 8.0                     | 8                    | 88                   | 38                   | 0.2      | 3 |       | 110 |
| 8.5                     | 10                   | 88                   | 38                   | 0.2      | 3 |       | 111 |
| 9.0                     | 10                   | 88                   | 38                   | 0.2      | 3 |       | 112 |
| 9.5                     | 10                   | 88                   | 38                   | 0.2      | 3 |       | 113 |
| 10.0                    | 10                   | 95                   | 45                   | 0.2      | 3 |       | 114 |
| 11.0                    | 12                   | 102                  | 45                   | 0.2      | 3 |       | 115 |
| 12.0                    | 12                   | 110                  | 53                   | 0.2      | 3 |       | 116 |
| 14.0                    | 14                   | 110                  | 53                   | 0.2      | 3 |       | 117 |
| 16.0                    | 16                   | 123                  | 63                   | 0.2      | 3 |       | 118 |
| 18.0                    | 18                   | 123                  | 63                   | 0.2      | 3 |       | 119 |
| 20.0                    | 20                   | 141                  | 75                   | 0.2      | 3 |       | 120 |

| Al<10%Si | Al>10%Si | Cu      | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1300N | <50HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G)  | Plastic |
|----------|----------|---------|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|--------|---------|
| 400-500  | 150-200  | 100-130 | 70-100  | 70-100  | 70-80   | 40-50    | 30-60    | -        | -      | -      | -      | -      | 50-60   | 40-50   | 35-50    | 80-120 | -       |

16535

## Solid carbide high-performance end mill HPC 41/43/45°

VHM  
TiAlN

HPC

Z3

41°/43°/45°

**ATORN®**

## Design

- With micro corner protection

## Advantage:

- Optimised chip removal
- Up to 60% higher feeds
- Up to 4 times the service life
- Best surface quality

## Applications

For roughing and finishing.

## Quality

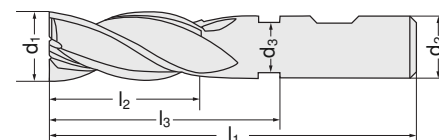
Universal carbide ultra-fine grain  
(P 20 - K 40) TiAlN-coated.

DIN  
6535  
HA

16535 203-220

DIN  
6535  
HB

16535 303-320



|                         |                      |                      | DIN 6535 HA          |                      |                      | DIN 6535 HB |     |       |
|-------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|-------------|-----|-------|
| d <sub>1</sub> e8<br>mm | l <sub>2</sub><br>mm | l <sub>3</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub><br>mm | d <sub>3</sub><br>mm | 16535       | ... | 16535 |
| 3.0                     | 8                    | 15                   | 57                   | 6                    | 2.7                  |             | 203 | 303   |
| 4.0                     | 11                   | 18                   | 57                   | 6                    | 3.7                  |             | 204 | 304   |
| 5.0                     | 13                   | 18                   | 57                   | 6                    | 4.7                  |             | 205 | 305   |
| 6.0                     | 13                   | 21                   | 57                   | 6                    | 5.7                  |             | 206 | 306   |
| 8.0                     | 19                   | 27                   | 63                   | 8                    | 7.5                  |             | 208 | 308   |
| 10.0                    | 22                   | 32                   | 72                   | 10                   | 9.2                  |             | 210 | 310   |
| 12.0                    | 26                   | 38                   | 83                   | 12                   | 11.0                 |             | 212 | 312   |
| 16.0                    | 32                   | 44                   | 92                   | 16                   | 15.0                 |             | 216 | 316   |
| 20.0                    | 38                   | 54                   | 104                  | 20                   | 19.0                 |             | 220 | 320   |

| Al<10%Si  | Al>10%Si | Cu | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G)   | Plastic |
|-----------|----------|----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|---------|---------|
| Roughing  |          |    |         |         |         |          |          |          |        |        |        |        |         |         |          |         |         |
| -         | -        | -  | 180-200 | 180-200 | 160-180 | 160-180  | 140-160  | 140-160  | -      | -      | -      | -      | 120-140 | 100-120 | 45-55    | 140-160 | -       |
| Finishing |          |    |         |         |         |          |          |          |        |        |        |        |         |         |          |         |         |
| -         | -        | -  | 260-280 | 260-280 | 200-220 | 200-220  | 180-200  | 180-200  | -      | -      | -      | -      | 130-160 | 100-130 | 55-70    | 160-180 | -       |

16618

## Solid carbide end mill

**ATORN®**

## Design

- With clearance and radial relief
- With centre cutting
- 4 cutting edges

## Applications

Universal application for finishing.

## Quality

Solid carbide ultra-fine grain/TiAlN ultra-coated.

TiAlN  
Ultra

N

Z4

≈ 45°

DIN  
6535  
HB

90°

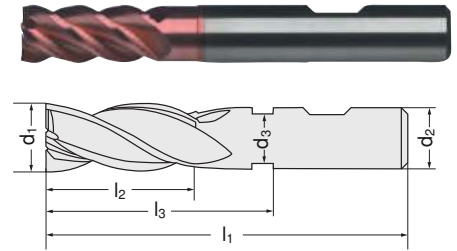
90°

Uni

16618

| d <sub>1</sub> h9<br>mm | d <sub>2</sub><br>mm | d <sub>3</sub><br>mm | l <sub>1</sub><br>mm | l <sub>3</sub><br>mm | l <sub>2</sub><br>mm | Z | 16618 | ... |
|-------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|---|-------|-----|
| 2.0                     | 6                    | -                    | 57                   | -                    | 8                    | 4 |       | 102 |
| 3.0                     | 6                    | -                    | 57                   | -                    | 8                    | 4 |       | 103 |
| 4.0                     | 6                    | 3.9                  | 57                   | 18                   | 11                   | 4 |       | 104 |
| 5.0                     | 6                    | 4.9                  | 57                   | 19                   | 13                   | 4 |       | 105 |
| 6.0                     | 6                    | 5.9                  | 57                   | 19                   | 13                   | 4 |       | 106 |
| 8.0                     | 8                    | 7.7                  | 63                   | 25                   | 19                   | 4 |       | 108 |
| 10.0                    | 10                   | 9.7                  | 72                   | 30                   | 22                   | 4 |       | 110 |
| 12.0                    | 12                   | 11.7                 | 83                   | 36                   | 26                   | 4 |       | 112 |
| 16.0                    | 16                   | 15.5                 | 92                   | 42                   | 32                   | 4 |       | 116 |
| 20.0                    | 20                   | 19.5                 | 104                  | 52                   | 38                   | 4 |       | 120 |

| Al<10%Si | Al>10%Si | Cu      | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1300N | <50HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G)  | Plastic |
|----------|----------|---------|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|--------|---------|
| 400-500  | 150-200  | 100-130 | 70-100  | 70-100  | 70-80   | 40-50    | 30-60    | -        | -      | -      | -      | -      | 50-60   | 40-50   | 35-50    | 80-120 | -       |



16552

## Solid carbide drill and plunge mill

**HHW**

## Design

- Face geometry for drilling and ramping with clearance

## Applications

Uneven pitch and uneven twist angle angle to prevent vibrations.

## Note:

Undersized tools for precise fitting.

## Advantage:

- High feeds even when ramping and drilling
- Plunge angle up to 45°

VHM  
AlTiN

HPC

Z4

36°/38°

90°

90°

90°

Uni

DIN  
1835  
HA

16552 101-114

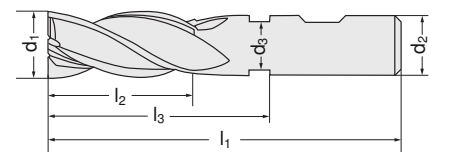
DIN  
1835  
HB

16552 201-214



| d <sub>1</sub> (h10)<br>mm | l <sub>2</sub><br>mm | l <sub>3</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub><br>mm | d <sub>3</sub><br>mm | DIN 1835 HA |     |       | DIN 1835 HB |       |     |
|----------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|-------------|-----|-------|-------------|-------|-----|
|                            |                      |                      |                      |                      |                      | 16552       | ... | 16552 | ...         | 16552 | ... |
| 5.7                        | 13                   | 19                   | 57                   | 6                    | 5.4                  |             |     | 101   |             | 201   |     |
| 6.0                        | 13                   | 19                   | 57                   | 6                    | 5.7                  |             |     | 102   |             | 202   |     |
| 7.7                        | 19                   | 25                   | 63                   | 8                    | 7.3                  |             |     | 103   |             | 203   |     |
| 8.0                        | 19                   | 25                   | 63                   | 8                    | 7.6                  |             |     | 104   |             | 204   |     |
| 9.7                        | 22                   | 30                   | 72                   | 10                   | 9.2                  |             |     | 105   |             | 205   |     |
| 10.0                       | 22                   | 30                   | 72                   | 10                   | 9.5                  |             |     | 106   |             | 206   |     |
| 11.7                       | 26                   | 36                   | 83                   | 12                   | 11.2                 |             |     | 107   |             | 207   |     |
| 12.0                       | 26                   | 36                   | 83                   | 12                   | 11.5                 |             |     | 108   |             | 208   |     |
| 13.7                       | 26                   | 36                   | 83                   | 14                   | 13.2                 |             |     | 109   |             | 209   |     |
| 14.0                       | 26                   | 36                   | 83                   | 14                   | 13.5                 |             |     | 110   |             | 210   |     |
| 15.6                       | 32                   | 42                   | 92                   | 16                   | 15.1                 |             |     | 111   |             | 211   |     |
| 16.0                       | 32                   | 42                   | 92                   | 16                   | 15.5                 |             |     | 112   |             | 212   |     |
| 19.5                       | 38                   | 52                   | 104                  | 20                   | 19.0                 |             |     | 113   |             | 213   |     |
| 20.0                       | 38                   | 52                   | 104                  | 20                   | 19.5                 |             |     | 114   |             | 214   |     |

| Al<10%Si | Al>10%Si | Cu | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|----------|----------|----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| -        | -        | -  | 210     | 200     | 180     | 150      | 120      | 100      | -      | -      | -      | -      | 120     | 90      | 70       | 150   | -       |



16537 - 16539

## Solid carbide square end mill

N

Z4

**HHW**

## Design

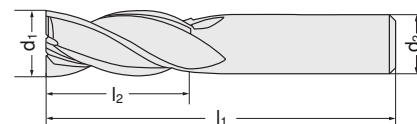
- Short
- Right cutting
- 4 cutting edges
- Right-hand twist approx. 30°
- Centre cutting
- With smooth shank in accordance with DIN 6535 HA

16537

VHM



16539

VHM  
TiAlN

| d <sub>1</sub> h10<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | Solid carbide |     | Solid carbide/TiAlN |     |
|--------------------------|----------------------|----------------------|-------------------------|---------------|-----|---------------------|-----|
|                          |                      |                      |                         | 16537         | ... | 16539               | ... |
| 2.0                      | 8                    | 32                   | 2.0                     |               | 101 |                     | 101 |
| 3.0                      | 12                   | 32                   | 3.0                     |               | 102 |                     | 102 |
| 4.0                      | 12                   | 40                   | 4.0                     |               | 103 |                     | 103 |
| 5.0                      | 14                   | 50                   | 5.0                     |               | 104 |                     | 104 |
| 6.0                      | 16                   | 50                   | 6.0                     |               | 105 |                     | 105 |
| 7.0                      | 20                   | 60                   | 7.0                     |               | 106 |                     | 106 |

| d <sub>1</sub> h10<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | Solid carbide |     | Solid carbide/TiAlN |     |
|--------------------------|----------------------|----------------------|-------------------------|---------------|-----|---------------------|-----|
|                          |                      |                      |                         | 16537         | ... | 16539               | ... |
| 8.0                      | 20                   | 60                   | 8.0                     |               | 107 |                     | 107 |
| 10.0                     | 22                   | 70                   | 10.0                    |               | 109 |                     | 109 |
| 12.0                     | 22                   | 70                   | 12.0                    |               | 110 |                     | 110 |
| 14.0                     | 25                   | 75                   | 14.0                    |               | 111 |                     | 111 |
| 16.0                     | 25                   | 75                   | 16.0                    |               | 112 |                     | 112 |
| 20.0                     | 32                   | 100                  | 20.0                    |               | 113 |                     | 113 |

| Al<10%Si | Al>10%Si | Cu  | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|----------|----------|-----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| 16537    |          |     |         |         |         |          |          |          |        |        |        |        |         |         |          |       |         |
| 180      | 160      | 140 | 120     | 100     | 90      | 80       | 70       | 60       | -      | -      | -      | -      | 80      | 60      | 30       | 85    | -       |
| 16539    |          |     |         |         |         |          |          |          |        |        |        |        |         |         |          |       |         |
| 230      | 200      | 180 | 150     | 130     | 120     | 100      | 90       | 80       | -      | -      | -      | -      | 105     | 80      | 40       | 110   | -       |

16542 - 16543

## Solid carbide square end mill

N

Z4

**HHW**

## Design

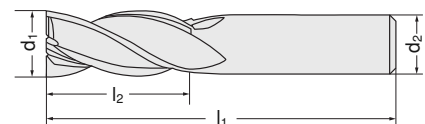
- Long
- Right cutting
- 4 cutting edges
- Right-hand twist approx. 30°
- Centre cutting
- With smooth shank in accordance with DIN 6535 HA

16542

VHM



16543

VHM  
TiAlN

| d <sub>1</sub> h10<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | Solid carbide |     | Solid carbide/TiAlN |     |
|--------------------------|----------------------|----------------------|-------------------------|---------------|-----|---------------------|-----|
|                          |                      |                      |                         | 16542         | ... | 16543               | ... |
| 4.0                      | 10                   | 50                   | 4                       |               | 102 |                     | 102 |
| 5.0                      | 13                   | 50                   | 5                       |               | 104 |                     | 104 |
| 6.0                      | 13                   | 57                   | 6                       |               | 106 |                     | 106 |
| 8.0                      | 19                   | 63                   | 8                       |               | 110 |                     | 110 |
| 10.0                     | 22                   | 72                   | 10                      |               | 114 |                     | 114 |

| d <sub>1</sub> h10<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | Solid carbide |     | Solid carbide/TiAlN |     |
|--------------------------|----------------------|----------------------|-------------------------|---------------|-----|---------------------|-----|
|                          |                      |                      |                         | 16542         | ... | 16543               | ... |
| 12.0                     | 26                   | 83                   | 12                      |               | 116 |                     | 116 |
| 14.0                     | 26                   | 83                   | 14                      |               |     |                     | 118 |
| 16.0                     | 32                   | 92                   | 16                      |               | 120 |                     | 120 |
| 18.0                     | 32                   | 92                   | 18                      |               |     |                     | 121 |
| 20.0                     | 38                   | 104                  | 20                      |               |     |                     | 122 |

| Al<10%Si | Al>10%Si | Cu  | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|----------|----------|-----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| 16542    |          |     |         |         |         |          |          |          |        |        |        |        |         |         |          |       |         |
| 180      | 160      | 140 | 120     | 100     | 90      | 80       | 70       | 60       | -      | -      | -      | -      | 80      | 60      | 30       | 85    | -       |
| 16543    |          |     |         |         |         |          |          |          |        |        |        |        |         |         |          |       |         |
| 230      | 200      | 180 | 150     | 130     | 120     | 100      | 90       | 80       | -      | -      | -      | -      | 105     | 80      | 40       | 110   | -       |

16610

## Solid carbide HPC end mill

TiAlN  
Ultra

HPC

Z4

**ATORN®****Design**

- Short
- With centre cutting
- 4 cutting edges
- 2 cutting edges for centre cutting
- Optimum chip removal thanks to an extremely smooth surface

**Applications**

Universal application for finishing.

**Quality**

Solid carbide ultra-fine grain/TiAlN ultra-coated.

**16610 102-104****Design**

- Without clearance
- With smooth straight shank in accordance with DIN 6535 HA

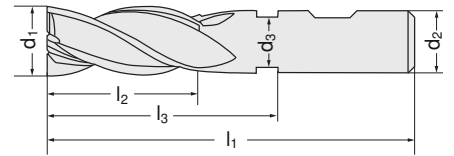
**16610 105****Design**

- With clearance
- With smooth straight shank in accordance with DIN 6535 HA

**16610 106-120****Design**

- With clearance
- With clamping surface in accordance with DIN 6535 HB

16610



| d <sub>1</sub> e8<br>mm | d <sub>2</sub> h5<br>mm | d <sub>3</sub><br>mm | l <sub>1</sub><br>mm | l <sub>3</sub><br>mm | l <sub>2</sub><br>mm | 16610 | ... |
|-------------------------|-------------------------|----------------------|----------------------|----------------------|----------------------|-------|-----|
| 2.0                     | 2                       | -                    | 32                   | -                    | 8                    |       | 102 |
| 3.0                     | 3                       | -                    | 38                   | -                    | 12                   |       | 103 |
| 4.0                     | 4                       | -                    | 40                   | -                    | 12                   |       | 104 |
| 5.0                     | 5                       | 4.8                  | 50                   | 20                   | 15                   |       | 105 |
| 6.0                     | 6                       | 5.8                  | 58                   | 20                   | 16                   |       | 106 |
| 8.0                     | 8                       | 7.7                  | 70                   | 32                   | 22                   |       | 108 |
| 10.0                    | 10                      | 9.7                  | 73                   | 31                   | 25                   |       | 110 |
| 12.0                    | 12                      | 9.6                  | 84                   | 37                   | 28                   |       | 112 |
| 16.0                    | 16                      | 15.5                 | 93                   | 43                   | 35                   |       | 116 |
| 20.0                    | 20                      | 19.5                 | 104                  | 52                   | 40                   |       | 120 |

| Al<10%Si | Al>10%Si | Cu      | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <50HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G)  | Plastic |
|----------|----------|---------|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|--------|---------|
| 400-500  | 150-200  | 100-130 | 70-100  | 70-100  | 70-80   | 40-50    | 30-60    | -        | -      | -      | -      | -      | 50-60   | 40-50   | 35-50    | 80-120 | -       |

## 16545 - 16547

## Solid carbide square end mill

N

Z4

**HHW****Design**

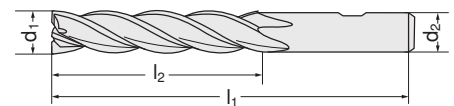
- Long
- Right cutting
- 4 cutting edges
- Right-hand twist approx. 30°
- Spiral-fluted
- Centre cutting
- Straight shank with driving surface in accordance with DIN 6535 HB

16545

VHM



16547

VHM  
TiAlN

| Solid carbide            |                      |                      |                         | Solid carbide/TiAlN |     |       |     |
|--------------------------|----------------------|----------------------|-------------------------|---------------------|-----|-------|-----|
| d <sub>1</sub> h10<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | 16545               | ... | 16547 | ... |
| 3.0                      | 8                    | 57                   | 6                       |                     | 101 |       | 101 |
| 3.5                      | 10                   | 57                   | 6                       |                     | 102 |       | 102 |
| 4.0                      | 11                   | 57                   | 6                       |                     | 103 |       | 103 |
| 4.5                      | 11                   | 57                   | 6                       |                     |     |       | 104 |
| 5.0                      | 13                   | 57                   | 6                       |                     | 105 |       | 105 |
| 6.0                      | 13                   | 57                   | 6                       |                     | 106 |       | 106 |
| 7.0                      | 16                   | 63                   | 8                       |                     |     |       | 107 |

| Solid carbide            |                      |                      |                         | Solid carbide/TiAlN |     |       |     |
|--------------------------|----------------------|----------------------|-------------------------|---------------------|-----|-------|-----|
| d <sub>1</sub> h10<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | 16545               | ... | 16547 | ... |
| 8.0                      | 19                   | 63                   | 8                       |                     | 108 |       | 108 |
| 9.0                      | 19                   | 72                   | 10                      |                     |     |       | 109 |
| 10.0                     | 22                   | 72                   | 10                      |                     | 110 |       | 110 |
| 12.0                     | 26                   | 83                   | 12                      |                     | 111 |       | 111 |
| 16.0                     | 32                   | 92                   | 16                      |                     | 113 |       | 113 |
| 18.0                     | 32                   | 92                   | 18                      |                     |     |       | 114 |
| 20.0                     | 38                   | 104                  | 20                      |                     | 115 |       | 115 |

| Al<10%Si | Al>10%Si | Cu  | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|----------|----------|-----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| 16545    |          |     |         |         |         |          |          |          |        |        |        |        |         |         |          |       |         |
| 180      | 160      | 140 | 120     | 100     | 90      | 80       | 70       | 60       | -      | -      | -      | -      | 80      | 60      | 30       | 85    | -       |
| 16547    |          |     |         |         |         |          |          |          |        |        |        |        |         |         |          |       |         |
| 230      | 200      | 180 | 150     | 130     | 120     | 100      | 90       | 80       | -      | -      | -      | -      | 105     | 80      | 40       | 110   | -       |

# Solid carbide square end mills | Solid carbide end mills

16548 - 16549

Solid carbide square end mill

N

Z4



**HHW**

## Design

- Extra-long
- Right cutting
- 4 cutting edges
- Right-hand twist approx. 30°
- Spiral-fluted
- Centre cutting
- With smooth shank DIN 6535 HA

VHM

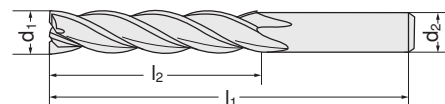


16548

VHM  
TiAlN



16549



|                          |                      |                      |                         | Solid carbide | Solid carbide/TiAlN |
|--------------------------|----------------------|----------------------|-------------------------|---------------|---------------------|
| d <sub>1</sub> h10<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | 16548         | 16549               |
| 3.0                      | 30                   | 75                   | 3                       | 101           | 101                 |
| 4.0                      | 30                   | 75                   | 4                       | 102           | 102                 |
| 5.0                      | 40                   | 100                  | 5                       | 103           | 103                 |
| 6.0                      | 50                   | 150                  | 6                       | 104           | 104                 |

|                          |                      |                      |                         | Solid carbide | Solid carbide/TiAlN |
|--------------------------|----------------------|----------------------|-------------------------|---------------|---------------------|
| d <sub>1</sub> h10<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | 16548         | 16549               |
| 8.0                      | 50                   | 150                  | 8                       | 105           | 105                 |
| 10.0                     | 60                   | 150                  | 10                      | 106           | 106                 |
| 12.0                     | 75                   | 150                  | 12                      | 107           | 107                 |

| Al<10%Si | Al>10%Si | Cu | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|----------|----------|----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| 16548    |          |    |         |         |         |          |          |          |        |        |        |        |         |         |          |       |         |
| 100      | 80       | 70 | 80      | 60      | 60      | 50       | 40       | 40       | -      | -      | -      | -      | 50      | 40      | 30       | 60    | -       |
| 16549    |          |    |         |         |         |          |          |          |        |        |        |        |         |         |          |       |         |
| 130      | 100      | 90 | 100     | 80      | 80      | 65       | 50       | 50       | -      | -      | -      | -      | 65      | 50      | 40       | 80    | -       |

16527

Solid carbide end mill 35/38° HPC Power Uni

**ATORN®**

## Design

- High-performance tool for roughing/finishing machining tasks with an uneven twist angle
- Face side for centre cutting
- With edge protection chamfer

## Advantage:

- Highest level of machining

## Applications

For machining steel and cast iron and for universal use.

VHM  
TiAlN

HPC

Z4



16527 101-120

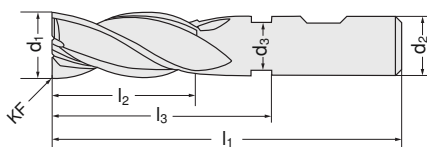


16527 204-220



|                            |                           |                      |                      |                      |          | DIN 6535 HA | DIN 6535 HB |
|----------------------------|---------------------------|----------------------|----------------------|----------------------|----------|-------------|-------------|
| d <sub>1</sub> (h10)<br>mm | d <sub>3</sub> (h6)<br>mm | l <sub>2</sub><br>mm | l <sub>3</sub><br>mm | l <sub>1</sub><br>mm | KF<br>mm | 16527       | 16527       |
| 1.0                        | 4                         | 2.5                  | 3                    | 40                   | 0.025    | 101         |             |
| 2.0                        | 4                         | 4.0                  | 6                    | 40                   | 0.05     | 102         |             |
| 3.0                        | 4                         | 6.0                  | 9                    | 40                   | 0.075    | 103         |             |
| 4.0                        | 6                         | 8.0                  | 12                   | 54                   | 0.1      | 104         | 204         |
| 5.0                        | 6                         | 10.0                 | 15                   | 54                   | 0.15     | 105         | 205         |
| 6.0                        | 6                         | 13.0                 | 21                   | 57                   | 0.2      | 106         | 206         |
| 8.0                        | 8                         | 19.0                 | 27                   | 63                   | 0.2      | 108         | 208         |
| 10.0                       | 10                        | 22.0                 | 32                   | 72                   | 0.2      | 110         | 210         |
| 12.0                       | 12                        | 26.0                 | 38                   | 83                   | 0.2      | 112         | 212         |
| 14.0                       | 14                        | 26.0                 | 38                   | 83                   | 0.3      | 114         | 214         |
| 16.0                       | 16                        | 32.0                 | 44                   | 92                   | 0.3      | 116         | 216         |
| 18.0                       | 18                        | 32.0                 | 44                   | 92                   | 0.3      | 118         | 218         |
| 20.0                       | 20                        | 38.0                 | 54                   | 104                  | 0.3      | 120         | 220         |

| Al<10%Si | Al>10%Si | Cu | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G)   | Plastic |
|----------|----------|----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|---------|---------|
| -        | -        | -  | 230-275 | 200-275 | 200-240 | 140-180  | 110-140  | 100-120  | -      | -      | -      | -      | -       | -       | -        | 150-220 |         |



**HHW****Design**

- Specially edge-treated solid carbide HPC end mill with **Varocon Plus coating**
- High machining volumes possible
- Additional special feature of the HHW HPC Premium cutter is the face specially optimised for ramping
- Micro-geometry and defined cutting edge preparation
- Polished chip chambers

**Applications**

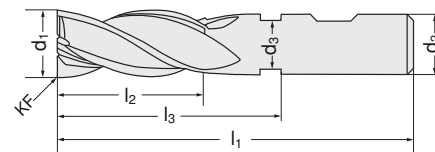
High-performance tool for steel machining.  
For roughing and finishing.

**Quality**

Solid carbide ultra-fine grain.

**Note:**

*This tool is not suitable for steels with high chromium content.  
Make sure the tool and workpiece are strongly clamped.*

**NEW**

16592 103-120

**Short without clearance**

|                          |                      |                      |                         | DIN 6535 HA    |     | DIN 6535 HB |     |
|--------------------------|----------------------|----------------------|-------------------------|----------------|-----|-------------|-----|
|                          |                      |                      |                         | 16592          | ... | 16592       | ... |
| d <sub>1</sub> h10<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | KF x 45°<br>mm |     |             |     |
| 3.0                      | 6                    | 54                   | 6                       | 0.06           |     | 103         | 203 |
| 4.0                      | 8                    | 54                   | 6                       | 0.08           |     | 104         | 204 |
| 5.0                      | 9                    | 54                   | 6                       | 0.10           |     | 105         | 205 |
| 6.0                      | 10                   | 54                   | 6                       | 0.13           |     | 106         | 206 |
| 8.0                      | 12                   | 58                   | 8                       | 0.15           |     | 108         | 208 |
| 10.0                     | 14                   | 66                   | 10                      | 0.20           |     | 110         | 210 |
| 12.0                     | 16                   | 73                   | 12                      | 0.25           |     | 112         | 212 |
| 16.0                     | 22                   | 82                   | 16                      | 0.35           |     | 116         | 216 |
| 20.0                     | 26                   | 92                   | 20                      | 0.40           |     | 120         | 220 |

| Al<10%Si | Al>10%Si | Cu | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|----------|----------|----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| -        | -        | -  | 280     | 270     | 260     | 250      | 190      | 180      | -      | -      | -      | -      | -       | -       | -        | 220   | -       |

**Long with clearance**

16593 103-120

|                          |                      |                      |                      | DIN 6535 HA             |                      | DIN 6535 HB    |     |
|--------------------------|----------------------|----------------------|----------------------|-------------------------|----------------------|----------------|-----|
|                          |                      |                      |                      | 16593                   | ...                  | 16593          | ... |
| d <sub>1</sub> h10<br>mm | l <sub>2</sub><br>mm | l <sub>3</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | d <sub>3</sub><br>mm | KF x 45°<br>mm |     |
| 3.0                      | 8                    | 18                   | 57                   | 6                       | 2.8                  | 0.06           |     |
| 4.0                      | 11                   | 21                   | 57                   | 6                       | 3.6                  | 0.08           |     |
| 5.0                      | 13                   | 21                   | 57                   | 6                       | 4.6                  | 0.10           |     |
| 6.0                      | 13                   | 21                   | 57                   | 6                       | 5.5                  | 0.13           |     |
| 8.0                      | 19                   | 27                   | 63                   | 8                       | 7.5                  | 0.15           |     |
| 10.0                     | 22                   | 32                   | 72                   | 10                      | 9.5                  | 0.20           |     |
| 12.0                     | 26                   | 38                   | 83                   | 12                      | 11.5                 | 0.25           |     |
| 16.0                     | 32                   | 44                   | 92                   | 16                      | 15.5                 | 0.35           |     |
| 20.0                     | 38                   | 54                   | 104                  | 20                      | 19.5                 | 0.40           |     |

| Al<10%Si | Al>10%Si | Cu | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|----------|----------|----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| -        | -        | -  | 280     | 270     | 260     | 250      | 190      | 180      | -      | -      | -      | -      | -       | -       | -        | 220   | -       |

**Extra-long with clearance**

16594 106-120

|                          |                      |                      |                      | DIN 6535 HA             |                      | DIN 6535 HB    |     |
|--------------------------|----------------------|----------------------|----------------------|-------------------------|----------------------|----------------|-----|
|                          |                      |                      |                      | 16594                   | ...                  | 16594          | ... |
| d <sub>1</sub> h10<br>mm | l <sub>2</sub><br>mm | l <sub>3</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | d <sub>3</sub><br>mm | KF x 45°<br>mm |     |
| 6.0                      | 22                   | 42                   | 80                   | 6                       | 5.5                  | 0.13           |     |
| 8.0                      | 28                   | 62                   | 100                  | 8                       | 7.5                  | 0.15           |     |
| 10.0                     | 33                   | 58                   | 100                  | 10                      | 9.5                  | 0.20           |     |
| 12.0                     | 42                   | 73                   | 120                  | 12                      | 11.5                 | 0.25           |     |
| 16.0                     | 53                   | 100                  | 150                  | 16                      | 15.5                 | 0.35           |     |
| 20.0                     | 68                   | 98                   | 150                  | 20                      | 19.5                 | 0.40           |     |

| Al<10%Si | Al>10%Si | Cu | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|----------|----------|----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| -        | -        | -  | 220     | 210     | 200     | 190      | 150      | 140      | -      | -      | -      | -      | -       | -       | -        | 200   | -       |

# Solid carbide end mill

16533 - 16534

Solid carbide end mill 35/38° G2

**HHW**

## Design

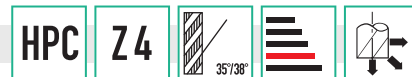
- 4 cutting edges
- Centre cutting
- Right-hand twist with uneven pitch 35/38°
- Optimised chip chamber
- Up to 80% longer service life
- Up to 60% more feed
- Roughing and finishing with just one tool
- No vibration

## Applications

Uneven twist angles produce smooth, vibration-free running and good surface quality. High machining performance.

## Quality

Universal carbide ultra-fine grain (P 20 - K 40)  
TiAlN-coated.  
Type VA: Nacro-coated.



16533



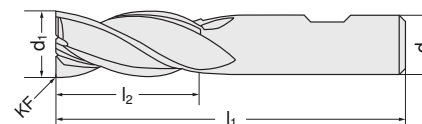
16534 103-120



16534 204-220



16534 304-320



## Short

| d <sub>1</sub><br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub><br>mm | KF<br>mm | Short/6535HB<br>16533 | ... |
|----------------------|----------------------|----------------------|----------------------|----------|-----------------------|-----|
| 3.0                  | 6                    | 54                   | 6                    | 0.10     |                       | 103 |
| 4.0                  | 8                    | 54                   | 6                    | 0.13     |                       | 104 |
| 5.0                  | 9                    | 54                   | 6                    | 0.18     |                       | 105 |
| 6.0                  | 10                   | 54                   | 6                    | 0.20     |                       | 106 |
| 7.0                  | 12                   | 58                   | 8                    | 0.20     |                       | 107 |
| 8.0                  | 12                   | 58                   | 8                    | 0.20     |                       | 108 |
| 9.0                  | 14                   | 66                   | 10                   | 0.30     |                       | 109 |
| 10.0                 | 14                   | 66                   | 10                   | 0.30     |                       | 110 |
| 11.0                 | 16                   | 73                   | 12                   | 0.30     |                       | 111 |
| 12.0                 | 16                   | 73                   | 12                   | 0.30     |                       | 112 |
| 14.0                 | 18                   | 75                   | 14                   | 0.30     |                       | 114 |
| 16.0                 | 22                   | 82                   | 16                   | 0.40     |                       | 116 |
| 18.0                 | 24                   | 84                   | 18                   | 0.40     |                       | 118 |
| 20.0                 | 26                   | 92                   | 20                   | 0.50     |                       | 120 |

## Long/6535HB

| d <sub>1</sub><br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub><br>mm | KF<br>mm | Long/6535HB<br>16534 | ... | VA/6535HB<br>16534 | ... | Long/6535HA<br>16534 | ... |
|----------------------|----------------------|----------------------|----------------------|----------|----------------------|-----|--------------------|-----|----------------------|-----|
| 3.0                  | 8                    | 57                   | 6                    | 0.10     |                      | 103 |                    |     |                      |     |
| 4.0                  | 11                   | 57                   | 6                    | 0.13     |                      | 104 |                    | 204 |                      | 304 |
| 5.0                  | 13                   | 57                   | 6                    | 0.18     |                      | 105 |                    | 205 |                      | 305 |
| 6.0                  | 13                   | 57                   | 6                    | 0.20     |                      | 106 |                    | 206 |                      | 306 |
| 7.0                  | 19                   | 63                   | 8                    | 0.20     |                      | 107 |                    |     |                      | 307 |
| 8.0                  | 19                   | 63                   | 8                    | 0.20     |                      | 108 |                    | 208 |                      | 308 |
| 9.0                  | 22                   | 72                   | 10                   | 0.30     |                      | 109 |                    |     |                      | 309 |
| 10.0                 | 22                   | 72                   | 10                   | 0.30     |                      | 110 |                    | 210 |                      | 310 |
| 11.0                 | 26                   | 83                   | 12                   | 0.30     |                      | 111 |                    |     |                      | 311 |
| 12.0                 | 26                   | 83                   | 12                   | 0.30     |                      | 112 |                    | 212 |                      | 312 |
| 14.0                 | 26                   | 83                   | 14                   | 0.30     |                      | 114 |                    |     |                      | 314 |
| 16.0                 | 32                   | 92                   | 16                   | 0.40     |                      | 116 |                    | 216 |                      | 316 |
| 18.0                 | 32                   | 92                   | 18                   | 0.40     |                      | 118 |                    |     |                      | 318 |
| 20.0                 | 38                   | 104                  | 20                   | 0.50     |                      | 120 |                    | 220 |                      | 320 |

| Al<10%Si         | Al>10%Si | Cu      | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G)   | Plastic |
|------------------|----------|---------|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|---------|---------|
| <b>Roughing</b>  |          |         |         |         |         |          |          |          |        |        |        |        |         |         |          |         |         |
| 450              | 250      | 80-160  | 180-230 | 180-190 | 170-180 | 165-170  | 150-160  | 40-60    | -      | -      | -      | -      | 105-130 | 70-75   | 105-160  | 145-160 | -       |
| <b>Finishing</b> |          |         |         |         |         |          |          |          |        |        |        |        |         |         |          |         |         |
| 600              | 400      | 140-250 | 300     | 220-235 | 210-220 | 190-210  | 180-190  | 50-80    | -      | -      | -      | -      | 130-160 | 80-90   | 130-200  | -       | -       |



16536

## Solid carbide end mill 35/38° HPC G2 with released shank

**HHW**

## Design

- Long
- With released straight shank with driving surface in accordance with DIN 6535 HB
- 4 cutting edges
- Centre cutting
- Right-hand twist with uneven pitch 35/38°
- Optimised chip chamber
- Up to 80% longer service life
- Up to 60% more feed
- Roughing and finishing with just one tool

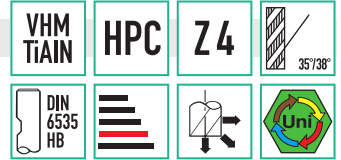
## Applications

For materials up to HRC 52.

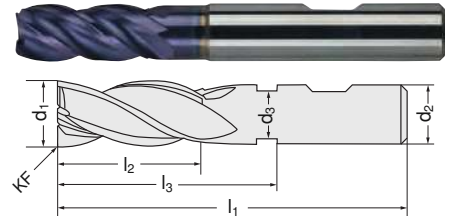
Uneven twist angles produce smooth, vibration-free running and good surface quality. High machining performance.

## Quality

Universal carbide ultra-fine grain (P 20 - K 40) TiAlN-coated.



16536



| d <sub>1</sub><br>mm | d <sub>3</sub><br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub><br>mm | l <sub>3</sub><br>mm | KF<br>mm | 16536 | ... |
|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------|-------|-----|
| 4.0                  | 3.6                  | 11                   | 57                   | 6                    | 21                   | 0.13     |       | 101 |
| 5.0                  | 4.6                  | 13                   | 57                   | 6                    | 21                   | 0.18     |       | 102 |
| 6.0                  | 5.5                  | 13                   | 57                   | 6                    | 21                   | 0.2      |       | 103 |
| 7.0                  | 6.5                  | 19                   | 63                   | 8                    | 27                   | 0.2      |       | 104 |
| 8.0                  | 7.5                  | 19                   | 63                   | 8                    | 27                   | 0.2      |       | 105 |
| 9.0                  | 8.5                  | 22                   | 72                   | 10                   | 32                   | 0.3      |       | 106 |
| 10.0                 | 9.5                  | 22                   | 72                   | 10                   | 32                   | 0.3      |       | 107 |

| d <sub>1</sub><br>mm | d <sub>3</sub><br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub><br>mm | l <sub>3</sub><br>mm | KF<br>mm | 16536 | ... |
|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------|-------|-----|
| 11.0                 | 10.5                 | 26                   | 83                   | 12                   | 38                   | 0.3      |       | 108 |
| 12.0                 | 11.5                 | 26                   | 83                   | 12                   | 38                   | 0.3      |       | 109 |
| 13.0                 | 12.5                 | 26                   | 83                   | 14                   | 42                   | 0.3      |       | 110 |
| 14.0                 | 13.5                 | 26                   | 83                   | 14                   | 42                   | 0.3      |       | 111 |
| 16.0                 | 15.5                 | 32                   | 92                   | 16                   | 44                   | 0.4      |       | 112 |
| 18.0                 | 17.5                 | 32                   | 92                   | 18                   | 50                   | 0.4      |       | 113 |
| 20.0                 | 19.5                 | 38                   | 104                  | 20                   | 54                   | 0.5      |       | 114 |

| Al<10%Si  | Al>10%Si | Cu      | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G)   | Plastic |
|-----------|----------|---------|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|---------|---------|
| Roughing  |          |         |         |         |         |          |          |          |        |        |        |        |         |         |          |         |         |
| 450       | 250      | 80-160  | 180-230 | 180-190 | 170-180 | 165-170  | 150-160  | 40-60    | -      | -      | -      | -      | 105-130 | 70-75   | 105-160  | 145-160 | -       |
| Finishing |          |         |         |         |         |          |          |          |        |        |        |        |         |         |          |         |         |
| 600       | 400      | 140-250 | 300     | 220-235 | 210-220 | 190-210  | 180-190  | 50-80    | -      | -      | -      | -      | 130-160 | 80-90   | 130-200  | -       | -       |

16627

## Solid carbide HPC end mill

**ATORN®**

## Design

- With clearance and edge protection chamfer
- With centre cutting
- 4 cutting edges

## Advantage:

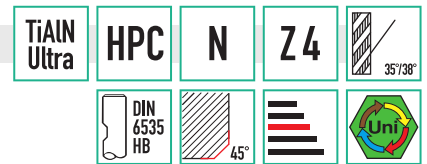
- Maximum smoothness

## Applications

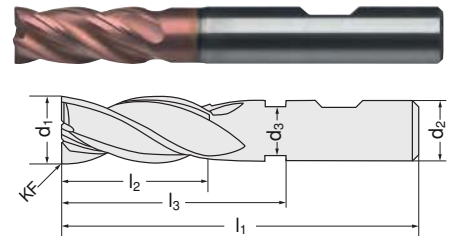
For roughing and finishing with the highest feed values of up to 1x5xD.

## Quality

Solid carbide ultra-fine grain/TiAlN ultra-coated.



16627



| d <sub>1</sub> h9<br>mm | d <sub>2</sub><br>mm | d <sub>3</sub><br>mm | l <sub>1</sub><br>mm | l <sub>3</sub><br>mm | l <sub>2</sub><br>mm | KF<br>mm | Z | 16627 | ... |
|-------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------|---|-------|-----|
| 3.0                     | 6                    | 2.7                  | 50                   | 10                   | 5                    | 0.05     | 4 |       | 101 |
| 3.0                     | 6                    | 2.7                  | 57                   | 13                   | 8                    | 0.05     | 4 |       | 102 |
| 4.0                     | 6                    | 3.7                  | 54                   | 17                   | 8                    | 0.1      | 4 |       | 103 |
| 4.0                     | 6                    | 3.7                  | 57                   | 17                   | 11                   | 0.1      | 4 |       | 104 |
| 5.0                     | 6                    | 4.7                  | 54                   | 14                   | 9                    | 0.1      | 4 |       | 105 |
| 5.0                     | 6                    | 4.7                  | 57                   | 17                   | 13                   | 0.1      | 4 |       | 106 |
| 6.0                     | 6                    | 5.5                  | 54                   | 17                   | 10                   | 0.1      | 4 |       | 107 |
| 6.0                     | 6                    | 5.5                  | 57                   | 19                   | 13                   | 0.1      | 4 |       | 108 |
| 8.0                     | 8                    | 7.4                  | 58                   | 22                   | 12                   | 0.2      | 4 |       | 109 |
| 8.0                     | 8                    | 7.4                  | 63                   | 25                   | 21                   | 0.2      | 4 |       | 110 |
| 10.0                    | 10                   | 9.2                  | 66                   | 26                   | 14                   | 0.2      | 4 |       | 111 |
| 10.0                    | 10                   | 9.2                  | 72                   | 30                   | 22                   | 0.2      | 4 |       | 112 |
| 12.0                    | 12                   | 11.0                 | 73                   | 28                   | 16                   | 0.2      | 4 |       | 113 |
| 12.0                    | 12                   | 11.0                 | 83                   | 36                   | 26                   | 0.2      | 4 |       | 114 |
| 14.0                    | 14                   | 13.0                 | 83                   | 36                   | 26                   | 0.2      | 4 |       | 115 |
| 16.0                    | 16                   | 15.0                 | 82                   | 34                   | 22                   | 0.2      | 4 |       | 116 |
| 16.0                    | 16                   | 15.0                 | 92                   | 42                   | 36                   | 0.2      | 4 |       | 117 |
| 20.0                    | 20                   | 19.0                 | 92                   | 42                   | 26                   | 0.2      | 4 |       | 118 |
| 20.0                    | 20                   | 19.0                 | 104                  | 52                   | 41                   | 0.2      | 4 |       | 119 |

| Al<10%Si | Al>10%Si | Cu | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1300N | <50HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G)   | Plastic |
|----------|----------|----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|---------|---------|
| -        | -        | -  | 240-250 | 230-240 | 150-200 | 150-190  | 150-190  | 150-170  | -      | -      | -      | -      | -       | -       | -        | 140-200 | -       |

## Solid carbide end mill

16538

### Solid carbide end mill 35/38° HPC with internal cooling supply



#### Design

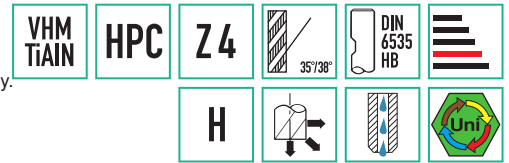
- Type H, long
- Straight shank with driving surface in accordance with DIN 6535 HB
- 4 cutting edges
- Centre cutting
- Right-hand twist with uneven pitch 35/38°
- Optimised chip chamber
- Up to 80% longer service life
- Up to 60% more feed
- Roughing and finishing with just one tool

#### Applications

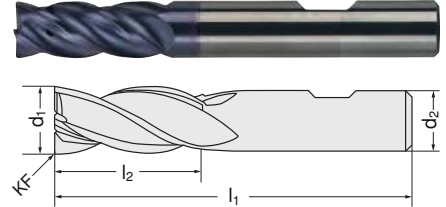
For materials up to HRC 52.  
Uneven twist angles produce smooth, vibration-free running and good surface quality.  
High machining performance.

#### Quality

Universal carbide ultra-fine grain (P 20 - K 40) TiAlN-coated.



16538



| d <sub>1</sub><br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub><br>mm | KF<br>mm | 16538 | ... |
|----------------------|----------------------|----------------------|----------------------|----------|-------|-----|
| 6.0                  | 13                   | 57                   | 6                    | 0.2      |       | 106 |
| 8.0                  | 19                   | 63                   | 8                    | 0.2      |       | 108 |
| 10.0                 | 22                   | 72                   | 10                   | 0.3      |       | 110 |

| d <sub>1</sub><br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub><br>mm | KF<br>mm | 16538 | ... |
|----------------------|----------------------|----------------------|----------------------|----------|-------|-----|
| 12.0                 | 26                   | 83                   | 12                   | 0.3      |       | 112 |
| 16.0                 | 32                   | 92                   | 16                   | 0.4      |       | 116 |
| 20.0                 | 38                   | 104                  | 20                   | 0.5      |       | 120 |

| Al<10%Si  | Al>10%Si | Cu      | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G)   | Plastic |
|-----------|----------|---------|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|---------|---------|
| Roughing  |          |         |         |         |         |          |          |          |        |        |        |        |         |         |          |         |         |
| 450       | 250      | 80-160  | 180-230 | 180-190 | 170-180 | 165-170  | 150-160  | 40-60    | -      | -      | -      | -      | 105-130 | 70-75   | 105-160  | 145-160 | -       |
| Finishing |          |         |         |         |         |          |          |          |        |        |        |        |         |         |          |         |         |
| 600       | 400      | 140-250 | 300     | 220-235 | 210-220 | 190-210  | 180-190  | 50-80    | -      | -      | -      | -      | 130-160 | 80-90   | 130-200  | -       | -       |

16540

### Solid carbide end mill 35/38° HPC G2 with corner radius



#### Design

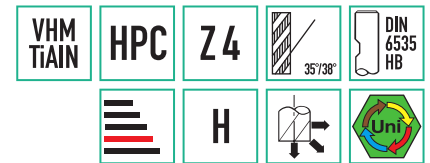
- Type H, long
- Straight shank with driving surface in accordance with DIN 6535 HB
- 4 cutting edges
- Centre cutting
- Right-hand twist with uneven pitch 35/38°
- Optimised chip chamber
- Up to 80% longer service life
- Up to 60% more feed
- Roughing and finishing with just one tool

#### Applications

For materials up to HRC 52.  
Uneven twist angles produce smooth, vibration-free running and good surface quality.  
High machining performance.

#### Quality

Universal carbide ultra-fine grain (P 20 - K 40) TiAlN-coated.



16540



| d <sub>1</sub><br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub><br>mm | Corner radius<br>mm | 16540 | ... |
|----------------------|----------------------|----------------------|----------------------|---------------------|-------|-----|
| 4.0                  | 11                   | 57                   | 6                    | 0.50                |       | 102 |
| 4.0                  | 11                   | 57                   | 6                    | 1.00                |       | 103 |
| 5.0                  | 13                   | 57                   | 6                    | 0.50                |       | 104 |
| 5.0                  | 13                   | 57                   | 6                    | 1.00                |       | 105 |
| 6.0                  | 13                   | 57                   | 6                    | 0.50                |       | 107 |
| 6.0                  | 13                   | 57                   | 6                    | 1.50                |       | 109 |
| 6.0                  | 13                   | 57                   | 6                    | 2.00                |       | 110 |
| 8.0                  | 19                   | 63                   | 8                    | 0.50                |       | 111 |
| 8.0                  | 19                   | 63                   | 8                    | 1.00                |       | 112 |
| 8.0                  | 19                   | 63                   | 8                    | 2.00                |       | 114 |

| d <sub>1</sub><br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub><br>mm | Corner radius<br>mm | 16540 | ... |
|----------------------|----------------------|----------------------|----------------------|---------------------|-------|-----|
| 10.0                 | 22                   | 72                   | 10                   | 0.50                |       | 115 |
| 10.0                 | 22                   | 72                   | 10                   | 1.00                |       | 116 |
| 10.0                 | 22                   | 72                   | 10                   | 1.50                |       | 117 |
| 12.0                 | 26                   | 83                   | 12                   | 0.50                |       | 119 |
| 12.0                 | 26                   | 83                   | 12                   | 1.00                |       | 120 |
| 12.0                 | 26                   | 83                   | 12                   | 1.50                |       | 121 |
| 12.0                 | 26                   | 83                   | 12                   | 2.00                |       | 122 |
| 16.0                 | 32                   | 92                   | 16                   | 1.00                |       | 125 |
| 16.0                 | 32                   | 92                   | 16                   | 2.00                |       | 127 |
| 16.0                 | 32                   | 92                   | 16                   | 2.50                |       | 128 |
| 20.0                 | 38                   | 104                  | 20                   | 1.00                |       | 131 |
| 20.0                 | 38                   | 104                  | 20                   | 2.00                |       | 133 |

| Al<10%Si  | Al>10%Si | Cu      | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G)   | Plastic |
|-----------|----------|---------|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|---------|---------|
| Roughing  |          |         |         |         |         |          |          |          |        |        |        |        |         |         |          |         |         |
| 450       | 250      | 80-160  | 180-230 | 180-190 | 170-180 | 165-170  | 150-160  | 40-60    | -      | -      | -      | -      | 105-130 | 70-75   | 105-160  | 145-160 | -       |
| Finishing |          |         |         |         |         |          |          |          |        |        |        |        |         |         |          |         |         |
| 600       | 400      | 140-250 | 300     | 220-235 | 210-220 | 190-210  | 180-190  | 50-80    | -      | -      | -      | -      | 130-160 | 80-90   | 130-200  | -       | -       |

16554

## Solid carbide end mill G2 medium long

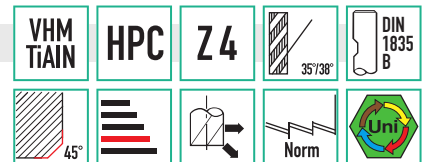


## Design

- Uneven twist 35/38°
- Optimised chip chamber
- Up to 80% longer service life and up to 60% more feed
- Roughing and finishing with just one tool
- Low-vibration running

## Advantage:

- Maximum machining performance

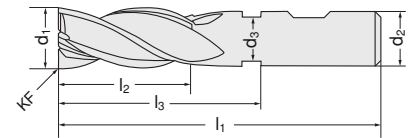


16554



| d <sub>1</sub><br>mm | d <sub>3</sub><br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub><br>mm | l <sub>3</sub><br>mm | KF<br>mm | 16554 | ... |
|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------|-------|-----|
| 5.0                  | 4.7                  | 18                   | 62                   | 6                    | 24                   | 0.18     |       | 101 |
| 6.0                  | 5.6                  | 21                   | 62                   | 6                    | 25                   | 0.2      |       | 102 |
| 8.0                  | 7.6                  | 26                   | 68                   | 8                    | 30                   | 0.2      |       | 103 |
| 10.0                 | 9.6                  | 31                   | 80                   | 10                   | 38                   | 0.3      |       | 104 |
| 12.0                 | 11.4                 | 41                   | 93                   | 12                   | 46                   | 0.3      |       | 105 |
| 16.0                 | 15.4                 | 52                   | 108                  | 16                   | 58                   | 0.4      |       | 106 |
| 20.0                 | 19.4                 | 62                   | 126                  | 20                   | 74                   | 0.5      |       | 107 |

| Al<10%Si | Al>10%Si | Cu | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G)   | Plastic |
|----------|----------|----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|---------|---------|
| -        | -        | -  | 140-160 | 130-135 | 120-130 | 105-120  | 85-105   | 60-85    | -      | -      | -      | -      | 65-80   | -       | -        | 110-160 | -       |



16555

## Solid carbide end mill G2 extra long

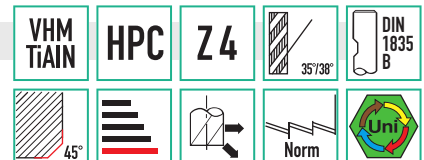


## Design

- Uneven twist 35/38°
- Optimised chip chamber
- Up to 80% longer service life and up to 60% more feed
- Roughing and finishing with just one tool
- Low-vibration running

## Advantage:

- Maximum machining performance

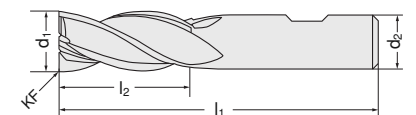


16555



| d <sub>1</sub><br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | KF<br>mm | d <sub>2</sub><br>mm | 16555 | ... |
|----------------------|----------------------|----------------------|----------|----------------------|-------|-----|
| 5.0                  | 21                   | 63                   | 0.18     | 6                    |       | 101 |
| 6.0                  | 22                   | 63                   | 0.2      | 6                    |       | 102 |
| 8.0                  | 28                   | 80                   | 0.2      | 8                    |       | 103 |
| 10.0                 | 33                   | 100                  | 0.3      | 10                   |       | 104 |
| 12.0                 | 42                   | 100                  | 0.3      | 12                   |       | 105 |
| 14.0                 | 48                   | 100                  | 0.3      | 14                   |       | 106 |
| 16.0                 | 53                   | 150                  | 0.4      | 16                   |       | 107 |
| 20.0                 | 68                   | 150                  | 0.5      | 20                   |       | 108 |
| 25.0                 | 85                   | 165                  | 0.5      | 25                   |       | 109 |

| Al<10%Si | Al>10%Si | Cu | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G)  | Plastic |
|----------|----------|----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|--------|---------|
| -        | -        | -  | 110-120 | 100-110 | 90-100  | 80-90    | 65-80    | 45-65    | -      | -      | -      | -      | 50-60   | -       | -        | 85-120 | -       |



16591

## Solid carbide end mill Premium Gold Edition

**HHW**

## Design

- High-performance tool with improved substrate
- With increasing core size
- Large shaped groove
- Defined support chamfer
- Roughened clamping shank
- Uneven pitch
- New multi-layer smooth layer
- With clearance

## Advantage:

- Extremely long service life
- Maximum smoothness
- Maximum process reliability

## Applications

For universal use with all steel materials. HPC cutter for roughing and finishing.

VHM  
Multilay  
HPC<sup>3</sup>

Z4

35°/38°

1200  
N/mm<sup>2</sup>

Norm

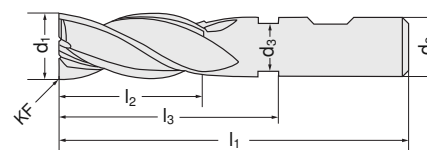
Norm

1200  
N/mm<sup>2</sup>DIN  
6535  
HA

16591 103-125

DIN  
6535  
HB

16591 203-225



| DIN 6535 HA          |                      |                      |                      |                      |                      |          | DIN 6535 HB |     |       |     |
|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------|-------------|-----|-------|-----|
| d <sub>1</sub><br>mm | l <sub>2</sub><br>mm | l <sub>3</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub><br>mm | d <sub>3</sub><br>mm | Kf<br>mm | 16591       | ... | 16591 | ... |
| 3.0                  | 8                    | 18                   | 57                   | 6                    | 2.8                  | 0.13     |             | 103 |       | 203 |
| 4.0                  | 11                   | 21                   | 57                   | 6                    | 3.6                  | 0.18     |             | 104 |       | 204 |
| 5.0                  | 13                   | 21                   | 57                   | 6                    | 4.6                  | 0.20     |             | 105 |       | 205 |
| 6.0                  | 13                   | 21                   | 57                   | 6                    | 5.5                  | 0.20     |             | 106 |       | 206 |
| 8.0                  | 19                   | 27                   | 63                   | 8                    | 7.5                  | 0.20     |             | 108 |       | 208 |
| 10.0                 | 22                   | 32                   | 72                   | 10                   | 9.5                  | 0.30     |             | 110 |       | 210 |
| 12.0                 | 26                   | 38                   | 83                   | 12                   | 11.5                 | 0.30     |             | 112 |       | 212 |
| 16.0                 | 32                   | 44                   | 92                   | 16                   | 15.5                 | 0.40     |             | 116 |       | 216 |
| 20.0                 | 38                   | 54                   | 104                  | 20                   | 19.5                 | 0.50     |             | 120 |       | 220 |
| 25.0                 | 42                   | 65                   | 121                  | 25                   | 24.0                 | 0.50     |             | 125 |       | 225 |

| Al<10%Si | Al>10%Si | Cu | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G)   | Plastic |
|----------|----------|----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|---------|---------|
| -        | -        | -  | 170-238 | 160-228 | 140-222 | 125-175  | 110-105  | 78-109   | -      | -      | -      | -      | 78-109  | -       | -        | 140-238 | -       |

16640

## Solid carbide HSC torus milling cutter

**ATORN®**

## Design

- With clearance and edge protection chamfer
- With centre cutting
- With uneven cutting edge pitch
- 4 cutting edges

## Applications

For circumferential machining and finishing.

## Quality

Solid carbide ultra-fine grain/TiAlN ultra-coated.

TiAlN  
Ultra

HSC

N

Z4

30°

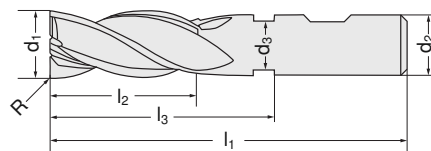
DIN  
6535  
HB

R

R

Uni

16640



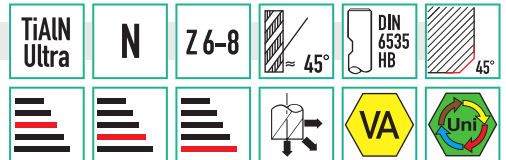
| d <sub>1</sub> h9<br>mm | d <sub>2</sub><br>mm | d <sub>3</sub><br>mm | l <sub>1</sub><br>mm | l <sub>3</sub><br>mm | l <sub>2</sub><br>mm | R<br>mm | Z | 16640 | ... |
|-------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|---------|---|-------|-----|
| 3.0                     | 6                    | 2.7                  | 57                   | 13                   | 8                    | 0.1     | 4 |       | 101 |
| 3.0                     | 6                    | 2.7                  | 57                   | 13                   | 8                    | 0.4     | 4 |       | 102 |
| 3.0                     | 6                    | 2.7                  | 57                   | 13                   | 8                    | 0.5     | 4 |       | 103 |
| 3.0                     | 6                    | 2.7                  | 57                   | 13                   | 8                    | 1.0     | 4 |       | 104 |
| 4.0                     | 6                    | 3.7                  | 57                   | 17                   | 11                   | 0.1     | 4 |       | 105 |
| 4.0                     | 6                    | 3.7                  | 57                   | 17                   | 11                   | 0.4     | 4 |       | 106 |
| 4.0                     | 6                    | 3.7                  | 57                   | 17                   | 11                   | 0.5     | 4 |       | 107 |
| 4.0                     | 6                    | 3.7                  | 57                   | 17                   | 11                   | 1.0     | 4 |       | 108 |
| 5.0                     | 6                    | 4.7                  | 57                   | 19                   | 13                   | 0.1     | 4 |       | 109 |
| 5.0                     | 6                    | 4.7                  | 57                   | 19                   | 13                   | 0.5     | 4 |       | 110 |
| 5.0                     | 6                    | 4.7                  | 57                   | 19                   | 13                   | 1.0     | 4 |       | 111 |
| 6.0                     | 6                    | 5.5                  | 57                   | 19                   | 13                   | 0.1     | 4 |       | 112 |
| 6.0                     | 6                    | 5.5                  | 57                   | 19                   | 13                   | 0.5     | 4 |       | 113 |
| 6.0                     | 6                    | 5.5                  | 57                   | 19                   | 13                   | 1.0     | 4 |       | 114 |
| 6.0                     | 6                    | 5.5                  | 57                   | 19                   | 13                   | 1.5     | 4 |       | 115 |
| 8.0                     | 8                    | 7.4                  | 63                   | 25                   | 21                   | 0.15    | 4 |       | 116 |
| 8.0                     | 8                    | 7.4                  | 63                   | 25                   | 21                   | 0.5     | 4 |       | 117 |
| 8.0                     | 8                    | 7.4                  | 63                   | 25                   | 21                   | 1.0     | 4 |       | 118 |
| 8.0                     | 8                    | 7.4                  | 63                   | 25                   | 21                   | 1.5     | 4 |       | 119 |

| d <sub>1</sub> h9<br>mm | d <sub>2</sub><br>mm | d <sub>3</sub><br>mm | l <sub>1</sub><br>mm | l <sub>3</sub><br>mm | l <sub>2</sub><br>mm | R<br>mm | Z | 16640 | ... |
|-------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|---------|---|-------|-----|
| 8.0                     | 8                    | 7.4                  | 63                   | 25                   | 21                   | 2.0     | 4 |       | 120 |
| 10.0                    | 10                   | 9.2                  | 72                   | 30                   | 22                   | 0.15    | 4 |       | 121 |
| 10.0                    | 10                   | 9.2                  | 72                   | 30                   | 22                   | 0.5     | 4 |       | 122 |
| 10.0                    | 10                   | 9.2                  | 72                   | 30                   | 22                   | 1.0     | 4 |       | 123 |
| 10.0                    | 10                   | 9.2                  | 72                   | 30                   | 22                   | 1.5     | 4 |       | 124 |
| 10.0                    | 10                   | 9.2                  | 72                   | 36                   | 26                   | 2.0     | 4 |       | 125 |
| 12.0                    | 12                   | 11.0                 | 83                   | 36                   | 26                   | 0.2     | 4 |       | 126 |
| 12.0                    | 12                   | 11.0                 | 83                   | 36                   | 26                   | 0.5     | 4 |       | 127 |
| 12.0                    | 12                   | 11.0                 | 83                   | 36                   | 26                   | 1.0     | 4 |       | 128 |
| 12.0                    | 12                   | 11.0                 | 83                   | 36                   | 26                   | 1.5     | 4 |       | 129 |
| 12.0                    | 12                   | 11.0                 | 83                   | 36                   | 26                   | 2.0     | 4 |       | 130 |
| 16.0                    | 16                   | 15.0                 | 92                   | 42                   | 36                   | 0.3     | 4 |       | 131 |
| 16.0                    | 16                   | 15.0                 | 92                   | 42                   | 36                   | 1.0     | 4 |       | 132 |
| 16.0                    | 16                   | 15.0                 | 92                   | 42                   | 36                   | 2.0     | 4 |       | 133 |
| 16.0                    | 16                   | 15.0                 | 92                   | 42                   | 36                   | 4.0     | 4 |       | 134 |
| 20.0                    | 20                   | 19.0                 | 104                  | 52                   | 41                   | 1.0     | 4 |       | 135 |
| 20.0                    | 20                   | 19.0                 | 104                  | 52                   | 41                   | 2.0     | 4 |       | 136 |
| 20.0                    | 20                   | 19.0                 | 104                  | 52                   | 41                   | 4.0     | 4 |       | 137 |

| Al<10%Si | Al>10%Si | Cu      | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1300N | <50HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G)   | Plastic |
|----------|----------|---------|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|---------|---------|
| -        | 330-400  | 220-250 | 220-250 | 220-230 | 180-220 | 150-180  | 130-140  | 130-140  | -      | -      | -      | -      | 120-130 | 120-130 | 100-160  | 120-180 | -       |

16616

## Solid carbide multi-tooth mills

**ATORN®**

## Design

- With clearance and edge protection chamfer
- With centre cutting
- 6-8 cutting edges
- 2 cutting edges for centre cutting

## Advantage:

- Optimum surface quality

## Applications

For circumferential machining and finishing.

## Quality

Solid carbide ultra-fine grain/TiAlN ultra-coated.

## Note:

- Face cut only with shallow feed depth.

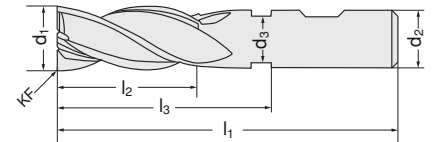
16616



Short

16616

| d <sub>1</sub> e8<br>mm | d <sub>2</sub> h5<br>mm | d <sub>3</sub><br>mm | l <sub>1</sub><br>mm | l <sub>3</sub><br>mm | l <sub>2</sub><br>mm | KF<br>mm | Z | ... |
|-------------------------|-------------------------|----------------------|----------------------|----------------------|----------------------|----------|---|-----|
| 4.0                     | 6                       | 3.7                  | 57                   | 19                   | 11                   | 0.1      | 6 | 201 |
| 5.0                     | 6                       | 4.7                  | 57                   | 19                   | 13                   | 0.1      | 6 | 202 |
| 6.0                     | 6                       | 5.7                  | 57                   | 19                   | 13                   | 0.1      | 6 | 203 |
| 8.0                     | 8                       | 7.6                  | 63                   | 25                   | 19                   | 0.1      | 6 | 204 |
| 10.0                    | 10                      | 9.6                  | 72                   | 30                   | 22                   | 0.1      | 6 | 205 |
| 12.0                    | 12                      | 11.5                 | 83                   | 36                   | 26                   | 0.2      | 6 | 206 |
| 16.0                    | 16                      | 15.5                 | 92                   | 42                   | 32                   | 0.2      | 6 | 208 |
| 18.0                    | 18                      | 17.5                 | 92                   | 42                   | 32                   | 0.2      | 8 | 209 |
| 20.0                    | 20                      | 19.5                 | 104                  | 52                   | 38                   | 0.2      | 8 | 210 |



Long

16616

| d <sub>1</sub> e8<br>mm | d <sub>2</sub> h5<br>mm | d <sub>3</sub><br>mm | l <sub>1</sub><br>mm | l <sub>3</sub><br>mm | l <sub>2</sub><br>mm | KF<br>mm | Z | ... |
|-------------------------|-------------------------|----------------------|----------------------|----------------------|----------------------|----------|---|-----|
| 6.0                     | 6                       | 5.7                  | 62                   | 24                   | 18                   | 0.1      | 6 | 303 |
| 8.0                     | 8                       | 7.6                  | 68                   | 30                   | 24                   | 0.1      | 6 | 304 |
| 10.0                    | 10                      | 9.6                  | 80                   | 38                   | 30                   | 0.1      | 6 | 305 |
| 12.0                    | 12                      | 11.5                 | 93                   | 46                   | 36                   | 0.2      | 6 | 306 |
| 16.0                    | 16                      | 15.5                 | 108                  | 58                   | 48                   | 0.2      | 8 | 308 |
| 20.0                    | 20                      | 19.5                 | 126                  | 74                   | 60                   | 0.2      | 8 | 310 |

Extra long

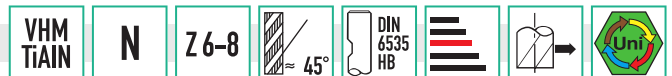
16616

| d <sub>1</sub> e8<br>mm | d <sub>2</sub> h5<br>mm | d <sub>3</sub><br>mm | l <sub>1</sub><br>mm | l <sub>3</sub><br>mm | l <sub>2</sub><br>mm | KF<br>mm | Z | ... |
|-------------------------|-------------------------|----------------------|----------------------|----------------------|----------------------|----------|---|-----|
| 6.0                     | 6                       | 5.8                  | 80                   | 40                   | 16                   | 0.1      | 6 | 403 |
| 8.0                     | 8                       | 7.7                  | 100                  | 50                   | 19                   | 0.1      | 6 | 404 |
| 10.0                    | 10                      | 9.7                  | 100                  | 60                   | 25                   | 0.1      | 6 | 405 |
| 12.0                    | 12                      | 11.6                 | 120                  | 60                   | 30                   | 0.2      | 6 | 406 |
| 16.0                    | 16                      | 15.6                 | 150                  | 100                  | 40                   | 0.2      | 6 | 408 |
| 16.0                    | 16                      | 15.5                 | 150                  | 100                  | 75                   | 0.2      | 6 | 409 |
| 20.0                    | 20                      | 19.6                 | 150                  | 100                  | 50                   | 0.2      | 8 | 410 |

| Al<10%Si | Al>10%Si | Cu      | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1300N | <50HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G)  | Plastic |
|----------|----------|---------|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|--------|---------|
| 400-500  | 150-200  | 100-130 | 70-100  | 70-100  | 70-80   | 40-50    | 30-60    | -        | -      | -      | -      | -      | 50-60   | 40-50   | 35-50    | 80-120 | -       |

16551

## Solid carbide end mill

**HHW**

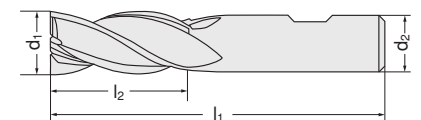
## Design

- Right cutting
- Straight shank with driving surface in accordance with DIN 6535 HB
- Right-hand twist approx. 45°
- 6-8 cutting edges

## Applications

For circumferential milling as a finishing operation to achieve optimum surface quality (face cut only with low cutting depths).

16551



| d <sub>1</sub> e8<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | Z | ... |
|-------------------------|----------------------|----------------------|-------------------------|---|-----|
| 6.0                     | 13                   | 57                   | 6                       | 6 | 101 |
| 8.0                     | 19                   | 63                   | 8                       | 6 | 103 |
| 10.0                    | 22                   | 72                   | 10                      | 6 | 105 |
| 12.0                    | 26                   | 83                   | 12                      | 6 | 106 |

| d <sub>1</sub> e8<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | Z | ... |
|-------------------------|----------------------|----------------------|-------------------------|---|-----|
| 14.0                    | 26                   | 83                   | 14                      | 6 | 107 |
| 16.0                    | 32                   | 92                   | 16                      | 6 | 108 |
| 18.0                    | 32                   | 92                   | 18                      | 8 | 109 |
| 20.0                    | 38                   | 104                  | 20                      | 8 | 110 |

| Al<10%Si | Al>10%Si | Cu | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|----------|----------|----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| -        | -        | -  | 180     | 140     | 130     | 120      | 110      | 100      | -      | -      | -      | -      | 100     | 80      | -        | 180   | -       |

16553

## Solid carbide end mill

VHM  
TiAlN

N

Z 6-8

**HHW**

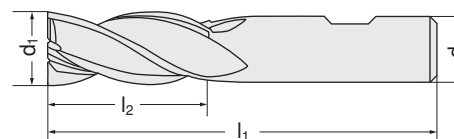
## Design

- Right cutting
- Straight shank with driving surface in accordance with DIN 6535 HB
- Right-hand twist approx. 45°
- Eccentric relief grinding for more stable cutting edges
- 6-8 cutting edges

## Applications

For circumferential milling as finishing operation to achieve optimum surface quality. Especially for working in low-lying and hard-to-reach places.

16553



| d <sub>1</sub> e8<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | Z | 16553 | ... |
|-------------------------|----------------------|----------------------|-------------------------|---|-------|-----|
| 6.0                     | 18                   | 62                   | 6                       | 6 |       | 201 |
| 8.0                     | 24                   | 68                   | 8                       | 6 |       | 203 |
| 10.0                    | 30                   | 80                   | 10                      | 6 |       | 205 |
| 12.0                    | 36                   | 93                   | 12                      | 6 |       | 206 |

| d <sub>1</sub> e8<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | Z | 16553 | ... |
|-------------------------|----------------------|----------------------|-------------------------|---|-------|-----|
| 14.0                    | 42                   | 99                   | 14                      | 6 |       | 207 |
| 16.0                    | 48                   | 108                  | 16                      | 6 |       | 208 |
| 18.0                    | 54                   | 114                  | 18                      | 8 |       | 209 |
| 20.0                    | 60                   | 126                  | 20                      | 8 |       | 210 |

| Al<10%Si | Al>10%Si | Cu | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|----------|----------|----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| -        | -        | -  | 180     | 140     | 130     | 120      | 110      | 100      | -      | -      | -      | -      | 100     | 80      | -        | 180   | -       |

16642

## Solid carbide radius cutter

TiAlN  
Ultra

N

Z 2

**ATORN®**

## Design

- 2 cutting edges

## Applications

Universal use for copy milling and in die and mould making.

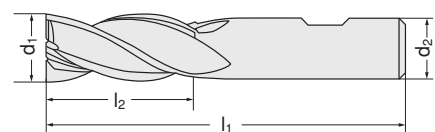
## Quality

Solid carbide ultra-fine grain/TiAlN ultra-coated.

## Note:

Up to Ø 5 mm with shank DIN 6535 HA.

16642



| d <sub>1</sub> h9<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub><br>mm | Z | 16642 | ... |
|-------------------------|----------------------|----------------------|----------------------|---|-------|-----|
| 3.0                     | 20                   | 60                   | 3                    | 2 |       | 103 |
| 4.0                     | 30                   | 75                   | 4                    | 2 |       | 104 |
| 5.0                     | 30                   | 75                   | 5                    | 2 |       | 105 |
| 6.0                     | 40                   | 100                  | 6                    | 2 |       | 106 |
| 8.0                     | 40                   | 100                  | 8                    | 2 |       | 108 |
| 10.0                    | 40                   | 100                  | 10                   | 2 |       | 110 |
| 12.0                    | 45                   | 100                  | 12                   | 2 |       | 112 |
| 16.0                    | 65                   | 150                  | 16                   | 2 |       | 116 |
| 20.0                    | 75                   | 150                  | 20                   | 2 |       | 120 |

| Al<10%Si | Al>10%Si | Cu      | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1300N | <50HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G)  | Plastic |
|----------|----------|---------|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|--------|---------|
| 400-500  | 400-500  | 120-140 | 70-100  | 70-90   | 70-90   | 60-70    | 55-70    | 55-70    | -      | -      | -      | -      | 40-50   | 40-50   | 20-50    | 80-120 | -       |

16643

## Solid carbide radius roughing cutter

TiAlN  
Ultra

NR

**ATORN®**

## Design

- 4 cutting edges

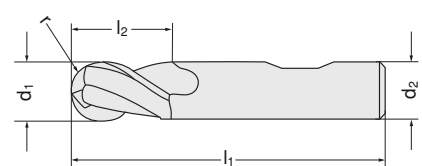
## Applications

Universal use for copy milling and in die and mould making.

## Quality

Solid carbide ultra-fine grain/TiAlN ultra-coated.

16643



| d <sub>1</sub> h9<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub><br>mm | Z | 16643 | ... |
|-------------------------|----------------------|----------------------|----------------------|---|-------|-----|
| 6.0                     | 13                   | 57                   | 6                    | 4 |       | 106 |
| 8.0                     | 19                   | 63                   | 8                    | 4 |       | 108 |
| 10.0                    | 22                   | 72                   | 10                   | 4 |       | 110 |
| 12.0                    | 26                   | 83                   | 12                   | 4 |       | 112 |
| 16.0                    | 32                   | 92                   | 16                   | 4 |       | 116 |

| Al<10%Si | Al>10%Si | Cu | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1300N | <50HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G)  | Plastic |
|----------|----------|----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|--------|---------|
| -        | -        | -  | 70-100  | 75-95   | 55-70   | 55-70    | 55-70    | -        | -      | -      | -      | -      | -       | -       | -        | 70-120 | -       |

16646

## Solid carbide HSC radius cutter

**ATORN®**

## Design

- 4 cutting edges

## Applications

Universal use.

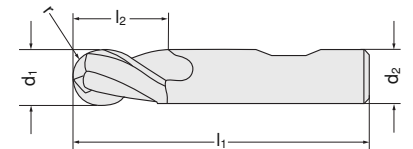
## Quality

Solid carbide ultra-fine grain/TiAlN ultra-coated.

16646 206-212



16646 106-116



| d <sub>1</sub> h9<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub><br>mm | Z | Long  |     | Extra long |     |
|-------------------------|----------------------|----------------------|----------------------|---|-------|-----|------------|-----|
|                         |                      |                      |                      |   | 16646 | ... | 16646      | ... |
| 6.0                     | 13                   | 57                   | 6                    | 4 |       | 106 |            |     |
| 6.0                     | 40                   | 100                  | 6                    | 4 |       |     |            | 206 |
| 8.0                     | 19                   | 63                   | 8                    | 4 |       | 108 |            |     |
| 8.0                     | 40                   | 100                  | 8                    | 4 |       |     |            | 208 |
| 10.0                    | 22                   | 72                   | 10                   | 4 |       | 110 |            |     |
| 10.0                    | 40                   | 100                  | 10                   | 4 |       |     |            | 210 |
| 12.0                    | 26                   | 83                   | 12                   | 4 |       | 112 |            |     |
| 12.0                    | 45                   | 100                  | 12                   | 4 |       |     |            | 212 |

| Al<10%Si | Al>10%Si | Cu      | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1300N | <50HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G)  | Plastic |
|----------|----------|---------|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|--------|---------|
| -        | 150-200  | 100-130 | 70-100  | 70-100  | 70-80   | 40-50    | 30-60    | -        | -      | -      | -      | -      | 50-60   | 40-50   | 35-50    | 80-120 | -       |

16557

## Solid carbide radius cutter

**HHW**

## Design

- Short

- 2 cutting edges

- Centre cutting

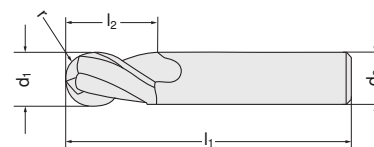
- Right-hand spiral approx. 30°

- With smooth shank in accordance with DIN 6535 HA

## Quality

Universal carbide ultra-fine grain (P 20 - K 40)

TiAlN-coated.



16557



| d <sub>1</sub> e8<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | 16557 | ... |
|-------------------------|----------------------|----------------------|-------------------------|-------|-----|
| mm                      |                      |                      | mm                      |       |     |
| 3.0                     | 4                    | 48                   | 6                       |       | 101 |
| 4.0                     | 6                    | 50                   | 6                       |       | 102 |
| 5.0                     | 7                    | 51                   | 6                       |       | 103 |
| 6.0                     | 7                    | 51                   | 6                       |       | 104 |
| 8.0                     | 9                    | 59                   | 8                       |       | 105 |

| d <sub>1</sub> e8<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | 16557 | ... |
|-------------------------|----------------------|----------------------|-------------------------|-------|-----|
| mm                      |                      |                      | mm                      |       |     |
| 10.0                    | 10                   | 60                   | 10                      |       | 106 |
| 12.0                    | 14                   | 71                   | 12                      |       | 107 |
| 16.0                    | 16                   | 76                   | 16                      |       | 109 |
| 20.0                    | 20                   | 82                   | 20                      |       | 111 |

| Al<10%Si | Al>10%Si | Cu  | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|----------|----------|-----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| 230      | 200      | 180 | 150     | 130     | 120     | 100      | 90       | 80       | -      | -      | -      | -      | 105     | 80      | 40       | 110   | -       |

16559

## Solid carbide radius cutter

**HHW**

## Design

- Long

- 2 cutting edges

- Centre cutting

- Right-hand spiral approx. 30°

16559 202-212

## Design

- With cylindrical shank with driving surface in accordance with DIN 6535 HB

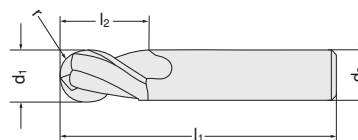


16559 201

16559 201

## Design

- With smooth straight shank in accordance with DIN 6535 HA



16559 202-212



| d <sub>1</sub> e8<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | 16559 | ... |
|-------------------------|----------------------|----------------------|-------------------------|-------|-----|
| mm                      |                      |                      | mm                      |       |     |
| 2.0                     | 6                    | 38                   | 3                       |       | 201 |
| 3.0                     | 7                    | 57                   | 6                       |       | 202 |
| 4.0                     | 8                    | 57                   | 6                       |       | 203 |
| 5.0                     | 10                   | 57                   | 6                       |       | 204 |
| 6.0                     | 10                   | 57                   | 6                       |       | 205 |

| d <sub>1</sub> e8<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | 16559 | ... |
|-------------------------|----------------------|----------------------|-------------------------|-------|-----|
| mm                      |                      |                      | mm                      |       |     |
| 8.0                     | 16                   | 63                   | 8                       |       | 206 |
| 10.0                    | 19                   | 72                   | 10                      |       | 207 |
| 12.0                    | 22                   | 83                   | 12                      |       | 208 |
| 16.0                    | 26                   | 92                   | 16                      |       | 210 |
| 20.0                    | 32                   | 104                  | 20                      |       | 212 |

| Al<10%Si | Al>10%Si | Cu  | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|----------|----------|-----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| 230      | 200      | 180 | 150     | 130     | 120     | 100      | 90       | 80       | -      | -      | -      | -      | 105     | 80      | 40       | 110   | -       |

# Solid carbide radius cutters | Solid carbide roughing cutters | Solid carbide roughing and finishing cutters

16561

## Solid carbide radius cutter

VHM  
TiAlN

Z4



DIN  
6535  
HA

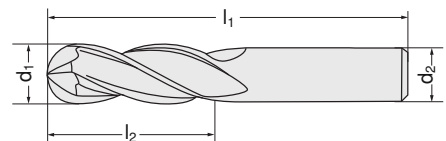


**HHW**

### Design

- Short
- 4 cutting edges
- Centre cutting
- Right-hand spiral 30°
- With smooth shank in accordance with DIN 6535 HA

16561



| d1 e8<br>mm | l2<br>mm | l1<br>mm | d2 h6<br>mm | 16561 | ... |
|-------------|----------|----------|-------------|-------|-----|
| 3.0         | 4        | 48       | 6           |       | 101 |
| 4.0         | 6        | 50       | 6           |       | 102 |
| 5.0         | 7        | 51       | 6           |       | 103 |
| 6.0         | 7        | 51       | 6           |       | 104 |
| 8.0         | 9        | 59       | 8           |       | 105 |
| 10.0        | 10       | 60       | 10          |       | 106 |

| d1 e8<br>mm | l2<br>mm | l1<br>mm | d2 h6<br>mm | 16561 | ... |
|-------------|----------|----------|-------------|-------|-----|
| 12.0        | 14       | 71       | 12          |       | 107 |
| 14.0        | 14       | 71       | 14          |       | 108 |
| 16.0        | 16       | 76       | 16          |       | 109 |
| 18.0        | 18       | 76       | 18          |       | 110 |
| 20.0        | 20       | 82       | 20          |       | 111 |

| Al<10%Si | Al>10%Si | Cu | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|----------|----------|----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| -        | -        | -  | 150     | 130     | 120     | 100      | 90       | 80       | -      | -      | -      | -      | 105     | 80      | 40       | 110   | -       |

16628

## Solid carbide roughing cutter

**ATORN®**

### Design

- With clearance and edge protection chamfer
- With centre cutting
- 3-4 cutting edges

### Advantage:

- Maximum machining performance

### Applications

For roughing. Ideal for dry machining.

### Quality

Solid carbide ultra-fine grain/TiAlN ultra-coated.

TiAlN  
Ultra

Z3-4

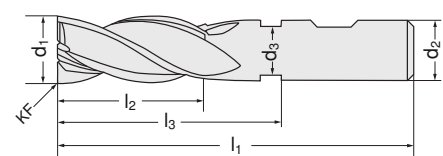
NR



DIN  
6535  
HB



16628



| d1 h9<br>mm | d2<br>mm | d3<br>mm | l1<br>mm | l3<br>mm | l2<br>mm | Kf<br>mm | Z | 16628 | ... |
|-------------|----------|----------|----------|----------|----------|----------|---|-------|-----|
| 4.0         | 6        | 3.8      | 57       | 18       | 8        | 0.1      | 3 |       | 101 |
| 4.0         | 6        | 3.8      | 57       | 18       | 11       | 0.1      | 3 |       | 102 |
| 5.0         | 6        | 4.8      | 57       | 20       | 9        | 0.1      | 3 |       | 103 |
| 5.0         | 6        | 4.8      | 57       | 20       | 13       | 0.1      | 3 |       | 104 |
| 6.0         | 6        | 5.8      | 57       | 20       | 10       | 0.1      | 4 |       | 105 |
| 6.0         | 6        | 5.8      | 57       | 20       | 13       | 0.1      | 4 |       | 106 |
| 8.0         | 8        | 7.7      | 63       | 25       | 12       | 0.2      | 4 |       | 107 |
| 8.0         | 8        | 7.7      | 63       | 25       | 19       | 0.2      | 4 |       | 108 |
| 10.0        | 10       | 9.5      | 72       | 30       | 15       | 0.2      | 4 |       | 109 |
| 10.0        | 10       | 9.5      | 72       | 30       | 22       | 0.2      | 4 |       | 110 |
| 12.0        | 12       | 11.5     | 83       | 35       | 18       | 0.3      | 4 |       | 111 |
| 12.0        | 12       | 11.5     | 83       | 35       | 26       | 0.3      | 4 |       | 112 |
| 16.0        | 16       | 15.5     | 92       | 40       | 24       | 0.3      | 4 |       | 113 |
| 16.0        | 16       | 15.5     | 92       | 40       | 32       | 0.3      | 4 |       | 114 |
| 20.0        | 20       | 19.5     | 104      | 50       | 30       | 0.3      | 4 |       | 115 |
| 20.0        | 20       | 19.5     | 104      | 50       | 38       | 0.3      | 4 |       | 116 |

| Al<10%Si | Al>10%Si | Cu      | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1300N | <50HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G)   | Plastic |
|----------|----------|---------|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|---------|---------|
| 300-400  | 85-180   | 110-180 | 135-180 | 135-155 | 100-120 | 70-100   | 70-100   | 70-100   | -      | -      | -      | -      | 100-120 | 100-120 | 60-80    | 120-180 | -       |



16565

## Solid carbide roughing and finishing cutter

VHM  
TiAlN

Z4

30°

DIN  
6535  
HB

NF



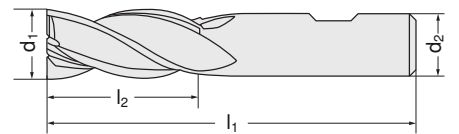
## Design

- With ground chip breakers
- Centre cutting
- 30° spiral for high roughing performance
- With straight shank with driving surface in accordance with DIN 6535 HB.

## Applications

For roughing and finishing with extreme feeds in steel. Excellent smoothness as the cutting pressure is reduced by the special chip breakers.

16565



| d <sub>1</sub> h10<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | 16565 | ... |
|--------------------------|----------------------|----------------------|-------------------------|-------|-----|
| 5.0                      | 15                   | 57                   | 6                       |       | 101 |
| 6.0                      | 16                   | 57                   | 6                       |       | 102 |
| 8.0                      | 22                   | 63                   | 8                       |       | 103 |
| 10.0                     | 25                   | 72                   | 10                      |       | 104 |

| d <sub>1</sub> h10<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | 16565 | ... |
|--------------------------|----------------------|----------------------|-------------------------|-------|-----|
| 12.0                     | 28                   | 83                   | 12                      |       | 105 |
| 16.0                     | 35                   | 92                   | 16                      |       | 106 |
| 20.0                     | 40                   | 104                  | 20                      |       | 107 |

| Al<10%Si | Al>10%Si | Cu | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|----------|----------|----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| -        | -        | -  | 120     | 105     | 90      | 70       | 40-60    | -        | -      | -      | -      | -      | 95      | 70      | -        | -     | -       |

16567

## Solid carbide roughing cutter

VHM  
TiAlN

Z4

25°

DIN  
6535  
HB

HR



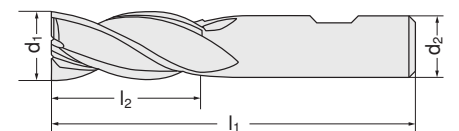
## Design

- Long
- 4 cutting edges
- Centre cutting
- Right-hand twist 25°
- Fine cord profile
- Straight shank with driving surface in accordance with DIN 6535 HB.

## Applications

For materials up to HRC 45. Excellent machining performance thanks to roughing teeth. Universal use, including for stainless steel, aluminium, non-ferrous metals and cast materials.

16567



| d <sub>1</sub> h10<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | 16567 | ... |
|--------------------------|----------------------|----------------------|-------------------------|-------|-----|
| 3.0                      | 6                    | 57                   | 6                       |       | 101 |
| 4.0                      | 8                    | 57                   | 6                       |       | 102 |
| 5.0                      | 10                   | 57                   | 6                       |       | 103 |
| 6.0                      | 13                   | 57                   | 6                       |       | 104 |

| d <sub>1</sub> h10<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | 16567 | ... |
|--------------------------|----------------------|----------------------|-------------------------|-------|-----|
| 8.0                      | 16                   | 63                   | 8                       |       | 105 |
| 10.0                     | 22                   | 72                   | 10                      |       | 106 |
| 12.0                     | 26                   | 83                   | 12                      |       | 107 |
| 16.0                     | 32                   | 92                   | 16                      |       | 108 |

| Al<10%Si | Al>10%Si | Cu | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G)  | Plastic |
|----------|----------|----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|--------|---------|
| 300      | 220      | -  | 120     | 105     | 90      | 70       | 40-60    | -        | -      | -      | -      | -      | 70-90   | 50-70   | 30-60    | 80-100 | -       |

16569

## Solid carbide roughing cutter with internal cooling supply

VHM  
TiAlN

Z4

25°

DIN  
6535  
HB

HR



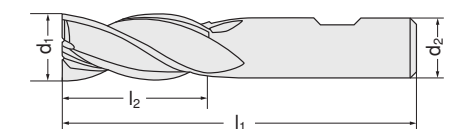
## Design

- Long
- Centre cutting
- Right-hand twist 25°
- With internal cooling in the flute
- Fine cord profile
- Straight shank with driving surface in accordance with DIN 6535 HB

## Use

For materials up to HRC 45. Universal use. The coolant is guided directly to the cutting edges. This results in a long service life and the chips are completely removed. Especially important when milling in solids and when milling out pockets.

16569



| d <sub>1</sub> h10<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | 16569 | ... |
|--------------------------|----------------------|----------------------|-------------------------|-------|-----|
| 6.0                      | 13                   | 57                   | 6                       |       | 101 |
| 8.0                      | 16                   | 63                   | 8                       |       | 102 |
| 10.0                     | 22                   | 72                   | 10                      |       | 103 |

| d <sub>1</sub> h10<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | 16569 | ... |
|--------------------------|----------------------|----------------------|-------------------------|-------|-----|
| 12.0                     | 26                   | 83                   | 12                      |       | 104 |
| 16.0                     | 32                   | 92                   | 16                      |       | 105 |
| 20.0                     | 38                   | 104                  | 20                      |       | 106 |

| Al<10%Si | Al>10%Si | Cu | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G)  | Plastic |
|----------|----------|----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|--------|---------|
| 300      | 220      | -  | 120     | 105     | 90      | 70       | 40-60    | -        | -      | -      | -      | -      | 70-90   | 50-70   | 30-60    | 80-100 | -       |

# Solid carbide roughing cutters | Solid carbide miniature end mills

16650 - 16651

## Solid carbide roughing cutter Quickmax

VHM  
TiAlN

HSC

Z3-6

HR

50  
HRC

VA

Unif

**HHW**

### Design

Short, 3-6 cutting edges, centre cutting. Right-hand twist 45°. High chipping performance. With protective chamfer, special roughing profile. Long service life. Quick chip removal. Extremely stable cutting edges. Great stability.

### Applications

Alloyed steels, stainless steel, titanium, Inconel.

### Quality

Universal carbide ultra-fine grain (P 20 - K 40)  
TiAlN-coated.

### 16650

With smooth straight shank in accordance with DIN 6535 HA.

### 16651

With clamping surface in accordance with DIN 6535 HB.

DIN  
6535  
HA

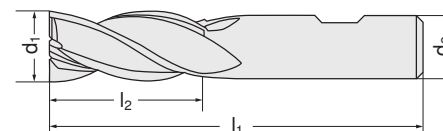


16650

DIN  
6535  
HB



16651



| DIN 6535 HA          |                      |                      |                      |   | DIN 6535 HB |     |       |
|----------------------|----------------------|----------------------|----------------------|---|-------------|-----|-------|
| d <sub>1</sub><br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub><br>mm | Z | 16650       | ... | 16651 |
| 4.0                  | 11                   | 57                   | 6                    | 3 |             | 101 | 101   |
| 6.0                  | 16                   | 57                   | 6                    | 4 |             | 102 | 102   |
| 8.0                  | 16                   | 63                   | 8                    | 4 |             | 103 | 103   |
| 10.0                 | 22                   | 72                   | 10                   | 4 |             | 104 | 104   |
| 12.0                 | 26                   | 83                   | 12                   | 4 |             | 105 | 105   |
| 16.0                 | 32                   | 92                   | 16                   | 5 |             | 106 | 106   |
| 20.0                 | 38                   | 104                  | 20                   | 6 |             | 107 | 107   |
| 25.0                 | 45                   | 121                  | 25                   | 6 |             | 108 | 108   |

| Al<10%Si | Al>10%Si | Cu | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|----------|----------|----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| -        | -        | -  | 140-160 | 100-140 | 90-120  | 90       | 80       | 60       | 60     | 50     | -      | -      | 100     | 90      | 70       | 80    | -       |

16629

## Solid carbide roughing cutter

VHM  
TiAlN

HSC

Z3-4

DIN  
6535  
HB

HR

60  
HRC

Unif

**HHW**

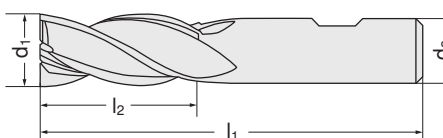
### Design

Long, relief ground, fine cord profile, right cutting with centre cutting. 3-4 cutting edges. With clamping surface in accordance with DIN 6535 HB.

### Quality

Universal carbide ultra-fine grain (P 20 - K 40)  
TiAlN-coated.

16629



| d <sub>1</sub> e8<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | Z | 16629 | ... |
|-------------------------|----------------------|----------------------|-------------------------|---|-------|-----|
| 6.0                     | 16                   | 57                   | 6                       | 3 |       | 101 |
| 8.0                     | 16                   | 63                   | 8                       | 3 |       | 103 |
| 10.0                    | 22                   | 72                   | 10                      | 4 |       | 105 |
| 12.0                    | 26                   | 83                   | 12                      | 4 |       | 106 |
| 14.0                    | 26                   | 83                   | 14                      | 4 |       | 107 |
| 16.0                    | 32                   | 92                   | 16                      | 4 |       | 108 |
| 20.0                    | 38                   | 104                  | 20                      | 4 |       | 110 |

| Al<10%Si | Al>10%Si | Cu  | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|----------|----------|-----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| 400      | 300      | 250 | 300     | 250     | 200     | 180      | 160      | 140      | 80     | 60     | 40     | -      | 120     | 100     | 60       | 180   | -       |

Hard machining is the machining of hardened materials with a hardness of 52 to 65 HRC. Hard milling offers decisive advantages thanks to time and money savings. Special HSC milling strategies, high surface quality as well as doing away with the hardening distortion make this process interesting to an even wider market. Furthermore, work processes such as multiple clamping and time-consuming polishing are also removed, resulting in enormous savings – **a cost benefit for your production!**

We have compiled the **ATORN range** for all of these processing and use cases. This range, which meets your every need in terms of assortment breadth and depth as well as cutting material and geometry, is designed for extremely high requirements.

The **ATORN hard milling tools** offer you the best conditions for efficient hard machining. The different geometries are optimally matched to the different milling operations. The cemented carbide used has a high level of hardness and is extremely tough.

Thanks to the special edge treatment as well as the new coatings **RockTec 52** and **RockTec 65**, the **ATORN tools have an extremely long service life.**

#### RockTec 52

Universal use: Up to 52 HRC  
Tolerance radius correction: +/- 0.01 mm  
Coating type: Monolayer  
Micro hardness: 3300 HV  
Max. application temperature: < 900 °C  
For wet and dry milling

#### RockTec 65

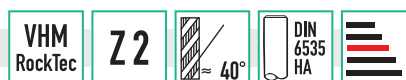
For HPC and HSC milling: Up to 65 HRC  
Tolerance radius correction: +/- 0.01 mm  
Type of coating: New multi-layer  
Micro hardness: 3600 HV  
Max. application temperature: < 1200 °C  
Longest possible service life when dry milling



The complete range for the most demanding applications

## 16800

## Solid carbide mini end mills



# ATORN®

#### Design

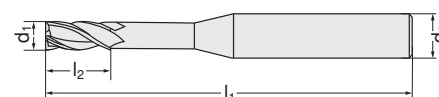
- Short
- Right cutting
- 2 cutting edges
- Right-hand twist 40°
- With smooth straight shank in accordance with DIN 6535 HA



16800 101-109



16800 301-309



| d <sub>1</sub><br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> (h6)<br>mm | RockTec 52 |     | RockTec 65 |     |
|----------------------|----------------------|----------------------|---------------------------|------------|-----|------------|-----|
|                      |                      |                      |                           | 16800      | ... | 16800      | ... |
| 0.1                  | 0.2                  | 40                   | 4                         |            | 101 |            | 301 |
| 0.2                  | 0.4                  | 40                   | 4                         |            | 102 |            | 302 |
| 0.3                  | 0.6                  | 40                   | 4                         |            | 103 |            | 303 |
| 0.4                  | 0.8                  | 40                   | 4                         |            | 104 |            | 304 |
| 0.5                  | 1.0                  | 40                   | 4                         |            | 105 |            | 305 |
| 0.6                  | 1.2                  | 40                   | 4                         |            | 106 |            | 306 |
| 0.7                  | 1.4                  | 40                   | 4                         |            | 107 |            | 307 |
| 0.8                  | 1.6                  | 40                   | 4                         |            | 108 |            | 308 |
| 0.9                  | 1.8                  | 40                   | 4                         |            | 109 |            | 309 |

| Al <10%Si  | Al > 10%Si | Cu | St <520N | St <750N | St <900N | St <1100N | St <1200N | St >1400N | > 45HRC | < 52HRC | < 58HRC | < 65HRC | VA <900N | VA >900N | Ti | GG(G) | Plastic |
|------------|------------|----|----------|----------|----------|-----------|-----------|-----------|---------|---------|---------|---------|----------|----------|----|-------|---------|
| Rocktec 52 |            |    |          |          |          |           |           |           |         |         |         |         |          |          |    |       |         |
| -          | -          | -  | 60-90    | 60-90    | 60-90    | 60-90     | 60-90     | 30-60     | 30-60   | 30-60   | -       | -       | -        | -        | -  | -     | -       |
| Rocktec 65 |            |    |          |          |          |           |           |           |         |         |         |         |          |          |    |       |         |
| -          | -          | -  | -        | -        | -        | -         | -         | 60-90     | 60-90   | 50-80   | 45-60   | 40-55   | -        | -        | -  | -     | -       |

## Solid carbide mini end mills | Solid carbide mini torus milling cutters

16801

## Solid carbide mini end mills

VHM  
RockTec

Z2

**ATORN®**

## Design

- Long
- Right cutting

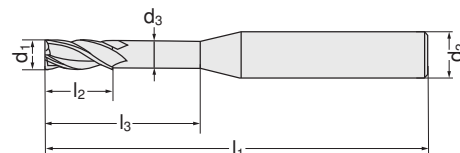
- 2 cutting edges
- Right-hand twist 40°
- With smooth straight shank in accordance with DIN 6535 HA



16801 101-154



16801 301-354



| d <sub>1</sub><br>mm | l <sub>2</sub><br>mm | l <sub>3</sub><br>mm | l <sub>1</sub><br>mm | d <sub>3</sub><br>mm | d <sub>2</sub> (h6)<br>mm | RockTec 52 |     | RockTec 65 |     |
|----------------------|----------------------|----------------------|----------------------|----------------------|---------------------------|------------|-----|------------|-----|
|                      |                      |                      |                      |                      |                           | 16801      | ... | 16801      | ... |
| 0.2                  | 0.3                  | 0.5                  | 50                   | 0.16                 | 4                         |            | 101 |            | 301 |
| 0.2                  | 0.3                  | 1.0                  | 50                   | 0.16                 | 4                         |            | 102 |            | 302 |
| 0.2                  | 0.3                  | 1.5                  | 50                   | 0.16                 | 4                         |            | 103 |            | 303 |
| 0.3                  | 0.4                  | 1.0                  | 50                   | 0.26                 | 4                         |            | 104 |            | 304 |
| 0.3                  | 0.4                  | 2.0                  | 50                   | 0.26                 | 4                         |            | 105 |            | 305 |
| 0.3                  | 0.4                  | 3.0                  | 50                   | 0.26                 | 4                         |            | 106 |            | 306 |
| 0.4                  | 0.6                  | 2.0                  | 50                   | 0.37                 | 4                         |            | 107 |            | 307 |
| 0.4                  | 0.6                  | 3.0                  | 50                   | 0.37                 | 4                         |            | 108 |            | 308 |
| 0.4                  | 0.6                  | 4.0                  | 50                   | 0.37                 | 4                         |            | 109 |            | 309 |
| 0.4                  | 0.6                  | 5.0                  | 50                   | 0.37                 | 4                         |            | 110 |            | 310 |
| 0.5                  | 0.7                  | 2.0                  | 50                   | 0.45                 | 4                         |            | 111 |            | 311 |
| 0.5                  | 0.7                  | 4.0                  | 50                   | 0.45                 | 4                         |            | 112 |            | 312 |
| 0.5                  | 0.7                  | 6.0                  | 50                   | 0.45                 | 4                         |            | 113 |            | 313 |
| 0.5                  | 0.7                  | 8.0                  | 50                   | 0.45                 | 4                         |            | 114 |            | 314 |
| 0.6                  | 0.9                  | 2.0                  | 50                   | 0.55                 | 4                         |            | 115 |            | 315 |
| 0.6                  | 0.9                  | 4.0                  | 50                   | 0.55                 | 4                         |            | 116 |            | 316 |
| 0.6                  | 0.9                  | 6.0                  | 50                   | 0.55                 | 4                         |            | 117 |            | 317 |
| 0.6                  | 0.9                  | 8.0                  | 50                   | 0.55                 | 4                         |            | 118 |            | 318 |
| 0.6                  | 0.9                  | 10.0                 | 50                   | 0.55                 | 4                         |            | 119 |            | 319 |
| 0.8                  | 1.2                  | 4.0                  | 50                   | 0.75                 | 4                         |            | 120 |            | 320 |
| 0.8                  | 1.2                  | 6.0                  | 50                   | 0.75                 | 4                         |            | 121 |            | 321 |
| 0.8                  | 1.2                  | 8.0                  | 50                   | 0.75                 | 4                         |            | 122 |            | 322 |
| 0.8                  | 1.2                  | 10.0                 | 50                   | 0.75                 | 4                         |            | 123 |            | 323 |
| 0.8                  | 1.2                  | 12.0                 | 50                   | 0.75                 | 4                         |            | 124 |            | 324 |
| 1.0                  | 1.5                  | 6.0                  | 50                   | 0.95                 | 4                         |            | 125 |            | 325 |
| 1.0                  | 1.5                  | 8.0                  | 50                   | 0.95                 | 4                         |            | 126 |            | 326 |
| 1.0                  | 1.5                  | 10.0                 | 50                   | 0.95                 | 4                         |            | 127 |            | 327 |
| 1.0                  | 1.5                  | 12.0                 | 50                   | 0.95                 | 4                         |            | 128 |            | 328 |
| 1.0                  | 1.5                  | 14.0                 | 50                   | 0.95                 | 4                         |            | 129 |            | 329 |
| 1.0                  | 1.5                  | 16.0                 | 50                   | 0.95                 | 4                         |            | 130 |            | 330 |
| 1.2                  | 1.8                  | 6.0                  | 50                   | 1.15                 | 4                         |            | 131 |            | 331 |
| 1.2                  | 1.8                  | 10.0                 | 50                   | 1.15                 | 4                         |            | 132 |            | 332 |
| 1.5                  | 2.3                  | 8.0                  | 50                   | 1.45                 | 4                         |            | 133 |            | 333 |
| 1.5                  | 2.3                  | 12.0                 | 50                   | 1.45                 | 4                         |            | 134 |            | 334 |
| 1.5                  | 2.3                  | 16.0                 | 50                   | 1.45                 | 4                         |            | 135 |            | 335 |
| 1.5                  | 2.3                  | 20.0                 | 60                   | 1.45                 | 4                         |            | 136 |            | 336 |
| 2.0                  | 3.0                  | 6.0                  | 50                   | 1.95                 | 4                         |            | 137 |            | 337 |
| 2.0                  | 3.0                  | 8.0                  | 50                   | 1.95                 | 4                         |            | 138 |            | 338 |
| 2.0                  | 3.0                  | 12.0                 | 50                   | 1.95                 | 4                         |            | 139 |            | 339 |
| 2.0                  | 3.0                  | 16.0                 | 50                   | 1.95                 | 4                         |            | 140 |            | 340 |
| 2.0                  | 3.0                  | 20.0                 | 60                   | 1.95                 | 4                         |            | 141 |            | 341 |
| 2.0                  | 3.0                  | 25.0                 | 75                   | 1.95                 | 4                         |            | 142 |            | 342 |
| 2.5                  | 3.7                  | 8.0                  | 50                   | 2.40                 | 4                         |            | 143 |            | 343 |
| 2.5                  | 3.7                  | 10.0                 | 50                   | 2.40                 | 4                         |            | 144 |            | 344 |
| 2.5                  | 3.7                  | 12.0                 | 50                   | 2.40                 | 4                         |            | 145 |            | 345 |
| 2.5                  | 3.7                  | 16.0                 | 50                   | 2.40                 | 4                         |            | 146 |            | 346 |
| 2.5                  | 3.7                  | 20.0                 | 60                   | 2.40                 | 4                         |            | 147 |            | 347 |
| 2.5                  | 3.7                  | 25.0                 | 75                   | 2.40                 | 4                         |            | 148 |            | 348 |
| 3.0                  | 4.5                  | 8.0                  | 50                   | 2.85                 | 6                         |            | 149 |            | 349 |
| 3.0                  | 4.5                  | 10.0                 | 50                   | 2.85                 | 6                         |            | 150 |            | 350 |
| 3.0                  | 4.5                  | 12.0                 | 50                   | 2.85                 | 6                         |            | 151 |            | 351 |
| 3.0                  | 4.5                  | 16.0                 | 60                   | 2.85                 | 6                         |            | 152 |            | 352 |
| 3.0                  | 4.5                  | 20.0                 | 60                   | 2.85                 | 6                         |            | 153 |            | 353 |
| 3.0                  | 4.5                  | 25.0                 | 75                   | 2.85                 | 6                         |            | 154 |            | 354 |

| Al <10%Si  | Al > 10%Si | Cu | St <520N | St <750N | St <900N | St <1100N | St <1200N | St >1400N | > 45HRC | < 52HRC | < 58HRC | < 65HRC | VA <900N | VA >900N | Ti | GG(G) | Plastic |
|------------|------------|----|----------|----------|----------|-----------|-----------|-----------|---------|---------|---------|---------|----------|----------|----|-------|---------|
| Rocktec 52 |            |    |          |          |          |           |           |           |         |         |         |         |          |          |    |       |         |
| -          | -          | -  | 60-90    | 60-90    | 60-90    | 60-90     | 60-90     | 30-60     | 30-60   | 30-60   | -       | -       | -        | -        | -  | -     | -       |
| Rocktec 65 |            |    |          |          |          |           |           |           |         |         |         |         |          |          |    |       |         |
| -          | -          | -  | -        | -        | -        | -         | -         | 60-90     | 60-90   | 50-80   | 45-60   | 40-55   | -        | -        | -  | -     | -       |

16.60



www.hhw.de  
Fax order hotline: 0800 0 915910



The specified prices are unit prices. Only sold in the specified packing units. Always specify number of units in order information.

eng/P

**ATORN®**

## Design

- Long
- With corner radius
- Right cutting

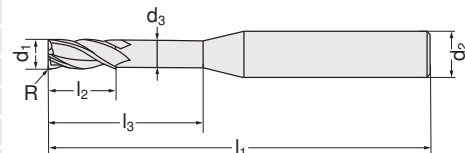
- 2 cutting edges
- Right-hand twist 40°
- With smooth straight shank in accordance with DIN 6535 HA

1600  
N/mm<sup>2</sup>52  
HRC

16802 101-154

65  
HRC

16802 301-354



| d <sub>1</sub><br>mm | R<br>mm | l <sub>2</sub><br>mm | l <sub>3</sub><br>mm | l <sub>1</sub><br>mm | d <sub>3</sub><br>mm | d <sub>2</sub> (h6)<br>mm | RockTec 52 |     | RockTec 65 |     |
|----------------------|---------|----------------------|----------------------|----------------------|----------------------|---------------------------|------------|-----|------------|-----|
|                      |         |                      |                      |                      |                      |                           | 16802      | ... | 16802      | ... |
| 0.2                  | 0.02    | 0.3                  | 0.5                  | 50                   | 0.16                 | 4                         |            | 101 |            | 301 |
| 0.2                  | 0.02    | 0.3                  | 1.0                  | 50                   | 0.16                 | 4                         |            | 102 |            | 302 |
| 0.2                  | 0.02    | 0.3                  | 1.5                  | 50                   | 0.16                 | 4                         |            | 103 |            | 303 |
| 0.3                  | 0.03    | 0.4                  | 1.0                  | 50                   | 0.26                 | 4                         |            | 104 |            | 304 |
| 0.3                  | 0.03    | 0.4                  | 2.0                  | 50                   | 0.26                 | 4                         |            | 105 |            | 305 |
| 0.3                  | 0.03    | 0.4                  | 3.0                  | 50                   | 0.26                 | 4                         |            | 106 |            | 306 |
| 0.4                  | 0.03    | 0.6                  | 2.0                  | 50                   | 0.37                 | 4                         |            | 107 |            | 307 |
| 0.4                  | 0.03    | 0.6                  | 3.0                  | 50                   | 0.37                 | 4                         |            | 108 |            | 308 |
| 0.4                  | 0.03    | 0.6                  | 4.0                  | 50                   | 0.37                 | 4                         |            | 109 |            | 309 |
| 0.4                  | 0.03    | 0.6                  | 5.0                  | 50                   | 0.37                 | 4                         |            | 110 |            | 310 |
| 0.5                  | 0.05    | 0.7                  | 2.0                  | 50                   | 0.45                 | 4                         |            | 111 |            | 311 |
| 0.5                  | 0.05    | 0.7                  | 4.0                  | 50                   | 0.45                 | 4                         |            | 112 |            | 312 |
| 0.5                  | 0.05    | 0.7                  | 6.0                  | 50                   | 0.45                 | 4                         |            | 113 |            | 313 |
| 0.5                  | 0.05    | 0.7                  | 8.0                  | 50                   | 0.45                 | 4                         |            | 114 |            | 314 |
| 0.6                  | 0.05    | 0.9                  | 2.0                  | 50                   | 0.55                 | 4                         |            | 115 |            | 315 |
| 0.6                  | 0.05    | 0.9                  | 4.0                  | 50                   | 0.55                 | 4                         |            | 116 |            | 316 |
| 0.6                  | 0.05    | 0.9                  | 6.0                  | 50                   | 0.55                 | 4                         |            | 117 |            | 317 |
| 0.6                  | 0.05    | 0.9                  | 8.0                  | 50                   | 0.55                 | 4                         |            | 118 |            | 318 |
| 0.6                  | 0.05    | 0.9                  | 10.0                 | 50                   | 0.55                 | 4                         |            | 119 |            | 319 |
| 0.8                  | 0.08    | 1.2                  | 4.0                  | 50                   | 0.75                 | 4                         |            | 120 |            | 320 |
| 0.8                  | 0.08    | 1.2                  | 6.0                  | 50                   | 0.75                 | 4                         |            | 121 |            | 321 |
| 0.8                  | 0.08    | 1.2                  | 8.0                  | 50                   | 0.75                 | 4                         |            | 122 |            | 322 |
| 0.8                  | 0.08    | 1.2                  | 10.0                 | 50                   | 0.75                 | 4                         |            | 123 |            | 323 |
| 0.8                  | 0.08    | 1.2                  | 12.0                 | 50                   | 0.75                 | 4                         |            | 124 |            | 324 |
| 1.0                  | 0.10    | 1.5                  | 6.0                  | 50                   | 0.95                 | 4                         |            | 125 |            | 325 |
| 1.0                  | 0.10    | 1.5                  | 8.0                  | 50                   | 0.95                 | 4                         |            | 126 |            | 326 |
| 1.0                  | 0.10    | 1.5                  | 10.0                 | 50                   | 0.95                 | 4                         |            | 127 |            | 327 |
| 1.0                  | 0.10    | 1.5                  | 12.0                 | 50                   | 0.95                 | 4                         |            | 128 |            | 328 |
| 1.0                  | 0.10    | 1.5                  | 14.0                 | 50                   | 0.95                 | 4                         |            | 129 |            | 329 |
| 1.0                  | 0.10    | 1.5                  | 16.0                 | 50                   | 0.95                 | 4                         |            | 130 |            | 330 |
| 1.2                  | 0.10    | 1.8                  | 6.0                  | 50                   | 1.15                 | 4                         |            | 131 |            | 331 |
| 1.2                  | 0.10    | 1.8                  | 10.0                 | 50                   | 1.15                 | 4                         |            | 132 |            | 332 |
| 1.5                  | 0.15    | 2.3                  | 8.0                  | 50                   | 1.45                 | 4                         |            | 133 |            | 333 |
| 1.5                  | 0.15    | 2.3                  | 12.0                 | 50                   | 1.45                 | 4                         |            | 134 |            | 334 |
| 1.5                  | 0.15    | 2.3                  | 16.0                 | 50                   | 1.45                 | 4                         |            | 135 |            | 335 |
| 1.5                  | 0.15    | 2.3                  | 20.0                 | 60                   | 1.45                 | 4                         |            | 136 |            | 336 |
| 2.0                  | 0.20    | 3.0                  | 6.0                  | 50                   | 1.95                 | 4                         |            | 137 |            | 337 |
| 2.0                  | 0.20    | 3.0                  | 8.0                  | 50                   | 1.95                 | 4                         |            | 138 |            | 338 |
| 2.0                  | 0.20    | 3.0                  | 12.0                 | 50                   | 1.95                 | 4                         |            | 139 |            | 339 |
| 2.0                  | 0.20    | 3.0                  | 16.0                 | 50                   | 1.95                 | 4                         |            | 140 |            | 340 |
| 2.0                  | 0.20    | 3.0                  | 20.0                 | 60                   | 1.95                 | 4                         |            | 141 |            | 341 |
| 2.0                  | 0.20    | 3.0                  | 25.0                 | 75                   | 1.95                 | 4                         |            | 142 |            | 342 |
| 2.5                  | 0.30    | 3.7                  | 8.0                  | 50                   | 2.40                 | 4                         |            | 143 |            | 343 |
| 2.5                  | 0.30    | 3.7                  | 10.0                 | 50                   | 2.40                 | 4                         |            | 144 |            | 344 |
| 2.5                  | 0.30    | 3.7                  | 12.0                 | 50                   | 2.40                 | 4                         |            | 145 |            | 345 |
| 2.5                  | 0.30    | 3.7                  | 16.0                 | 50                   | 2.40                 | 4                         |            | 146 |            | 346 |
| 2.5                  | 0.30    | 3.7                  | 20.0                 | 60                   | 2.40                 | 4                         |            | 147 |            | 347 |
| 2.5                  | 0.30    | 3.7                  | 25.0                 | 75                   | 2.40                 | 4                         |            | 148 |            | 348 |
| 3.0                  | 0.30    | 4.5                  | 8.0                  | 50                   | 2.85                 | 6                         |            | 149 |            | 349 |
| 3.0                  | 0.30    | 4.5                  | 10.0                 | 50                   | 2.85                 | 6                         |            | 150 |            | 350 |
| 3.0                  | 0.30    | 4.5                  | 12.0                 | 50                   | 2.85                 | 6                         |            | 151 |            | 351 |
| 3.0                  | 0.30    | 4.5                  | 16.0                 | 60                   | 2.85                 | 6                         |            | 152 |            | 352 |
| 3.0                  | 0.30    | 4.5                  | 20.0                 | 60                   | 2.85                 | 6                         |            | 153 |            | 353 |
| 3.0                  | 0.30    | 4.5                  | 25.0                 | 75                   | 2.85                 | 6                         |            | 154 |            | 354 |

| Al <10%Si  | Al > 10%Si | Cu | St <520N | St <750N | St <900N | St <1100N | St <1200N | St >1400N | > 45HRC | < 52HRC | < 58HRC | < 65HRC | VA <900N | VA >900N | Ti | GG(G) | Plastic |
|------------|------------|----|----------|----------|----------|-----------|-----------|-----------|---------|---------|---------|---------|----------|----------|----|-------|---------|
| Rocktec 52 |            |    |          |          |          |           |           |           |         |         |         |         |          |          |    |       |         |
| -          | -          | -  | 60-90    | 60-90    | 60-90    | 60-90     | 60-90     | 30-60     | 30-60   | 30-60   | -       | -       | -        | -        | -  | -     | -       |
| Rocktec 65 |            |    |          |          |          |           |           |           |         |         |         |         |          |          |    |       |         |
| -          | -          | -  | -        | -        | -        | -         | -         | 60-90     | 60-90   | 50-80   | 45-60   | 40-55   | -        | -        | -  | -     | -       |

## Solid carbide mini radius cutters

16805

### Solid carbide mini radius cutters

VHM  
RockTec

Z2

30°

DIN  
6535  
HA



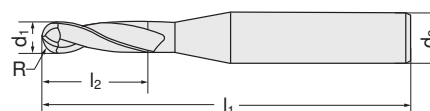
1600  
N/mm²

52  
HRC

16805 101-108

65  
HRC

16805 301-308



#### Design

- Short
- Right cutting
- 2 cutting edges
- Right-hand twist 30°
- With smooth straight shank in accordance with DIN 6535 HA

| d <sub>1</sub><br>mm | R<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> (h6)<br>mm | RockTec 52 |     | RockTec 65 |     |
|----------------------|---------|----------------------|----------------------|---------------------------|------------|-----|------------|-----|
|                      |         |                      |                      |                           | 16805      | ... | 16805      | ... |
| 0.2                  | 0.10    | 0.4                  | 40                   | 4                         |            | 101 |            | 301 |
| 0.3                  | 0.15    | 0.6                  | 40                   | 4                         |            | 102 |            | 302 |
| 0.4                  | 0.20    | 0.8                  | 40                   | 4                         |            | 103 |            | 303 |
| 0.5                  | 0.25    | 1.2                  | 40                   | 4                         |            | 104 |            | 304 |
| 0.6                  | 0.30    | 1.4                  | 40                   | 4                         |            | 105 |            | 305 |
| 0.7                  | 0.35    | 1.6                  | 40                   | 4                         |            | 106 |            | 306 |
| 0.8                  | 0.40    | 1.8                  | 40                   | 4                         |            | 107 |            | 307 |
| 0.9                  | 0.45    | 2.0                  | 40                   | 4                         |            | 108 |            | 308 |

| Al <10%Si | Al >10%Si | Cu | St <520N | St <750N | St <900N | St <1100N | St <1200N | St >1400N | > 45HRC | < 52HRC | < 58HRC | < 65HRC | VA <900N | VA >900N | Ti | GG(G) | Plastic |
|-----------|-----------|----|----------|----------|----------|-----------|-----------|-----------|---------|---------|---------|---------|----------|----------|----|-------|---------|
| -         | -         | -  | 60-90    | 60-90    | 60-90    | 60-90     | 60-90     | 30-60     | 30-60   | 30-60   | -       | -       | -        | -        | -  | -     | -       |
| -         | -         | -  | -        | -        | -        | -         | -         | 60-90     | 60-90   | 50-80   | 45-60   | 40-55   | -        | -        | -  | -     | -       |



**ATORN®**

## Design

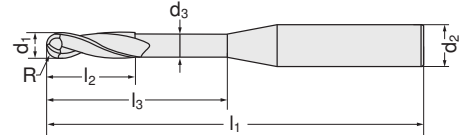
- Long
- Right cutting

- 2 cutting edges
- Right-hand twist 30°
- With smooth straight shank in accordance with DIN 6535 HA

16806 101-153



16806 301-353



| d <sub>1</sub><br>mm | R<br>mm | l <sub>2</sub><br>mm | l <sub>3</sub><br>mm | l <sub>1</sub><br>mm | d <sub>3</sub><br>mm | d <sub>2</sub> (h6)<br>mm | RockTec 52 |     | RockTec 65 |     |
|----------------------|---------|----------------------|----------------------|----------------------|----------------------|---------------------------|------------|-----|------------|-----|
|                      |         |                      |                      |                      |                      |                           | 16806      | ... | 16806      | ... |
| 0.2                  | 0.10    | 0.2                  | 0.5                  | 50                   | 0.15                 | 4                         |            | 101 |            | 301 |
| 0.2                  | 0.10    | 0.2                  | 1.0                  | 50                   | 0.15                 | 4                         |            | 102 |            | 302 |
| 0.2                  | 0.10    | 0.2                  | 1.5                  | 50                   | 0.15                 | 4                         |            | 103 |            | 303 |
| 0.3                  | 0.15    | 0.3                  | 1.0                  | 50                   | 0.25                 | 4                         |            | 104 |            | 304 |
| 0.3                  | 0.15    | 0.3                  | 2.0                  | 50                   | 0.25                 | 4                         |            | 105 |            | 305 |
| 0.3                  | 0.15    | 0.3                  | 3.0                  | 50                   | 0.25                 | 4                         |            | 106 |            | 306 |
| 0.4                  | 0.20    | 0.4                  | 1.0                  | 50                   | 0.35                 | 4                         |            | 107 |            | 307 |
| 0.4                  | 0.20    | 0.4                  | 2.0                  | 50                   | 0.35                 | 4                         |            | 108 |            | 308 |
| 0.4                  | 0.20    | 0.4                  | 3.0                  | 50                   | 0.35                 | 4                         |            | 109 |            | 309 |
| 0.4                  | 0.20    | 0.4                  | 4.0                  | 50                   | 0.35                 | 4                         |            | 110 |            | 310 |
| 0.4                  | 0.20    | 0.4                  | 5.0                  | 50                   | 0.35                 | 4                         |            | 111 |            | 311 |
| 0.5                  | 0.25    | 0.4                  | 2.0                  | 50                   | 0.45                 | 4                         |            | 112 |            | 312 |
| 0.5                  | 0.25    | 0.4                  | 3.0                  | 50                   | 0.45                 | 4                         |            | 113 |            | 313 |
| 0.5                  | 0.25    | 0.4                  | 4.0                  | 50                   | 0.45                 | 4                         |            | 114 |            | 314 |
| 0.5                  | 0.25    | 0.4                  | 5.0                  | 50                   | 0.45                 | 4                         |            | 115 |            | 315 |
| 0.5                  | 0.25    | 0.4                  | 6.0                  | 50                   | 0.45                 | 4                         |            | 116 |            | 316 |
| 0.5                  | 0.25    | 0.4                  | 8.0                  | 50                   | 0.45                 | 4                         |            | 117 |            | 317 |
| 0.6                  | 0.30    | 0.5                  | 2.0                  | 50                   | 0.55                 | 4                         |            | 118 |            | 318 |
| 0.6                  | 0.30    | 0.5                  | 3.0                  | 50                   | 0.55                 | 4                         |            | 119 |            | 319 |
| 0.6                  | 0.30    | 0.5                  | 4.0                  | 50                   | 0.55                 | 4                         |            | 120 |            | 320 |
| 0.6                  | 0.30    | 0.5                  | 5.0                  | 50                   | 0.55                 | 4                         |            | 121 |            | 321 |
| 0.6                  | 0.30    | 0.5                  | 6.0                  | 50                   | 0.55                 | 4                         |            | 122 |            | 322 |
| 0.6                  | 0.30    | 0.5                  | 8.0                  | 50                   | 0.55                 | 4                         |            | 123 |            | 323 |
| 0.8                  | 0.40    | 0.6                  | 2.0                  | 50                   | 0.75                 | 4                         |            | 124 |            | 324 |
| 0.8                  | 0.40    | 0.6                  | 4.0                  | 50                   | 0.75                 | 4                         |            | 125 |            | 325 |
| 0.8                  | 0.40    | 0.6                  | 5.0                  | 50                   | 0.75                 | 4                         |            | 126 |            | 326 |
| 0.8                  | 0.40    | 0.6                  | 6.0                  | 50                   | 0.75                 | 4                         |            | 127 |            | 327 |
| 0.8                  | 0.40    | 0.6                  | 7.0                  | 50                   | 0.75                 | 4                         |            | 128 |            | 328 |
| 0.8                  | 0.40    | 0.6                  | 8.0                  | 50                   | 0.75                 | 4                         |            | 129 |            | 329 |
| 0.8                  | 0.40    | 0.6                  | 10.0                 | 50                   | 0.75                 | 4                         |            | 130 |            | 330 |
| 1.0                  | 0.50    | 0.8                  | 3.0                  | 50                   | 0.95                 | 4                         |            | 131 |            | 331 |
| 1.0                  | 0.50    | 0.8                  | 6.0                  | 50                   | 0.95                 | 4                         |            | 132 |            | 332 |
| 1.0                  | 0.50    | 0.8                  | 8.0                  | 50                   | 0.95                 | 4                         |            | 133 |            | 333 |
| 1.0                  | 0.50    | 0.8                  | 10.0                 | 50                   | 0.95                 | 4                         |            | 134 |            | 334 |
| 1.0                  | 0.50    | 0.8                  | 16.0                 | 50                   | 0.95                 | 4                         |            | 135 |            | 335 |
| 1.0                  | 0.50    | 0.8                  | 20.0                 | 60                   | 0.95                 | 4                         |            | 136 |            | 336 |
| 1.2                  | 0.60    | 1.0                  | 6.0                  | 50                   | 1.15                 | 4                         |            | 137 |            | 337 |
| 1.2                  | 0.60    | 1.0                  | 10.0                 | 50                   | 1.15                 | 4                         |            | 138 |            | 338 |
| 1.5                  | 0.75    | 1.2                  | 8.0                  | 50                   | 1.45                 | 4                         |            | 139 |            | 339 |
| 1.5                  | 0.75    | 1.2                  | 12.0                 | 50                   | 1.45                 | 4                         |            | 140 |            | 340 |
| 1.5                  | 0.75    | 1.2                  | 16.0                 | 50                   | 1.45                 | 4                         |            | 141 |            | 341 |
| 1.5                  | 0.75    | 1.2                  | 18.0                 | 60                   | 1.45                 | 4                         |            | 142 |            | 342 |
| 2.0                  | 1.00    | 1.6                  | 4.0                  | 50                   | 1.95                 | 4                         |            | 143 |            | 343 |
| 2.0                  | 1.00    | 1.6                  | 8.0                  | 50                   | 1.95                 | 4                         |            | 144 |            | 344 |
| 2.0                  | 1.00    | 1.6                  | 12.0                 | 50                   | 1.95                 | 4                         |            | 145 |            | 345 |
| 2.0                  | 1.00    | 1.6                  | 16.0                 | 50                   | 1.95                 | 4                         |            | 146 |            | 346 |
| 2.0                  | 1.00    | 1.6                  | 20.0                 | 60                   | 1.95                 | 4                         |            | 147 |            | 347 |
| 2.0                  | 1.00    | 1.6                  | 25.0                 | 75                   | 1.95                 | 4                         |            | 148 |            | 348 |
| 3.0                  | 1.50    | 2.4                  | 8.0                  | 50                   | 2.85                 | 6                         |            | 149 |            | 349 |
| 3.0                  | 1.50    | 2.4                  | 10.0                 | 50                   | 2.85                 | 6                         |            | 150 |            | 350 |
| 3.0                  | 1.50    | 2.4                  | 16.0                 | 60                   | 2.85                 | 6                         |            | 151 |            | 351 |
| 3.0                  | 1.50    | 2.4                  | 20.0                 | 60                   | 2.85                 | 6                         |            | 152 |            | 352 |
| 3.0                  | 1.50    | 2.4                  | 25.0                 | 75                   | 2.85                 | 6                         |            | 153 |            | 353 |

| Al <10%Si  | Al > 10%Si | Cu | St <520N | St <750N | St <900N | St <1100N | St <1200N | St >1400N | > 45HRC | < 52HRC | < 58HRC | < 65HRC | VA <900N | VA >900N | Ti | GG(G) | Plastic |
|------------|------------|----|----------|----------|----------|-----------|-----------|-----------|---------|---------|---------|---------|----------|----------|----|-------|---------|
| Rocktec 52 |            |    |          |          |          |           |           |           |         |         |         |         |          |          |    |       |         |
| -          | -          | -  | 60-100   | 60-100   | 60-100   | 60-100    | 60-100    | 30-70     | 30-70   | 30-70   | -       | -       | -        | -        | -  | -     | -       |
| Rocktec 65 |            |    |          |          |          |           |           |           |         |         |         |         |          |          |    |       |         |
| -          | -          | -  | -        | -        | -        | -         | -         | 60-100    | 60-100  | 50-90   | 45-70   | 40-65   | -        | -        | -  | -     | -       |

## Solid carbide end mill

16601

### Solid carbide end mill



#### Design

- Short
- Right cutting
- 2 cutting edges
- Right-hand twist
- Centre cutting
- With clamping surface in accordance with DIN 6535 HB

VHM  
TiAlN

HSC

Z2

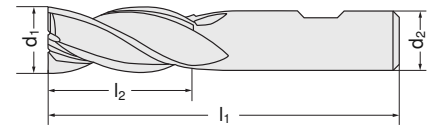
30°

DIN  
6535  
HB

60  
HRC

60  
HRC

16601



| d <sub>1</sub> e8<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | 16601 | ... |
|-------------------------|----------------------|----------------------|-------------------------|-------|-----|
| 3.0                     | 8                    | 45                   | 6                       | 101   |     |
| 4.0                     | 11                   | 45                   | 6                       | 103   |     |
| 5.0                     | 13                   | 50                   | 6                       | 105   |     |
| 6.0                     | 13                   | 50                   | 6                       | 107   |     |
| 8.0                     | 19                   | 60                   | 8                       | 111   |     |

| d <sub>1</sub> e8<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | 16601 | ... |
|-------------------------|----------------------|----------------------|-------------------------|-------|-----|
| 10.0                    | 22                   | 70                   | 10                      | 115   |     |
| 12.0                    | 26                   | 75                   | 12                      | 119   |     |
| 16.0                    | 32                   | 100                  | 16                      | 121   |     |
| 20.0                    | 38                   | 105                  | 20                      | 123   |     |
| 25.0                    | 45                   | 120                  | 25                      | 124   |     |

| Al<10%Si | Al>10%Si | Cu | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <50HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|----------|----------|----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| -        | -        | -  | 150-190 | 140-170 | 130-160 | 100-120  | 90-110   | 60-90    | 55-65  | 50-55  | 40-55  | -      | -       | -       | -        | -     | -       |

16604

### Solid carbide end mill



#### Design

- Long
- Right cutting
- 2 cutting edges
- Right-hand twist
- Centre cutting

#### Quality

Universal carbide ultra-fine grain (P 20 - K 40)  
TiAlN-coated.

VHM  
TiAlN

HSC

Z2

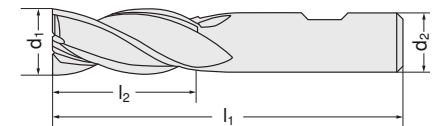
30°

DIN  
6535  
HB

60  
HRC

60  
HRC

16604



| d <sub>1</sub> e8<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | 16604 | ... |
|-------------------------|----------------------|----------------------|-------------------------|-------|-----|
| 3.0                     | 12                   | 50                   | 6                       | 101   |     |
| 4.0                     | 15                   | 50                   | 6                       | 102   |     |
| 5.0                     | 20                   | 60                   | 6                       | 103   |     |
| 6.0                     | 20                   | 60                   | 6                       | 104   |     |
| 8.0                     | 25                   | 70                   | 8                       | 105   |     |

| d <sub>1</sub> e8<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | 16604 | ... |
|-------------------------|----------------------|----------------------|-------------------------|-------|-----|
| 10.0                    | 30                   | 90                   | 10                      | 106   |     |
| 12.0                    | 30                   | 90                   | 12                      | 107   |     |
| 16.0                    | 50                   | 110                  | 16                      | 108   |     |
| 20.0                    | 55                   | 110                  | 20                      | 109   |     |
| 25.0                    | 75                   | 140                  | 25                      | 110   |     |

| Al<10%Si | Al>10%Si | Cu | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <50HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|----------|----------|----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| -        | -        | -  | 150-190 | 140-170 | 130-160 | 100-120  | 90-110   | 60-90    | 55-65  | 50-55  | 40-55  | -      | -       | -       | -        | -     | -       |

16810

### Solid carbide end mill



#### Design

- Short
- With clearance
- Right cutting
- 4 cutting edges

- Right-hand twist 40°
- With smooth straight shank in accordance with DIN 6535 HA

VHM  
Rocktec

Z4

40°

DIN  
6535  
HA

65  
HRC

1600  
N/mm<sup>2</sup>

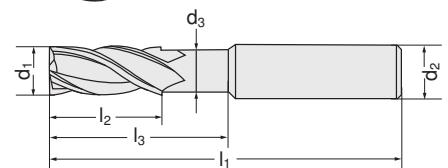
52  
HRC

16810 101-109



65  
HRC

16810 301-309



| d <sub>1</sub> (e8)<br>mm | l <sub>2</sub><br>mm | l <sub>3</sub><br>mm | l <sub>1</sub><br>mm | d <sub>3</sub><br>mm | d <sub>2</sub> (h6)<br>mm | RockTec 52 |     | RockTec 65 |     |
|---------------------------|----------------------|----------------------|----------------------|----------------------|---------------------------|------------|-----|------------|-----|
|                           |                      |                      |                      |                      |                           | 16810      | ... | 16810      | ... |
| 3.0                       | 9                    | 15                   | 50                   | 2.8                  | 6                         | 101        |     | 301        |     |
| 4.0                       | 12                   | 20                   | 50                   | 3.7                  | 6                         | 102        |     | 302        |     |
| 5.0                       | 15                   | 20                   | 50                   | 4.6                  | 6                         | 103        |     | 303        |     |
| 6.0                       | 16                   | 20                   | 50                   | 5.5                  | 6                         | 104        |     | 304        |     |
| 8.0                       | 20                   | 30                   | 64                   | 7.4                  | 8                         | 105        |     | 305        |     |
| 10.0                      | 22                   | 32                   | 70                   | 9.2                  | 10                        | 106        |     | 306        |     |
| 12.0                      | 25                   | 37                   | 75                   | 11.0                 | 12                        | 107        |     | 307        |     |
| 16.0                      | 32                   | 46                   | 90                   | 15.0                 | 16                        | 108        |     | 308        |     |
| 20.0                      | 38                   | 58                   | 100                  | 19.0                 | 20                        | 109        |     | 309        |     |

| Al<10%Si   | Al>10%Si | Cu | St<520N | St<750N | St<900N | St<1100N | St<1200N | St>1400N | >45HRC  | <52HRC  | <58HRC | <65HRC | VA<900N | VA>900N | Ti | GG(G) | Plastic |
|------------|----------|----|---------|---------|---------|----------|----------|----------|---------|---------|--------|--------|---------|---------|----|-------|---------|
| Rocktec 52 | -        | -  | 140-160 | 140-160 | 140-160 | 130-150  | 120-140  | 100-130  | 60-80   | 60-80   | -      | -      | -       | -       | -  | -     | -       |
| Rocktec 65 | -        | -  | -       | -       | -       | -        | -        | 160-200  | 120-140 | 100-130 | 90-100 | 80-90  | -       | -       | -  | -     | -       |



16609

## Solid carbide end mill

VHM  
TiAlN

HSC

Z4

30°

DIN  
6535  
HB

H

60  
HRC**HHW**

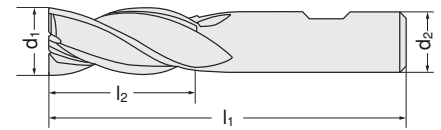
## Design

- Short
- Right cutting
- **4 cutting edges**
- Right-hand twist
- **Centre cutting**
- With clamping surface in accordance with DIN 6535 HB

## Quality

Universal carbide ultra-fine grain (P 20 - K 40)  
TiAlN-coated.

16609



| d <sub>1</sub> e8<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | 16609 | ... |
|-------------------------|----------------------|----------------------|-------------------------|-------|-----|
| 3.0                     | 8                    | 45                   | 6                       |       | 103 |
| 3.5                     | 10                   | 45                   | 6                       |       | 104 |
| 4.0                     | 11                   | 45                   | 6                       |       | 105 |
| 4.5                     | 11                   | 45                   | 6                       |       | 106 |
| 5.0                     | 13                   | 50                   | 6                       |       | 107 |
| 5.5                     | 13                   | 50                   | 6                       |       | 108 |
| 6.0                     | 13                   | 50                   | 6                       |       | 109 |
| 8.0                     | 19                   | 60                   | 8                       |       | 113 |

| d <sub>1</sub> e8<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | 16609 | ... |
|-------------------------|----------------------|----------------------|-------------------------|-------|-----|
| 9.0                     | 19                   | 70                   | 10                      |       | 115 |
| 10.0                    | 22                   | 70                   | 10                      |       | 117 |
| 12.0                    | 26                   | 75                   | 12                      |       | 121 |
| 14.0                    | 26                   | 85                   | 14                      |       | 122 |
| 16.0                    | 32                   | 100                  | 16                      |       | 123 |
| 20.0                    | 38                   | 105                  | 20                      |       | 125 |
| 25.0                    | 45                   | 120                  | 25                      |       | 126 |

| Al<10%Si | Al>10%Si | Cu  | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|----------|----------|-----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| 400      | 300      | 250 | 300     | 250     | 200     | 180      | 160      | 140      | 80     | 60     | 40     | -      | 120     | 100     | 60       | 180   | -       |

16613

## Solid carbide end mill

VHM  
TiAlN

HSC

Z4

30°

DIN  
6535  
HB

H

60  
HRC**HHW**

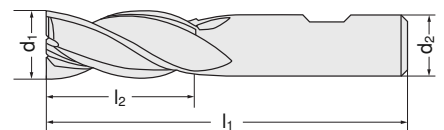
## Design

- Long
- Centre cutting

## Quality

Universal carbide ultra-fine grain (P 20 - K 40)  
TiAlN-coated.

16613



| d <sub>1</sub><br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub><br>mm | 16613 | ... |
|----------------------|----------------------|----------------------|----------------------|-------|-----|
| 3.0                  | 12                   | 50                   | 6                    |       | 201 |
| 4.0                  | 15                   | 50                   | 6                    |       | 202 |
| 5.0                  | 20                   | 60                   | 6                    |       | 203 |
| 6.0                  | 20                   | 60                   | 6                    |       | 204 |
| 8.0                  | 25                   | 70                   | 8                    |       | 205 |

| d <sub>1</sub><br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub><br>mm | 16613 | ... |
|----------------------|----------------------|----------------------|----------------------|-------|-----|
| 10.0                 | 30                   | 90                   | 10                   |       | 206 |
| 12.0                 | 30                   | 90                   | 12                   |       | 207 |
| 16.0                 | 50                   | 110                  | 16                   |       | 208 |
| 20.0                 | 55                   | 110                  | 20                   |       | 209 |
| 25.0                 | 75                   | 140                  | 25                   |       | 210 |

| Al<10%Si | Al>10%Si | Cu | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|----------|----------|----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| -        | -        | -  | 300     | 250     | 200     | 180      | 160      | 140      | 80     | 60     | 40     | -      | -       | -       | -        | -     | -       |

## Solid carbide end mill

16812

Solid carbide end mill

VHM  
RockTec

Z 4

40°

DIN  
6535  
HA



≤ 1600  
N/mm<sup>2</sup>

52  
HRC

16812 101-109

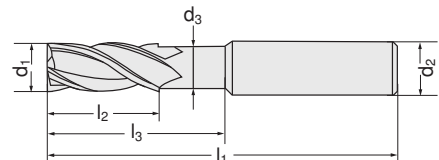


65  
HRC

16812 301-309



| d <sub>1</sub> (e8)<br>mm | l <sub>2</sub><br>mm | l <sub>3</sub><br>mm | l <sub>1</sub><br>mm | d <sub>3</sub><br>mm | d <sub>2</sub> (h6)<br>mm | RockTec 52 |     | RockTec 65 |     |
|---------------------------|----------------------|----------------------|----------------------|----------------------|---------------------------|------------|-----|------------|-----|
|                           |                      |                      |                      |                      |                           | 16812      | ... | 16812      | ... |
| 3.0                       | 5                    | 30                   | 75                   | 2.8                  | 6                         |            | 101 |            | 301 |
| 4.0                       | 8                    | 32                   | 75                   | 3.7                  | 6                         |            | 102 |            | 302 |
| 5.0                       | 9                    | 32                   | 75                   | 4.6                  | 6                         |            | 103 |            | 303 |
| 6.0                       | 10                   | 40                   | 75                   | 5.5                  | 6                         |            | 104 |            | 304 |
| 8.0                       | 12                   | 40                   | 75                   | 7.4                  | 8                         |            | 105 |            | 305 |
| 10.0                      | 14                   | 60                   | 100                  | 9.2                  | 10                        |            | 106 |            | 306 |
| 12.0                      | 16                   | 60                   | 100                  | 11.0                 | 12                        |            | 107 |            | 307 |
| 16.0                      | 22                   | 85                   | 125                  | 15.0                 | 16                        |            | 108 |            | 308 |
| 20.0                      | 26                   | 85                   | 125                  | 19.0                 | 20                        |            | 109 |            | 309 |



| Al <10%Si  | Al >10%Si | Cu | St <520N | St <750N | St <900N | St <1100N | St <1200N | St >1400N | > 45HRC | < 52HRC | < 58HRC | < 65HRC | VA <900N | VA >900N | Ti | GG(G) | Plastic |
|------------|-----------|----|----------|----------|----------|-----------|-----------|-----------|---------|---------|---------|---------|----------|----------|----|-------|---------|
| Rocktec 52 | -         | -  | 120-140  | 120-140  | 120-140  | 110-130   | 100-120   | 80-100    | 50-70   | 50-70   | -       | -       | -        | -        | -  | -     | -       |
| Rocktec 65 | -         | -  | -        | -        | -        | -         | -         | 140-160   | 100-130 | 90-100  | 80-90   | 70-80   | -        | -        | -  | -     | -       |

16619

Solid carbide end mill

VHM  
TiAlN

HSC

Z 6

45°

DIN  
6535  
HB



60  
HRC

16619

HHW

Design

Extra long, right cutting, 6 cutting edges. Right-hand twist, approx. 45°. With clamping surface in accordance with DIN 6535 HB.

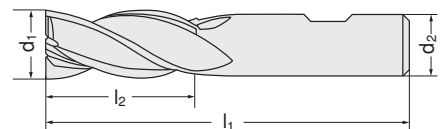
Applications

For circumferential milling as a finishing operation to achieve optimum surface quality (face cut only with low cutting depths).

Quality

Universal carbide ultra-fine grain (P 20 - K 40)

TiAlN-coated.



| d <sub>1</sub> e8<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | 16619 | ... |
|-------------------------|----------------------|----------------------|-------------------------|-------|-----|
| 6.0                     | 26                   | 70                   | 6                       |       | 201 |
| 8.0                     | 36                   | 90                   | 8                       |       | 202 |
| 10.0                    | 46                   | 100                  | 10                      |       | 203 |
| 12.0                    | 56                   | 110                  | 12                      |       | 204 |

| d <sub>1</sub> e8<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | 16619 | ... |
|-------------------------|----------------------|----------------------|-------------------------|-------|-----|
| 16.0                    | 66                   | 130                  | 16                      |       | 205 |
| 20.0                    | 76                   | 140                  | 20                      |       | 206 |
| 25.0                    | 92                   | 180                  | 25                      |       | 207 |

| Al <10%Si | Al >10%Si | Cu | St <520N | St <750N | St <900N | St <1100N | St <1200N | St >1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA <900N | VA >900N | Ti alloy | GG(G) | Plastic |
|-----------|-----------|----|----------|----------|----------|-----------|-----------|-----------|--------|--------|--------|--------|----------|----------|----------|-------|---------|
| -         | -         | -  | 300      | 250      | 200      | 180       | 160       | 140       | 80     | 60     | 40     | -      | -        | -        | -        | -     | -       |

16813

## Solid carbide end mill

VHM  
RockTec

Z 4

40°

DIN  
6535  
HA1600  
N/mm²52  
HRC**ATORN®**

## Design

- Extra long
- With clearance
- Right cutting
- 4 short cutting edges
- Right-hand twist 40°
- With smooth straight shank in accordance with DIN 6535 HA

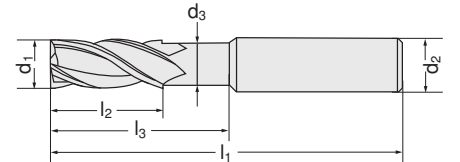
16813 101-109

65  
HRC

16813 301-309



| d <sub>1</sub> (e8)<br>mm | l <sub>2</sub><br>mm | l <sub>3</sub><br>mm | l <sub>1</sub><br>mm | d <sub>3</sub><br>mm | d <sub>2</sub> (h6)<br>mm | RockTec 52 |     | RockTec 65 |     |
|---------------------------|----------------------|----------------------|----------------------|----------------------|---------------------------|------------|-----|------------|-----|
|                           |                      |                      |                      |                      |                           | 16813      | ... | 16813      | ... |
| 3.0                       | 5                    | 60                   | 100                  | 2.8                  | 6                         |            | 101 |            | 301 |
| 4.0                       | 8                    | 60                   | 100                  | 3.7                  | 6                         |            | 102 |            | 302 |
| 5.0                       | 9                    | 60                   | 100                  | 4.6                  | 6                         |            | 103 |            | 303 |
| 6.0                       | 10                   | 60                   | 100                  | 5.5                  | 6                         |            | 104 |            | 304 |
| 8.0                       | 12                   | 60                   | 100                  | 7.4                  | 8                         |            | 105 |            | 305 |
| 10.0                      | 14                   | 85                   | 125                  | 9.2                  | 10                        |            | 106 |            | 306 |
| 12.0                      | 16                   | 110                  | 150                  | 11.0                 | 12                        |            | 107 |            | 307 |
| 16.0                      | 22                   | 110                  | 150                  | 15.0                 | 16                        |            | 108 |            | 308 |
| 20.0                      | 26                   | 110                  | 150                  | 19.0                 | 20                        |            | 109 |            | 309 |



| Al <10%Si  | Al > 10%Si | Cu | St <520N | St <750N | St <900N | St <1100N | St <1200N | St >1400N | > 45HRC | < 52HRC | < 58HRC | < 65HRC | VA <900N | VA >900N | Ti | GG(G) | Plastic |
|------------|------------|----|----------|----------|----------|-----------|-----------|-----------|---------|---------|---------|---------|----------|----------|----|-------|---------|
| Rocktec 52 |            |    |          |          |          |           |           |           |         |         |         |         |          |          |    |       |         |
| -          | -          | -  | 100-120  | 100-120  | 90-110   | 90-110    | 80-100    | 60-80     | 60-80   | 40-60   | -       | -       | -        | -        | -  | -     | -       |
| Rocktec 65 |            |    |          |          |          |           |           |           |         |         |         |         |          |          |    |       |         |
| -          | -          | -  | -        | -        | -        | -         | -         | 120-140   | 80-110  | 70-80   | 60-70   | 50-50   | -        | -        | -  | -     | -       |

16626

## Solid carbide end mill

**ATORN®**

## Design

- With clearance and edge protection chamfer/edge radius
- With centre cutting
- 4 cutting edges
- Right-hand twist 50°

## Applications

Universal application for finishing.

## Quality

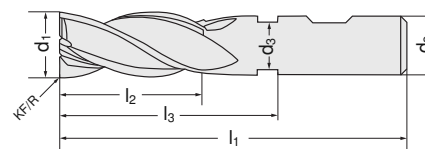
Solid carbide ultra-fine grain/TiAlN ultra-coated.

## Note:

Extra-long design without clearance.



16626



## RockTec 65

| d <sub>1</sub> h9<br>mm | l <sub>2</sub><br>mm | l <sub>3</sub><br>mm | l <sub>1</sub><br>mm | d <sub>3</sub><br>mm | d <sub>2</sub><br>mm | KF<br>mm | R<br>mm | Z | 16626 | ... |
|-------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------|---------|---|-------|-----|
| 4.0                     | 11                   | 18                   | 57                   | 3.9                  | 6                    | 0.1      | -       | 4 |       | 040 |
| 4.0                     | 16                   | -                    | 62                   | -                    | 6                    | 0.1      | -       | 4 |       | 041 |
| 4.0                     | 11                   | 18                   | 57                   | 3.9                  | 6                    | -        | 0.5     | 4 |       | 042 |
| 4.0                     | 16                   | -                    | 62                   | -                    | 6                    | -        | 0.5     | 4 |       | 043 |
| 5.0                     | 13                   | 19                   | 57                   | 4.9                  | 6                    | 0.1      | -       | 4 |       | 050 |
| 5.0                     | 17                   | -                    | 62                   | -                    | 6                    | 0.1      | -       | 4 |       | 051 |
| 5.0                     | 13                   | 19                   | 57                   | 4.9                  | 6                    | -        | 0.5     | 4 |       | 052 |
| 5.0                     | 17                   | -                    | 62                   | -                    | 6                    | -        | 0.5     | 4 |       | 053 |
| 6.0                     | 13                   | 19                   | 57                   | 5.9                  | 6                    | 0.1      | -       | 4 |       | 060 |
| 6.0                     | 18                   | -                    | 62                   | -                    | 6                    | 0.1      | -       | 4 |       | 061 |
| 6.0                     | 13                   | 19                   | 57                   | 5.9                  | 6                    | -        | 0.5     | 4 |       | 062 |
| 6.0                     | 18                   | -                    | 62                   | -                    | 6                    | -        | 0.5     | 4 |       | 063 |
| 8.0                     | 19                   | 25                   | 63                   | 7.7                  | 8                    | 0.1      | -       | 4 |       | 080 |
| 8.0                     | 24                   | -                    | 68                   | -                    | 8                    | 0.1      | -       | 4 |       | 081 |
| 8.0                     | 19                   | 25                   | 63                   | 7.7                  | 8                    | -        | 1.0     | 4 |       | 082 |
| 8.0                     | 24                   | -                    | 68                   | -                    | 8                    | -        | 1.0     | 4 |       | 083 |
| 10.0                    | 22                   | 30                   | 72                   | -                    | 10                   | 0.1      | -       | 4 |       | 100 |
| 10.0                    | 30                   | -                    | 80                   | 9.7                  | 10                   | 0.1      | -       | 4 |       | 101 |
| 10.0                    | 30                   | -                    | 80                   | -                    | 10                   | -        | 1.0     | 4 |       | 102 |
| 12.0                    | 26                   | 36                   | 83                   | 11.7                 | 12                   | 0.1      | -       | 4 |       | 103 |
| 12.0                    | 36                   | -                    | 93                   | -                    | 12                   | 0.1      | -       | 4 |       | 120 |
| 12.0                    | 36                   | -                    | 93                   | -                    | 12                   | -        | 1.5     | 4 |       | 121 |
| 16.0                    | 32                   | 42                   | 92                   | 15.5                 | 16                   | 0.1      | -       | 4 |       | 160 |
| 16.0                    | 48                   | -                    | 108                  | -                    | 16                   | 0.1      | -       | 4 |       | 161 |
| 20.0                    | 38                   | 52                   | 104                  | 19.5                 | 20                   | 0.1      | -       | 4 |       | 200 |
| 20.0                    | 60                   | -                    | 126                  | -                    | 20                   | 0.1      | -       | 4 |       | 201 |
| 20.0                    | 60                   | -                    | 126                  | -                    | 20                   | -        | 2.0     | 4 |       | 202 |

| Al<10%Si | Al>10%Si | Cu | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <50HRC | <55HRC | <60HRC | <65HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|----------|----------|----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| -        | -        | -  | -       | -       | -       | 50-70    | 40-60    | 30-35    | 30-35  | 30-35  | 30-35  | 30-35  | -       | -       | -        | -     | -       |



**ATORN®****Design**

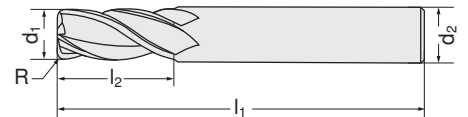
- Short
- Right cutting
- 4 cutting edges
- Right-hand twist 40°
- With smooth straight shank in accordance with DIN 6535 HA



16816 101-128



16816 301-328



| d <sub>1</sub> (e8)<br>mm | R<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> (h6)<br>mm | RockTec 52 |     | RockTec 65 |     |
|---------------------------|---------|----------------------|----------------------|---------------------------|------------|-----|------------|-----|
|                           |         |                      |                      |                           | 16816      | ... | 16816      | ... |
| 3.0                       | 0.3     | 9                    | 50                   | 6                         |            | 101 |            | 301 |
| 3.0                       | 0.5     | 9                    | 50                   | 6                         |            | 102 |            | 302 |
| 4.0                       | 0.3     | 12                   | 50                   | 6                         |            | 103 |            | 303 |
| 4.0                       | 0.5     | 12                   | 50                   | 6                         |            | 104 |            | 304 |
| 4.0                       | 1.0     | 12                   | 50                   | 6                         |            | 105 |            | 305 |
| 5.0                       | 0.3     | 15                   | 50                   | 6                         |            | 127 |            | 327 |
| 5.0                       | 0.5     | 15                   | 50                   | 6                         |            | 106 |            | 306 |
| 5.0                       | 1.0     | 15                   | 50                   | 6                         |            | 107 |            | 307 |
| 6.0                       | 0.3     | 20                   | 60                   | 6                         |            | 108 |            | 308 |
| 6.0                       | 0.5     | 20                   | 60                   | 6                         |            | 109 |            | 309 |
| 6.0                       | 1.0     | 20                   | 60                   | 6                         |            | 110 |            | 310 |
| 8.0                       | 0.5     | 20                   | 64                   | 8                         |            | 111 |            | 311 |
| 8.0                       | 1.0     | 20                   | 64                   | 8                         |            | 112 |            | 312 |
| 8.0                       | 1.5     | 20                   | 64                   | 8                         |            | 113 |            | 313 |
| 8.0                       | 2.0     | 20                   | 64                   | 8                         |            | 126 |            | 326 |
| 10.0                      | 0.5     | 22                   | 75                   | 10                        |            | 114 |            | 314 |
| 10.0                      | 1.0     | 22                   | 75                   | 10                        |            | 128 |            | 328 |
| 10.0                      | 1.5     | 22                   | 75                   | 10                        |            | 115 |            | 315 |
| 10.0                      | 2.0     | 22                   | 75                   | 10                        |            | 116 |            | 316 |
| 12.0                      | 1.0     | 25                   | 75                   | 12                        |            | 117 |            | 317 |
| 12.0                      | 2.0     | 25                   | 75                   | 12                        |            | 118 |            | 318 |
| 12.0                      | 3.0     | 25                   | 75                   | 12                        |            | 119 |            | 319 |
| 16.0                      | 1.0     | 32                   | 90                   | 16                        |            | 120 |            | 320 |
| 16.0                      | 2.0     | 32                   | 90                   | 16                        |            | 121 |            | 321 |
| 16.0                      | 3.0     | 32                   | 90                   | 16                        |            | 122 |            | 322 |
| 20.0                      | 1.0     | 38                   | 100                  | 20                        |            | 123 |            | 323 |
| 20.0                      | 2.0     | 38                   | 100                  | 20                        |            | 124 |            | 324 |
| 20.0                      | 3.0     | 38                   | 100                  | 20                        |            | 125 |            | 325 |

| Al <10%Si         | Al >10%Si | Cu | St <520N | St <750N | St <900N | St <1100N | St <1200N | St >1400N | > 45HRC | < 52HRC | < 58HRC | < 65HRC | VA <900N | VA >900N | Ti | GG(G) | Plastic |
|-------------------|-----------|----|----------|----------|----------|-----------|-----------|-----------|---------|---------|---------|---------|----------|----------|----|-------|---------|
| <b>Rocktec 52</b> |           |    |          |          |          |           |           |           |         |         |         |         |          |          |    |       |         |
| -                 | -         | -  | 140-160  | 140-160  | 130-150  | 130-150   | 120-140   | 100-120   | 80-100  | 60-80   | -       | -       | -        | -        | -  | -     | -       |
| <b>Rocktec 65</b> |           |    |          |          |          |           |           |           |         |         |         |         |          |          |    |       |         |
| -                 | -         | -  | -        | -        | -        | -         | -         | 160-200   | 120-140 | 100-120 | 90-100  | 80-90   | -        | -        | -  | -     | -       |

16817

## Solid carbide torus milling cutters

VHM  
RockTec

Z4

45°

DIN  
6535  
HA

R

R

**ATORN®**

## Design

## - Short

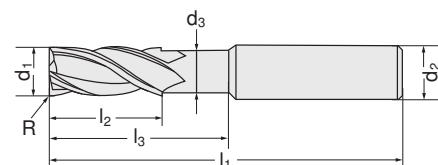
- With clearance
- Right cutting
- 4 short cutting edges
- Right-hand twist 45°
- With smooth straight shank in accordance with DIN 6535 HA

1600  
N/mm²52  
HRC

16817 101-116

65  
HRC

16817 301-316



| d <sub>1</sub> (e8)<br>mm | R<br>mm | l <sub>2</sub><br>mm | l <sub>3</sub><br>mm | l <sub>1</sub><br>mm | d <sub>3</sub><br>mm | d <sub>2</sub> (h6)<br>mm | RockTec 52 |     | RockTec 65 |     |
|---------------------------|---------|----------------------|----------------------|----------------------|----------------------|---------------------------|------------|-----|------------|-----|
|                           |         |                      |                      |                      |                      |                           | 16817      | ... | 16817      | ... |
| 3.0                       | 0.3     | 4                    | 14                   | 60                   | 2.8                  | 6                         |            | 101 |            | 301 |
| 3.0                       | 0.5     | 4                    | 14                   | 60                   | 2.8                  | 6                         |            | 102 |            | 302 |
| 4.0                       | 0.3     | 5                    | 16                   | 60                   | 3.7                  | 6                         |            | 103 |            | 303 |
| 4.0                       | 0.5     | 5                    | 16                   | 60                   | 3.7                  | 6                         |            | 104 |            | 304 |
| 5.0                       | 0.3     | 6                    | 18                   | 60                   | 4.6                  | 6                         |            | 105 |            | 305 |
| 5.0                       | 0.5     | 6                    | 18                   | 60                   | 4.6                  | 6                         |            | 106 |            | 306 |
| 6.0                       | 0.5     | 7                    | 20                   | 60                   | 5.5                  | 6                         |            | 107 |            | 307 |
| 6.0                       | 1.0     | 7                    | 20                   | 60                   | 5.5                  | 6                         |            | 108 |            | 308 |
| 8.0                       | 0.5     | 9                    | 26                   | 64                   | 7.4                  | 8                         |            | 109 |            | 309 |
| 8.0                       | 1.0     | 9                    | 26                   | 64                   | 7.4                  | 8                         |            | 110 |            | 310 |
| 10.0                      | 1.0     | 11                   | 31                   | 70                   | 9.2                  | 10                        |            | 111 |            | 311 |
| 10.0                      | 2.0     | 11                   | 31                   | 70                   | 9.2                  | 10                        |            | 112 |            | 312 |
| 12.0                      | 1.0     | 13                   | 37                   | 75                   | 11.0                 | 12                        |            | 113 |            | 313 |
| 12.0                      | 2.0     | 13                   | 37                   | 75                   | 11.0                 | 12                        |            | 114 |            | 314 |
| 16.0                      | 1.0     | 17                   | 43                   | 90                   | 15.0                 | 16                        |            | 115 |            | 315 |
| 16.0                      | 2.0     | 17                   | 43                   | 90                   | 15.0                 | 16                        |            | 116 |            | 316 |

| Al <10%Si  | Al >10%Si | Cu | St <520N | St <750N | St <900N | St <1100N | St <1200N | St >1400N | > 45HRC | < 52HRC | < 58HRC | < 65HRC | VA <900N | VA >900N | Ti | GG(G) | Plastic |
|------------|-----------|----|----------|----------|----------|-----------|-----------|-----------|---------|---------|---------|---------|----------|----------|----|-------|---------|
| Rocktec 52 | -         | -  | 140-160  | 140-160  | 130-150  | 130-150   | 120-140   | 100-120   | 80-100  | 60-80   | -       | -       | -        | -        | -  | -     | -       |
| Rocktec 65 | -         | -  | -        | -        | -        | -         | -         | 160-200   | 120-140 | 100-120 | 90-100  | 80-90   | -        | -        | -  | -     | -       |

16637

## Solid carbide torus milling cutters

VHM  
TiAlN

HSC

Z4

DIN  
6535  
HB

R

R

65  
HRC**HHW**

## Design

## - Long

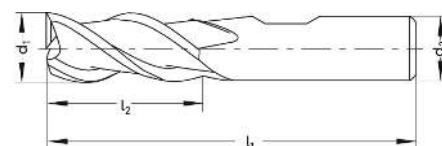
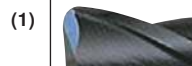
- With clamping surface in accordance with DIN 6535 HB
- Right cutting
- 4 cutting edges
- With corner radius (1)

## Quality

Universal carbide ultra-fine grain (P 20 - K 40)

TiAlN-coated.

16637



| d <sub>1</sub> e8<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub><br>mm | 16637 | ... |
|-------------------------|----------------------|----------------------|----------------------|-------|-----|
| 6 x R 0.5               | 20                   | 60                   | 6                    |       | 101 |
| 6 x R 1                 | 20                   | 60                   | 6                    |       | 102 |
| 8 x R 0.5               | 25                   | 70                   | 8                    |       | 103 |
| 8 x R 1                 | 25                   | 70                   | 8                    |       | 104 |
| 8 x R 2                 | 25                   | 70                   | 8                    |       | 106 |
| 10 x R 0.5              | 30                   | 90                   | 10                   |       | 107 |

| d <sub>1</sub> e8<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub><br>mm | 16637 | ... |
|-------------------------|----------------------|----------------------|----------------------|-------|-----|
| 10 x R 1                | 30                   | 90                   | 10                   |       | 108 |
| 10 x R 2                | 30                   | 90                   | 10                   |       | 110 |
| 12 x R 0.5              | 30                   | 90                   | 12                   |       | 111 |
| 12 x R 1                | 30                   | 90                   | 12                   |       | 112 |
| 12 x R 2                | 30                   | 90                   | 12                   |       | 114 |

| Al <10%Si | Al >10%Si | Cu  | St <520N | St <750N | St <900N | St <1100N | St <1200N | St <1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA <900N | VA >900N | Ti alloy | GG(G) | Plastic |
|-----------|-----------|-----|----------|----------|----------|-----------|-----------|-----------|--------|--------|--------|--------|----------|----------|----------|-------|---------|
| 400       | 300       | 250 | 300      | 250      | 200      | 180       | 160       | 140       | 80     | 60     | 40     | -      | 120      | 100      | 60       | 180   | -       |



16818

## Solid carbide torus milling cutters

VHM  
RockTec

Z4

40°

DIN  
6535  
HA

R

**ATORN®**

## Design

- Long
- With clearance
- Right cutting
- 4 short cutting edges
- Right-hand twist 40°
- With smooth straight shank in accordance with DIN 6535 HA

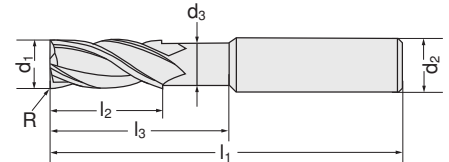


16818 101-116



16818 301-316

| d <sub>1</sub> (e8)<br>mm | R<br>mm | l <sub>2</sub><br>mm | l <sub>3</sub><br>mm | l <sub>1</sub><br>mm | d <sub>3</sub><br>mm | d <sub>2</sub> (h6)<br>mm | RockTec 52 |     | RockTec 65 |     |
|---------------------------|---------|----------------------|----------------------|----------------------|----------------------|---------------------------|------------|-----|------------|-----|
|                           |         |                      |                      |                      |                      |                           | 16818      | ... | 16818      | ... |
| 3.0                       | 0.3     | 5                    | 30                   | 75                   | 2.8                  | 6                         |            | 101 |            | 301 |
| 3.0                       | 0.5     | 5                    | 30                   | 75                   | 2.8                  | 6                         |            | 102 |            | 302 |
| 4.0                       | 0.3     | 8                    | 32                   | 75                   | 3.7                  | 6                         |            | 103 |            | 303 |
| 4.0                       | 0.5     | 8                    | 32                   | 75                   | 3.7                  | 6                         |            | 104 |            | 304 |
| 5.0                       | 0.3     | 9                    | 32                   | 75                   | 4.6                  | 6                         |            | 105 |            | 305 |
| 5.0                       | 0.5     | 9                    | 32                   | 75                   | 4.6                  | 6                         |            | 106 |            | 306 |
| 6.0                       | 0.5     | 10                   | 40                   | 75                   | 5.5                  | 6                         |            | 107 |            | 307 |
| 6.0                       | 1.0     | 10                   | 40                   | 75                   | 5.5                  | 6                         |            | 108 |            | 308 |
| 8.0                       | 0.5     | 12                   | 40                   | 75                   | 7.4                  | 8                         |            | 109 |            | 309 |
| 8.0                       | 1.0     | 12                   | 40                   | 75                   | 7.4                  | 8                         |            | 110 |            | 310 |
| 10.0                      | 1.0     | 14                   | 60                   | 100                  | 9.2                  | 10                        |            | 111 |            | 311 |
| 10.0                      | 2.0     | 14                   | 60                   | 100                  | 9.2                  | 10                        |            | 112 |            | 312 |
| 12.0                      | 1.0     | 16                   | 60                   | 100                  | 11.0                 | 12                        |            | 113 |            | 313 |
| 12.0                      | 2.0     | 16                   | 60                   | 100                  | 11.0                 | 12                        |            | 114 |            | 314 |
| 16.0                      | 1.0     | 22                   | 85                   | 125                  | 15.0                 | 16                        |            | 115 |            | 315 |
| 16.0                      | 2.0     | 22                   | 85                   | 125                  | 15.0                 | 16                        |            | 116 |            | 316 |



| Al <10%Si  | Al >10%Si | Cu | St <520N | St <750N | St <900N | St <1100N | St <1200N | St >1400N | >45HRC  | <52HRC | <58HRC | <65HRC | VA <900N | VA >900N | Ti | GG(G) | Plastic |
|------------|-----------|----|----------|----------|----------|-----------|-----------|-----------|---------|--------|--------|--------|----------|----------|----|-------|---------|
| Rocktec 52 |           |    |          |          |          |           |           |           |         |        |        |        |          |          |    |       |         |
| -          | -         | -  | 120-140  | 120-140  | 110-130  | 110-130   | 100-120   | 80-100    | 70-90   | 50-70  | -      | -      | -        | -        | -  | -     | -       |
| Rocktec 65 |           |    |          |          |          |           |           |           |         |        |        |        |          |          |    |       |         |
| -          | -         | -  | -        | -        | -        | -         | -         | 140-160   | 100-130 | 90-100 | 80-90  | 70-80  | -        | -        | -  | -     | -       |

16819

## Solid carbide torus milling cutters

VHM  
RockTec

Z4

40°

DIN  
6535  
HA

R

**ATORN®**

## Design

- Extra long
- With clearance
- Right cutting
- 4 short cutting edges
- Right-hand twist 40°
- With smooth straight shank in accordance with DIN 6535 HA

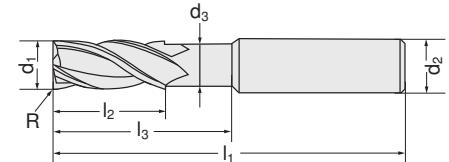


16819 101-116



16819 301-316

| d <sub>1</sub> (e8)<br>mm | R<br>mm | l <sub>2</sub><br>mm | l <sub>3</sub><br>mm | l <sub>1</sub><br>mm | d <sub>3</sub><br>mm | d <sub>2</sub> (h6)<br>mm | RockTec 52 |     | RockTec 65 |     |
|---------------------------|---------|----------------------|----------------------|----------------------|----------------------|---------------------------|------------|-----|------------|-----|
|                           |         |                      |                      |                      |                      |                           | 16819      | ... | 16819      | ... |
| 3.0                       | 0.3     | 5                    | 60                   | 100                  | 2.8                  | 6                         |            | 101 |            | 301 |
| 3.0                       | 0.5     | 5                    | 60                   | 100                  | 2.8                  | 6                         |            | 102 |            | 302 |
| 4.0                       | 0.3     | 8                    | 60                   | 100                  | 3.7                  | 6                         |            | 103 |            | 303 |
| 4.0                       | 0.5     | 8                    | 60                   | 100                  | 3.7                  | 6                         |            | 104 |            | 304 |
| 5.0                       | 0.3     | 9                    | 60                   | 100                  | 4.6                  | 6                         |            | 105 |            | 305 |
| 5.0                       | 0.5     | 9                    | 60                   | 100                  | 4.6                  | 6                         |            | 106 |            | 306 |
| 6.0                       | 0.5     | 10                   | 60                   | 100                  | 5.5                  | 6                         |            | 107 |            | 307 |
| 6.0                       | 1.0     | 10                   | 60                   | 100                  | 5.5                  | 6                         |            | 108 |            | 308 |
| 8.0                       | 0.5     | 12                   | 60                   | 100                  | 7.4                  | 8                         |            | 109 |            | 309 |
| 8.0                       | 1.0     | 12                   | 60                   | 100                  | 7.4                  | 8                         |            | 110 |            | 310 |
| 10.0                      | 1.0     | 14                   | 85                   | 125                  | 9.2                  | 10                        |            | 111 |            | 311 |
| 10.0                      | 2.0     | 14                   | 85                   | 125                  | 9.2                  | 10                        |            | 112 |            | 312 |
| 12.0                      | 1.0     | 16                   | 110                  | 150                  | 11.0                 | 12                        |            | 113 |            | 313 |
| 12.0                      | 2.0     | 16                   | 110                  | 150                  | 11.0                 | 12                        |            | 114 |            | 314 |
| 16.0                      | 1.0     | 22                   | 110                  | 150                  | 15.0                 | 16                        |            | 115 |            | 315 |
| 16.0                      | 2.0     | 22                   | 110                  | 150                  | 15.0                 | 16                        |            | 116 |            | 316 |



| Al <10%Si  | Al >10%Si | Cu | St <520N | St <750N | St <900N | St <1100N | St <1200N | St >1400N | >45HRC | <52HRC | <58HRC | <65HRC | VA <900N | VA >900N | Ti | GG(G) | Plastic |
|------------|-----------|----|----------|----------|----------|-----------|-----------|-----------|--------|--------|--------|--------|----------|----------|----|-------|---------|
| Rocktec 52 |           |    |          |          |          |           |           |           |        |        |        |        |          |          |    |       |         |
| -          | -         | -  | 100-120  | 100-120  | 90-110   | 90-110    | 80-100    | 70-80     | 60-70  | 40-60  | -      | -      | -        | -        | -  | -     | -       |
| Rocktec 65 |           |    |          |          |          |           |           |           |        |        |        |        |          |          |    |       |         |
| -          | -         | -  | -        | -        | -        | -         | -         | 120-140   | 80-110 | 70-80  | 60-70  | 50-60  | -        | -        | -  | -     | -       |

16824

## Solid carbide multi-tooth mills

VHM  
RockTec

Z 6-8

DIN  
6535  
HA**ATORN®**

## Design

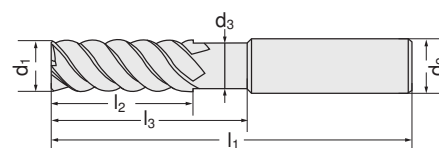
- Short
- With clearance
- Right cutting
- 6-8 cutting edges
- Right-hand twist 50°
- With smooth straight shank in accordance with DIN 6535 HA



16824 101-109



16824 301-309



| d <sub>1</sub> (e8)<br>mm | l <sub>2</sub><br>mm | l <sub>3</sub><br>mm | l <sub>1</sub><br>mm | d <sub>3</sub><br>mm | d <sub>2</sub> (h6)<br>mm | Z | RockTec 52 |     | RockTec 65 |     |
|---------------------------|----------------------|----------------------|----------------------|----------------------|---------------------------|---|------------|-----|------------|-----|
|                           |                      |                      |                      |                      |                           |   | 16824      | ... | 16824      | ... |
| 3.0                       | 8                    | 20                   | 50                   | 2.8                  | 6                         | 6 |            | 101 |            | 301 |
| 4.0                       | 11                   | 20                   | 50                   | 3.7                  | 6                         | 6 |            | 102 |            | 302 |
| 5.0                       | 13                   | 20                   | 50                   | 4.6                  | 6                         | 6 |            | 103 |            | 303 |
| 6.0                       | 15                   | 20                   | 50                   | 5.5                  | 6                         | 6 |            | 104 |            | 304 |
| 8.0                       | 20                   | 30                   | 64                   | 7.4                  | 8                         | 6 |            | 105 |            | 305 |
| 10.0                      | 22                   | 32                   | 70                   | 9.2                  | 10                        | 6 |            | 106 |            | 306 |
| 12.0                      | 25                   | 37                   | 75                   | 11.0                 | 12                        | 6 |            | 107 |            | 307 |
| 16.0                      | 30                   | 46                   | 90                   | 15.0                 | 16                        | 8 |            | 108 |            | 308 |
| 20.0                      | 38                   | 58                   | 100                  | 19.0                 | 20                        | 8 |            | 109 |            | 309 |

| Al <10%Si  | Al >10%Si | Cu | St <520N | St <750N | St <900N | St <1100N | St <1200N | St >1400N | >45HRC  | <52HRC  | <58HRC | <65HRC | VA <900N | VA >900N | Ti | GG(G) | Plastic |
|------------|-----------|----|----------|----------|----------|-----------|-----------|-----------|---------|---------|--------|--------|----------|----------|----|-------|---------|
| Rocktec 52 |           |    |          |          |          |           |           |           |         |         |        |        |          |          |    |       |         |
| -          | -         | -  | 140-160  | 140-160  | 130-150  | 130-150   | 120-140   | 100-120   | 80-100  | 60-80   | -      | -      | -        | -        | -  | -     | -       |
| Rocktec 65 |           |    |          |          |          |           |           |           |         |         |        |        |          |          |    |       |         |
| -          | -         | -  | -        | -        | -        | -         | -         | 160-200   | 120-140 | 100-120 | 80-100 | 80-90  | -        | -        | -  | -     | -       |

16825

## Solid carbide multi-tooth mills

VHM  
RockTec

Z 6-8

DIN  
6535  
HA**ATORN®**

## Design

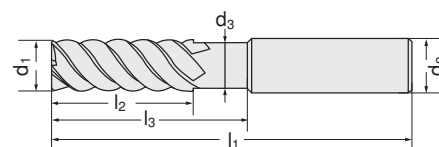
- Long
- With clearance
- Right cutting
- 6-8 cutting edges
- Right-hand twist 50°
- With smooth straight shank in accordance with DIN 6535 HA



16825 101-109



16825 301-309



| d <sub>1</sub> (e8)<br>mm | l <sub>2</sub><br>mm | l <sub>3</sub><br>mm | l <sub>1</sub><br>mm | d <sub>3</sub><br>mm | d <sub>2</sub> (h6)<br>mm | Z | RockTec 52 |     | RockTec 65 |     |
|---------------------------|----------------------|----------------------|----------------------|----------------------|---------------------------|---|------------|-----|------------|-----|
|                           |                      |                      |                      |                      |                           |   | 16825      | ... | 16825      | ... |
| 3.0                       | 19                   | 30                   | 75                   | 2.8                  | 6                         | 6 |            | 101 |            | 301 |
| 4.0                       | 19                   | 32                   | 75                   | 3.7                  | 6                         | 6 |            | 102 |            | 302 |
| 5.0                       | 19                   | 32                   | 75                   | 4.6                  | 6                         | 6 |            | 103 |            | 303 |
| 6.0                       | 31                   | 40                   | 75                   | 5.5                  | 6                         | 6 |            | 104 |            | 304 |
| 8.0                       | 31                   | 40                   | 75                   | 7.4                  | 8                         | 6 |            | 105 |            | 305 |
| 10.0                      | 45                   | 60                   | 100                  | 9.2                  | 10                        | 6 |            | 106 |            | 306 |
| 12.0                      | 50                   | 60                   | 100                  | 11.0                 | 12                        | 6 |            | 107 |            | 307 |
| 16.0                      | 57                   | 85                   | 125                  | 15.0                 | 16                        | 8 |            | 108 |            | 308 |
| 20.0                      | 57                   | 85                   | 125                  | 19.0                 | 20                        | 8 |            | 109 |            | 309 |

| Al <10%Si  | Al >10%Si | Cu | St <520N | St <750N | St <900N | St <1100N | St <1200N | St >1400N | >45HRC  | <52HRC | <58HRC | <65HRC | VA <900N | VA >900N | Ti | GG(G) | Plastic |
|------------|-----------|----|----------|----------|----------|-----------|-----------|-----------|---------|--------|--------|--------|----------|----------|----|-------|---------|
| Rocktec 52 |           |    |          |          |          |           |           |           |         |        |        |        |          |          |    |       |         |
| -          | -         | -  | 120-140  | 120-140  | 110-130  | 110-130   | 100-120   | 80-100    | 70-80   | 50-70  | -      | -      | -        | -        | -  | -     | -       |
| Rocktec 65 |           |    |          |          |          |           |           |           |         |        |        |        |          |          |    |       |         |
| -          | -         | -  | -        | -        | -        | -         | -         | 140-160   | 100-130 | 90-100 | 80-90  | 70-80  | -        | -        | -  | -     | -       |

16827

## Solid carbide radius cutter

VHM  
RockTec

Z2

DIN  
6535  
HA**ATORN®**

## Design

## - Short

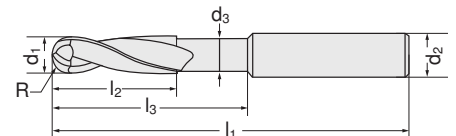
- With clearance
- Right cutting
- 2 cutting edges
- Right-hand twist 30°
- With smooth straight shank in accordance with DIN 6535 HA



16827 101-111



16827 301-311



| d <sub>1</sub><br>mm | R<br>mm | l <sub>2</sub><br>mm | l <sub>3</sub><br>mm | l <sub>1</sub><br>mm | d <sub>3</sub><br>mm | d <sub>2</sub> (h6)<br>mm | RockTec 52 |     | RockTec 65 |     |
|----------------------|---------|----------------------|----------------------|----------------------|----------------------|---------------------------|------------|-----|------------|-----|
|                      |         |                      |                      |                      |                      |                           | 16827      | ... | 16827      | ... |
| 2.0                  | 1.00    | 4                    | 8                    | 40                   | 1.95                 | 4                         |            | 101 |            | 301 |
| 2.5                  | 1.25    | 4                    | 10                   | 40                   | 2.4                  | 4                         |            | 102 |            | 302 |
| 3.0                  | 1.50    | 5                    | 14                   | 50                   | 2.8                  | 4                         |            | 103 |            | 303 |
| 4.0                  | 2.00    | 8                    | 20                   | 50                   | 3.7                  | 4                         |            | 104 |            | 304 |
| 5.0                  | 2.50    | 9                    | 20                   | 50                   | 4.6                  | 6                         |            | 105 |            | 305 |
| 6.0                  | 3.00    | 10                   | 20                   | 50                   | 5.5                  | 6                         |            | 106 |            | 306 |
| 8.0                  | 4.00    | 12                   | 30                   | 64                   | 7.4                  | 8                         |            | 107 |            | 307 |
| 10.0                 | 5.00    | 14                   | 32                   | 70                   | 9.2                  | 10                        |            | 108 |            | 308 |
| 12.0                 | 6.00    | 16                   | 38                   | 75                   | 11.0                 | 12                        |            | 109 |            | 309 |
| 16.0                 | 8.00    | 32                   | 46                   | 90                   | 15.0                 | 16                        |            | 110 |            | 310 |
| 20.0                 | 10.00   | 38                   | 58                   | 100                  | 19.0                 | 20                        |            | 111 |            | 311 |

| Al <10%Si  | Al >10%Si | Cu | St <520N | St <750N | St <900N | St <1100N | St <1200N | St >1400N | >45HRC  | <52HRC  | <58HRC | <65HRC | VA <900N | VA >900N | Ti | GG(G) | Plastic |
|------------|-----------|----|----------|----------|----------|-----------|-----------|-----------|---------|---------|--------|--------|----------|----------|----|-------|---------|
| Rocktec 52 |           |    |          |          |          |           |           |           |         |         |        |        |          |          |    |       |         |
| -          | -         | -  | 180-370  | 180-370  | 180-350  | 180-350   | 150-300   | 140-270   | 130-260 | 120-240 | -      | -      | -        | -        | -  | -     | -       |
| Rocktec 65 |           |    |          |          |          |           |           |           |         |         |        |        |          |          |    |       |         |
| -          | -         | -  | -        | -        | -        | -         | -         | 180-370   | 100-220 | 80-150  | 60-80  | 50-70  | -        | -        | -  | -     | -       |

16828

## Solid carbide radius cutter

VHM  
RockTec

Z2

DIN  
6535  
HA**ATORN®**

## Design

## - Long

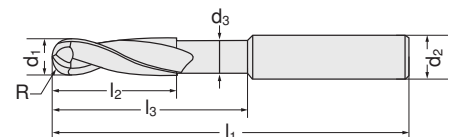
- With clearance
- Right cutting
- 2 cutting edges
- Right-hand twist 30°
- With smooth straight shank in accordance with DIN 6535 HA



16828 101-111



16828 301-311



| d <sub>1</sub> (e8)<br>mm | R<br>mm | l <sub>2</sub><br>mm | l <sub>3</sub><br>mm | l <sub>1</sub><br>mm | d <sub>3</sub><br>mm | d <sub>2</sub> (h6)<br>mm | RockTec 52 |     | RockTec 65 |     |
|---------------------------|---------|----------------------|----------------------|----------------------|----------------------|---------------------------|------------|-----|------------|-----|
|                           |         |                      |                      |                      |                      |                           | 16828      | ... | 16828      | ... |
| 2.0                       | 1.00    | 4                    | 14                   | 75                   | 1.95                 | 6                         |            | 101 |            | 301 |
| 2.5                       | 1.25    | 4                    | 18                   | 75                   | 2.4                  | 6                         |            | 102 |            | 302 |
| 3.0                       | 1.50    | 5                    | 21                   | 75                   | 2.8                  | 6                         |            | 103 |            | 303 |
| 4.0                       | 2.00    | 8                    | 28                   | 75                   | 3.7                  | 6                         |            | 104 |            | 304 |
| 5.0                       | 2.50    | 9                    | 32                   | 75                   | 4.6                  | 6                         |            | 105 |            | 305 |
| 6.0                       | 3.00    | 10                   | 40                   | 75                   | 5.5                  | 6                         |            | 106 |            | 306 |
| 8.0                       | 4.00    | 12                   | 40                   | 75                   | 7.4                  | 8                         |            | 107 |            | 307 |
| 10.0                      | 5.00    | 14                   | 60                   | 100                  | 9.2                  | 10                        |            | 108 |            | 308 |
| 12.0                      | 6.00    | 16                   | 60                   | 100                  | 11.0                 | 12                        |            | 109 |            | 309 |
| 16.0                      | 8.00    | 32                   | 80                   | 125                  | 15.0                 | 16                        |            | 110 |            | 310 |
| 20.0                      | 10.00   | 38                   | 80                   | 125                  | 19.0                 | 20                        |            | 111 |            | 311 |

| Al <10%Si  | Al >10%Si | Cu | St <520N | St <750N | St <900N | St <1100N | St <1200N | St >1400N | >45HRC  | <52HRC  | <58HRC | <65HRC | VA <900N | VA >900N | Ti | GG(G) | Plastic |
|------------|-----------|----|----------|----------|----------|-----------|-----------|-----------|---------|---------|--------|--------|----------|----------|----|-------|---------|
| Rocktec 52 |           |    |          |          |          |           |           |           |         |         |        |        |          |          |    |       |         |
| -          | -         | -  | 160-320  | 160-320  | 160-300  | 160-300   | 160-300   | 130-250   | 120-180 | 110-200 | -      | -      | -        | -        | -  | -     | -       |
| Rocktec 65 |           |    |          |          |          |           |           |           |         |         |        |        |          |          |    |       |         |
| -          | -         | -  | -        | -        | -        | -         | -         | 130-320   | 100-150 | 80-100  | 50-65  | 40-55  | -        | -        | -  | -     | -       |

16829

## Solid carbide radius cutter

VHM  
RockTec

Z 2

DIN  
6535  
HA**ATORN®**

## Design

- Extra long
- With clearance
- Right cutting
- 2 cutting edges
- Right-hand twist 30°
- With smooth straight shank in accordance with DIN 6535 HA



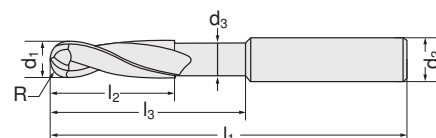
16829 101-111



16829 301-311



| d <sub>1</sub> (e8)<br>mm | R<br>mm | l <sub>2</sub><br>mm | l <sub>3</sub><br>mm | l <sub>1</sub><br>mm | d <sub>3</sub><br>mm | d <sub>2</sub> (h6)<br>mm | RockTec 52 |     | RockTec 65 |     |
|---------------------------|---------|----------------------|----------------------|----------------------|----------------------|---------------------------|------------|-----|------------|-----|
|                           |         |                      |                      |                      |                      |                           | 16829      | ... | 16829      | ... |
| 2.0                       | 1.00    | 4                    | 20                   | 100                  | 1.95                 | 6                         |            | 101 |            | 301 |
| 2.5                       | 1.25    | 4                    | 25                   | 100                  | 2.4                  | 6                         |            | 102 |            | 302 |
| 3.0                       | 1.50    | 5                    | 30                   | 100                  | 2.8                  | 6                         |            | 103 |            | 303 |
| 4.0                       | 2.00    | 8                    | 40                   | 100                  | 3.7                  | 6                         |            | 104 |            | 304 |
| 5.0                       | 2.50    | 9                    | 50                   | 100                  | 4.6                  | 6                         |            | 105 |            | 305 |
| 6.0                       | 3.00    | 10                   | 60                   | 150                  | 5.5                  | 6                         |            | 106 |            | 306 |
| 8.0                       | 4.00    | 12                   | 80                   | 150                  | 7.4                  | 8                         |            | 107 |            | 307 |
| 10.0                      | 5.00    | 14                   | 100                  | 150                  | 9.2                  | 10                        |            | 108 |            | 308 |
| 12.0                      | 6.00    | 16                   | 110                  | 150                  | 11.0                 | 12                        |            | 109 |            | 309 |
| 16.0                      | 8.00    | 32                   | 150                  | 200                  | 15.0                 | 16                        |            | 110 |            | 310 |
| 20.0                      | 10.00   | 38                   | 150                  | 200                  | 19.0                 | 20                        |            | 111 |            | 311 |



| Al <10%Si  | Al >10%Si | Cu | St <520N | St <750N | St <900N | St <1100N | St <1200N | St >1400N | >45HRC | <52HRC | <58HRC | <65HRC | VA <900N | VA >900N | Ti | GG(G) | Plastic |
|------------|-----------|----|----------|----------|----------|-----------|-----------|-----------|--------|--------|--------|--------|----------|----------|----|-------|---------|
| Rocktec 52 |           |    |          |          |          |           |           |           |        |        |        |        |          |          |    |       |         |
| -          | -         | -  | 90-190   | 90-190   | 90-190   | 90-190    | 90-190    | 100-130   | 80-150 | 60-130 | -      | -      | -        | -        | -  | -     | -       |
| Rocktec 65 |           |    |          |          |          |           |           |           |        |        |        |        |          |          |    |       |         |
| -          | -         | -  | -        | -        | -        | -         | -         | 90-190    | 60-130 | 40-45  | 30-40  | 25-35  | -        | -        | -  | -     | -       |

16621

## Solid carbide radius cutter

VHM  
TiAlN

HSC

Z 2

DIN  
6535  
HB

60 HRC

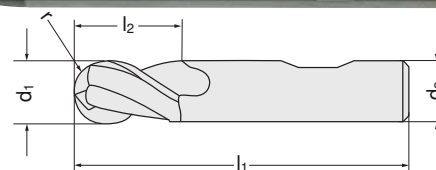
**HHW**

## Design

- Long
- Right cutting
- 2 cutting edges
- Right-hand twist
- Centre cutting
- Radius tolerance +/- 0.02 mm
- With clamping surface in accordance with DIN 6535 HB

Quality  
Universal carbide ultra-fine grain  
(P 20 - K 40)  
TiAlN-coated.

16621



| d <sub>1</sub> e8<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | 16621 | ... |
|-------------------------|----------------------|----------------------|-------------------------|-------|-----|
| 2.0                     | 5                    | 50                   | 6                       | 203   |     |
| 3.0                     | 8                    | 60                   | 6                       | 204   |     |
| 4.0                     | 8                    | 70                   | 6                       | 205   |     |
| 5.0                     | 10                   | 80                   | 6                       | 206   |     |
| 6.0                     | 12                   | 90                   | 6                       | 207   |     |

| d <sub>1</sub> e8<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | 16621 | ... |
|-------------------------|----------------------|----------------------|-------------------------|-------|-----|
| 8.0                     | 14                   | 100                  | 8                       | 209   |     |
| 10.0                    | 18                   | 100                  | 10                      | 211   |     |
| 12.0                    | 22                   | 110                  | 12                      | 212   |     |
| 16.0                    | 30                   | 140                  | 16                      | 214   |     |
| 20.0                    | 38                   | 160                  | 20                      | 216   |     |

| Al <10%Si | Al >10%Si | Cu | St <520N | St <750N | St <900N | St <1100N | St <1200N | St <1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA <900N | VA >900N | Ti alloy | GG(G) | Plastic |
|-----------|-----------|----|----------|----------|----------|-----------|-----------|-----------|--------|--------|--------|--------|----------|----------|----------|-------|---------|
| -         | -         | -  | 300      | 250      | 200      | 180       | 160       | 140       | 80     | 60     | 40     | -      | 120      | 100      | 60       | 180   | -       |



16625

## Solid carbide radius cutter

VHM  
TiAlN

HSC

Z4

DIN  
6535  
HB60  
HRC

HHW

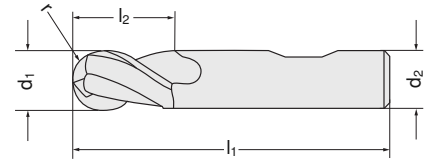
## Design

- Long
- Right cutting
- 4 cutting edges
- Right-hand twist
- Centre cutting
- Radius tolerance  $\pm 0.02$  mm
- With clamping surface in accordance with DIN 6535 HB

## Quality

Universal carbide ultra-fine grain  
(P 20 - K 40)  
TiAlN-coated.

16625



| d1 e8<br>mm | l2<br>mm | l1<br>mm | d2<br>mm | 16625 | ... |
|-------------|----------|----------|----------|-------|-----|
| 2.0         | 5        | 50       | 6        |       | 103 |
| 3.0         | 8        | 60       | 6        |       | 104 |
| 4.0         | 8        | 70       | 6        |       | 105 |
| 5.0         | 10       | 80       | 6        |       | 106 |
| 6.0         | 12       | 90       | 6        |       | 107 |
| 8.0         | 14       | 100      | 8        |       | 109 |

| d1 e8<br>mm | l2<br>mm | l1<br>mm | d2<br>mm | 16625 | ... |
|-------------|----------|----------|----------|-------|-----|
| 10.0        | 18       | 100      | 10       |       | 111 |
| 12.0        | 22       | 110      | 12       |       | 112 |
| 14.0        | 26       | 110      | 14       |       | 113 |
| 16.0        | 30       | 140      | 16       |       | 114 |
| 18.0        | 34       | 140      | 18       |       | 115 |
| 20.0        | 38       | 160      | 20       |       | 116 |

| Al<10%Si | Al>10%Si | Cu | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|----------|----------|----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| -        | -        | -  | 300     | 250     | 200     | 180      | 160      | 140      | 80     | 60     | 40     | -      | -       | -       | -        | -     | -       |

16655

## Solid carbide ball milling cutter

VHM  
TiAlN

Z2

DIN  
6535  
HA

H

65  
HRC

HHW

## Design

- Extra long
- 2 cutting edges
- Centre cutting
- Ball up to 220°
- Increased concentricity
- With smooth straight shank in accordance with DIN 6535 HA

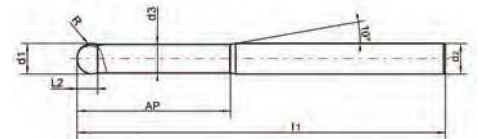
## Applications

For hard machining for 3D copy milling of high-strength materials as well as for milling of hardened steels up to HRC 65.

## Quality

Universal carbide ultra-fine grain  
(P 20 - K 40)  
TiAlN-coated.

16655



| d1<br>mm | d2<br>mm | d3<br>mm | AP<br>mm | l1<br>mm | 16655 | ... |
|----------|----------|----------|----------|----------|-------|-----|
| 3.0      | 6        | 2.8      | 15       | 80       |       | 103 |
| 4.0      | 6        | 3.8      | 20       | 80       |       | 104 |
| 5.0      | 6        | 4.7      | 25       | 90       |       | 105 |
| 6.0      | 6        | 5.7      | 30       | 100      |       | 106 |

| d1<br>mm | d2<br>mm | d3<br>mm | AP<br>mm | l1<br>mm | 16655 | ... |
|----------|----------|----------|----------|----------|-------|-----|
| 8.0      | 8        | 7.5      | 40       | 100      |       | 107 |
| 10.0     | 10       | 9.4      | 50       | 120      |       | 108 |
| 12.0     | 12       | 11.2     | 50       | 120      |       | 109 |

| Al<10%Si | Al>10%Si | Cu | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|----------|----------|----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| -        | -        | -  | 140-160 | 120-140 | 100-120 | 70-80    | 60-70    | 70       | 65     | 50     | 30     | 30     | -       | -       | -        | -     | -       |

# Solid carbide radius cutters | Solid carbide high-feed milling cutters | Trochoidal milling cutters

16830

## Solid carbide radius cutter

VHM  
RockTec

Z4



DIN  
6535  
HA



< 1600  
N/mm²

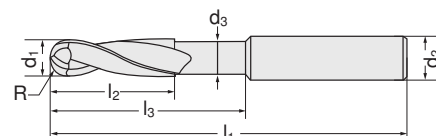
52  
HRC

16830 103-111



65  
HRC

16830 303-311



| d <sub>1</sub> (e8)<br>mm | R<br>mm | l <sub>2</sub><br>mm | l <sub>3</sub><br>mm | l <sub>1</sub><br>mm | d <sub>3</sub><br>mm | d <sub>2</sub> (h6)<br>mm | RockTec 52 |     | RockTec 65 |     |
|---------------------------|---------|----------------------|----------------------|----------------------|----------------------|---------------------------|------------|-----|------------|-----|
|                           |         |                      |                      |                      |                      |                           | 16830      | ... | 16830      | ... |
| 3.0                       | 1.50    | 5                    | 14                   | 50                   | 2.8                  | 6                         |            | 103 |            | 303 |
| 4.0                       | 2.00    | 8                    | 20                   | 50                   | 3.7                  | 6                         |            | 104 |            | 304 |
| 5.0                       | 2.50    | 9                    | 20                   | 50                   | 4.6                  | 6                         |            | 105 |            | 305 |
| 6.0                       | 3.00    | 10                   | 20                   | 50                   | 5.5                  | 6                         |            | 106 |            | 306 |
| 8.0                       | 4.00    | 12                   | 30                   | 64                   | 7.4                  | 8                         |            | 107 |            | 307 |
| 10.0                      | 5.00    | 14                   | 32                   | 70                   | 9.2                  | 10                        |            | 108 |            | 308 |
| 12.0                      | 6.00    | 16                   | 38                   | 75                   | 11.0                 | 12                        |            | 109 |            | 309 |
| 16.0                      | 8.00    | 32                   | 46                   | 90                   | 15.0                 | 16                        |            | 110 |            | 310 |
| 20.0                      | 10.00   | 38                   | 58                   | 100                  | 19.0                 | 20                        |            | 111 |            | 311 |

| Al <10%Si  | Al >10%Si | Cu | St <520N | St <750N | St <900N | St <1100N | St <1200N | St >1400N | >45HRC  | <52HRC  | <58HRC | <65HRC | VA <900N | VA >900N | Ti | GG(G) | Plastic |
|------------|-----------|----|----------|----------|----------|-----------|-----------|-----------|---------|---------|--------|--------|----------|----------|----|-------|---------|
| Rocktec 52 |           |    |          |          |          |           |           |           |         |         |        |        |          |          |    |       |         |
| -          | -         | -  | 160-320  | 160-320  | 160-300  | 160-300   | 160-300   | 140-220   | 130-180 | 110-200 | -      | -      | -        | -        | -  | -     | -       |
| Rocktec 65 |           |    |          |          |          |           |           |           |         |         |        |        |          |          |    |       |         |
| -          | -         | -  | -        | -        | -        | -         | -         | 130-320   | 70-130  | 60-70   | 50-65  | 40-55  | -        | -        | -  | -     | -       |

16831

## Solid carbide radius cutter

VHM  
RockTec

Z4



DIN  
6535  
HA



< 1600  
N/mm²

52  
HRC

16831 103-111



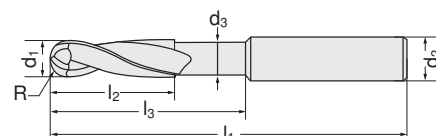
65  
HRC

16831 303-311



| d <sub>1</sub> (e8)<br>mm | R<br>mm | l <sub>2</sub><br>mm | l <sub>3</sub><br>mm | l <sub>1</sub><br>mm | d <sub>3</sub><br>mm | d <sub>2</sub> (h6)<br>mm | RockTec 52 |     | RockTec 65 |     |
|---------------------------|---------|----------------------|----------------------|----------------------|----------------------|---------------------------|------------|-----|------------|-----|
|                           |         |                      |                      |                      |                      |                           | 16831      | ... | 16831      | ... |
| 3.0                       | 1.50    | 5                    | 21                   | 75                   | 2.8                  | 6                         |            | 103 |            | 303 |
| 4.0                       | 2.00    | 8                    | 28                   | 75                   | 3.7                  | 6                         |            | 104 |            | 304 |
| 5.0                       | 2.50    | 9                    | 32                   | 75                   | 4.6                  | 6                         |            | 105 |            | 305 |
| 6.0                       | 3.00    | 10                   | 40                   | 75                   | 5.5                  | 6                         |            | 106 |            | 306 |
| 8.0                       | 4.00    | 12                   | 40                   | 75                   | 7.4                  | 8                         |            | 107 |            | 307 |
| 10.0                      | 5.00    | 14                   | 60                   | 100                  | 9.2                  | 10                        |            | 108 |            | 308 |
| 12.0                      | 6.00    | 16                   | 60                   | 100                  | 11.0                 | 12                        |            | 109 |            | 309 |
| 16.0                      | 8.00    | 32                   | 80                   | 125                  | 15.0                 | 16                        |            | 110 |            | 310 |
| 20.0                      | 10.00   | 38                   | 80                   | 125                  | 19.0                 | 20                        |            | 111 |            | 311 |

| Al <10%Si  | Al >10%Si | Cu | St <520N | St <750N | St <900N | St <1100N | St <1200N | St >1400N | >45HRC | <52HRC | <58HRC | <65HRC | VA <900N | VA >900N | Ti | GG(G) | Plastic |
|------------|-----------|----|----------|----------|----------|-----------|-----------|-----------|--------|--------|--------|--------|----------|----------|----|-------|---------|
| Rocktec 52 |           |    |          |          |          |           |           |           |        |        |        |        |          |          |    |       |         |
| -          | -         | -  | 90-190   | 90-190   | 90-190   | 90-190    | 90-190    | 100-130   | 80-150 | 60-130 | -      | -      | -        | -        | -  | -     | -       |
| Rocktec 65 |           |    |          |          |          |           |           |           |        |        |        |        |          |          |    |       |         |
| -          | -         | -  | -        | -        | -        | -         | -         | 90-190    | 60-130 | 40-45  | 30-40  | 25-35  | -        | -        | -  | -     | -       |



16832

## Solid carbide high-feed milling cutter

VHM  
RockTec

Z4-6

DIN  
6535  
HA

R

R

**ATORN®**

## Design

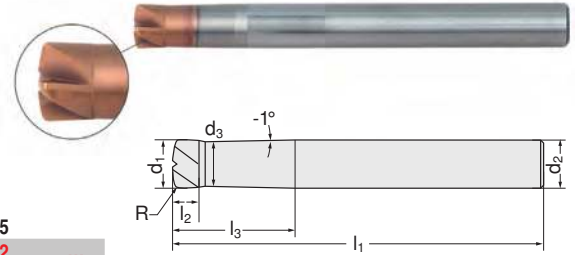
- 4 or 6-edged high-feed milling cutter with a TiSi-based PVD coating
- Short cutting edges for increased stability, longer service life, greater removal rate and higher feed

## Applications

For roughing in tool and mould making and in general mechanical engineering, also for dry milling or with air cooling.

65  
HRC

16832



RockTec 65

| d <sub>1</sub> (e8)<br>mm | R<br>mm | l <sub>2</sub><br>mm | l <sub>3</sub><br>mm | l <sub>1</sub><br>mm | d <sub>3</sub><br>mm | d <sub>2</sub> (h6)<br>mm | Z | 16832 | ... |
|---------------------------|---------|----------------------|----------------------|----------------------|----------------------|---------------------------|---|-------|-----|
| 4.0                       | 0.4     | 1.5                  | 8                    | 57                   | 3.7                  | 6                         | 4 |       | 101 |
| 4.0                       | 0.4     | 1.5                  | 15                   | 57                   | 3.7                  | 6                         | 4 |       | 102 |
| 5.0                       | 0.5     | 2.0                  | 10                   | 57                   | 4.6                  | 6                         | 4 |       | 103 |
| 5.0                       | 0.5     | 2.0                  | 21                   | 57                   | 4.6                  | 6                         | 4 |       | 104 |
| 6.0                       | 0.6     | 2.5                  | 12                   | 57                   | 5.5                  | 6                         | 4 |       | 105 |
| 6.0                       | 0.6     | 2.5                  | 26                   | 57                   | 5.5                  | 6                         | 4 |       | 106 |
| 8.0                       | 0.8     | 3.0                  | 16                   | 63                   | 7.4                  | 8                         | 6 |       | 107 |
| 8.0                       | 0.8     | 3.0                  | 31                   | 63                   | 7.4                  | 8                         | 6 |       | 108 |
| 10.0                      | 1.0     | 3.5                  | 20                   | 72                   | 9.2                  | 10                        | 6 |       | 109 |
| 10.0                      | 1.0     | 3.5                  | 36                   | 72                   | 9.2                  | 10                        | 6 |       | 110 |
| 12.0                      | 1.2     | 4.0                  | 24                   | 83                   | 11.0                 | 12                        | 6 |       | 111 |
| 12.0                      | 1.2     | 4.0                  | 41                   | 83                   | 11.0                 | 12                        | 6 |       | 112 |

| Al<10%Si | Al>10%Si | Cu | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti | GG(G) | Plastic |
|----------|----------|----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----|-------|---------|
| -        | -        | -  | -       | -       | -       | -        | -        | 160      | 160    | 150    | 140    | 120    | -       | -       | -  | -     | -       |

16664

## Trochoidal milling cutter (steel)

VHM  
AlCrN

Z5

37°/38°

DIN  
6535  
HB

45°

1400  
N/mm<sup>2</sup>**HHW**

## Design

- Extra long
- Uneven pitch
- With variable 37–38° twist angle for carbon steel
- With clearance
- Edge chamfer 45°

- 5 short cutting edges
- 3xD cutting length
- With chip breaker

16664

DIN  
6535  
HA

| d <sub>1</sub> e8<br>mm | l <sub>2</sub><br>mm | l <sub>3</sub><br>mm | l <sub>1</sub><br>mm | d <sub>3</sub><br>mm | d <sub>2</sub><br>mm | KF<br>mm | DIN 6535 HA<br>16664 | ... | DIN 6535 HB<br>16664 | ... |
|-------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------|----------------------|-----|----------------------|-----|
| 6.0                     | 18                   | 24                   | 62                   | 5.7                  | 6                    | 0.12     |                      | 106 |                      | 206 |
| 8.0                     | 24                   | 30                   | 68                   | 7.6                  | 8                    | 0.16     |                      | 108 |                      | 208 |
| 10.0                    | 30                   | 38                   | 80                   | 9.5                  | 10                   | 0.20     |                      | 110 |                      | 210 |
| 12.0                    | 36                   | 46                   | 93                   | 11.5                 | 12                   | 0.24     |                      | 112 |                      | 212 |
| 16.0                    | 48                   | 58                   | 108                  | 15.5                 | 16                   | 0.32     |                      | 116 |                      | 216 |
| 20.0                    | 60                   | 74                   | 126                  | 19.5                 | 20                   | 0.40     |                      | 120 |                      | 220 |

| Al<10%Si | Al>10%Si | Cu | St<520N | St<750N | St<900N | St<1100N | St<1200N | St>1400N | >50HRC | <55HRC | <60HRC | <65HRC | VA<900N | VA>900N | Ti | GG(G) | Plastic |
|----------|----------|----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----|-------|---------|
| -        | -        | -  | 300     | 250     | 220     | 190      | 190      | 180      | 100    | 70     | 50     | -      | -       | -       | -  | -     | -       |

16665

## Trochoidal milling cutter (VA)

VHM  
AlCrN

Z5



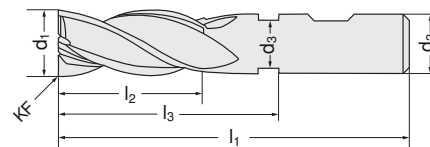
H+W

## Design

- Extra long
- Uneven pitch
- With variable 41–42° twist angle for stainless steels and heat-resistant alloys
- With clearance
- Edge chamfer 45°
- 5 short cutting edges
- 3xD cutting length



16665



| DIN 6535 HA          |                      |                      |                      |                      |                      |          | DIN 6535 HB |     |       |     |
|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------|-------------|-----|-------|-----|
| d <sub>1</sub><br>mm | l <sub>2</sub><br>mm | l <sub>3</sub><br>mm | l <sub>1</sub><br>mm | d <sub>3</sub><br>mm | d <sub>2</sub><br>mm | KF<br>mm | 16665       | ... | 16665 | ... |
| 6.0                  | 18                   | 24                   | 62                   | 5.7                  | 6                    | 0.12     |             | 106 |       | 206 |
| 8.0                  | 24                   | 30                   | 68                   | 7.6                  | 8                    | 0.16     |             | 108 |       | 208 |
| 10.0                 | 30                   | 38                   | 80                   | 9.5                  | 10                   | 0.20     |             | 110 |       | 210 |
| 12.0                 | 36                   | 46                   | 93                   | 11.5                 | 12                   | 0.24     |             | 112 |       | 212 |
| 16.0                 | 48                   | 58                   | 108                  | 15.5                 | 16                   | 0.32     |             | 116 |       | 216 |
| 20.0                 | 60                   | 74                   | 126                  | 19.5                 | 20                   | 0.40     |             | 120 |       | 220 |

| Al <10%Si | Al >10%Si | Cu | St <520N | St <750N | St <900N | St <1100N | St <1200N | St >1400N | >45HRC | <52HRC | <58HRC | <65HRC | VA <900N | VA >900N | Ti  | GG(G) | Plastic |
|-----------|-----------|----|----------|----------|----------|-----------|-----------|-----------|--------|--------|--------|--------|----------|----------|-----|-------|---------|
| -         | -         | -  | -        | -        | -        | -         | -         | -         | -      | -      | -      | -      | 190      | 170      | 130 | -     | -       |

16400

## Mini end mill Ultra MS

VHM  
AlCrN

HPC



ATORN®

## Design

Solid carbide end mill with AlCrN coating.

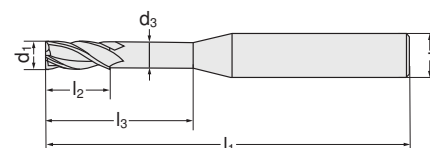
## Advantage:

Maximum machining performance.

## Applications

Especially suitable for processing stainless and acid-resistant steels, titanium and nickel alloys, bronze, brass and steel up to 1300 N/mm<sup>2</sup>.

16400



| d <sub>1</sub><br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | l <sub>3</sub><br>mm | d <sub>3</sub><br>mm | d <sub>2</sub><br>mm | 16400 | ... |
|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|-------|-----|
| 0.5                  | 0.7                  | 50                   | 2.0                  | 0.45                 | 4                    |       | 101 |
| 0.5                  | 0.7                  | 50                   | 4.0                  | 0.45                 | 4                    |       | 102 |
| 0.5                  | 0.7                  | 50                   | 6.0                  | 0.45                 | 4                    |       | 103 |
| 0.5                  | 0.7                  | 50                   | 8.0                  | 0.45                 | 4                    |       | 104 |
| 0.8                  | 1.2                  | 50                   | 4.0                  | 0.75                 | 4                    |       | 105 |
| 0.8                  | 1.2                  | 50                   | 6.0                  | 0.75                 | 4                    |       | 106 |
| 0.8                  | 1.2                  | 50                   | 8.0                  | 0.75                 | 4                    |       | 107 |
| 0.8                  | 1.2                  | 50                   | 10.0                 | 0.75                 | 4                    |       | 108 |
| 0.8                  | 1.2                  | 50                   | 12.0                 | 0.75                 | 4                    |       | 109 |
| 1.0                  | 1.5                  | 50                   | 6.0                  | 0.95                 | 4                    |       | 110 |
| 1.0                  | 1.5                  | 50                   | 8.0                  | 0.95                 | 4                    |       | 111 |
| 1.0                  | 1.5                  | 50                   | 10.0                 | 0.95                 | 4                    |       | 112 |
| 1.0                  | 1.5                  | 50                   | 12.0                 | 0.95                 | 4                    |       | 113 |
| 1.0                  | 1.5                  | 50                   | 16.0                 | 0.95                 | 4                    |       | 114 |
| 1.2                  | 1.8                  | 50                   | 6.0                  | 1.15                 | 4                    |       | 115 |
| 1.2                  | 1.8                  | 50                   | 8.0                  | 1.15                 | 4                    |       | 116 |
| 1.2                  | 1.8                  | 50                   | 10.0                 | 1.15                 | 4                    |       | 117 |
| 1.2                  | 1.8                  | 50                   | 12.0                 | 1.15                 | 4                    |       | 118 |
| 1.5                  | 2.3                  | 50                   | 6.0                  | 1.45                 | 4                    |       | 119 |
| 1.5                  | 2.3                  | 50                   | 8.0                  | 1.45                 | 4                    |       | 120 |
| 1.5                  | 2.3                  | 50                   | 10.0                 | 1.45                 | 4                    |       | 121 |
| 1.5                  | 2.3                  | 50                   | 12.0                 | 1.45                 | 4                    |       | 122 |
| 1.5                  | 2.3                  | 50                   | 16.0                 | 1.45                 | 4                    |       | 123 |
| 1.5                  | 2.3                  | 60                   | 20.0                 | 1.45                 | 4                    |       | 124 |

| d <sub>1</sub><br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | l <sub>3</sub><br>mm | d <sub>3</sub><br>mm | d <sub>2</sub><br>mm | 16400 | ... |
|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|-------|-----|
| 2.0                  | 3.0                  | 50                   | 6.0                  | 1.95                 | 4                    |       | 125 |
| 2.0                  | 3.0                  | 50                   | 8.0                  | 1.95                 | 4                    |       | 126 |
| 2.0                  | 3.0                  | 50                   | 10.0                 | 1.95                 | 4                    |       | 127 |
| 2.0                  | 3.0                  | 50                   | 12.0                 | 1.95                 | 4                    |       | 128 |
| 2.0                  | 3.0                  | 50                   | 16.0                 | 1.95                 | 4                    |       | 129 |
| 2.0                  | 3.0                  | 60                   | 20.0                 | 1.95                 | 4                    |       | 130 |
| 2.0                  | 3.0                  | 75                   | 25.0                 | 1.95                 | 4                    |       | 131 |
| 2.5                  | 3.7                  | 50                   | 8.0                  | 2.40                 | 4                    |       | 132 |
| 2.5                  | 3.7                  | 50                   | 10.0                 | 2.40                 | 4                    |       | 133 |
| 2.5                  | 3.7                  | 50                   | 12.0                 | 2.40                 | 4                    |       | 134 |
| 2.5                  | 3.7                  | 50                   | 16.0                 | 2.40                 | 4                    |       | 135 |
| 2.5                  | 3.7                  | 50                   | 20.0                 | 2.40                 | 4                    |       | 136 |
| 2.5                  | 3.7                  | 60                   | 25.0                 | 2.40                 | 4                    |       | 137 |
| 3.0                  | 4.5                  | 50                   | 8.0                  | 2.85                 | 6                    |       | 138 |
| 3.0                  | 4.5                  | 50                   | 10.0                 | 2.85                 | 6                    |       | 139 |
| 3.0                  | 4.5                  | 50                   | 12.0                 | 2.85                 | 6                    |       | 140 |
| 3.0                  | 4.5                  | 60                   | 16.0                 | 2.85                 | 6                    |       | 141 |
| 3.0                  | 4.5                  | 60                   | 20.0                 | 2.85                 | 6                    |       | 142 |
| 3.0                  | 4.5                  | 75                   | 25.0                 | 2.85                 | 6                    |       | 143 |
| 4.0                  | 4.5                  | 60                   | 20.0                 | 3.85                 | 6                    |       | 144 |
| 4.0                  | 4.5                  | 75                   | 25.0                 | 3.85                 | 6                    |       | 145 |
| 4.0                  | 4.5                  | 75                   | 30.0                 | 3.85                 | 6                    |       | 146 |
| 4.0                  | 4.5                  | 75                   | 40.0                 | 3.85                 | 6                    |       | 147 |

| Al <14%Si | Brass | Bronze | St <700N | St <900N | St <1000N | St <1300N | VA <900N | VA >900N | Ti <700N | Ti >700N | Ni-Co <700N | Ni-Co <1200N | Ni-based alloy |
|-----------|-------|--------|----------|----------|-----------|-----------|----------|----------|----------|----------|-------------|--------------|----------------|
| -         | -     | -      | 40-130   | 40-130   | 40-130    | 40-80     | 20-60    | 20-60    | 25-80    | 20-40    | 25-80       | 20-40        | 20-30          |

16401

## Mini torus milling cutter Ultra MS

VHM  
AlCrN

HPC

Z 2

R

DIN  
6535  
HA

Ti/Ni

**ATORN®****Design**

Solid carbide torus milling cutter with AlCrN coating.

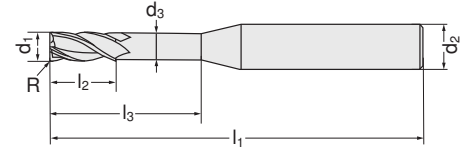
**Advantage:**

Maximum machining performance.

**Applications**

Especially suitable for processing stainless and acid-resistant steels, titanium and nickel alloys, bronze, brass and steel up to 1300 N/mm².

16401



| d <sub>1</sub><br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | l <sub>3</sub><br>mm | d <sub>3</sub><br>mm | d <sub>2</sub><br>mm | R<br>mm | 16401 | ... |
|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|---------|-------|-----|
| 0.5                  | 0.7                  | 50                   | 2.0                  | 0.45                 | 4                    | 0.05    | 101   |     |
| 0.5                  | 0.7                  | 50                   | 4.0                  | 0.45                 | 4                    | 0.05    | 102   |     |
| 0.5                  | 0.7                  | 50                   | 6.0                  | 0.45                 | 4                    | 0.05    | 103   |     |
| 0.5                  | 0.7                  | 50                   | 8.0                  | 0.45                 | 4                    | 0.05    | 104   |     |
| 0.8                  | 1.2                  | 50                   | 4.0                  | 0.75                 | 4                    | 0.10    | 105   |     |
| 0.8                  | 1.2                  | 50                   | 6.0                  | 0.75                 | 4                    | 0.10    | 106   |     |
| 0.8                  | 1.2                  | 50                   | 8.0                  | 0.75                 | 4                    | 0.10    | 107   |     |
| 0.8                  | 1.2                  | 50                   | 10.0                 | 0.75                 | 4                    | 0.10    | 108   |     |
| 0.8                  | 1.2                  | 50                   | 12.0                 | 0.75                 | 4                    | 0.10    | 109   |     |
| 1.0                  | 1.5                  | 50                   | 6.0                  | 0.95                 | 4                    | 0.10    | 110   |     |
| 1.0                  | 1.5                  | 50                   | 8.0                  | 0.95                 | 4                    | 0.10    | 111   |     |
| 1.0                  | 1.5                  | 50                   | 10.0                 | 0.95                 | 4                    | 0.10    | 112   |     |
| 1.0                  | 1.5                  | 50                   | 12.0                 | 0.95                 | 4                    | 0.10    | 113   |     |
| 1.0                  | 1.5                  | 50                   | 16.0                 | 0.95                 | 4                    | 0.10    | 114   |     |
| 1.2                  | 1.8                  | 50                   | 6.0                  | 1.15                 | 4                    | 0.10    | 115   |     |
| 1.2                  | 1.8                  | 50                   | 8.0                  | 1.15                 | 4                    | 0.10    | 116   |     |
| 1.2                  | 1.8                  | 50                   | 10.0                 | 1.15                 | 4                    | 0.10    | 117   |     |
| 1.2                  | 1.8                  | 50                   | 12.0                 | 1.15                 | 4                    | 0.10    | 118   |     |
| 1.5                  | 2.3                  | 50                   | 6.0                  | 1.45                 | 4                    | 0.20    | 119   |     |
| 1.5                  | 2.3                  | 50                   | 8.0                  | 1.45                 | 4                    | 0.20    | 120   |     |
| 1.5                  | 2.3                  | 50                   | 10.0                 | 1.45                 | 4                    | 0.20    | 121   |     |
| 1.5                  | 2.3                  | 50                   | 12.0                 | 1.45                 | 4                    | 0.20    | 122   |     |
| 1.5                  | 2.3                  | 50                   | 16.0                 | 1.45                 | 4                    | 0.20    | 123   |     |

| d <sub>1</sub><br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | l <sub>3</sub><br>mm | d <sub>3</sub><br>mm | d <sub>2</sub><br>mm | R<br>mm | 16401 | ... |
|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|---------|-------|-----|
| 1.5                  | 2.3                  | 60                   | 20.0                 | 1.45                 | 4                    | 0.20    | 124   |     |
| 2.0                  | 3.0                  | 50                   | 6.0                  | 1.95                 | 4                    | 0.20    | 125   |     |
| 2.0                  | 3.0                  | 50                   | 8.0                  | 1.95                 | 4                    | 0.20    | 126   |     |
| 2.0                  | 3.0                  | 50                   | 10.0                 | 1.95                 | 4                    | 0.20    | 127   |     |
| 2.0                  | 3.0                  | 50                   | 12.0                 | 1.95                 | 4                    | 0.20    | 128   |     |
| 2.0                  | 3.0                  | 60                   | 20.0                 | 1.95                 | 4                    | 0.20    | 130   |     |
| 2.0                  | 3.0                  | 75                   | 25.0                 | 1.95                 | 4                    | 0.20    | 131   |     |
| 2.5                  | 3.7                  | 50                   | 8.0                  | 2.40                 | 4                    | 0.30    | 132   |     |
| 2.5                  | 3.7                  | 50                   | 10.0                 | 2.40                 | 4                    | 0.30    | 133   |     |
| 2.5                  | 3.7                  | 50                   | 12.0                 | 2.40                 | 4                    | 0.30    | 134   |     |
| 2.5                  | 3.7                  | 50                   | 16.0                 | 2.40                 | 4                    | 0.30    | 135   |     |
| 2.5                  | 3.7                  | 50                   | 20.0                 | 2.40                 | 4                    | 0.30    | 136   |     |
| 2.5                  | 3.7                  | 60                   | 25.0                 | 2.40                 | 4                    | 0.30    | 137   |     |
| 3.0                  | 4.5                  | 50                   | 8.0                  | 2.85                 | 6                    | 0.30    | 138   |     |
| 3.0                  | 4.5                  | 50                   | 10.0                 | 2.85                 | 6                    | 0.30    | 139   |     |
| 3.0                  | 4.5                  | 50                   | 12.0                 | 2.85                 | 6                    | 0.30    | 140   |     |
| 3.0                  | 4.5                  | 60                   | 16.0                 | 2.85                 | 6                    | 0.30    | 141   |     |
| 3.0                  | 4.5                  | 60                   | 20.0                 | 2.85                 | 6                    | 0.30    | 142   |     |
| 3.0                  | 4.5                  | 75                   | 25.0                 | 2.85                 | 6                    | 0.30    | 143   |     |
| 4.0                  | 4.5                  | 60                   | 20.0                 | 3.85                 | 6                    | 0.40    | 144   |     |
| 4.0                  | 4.5                  | 75                   | 25.0                 | 3.85                 | 6                    | 0.40    | 145   |     |
| 4.0                  | 4.5                  | 75                   | 30.0                 | 3.85                 | 6                    | 0.40    | 146   |     |
| 4.0                  | 4.5                  | 75                   | 40.0                 | 3.85                 | 6                    | 0.40    | 147   |     |

| Al<14%Si | Brass | Bronze | St<700N | St<900N | St<1000N | St<1300N | VA<900N | VA>900N | Ti<700N | Ti>700N | Ni-Co<700N | Ni-Co<1200N | Ni-based alloy |
|----------|-------|--------|---------|---------|----------|----------|---------|---------|---------|---------|------------|-------------|----------------|
| -        | -     | -      | 40-130  | 40-130  | 40-130   | 40-80    | 20-60   | 20-60   | 25-80   | 20-40   | 25-80      | 20-40       | 20-30          |

Milling tools

16402

## Mini radius cutter Ultra MS

VHM  
AlCrN

HPC

Z2

DIN  
6535  
HA**ATORN®**

## Design

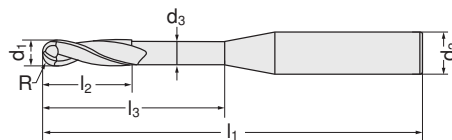
Solid carbide radius cutter with AlCrN coating.

## Advantage:

Maximum machining performance.

## Applications

Especially suitable for processing stainless and acid-resistant steels, titanium and nickel alloys, bronze, brass and steel up to 1300 N/mm².



16402

| d <sub>1</sub><br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | l <sub>3</sub><br>mm | d <sub>3</sub><br>mm | d <sub>2</sub><br>mm | R<br>mm | 16402 | ... |
|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|---------|-------|-----|
| 0.5                  | 0.4                  | 50                   | 2.0                  | 0.45                 | 4                    | 0.25    | 101   |     |
| 0.5                  | 0.4                  | 50                   | 4.0                  | 0.45                 | 4                    | 0.25    | 102   |     |
| 0.5                  | 0.4                  | 50                   | 6.0                  | 0.45                 | 4                    | 0.25    | 103   |     |
| 0.5                  | 0.4                  | 50                   | 8.0                  | 0.45                 | 4                    | 0.25    | 104   |     |
| 0.8                  | 0.6                  | 50                   | 2.0                  | 0.75                 | 4                    | 0.40    | 105   |     |
| 0.8                  | 0.6                  | 50                   | 4.0                  | 0.75                 | 4                    | 0.40    | 106   |     |
| 0.8                  | 0.6                  | 50                   | 6.0                  | 0.75                 | 4                    | 0.40    | 107   |     |
| 0.8                  | 0.6                  | 50                   | 8.0                  | 0.75                 | 4                    | 0.40    | 108   |     |
| 0.8                  | 0.6                  | 50                   | 10.0                 | 0.75                 | 4                    | 0.40    | 109   |     |
| 1.0                  | 0.8                  | 50                   | 3.0                  | 0.95                 | 4                    | 0.50    | 110   |     |
| 1.0                  | 0.8                  | 50                   | 4.0                  | 0.95                 | 4                    | 0.50    | 111   |     |
| 1.0                  | 0.8                  | 50                   | 6.0                  | 0.95                 | 4                    | 0.50    | 112   |     |
| 1.0                  | 0.8                  | 50                   | 8.0                  | 0.95                 | 4                    | 0.50    | 113   |     |
| 1.0                  | 0.8                  | 50                   | 10.0                 | 0.95                 | 4                    | 0.50    | 114   |     |
| 1.0                  | 0.8                  | 50                   | 12.0                 | 0.95                 | 4                    | 0.50    | 115   |     |
| 1.0                  | 0.8                  | 50                   | 20.0                 | 0.95                 | 4                    | 0.50    | 116   |     |
| 1.5                  | 1.2                  | 50                   | 8.0                  | 1.45                 | 4                    | 0.75    | 117   |     |
| 1.5                  | 1.2                  | 50                   | 12.0                 | 1.45                 | 4                    | 0.75    | 118   |     |
| 1.5                  | 1.2                  | 50                   | 16.0                 | 1.45                 | 4                    | 0.75    | 119   |     |
| 2.0                  | 1.6                  | 50                   | 6.0                  | 1.95                 | 4                    | 1.00    | 120   |     |

| d <sub>1</sub><br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | l <sub>3</sub><br>mm | d <sub>3</sub><br>mm | d <sub>2</sub><br>mm | R<br>mm | 16402 | ... |
|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|---------|-------|-----|
| 2.0                  | 1.6                  | 50                   | 8.0                  | 1.95                 | 4                    | 1.00    | 121   |     |
| 2.0                  | 1.6                  | 50                   | 10.0                 | 1.95                 | 4                    | 1.00    | 122   |     |
| 2.0                  | 1.6                  | 50                   | 12.0                 | 1.95                 | 4                    | 1.00    | 123   |     |
| 2.0                  | 1.6                  | 50                   | 16.0                 | 1.95                 | 4                    | 1.00    | 124   |     |
| 2.0                  | 1.6                  | 60                   | 20.0                 | 1.95                 | 4                    | 1.00    | 125   |     |
| 2.0                  | 1.6                  | 75                   | 25.0                 | 1.95                 | 4                    | 1.00    | 126   |     |
| 3.0                  | 2.4                  | 50                   | 8.0                  | 2.85                 | 6                    | 1.50    | 127   |     |
| 3.0                  | 2.4                  | 50                   | 10.0                 | 2.85                 | 6                    | 1.50    | 128   |     |
| 3.0                  | 2.4                  | 60                   | 16.0                 | 2.85                 | 6                    | 1.50    | 129   |     |
| 3.0                  | 2.4                  | 60                   | 20.0                 | 2.85                 | 6                    | 1.50    | 130   |     |
| 3.0                  | 2.4                  | 75                   | 25.0                 | 2.85                 | 6                    | 1.50    | 131   |     |
| 3.0                  | 2.4                  | 75                   | 30.0                 | 2.85                 | 6                    | 1.50    | 132   |     |
| 4.0                  | 3.2                  | 50                   | 10.0                 | 3.85                 | 6                    | 2.00    | 133   |     |
| 4.0                  | 3.2                  | 60                   | 16.0                 | 3.85                 | 6                    | 2.00    | 134   |     |
| 4.0                  | 3.2                  | 60                   | 20.0                 | 3.85                 | 6                    | 2.00    | 135   |     |
| 4.0                  | 3.2                  | 75                   | 25.0                 | 3.85                 | 6                    | 2.00    | 136   |     |
| 4.0                  | 3.2                  | 75                   | 30.0                 | 3.85                 | 6                    | 2.00    | 137   |     |
| 4.0                  | 3.2                  | 75                   | 35.0                 | 3.85                 | 6                    | 2.00    | 138   |     |
| 4.0                  | 3.2                  | 100                  | 40.0                 | 3.85                 | 6                    | 2.00    | 139   |     |
| 4.0                  | 3.2                  | 100                  | 50.0                 | 3.85                 | 6                    | 2.00    | 140   |     |

| Al<14%Si | Brass | Bronze | St<700N | St<900N | St<1000N | St<1300N | VA<900N | VA>900N | Ti<700N | Ti>700N | Ni-Co<700N | Ni-Co<1200N | Ni-based alloy |
|----------|-------|--------|---------|---------|----------|----------|---------|---------|---------|---------|------------|-------------|----------------|
| -        | -     | -      | 40-130  | 40-130  | 40-130   | 40-80    | 20-60   | 20-60   | 25-80   | 20-40   | 25-80      | 20-40       | 20-30          |

16403

## Solid carbide square end mill Ultra MS

**ATORN®**

## Design

Solid carbide square end mill with clearance and AlCrN coating.

## Advantage:

Maximum machining performance.

## Applications

Especially suitable for processing stainless and acid-resistant steels, titanium and nickel alloys, bronze, brass and steel up to 1300 N/mm².

VHM  
AlCrN

Z3

DIN  
6535  
HA

HPC



max.



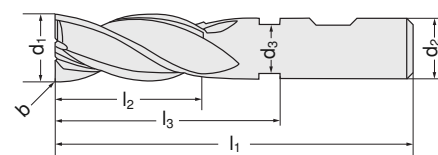
16403 101-109

DIN  
6535  
HADIN  
6535  
HB

16403 201-209



| DIN 6535 HA          |                      |                      |                      |                      |                      | DIN 6535 HB |       |
|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|-------------|-------|
| d <sub>1</sub><br>mm | d <sub>2</sub><br>mm | d <sub>3</sub><br>mm | l <sub>1</sub><br>mm | l <sub>3</sub><br>mm | l <sub>2</sub><br>mm | 16403       | 16403 |
| 3.0                  | 6                    | 2.8                  | 50                   | 15                   | 9                    | 101         | 201   |
| 4.0                  | 6                    | 3.7                  | 50                   | 20                   | 12                   | 102         | 202   |
| 5.0                  | 6                    | 4.6                  | 50                   | 20                   | 15                   | 103         | 203   |
| 6.0                  | 6                    | 5.5                  | 50                   | 20                   | 16                   | 104         | 204   |
| 8.0                  | 8                    | 7.4                  | 64                   | 30                   | 20                   | 105         | 205   |
| 10.0                 | 10                   | 9.2                  | 70                   | 32                   | 22                   | 106         | 206   |
| 12.0                 | 12                   | 11.0                 | 75                   | 37                   | 25                   | 107         | 207   |
| 16.0                 | 16                   | 15.0                 | 90                   | 46                   | 32                   | 108         | 208   |
| 20.0                 | 20                   | 19.0                 | 100                  | 58                   | 38                   | 109         | 209   |



| Al<14%Si | Brass | Bronze | St<700N | St<900N | St<1000N | St<1300N | VA<900N | VA>900N | Ti<700N | Ti>700N | Ni-Co<700N | Ni-Co<1200N | Ni-based alloy |
|----------|-------|--------|---------|---------|----------|----------|---------|---------|---------|---------|------------|-------------|----------------|
| -        | -     | -      | 120-140 | 120-140 | 120-140  | 50-70    | 50-70   | 50-70   | 70-80   | 50-60   | 70-80      | 60-70       | 20-30          |

16405

## Solid carbide radius cutter short Ultra MS

**ATORN®****Design**

Solid carbide radius cutter with AlCrN coating.

**Advantage:**

Maximum machining performance.

**Applications**

Especially suitable for processing stainless and acid-resistant steels, titanium and nickel alloys, bronze, brass and steel up to 1300 N/mm².

VHM  
AlCrN

Z2



HPC



16405 101-109

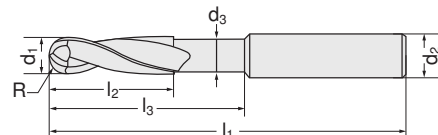
DIN  
6535  
HA

16405 201-209

DIN  
6535  
HB

| d <sub>1</sub><br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | l <sub>3</sub><br>mm | d <sub>3</sub><br>mm | d <sub>2</sub><br>mm | R<br>mm | DIN 6535 HA |     | DIN 6535 HB |     |
|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|---------|-------------|-----|-------------|-----|
|                      |                      |                      |                      |                      |                      |         | 16405       | ... | 16405       | ... |
| 3.0                  | 5                    | 57                   | 20                   | 2.8                  | 6                    | 1.5     |             | 101 |             | 201 |
| 4.0                  | 6                    | 57                   | 20                   | 3.7                  | 6                    | 2.0     |             | 102 |             | 202 |
| 5.0                  | 7                    | 57                   | 20                   | 4.6                  | 6                    | 2.5     |             | 103 |             | 203 |
| 6.0                  | 8                    | 57                   | 20                   | 5.5                  | 6                    | 3.0     |             | 104 |             | 204 |
| 8.0                  | 10                   | 64                   | 25                   | 7.4                  | 8                    | 4.0     |             | 105 |             | 205 |
| 10.0                 | 12                   | 75                   | 35                   | 9.2                  | 10                   | 5.0     |             | 106 |             | 206 |
| 12.0                 | 14                   | 75                   | 35                   | 11.0                 | 12                   | 6.0     |             | 107 |             | 207 |
| 16.0                 | 18                   | 90                   | 45                   | 15.0                 | 16                   | 8.0     |             | 108 |             | 208 |
| 20.0                 | 20                   | 100                  | 50                   | 19.0                 | 20                   | 10.0    |             | 109 |             | 209 |

| Al<14%Si | Brass | Bronze | St<700N | St<900N | St<1000N | St<1300N | VA<900N | VA>900N | Ti<700N | Ti>700N | Ni-Co<700N | Ni-Co<1200N | Ni-based alloy |
|----------|-------|--------|---------|---------|----------|----------|---------|---------|---------|---------|------------|-------------|----------------|
| -        | -     | -      | 120-140 | 120-140 | 120-140  | 50-70    | 50-70   | 50-70   | 70-80   | 50-60   | 70-80      | 60-70       | 20-30          |



16407

## Solid carbide radius cutter long Ultra MS

**ATORN®****Design**

Solid carbide radius cutter with AlCrN coating.

**Advantage:**

Maximum machining performance.

**Applications**

Especially suitable for processing stainless and acid-resistant steels, titanium and nickel alloys, bronze, brass and steel up to 1300 N/mm².

VHM  
AlCrN

HPC

Z2



16407 101-109

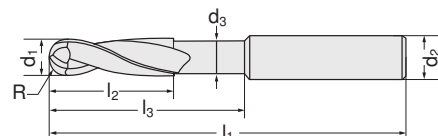
DIN  
6535  
HA

16407 201-209

DIN  
6535  
HB

| d <sub>1</sub><br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | l <sub>3</sub><br>mm | d <sub>3</sub><br>mm | d <sub>2</sub><br>mm | R<br>mm | DIN 6535 HA |     | DIN 6535 HB |     |
|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|---------|-------------|-----|-------------|-----|
|                      |                      |                      |                      |                      |                      |         | 16407       | ... | 16407       | ... |
| 3.0                  | 5.0                  | 75                   | 21                   | 2.8                  | 6                    | 1.5     |             | 101 |             | 201 |
| 4.0                  | 8.0                  | 75                   | 28                   | 3.7                  | 6                    | 2.0     |             | 102 |             | 202 |
| 5.0                  | 9.0                  | 75                   | 32                   | 4.6                  | 6                    | 2.5     |             | 103 |             | 203 |
| 6.0                  | 10.0                 | 75                   | 40                   | 5.5                  | 6                    | 3.0     |             | 104 |             | 204 |
| 8.0                  | 12.0                 | 75                   | 40                   | 7.4                  | 8                    | 4.0     |             | 105 |             | 205 |
| 10.0                 | 14.0                 | 100                  | 60                   | 9.2                  | 10                   | 5.0     |             | 106 |             | 206 |
| 12.0                 | 16.0                 | 100                  | 60                   | 11.0                 | 12                   | 6.0     |             | 107 |             | 207 |
| 16.0                 | 32.0                 | 125                  | 80                   | 15.0                 | 16                   | 8.0     |             | 108 |             | 208 |
| 20.0                 | 38.0                 | 125                  | 80                   | 19.0                 | 20                   | 10.0    |             | 109 |             | 209 |

| Al<14%Si | Brass | Bronze | St<700N | St<900N | St<1000N | St<1300N | VA<900N | VA>900N | Ti<700N | Ti>700N | Ni-Co<700N | Ni-Co<1200N | Ni-based alloy |
|----------|-------|--------|---------|---------|----------|----------|---------|---------|---------|---------|------------|-------------|----------------|
| -        | -     | -      | 120-140 | 120-140 | 120-140  | 50-70    | 50-70   | 50-70   | 70-80   | 50-60   | 70-80      | 60-70       | 20-30          |



16544

## Solid carbide end mill Ultra MS

VHM  
AlCrN

HPC

Z4  
35°/38°Z4  
45°

VA

Ti/Ni

**ATORN®****Design**

Solid carbide cutter with clearance for roughing and finishing with variable pitch and uneven twist.

**Advantage:**

Maximum machining performance with unbeatable smoothness.

**Applications**

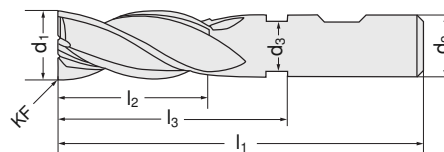
Especially suitable for processing stainless and acid-resistant steels, titanium and nickel alloys, bronze, brass and steels up to 1300 N/mm².



16544 101-108



16544 201-208



| d <sub>1</sub><br>mm | d <sub>2</sub><br>mm | d <sub>3</sub><br>mm | l <sub>1</sub><br>mm | l <sub>3</sub><br>mm | l <sub>2</sub><br>mm | KF<br>mm | DIN 6535 HA |     | DIN 6535 HB |     |
|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------|-------------|-----|-------------|-----|
|                      |                      |                      |                      |                      |                      |          | 16544       | ... | 16544       | ... |
| 4                    | 6                    | 3.7                  | 57                   | 20                   | 11                   | 0.1      |             |     | 101         | 201 |
| 5                    | 6                    | 4.6                  | 57                   | 20                   | 13                   | 0.1      |             |     | 102         | 202 |
| 6                    | 6                    | 5.5                  | 57                   | 20                   | 13                   | 0.1      |             |     | 103         | 203 |
| 8                    | 8                    | 7.4                  | 64                   | 30                   | 20                   | 0.2      |             |     | 104         | 204 |
| 10                   | 10                   | 9.2                  | 72                   | 32                   | 22                   | 0.2      |             |     | 105         | 205 |
| 12                   | 12                   | 11.0                 | 83                   | 37                   | 26                   | 0.2      |             |     | 106         | 206 |
| 16                   | 16                   | 15.0                 | 92                   | 46                   | 32                   | 0.3      |             |     | 107         | 207 |
| 20                   | 20                   | 19.0                 | 104                  | 58                   | 38                   | 0.4      |             |     | 108         | 208 |

| Al<14%Si | Brass | Bronze | St<700N | St<900N | St<1000N | St<1300N | VA<900N | VA>900N | Ti<700N | Ti>700N | Ni-Co<700N | Ni-Co<1200N | Ni-based alloy |
|----------|-------|--------|---------|---------|----------|----------|---------|---------|---------|---------|------------|-------------|----------------|
| -        | -     | -      | 120-140 | 120-140 | 120-140  | 50-70    | 50-70   | 50-70   | 70-80   | 50-60   | 70-80      | 60-70       | 20-30          |

16550

## Solid carbide torus milling cutter Ultra MS

VHM  
AlCrN

HPC

Z4  
35°/38°Z4  
45°

VA

Ti/Ni

**ATORN®****Design**

Solid carbide torus milling cutter with clearance, variable pitch and uneven twist.

**Advantage:**

Maximum machining performance with unbeatable smoothness.

**Applications**

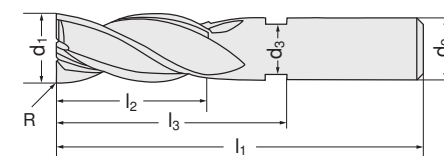
Especially suitable for processing stainless and acid-resistant steels, titanium and nickel alloys, bronze, brass and steels up to 1300 N/mm².



16550 301-321



16550 401-421



| d <sub>1</sub><br>mm | d <sub>2</sub><br>mm | d <sub>3</sub><br>mm | l <sub>1</sub><br>mm | l <sub>3</sub><br>mm | l <sub>2</sub><br>mm | R<br>mm | DIN 6535 HA |     | DIN 6535 HB |     |
|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|---------|-------------|-----|-------------|-----|
|                      |                      |                      |                      |                      |                      |         | 16550       | ... | 16550       | ... |
| 4.0                  | 6                    | 3.7                  | 57                   | 20                   | 11                   | 0.3     |             |     | 301         | 401 |
| 4.0                  | 6                    | 3.7                  | 57                   | 20                   | 11                   | 0.5     |             |     | 302         | 402 |
| 5.0                  | 6                    | 4.6                  | 57                   | 20                   | 13                   | 0.3     |             |     | 303         | 403 |
| 5.0                  | 6                    | 4.6                  | 57                   | 20                   | 13                   | 0.5     |             |     | 304         | 404 |
| 6.0                  | 6                    | 5.5                  | 57                   | 20                   | 13                   | 0.3     |             |     | 305         | 405 |
| 6.0                  | 6                    | 5.5                  | 57                   | 20                   | 13                   | 0.5     |             |     | 306         | 406 |
| 6.0                  | 6                    | 5.5                  | 57                   | 20                   | 13                   | 1.0     |             |     | 307         | 407 |
| 8.0                  | 8                    | 7.4                  | 64                   | 30                   | 20                   | 0.5     |             |     | 308         | 408 |
| 8.0                  | 8                    | 7.4                  | 64                   | 30                   | 20                   | 1.0     |             |     | 309         | 409 |
| 10.0                 | 10                   | 9.2                  | 72                   | 32                   | 22                   | 0.5     |             |     | 310         | 410 |
| 10.0                 | 10                   | 9.2                  | 72                   | 32                   | 22                   | 1.0     |             |     | 311         | 411 |
| 12.0                 | 12                   | 11.0                 | 83                   | 37                   | 26                   | 0.5     |             |     | 312         | 412 |
| 12.0                 | 12                   | 11.0                 | 83                   | 37                   | 26                   | 1.0     |             |     | 313         | 413 |
| 12.0                 | 12                   | 11.0                 | 83                   | 37                   | 26                   | 2.0     |             |     | 314         | 414 |
| 12.0                 | 12                   | 11.0                 | 83                   | 37                   | 26                   | 3.0     |             |     | 315         | 415 |
| 16.0                 | 16                   | 15.0                 | 92                   | 46                   | 32                   | 1.0     |             |     | 316         | 416 |
| 16.0                 | 16                   | 15.0                 | 92                   | 46                   | 32                   | 2.0     |             |     | 317         | 417 |
| 16.0                 | 16                   | 15.0                 | 92                   | 46                   | 32                   | 3.0     |             |     | 318         | 418 |
| 20.0                 | 20                   | 19.0                 | 104                  | 58                   | 38                   | 1.0     |             |     | 319         | 419 |
| 20.0                 | 20                   | 19.0                 | 104                  | 58                   | 38                   | 2.0     |             |     | 320         | 420 |
| 20.0                 | 20                   | 19.0                 | 104                  | 58                   | 38                   | 3.0     |             |     | 321         | 421 |

| Al<14%Si | Brass | Bronze | St<700N | St<900N | St<1000N | St<1300N | VA<900N | VA>900N | Ti<700N | Ti>700N | Ni-Co<700N | Ni-Co<1200N | Ni-based alloy |
|----------|-------|--------|---------|---------|----------|----------|---------|---------|---------|---------|------------|-------------|----------------|
| -        | -     | -      | 120-140 | 120-140 | 120-140  | 50-70    | 50-70   | 50-70   | 70-80   | 50-60   | 70-80      | 60-70       | 20-30          |



16556

## Solid carbide end mill HPC Power INOX

VHM  
TiAlN

HPC

Z4

45°

41°/43°/45°

**ATORN®****Design**

- High-performance tool for roughing/finishing machining tasks with an uneven twist angle
- Face side for centre cutting
- With edge protection chamfer

**Advantage:**

- Maximum machining

**Applications**

For machining VA and materials that are difficult to machine.

DIN  
6535  
HA

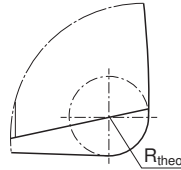
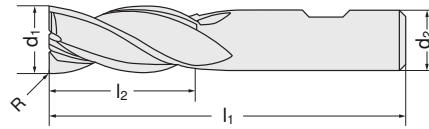
16556 104-120

DIN  
6535  
HB

16556 204-220

DIN  
6535  
HB

16556 306-320



| d <sub>1</sub> (h10)<br>mm | l <sub>2</sub><br>mm | l <sub>3</sub><br>mm | l <sub>1</sub><br>mm | R theo (+0.05)<br>mm | d <sub>3</sub> (h6)<br>mm | DIN 6535 HA |     | DIN 6535 HB |     | DIN 6535 HB with internal cooling |     |
|----------------------------|----------------------|----------------------|----------------------|----------------------|---------------------------|-------------|-----|-------------|-----|-----------------------------------|-----|
|                            |                      |                      |                      |                      |                           | 16556       | ... | 16556       | ... | 16556                             | ... |
| 4.0                        | 8                    | 12                   | 54                   | 0.15                 | 6                         |             | 104 |             | 204 |                                   |     |
| 5.0                        | 10                   | 15                   | 54                   | 0.2                  | 6                         |             | 105 |             | 205 |                                   |     |
| 6.0                        | 13                   | 21                   | 57                   | 0.3                  | 6                         |             | 106 |             | 206 |                                   | 306 |
| 8.0                        | 19                   | 27                   | 63                   | 0.3                  | 8                         |             | 108 |             | 208 |                                   | 308 |
| 10.0                       | 22                   | 32                   | 72                   | 0.3                  | 10                        |             | 110 |             | 210 |                                   | 310 |
| 12.0                       | 26                   | 38                   | 83                   | 0.3                  | 12                        |             | 112 |             | 212 |                                   | 312 |
| 16.0                       | 32                   | 44                   | 92                   | 0.4                  | 16                        |             | 116 |             | 216 |                                   | 316 |
| 20.0                       | 38                   | 54                   | 104                  | 0.4                  | 20                        |             | 120 |             | 220 |                                   | 320 |

| Al<10%Si | Al>10%Si | Cu      | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|----------|----------|---------|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| 300-330  | -        | 250-275 | -       | -       | -       | -        | -        | -        | -      | -      | -      | -      | 100-130 | 100-130 | 30-45    | -     | -       |

Milling tools

16525 - 16526

## Solid carbide premium end mill HPC INOX

VHM  
Duocon

HPC

Z4

45°

35°/38°

35°/38°



Norm

DIN 6535 HA

DIN 6535 HB

VA

**HHW**

## Design

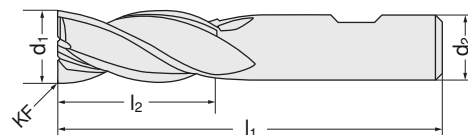
- Specially edge-treated solid carbide HPC end mill with **Duocon coating**
- Uneven twist, uneven pitch
- With the **latest micro-geometry** for INOX processing
- High machining volumes possible
- Additional special feature of the HHW HPC Premium cutter is the face specially optimised for ramping

## Note:

Make sure the tool and workpiece are strongly clamped.

**NEW**

16525 103-120



## Applications

High-performance tool especially for machining stainless steels. For roughing and finishing.

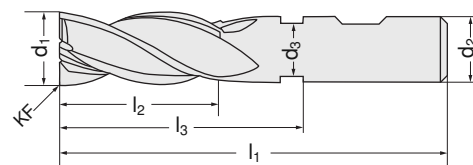
## Short without clearance

| d <sub>1</sub> h10<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | KF x 45°<br>mm | DIN 6535 HA |     | DIN 6535 HB |     |
|--------------------------|----------------------|----------------------|-------------------------|----------------|-------------|-----|-------------|-----|
|                          |                      |                      |                         |                | 16525       | ... | 16525       | ... |
| 3.0                      | 6                    | 54                   | 6                       | 0.06           |             |     | 103         | 203 |
| 4.0                      | 8                    | 54                   | 6                       | 0.08           |             |     | 104         | 204 |
| 5.0                      | 9                    | 54                   | 6                       | 0.10           |             |     | 105         | 205 |
| 6.0                      | 10                   | 54                   | 6                       | 0.13           |             |     | 106         | 206 |
| 8.0                      | 12                   | 58                   | 8                       | 0.15           |             |     | 108         | 208 |
| 10.0                     | 14                   | 66                   | 10                      | 0.20           |             |     | 110         | 210 |
| 12.0                     | 16                   | 73                   | 12                      | 0.25           |             |     | 112         | 212 |
| 16.0                     | 22                   | 82                   | 16                      | 0.35           |             |     | 116         | 216 |
| 20.0                     | 26                   | 92                   | 20                      | 0.40           |             |     | 120         | 220 |

## Long with clearance

**NEW**

16526 203-220



| d <sub>1</sub> h10<br>mm | l <sub>2</sub><br>mm | l <sub>3</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | d <sub>3</sub><br>mm | KF x 45°<br>mm | DIN 6535 HA |     | DIN 6535 HB |     |
|--------------------------|----------------------|----------------------|----------------------|-------------------------|----------------------|----------------|-------------|-----|-------------|-----|
|                          |                      |                      |                      |                         |                      |                | 16526       | ... | 16526       | ... |
| 3.0                      | 8                    | 18                   | 57                   | 6                       | 2.8                  | 0.06           |             |     | 103         | 203 |
| 4.0                      | 11                   | 21                   | 57                   | 6                       | 3.6                  | 0.08           |             |     | 104         | 204 |
| 5.0                      | 13                   | 21                   | 57                   | 6                       | 4.6                  | 0.10           |             |     | 105         | 205 |
| 6.0                      | 13                   | 21                   | 57                   | 6                       | 5.5                  | 0.13           |             |     | 106         | 206 |
| 8.0                      | 19                   | 27                   | 63                   | 8                       | 7.5                  | 0.15           |             |     | 108         | 208 |
| 10.0                     | 22                   | 32                   | 72                   | 10                      | 9.5                  | 0.20           |             |     | 110         | 210 |
| 12.0                     | 26                   | 38                   | 83                   | 12                      | 11.5                 | 0.25           |             |     | 112         | 212 |
| 16.0                     | 32                   | 44                   | 92                   | 16                      | 15.5                 | 0.35           |             |     | 116         | 216 |
| 20.0                     | 38                   | 54                   | 104                  | 20                      | 19.5                 | 0.40           |             |     | 120         | 220 |

| Al<10%Si | Al>10%Si | Cu | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|----------|----------|----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| 16525    | -        | -  | -       | -       | -       | -        | -        | -        | -      | -      | -      | -      | 120     | 100     | -        | -     | -       |
| 16526    | -        | -  | -       | -       | -       | -        | -        | -        | -      | -      | -      | -      | 110     | 80      | -        | -     | -       |



16630

## Solid carbide roughing cutter

TiAlN  
Ultra

HSC

Z4-6

NR

**ATORN®**

## Design

- With clearance and edge protection chamfer
- With centre cutting
- 4-6 cutting edges

## Advantage:

- Maximum machining performance

## Applications

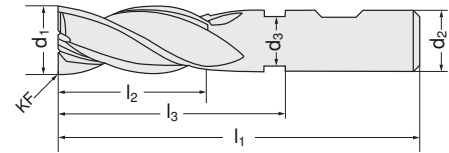
For roughing.

## Quality

Solid carbide ultra-fine grain/TiAlN ultra-coated.



16630



DIN 6535 HA

DIN 6535 HB

| d <sub>1</sub> h9<br>mm | d <sub>2</sub><br>mm | d <sub>3</sub><br>mm | l <sub>1</sub><br>mm | l <sub>3</sub><br>mm | l <sub>2</sub><br>mm | KF<br>mm | Z | DIN 6535 HA<br>16630 | ... | DIN 6535 HB<br>16630 | ... |
|-------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------|---|----------------------|-----|----------------------|-----|
| 6.0                     | 6                    | 5.8                  | 54                   | 16                   | 8                    | 0.1      | 4 |                      | 101 |                      | 201 |
| 6.0                     | 6                    | 5.8                  | 57                   | 19                   | 13                   | 0.1      | 4 |                      | 102 |                      | 202 |
| 8.0                     | 8                    | 7.7                  | 58                   | 20                   | 11                   | 0.2      | 4 |                      | 103 |                      | 203 |
| 8.0                     | 8                    | 7.7                  | 63                   | 25                   | 19                   | 0.2      | 4 |                      | 104 |                      | 204 |
| 10.0                    | 10                   | 9.8                  | 66                   | 24                   | 13                   | 0.2      | 4 |                      | 105 |                      | 205 |
| 10.0                    | 10                   | 9.8                  | 72                   | 30                   | 22                   | 0.2      | 4 |                      | 106 |                      | 206 |
| 12.0                    | 12                   | 11.8                 | 73                   | 26                   | 16                   | 0.2      | 4 |                      | 107 |                      | 207 |
| 12.0                    | 12                   | 11.8                 | 83                   | 36                   | 26                   | 0.2      | 4 |                      | 108 |                      | 208 |
| 16.0                    | 16                   | 15.7                 | 82                   | 32                   | 19                   | 0.3      | 5 |                      | 109 |                      | 209 |
| 16.0                    | 16                   | 15.7                 | 92                   | 42                   | 32                   | 0.3      | 5 |                      | 110 |                      | 210 |
| 20.0                    | 20                   | 19.7                 | 92                   | 40                   | 19                   | 0.3      | 6 |                      | 111 |                      | 211 |
| 20.0                    | 20                   | 19.7                 | 104                  | 52                   | 38                   | 0.3      | 6 |                      | 112 |                      | 212 |

| Al<10%Si | Al>10%Si | Cu      | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1300N | <50HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G)   | Plastic |
|----------|----------|---------|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|---------|---------|
| 300-400  | 300-400  | 120-150 | 135-180 | 135-155 | 135-155 | 120-135  | 70-100   | 70-100   | -      | -      | -      | -      | 40-60   | 40-60   | 30-40    | 100-140 | -       |

16580

## Solid carbide universal cutters

VHM

Z2

**HHW**

## Design

Short, 2 cutting edges, tip angle 90° (+/- 1°), 25° right-hand spiral, straight shank shape A.

## Applications

A new concept for shank tools with a focus on versatility. It allows up to 8 machining operations with just one tool.

## Quality

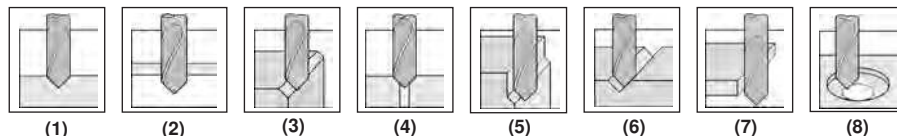
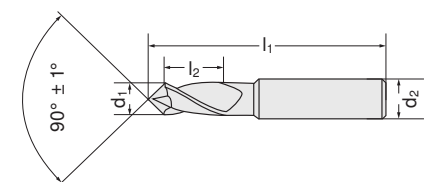
Solid carbide.

## Note:

d<sub>1</sub> 3-10 mm = h<sub>9</sub>,  
d<sub>1</sub> 12-20 mm = d<sub>9</sub>.

- (1) = centring,
- (2) = drilling,
- (3) = combined milling/chamfering,
- (4) = countersinking,
- (5) = chamfering,
- (6) = V-groove milling,
- (7) = circumferential milling,
- (8) = face/circular milling

16580



| d <sub>1</sub><br>mm | l <sub>1</sub><br>mm | l <sub>2</sub><br>mm | d <sub>2</sub> h6<br>mm | VHM<br>16580 | ... | d <sub>1</sub><br>mm | l <sub>1</sub><br>mm | l <sub>2</sub><br>mm | d <sub>2</sub> h6<br>mm | VHM<br>16580 | ... |
|----------------------|----------------------|----------------------|-------------------------|--------------|-----|----------------------|----------------------|----------------------|-------------------------|--------------|-----|
| 3.0                  | 50                   | 7.5                  | 4                       |              | 101 | 10.0                 | 90                   | 23                   | 12                      |              | 106 |
| 4.0                  | 50                   | 10                   | 5                       |              | 102 | 12.0                 | 90                   | 26                   | 12                      |              | 107 |
| 5.0                  | 50                   | 12.5                 | 6                       |              | 103 | 16.0                 | 92                   | 34                   | 16                      |              | 108 |
| 6.0                  | 58                   | 15                   | 8                       |              | 104 | 20.0                 | 100                  | 42                   | 20                      |              | 109 |
| 8.0                  | 72                   | 20                   | 10                      |              | 105 |                      |                      |                      |                         |              |     |

| Al<10%Si | Al>10%Si | Cu     | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <50HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|----------|----------|--------|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| 120-150  | 120-150  | 50-120 | 70-75   | 50-60   | 40-50   | -        | 30-40    | 25-30    | -      | -      | -      | -      | 30-35   | 30-35   | 25-30    | 30-40 | 100-150 |

# Solid carbide engraver's milling cutters | Solid carbide deburring tools | Solid carbide keyway cutters

16575

Solid carbide engraver's milling cutter 60°

VHM  
TiAlN

Z1

60°

DIN  
6535  
HA

N

Norm



**HHW**

Design

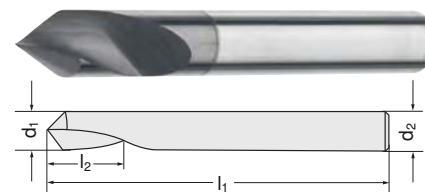
- 1 cutting edge

- With smooth straight shank in accordance with DIN 6535 HA

Applications

For engraving contours.

16575



| d <sub>1</sub> h6<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | 16575 | ... |
|-------------------------|----------------------|----------------------|-------------------------|-------|-----|
| 3.0                     | 10                   | 40                   | 3                       |       | 101 |
| 4.0                     | 10                   | 40                   | 4                       |       | 102 |
| 6.0                     | 10                   | 50                   | 6                       |       | 103 |

| Al<10%Si | Al>10% Si | Cu      | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G)   | Plastic |
|----------|-----------|---------|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|---------|---------|
| 220-240  | 170-200   | 140-160 | 120-140 | 100-120 | 80-100  | 70-80    | 60-70    | 50-60    | -      | -      | -      | -      | 60-70   | 60-70   | -        | 120-140 | 200-240 |

16570 - 16571

Solid carbide 90° deburring tool

Z4-6

90°

DIN  
6535  
HA

DIN  
6535  
HB



**ATORN®**

Design

- Short

- 4-6 cutting edges

- With reinforced straight shank with driving surfaces in accordance with DIN 6535 HB (with Weldon)

- Ø 4 mm with smooth straight shank in accordance with DIN 6535 HA

Note:

Tolerance 90° +/- 2°.

VHM

VHM  
TiAlN



| d <sub>1</sub> h10<br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | Z | Solid carbide<br>16570 | ... | Solid carbide/TiAlN<br>16571 | ... |
|--------------------------|----------------------|-------------------------|---|------------------------|-----|------------------------------|-----|
| 4.0                      | 51                   | 4                       | 4 |                        | 101 |                              | 101 |
| 6.0                      | 64                   | 6                       | 4 |                        | 102 |                              | 102 |
| 8.0                      | 64                   | 8                       | 5 |                        | 103 |                              | 103 |
| 10.0                     | 70                   | 10                      | 6 |                        | 104 |                              | 104 |

| d <sub>1</sub> h10<br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | Z | Solid carbide<br>16570 | ... | Solid carbide/TiAlN<br>16571 | ... |
|--------------------------|----------------------|-------------------------|---|------------------------|-----|------------------------------|-----|
| 12.0                     | 78                   | 12                      | 6 |                        | 105 |                              | 105 |
| 16.0                     | 89                   | 16                      | 6 |                        | 106 |                              | 106 |
| 20.0                     | 104                  | 20                      | 6 |                        | 107 |                              | 107 |

| Al<10%Si | Al>10% Si | Cu      | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G)  | Plastic |
|----------|-----------|---------|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|--------|---------|
| 16570    |           |         |         |         |         |          |          |          |        |        |        |        |         |         |          |        |         |
| 140-160  | 100-120   | 100-120 | 90-120  | 60-80   | 55-60   | 50-55    | 40-50    | -        | -      | -      | -      | -      | 50-60   | 40-50   | 30-60    | 60-80  | -       |
| 16571    |           |         |         |         |         |          |          |          |        |        |        |        |         |         |          |        |         |
| 280-350  | 200-250   | 150-180 | 120-140 | 110-120 | 100-110 | 70-80    | 60-70    | -        | -      | -      | -      | -      | 80-120  | 60-90   | 30-60    | 80-120 | -       |

16573

VHM-Entgrater 60°

VHM  
TiAlN

Z4-6

60°

DIN  
6535  
HA

DIN  
6535  
HB



**ATORN®**

Design

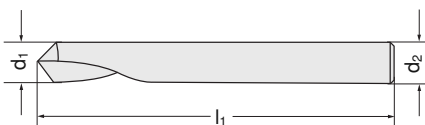
- Short

- 4-6 cutting edges

- With reinforced straight shank with driving surfaces in accordance with DIN 6535 HB (with Weldon)

- Ø 4 mm with smooth straight shank in accordance with DIN 6535 HA

16573



| d <sub>1</sub> h10<br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | Z | Solid carbide/TiAlN<br>16573 | ... |
|--------------------------|----------------------|-------------------------|---|------------------------------|-----|
| 4.0                      | 51                   | 4                       | 4 |                              | 101 |
| 6.0                      | 64                   | 6                       | 4 |                              | 102 |
| 8.0                      | 64                   | 8                       | 5 |                              | 103 |

| d <sub>1</sub> h10<br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | Z | Solid carbide/TiAlN<br>16573 | ... |
|--------------------------|----------------------|-------------------------|---|------------------------------|-----|
| 10.0                     | 70                   | 10                      | 6 |                              | 104 |
| 12.0                     | 78                   | 12                      | 6 |                              | 105 |
| 16.0                     | 89                   | 16                      | 6 |                              | 106 |

| Al<10%Si | Al>10%Si | Cu      | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G)  | Plastic |
|----------|----------|---------|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|--------|---------|
| 280-350  | 200-250  | 150-180 | 120-140 | 110-120 | 100-110 | 70-80    | 60-70    | -        | -      | -      | -      | -      | 80-120  | 60-90   | 30-60    | 80-120 | -       |

16583

## Solid carbide forward/reverse deburring tool

VHM  
TiAlN

Z4

DIN  
6535  
HA

## Design

- 4 cutting edges, 45°

- With smooth straight shank in accordance with DIN 6535 HA

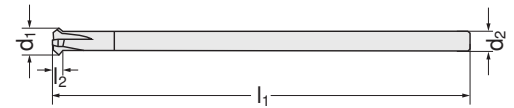
## Applications

For forward/reverse deburring and chamfering.

16583 101-102



16583 103-106



DIN 6535 HA

| d <sub>1</sub> h10<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | AP<br>mm | 16583 | ... |
|--------------------------|----------------------|----------------------|-------------------------|----------|-------|-----|
| 4.0                      | 2                    | 100                  | 6                       | 10       |       | 101 |
| 6.0                      | 2                    | 100                  | 6                       | 15       |       | 102 |
| 8.0                      | 2                    | 100                  | 6                       | -        |       | 103 |

DIN 6535 HA

| d <sub>1</sub> h10<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | AP<br>mm | 16583 | ... |
|--------------------------|----------------------|----------------------|-------------------------|----------|-------|-----|
| 10.0                     | 4                    | 100                  | 6                       | -        |       | 104 |
| 12.0                     | 4                    | 100                  | 6                       | -        |       | 105 |
| 16.0                     | 5                    | 100                  | 10                      | -        |       | 106 |

| Al<10%Si | Al>10%Si | Cu  | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G)  | Plastic |
|----------|----------|-----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|--------|---------|
| 300      | 250      | 250 | 90-120  | 80-120  | 80-100  | 50-80    | 40-70    | 30-35    | -      | -      | -      | -      | 80-120  | 60-90   | 30-60    | 50-100 | -       |

16660

## Solid carbide keyway cutter

## Design

- 6-10 cutting edges

- Right cutting

- Cross-toothed

- For cutting on periphery

## Advantage:

- High machining performance

## Applications

For cutting grooves for disc springs in accordance with DIN 6888.

## Note:

 $f_z$  for  $a_p = 0.25 \times D$ VHM  
Alcrona

Z6-10

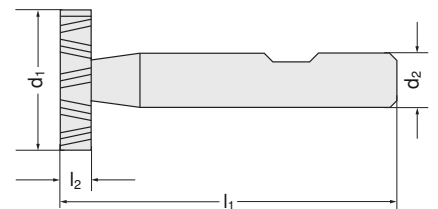
DIN  
1835BDIN  
850

16660



| d <sub>1</sub> (h11) x l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> (h6)<br>mm | Z  | 16660 | ... |
|---------------------------------------------|----------------------|---------------------------|----|-------|-----|
| 10.5 x 2.0                                  | 50                   | 6                         | 6  |       | 101 |
| 10.5 x 3.0                                  | 50                   | 6                         | 6  |       | 102 |
| 13.5 x 2.0                                  | 56                   | 10                        | 8  |       | 103 |
| 13.5 x 3.0                                  | 56                   | 10                        | 8  |       | 104 |
| 13.5 x 4.0                                  | 56                   | 10                        | 8  |       | 115 |
| 16.5 x 3.0                                  | 56                   | 10                        | 10 |       | 105 |
| 16.5 x 4.0                                  | 56                   | 10                        | 10 |       | 106 |
| 19.5 x 3.0                                  | 63                   | 10                        | 10 |       | 107 |
| 19.5 x 4.0                                  | 63                   | 10                        | 10 |       | 108 |
| 22.5 x 4.0                                  | 63                   | 10                        | 10 |       | 109 |
| 25.5 x 5.0                                  | 63                   | 10                        | 10 |       | 110 |
| 28.5 x 5.0                                  | 63                   | 10                        | 10 |       | 111 |
| 32.5 x 5.0                                  | 71                   | 12                        | 10 |       | 112 |
| 38.5 x 10.0                                 | 71                   | 12                        | 10 |       | 113 |
| 45.5 x 10.0                                 | 71                   | 12                        | 10 |       | 114 |

| Al<10%Si | Al>10%Si | Cu | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|----------|----------|----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| -        | -        | -  | 120     | 100     | 90      | 80       | 70       | -        | -      | -      | -      | -      | 80      | -       | -        | 120   | -       |



16661

## Solid carbide T-slot cutter



## Design

- 6 cutting edges
- Right cutting
- Cross-toothed
- For cutting on periphery and end face
- Straight shank with driving surface in accordance with DIN 1835 B

## Advantage:

- High machining performance

## Applications

For milling T-slots.

## Note:

Drive up to full engagement  $f_z$  with 50%.

16661 101-107

## Design

- Type N

16661 201-207

## Design

- Type NF

VHM  
Alcrona

N

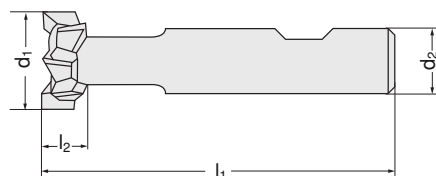
NF

Z 6

DIN  
6535  
HB

DIN  
851


16661



| d <sub>1</sub> (h11)<br>mm | l <sub>2</sub> (h11)<br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> (h6)<br>mm | d <sub>3</sub><br>mm | t <sub>max</sub><br>mm | Type N |     | Type NF |     |
|----------------------------|----------------------------|----------------------|---------------------------|----------------------|------------------------|--------|-----|---------|-----|
|                            |                            |                      |                           |                      |                        | 16661  | ... | 16661   | ... |
| 12.5                       | 6                          | 57                   | 10                        | 5                    | 3.75                   |        | 101 |         | 201 |
| 16.0                       | 8                          | 62                   | 10                        | 7                    | 4.50                   |        | 102 |         | 202 |
| 18.0                       | 8                          | 70                   | 12                        | 8                    | 5.00                   |        | 103 |         | 203 |
| 21.0                       | 9                          | 74                   | 12                        | 10                   | 5.50                   |        | 104 |         | 204 |
| 25.0                       | 11                         | 82                   | 16                        | 12                   | 6.50                   |        | 105 |         | 205 |
| 28.0                       | 12                         | 85                   | 16                        | 13                   | 7.50                   |        | 106 |         | 206 |
| 32.0                       | 14                         | 90                   | 16                        | 15                   | 8.50                   |        | 107 |         | 207 |

| Al<10%Si | Al>10%Si | Cu | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|----------|----------|----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| -        | -        | -  | 120     | 100     | 90      | 80       | 70       | -        | -      | -      | -      | -      | 80      | -       | -        | 120   | -       |

16662

## Solid carbide angle cutter



## Design

- 6-9 cutting edges
- Right cutting
- Straight shank with driving surface in accordance with DIN 1835 B

## Applications

For cutting angle grooves (slide guideways etc.).

## Note:

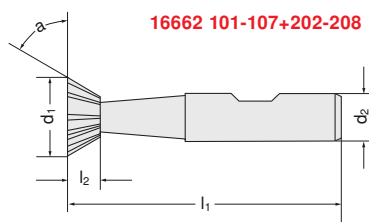
Drive up to full engagement  $f_z$  with 50%.

16662 101-107

## Design

- Shape C

- Cutting edge tapering in the direction of the shank
- For cutting on periphery and end face
- $\alpha = 45^\circ$



16662 101-107+202-208

16662 202-208

## Design

- Shape C

- Cutting edge tapering in the direction of the shank
- For cutting on periphery and end face
- $\alpha = 60^\circ$

16662 301-307

## Design

- Shape D

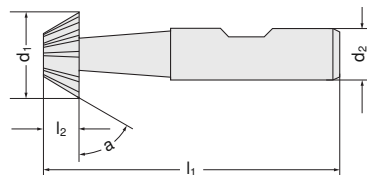
- Cutting edge tapering in the direction of the end face
- Only cuts on periphery
- $\alpha = 45^\circ$

16662 401-407

## Design

- Shape D

- Cutting edge tapering in the direction of the end face
- Only cuts on periphery
- $\alpha = 60^\circ$

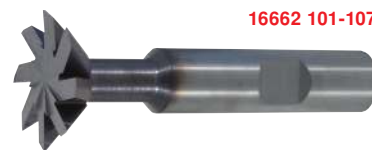


16662 301-307+401-407

VHM  
Alcrona

Z 6-9

DIN  
6535  
HB

DIN  
1833C


16662 101-107

DIN  
1833C


16662 202-208

DIN  
1833D


16662 301-307

DIN  
1833D


16662 401-407

| d <sub>1</sub> (js16)<br>mm | 45°                  |                      | l <sub>1</sub><br>mm | d <sub>2</sub> (h6)<br>mm | Z | 45° / C |     | 60° / C |     | 45° / D |     | 60° / D |     |
|-----------------------------|----------------------|----------------------|----------------------|---------------------------|---|---------|-----|---------|-----|---------|-----|---------|-----|
|                             | l <sub>2</sub><br>mm | l <sub>2</sub><br>mm |                      |                           |   | 16662   | ... | 16662   | ... | 16662   | ... | 16662   | ... |
| 16                          | 4.0                  | 6.3                  | 60                   | 10                        | 6 |         | 101 |         | 202 |         | 301 |         | 401 |
| 20                          | 5.0                  | 8.0                  | 63                   | 12                        | 8 |         | 102 |         | 203 |         | 302 |         | 402 |
| 22                          | 6.0                  | 9.0                  | 67                   | 12                        | 8 |         | 103 |         | 204 |         | 303 |         | 403 |
| 25                          | 6.3                  | 10.0                 | 67                   | 12                        | 8 |         | 104 |         | 205 |         | 304 |         | 404 |
| 28                          | 7.5                  | 11.0                 | 80                   | 16                        | 9 |         | 105 |         | 206 |         | 305 |         | 405 |
| 32                          | 8.0                  | 12.5                 | 71                   | 16                        | 9 |         | 106 |         | 207 |         | 306 |         | 406 |
| 38                          | 10.0                 | 16.0                 | 80                   | 16                        | 9 |         | 107 |         | 208 |         | 307 |         | 407 |

| Al<10%Si | Al>10%Si | Cu | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|----------|----------|----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| -        | -        | -  | 120     | 100     | 90      | 80       | 70       | -        | -      | -      | -      | -      | 80      | -       | -        | 120   | -       |

16658

## Solid carbide quarter circle cutter

VHM  
TiAlN

Z4



H+W

## Design

- 4 cutting edges
- Straight-grooved
- With smooth straight shank in accordance with DIN 6535 HA
- Radius tolerance +/- 0.01 mm

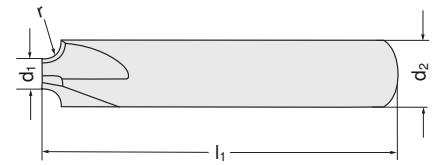
## Applications

For materials up to HRC 45. For rounding and deburring of edges and contours. For high-strength materials as well as for aluminium and non-ferrous metals.

## Quality

Universal carbide ultra-fine grain (P 20 - K 40)  
TiAlN-coated.

16658



| Radius | d <sub>1</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub><br>mm | 16658 | ... |
|--------|----------------------|----------------------|----------------------|-------|-----|
| 0.2    | 5.6                  | 58                   | 6                    |       | 102 |
| 0.3    | 5.4                  | 58                   | 6                    |       | 103 |
| 0.5    | 7.0                  | 70                   | 8                    |       | 105 |
| 1.0    | 6.0                  | 70                   | 8                    |       | 110 |
| 1.5    | 7.0                  | 75                   | 10                   |       | 115 |
| 2.0    | 6.0                  | 75                   | 10                   |       | 120 |
| 2.5    | 7.0                  | 75                   | 12                   |       | 125 |
| 3.0    | 6.0                  | 75                   | 12                   |       | 130 |
| 3.5    | 9.0                  | 80                   | 16                   |       | 135 |
| 4.0    | 8.0                  | 80                   | 16                   |       | 140 |
| 4.5    | 7.0                  | 80                   | 16                   |       | 145 |
| 5.0    | 10.0                 | 80                   | 20                   |       | 150 |
| 6.0    | 8.0                  | 80                   | 20                   |       | 160 |

| Al<10%Si | Al>10%Si | Cu     | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G)  | Plastic |
|----------|----------|--------|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|--------|---------|
| 120-600  | 100-400  | 80-250 | 60-150  | 50-120  | 50-100  | 40-90    | 40-80    | 30-70    | 55-75  | -      | -      | -      | 30-80   | 20-70   | 20-60    | 60-130 | -       |

16710

## Solid carbide mini end mills

VHM  
ZrCN Ultra-N

HSC

Z2



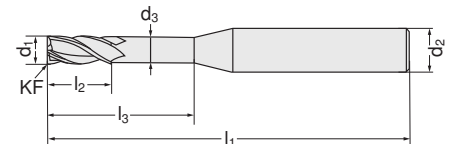
ATORN®

## Design

- With edge chamfer

| d <sub>1</sub> (e8)<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | l <sub>3</sub><br>mm | d <sub>3</sub><br>mm | d <sub>2</sub> (h5)<br>mm | KF<br>mm | 16710 | ... |
|---------------------------|----------------------|----------------------|----------------------|----------------------|---------------------------|----------|-------|-----|
| 0.5                       | 0.9                  | 55                   | 4                    | 0.48                 | 4                         | 0.05     |       | 101 |
| 0.5                       | 0.9                  | 65                   | 6                    | 0.48                 | 4                         | 0.05     |       | 102 |
| 0.5                       | 0.9                  | 65                   | 10                   | 0.48                 | 4                         | 0.05     |       | 103 |
| 1.0                       | 1.5                  | 55                   | 5                    | 0.95                 | 4                         | 0.10     |       | 104 |
| 1.0                       | 1.5                  | 65                   | 10                   | 0.95                 | 4                         | 0.10     |       | 105 |
| 1.0                       | 1.5                  | 65                   | 15                   | 0.95                 | 4                         | 0.10     |       | 106 |
| 1.5                       | 1.8                  | 55                   | 8                    | 1.44                 | 4                         | 0.10     |       | 107 |
| 1.5                       | 1.8                  | 65                   | 15                   | 1.44                 | 4                         | 0.10     |       | 108 |
| 1.5                       | 1.8                  | 65                   | 20                   | 1.44                 | 4                         | 0.10     |       | 109 |
| 2.0                       | 2.0                  | 55                   | 10                   | 1.92                 | 4                         | 0.10     |       | 110 |
| 2.0                       | 2.0                  | 65                   | 20                   | 1.92                 | 4                         | 0.10     |       | 111 |
| 2.5                       | 2.5                  | 55                   | 12                   | 2.40                 | 4                         | 0.10     |       | 112 |
| 2.5                       | 2.5                  | 65                   | 20                   | 2.40                 | 4                         | 0.10     |       | 113 |

| Al <10%Si | Al >10%Si | Cu long-chipping | Cu short-chipping | Duroplast | Thermoplastic | CFRP, GFRP |
|-----------|-----------|------------------|-------------------|-----------|---------------|------------|
| 400-450   | 180-320   | 250-420          | 180-320           | 300-450   | 400-550       | 250-420    |



16710

# Solid carbide mini torus milling cutters | Solid carbide mini radius cutters | Solid carbide single-tooth milling cutters | Solid carbide end mills

16711

## Solid carbide mini torus milling cutter

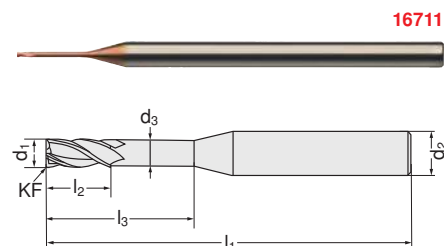
**ATORN®**

Design  
Radius tolerance 0/-0.015



| d <sub>1</sub> (e8)<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | l <sub>3</sub><br>mm | d <sub>3</sub><br>mm | d <sub>2</sub> (h5)<br>mm | R<br>mm | 16711 | ... |
|---------------------------|----------------------|----------------------|----------------------|----------------------|---------------------------|---------|-------|-----|
| 0.5                       | 0.9                  | 55                   | 4                    | 0.48                 | 4                         | 0.05    | 101   |     |
| 0.5                       | 0.9                  | 65                   | 6                    | 0.48                 | 4                         | 0.05    | 102   |     |
| 0.5                       | 0.9                  | 65                   | 10                   | 0.48                 | 4                         | 0.08    | 103   |     |
| 1.0                       | 1.5                  | 55                   | 5                    | 0.95                 | 4                         | 0.08    | 104   |     |
| 1.0                       | 1.5                  | 65                   | 10                   | 0.95                 | 4                         | 0.10    | 105   |     |
| 1.0                       | 1.5                  | 65                   | 15                   | 0.95                 | 4                         | 0.10    | 106   |     |
| 1.5                       | 1.8                  | 55                   | 8                    | 1.44                 | 4                         | 0.12    | 107   |     |
| 1.5                       | 1.8                  | 65                   | 15                   | 1.44                 | 4                         | 0.15    | 108   |     |
| 1.5                       | 1.8                  | 65                   | 20                   | 1.44                 | 4                         | 0.15    | 109   |     |
| 2.0                       | 2.0                  | 55                   | 10                   | 1.92                 | 4                         | 0.20    | 110   |     |
| 2.0                       | 2.0                  | 65                   | 20                   | 1.92                 | 4                         | 0.20    | 111   |     |
| 2.5                       | 2.5                  | 55                   | 12                   | 2.40                 | 4                         | 0.25    | 112   |     |
| 2.5                       | 2.5                  | 65                   | 20                   | 2.40                 | 4                         | 0.25    | 113   |     |

| Al <10%Si | Al >10%Si | Cu long-chipping | Cu short-chipping | Duroplast | Thermoplastic | CFRP, GFRP |
|-----------|-----------|------------------|-------------------|-----------|---------------|------------|
| 400-450   | 180-320   | 250-420          | 180-320           | 300-450   | 400-550       | 250-420    |



16712

## Solid carbide mini radius cutters

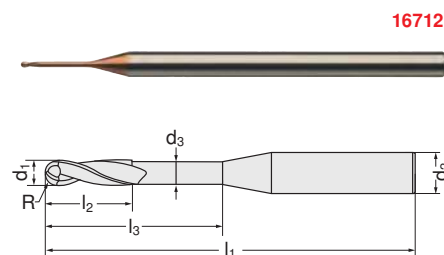
**ATORN®**

Design  
Radius tolerance +/-0.01



| d <sub>1</sub> (h9)<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | l <sub>3</sub><br>mm | d <sub>3</sub><br>mm | d <sub>2</sub> (h5)<br>mm | R<br>mm | 16712 | ... |
|---------------------------|----------------------|----------------------|----------------------|----------------------|---------------------------|---------|-------|-----|
| 0.5                       | 0.9                  | 55                   | 4                    | 0.48                 | 4                         | 0.25    | 101   |     |
| 0.5                       | 0.9                  | 65                   | 6                    | 0.48                 | 4                         | 0.25    | 102   |     |
| 0.5                       | 0.9                  | 65                   | 10                   | 0.48                 | 4                         | 0.25    | 103   |     |
| 1.0                       | 1.5                  | 55                   | 5                    | 0.95                 | 4                         | 0.50    | 104   |     |
| 1.0                       | 1.5                  | 65                   | 10                   | 0.95                 | 4                         | 0.50    | 105   |     |
| 1.0                       | 1.5                  | 65                   | 15                   | 0.95                 | 4                         | 0.50    | 106   |     |
| 1.5                       | 1.8                  | 55                   | 8                    | 1.44                 | 4                         | 0.75    | 107   |     |
| 1.5                       | 1.8                  | 65                   | 15                   | 1.44                 | 4                         | 0.75    | 108   |     |
| 1.5                       | 1.8                  | 65                   | 20                   | 1.44                 | 4                         | 0.75    | 109   |     |
| 2.0                       | 2.0                  | 55                   | 10                   | 1.92                 | 4                         | 1.00    | 110   |     |
| 2.0                       | 2.0                  | 65                   | 20                   | 1.92                 | 4                         | 1.00    | 111   |     |
| 2.5                       | 2.5                  | 55                   | 12                   | 2.40                 | 4                         | 1.75    | 112   |     |
| 2.5                       | 2.5                  | 65                   | 20                   | 2.40                 | 4                         | 1.75    | 113   |     |

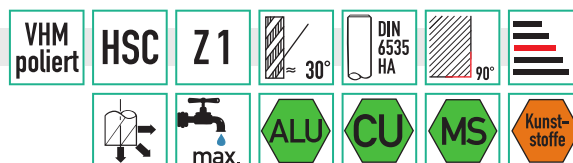
| Al <10%Si | Al >10%Si | Cu long-chipping | Cu short-chipping | Duroplast | Thermoplastic | CFRP, GFRP |
|-----------|-----------|------------------|-------------------|-----------|---------------|------------|
| 400-450   | 180-320   | 250-420          | 180-320           | 300-450   | 400-550       | 250-420    |



16715

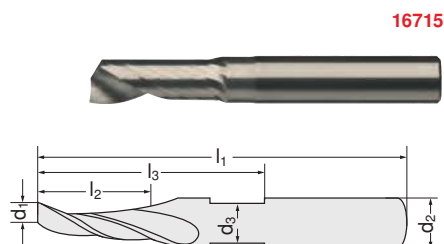
## Solid carbide single-tooth cutters

**ATORN®**



| d <sub>1</sub> (h9)<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | l <sub>3</sub><br>mm | d <sub>3</sub><br>mm | d <sub>2</sub> (h5)<br>mm | 16715 | ... |
|---------------------------|----------------------|----------------------|----------------------|----------------------|---------------------------|-------|-----|
| 1.5                       | 6                    | 50                   | 22                   | 1.45                 | 3                         | 101   |     |
| 2.0                       | 8                    | 50                   | 22                   | 1.80                 | 3                         | 102   |     |
| 3.0                       | 12                   | 50                   | 22                   | 2.80                 | 3                         | 103   |     |
| 4.0                       | 15                   | 57                   | 29                   | 3.80                 | 4                         | 104   |     |
| 5.0                       | 17                   | 60                   | 32                   | 4.80                 | 5                         | 105   |     |
| 6.0                       | 20                   | 64                   | 28                   | 5.80                 | 6                         | 106   |     |
| 8.0                       | 24                   | 64                   | 28                   | 7.80                 | 8                         | 107   |     |
| 10.0                      | 25                   | 73                   | 33                   | 9.70                 | 10                        | 108   |     |
| 12.0                      | 32                   | 84                   | 39                   | 11.70                | 12                        | 109   |     |
| 16.0                      | 38                   | 93                   | 45                   | 15.70                | 16                        | 110   |     |

| Al <10%Si | Al >10%Si | Cu long-chipping | Cu short-chipping | Duroplast | Thermoplastic | CFRP, GFRP |
|-----------|-----------|------------------|-------------------|-----------|---------------|------------|
| 350-500   | 150-250   | 200-350          | 150-250           | 250-400   | 350-500       | 200-350    |



16717

## Solid carbide end mill

**ATORN®**

Design

- With edge chamfer

| d <sub>1</sub> (h9)<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | l <sub>3</sub><br>mm | d <sub>3</sub><br>mm | d <sub>2</sub> (h5)<br>mm | KF<br>mm | 16717 | ... |
|---------------------------|----------------------|----------------------|----------------------|----------------------|---------------------------|----------|-------|-----|
| 3.0                       | 8                    | 57                   | 18                   | 2.90                 | 6                         | 0.1      |       | 101 |
| 4.0                       | 11                   | 57                   | 18                   | 3.90                 | 6                         | 0.1      |       | 102 |
| 5.0                       | 13                   | 57                   | 20                   | 4.90                 | 6                         | 0.1      |       | 103 |
| 6.0                       | 13                   | 57                   | 20                   | 5.80                 | 6                         | 0.1      |       | 104 |
| 8.0                       | 19                   | 63                   | 26                   | 7.80                 | 8                         | 0.1      |       | 105 |
| 10.0                      | 22                   | 72                   | 29                   | 9.70                 | 10                        | 0.2      |       | 106 |
| 12.0                      | 26                   | 83                   | 36                   | 11.70                | 12                        | 0.2      |       | 107 |
| 16.0                      | 32                   | 92                   | 42                   | 15.70                | 16                        | 0.2      |       | 108 |
| 20.0                      | 38                   | 104                  | 52                   | 19.70                | 20                        | 0.2      |       | 109 |

|           |           |                  |                   |           |               |            |
|-----------|-----------|------------------|-------------------|-----------|---------------|------------|
| Al <10%Si | Al >10%Si | Cu long-chipping | Cu short-chipping | Duroplast | Thermoplastic | CFRP, GFRP |
| 300-400   | 120-200   | 160-300          | 120-200           | 200-250   | 300-400       | 160-300    |

VHM  
poliert

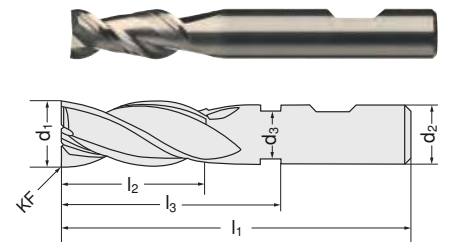
HSC

Z 2

≈ 45°

DIN  
6535  
HB

≈ 45°



16717

16718 - 16719

## Solid carbide end mill

**ATORN®**

Design

- With edge chamfer

| d <sub>1</sub> (h9)<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | l <sub>3</sub><br>mm | d <sub>3</sub><br>mm | d <sub>2</sub> (h5)<br>mm | KF<br>mm | 16718 | ... | 16719 | ... |
|---------------------------|----------------------|----------------------|----------------------|----------------------|---------------------------|----------|-------|-----|-------|-----|
| 3.0                       | 8                    | 57                   | 18                   | 2.9                  | 6                         | 0.1      |       | 101 |       | 101 |
| 4.0                       | 11                   | 57                   | 18                   | 3.9                  | 6                         | 0.1      |       | 102 |       | 102 |
| 5.0                       | 13                   | 57                   | 20                   | 4.9                  | 6                         | 0.1      |       | 103 |       | 103 |
| 6.0                       | 13                   | 57                   | 20                   | 5.8                  | 6                         | 0.1      |       | 104 |       | 104 |
| 8.0                       | 19                   | 63                   | 26                   | 7.8                  | 8                         | 0.1      |       | 105 |       | 105 |
| 10.0                      | 22                   | 72                   | 29                   | 9.7                  | 10                        | 0.2      |       | 106 |       | 106 |
| 12.0                      | 26                   | 83                   | 36                   | 11.7                 | 12                        | 0.2      |       | 107 |       | 107 |
| 16.0                      | 32                   | 92                   | 42                   | 15.7                 | 16                        | 0.2      |       | 108 |       | 108 |

|           |           |                  |                   |           |               |            |
|-----------|-----------|------------------|-------------------|-----------|---------------|------------|
| Al <10%Si | Al >10%Si | Cu long-chipping | Cu short-chipping | Duroplast | Thermoplastic | CFRP, GFRP |
| 350-500   | 150-250   | 200-350          | 150-250           | 250-400   | 250-500       | 200-350    |

VHM  
ZrCN Ultra-V

HSC

Z 2

≈ 45°

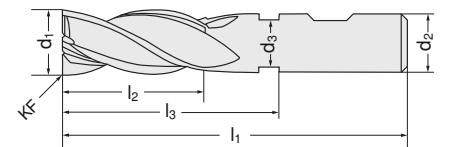
≈ 45°

DIN  
6535  
HA

16718

DIN  
6535  
HB

16719



16722 - 16724

## Solid carbide end mill

**ATORN®**

Design

- With edge chamfer

| d <sub>1</sub> (h9)<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | l <sub>3</sub><br>mm | d <sub>3</sub><br>mm | d <sub>2</sub> (h5)<br>mm | KF<br>mm | 16722 | ... | 16724 | ... |
|---------------------------|----------------------|----------------------|----------------------|----------------------|---------------------------|----------|-------|-----|-------|-----|
| 3.0                       | 12                   | 57                   | 16                   | 2.8                  | 6                         | 0.1      |       | 101 |       | 101 |
| 4.0                       | 12                   | 57                   | 18                   | 3.8                  | 6                         | 0.1      |       | 102 |       | 102 |
| 5.0                       | 15                   | 57                   | 18                   | 4.7                  | 6                         | 0.1      |       | 103 |       | 103 |
| 6.0                       | 16                   | 57                   | 21                   | 5.6                  | 6                         | 0.1      |       | 104 |       | 104 |
| 8.0                       | 22                   | 64                   | 28                   | 7.6                  | 8                         | 0.1      |       | 105 |       | 105 |
| 10.0                      | 25                   | 73                   | 33                   | 9.6                  | 10                        | 0.2      |       | 106 |       | 106 |
| 12.0                      | 28                   | 84                   | 39                   | 11.4                 | 12                        | 0.2      |       | 107 |       | 107 |
| 16.0                      | 35                   | 93                   | 45                   | 15.4                 | 16                        | 0.2      |       | 108 |       | 108 |
| 20.0                      | 40                   | 104                  | 54                   | 19.4                 | 20                        | 0.2      |       | 109 |       | 109 |

|           |           |                  |                   |           |               |            |
|-----------|-----------|------------------|-------------------|-----------|---------------|------------|
| Al <10%Si | Al >10%Si | Cu long-chipping | Cu short-chipping | Duroplast | Thermoplastic | CFRP, GFRP |
| 300-450   | 125-200   | 175-300          | 175-300           | 200-350   | 300-450       | 175-300    |

VHM  
poliert

HSC

Z 3

≈ 45°

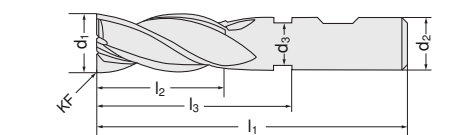
≈ 45°

DIN  
6535  
HA

16722

DIN  
6535  
HB

16724



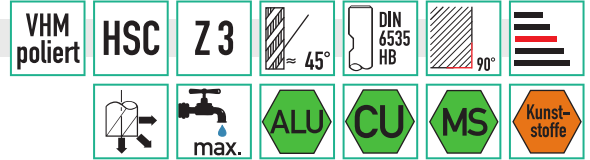
## Solid carbide end mill

16725

### Solid carbide end mill

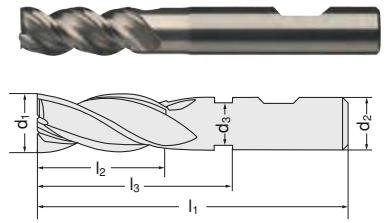
**ATORN®**

Design  
- Sharp-edged



| d <sub>1</sub> (h9)<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | l <sub>3</sub><br>mm | d <sub>3</sub><br>mm | d <sub>2</sub> (h5)<br>mm | 16725 | ... |
|---------------------------|----------------------|----------------------|----------------------|----------------------|---------------------------|-------|-----|
| 3.0                       | 12                   | 57                   | 16                   | 2.8                  | 6                         |       | 101 |
| 4.0                       | 12                   | 57                   | 18                   | 3.8                  | 6                         |       | 102 |
| 5.0                       | 15                   | 57                   | 18                   | 4.7                  | 6                         |       | 103 |
| 6.0                       | 16                   | 57                   | 21                   | 5.6                  | 6                         |       | 104 |
| 8.0                       | 22                   | 64                   | 28                   | 7.6                  | 8                         |       | 105 |
| 10.0                      | 25                   | 73                   | 33                   | 9.6                  | 10                        |       | 106 |
| 12.0                      | 28                   | 84                   | 39                   | 11.4                 | 12                        |       | 107 |
| 16.0                      | 35                   | 93                   | 45                   | 15.4                 | 16                        |       | 108 |
| 20.0                      | 40                   | 104                  | 54                   | 19.4                 | 20                        |       | 109 |

| Al <10%Si | Al >10%Si | Cu long-chipping | Cu short-chipping | Duroplast | Thermoplastic | CFRP, GFRP |
|-----------|-----------|------------------|-------------------|-----------|---------------|------------|
| 300-450   | 125-200   | 175-300          | 175-300           | 200-350   | 300-450       | 175-300    |

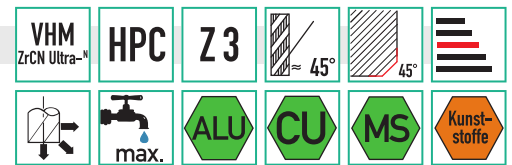


16726 - 16727

### Solid carbide end mill

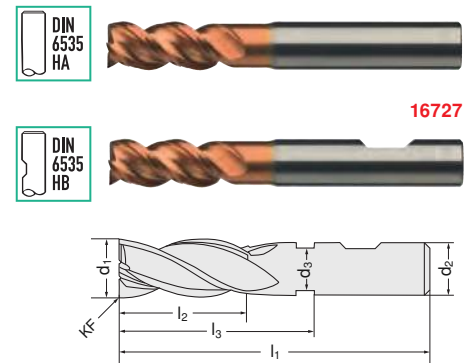
**ATORN®**

Design  
- With edge chamfer



| d <sub>1</sub> (h9)<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | l <sub>3</sub><br>mm | d <sub>3</sub><br>mm | d <sub>2</sub> (h5)<br>mm | KF<br>mm | 16726 | ... | 16727 | ... |
|---------------------------|----------------------|----------------------|----------------------|----------------------|---------------------------|----------|-------|-----|-------|-----|
| 3.0                       | 12                   | 57                   | 16                   | 2.8                  | 6                         | 0.1      |       |     | 101   | 101 |
| 4.0                       | 12                   | 57                   | 18                   | 3.8                  | 6                         | 0.1      |       |     | 102   | 102 |
| 5.0                       | 15                   | 57                   | 18                   | 4.7                  | 6                         | 0.1      |       |     | 103   | 103 |
| 6.0                       | 16                   | 57                   | 21                   | 5.6                  | 6                         | 0.1      |       |     | 104   | 104 |
| 8.0                       | 22                   | 64                   | 28                   | 7.6                  | 8                         | 0.1      |       |     | 105   | 105 |
| 10.0                      | 25                   | 73                   | 33                   | 9.6                  | 10                        | 0.2      |       |     | 106   | 106 |
| 12.0                      | 28                   | 84                   | 39                   | 11.4                 | 12                        | 0.2      |       |     | 107   | 107 |
| 16.0                      | 35                   | 93                   | 45                   | 15.4                 | 16                        | 0.2      |       |     | 108   | 108 |
| 20.0                      | 40                   | 104                  | 54                   | 19.4                 | 20                        | 0.2      |       |     | 109   | 109 |

| Al <10%Si | Al >10%Si | Cu long-chipping | Cu short-chipping | Duroplast | Thermoplastic | CFRP, GFRP |
|-----------|-----------|------------------|-------------------|-----------|---------------|------------|
| 350-500   | 150-250   | 200-350          | 150-250           | 250-400   | 350-500       | 200-350    |



16728

### Solid carbide end mill

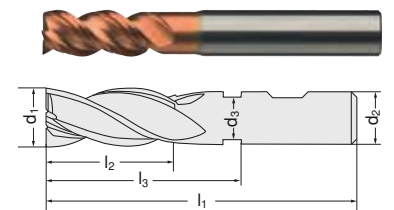
**ATORN®**

Design  
- Sharp-edged



| d <sub>1</sub> (h9)<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | l <sub>3</sub><br>mm | d <sub>3</sub><br>mm | d <sub>2</sub> (h5)<br>mm | 16728 | ... |
|---------------------------|----------------------|----------------------|----------------------|----------------------|---------------------------|-------|-----|
| 3.0                       | 12                   | 57                   | 16                   | 2.8                  | 6                         |       | 101 |
| 4.0                       | 12                   | 57                   | 18                   | 3.8                  | 6                         |       | 102 |
| 5.0                       | 15                   | 57                   | 18                   | 4.7                  | 6                         |       | 103 |
| 6.0                       | 16                   | 57                   | 21                   | 5.6                  | 6                         |       | 104 |
| 8.0                       | 22                   | 64                   | 28                   | 7.6                  | 8                         |       | 105 |
| 10.0                      | 25                   | 73                   | 33                   | 9.6                  | 10                        |       | 106 |
| 12.0                      | 28                   | 84                   | 39                   | 11.4                 | 12                        |       | 107 |
| 16.0                      | 35                   | 93                   | 45                   | 15.4                 | 16                        |       | 108 |
| 20.0                      | 40                   | 104                  | 54                   | 19.4                 | 20                        |       | 109 |

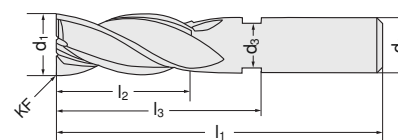
| Al <10%Si | Al >10%Si | Cu long-chipping | Cu short-chipping | Duroplast | Thermoplastic | CFRP, GFRP |
|-----------|-----------|------------------|-------------------|-----------|---------------|------------|
| 350-500   | 150-250   | 200-350          | 150-250           | 250-400   | 350-500       | 200-350    |



**16729 - 16730**
**Solid carbide end mill**
**ATORN®**
**Design**

- With edge chamfer


**VHM poliert** **HSC**
**16729**

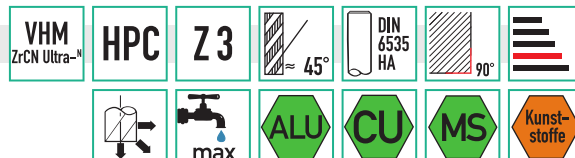
**VHM ZrCN Ultra-N** **HPC**
**16730**


| d <sub>1</sub> (h9)<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | l <sub>3</sub><br>mm | d <sub>3</sub><br>mm | d <sub>2</sub> (h5)<br>mm | KF<br>mm | 16729 | ... | 16730 | ... |
|---------------------------|----------------------|----------------------|----------------------|----------------------|---------------------------|----------|-------|-----|-------|-----|
| 3.0                       | 15                   | 64                   | 21                   | 2.8                  | 6                         | 0.1      |       |     | 101   | 101 |
| 4.0                       | 19                   | 64                   | 27                   | 3.8                  | 6                         | 0.1      |       |     | 102   | 102 |
| 5.0                       | 20                   | 64                   | 28                   | 4.7                  | 6                         | 0.1      |       |     | 103   | 103 |
| 6.0                       | 20                   | 64                   | 28                   | 5.6                  | 6                         | 0.1      |       |     | 104   | 104 |
| 8.0                       | 38                   | 80                   | 44                   | 7.6                  | 8                         | 0.1      |       |     | 105   | 105 |
| 10.0                      | 45                   | 95                   | 55                   | 9.6                  | 10                        | 0.2      |       |     | 106   | 106 |
| 12.0                      | 53                   | 100                  | 55                   | 11.4                 | 12                        | 0.2      |       |     | 107   | 107 |
| 16.0                      | 63                   | 123                  | 75                   | 15.4                 | 16                        | 0.2      |       |     | 108   | 108 |
| 20.0                      | 65                   | 125                  | 75                   | 19.4                 | 20                        | 0.2      |       |     | 109   | 109 |

|           |           |                  |                   |           |               |            |
|-----------|-----------|------------------|-------------------|-----------|---------------|------------|
| Al <10%Si | Al >10%Si | Cu long-chipping | Cu short-chipping | Duroplast | Thermoplastic | CFRP, GFRP |
| 300-450   | 125-200   | 175-300          | 175-300           | 200-350   | 300-450       | 175-300    |

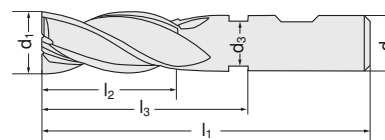
**16731**
**Solid carbide end mill**
**ATORN®**
**Design**

- Sharp-edged



| d <sub>1</sub> (h9)<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | l <sub>3</sub><br>mm | d <sub>3</sub><br>mm | d <sub>2</sub> (h5)<br>mm | 16731 | ... |
|---------------------------|----------------------|----------------------|----------------------|----------------------|---------------------------|-------|-----|
| 3.0                       | 15                   | 64                   | 21                   | 2.8                  | 6                         |       | 101 |
| 4.0                       | 19                   | 64                   | 27                   | 3.8                  | 6                         |       | 102 |
| 5.0                       | 20                   | 64                   | 28                   | 4.7                  | 6                         |       | 103 |
| 6.0                       | 20                   | 64                   | 28                   | 5.6                  | 6                         |       | 104 |
| 8.0                       | 38                   | 80                   | 44                   | 7.6                  | 8                         |       | 105 |
| 10.0                      | 45                   | 95                   | 55                   | 9.6                  | 10                        |       | 106 |
| 12.0                      | 53                   | 100                  | 55                   | 11.4                 | 12                        |       | 107 |
| 16.0                      | 63                   | 123                  | 75                   | 15.4                 | 16                        |       | 108 |
| 20.0                      | 65                   | 125                  | 75                   | 19.4                 | 20                        |       | 109 |

|           |           |                  |                   |           |               |            |
|-----------|-----------|------------------|-------------------|-----------|---------------|------------|
| Al <10%Si | Al >10%Si | Cu long-chipping | Cu short-chipping | Duroplast | Thermoplastic | CFRP, GFRP |
| 350-500   | 150-250   | 200-350          | 150-250           | 250-400   | 350-500       | 200-350    |



16758

## Solid carbide roughing cutter

**HHW**

## Design

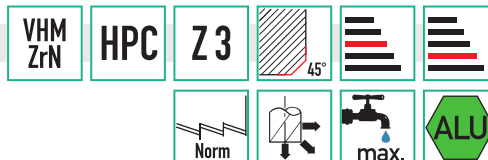
- Robust roughing cutter with reinforced core
- Before and after coating polished chip spaces and special edge treatment

## Advantage:

- Titanium-free ZrN coating for best sliding properties developed for aluminium processing.
- Maximum machining performance and unbeatable surface quality

## Applications

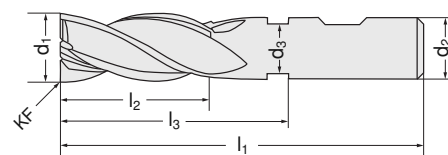
For roughing with the highest standards.



16758 103-125



16758 203-225



| Short                     |                      |                      |                      |                      |                           |          | DIN 1835 HA |     | DIN 1835 HB |     |
|---------------------------|----------------------|----------------------|----------------------|----------------------|---------------------------|----------|-------------|-----|-------------|-----|
| d <sub>1</sub> (h9)<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | l <sub>3</sub><br>mm | d <sub>3</sub><br>mm | d <sub>2</sub> (h5)<br>mm | KF<br>mm | 16758       | ... | 16758       | ... |
| 3.0                       | 8                    | 57                   | 12                   | 2.8                  | 6                         | 0.1      |             | 103 |             | 203 |
| 4.0                       | 11                   | 57                   | 18                   | 3.8                  | 6                         | 0.1      |             | 104 |             | 204 |
| 5.0                       | 13                   | 57                   | 18                   | 4.8                  | 6                         | 0.1      |             | 105 |             | 205 |
| 6.0                       | 13                   | 57                   | 18                   | 5.8                  | 6                         | 0.2      |             | 106 |             | 206 |
| 8.0                       | 21                   | 63                   | 25                   | 7.8                  | 8                         | 0.2      |             | 108 |             | 208 |
| 10.0                      | 22                   | 72                   | 30                   | 9.7                  | 10                        | 0.2      |             | 110 |             | 210 |
| 12.0                      | 26                   | 83                   | 36                   | 11.7                 | 12                        | 0.2      |             | 112 |             | 212 |
| 16.0                      | 36                   | 92                   | 42                   | 15.7                 | 16                        | 0.2      |             | 116 |             | 216 |
| 18.0                      | 36                   | 92                   | 42                   | 17.6                 | 18                        | 0.2      |             | 118 |             | 218 |
| 20.0                      | 41                   | 104                  | 52                   | 19.5                 | 20                        | 0.2      |             | 120 |             | 220 |
| 25.0                      | 50                   | 125                  | 65                   | 24.5                 | 25                        | 0.3      |             | 125 |             | 225 |

| Long                      |                      |                      |                      |                      |                           |          | DIN 1835 HA |     | DIN 1835 HB |     |
|---------------------------|----------------------|----------------------|----------------------|----------------------|---------------------------|----------|-------------|-----|-------------|-----|
| d <sub>1</sub> (h9)<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | l <sub>3</sub><br>mm | d <sub>3</sub><br>mm | d <sub>2</sub> (h5)<br>mm | KF<br>mm | 16758       | ... | 16758       | ... |
| 6.0                       | 13                   | 80                   | 42                   | 5.8                  | 6                         | 0.2      |             | 306 |             | 406 |
| 8.0                       | 21                   | 100                  | 62                   | 7.8                  | 8                         | 0.2      |             | 308 |             | 408 |
| 10.0                      | 22                   | 100                  | 58                   | 9.7                  | 10                        | 0.2      |             | 310 |             | 410 |
| 12.0                      | 26                   | 120                  | 73                   | 11.7                 | 12                        | 0.2      |             | 312 |             | 412 |
| 16.0                      | 36                   | 150                  | 100                  | 15.7                 | 16                        | 0.2      |             | 316 |             | 416 |
| 20.0                      | 41                   | 150                  | 98                   | 19.5                 | 20                        | 0.2      |             | 320 |             | 420 |

| Al <10%Si | Al >10%Si | Cu long-chipping | Cu short-chipping | Duroplast | Thermoplastic | CFRP, GFRP |
|-----------|-----------|------------------|-------------------|-----------|---------------|------------|
| 370-550   | 210-300   | 160-220          | -                 | -         | -             | -          |

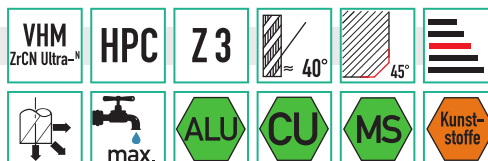
16732 - 16734

## Solid carbide roughing cutter

**ATORN®**

## Design

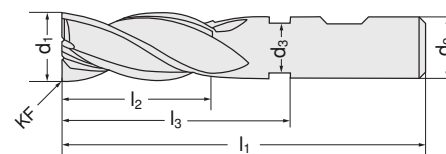
- With edge chamfer



16732



16734

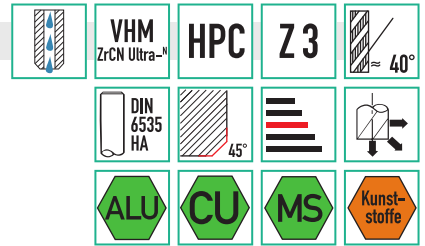


| d <sub>1</sub> (h9)<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | l <sub>3</sub><br>mm | d <sub>3</sub><br>mm | d <sub>2</sub> (h5)<br>mm | KF<br>mm | 16732 | ... | 16734 | ... |
|---------------------------|----------------------|----------------------|----------------------|----------------------|---------------------------|----------|-------|-----|-------|-----|
| 6.0                       | 13                   | 57                   | 18                   | 5.6                  | 6                         | 0.4      |       | 101 |       | 101 |
| 8.0                       | 21                   | 63                   | 25                   | 7.6                  | 8                         | 0.4      |       | 102 |       | 102 |
| 10.0                      | 22                   | 72                   | 30                   | 9.6                  | 10                        | 0.4      |       | 103 |       | 103 |
| 12.0                      | 26                   | 83                   | 36                   | 11.4                 | 12                        | 0.4      |       | 104 |       | 104 |
| 16.0                      | 36                   | 92                   | 42                   | 15.4                 | 16                        | 0.4      |       | 105 |       | 105 |
| 20.0                      | 41                   | 104                  | 52                   | 19.4                 | 20                        | 0.4      |       | 106 |       | 106 |

| Al <10%Si | Al >10%Si | Cu long-chipping | Cu short-chipping | Duroplast | Thermoplastic | CFRP, GFRP |
|-----------|-----------|------------------|-------------------|-----------|---------------|------------|
| 350-500   | 150-250   | 200-350          | 150-250           | 250-400   | 350-500       | 200-350    |

16735

## Solid carbide roughing cutter with internal cooling

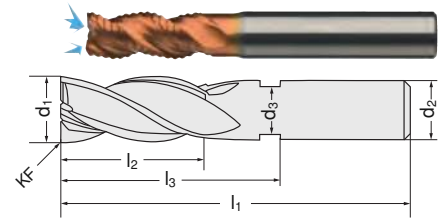
**ATORN®**

## Design

- With edge chamfer

| d <sub>1</sub> (h9)<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | l <sub>3</sub><br>mm | d <sub>3</sub><br>mm | d <sub>2</sub> (h5)<br>mm | KF<br>mm | 16735 | ... |
|---------------------------|----------------------|----------------------|----------------------|----------------------|---------------------------|----------|-------|-----|
| 6.0                       | 13                   | 57                   | 18                   | 5.6                  | 6                         | 0.4      |       | 101 |
| 8.0                       | 21                   | 63                   | 25                   | 7.6                  | 8                         | 0.4      |       | 102 |
| 10.0                      | 22                   | 72                   | 30                   | 9.6                  | 10                        | 0.4      |       | 103 |
| 12.0                      | 26                   | 83                   | 36                   | 11.4                 | 12                        | 0.4      |       | 104 |
| 16.0                      | 36                   | 92                   | 42                   | 15.4                 | 16                        | 0.4      |       | 105 |
| 20.0                      | 41                   | 104                  | 52                   | 19.4                 | 20                        | 0.4      |       | 106 |

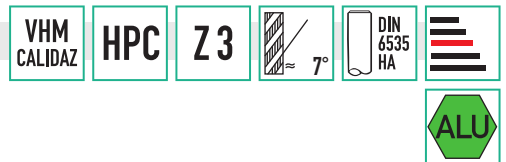
| Al <10%Si | Al >10%Si | Cu long-chipping | Cu short-chipping | Duroplast | Thermoplastic | CFRP, GFRP |
|-----------|-----------|------------------|-------------------|-----------|---------------|------------|
| 350-500   | 150-250   | 200-350          | 150-250           | 250-400   | 350-500       | 200-350    |



16735

16564

## Solid carbide 3D aluminium roughing cutter

**ATORN®**

## Design

**Centre cutting**, with clearance, defined edge rounding. With straight shank in accordance with DIN 6535 HA.

**Advantages:** The highest cutting values can be reached in the range  $V_c=1000-1600$  m/min with this tool thanks to the optimised cutting edge geometry (flat spirals of 7°, reinforced core, defined corner radius, chip breaker for creating discontinuous chips as well as defined edge rounding).

## Applications

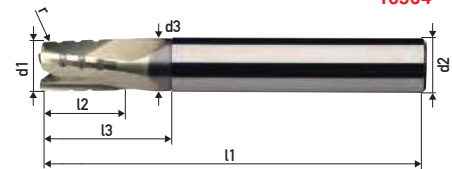
Especially for machining of non-ferrous metals.  
Suitable for shrinking.

## Quality

**Multilayer PVD coating CALIDA Z (titanium-free).**

## Note:

Ensure stable machine conditions, secure workpiece clamping as well as sufficient coolant supply.



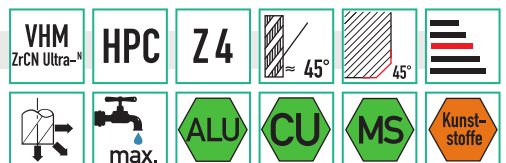
16564

| d <sub>1</sub> e8<br>mm | l <sub>2</sub><br>mm | l <sub>3</sub><br>mm | l <sub>1</sub><br>mm | r<br>mm | d <sub>2</sub> h5<br>mm | d <sub>3</sub><br>mm | 16564 | ... |
|-------------------------|----------------------|----------------------|----------------------|---------|-------------------------|----------------------|-------|-----|
| 6.0                     | 8                    | 21                   | 57                   | 0.6     | 6                       | 5.7                  |       | 106 |
| 8.0                     | 10                   | 27                   | 63                   | 0.8     | 8                       | 7.7                  |       | 108 |
| 10.0                    | 12                   | 32                   | 72                   | 1.0     | 10                      | 9.7                  |       | 110 |
| 12.0                    | 16                   | 38                   | 83                   | 1.2     | 12                      | 11.7                 |       | 112 |
| 16.0                    | 20                   | 44                   | 92                   | 1.6     | 16                      | 15.7                 |       | 116 |
| 20.0                    | 25                   | 54                   | 104                  | 2.0     | 20                      | 19.0                 |       | 120 |

| Al, Al alloy | Al wrought alloy | Al<10%Si | Al >10% Si | Mg alloy | CU low alloy | Ms shrt chp. | Ms long chip. | Bronze shrt chp. | Bronze long chip. |
|--------------|------------------|----------|------------|----------|--------------|--------------|---------------|------------------|-------------------|
| 700-730      | 850-890          | 300-330  | 200-240    | 200-240  | 200-230      | 290-315      | 200-240       | 290-315          | 200-240           |

16737 - 16738

## Solid carbide end mill

**ATORN®**

## Design

- With edge chamfer

| d <sub>1</sub> (h9)<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | l <sub>3</sub><br>mm | d <sub>3</sub><br>mm | d <sub>2</sub> (h5)<br>mm | KF<br>mm | 16737 | ... | 16738 | ... |
|---------------------------|----------------------|----------------------|----------------------|----------------------|---------------------------|----------|-------|-----|-------|-----|
| 3.0                       | 6                    | 57                   | 10                   | 2.8                  | 6                         | 0.1      |       | 101 |       | 101 |
| 4.0                       | 8                    | 57                   | 14                   | 3.8                  | 6                         | 0.1      |       | 102 |       | 102 |
| 5.0                       | 10                   | 57                   | 16                   | 4.7                  | 6                         | 0.1      |       | 103 |       | 103 |
| 6.0                       | 12                   | 57                   | 19                   | 5.6                  | 6                         | 0.2      |       | 104 |       | 104 |
| 8.0                       | 16                   | 63                   | 25                   | 7.6                  | 8                         | 0.2      |       | 105 |       | 105 |
| 10.0                      | 20                   | 72                   | 30                   | 9.6                  | 10                        | 0.2      |       | 106 |       | 106 |
| 12.0                      | 24                   | 83                   | 36                   | 11.4                 | 12                        | 0.2      |       | 107 |       | 107 |
| 16.0                      | 32                   | 92                   | 42                   | 15.4                 | 16                        | 0.2      |       | 108 |       | 108 |
| 20.0                      | 40                   | 104                  | 52                   | 19.4                 | 20                        | 0.2      |       | 109 |       | 109 |

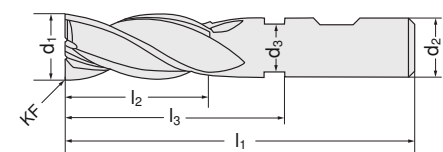
| Al <10%Si | Al >10%Si | Cu long-chipping | Cu short-chipping | Duroplast | Thermoplastic | CFRP, GFRP |
|-----------|-----------|------------------|-------------------|-----------|---------------|------------|
| 350-500   | 150-250   | 200-350          | 150-250           | 250-400   | 350-500       | 200-350    |



16737



16738



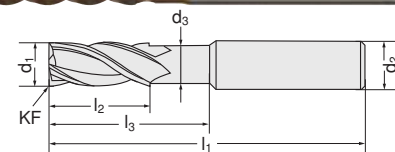
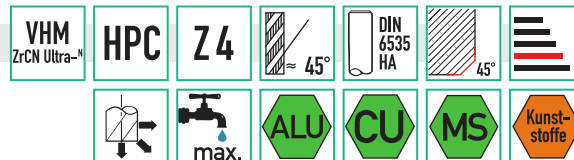
16739

## Solid carbide end mill

**ATORN®**Design  
- With edge chamfer

| d <sub>1</sub> (h9)<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | l <sub>3</sub><br>mm | d <sub>3</sub><br>mm | d <sub>2</sub> (h5)<br>mm | KF<br>mm | 16739 | ... |
|---------------------------|----------------------|----------------------|----------------------|----------------------|---------------------------|----------|-------|-----|
| 4.0                       | 16                   | 62                   | 22                   | 3.8                  | 6                         | 0.1      | 101   |     |
| 5.0                       | 17                   | 62                   | 24                   | 4.7                  | 6                         | 0.1      | 102   |     |
| 6.0                       | 18                   | 62                   | 24                   | 5.6                  | 6                         | 0.2      | 103   |     |
| 8.0                       | 24                   | 72                   | 30                   | 7.6                  | 8                         | 0.2      | 104   |     |
| 10.0                      | 30                   | 80                   | 38                   | 9.6                  | 10                        | 0.2      | 105   |     |
| 12.0                      | 36                   | 93                   | 46                   | 11.4                 | 12                        | 0.2      | 106   |     |
| 16.0                      | 48                   | 108                  | 58                   | 15.4                 | 16                        | 0.2      | 107   |     |

| Al <10%Si | Al >10%Si | Cu long-chipping | Cu short-chipping | Duroplast | Thermoplastic | CFRP, GFRP |
|-----------|-----------|------------------|-------------------|-----------|---------------|------------|
| 350-500   | 150-250   | 200-350          | 150-250           | 250-400   | 350-500       | 200-350    |



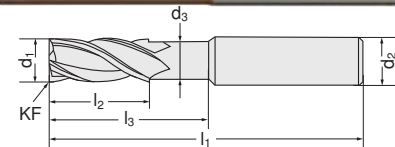
16740

## Solid carbide end mill

**ATORN®**Design  
- With edge chamfer

| d <sub>1</sub> (h9)<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | l <sub>3</sub><br>mm | d <sub>3</sub><br>mm | d <sub>2</sub> (h5)<br>mm | KF<br>mm | 16740 | ... |
|---------------------------|----------------------|----------------------|----------------------|----------------------|---------------------------|----------|-------|-----|
| 6.0                       | 12                   | 80                   | 42                   | 5.6                  | 6                         | 0.2      | 101   |     |
| 8.0                       | 16                   | 100                  | 58                   | 7.6                  | 8                         | 0.2      | 102   |     |
| 10.0                      | 20                   | 100                  | 62                   | 9.6                  | 10                        | 0.2      | 103   |     |
| 12.0                      | 24                   | 120                  | 75                   | 11.4                 | 12                        | 0.2      | 104   |     |
| 16.0                      | 32                   | 150                  | 100                  | 15.4                 | 16                        | 0.2      | 105   |     |

| Al <10%Si | Al >10%Si | Cu long-chipping | Cu short-chipping | Duroplast | Thermoplastic | CFRP, GFRP |
|-----------|-----------|------------------|-------------------|-----------|---------------|------------|
| 300-450   | 125-200   | 175-300          | 125-200           | 225-350   | 300-450       | 175-300    |



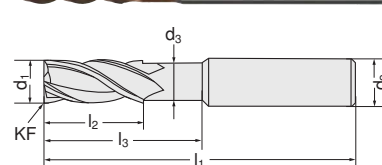
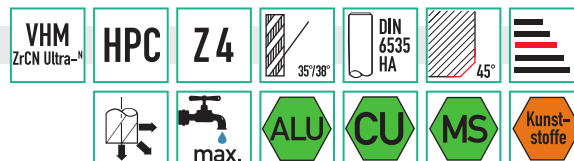
16741

## Solid carbide end mill HPC

**ATORN®**Design  
- With edge chamfer

| d <sub>1</sub> (h9)<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | l <sub>3</sub><br>mm | d <sub>3</sub><br>mm | d <sub>2</sub> (h5)<br>mm | KF<br>mm | 16741 | ... |
|---------------------------|----------------------|----------------------|----------------------|----------------------|---------------------------|----------|-------|-----|
| 3.0                       | 6                    | 57                   | 10                   | 2.8                  | 6                         | 0.1      | 101   |     |
| 4.0                       | 8                    | 57                   | 14                   | 3.8                  | 6                         | 0.1      | 102   |     |
| 5.0                       | 10                   | 57                   | 16                   | 4.7                  | 6                         | 0.1      | 103   |     |
| 6.0                       | 12                   | 57                   | 19                   | 5.6                  | 6                         | 0.2      | 104   |     |
| 8.0                       | 16                   | 63                   | 25                   | 7.6                  | 8                         | 0.2      | 105   |     |
| 10.0                      | 20                   | 72                   | 30                   | 9.6                  | 10                        | 0.2      | 106   |     |
| 12.0                      | 24                   | 83                   | 36                   | 11.4                 | 12                        | 0.2      | 107   |     |
| 16.0                      | 32                   | 92                   | 42                   | 15.4                 | 16                        | 0.2      | 108   |     |
| 20.0                      | 40                   | 104                  | 52                   | 19.4                 | 20                        | 0.2      | 109   |     |

| Al <10%Si | Al >10%Si | Cu long-chipping | Cu short-chipping | Duroplast | Thermoplastic | CFRP, GFRP |
|-----------|-----------|------------------|-------------------|-----------|---------------|------------|
| 350-500   | 150-250   | 200-350          | 150-250           | 250-400   | 350-500       | 200-350    |



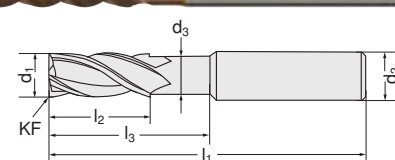
16742

## Solid carbide end mill HPC

**ATORN®**Design  
- With edge chamfer

| d <sub>1</sub> (h9)<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | l <sub>3</sub><br>mm | d <sub>3</sub><br>mm | d <sub>2</sub> (h5)<br>mm | KF<br>mm | 16742 | ... |
|---------------------------|----------------------|----------------------|----------------------|----------------------|---------------------------|----------|-------|-----|
| 4.0                       | 16                   | 62                   | 22                   | 3.8                  | 6                         | 0.1      | 101   |     |
| 5.0                       | 17                   | 62                   | 24                   | 4.7                  | 6                         | 0.1      | 102   |     |
| 6.0                       | 18                   | 62                   | 24                   | 5.6                  | 6                         | 0.2      | 103   |     |
| 8.0                       | 24                   | 68                   | 30                   | 7.6                  | 8                         | 0.2      | 104   |     |
| 10.0                      | 30                   | 80                   | 38                   | 9.6                  | 10                        | 0.2      | 105   |     |
| 12.0                      | 36                   | 93                   | 46                   | 11.4                 | 12                        | 0.2      | 106   |     |
| 16.0                      | 48                   | 108                  | 58                   | 15.4                 | 16                        | 0.2      | 107   |     |
| 20.0                      | 60                   | 126                  | 74                   | 19.4                 | 20                        | 0.2      | 108   |     |

| Al <10%Si | Al >10%Si | Cu long-chipping | Cu short-chipping | Duroplast | Thermoplastic | CFRP, GFRP |
|-----------|-----------|------------------|-------------------|-----------|---------------|------------|
| 350-500   | 150-250   | 200-350          | 150-250           | 250-400   | 350-500       | 200-350    |



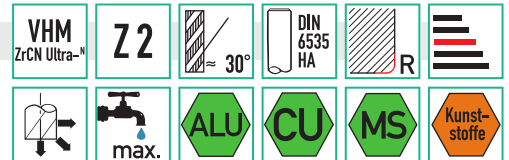
16745

## Solid carbide torus milling cutters

**ATORN®**

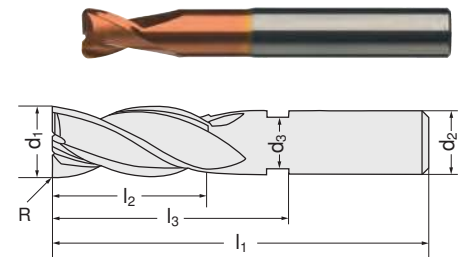
Design

Radius tolerance +/-0.015



| d <sub>1</sub> (e8)<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | l <sub>3</sub><br>mm | d <sub>3</sub><br>mm | d <sub>2</sub> (h5)<br>mm | R<br>mm | 16745 | ... |
|---------------------------|----------------------|----------------------|----------------------|----------------------|---------------------------|---------|-------|-----|
| 3.0                       | 4                    | 50                   | 14                   | 2.9                  | 3                         | 0.3     |       | 101 |
| 4.0                       | 5                    | 50                   | 16                   | 3.8                  | 4                         | 0.3     |       | 102 |
| 5.0                       | 6                    | 54                   | 18                   | 4.8                  | 5                         | 0.3     |       | 103 |
| 6.0                       | 7                    | 57                   | 21                   | 5.7                  | 6                         | 0.3     |       | 104 |
| 6.0                       | 7                    | 57                   | 21                   | 5.7                  | 6                         | 1.0     |       | 105 |
| 6.0                       | 7                    | 57                   | 21                   | 5.7                  | 6                         | 2.0     |       | 106 |
| 8.0                       | 9                    | 63                   | 27                   | 7.7                  | 8                         | 0.3     |       | 107 |
| 8.0                       | 9                    | 63                   | 27                   | 7.7                  | 8                         | 1.0     |       | 108 |
| 8.0                       | 9                    | 63                   | 27                   | 7.7                  | 8                         | 2.0     |       | 109 |
| 10.0                      | 11                   | 72                   | 32                   | 9.6                  | 10                        | 0.3     |       | 110 |
| 10.0                      | 11                   | 72                   | 32                   | 9.6                  | 10                        | 1.5     |       | 111 |
| 10.0                      | 11                   | 72                   | 32                   | 9.6                  | 10                        | 3.0     |       | 112 |
| 12.0                      | 12                   | 83                   | 38                   | 11.6                 | 12                        | 1.5     |       | 113 |
| 12.0                      | 12                   | 83                   | 38                   | 11.6                 | 12                        | 4.0     |       | 114 |
| 16.0                      | 16                   | 92                   | 44                   | 15.5                 | 16                        | 2.0     |       | 115 |
| 16.0                      | 16                   | 92                   | 44                   | 15.5                 | 16                        | 4.0     |       | 116 |

| Al <10%Si | Al >10%Si | Cu long-chipping | Cu short-chipping | Duroplast | Thermoplastic | CFRP, GFRP |
|-----------|-----------|------------------|-------------------|-----------|---------------|------------|
| 375-550   | 175-275   | 225-375          | 175-275           | 275-450   | 375-550       | 225-375    |



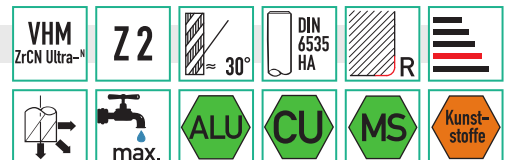
16746

## Solid carbide torus milling cutters

**ATORN®**

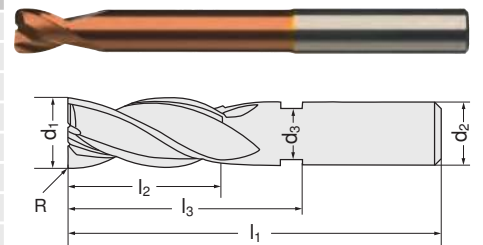
Design

Radius tolerance +/-0.015



| d <sub>1</sub> (e8)<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | l <sub>3</sub><br>mm | d <sub>3</sub><br>mm | d <sub>2</sub> (h5)<br>mm | R<br>mm | 16746 | ... |
|---------------------------|----------------------|----------------------|----------------------|----------------------|---------------------------|---------|-------|-----|
| 3.0                       | 4                    | 75                   | 32                   | 2.80                 | 3                         | 0.3     |       | 101 |
| 4.0                       | 5                    | 75                   | 36                   | 3.75                 | 4                         | 0.3     |       | 102 |
| 5.0                       | 6                    | 75                   | 40                   | 4.70                 | 5                         | 0.3     |       | 103 |
| 6.0                       | 7                    | 80                   | 44                   | 5.60                 | 6                         | 0.3     |       | 104 |
| 6.0                       | 7                    | 80                   | 44                   | 5.60                 | 6                         | 1.0     |       | 105 |
| 6.0                       | 7                    | 80                   | 44                   | 5.60                 | 6                         | 2.0     |       | 106 |
| 8.0                       | 9                    | 100                  | 54                   | 7.60                 | 8                         | 0.3     |       | 107 |
| 8.0                       | 9                    | 100                  | 54                   | 7.60                 | 8                         | 1.0     |       | 108 |
| 8.0                       | 9                    | 100                  | 54                   | 7.60                 | 8                         | 2.0     |       | 109 |
| 10.0                      | 11                   | 100                  | 60                   | 9.50                 | 10                        | 0.3     |       | 110 |
| 10.0                      | 11                   | 100                  | 60                   | 9.50                 | 10                        | 1.5     |       | 111 |
| 10.0                      | 11                   | 100                  | 60                   | 9.50                 | 10                        | 3.0     |       | 112 |
| 12.0                      | 12                   | 120                  | 75                   | 11.50                | 12                        | 1.5     |       | 113 |
| 12.0                      | 12                   | 120                  | 75                   | 11.50                | 12                        | 4.0     |       | 114 |
| 16.0                      | 16                   | 150                  | 92                   | 15.50                | 16                        | 2.0     |       | 115 |
| 16.0                      | 16                   | 150                  | 92                   | 15.50                | 16                        | 4.0     |       | 116 |

| Al <10%Si | Al >10%Si | Cu long-chipping | Cu short-chipping | Duroplast | Thermoplastic | CFRP, GFRP |
|-----------|-----------|------------------|-------------------|-----------|---------------|------------|
| 375-550   | 175-275   | 225-375          | 175-275           | 275-450   | 375-550       | 225-375    |



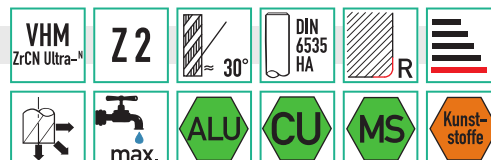
16747

## Solid carbide torus milling cutters

**ATORN®**

Design

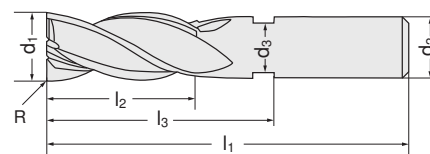
Radius tolerance +/-0.015



16747



| d <sub>1</sub> (e8)<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | l <sub>3</sub><br>mm | d <sub>3</sub><br>mm | d <sub>2</sub> (h5)<br>mm | R<br>mm | 16747 | ... |
|---------------------------|----------------------|----------------------|----------------------|----------------------|---------------------------|---------|-------|-----|
| 6.0                       | 7                    | 120                  | 80                   | 5.6                  | 6                         | 0.3     |       | 101 |
| 6.0                       | 7                    | 120                  | 80                   | 5.6                  | 6                         | 1.0     |       | 102 |
| 8.0                       | 9                    | 130                  | 90                   | 7.6                  | 8                         | 0.3     |       | 103 |
| 8.0                       | 9                    | 130                  | 90                   | 7.6                  | 8                         | 1.0     |       | 104 |
| 8.0                       | 9                    | 130                  | 90                   | 7.6                  | 8                         | 2.0     |       | 105 |
| 10.0                      | 11                   | 150                  | 110                  | 9.5                  | 10                        | 0.3     |       | 106 |
| 10.0                      | 11                   | 150                  | 110                  | 9.5                  | 10                        | 3.0     |       | 107 |
| 12.0                      | 12                   | 160                  | 115                  | 11.5                 | 12                        | 1.5     |       | 108 |
| 12.0                      | 12                   | 160                  | 115                  | 11.5                 | 12                        | 4.0     |       | 109 |
| 16.0                      | 16                   | 200                  | 140                  | 15.5                 | 16                        | 2.0     |       | 110 |



| Al <10%Si | Al >10%Si | Cu long-chipping | Cu short-chipping | Duroplast | Thermoplastic | CFRP, GFRP |
|-----------|-----------|------------------|-------------------|-----------|---------------|------------|
| 350-500   | 150-250   | 200-350          | 150-250           | 250-400   | 350-500       | 200-350    |

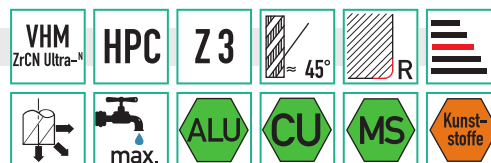
16748 - 16749

## Solid carbide torus milling cutters

**ATORN®**

Design

Radius tolerance +/-0.015

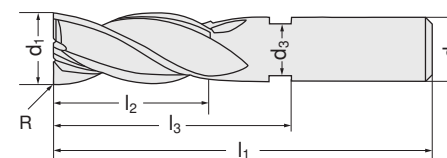


| d <sub>1</sub> (h9)<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | l <sub>3</sub><br>mm | d <sub>3</sub><br>mm | d <sub>2</sub> (h5)<br>mm | R<br>mm | 16748 | ... | 16749 | ... |
|---------------------------|----------------------|----------------------|----------------------|----------------------|---------------------------|---------|-------|-----|-------|-----|
| 5.0                       | 13                   | 57                   | 18                   | 4.7                  | 6                         | 0.5     |       | 101 |       | 101 |
| 5.0                       | 13                   | 57                   | 18                   | 4.7                  | 6                         | 1.0     |       | 102 |       | 102 |
| 6.0                       | 13                   | 57                   | 18                   | 5.6                  | 6                         | 0.5     |       | 103 |       | 103 |
| 6.0                       | 13                   | 57                   | 18                   | 5.6                  | 6                         | 1.0     |       | 104 |       | 104 |
| 8.0                       | 21                   | 63                   | 25                   | 7.6                  | 8                         | 0.5     |       | 105 |       | 105 |
| 8.0                       | 21                   | 63                   | 25                   | 7.6                  | 8                         | 1.0     |       | 106 |       | 106 |
| 10.0                      | 22                   | 72                   | 30                   | 9.6                  | 10                        | 0.5     |       | 107 |       | 107 |
| 10.0                      | 22                   | 72                   | 30                   | 9.6                  | 10                        | 1.0     |       | 108 |       | 108 |
| 12.0                      | 26                   | 83                   | 36                   | 11.4                 | 12                        | 0.5     |       | 109 |       | 109 |
| 12.0                      | 26                   | 83                   | 36                   | 11.4                 | 12                        | 1.0     |       | 110 |       | 110 |
| 16.0                      | 36                   | 92                   | 42                   | 15.4                 | 16                        | 2.0     |       | 111 |       | 111 |
| 16.0                      | 36                   | 92                   | 42                   | 15.4                 | 16                        | 4.0     |       | 112 |       | 112 |
| 20.0                      | 41                   | 104                  | 52                   | 19.4                 | 20                        | 4.0     |       | 113 |       | 113 |

16748



16749

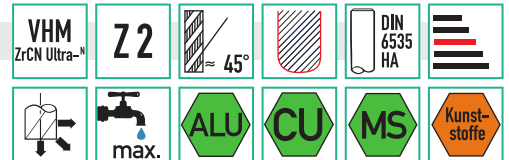


| Al <10%Si | Al >10%Si | Cu long-chipping | Cu short-chipping | Duroplast | Thermoplastic | CFRP, GFRP |
|-----------|-----------|------------------|-------------------|-----------|---------------|------------|
| 375-550   | 175-275   | 225-375          | 175-275           | 275-450   | 375-550       | 225-375    |



16755

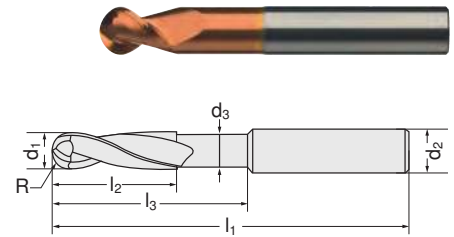
## Solid carbide radius cutter

**ATORN®**Design  
Radius tolerance +/-0.015

16755

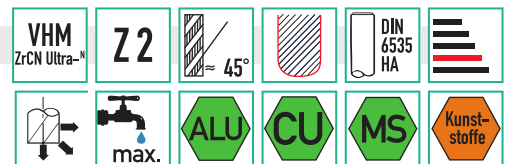
| d <sub>1</sub> (e8)<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | l <sub>3</sub><br>mm | d <sub>3</sub><br>mm | d <sub>2</sub> (h5)<br>mm | R<br>mm | 16755 | ... |
|---------------------------|----------------------|----------------------|----------------------|----------------------|---------------------------|---------|-------|-----|
| 3.0                       | 6                    | 50                   | 16                   | 2.9                  | 3                         | 1.5     |       | 101 |
| 4.0                       | 7                    | 54                   | 17                   | 3.8                  | 4                         | 2.0     |       | 102 |
| 5.0                       | 8                    | 54                   | 18                   | 4.8                  | 5                         | 2.5     |       | 103 |
| 6.0                       | 10                   | 54                   | 21                   | 5.7                  | 6                         | 3.0     |       | 104 |
| 8.0                       | 12                   | 60                   | 27                   | 7.7                  | 8                         | 4.0     |       | 105 |
| 10.0                      | 13                   | 67                   | 32                   | 9.6                  | 10                        | 5.0     |       | 106 |
| 12.0                      | 16                   | 73                   | 38                   | 11.6                 | 12                        | 6.0     |       | 107 |
| 16.0                      | 20                   | 83                   | 44                   | 15.5                 | 16                        | 8.0     |       | 108 |

| Al <10%Si | Al >10%Si | Cu long-chipping | Cu short-chipping | Duroplast | Thermoplastic | CFRP, GFRP |
|-----------|-----------|------------------|-------------------|-----------|---------------|------------|
| 400-550   | 180-320   | 250-420          | 180-320           | 300-450   | 400-550       | 250-420    |



16756

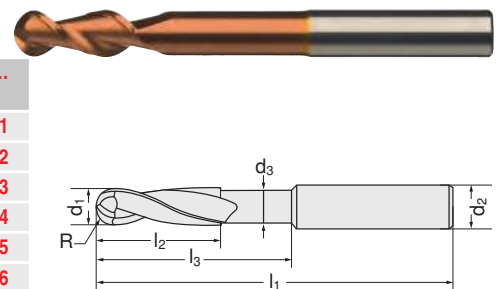
## Solid carbide radius cutter

**ATORN®**Design  
Radius tolerance +/-0.015

16756

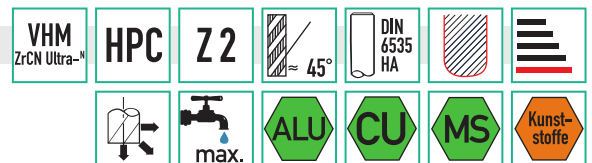
| d <sub>1</sub> (e8)<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | l <sub>3</sub><br>mm | d <sub>3</sub><br>mm | d <sub>2</sub> (h5)<br>mm | R<br>mm | 16756 | ... |
|---------------------------|----------------------|----------------------|----------------------|----------------------|---------------------------|---------|-------|-----|
| 3.0                       | 10                   | 75                   | 32                   | 2.9                  | 3                         | 1.5     |       | 101 |
| 4.0                       | 13                   | 75                   | 36                   | 3.8                  | 4                         | 2.0     |       | 102 |
| 5.0                       | 15                   | 75                   | 40                   | 4.8                  | 5                         | 2.5     |       | 103 |
| 6.0                       | 16                   | 100                  | 44                   | 5.7                  | 6                         | 3.0     |       | 104 |
| 8.0                       | 22                   | 100                  | 54                   | 7.7                  | 8                         | 4.0     |       | 105 |
| 10.0                      | 25                   | 100                  | 60                   | 9.6                  | 10                        | 5.0     |       | 106 |
| 12.0                      | 26                   | 100                  | 60                   | 11.6                 | 12                        | 6.0     |       | 107 |
| 16.0                      | 30                   | 150                  | 92                   | 15.5                 | 16                        | 8.0     |       | 108 |

| Al <10%Si | Al >10%Si | Cu long-chipping | Cu short-chipping | Duroplast | Thermoplastic | CFRP, GFRP |
|-----------|-----------|------------------|-------------------|-----------|---------------|------------|
| 400-550   | 180-320   | 250-420          | 180-320           | 300-450   | 400-550       | 250-420    |



16757

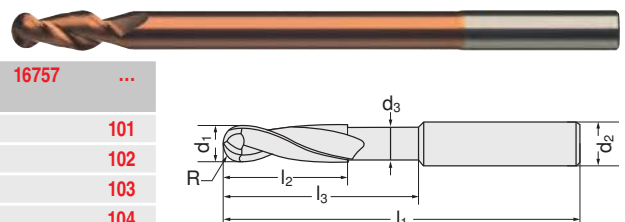
## Solid carbide radius cutter

**ATORN®**Design  
Radius tolerance +/-0.015

16757

| d <sub>1</sub> (e8)<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | l <sub>3</sub><br>mm | d <sub>3</sub><br>mm | d <sub>2</sub> (h5)<br>mm | R<br>mm | 16757 | ... |
|---------------------------|----------------------|----------------------|----------------------|----------------------|---------------------------|---------|-------|-----|
| 3.0                       | 10                   | 125                  | 82                   | 2.80                 | 3                         | 1.5     |       | 101 |
| 4.0                       | 13                   | 125                  | 86                   | 3.75                 | 4                         | 2.0     |       | 102 |
| 6.0                       | 16                   | 150                  | 94                   | 5.60                 | 6                         | 3.0     |       | 103 |
| 8.0                       | 22                   | 150                  | 104                  | 7.60                 | 8                         | 4.0     |       | 104 |
| 10.0                      | 25                   | 150                  | 110                  | 9.60                 | 10                        | 5.0     |       | 105 |
| 12.0                      | 26                   | 150                  | 110                  | 11.40                | 12                        | 6.0     |       | 106 |

| Al <10%Si | Al >10%Si | Cu long-chipping | Cu short-chipping | Duroplast | Thermoplastic | CFRP, GFRP |
|-----------|-----------|------------------|-------------------|-----------|---------------|------------|
| 350-500   | 150-250   | 200-350          | 150-250           | 250-400   | 350-500       | 200-350    |



# Solid carbide radius cutters | Solid carbide square end mills | Solid carbide high-performance cutters

16886

## Solid carbide single-tooth cutter Ultra Npro

**ATORN®**

### Design

- Solid carbide ultra-fine grain cutter with **Ultra Npro coating** (same as DLC)
- With polishing sanding in the chip chambers

### Advantage:

- Very good chip removal, highest cutting performance
- Ultra-smooth coating
- For grooving and contour milling
- Extremely wear-resistant
- Micro-geometry at the cutting edge

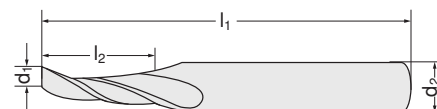
### Applications

Specially for use on modern turning and milling centres.

**NEW**



16886



| d1 h9<br>mm | l2<br>mm | l1<br>mm | d2 h6<br>mm | 16886 | ... |
|-------------|----------|----------|-------------|-------|-----|
| 1.0         | 4        | 50       | 3           |       | 101 |
| 1.5         | 6        | 50       | 3           |       | 102 |
| 2.0         | 8        | 50       | 3           |       | 103 |
| 3.0         | 12       | 50       | 3           |       | 104 |
| 4.0         | 15       | 60       | 4           |       | 105 |
| 5.0         | 17       | 60       | 5           |       | 106 |
| 6.0         | 20       | 65       | 6           |       | 107 |
| 8.0         | 22       | 65       | 8           |       | 108 |
| 10.0        | 25       | 75       | 10          |       | 109 |
| 12.0        | 30       | 80       | 12          |       | 110 |

| Al <10%Si | Al >10%Si | Brass long-chipping | Brass short-chipping | Bronze long-chipping | Bronze short-chipping | Thermoplastic | CFRP, GFRP |
|-----------|-----------|---------------------|----------------------|----------------------|-----------------------|---------------|------------|
| 450       | 400       | 250                 | 190                  | 210                  | 175                   | 220           | 110        |

16887

## Solid carbide square end mill Ultra Npro

**ATORN®**

### Design

- Solid carbide ultra-fine grain cutter with **Ultra Npro coating** (same as DLC)
- With polishing sanding in the chip chambers
- With clearance

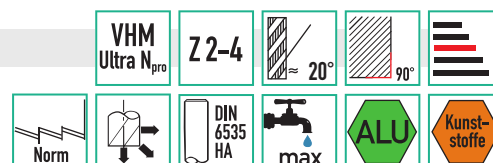
### Advantage:

- Very good chip removal, highest cutting performance
- Ultra-smooth coating
- Extremely wear-resistant
- Micro-geometry at the cutting edges

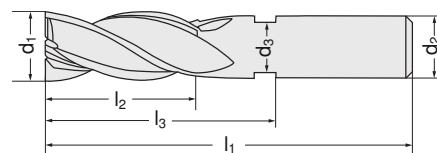
### Applications

Specially for use on modern turning and milling centres.

**NEW**



16887



| d1 h9<br>mm | l2<br>mm | l3<br>mm | l1<br>mm | d2 h6<br>mm | d3<br>mm | Z | 16887 | ... |
|-------------|----------|----------|----------|-------------|----------|---|-------|-----|
| 3.0         | 11       | 14       | 50       | 3           | 2.9      | 2 |       | 101 |
| 4.0         | 13       | 16       | 54       | 4           | 3.9      | 2 |       | 102 |
| 5.0         | 15       | 18       | 54       | 5           | 4.9      | 2 |       | 103 |
| 6.0         | 16       | 21       | 64       | 6           | 5.8      | 2 |       | 104 |
| 8.0         | 22       | 27       | 70       | 8           | 7.8      | 2 |       | 105 |
| 10.0        | 25       | 32       | 72       | 10          | 9.7      | 2 |       | 106 |
| 12.0        | 28       | 38       | 83       | 12          | 11.7     | 3 |       | 107 |
| 16.0        | 36       | 44       | 92       | 16          | 15.7     | 3 |       | 108 |
| 20.0        | 41       | 54       | 104      | 20          | 19.5     | 4 |       | 109 |

| Al <10%Si | Al >10%Si | Brass long-chipping | Brass short-chipping | Bronze long-chipping | Bronze short-chipping | Thermoplastic | CFRP, GFRP |
|-----------|-----------|---------------------|----------------------|----------------------|-----------------------|---------------|------------|
| 450       | 400       | 250                 | 190                  | 210                  | 175                   | 220           | 110        |

16888

## Solid carbide square end mill Ultra Npro

VHM  
Ultra N<sub>pro</sub>

Z 2

**ATORN®****Design**

- Solid carbide ultra-fine grain cutter with **Ultra Npro coating** (same as DLC)
- With polishing sanding in the chip chambers

**Advantage:**

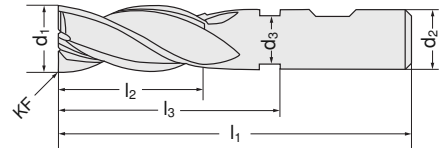
- Very good chip removal, highest cutting performance
- With edge protection chamfer for more stable cutting edges
- Ultra-smooth coating
- Extremely wear-resistant

**Applications**

Specially for use on modern turning and milling centres.

**NEW**

16888 101-107



|                               |                |                |                |                               |                |          |  | DIN 6535 HA |     | DIN 6535 HB |     |
|-------------------------------|----------------|----------------|----------------|-------------------------------|----------------|----------|--|-------------|-----|-------------|-----|
| d <sub>1</sub> h <sub>9</sub> | l <sub>2</sub> | l <sub>3</sub> | l <sub>1</sub> | d <sub>2</sub> h <sub>6</sub> | d <sub>3</sub> | KF x 45° |  | 16888       | ... | 16888       | ... |
| mm                            | mm             | mm             | mm             | mm                            | mm             | mm       |  |             |     |             |     |
| 3.0                           | 8              | 18             | 57             | 6                             | 2.9            | 0.1      |  |             | 101 |             |     |
| 4.0                           | 11             | 18             | 57             | 6                             | 3.9            | 0.1      |  |             | 102 |             |     |
| 5.0                           | 13             | 20             | 57             | 6                             | 4.9            | 0.1      |  |             | 103 |             |     |
| 6.0                           | 13             | 20             | 57             | 6                             | 5.8            | 0.1      |  |             | 104 |             |     |
| 8.0                           | 19             | 26             | 63             | 8                             | 7.8            | 0.1      |  |             | 105 |             |     |
| 10.0                          | 22             | 29             | 72             | 10                            | 9.7            | 0.2      |  |             | 106 |             |     |
| 12.0                          | 26             | 36             | 83             | 12                            | 11.7           | 0.2      |  |             | 107 |             |     |
| 16.0                          | 32             | 42             | 92             | 16                            | 15.7           | 0.2      |  |             |     |             | 108 |
| 20.0                          | 38             | 52             | 104            | 20                            | 19.5           | 0.2      |  |             |     |             | 109 |

| Al <10%Si | Al >10%Si | Brass long-chipping | Brass short-chipping | Bronze long-chipping | Bronze short-chipping | Thermoplastic | CFRP, GFRP |
|-----------|-----------|---------------------|----------------------|----------------------|-----------------------|---------------|------------|
| 450       | 400       | 225                 | 170                  | 190                  | 160                   | 220           | 110        |

16891

## Solid carbide HPC high-performance cutter Ultra Npro

VHM  
Ultra N<sub>pro</sub>

Z 3

**ATORN®****Design**

- Solid carbide ultra-fine grain cutter with **Ultra Npro coating** (same as DLC)
- With polishing sanding in the chip chambers

**Advantage:**

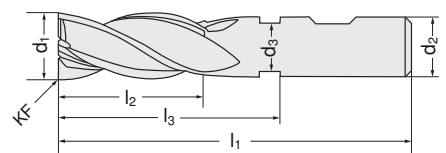
- Very good chip removal, highest cutting performance
- Uneven tooth pitch reduces vibrations
- With edge protection chamfer for more stable cutting edges
- Extremely wear-resistant
- Ultra-smooth coating
- Micro-geometry at the cutting edges

**Applications**

Specially for use on modern turning and milling centres.

**NEW**

16891 101-107



|                               |                |                |                |                               |                |          |  | DIN 6535 HA |     | DIN 6535 HB |     |
|-------------------------------|----------------|----------------|----------------|-------------------------------|----------------|----------|--|-------------|-----|-------------|-----|
| d <sub>1</sub> h <sub>9</sub> | l <sub>2</sub> | l <sub>3</sub> | l <sub>1</sub> | d <sub>2</sub> h <sub>6</sub> | d <sub>3</sub> | KF x 45° |  | 16891       | ... | 16891       | ... |
| mm                            | mm             | mm             | mm             | mm                            | mm             | mm       |  |             |     |             |     |
| 3.0                           | 12             | 16             | 57             | 6                             | 2.9            | 0.1      |  |             | 101 |             |     |
| 4.0                           | 12             | 18             | 57             | 6                             | 3.9            | 0.1      |  |             | 102 |             |     |
| 5.0                           | 15             | 18             | 57             | 6                             | 4.9            | 0.1      |  |             | 103 |             |     |
| 6.0                           | 15             | 21             | 57             | 6                             | 5.8            | 0.1      |  |             | 104 |             |     |
| 8.0                           | 22             | 28             | 64             | 8                             | 7.8            | 0.1      |  |             | 105 |             |     |
| 10.0                          | 25             | 33             | 73             | 10                            | 9.7            | 0.2      |  |             | 106 |             |     |
| 12.0                          | 28             | 39             | 84             | 12                            | 11.7           | 0.2      |  |             | 107 |             |     |
| 16.0                          | 35             | 45             | 93             | 16                            | 15.7           | 0.2      |  |             |     |             | 108 |
| 20.0                          | 41             | 52             | 104            | 20                            | 19.5           | 0.2      |  |             |     |             | 109 |

| Al <10%Si | Al >10%Si | Brass long-chipping | Brass short-chipping | Bronze long-chipping | Bronze short-chipping | Thermoplastic | CFRP, GFRP |
|-----------|-----------|---------------------|----------------------|----------------------|-----------------------|---------------|------------|
| 450       | 400       | 250                 | 190                  | 210                  | 175                   | 220           | 110        |

# Solid carbide end mills | Solid carbide roughing cutters

16889

## Solid carbide end mill Ultra Npro

**ATORN®**

### Design

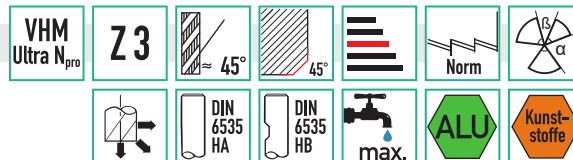
- Solid carbide ultra-fine grain cutter with **Ultra Npro coating** (same as DLC)
- With polishing sanding in the chip chambers

### Advantage:

- Very good chip removal, highest cutting performance
- Uneven tooth pitch reduces vibrations
- With edge protection chamfer for more stable cutting edges
- Ultra-smooth coating
- Extremely wear-resistant
- Micro-geometry at the cutting edges

### Applications

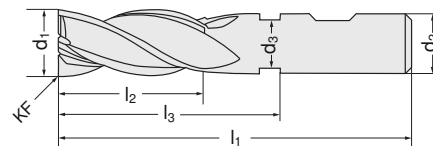
Specially for use on modern turning and milling centres.



**NEW**



16889 101-106



| d1 h9<br>mm | l2<br>mm | l3<br>mm | l1<br>mm | d2 h6<br>mm | d3<br>mm | KF x 45°<br>mm | DIN 6535 HA<br>16889 | ... | DIN 6535 HB<br>16889 | ... |
|-------------|----------|----------|----------|-------------|----------|----------------|----------------------|-----|----------------------|-----|
| 4.0         | 6.5      | 24       | 80       | 6           | 3.9      | 0.1            |                      |     | 101                  |     |
| 5.0         | 8        | 30       | 80       | 6           | 4.9      | 0.1            |                      |     | 102                  |     |
| 6.0         | 10       | 42       | 80       | 6           | 5.8      | 0.2            |                      |     | 103                  |     |
| 8.0         | 13       | 62       | 100      | 8           | 7.8      | 0.2            |                      |     | 104                  |     |
| 10.0        | 16       | 58       | 100      | 10          | 9.7      | 0.2            |                      |     | 105                  |     |
| 12.0        | 19       | 73       | 120      | 12          | 11.7     | 0.2            |                      |     | 106                  |     |
| 16.0        | 25       | 92       | 150      | 16          | 15.7     | 0.2            |                      |     |                      | 107 |
| 20.0        | 32       | 100      | 150      | 20          | 19.5     | 0.2            |                      |     |                      | 108 |

| Al <10%Si | Al >10%Si | Brass long-chipping | Brass short-chipping | Bronze long-chipping | Bronze short-chipping | Thermoplastic | CFRP, GFRP |
|-----------|-----------|---------------------|----------------------|----------------------|-----------------------|---------------|------------|
| 300       | 280       | 225                 | 170                  | 190                  | 160                   | 150           | 80         |

16890

## Solid carbide end mill with Ultra Npro internal cooling

**ATORN®**

### Design

- Solid carbide ultra-fine grain cutter with **Ultra Npro coating** (same as DLC)
- With polishing sanding in the chip chambers

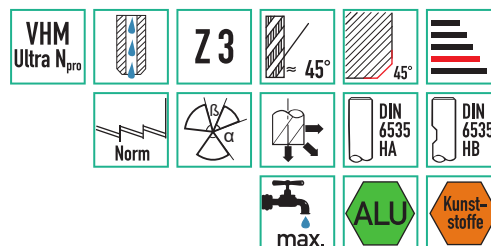
### Advantage:

- Very good chip removal, highest cutting performance
- Uneven tooth pitch reduces vibrations
- With edge protection chamfer for more stable cutting edges
- Extremely wear-resistant
- Ultra-smooth coating
- Micro-geometry at the cutting edges
- Radial coolant outlet

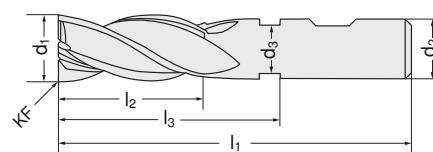
### Applications

Specially for use on modern turning and milling centres.

**NEW**



16890 101-104



| d1 h9<br>mm | l2<br>mm | l3<br>mm | l1<br>mm | d2 h6<br>mm | d3<br>mm | KF x 45°<br>mm | DIN 6535 HA<br>16890 | ... | DIN 6535 HB<br>16890 | ... |
|-------------|----------|----------|----------|-------------|----------|----------------|----------------------|-----|----------------------|-----|
| 6.0         | 10       | 42       | 80       | 6           | 5.8      | 0.2            |                      |     | 101                  |     |
| 8.0         | 13       | 62       | 100      | 8           | 7.8      | 0.2            |                      |     | 102                  |     |
| 10.0        | 16       | 58       | 100      | 10          | 9.7      | 0.2            |                      |     | 103                  |     |
| 12.0        | 19       | 73       | 120      | 12          | 11.7     | 0.2            |                      |     | 104                  |     |
| 16.0        | 25       | 92       | 150      | 16          | 15.7     | 0.2            |                      |     |                      | 105 |
| 20.0        | 32       | 100      | 150      | 20          | 19.5     | 0.2            |                      |     |                      | 106 |

| Al <10%Si | Al >10%Si | Brass long-chipping | Brass short-chipping | Bronze long-chipping | Bronze short-chipping | Thermoplastic | CFRP, GFRP |
|-----------|-----------|---------------------|----------------------|----------------------|-----------------------|---------------|------------|
| 300       | 280       | 225                 | 170                  | 190                  | 160                   | 150           | 80         |

16898

## Solid carbide roughing cutter Ultra Npro

**ATORN®****Design**

- Solid carbide ultra-fine grain cutter with **Ultra Npro coating** (same as DLC)
- With polishing sanding in the chip chambers

**Advantage:**

- Very good chip removal, highest cutting performance
- Extremely wear-resistant
- Ultra-smooth coating
- Roughing profile with micro-geometry

**Applications**

Specially for use on modern turning and milling centres.

**NEW**VHM  
Ultra Npro

Z3

DIN 6535  
HADIN 6535  
HB

WF

max.

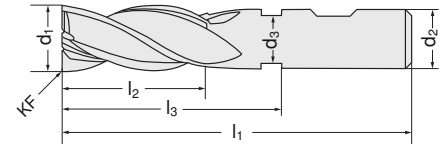
ALU

Kunst-  
stoffe

16898 101-104



16898 201-204



|                               |                |                |                |                |                |          | DIN 6535 HA |     | DIN 6535 HB |     | DIN 6535 HA / IC |     | DIN 6535 HB / IC |     |
|-------------------------------|----------------|----------------|----------------|----------------|----------------|----------|-------------|-----|-------------|-----|------------------|-----|------------------|-----|
| d <sub>1</sub> h <sub>9</sub> | l <sub>2</sub> | l <sub>3</sub> | l <sub>1</sub> | d <sub>2</sub> | d <sub>3</sub> | KF x 45° | 16898       | ... | 16898       | ... | 16898            | ... | 16898            | ... |
| mm                            | mm             | mm             | mm             | mm             | mm             | mm       |             |     |             |     |                  |     |                  |     |
| 6.0                           | 14             | 20             | 57             | 6              | 5.9            | 0.2      |             | 101 |             |     |                  | 201 |                  |     |
| 8.0                           | 21             | 26             | 63             | 8              | 7.8            | 0.25     |             | 102 |             |     |                  | 202 |                  |     |
| 10.0                          | 23             | 31             | 72             | 10             | 9.8            | 0.3      |             | 103 |             |     |                  | 203 |                  |     |
| 12.0                          | 27             | 37             | 83             | 12             | 11.7           | 0.35     |             | 104 |             |     |                  | 204 |                  |     |
| 16.0                          | 36             | 43             | 92             | 16             | 15.7           | 0.4      |             |     |             | 105 |                  |     |                  | 205 |
| 20.0                          | 41             | 52             | 104            | 20             | 19.5           | 0.4      |             |     |             | 106 |                  |     |                  | 206 |

| Al <10%Si | Al >10%Si | Brass long-chipping | Brass short-chipping | Bronze long-chipping | Bronze short-chipping | Thermoplastic | CFRP, GFRP |
|-----------|-----------|---------------------|----------------------|----------------------|-----------------------|---------------|------------|
| 520       | 490       | 275                 | 210                  | 230                  | 195                   | 280           | -          |

16899

## Solid carbide TVC end mill Ultra Npro

**ATORN®****Design**

- Solid carbide ultra-fine grain **trochoidal milling cutters** with **Ultra Npro coating** (same as DLC)
- With polishing sanding in the chip chambers
- Chip breaker at the circumference cutting edge

**Advantage:**

- Very good chip removal, highest cutting performance
- Ultra-smooth coating
- Extremely wear-resistant
- Micro-geometry at the cutting edges

**Applications**

Specially for use on modern turning and milling centres.  
For trochoidal milling.

**NEW**VHM  
Ultra Npro

Z3

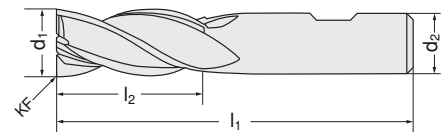
DIN 6535  
HADIN 6535  
HB

max.

ALU

Kunst-  
stoffe

16899 101-104



|                               |                |                |                               |          | DIN 6535 HA |     | DIN 6535 HB |     |
|-------------------------------|----------------|----------------|-------------------------------|----------|-------------|-----|-------------|-----|
| d <sub>1</sub> h <sub>9</sub> | l <sub>2</sub> | l <sub>1</sub> | d <sub>2</sub> h <sub>6</sub> | KF x 45° | 16899       | ... | 16899       | ... |
| mm                            | mm             | mm             | mm                            | mm       |             |     |             |     |
| 6.0                           | 21             | 62             | 6                             | 0.2      |             | 101 |             |     |
| 8.0                           | 28             | 68             | 8                             | 0.2      |             | 102 |             |     |
| 10.0                          | 35             | 80             | 10                            | 0.2      |             | 103 |             |     |
| 12.0                          | 42             | 93             | 12                            | 0.2      |             | 104 |             |     |
| 16.0                          | 56             | 108            | 16                            | 0.2      |             |     | 105         |     |
| 20.0                          | 70             | 126            | 20                            | 0.2      |             |     | 106         |     |

| Al <10%Si | Al >10%Si | Brass long-chipping | Brass short-chipping | Bronze long-chipping | Bronze short-chipping | Thermoplastic | CFRP, GFRP |
|-----------|-----------|---------------------|----------------------|----------------------|-----------------------|---------------|------------|
| 280       | 260       | 250                 | 190                  | 210                  | 175                   | 160           | 120        |



Offset chip breaker at the circumferential cutting edge

16892

## Solid carbide HPC high-performance cutter Ultra Npro

**ATORN®**

## Design

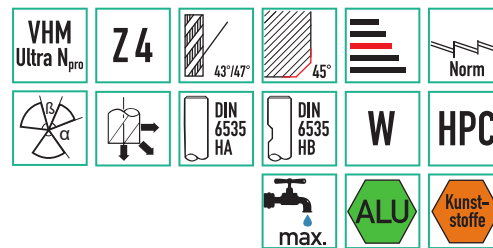
- Solid carbide ultra-fine grain cutter with **Ultra Npro coating** (same as DLC)
- With polishing sanding in the chip chambers
- Uneven pitch, uneven twist

## Advantage:

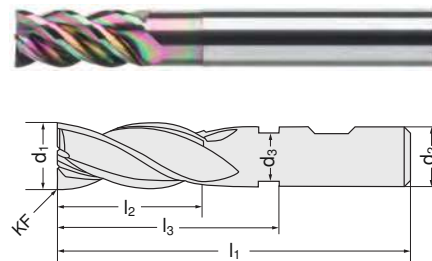
- Very good chip removal, highest cutting performance
- Uneven tooth pitch reduces vibrations
- With edge protection chamfer for more stable cutting edges
- Extremely wear-resistant
- Ultra-smooth coating
- Micro-geometry at the cutting edges

## Applications

Specially for use on modern turning and milling centres.

**NEW**

16892 101-107



| d <sub>1</sub> h <sub>9</sub><br>mm | l <sub>2</sub><br>mm | l <sub>3</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h <sub>6</sub><br>mm | d <sub>3</sub><br>mm | KF x 45°<br>mm | DIN 6535 HA |     | DIN 6535 HB |     |
|-------------------------------------|----------------------|----------------------|----------------------|-------------------------------------|----------------------|----------------|-------------|-----|-------------|-----|
|                                     |                      |                      |                      |                                     |                      |                | 16892       | ... | 16892       | ... |
| 3.0                                 | 6                    | 10                   | 57                   | 6                                   | 2.9                  | 0.1            |             |     | 101         |     |
| 4.0                                 | 8                    | 14                   | 57                   | 6                                   | 3.9                  | 0.1            |             |     | 102         |     |
| 5.0                                 | 10                   | 16                   | 57                   | 6                                   | 4.9                  | 0.1            |             |     | 103         |     |
| 6.0                                 | 12                   | 19                   | 57                   | 6                                   | 5.8                  | 0.1            |             |     | 104         |     |
| 8.0                                 | 16                   | 25                   | 63                   | 8                                   | 7.8                  | 0.1            |             |     | 105         |     |
| 10.0                                | 20                   | 30                   | 72                   | 10                                  | 9.7                  | 0.2            |             |     | 106         |     |
| 12.0                                | 24                   | 36                   | 83                   | 12                                  | 11.7                 | 0.2            |             |     | 107         |     |
| 16.0                                | 32                   | 42                   | 92                   | 16                                  | 15.7                 | 0.2            |             |     |             | 108 |
| 20.0                                | 40                   | 52                   | 104                  | 20                                  | 19.5                 | 0.2            |             |     |             | 109 |

| Al <10%Si | Al >10%Si | Brass long-chipping | Brass short-chipping | Bronze long-chipping | Bronze short-chipping | Thermoplastic | CFRP, GFRP |
|-----------|-----------|---------------------|----------------------|----------------------|-----------------------|---------------|------------|
| 380       | 360       | 240                 | 180                  | 210                  | 150                   | -             | -          |

16893

## Solid carbide torus milling cutter Ultra Npro

**ATORN®**

## Design

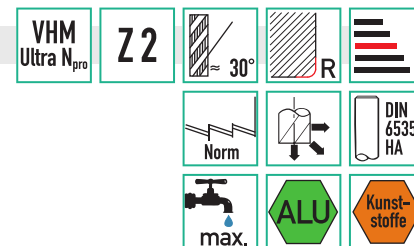
- Solid carbide ultra-fine grain cutter with **Ultra Npro coating** (same as DLC)
- With polishing sanding in the chip chambers

## Advantage:

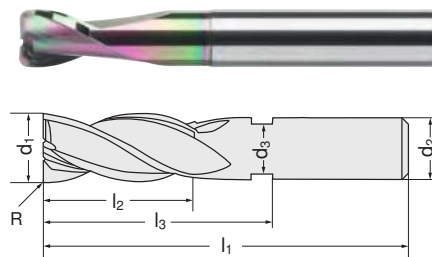
- Very good chip removal, highest cutting performance
- Extremely wear-resistant
- Ultra-smooth coating

## Applications

Specially for use on modern turning and milling centres.

**NEW**

16893



| d <sub>1</sub> h <sub>9</sub> x R<br>mm | l <sub>2</sub><br>mm | l <sub>3</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h <sub>6</sub><br>mm | d <sub>3</sub><br>mm | 16893 | ... |
|-----------------------------------------|----------------------|----------------------|----------------------|-------------------------------------|----------------------|-------|-----|
| 3 x 0.3                                 | 4                    | 14                   | 50                   | 6                                   | 2.9                  |       | 101 |
| 4 x 0.3                                 | 5                    | 16                   | 50                   | 6                                   | 3.9                  |       | 102 |
| 5 x 0.3                                 | 6                    | 18                   | 54                   | 6                                   | 4.9                  |       | 103 |
| 6 x 0.3                                 | 7                    | 21                   | 57                   | 6                                   | 5.8                  |       | 104 |
| 6 x 1.0                                 | 7                    | 21                   | 57                   | 6                                   | 5.8                  |       | 105 |
| 6 x 2.0                                 | 7                    | 21                   | 57                   | 6                                   | 5.8                  |       | 106 |
| 8 x 0.3                                 | 9                    | 27                   | 63                   | 8                                   | 7.8                  |       | 107 |
| 8 x 1.0                                 | 9                    | 27                   | 63                   | 8                                   | 7.8                  |       | 108 |
| 8 x 2.0                                 | 9                    | 27                   | 63                   | 8                                   | 7.8                  |       | 109 |
| 10 x 0.3                                | 11                   | 32                   | 72                   | 10                                  | 9.7                  |       | 110 |
| 10 x 1.5                                | 11                   | 32                   | 72                   | 10                                  | 9.7                  |       | 111 |
| 10 x 3.0                                | 11                   | 32                   | 72                   | 10                                  | 9.7                  |       | 112 |
| 12 x 1.5                                | 13                   | 38                   | 83                   | 12                                  | 11.7                 |       | 113 |
| 12 x 4.0                                | 13                   | 38                   | 83                   | 12                                  | 11.7                 |       | 114 |
| 16 x 2.0                                | 17                   | 44                   | 92                   | 16                                  | 15.7                 |       | 115 |
| 16 x 5.0                                | 17                   | 44                   | 92                   | 16                                  | 15.7                 |       | 116 |

| Al <10%Si | Al >10%Si | Brass long-chipping | Brass short-chipping | Bronze long-chipping | Bronze short-chipping | Thermoplastic | CFRP, GFRP |
|-----------|-----------|---------------------|----------------------|----------------------|-----------------------|---------------|------------|
| 320       | 280       | 250                 | 190                  | 210                  | 175                   | 240           | 160        |

16894

## Solid carbide torus milling cutter Ultra Npro

VHM  
Ultra N<sub>pro</sub>

Z2

**ATORN®****Design**

- Solid carbide ultra-fine grain cutter with **Ultra Npro coating** (same as DLC)
- With polishing sanding in the chip chambers

**Advantage:**

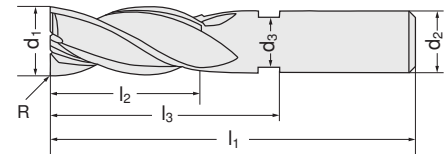
- Very good chip removal, highest cutting performance
- Extremely wear-resistant
- Ultra-smooth coating

**Applications**

Specially for use on modern turning and milling centres.

**NEW**

16894



| d <sub>1</sub> h9 x R<br>mm | l <sub>2</sub><br>mm | l <sub>3</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | d <sub>3</sub><br>mm | 16894 | ... |
|-----------------------------|----------------------|----------------------|----------------------|-------------------------|----------------------|-------|-----|
| 3 x 0.3                     | 4                    | 32                   | 75                   | 6                       | 2.9                  |       | 101 |
| 4 x 0.3                     | 5                    | 36                   | 75                   | 6                       | 3.9                  |       | 102 |
| 5 x 0.3                     | 6                    | 40                   | 75                   | 6                       | 4.9                  |       | 103 |
| 6 x 0.3                     | 7                    | 44                   | 80                   | 6                       | 5.8                  |       | 104 |
| 6 x 1.0                     | 7                    | 44                   | 80                   | 6                       | 5.8                  |       | 105 |
| 6 x 2.0                     | 7                    | 44                   | 80                   | 6                       | 5.8                  |       | 106 |
| 8 x 0.3                     | 9                    | 54                   | 100                  | 8                       | 7.8                  |       | 107 |
| 8 x 1.0                     | 9                    | 54                   | 100                  | 8                       | 7.8                  |       | 108 |
| 8 x 2.0                     | 9                    | 54                   | 100                  | 8                       | 7.8                  |       | 109 |
| 10 x 0.3                    | 11                   | 60                   | 100                  | 10                      | 9.7                  |       | 110 |
| 10 x 1.5                    | 11                   | 60                   | 100                  | 10                      | 9.7                  |       | 111 |
| 10 x 3.0                    | 11                   | 60                   | 100                  | 10                      | 9.7                  |       | 112 |
| 12 x 1.5                    | 13                   | 75                   | 120                  | 12                      | 11.7                 |       | 113 |
| 12 x 4.0                    | 13                   | 75                   | 120                  | 12                      | 11.7                 |       | 114 |
| 16 x 2.0                    | 17                   | 92                   | 150                  | 16                      | 15.7                 |       | 115 |
| 16 x 5.0                    | 17                   | 92                   | 150                  | 16                      | 15.7                 |       | 116 |

| Al <10%Si | Al >10%Si | Brass long-chipping | Brass short-chipping | Bronze long-chipping | Bronze short-chipping | Thermoplastic | CFRP, GFRP |
|-----------|-----------|---------------------|----------------------|----------------------|-----------------------|---------------|------------|
| 220       | 180       | 250                 | 190                  | 210                  | 175                   | 160           | 120        |

16895

## Solid carbide TVC/HPC torus milling cutter Ultra Npro

VHM  
Ultra N<sub>pro</sub>

Z3

**ATORN®****Design**

- Solid carbide ultra-fine grain cutter with **Ultra Npro coating** (same as DLC)

- Uneven pitch

**Advantage:**

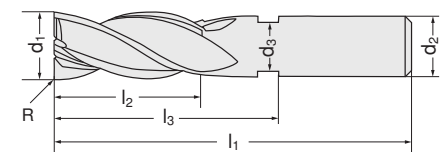
- Very good chip removal, highest cutting performance
- Uneven tooth pitch reduces vibrations
- Extremely wear-resistant
- Ultra-smooth coating
- Micro-geometry at the face cutting edges

**Applications**

Specially for use on modern turning and milling centres.  
For trochoidal milling.

**NEW**

16895



| d <sub>1</sub> h9 x R<br>mm | l <sub>2</sub><br>mm | l <sub>3</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub> h6<br>mm | d <sub>3</sub><br>mm | 16895 | ... |
|-----------------------------|----------------------|----------------------|----------------------|-------------------------|----------------------|-------|-----|
| 6 x 0.5                     | 25                   | 31                   | 71                   | 6                       | 5.8                  |       | 101 |
| 6 x 1.0                     | 25                   | 31                   | 71                   | 6                       | 5.8                  |       | 102 |
| 8 x 0.5                     | 33                   | 41                   | 80                   | 8                       | 7.8                  |       | 103 |
| 8 x 1.0                     | 33                   | 41                   | 80                   | 8                       | 7.8                  |       | 104 |
| 8 x 2.0                     | 33                   | 41                   | 80                   | 8                       | 7.8                  |       | 105 |
| 10 x 0.5                    | 41                   | 51                   | 95                   | 10                      | 9.7                  |       | 106 |
| 10 x 1.0                    | 41                   | 51                   | 95                   | 10                      | 9.7                  |       | 107 |
| 10 x 2.0                    | 41                   | 51                   | 95                   | 10                      | 9.7                  |       | 108 |
| 12 x 0.5                    | 49                   | 61                   | 109                  | 12                      | 11.7                 |       | 109 |
| 12 x 1.0                    | 49                   | 61                   | 109                  | 12                      | 11.7                 |       | 110 |
| 12 x 2.0                    | 49                   | 61                   | 109                  | 12                      | 11.7                 |       | 111 |
| 16 x 2.0                    | 65                   | 81                   | 132                  | 16                      | 15.7                 |       | 112 |
| 16 x 3.0                    | 65                   | 81                   | 132                  | 16                      | 15.7                 |       | 113 |
| 20 x 2.0                    | 82                   | 101                  | 154                  | 20                      | 19.5                 |       | 114 |
| 20 x 3.0                    | 82                   | 101                  | 154                  | 20                      | 19.5                 |       | 115 |

| Al <10%Si | Al >10%Si | Brass long-chipping | Brass short-chipping | Bronze long-chipping | Bronze short-chipping | Thermoplastic | CFRP, GFRP |
|-----------|-----------|---------------------|----------------------|----------------------|-----------------------|---------------|------------|
| 280       | 260       | 250                 | 190                  | 210                  | 175                   | 160           | 120        |



Offset chip breaker at the circumferential cutting edge

16896

## Solid carbide radius cutter short Ultra Npro

**ATORN®****Design**

- Solid carbide ultra-fine grain cutter with **Ultra Npro coating** (same as DLC)
- Radius tolerance +/- 0.01 mm

**Advantage:**

- Very good chip removal, highest cutting performance
- Extremely wear-resistant
- Ultra-smooth coating

**Applications**

Specially for use on modern turning and milling centres.

**NEW**VHM  
Ultra Npro

Z2

45°

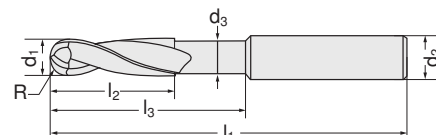
DIN 6535  
HA

Norm

max.

Kunst-  
stoffe

16896



| d <sub>1</sub> h9<br>mm | l <sub>2</sub><br>mm | l <sub>3</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub><br>mm | d <sub>3</sub><br>mm | KF x 45°<br>mm | 16896 | ... |
|-------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------|-------|-----|
| 3.0                     | 6                    | 16                   | 50                   | 3                    | 2.9                  | 0.1            |       | 101 |
| 4.0                     | 7                    | 17                   | 54                   | 4                    | 3.9                  | 0.1            |       | 102 |
| 5.0                     | 8                    | 18                   | 54                   | 5                    | 4.9                  | 0.1            |       | 103 |
| 6.0                     | 10                   | 21                   | 54                   | 6                    | 5.8                  | 0.1            |       | 104 |
| 8.0                     | 12                   | 27                   | 59                   | 8                    | 7.8                  | 0.1            |       | 105 |
| 10.0                    | 13                   | 32                   | 67                   | 10                   | 9.7                  | 0.2            |       | 106 |
| 12.0                    | 16                   | 38                   | 73                   | 12                   | 11.7                 | 0.2            |       | 107 |
| 16.0                    | 20                   | 44                   | 83                   | 16                   | 15.7                 | 0.2            |       | 108 |

| Al <10%Si | Al >10%Si | Brass long-chipping | Brass short-chipping | Bronze long-chipping | Bronze short-chipping | Thermoplastic | CFRP, GFRP |
|-----------|-----------|---------------------|----------------------|----------------------|-----------------------|---------------|------------|
| 800       | 600       | 275                 | 210                  | 230                  | 190                   | 500           | -          |

16897

## Solid carbide radius cutter Ultra Npro

**ATORN®****Design**

- Solid carbide ultra-fine grain cutter with **Ultra Npro coating** (same as DLC)
- Radius tolerance +/- 0.01 mm

**Advantage:**

- Very good chip removal, highest cutting performance
- Extremely wear-resistant
- Ultra-smooth coating

**Applications**

Specially for use on modern turning and milling centres.

**NEW**VHM  
Ultra Npro

Z2

45°

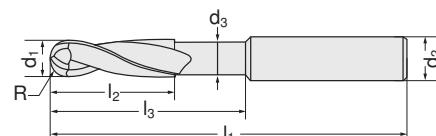
DIN 6535  
HA

Norm

max.

Kunst-  
stoffe

16897



| d <sub>1</sub> h9<br>mm | l <sub>2</sub><br>mm | l <sub>3</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub><br>mm | d <sub>3</sub><br>mm | KF x 45°<br>mm | 16897 | ... |
|-------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------|-------|-----|
| 3.0                     | 10                   | 32                   | 75                   | 3                    | 2.9                  | 0.1            |       | 101 |
| 4.0                     | 13                   | 36                   | 75                   | 4                    | 3.9                  | 0.1            |       | 102 |
| 5.0                     | 15                   | 40                   | 75                   | 5                    | 4.9                  | 0.1            |       | 103 |
| 6.0                     | 16                   | 44                   | 100                  | 6                    | 5.8                  | 0.1            |       | 104 |
| 8.0                     | 22                   | 54                   | 100                  | 8                    | 7.8                  | 0.1            |       | 105 |
| 10.0                    | 25                   | 60                   | 100                  | 10                   | 9.7                  | 0.2            |       | 106 |
| 12.0                    | 26                   | 60                   | 100                  | 12                   | 11.7                 | 0.2            |       | 107 |
| 16.0                    | 30                   | 92                   | 150                  | 16                   | 15.7                 | 0.2            |       | 108 |

| Al <10%Si | Al >10%Si | Brass long-chipping | Brass short-chipping | Bronze long-chipping | Bronze short-chipping | Thermoplastic | CFRP, GFRP |
|-----------|-----------|---------------------|----------------------|----------------------|-----------------------|---------------|------------|
| 700       | 550       | 250                 | 190                  | 210                  | 170                   | 450           | -          |

16702

## Solid carbide end mill for graphite



Z2-3

DIN 6535 HA



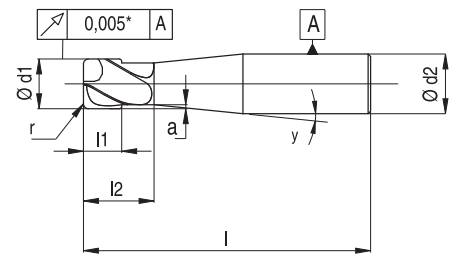
Graphit

GFK

## Design

Long and extra long, right cutting,  
2-3 cutting edges, right-hand twist approx. 40°,  
centre cutting, with smooth straight shank in  
accordance with DIN 6535 HA.

16702



| d <sub>1</sub> g7<br>mm | r<br>mm | d <sub>2</sub> h5<br>mm | l<br>mm | l <sub>1</sub><br>mm | Z | y<br>(°) | 16702 | ... |
|-------------------------|---------|-------------------------|---------|----------------------|---|----------|-------|-----|
| 2.0                     | 0.1     | 2                       | 50      | 10                   | 3 | -        |       | 102 |
| 2.0                     | 0.1     | 3                       | 50      | 10                   | 3 | 15       |       | 103 |
| 3.0                     | 0.1     | 3                       | 50      | 10                   | 3 | -        |       | 104 |
| 4.0                     | 0.2     | 4                       | 60      | 15                   | 3 | -        |       | 106 |
| L 4.0                   | 0.3     | 4                       | 102     | 10                   | 2 | -        |       | 107 |
| 5.0                     | 0.2     | 5                       | 60      | 20                   | 3 | -        |       | 109 |
| L 5.0                   | 0.5     | 5                       | 102     | 13                   | 2 | -        |       | 110 |
| 6.0                     | 0.3     | 6                       | 78      | 30                   | 3 | -        |       | 112 |
| L 6.0                   | 0.5     | 6                       | 102     | 42                   | 2 | -        |       | 113 |
| XL 6.0                  | 0.5     | 6                       | 150     | 26                   | 2 | -        |       | 114 |
| 8.0                     | 0.3     | 8                       | 78      | 30                   | 3 | -        |       | 116 |
| L 8.0                   | 0.5     | 8                       | 150     | 41                   | 2 | -        |       | 117 |
| 10.0                    | 0.3     | 10                      | 78      | 30                   | 3 | -        |       | 119 |
| L 10.0                  | 0.5     | 10                      | 150     | 42                   | 2 | -        |       | 120 |
| 12.0                    | 0.3     | 12                      | 89      | 30                   | 3 | -        |       | 122 |

| Al<10%Si | Al>10%Si | Cu | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Graphite |
|----------|----------|----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|----------|
| -        | -        | -  | -       | -       | -       | -        | -        | -        | -      | -      | -      | -      | -       | -       | -        | -     | 200      |

16703

## Solid carbide diamond copy milling cutter DC Ultra

## Design

- Solid carbide cutter with crystalline diamond coating
- Special cemented carbide with excellent coating adhesion for the longest possible service life
- Shaft tolerance: h5
- Coating thickness: 6 + 2 µm

- Concentricity: 5 µm
- Radius accuracy: +/- 3 µm

## Applications

For milling graphite, copper and GFRP materials.



Z4

DIN 6535 HA



Norm

Graphit

GFK

16703



| d <sub>1</sub><br>mm | R<br>mm | l <sub>2</sub><br>mm | l <sub>3</sub><br>mm | l <sub>1</sub><br>mm | d <sub>3</sub><br>mm | d <sub>2</sub> (h5)<br>mm | Short<br>16703 | ... |
|----------------------|---------|----------------------|----------------------|----------------------|----------------------|---------------------------|----------------|-----|
| 4.0                  | 0.40    | 8                    | 16                   | 50                   | 3.7                  | 4                         |                | 101 |
| 4.0                  | 0.50    | 8                    | 16                   | 50                   | 3.7                  | 4                         |                | 102 |
| 4.0                  | 1.00    | 8                    | 16                   | 50                   | 3.7                  | 4                         |                | 103 |
| 5.0                  | 0.50    | 10                   | 18                   | 54                   | 4.6                  | 5                         |                | 104 |
| 5.0                  | 1.00    | 10                   | 18                   | 54                   | 4.6                  | 5                         |                | 105 |
| 6.0                  | 0.50    | 13                   | 21                   | 57                   | 5.5                  | 6                         |                | 106 |
| 6.0                  | 1.00    | 13                   | 21                   | 57                   | 5.5                  | 6                         |                | 107 |
| 6.0                  | 1.50    | 13                   | 21                   | 57                   | 5.5                  | 6                         |                | 108 |
| 8.0                  | 0.50    | 15                   | 27                   | 63                   | 7.4                  | 8                         |                | 109 |
| 8.0                  | 1.00    | 15                   | 27                   | 63                   | 7.4                  | 8                         |                | 110 |
| 8.0                  | 1.50    | 15                   | 27                   | 63                   | 7.4                  | 8                         |                | 111 |
| 8.0                  | 2.00    | 15                   | 27                   | 63                   | 7.4                  | 8                         |                | 112 |
| 10.0                 | 0.50    | 18                   | 32                   | 72                   | 9.2                  | 10                        |                | 113 |
| 10.0                 | 1.00    | 18                   | 32                   | 72                   | 9.2                  | 10                        |                | 114 |
| 10.0                 | 1.50    | 18                   | 32                   | 72                   | 9.2                  | 10                        |                | 115 |
| 10.0                 | 2.00    | 18                   | 32                   | 72                   | 9.2                  | 10                        |                | 116 |
| 12.0                 | 0.50    | 26                   | 38                   | 83                   | 11.0                 | 12                        |                | 117 |
| 12.0                 | 1.00    | 26                   | 38                   | 83                   | 11.0                 | 12                        |                | 118 |
| 12.0                 | 1.50    | 26                   | 38                   | 83                   | 11.0                 | 12                        |                | 119 |
| 12.0                 | 2.00    | 26                   | 38                   | 83                   | 11.0                 | 12                        |                | 120 |
| 16.0                 | 0.50    | 32                   | 50                   | 92                   | 15.0                 | 16                        |                | 121 |
| 16.0                 | 1.00    | 32                   | 50                   | 92                   | 15.0                 | 16                        |                | 122 |
| 16.0                 | 1.50    | 32                   | 50                   | 92                   | 15.0                 | 16                        |                | 123 |
| 16.0                 | 2.00    | 32                   | 50                   | 92                   | 15.0                 | 16                        |                | 124 |

| d <sub>1</sub><br>mm | R<br>mm | l <sub>2</sub><br>mm | l <sub>3</sub><br>mm | l <sub>1</sub><br>mm | d <sub>3</sub><br>mm | d <sub>2</sub> (h5)<br>mm | Long<br>16703 | ... |
|----------------------|---------|----------------------|----------------------|----------------------|----------------------|---------------------------|---------------|-----|
| 4.0                  | 0.40    | 8                    | 36                   | 80                   | 3.7                  | 4                         |               | 201 |
| 4.0                  | 0.50    | 8                    | 36                   | 80                   | 3.7                  | 4                         |               | 202 |
| 4.0                  | 1.00    | 8                    | 36                   | 80                   | 3.7                  | 4                         |               | 203 |
| 5.0                  | 0.50    | 10                   | 40                   | 80                   | 4.6                  | 5                         |               | 204 |
| 5.0                  | 1.00    | 10                   | 40                   | 80                   | 4.6                  | 5                         |               | 205 |
| 6.0                  | 0.50    | 13                   | 44                   | 90                   | 5.5                  | 6                         |               | 206 |
| 6.0                  | 1.00    | 13                   | 44                   | 90                   | 5.5                  | 6                         |               | 207 |
| 6.0                  | 1.50    | 13                   | 44                   | 90                   | 5.5                  | 6                         |               | 208 |
| 8.0                  | 0.50    | 15                   | 54                   | 100                  | 7.4                  | 8                         |               | 209 |
| 8.0                  | 1.00    | 15                   | 54                   | 100                  | 7.4                  | 8                         |               | 210 |
| 8.0                  | 1.50    | 15                   | 54                   | 100                  | 7.4                  | 8                         |               | 211 |
| 8.0                  | 2.00    | 15                   | 54                   | 100                  | 7.4                  | 8                         |               | 212 |
| 10.0                 | 0.50    | 18                   | 60                   | 100                  | 9.2                  | 10                        |               | 213 |
| 10.0                 | 1.00    | 18                   | 60                   | 100                  | 9.2                  | 10                        |               | 214 |
| 10.0                 | 1.50    | 18                   | 60                   | 100                  | 9.2                  | 10                        |               | 215 |
| 10.0                 | 2.00    | 18                   | 60                   | 100                  | 9.2                  | 10                        |               | 216 |
| 12.0                 | 0.50    | 26                   | 75                   | 120                  | 11.0                 | 12                        |               | 217 |
| 12.0                 | 1.00    | 26                   | 75                   | 120                  | 11.0                 | 12                        |               | 218 |
| 12.0                 | 1.50    | 26                   | 75                   | 120                  | 11.0                 | 12                        |               | 219 |
| 12.0                 | 2.00    | 26                   | 75                   | 120                  | 11.0                 | 12                        |               | 220 |
| 16.0                 | 0.50    | 32                   | 85                   | 120                  | 15.0                 | 16                        |               | 221 |
| 16.0                 | 1.00    | 32                   | 85                   | 120                  | 15.0                 | 16                        |               | 222 |
| 16.0                 | 1.50    | 32                   | 85                   | 120                  | 15.0                 | 16                        |               | 223 |
| 16.0                 | 2.00    | 32                   | 85                   | 120                  | 15.0                 | 16                        |               | 224 |

| Al<10%Si | Al>10%Si | Cu | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Graphite |
|----------|----------|----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|----------|
| -        | -        | -  | -       | -       | -       | -        | -        | -        | -      | -      | -      | -      | -       | -       | -        | -     | 140-340  |

16704

## Solid carbide diamond radius cutter DC Ultra



Z2

**ATORN®****Design**

- Solid carbide cutter with crystalline diamond coating (DiaDur)
- Special cemented carbide with excellent coating adhesion for the longest possible service life
- Shaft tolerance: h5
- Coating thickness: 10 + 2 µm
- Concentricity: 5 µm
- Radius accuracy: +/- 3 µm

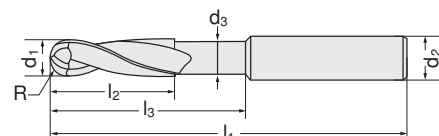
**Applications**

For milling graphite, copper and GFRP materials.

16704 101-151



16704 152-161



| d <sub>1</sub><br>mm | R<br>mm | l <sub>2</sub><br>mm | l <sub>3</sub><br>mm | l <sub>1</sub><br>mm | d <sub>3</sub><br>mm | d <sub>2</sub> (h5)<br>mm | 16704 | ... |
|----------------------|---------|----------------------|----------------------|----------------------|----------------------|---------------------------|-------|-----|
| 0.2                  | 0.10    | 0.2                  | 1                    | 55                   | 0.18                 | 4                         |       | 101 |
| 0.3                  | 0.15    | 0.3                  | 1                    | 55                   | 0.27                 | 4                         |       | 102 |
| 0.3                  | 0.15    | 0.3                  | 3                    | 55                   | 0.27                 | 4                         |       | 103 |
| 0.3                  | 0.15    | 0.3                  | 5                    | 55                   | 0.27                 | 4                         |       | 104 |
| 0.3                  | 0.15    | 0.3                  | 8                    | 55                   | 0.27                 | 4                         |       | 105 |
| 0.4                  | 0.20    | 0.4                  | 4                    | 55                   | 0.35                 | 4                         |       | 106 |
| 0.4                  | 0.20    | 0.4                  | 6                    | 55                   | 0.35                 | 4                         |       | 107 |
| 0.4                  | 0.20    | 0.4                  | 8                    | 55                   | 0.35                 | 4                         |       | 108 |
| 0.5                  | 0.25    | 0.5                  | 5                    | 55                   | 0.45                 | 4                         |       | 109 |
| 0.5                  | 0.25    | 0.5                  | 10                   | 55                   | 0.45                 | 4                         |       | 110 |
| 0.6                  | 0.30    | 0.6                  | 6                    | 55                   | 0.56                 | 4                         |       | 111 |
| 0.6                  | 0.30    | 0.6                  | 9                    | 55                   | 0.56                 | 4                         |       | 112 |
| 0.6                  | 0.30    | 0.6                  | 12                   | 55                   | 0.56                 | 4                         |       | 113 |
| 0.7                  | 0.35    | 0.7                  | 7                    | 55                   | 0.65                 | 4                         |       | 114 |
| 0.7                  | 0.35    | 0.7                  | 14                   | 55                   | 0.65                 | 4                         |       | 115 |
| 0.8                  | 0.40    | 0.8                  | 8                    | 55                   | 0.75                 | 4                         |       | 116 |
| 0.8                  | 0.40    | 0.8                  | 12                   | 55                   | 0.75                 | 4                         |       | 117 |
| 0.8                  | 0.40    | 0.8                  | 16                   | 55                   | 0.75                 | 4                         |       | 118 |
| 1.0                  | 0.50    | 1.0                  | 5                    | 55                   | 0.90                 | 4                         |       | 119 |
| 1.0                  | 0.50    | 1.0                  | 10                   | 55                   | 0.90                 | 4                         |       | 120 |
| 1.0                  | 0.50    | 1.0                  | 15                   | 55                   | 0.90                 | 4                         |       | 121 |
| 1.0                  | 0.50    | 1.0                  | 20                   | 55                   | 0.90                 | 4                         |       | 122 |
| 1.0                  | 0.50    | 1.0                  | 25                   | 55                   | 0.90                 | 4                         |       | 123 |
| 1.0                  | 0.50    | 1.0                  | 30                   | 55                   | 0.90                 | 4                         |       | 124 |
| 1.2                  | 0.60    | 1.2                  | 5                    | 55                   | 1.10                 | 4                         |       | 125 |
| 1.2                  | 0.60    | 1.2                  | 10                   | 55                   | 1.10                 | 4                         |       | 126 |
| 1.2                  | 0.60    | 1.2                  | 15                   | 55                   | 1.10                 | 4                         |       | 127 |
| 1.5                  | 0.75    | 1.5                  | 5                    | 55                   | 1.40                 | 4                         |       | 128 |
| 1.5                  | 0.75    | 1.5                  | 10                   | 55                   | 1.40                 | 4                         |       | 129 |
| 1.5                  | 0.75    | 1.5                  | 15                   | 55                   | 1.40                 | 4                         |       | 130 |
| 1.5                  | 0.75    | 1.5                  | 20                   | 55                   | 1.40                 | 4                         |       | 131 |

| d <sub>1</sub><br>mm | R<br>mm | l <sub>2</sub><br>mm | l <sub>3</sub><br>mm | l <sub>1</sub><br>mm | d <sub>3</sub><br>mm | d <sub>2</sub> (h5)<br>mm | 16704 | ... |
|----------------------|---------|----------------------|----------------------|----------------------|----------------------|---------------------------|-------|-----|
| 1.5                  | 0.75    | 1.5                  | 25                   | 55                   | 1.40                 | 4                         |       | 132 |
| 1.8                  | 0.90    | 1.8                  | 10                   | 55                   | 1.70                 | 4                         |       | 133 |
| 1.8                  | 0.90    | 1.8                  | 20                   | 55                   | 1.70                 | 4                         |       | 134 |
| 2.0                  | 1.00    | 2                    | 10                   | 55                   | 1.90                 | 4                         |       | 135 |
| 2.0                  | 1.00    | 2                    | 15                   | 55                   | 1.90                 | 4                         |       | 136 |
| 2.0                  | 1.00    | 2                    | 20                   | 55                   | 1.90                 | 4                         |       | 137 |
| 2.0                  | 1.00    | 2                    | 25                   | 65                   | 1.90                 | 4                         |       | 138 |
| 2.0                  | 1.00    | 2                    | 30                   | 65                   | 1.90                 | 4                         |       | 139 |
| 3.0                  | 1.50    | 3                    | 10                   | 65                   | 2.90                 | 4                         |       | 140 |
| 3.0                  | 1.50    | 3                    | 15                   | 65                   | 2.90                 | 4                         |       | 141 |
| 3.0                  | 1.50    | 3                    | 20                   | 65                   | 2.90                 | 4                         |       | 142 |
| 3.0                  | 1.50    | 3                    | 25                   | 75                   | 2.90                 | 4                         |       | 143 |
| 3.0                  | 1.50    | 3                    | 30                   | 75                   | 2.90                 | 4                         |       | 144 |
| 4.0                  | 2.00    | 4                    | 20                   | 65                   | 3.90                 | 6                         |       | 145 |
| 4.0                  | 2.00    | 4                    | 30                   | 75                   | 3.90                 | 6                         |       | 146 |
| 4.0                  | 2.00    | 4                    | 40                   | 90                   | 3.90                 | 6                         |       | 147 |
| 5.0                  | 2.50    | 5                    | 20                   | 65                   | 4.90                 | 6                         |       | 148 |
| 5.0                  | 2.50    | 5                    | 30                   | 75                   | 4.90                 | 6                         |       | 149 |
| 5.0                  | 2.50    | 5                    | 40                   | 90                   | 4.90                 | 6                         |       | 150 |
| 5.0                  | 2.50    | 5                    | 50                   | 90                   | 4.90                 | 6                         |       | 151 |
| 6.0                  | 3.00    | 6                    | 30                   | 75                   | 5.90                 | 6                         |       | 152 |
| 6.0                  | 3.00    | 6                    | 40                   | 90                   | 5.90                 | 6                         |       | 153 |
| 6.0                  | 3.00    | 6                    | 50                   | 90                   | 5.90                 | 6                         |       | 154 |
| 6.0                  | 3.00    | 6                    | 60                   | 100                  | 5.90                 | 6                         |       | 155 |
| 8.0                  | 4.00    | 8                    | 30                   | 80                   | 7.80                 | 8                         |       | 156 |
| 8.0                  | 4.00    | 8                    | 60                   | 100                  | 7.80                 | 8                         |       | 157 |
| 10.0                 | 5.00    | 10                   | 30                   | 80                   | 9.80                 | 10                        |       | 158 |
| 10.0                 | 5.00    | 10                   | 60                   | 100                  | 9.80                 | 10                        |       | 159 |
| 12.0                 | 6.00    | 12                   | 30                   | 80                   | 11.80                | 12                        |       | 160 |
| 12.0                 | 6.00    | 12                   | 60                   | 100                  | 11.80                | 12                        |       | 161 |

| Al<10%Si | Al>10%Si | Cu | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Graphite |
|----------|----------|----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|----------|
| -        | -        | -  | -       | -       | -       | -        | -        | -        | -      | -      | -      | -      | -       | -       | -        | -     | 140-340  |



16705

## Solid carbide diamond torus milling cutter DC Ultra


**ATORN®**

## Design

- Solid carbide cutter with crystalline diamond coating
- Special cemented carbide with excellent coating adhesion for the longest possible service life
- Shaft tolerance: h5
- Coating thickness: 10 + 2 µm
- Concentricity: 5 µm
- Radius accuracy: +/- 3 µm

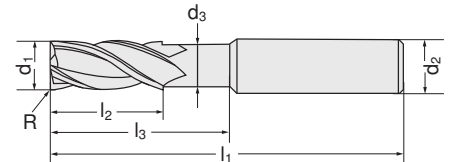
## Applications

For milling graphite, copper and GFRP materials.

16705 201-257



16705 258-275



| d <sub>1</sub><br>mm | R<br>mm | l <sub>2</sub><br>mm | l <sub>3</sub><br>mm | l <sub>1</sub><br>mm | d <sub>3</sub><br>mm | d <sub>2</sub> (h5)<br>mm | 16705 | ... |
|----------------------|---------|----------------------|----------------------|----------------------|----------------------|---------------------------|-------|-----|
| 0.2                  | 0.05    | 0.20                 | 1                    | 55                   | 0.19                 | 4                         | 201   |     |
| 0.3                  | 0.05    | 0.30                 | 1                    | 55                   | 0.27                 | 4                         | 202   |     |
| 0.3                  | 0.05    | 0.30                 | 3                    | 55                   | 0.27                 | 4                         | 203   |     |
| 0.4                  | 0.05    | 0.40                 | 2                    | 55                   | 0.35                 | 4                         | 204   |     |
| 0.4                  | 0.05    | 0.40                 | 4                    | 55                   | 0.35                 | 4                         | 205   |     |
| 0.4                  | 0.05    | 0.40                 | 8                    | 55                   | 0.35                 | 4                         | 206   |     |
| 0.5                  | 0.05    | 0.50                 | 2                    | 55                   | 0.45                 | 4                         | 207   |     |
| 0.5                  | 0.05    | 0.50                 | 5                    | 55                   | 0.45                 | 4                         | 208   |     |
| 0.5                  | 0.05    | 0.50                 | 10                   | 55                   | 0.45                 | 4                         | 209   |     |
| 0.6                  | 0.06    | 0.80                 | 3                    | 55                   | 0.56                 | 4                         | 210   |     |
| 0.6                  | 0.06    | 0.80                 | 6                    | 55                   | 0.56                 | 4                         | 211   |     |
| 0.6                  | 0.06    | 0.80                 | 9                    | 55                   | 0.56                 | 4                         | 212   |     |
| 0.6                  | 0.06    | 1.80                 | 12                   | 55                   | 0.56                 | 4                         | 213   |     |
| 0.8                  | 0.08    | 1.00                 | 4                    | 55                   | 0.75                 | 4                         | 214   |     |
| 0.8                  | 0.08    | 1.00                 | 8                    | 55                   | 0.75                 | 4                         | 215   |     |
| 0.8                  | 0.08    | 1.00                 | 12                   | 55                   | 0.75                 | 4                         | 216   |     |
| 0.8                  | 0.08    | 1.00                 | 16                   | 55                   | 0.75                 | 4                         | 217   |     |
| 1.0                  | 0.10    | 1.00                 | 5                    | 55                   | 0.90                 | 4                         | 218   |     |
| 1.0                  | 0.10    | 1.00                 | 10                   | 55                   | 0.90                 | 4                         | 219   |     |
| 1.0                  | 0.10    | 1.00                 | 15                   | 55                   | 0.90                 | 4                         | 220   |     |
| 1.0                  | 0.10    | 1.00                 | 20                   | 55                   | 0.90                 | 4                         | 221   |     |
| 1.0                  | 0.10    | 1.00                 | 25                   | 55                   | 0.90                 | 4                         | 222   |     |
| 1.2                  | 0.12    | 1.50                 | 5                    | 55                   | 1.10                 | 4                         | 223   |     |
| 1.2                  | 0.12    | 1.50                 | 10                   | 55                   | 1.10                 | 4                         | 224   |     |
| 1.2                  | 0.12    | 1.50                 | 15                   | 55                   | 1.10                 | 4                         | 225   |     |
| 1.5                  | 0.15    | 2.00                 | 5                    | 55                   | 1.50                 | 4                         | 226   |     |
| 1.5                  | 0.15    | 2.00                 | 10                   | 55                   | 1.50                 | 4                         | 227   |     |
| 1.5                  | 0.15    | 2.00                 | 15                   | 55                   | 1.50                 | 4                         | 228   |     |
| 1.5                  | 0.15    | 2.00                 | 20                   | 55                   | 1.50                 | 4                         | 229   |     |
| 1.5                  | 0.15    | 2.00                 | 25                   | 55                   | 1.50                 | 4                         | 230   |     |
| 1.8                  | 0.18    | 2.00                 | 10                   | 55                   | 1.70                 | 4                         | 231   |     |
| 1.8                  | 0.18    | 2.00                 | 20                   | 55                   | 1.70                 | 4                         | 232   |     |
| 2.0                  | 0.20    | 2.00                 | 10                   | 56                   | 1.90                 | 4                         | 233   |     |
| 2.0                  | 0.20    | 2.00                 | 15                   | 56                   | 1.90                 | 4                         | 234   |     |
| 2.0                  | 0.20    | 2.00                 | 20                   | 56                   | 1.90                 | 4                         | 235   |     |
| 2.0                  | 0.20    | 2.00                 | 25                   | 56                   | 1.90                 | 4                         | 236   |     |
| 2.0                  | 0.50    | 2.00                 | 10                   | 56                   | 1.90                 | 4                         | 237   |     |
| 2.0                  | 0.50    | 2.00                 | 15                   | 56                   | 1.90                 | 4                         | 238   |     |

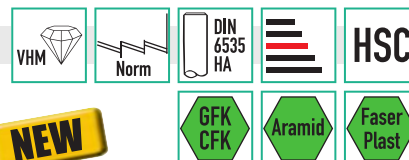
| d <sub>1</sub><br>mm | R<br>mm | l <sub>2</sub><br>mm | l <sub>3</sub><br>mm | l <sub>1</sub><br>mm | d <sub>3</sub><br>mm | d <sub>2</sub> (h5)<br>mm | 16705 | ... |
|----------------------|---------|----------------------|----------------------|----------------------|----------------------|---------------------------|-------|-----|
| 2.0                  | 0.50    | 2.00                 | 20                   | 65                   | 1.90                 | 4                         | 239   |     |
| 2.0                  | 0.50    | 2.00                 | 25                   | 65                   | 1.90                 | 4                         | 240   |     |
| 3.0                  | 0.30    | 3.00                 | 15                   | 65                   | 2.90                 | 4                         | 241   |     |
| 3.0                  | 0.30    | 3.00                 | 25                   | 75                   | 2.90                 | 4                         | 242   |     |
| 3.0                  | 0.50    | 3.00                 | 10                   | 65                   | 2.90                 | 4                         | 243   |     |
| 3.0                  | 0.50    | 3.00                 | 15                   | 65                   | 2.90                 | 4                         | 244   |     |
| 3.0                  | 0.50    | 3.00                 | 20                   | 65                   | 2.90                 | 4                         | 245   |     |
| 3.0                  | 0.50    | 3.00                 | 25                   | 75                   | 2.90                 | 4                         | 246   |     |
| 3.0                  | 0.50    | 3.00                 | 30                   | 75                   | 2.90                 | 4                         | 247   |     |
| 4.0                  | 0.30    | 4.00                 | 15                   | 65                   | 3.90                 | 6                         | 248   |     |
| 4.0                  | 0.40    | 4.00                 | 15                   | 65                   | 3.90                 | 6                         | 249   |     |
| 4.0                  | 0.40    | 4.00                 | 25                   | 75                   | 3.90                 | 6                         | 250   |     |
| 4.0                  | 0.50    | 4.00                 | 20                   | 65                   | 3.90                 | 6                         | 251   |     |
| 4.0                  | 0.50    | 4.00                 | 30                   | 75                   | 3.90                 | 6                         | 252   |     |
| 4.0                  | 0.50    | 5.00                 | 40                   | 90                   | 3.90                 | 6                         | 253   |     |
| 5.0                  | 0.50    | 5.00                 | 20                   | 75                   | 4.90                 | 6                         | 254   |     |
| 5.0                  | 0.50    | 5.00                 | 30                   | 75                   | 4.90                 | 6                         | 255   |     |
| 5.0                  | 0.50    | 5.00                 | 40                   | 90                   | 4.90                 | 6                         | 256   |     |
| 5.0                  | 0.50    | 5.00                 | 50                   | 90                   | 4.90                 | 6                         | 257   |     |
| 6.0                  | 0.50    | 6.00                 | 30                   | 75                   | 5.90                 | 6                         | 258   |     |
| 6.0                  | 0.50    | 6.00                 | 40                   | 90                   | 5.90                 | 6                         | 259   |     |
| 6.0                  | 0.50    | 6.00                 | 50                   | 90                   | 5.90                 | 6                         | 260   |     |
| 6.0                  | 0.50    | 6.00                 | 60                   | 90                   | 5.90                 | 6                         | 261   |     |
| 6.0                  | 1.00    | 6.00                 | 30                   | 75                   | 5.90                 | 6                         | 262   |     |
| 6.0                  | 1.00    | 6.00                 | 40                   | 90                   | 5.90                 | 6                         | 263   |     |
| 8.0                  | 0.50    | 8.00                 | 30                   | 80                   | 7.80                 | 8                         | 264   |     |
| 8.0                  | 0.50    | 8.00                 | 60                   | 100                  | 8.80                 | 8                         | 265   |     |
| 8.0                  | 1.00    | 8.00                 | 30                   | 80                   | 9.80                 | 8                         | 266   |     |
| 8.0                  | 1.00    | 8.00                 | 60                   | 100                  | 10.80                | 8                         | 267   |     |
| 10.0                 | 0.50    | 10.00                | 30                   | 80                   | 9.80                 | 10                        | 268   |     |
| 10.0                 | 0.50    | 10.00                | 60                   | 100                  | 9.80                 | 10                        | 269   |     |
| 10.0                 | 1.00    | 10.00                | 30                   | 80                   | 9.80                 | 10                        | 270   |     |
| 10.0                 | 1.00    | 10.00                | 60                   | 100                  | 9.80                 | 10                        | 271   |     |
| 12.0                 | 0.50    | 12.00                | 30                   | 80                   | 11.80                | 12                        | 272   |     |
| 12.0                 | 0.50    | 12.00                | 60                   | 100                  | 11.80                | 12                        | 273   |     |
| 12.0                 | 1.00    | 12.00                | 30                   | 80                   | 11.80                | 12                        | 274   |     |
| 12.0                 | 1.00    | 12.00                | 60                   | 100                  | 11.80                | 12                        | 275   |     |

| Al<10%Si | Al>10%Si | Cu | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Graphite |
|----------|----------|----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|----------|
| -        | -        | -  | -       | -       | -       | -        | -        | -        | -      | -      | -      | -      | -       | -       | -        | -     | 140-340  |

# Solid carbide compression milling cutters | Solid carbide end mills | Solid carbide honeycomb cutters

16909

## Solid carbide HSC compression milling cutters



**NEW**

**ATORN®**

### Design

- With opposing chip flutes
- With chip breaker and spiral from left to right
- Simultaneous drawing and pushing cut
- Finishing quality ( $R_a < 2 \mu m$ )

### Advantage:

- Prevention of delamination

### Applications

For machining fibre plastics as well as carbon and epoxy resin or polyester-based fibreglass.

### Quality

Dia.HC-coated surface.



| Alternating twist short  |                      |                      |                      |                      |           |
|--------------------------|----------------------|----------------------|----------------------|----------------------|-----------|
| d <sub>1</sub> h10<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | W <sub>A</sub><br>mm | d <sub>2</sub><br>mm | 16909 ... |
| 6.0                      | 13                   | 57                   | 4                    | 6                    | 101       |
| 8.0                      | 19                   | 63                   | 6                    | 8                    | 102       |
| 10.0                     | 22                   | 72                   | 7                    | 10                   | 103       |
| 12.0                     | 26                   | 83                   | 8                    | 12                   | 104       |

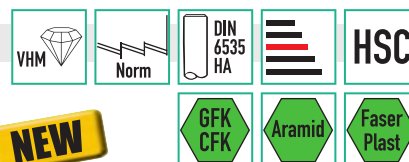
| Alternating twist medium |                      |                      |                      |                      |           |
|--------------------------|----------------------|----------------------|----------------------|----------------------|-----------|
| d <sub>1</sub> h10<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | W <sub>B</sub><br>mm | d <sub>2</sub><br>mm | 16909 ... |
| 6.0                      | 13                   | 57                   | 6.5                  | 6                    | 105       |
| 8.0                      | 19                   | 63                   | 9.5                  | 8                    | 106       |
| 10.0                     | 22                   | 72                   | 11                   | 10                   | 107       |
| 12.0                     | 26                   | 83                   | 13                   | 12                   | 108       |

| Alternating twist long   |                      |                      |                      |                      |           |
|--------------------------|----------------------|----------------------|----------------------|----------------------|-----------|
| d <sub>1</sub> h10<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | W <sub>C</sub><br>mm | d <sub>2</sub><br>mm | 16909 ... |
| 6.0                      | 22                   | 60                   | 11                   | 6                    | 109       |
| 8.0                      | 32                   | 78                   | 16                   | 8                    | 110       |
| 10.0                     | 35                   | 78                   | 17.5                 | 10                   | 111       |
| 12.0                     | 40                   | 83                   | 20                   | 12                   | 112       |

| Al<8%Si | Al>8%Si | Cu alloy | Duro | Thermo | GFRP    | CFRP    | Aramid | Composite ceramic | Faserplast | Honeycomb |
|---------|---------|----------|------|--------|---------|---------|--------|-------------------|------------|-----------|
| -       | -       | -        | -    | -      | 300-500 | 300-500 | -      | -                 | -          | -         |

16911

## VHM HSC end mill



**NEW**

**ATORN®**

### Design

- With large chip flutes and synchronous chip breaker
- Diamond-coated surface

### Advantage:

- Continuous cutting with good chip removal

### Applications

For machining fibre composite materials.

### Quality

Dia.HC-coated surface.

| Helix W 0°               |                      |                      |                      | 5 cutting edges |     |
|--------------------------|----------------------|----------------------|----------------------|-----------------|-----|
| d <sub>1</sub> h10<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub><br>mm | 16911           | ... |
| 4.0                      | 14                   | 40                   | 6                    |                 | 103 |
| 5.0                      | 16                   | 50                   | 6                    |                 | 104 |
| 6.0                      | 18                   | 50                   | 6                    |                 | 105 |
| 8.0                      | 20                   | 63                   | 8                    |                 | 106 |
| 10.0                     | 25                   | 72                   | 10                   |                 | 107 |
| 12.0                     | 30                   | 83                   | 12                   |                 | 108 |

| Helix W 10°        |                |                |                | 6 cutting edges |     |
|--------------------|----------------|----------------|----------------|-----------------|-----|
| d <sub>1</sub> h10 | l <sub>2</sub> | l <sub>1</sub> | d <sub>2</sub> | 16911           | ... |
| mm                 | mm             | mm             | mm             |                 |     |
| 4.0                | 20             | 50             | 6              |                 | 111 |
| 5.0                | 16             | 50             | 6              |                 | 112 |
| 6.0                | 18             | 50             | 6              |                 | 113 |
| L 6.0              | 35             | 75             | 6              |                 | 114 |
| 8.0                | 20             | 63             | 8              |                 | 115 |
| L 8.0              | 40             | 100            | 8              |                 | 116 |
| 10.0               | 25             | 72             | 10             |                 | 117 |
| 12.0               | 30             | 83             | 12             |                 | 118 |

| Al<8%Si | Al>8%Si | Cu alloy | Duro | Thermo | GFRP    | CFRP    | Aramid | Composite ceramic | Faserplast | Honeycomb |
|---------|---------|----------|------|--------|---------|---------|--------|-------------------|------------|-----------|
| -       | -       | -        | -    | -      | 100-150 | 100-200 | 90-140 | -                 | -          | -         |

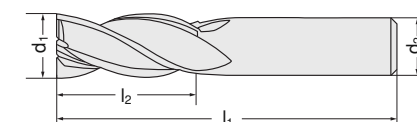
**Z5**

16911 103-108



**Z6**

16911 111-118



**16912 - 16914**
**Solid carbide HSC end mill with spur cut**

VHM  
poliert

Norm

DIN  
6535  
HA

HSC

HSC

**NEW**

GFK  
CFK

Aramid

Faser  
Plast

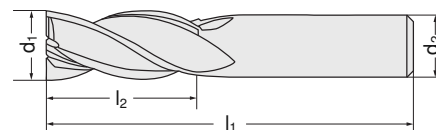
**ATORN®**
**Design**

- With pyramid cross-toothing with extremely sharp cutting edges
- Multi-tooth milling cutter face

**Advantage:**

- Can be used for a wide variety of materials

**Applications**
**Fine:** For machining fibre plastics with high fibre content

**Medium:** Soft fibre plastics with a tendency to stick  
**Coarse:** Sandwich materials and foams


|                          |                      |                      |                      | Fine toothting |     |
|--------------------------|----------------------|----------------------|----------------------|----------------|-----|
| d <sub>1</sub> h10<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub><br>mm | 16912          | ... |
| 4.0                      | 15                   | 40                   | 4                    |                | 105 |
| 5.0                      | 16                   | 50                   | 5                    |                | 107 |
| 6.0                      | 18                   | 50                   | 6                    |                | 109 |
| 8.0                      | 25                   | 63                   | 8                    |                | 111 |
| 10.0                     | 30                   | 72                   | 10                   |                | 113 |
| 12.0                     | 32                   | 83                   | 12                   |                | 114 |



16912

|                          |                      |                      |                      | Medium toothting |     |
|--------------------------|----------------------|----------------------|----------------------|------------------|-----|
| d <sub>1</sub> h10<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub><br>mm | 16913            | ... |
| 4.0                      | 15                   | 40                   | 4                    |                  | 105 |
| 5.0                      | 16                   | 50                   | 5                    |                  | 107 |
| 6.0                      | 18                   | 50                   | 6                    |                  | 109 |
| 8.0                      | 25                   | 63                   | 8                    |                  | 111 |
| 10.0                     | 30                   | 72                   | 10                   |                  | 113 |
| 12.0                     | 32                   | 83                   | 12                   |                  | 114 |



16913

|                          |                      |                      |                      | Coarse toothting |     |
|--------------------------|----------------------|----------------------|----------------------|------------------|-----|
| d <sub>1</sub> h10<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub><br>mm | 16914            | ... |
| 4.0                      | 15                   | 40                   | 4                    |                  | 105 |
| 5.0                      | 16                   | 50                   | 5                    |                  | 107 |
| 6.0                      | 18                   | 50                   | 6                    |                  | 109 |
| 8.0                      | 25                   | 63                   | 8                    |                  | 111 |
| 10.0                     | 30                   | 72                   | 10                   |                  | 113 |
| 12.0                     | 32                   | 83                   | 12                   |                  | 114 |



16914

| Al<8%Si | Al>8%Si | Cu alloy | Duro | Thermo | GFRP    | CFRP    | Aramid | Composite ceramic | Faserplast | Honeycomb |
|---------|---------|----------|------|--------|---------|---------|--------|-------------------|------------|-----------|
| -       | -       | -        | -    | -      | 100-150 | 100-200 | 90-140 | -                 | -          | -         |

**16915**
**Solid carbide HSC honeycomb cutter**

VHM  
poliert

Norm

DIN  
6535  
HA

HSC

HSC

**NEW**

Honey  
Comb

**ATORN®**
**Design**

- With special toothting for drawing cut
- Extremely sharp multi-flute toothting

**Advantage:**

- Good surface for further machining

**Applications**

For machining honeycomb materials.



16915

| d <sub>1</sub> h10<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub><br>mm | 16915 | ... |
|--------------------------|----------------------|----------------------|----------------------|-------|-----|
| 6.0                      | 16                   | 50                   | 6                    |       | 101 |
| 8.0                      | 19                   | 63                   | 8                    |       | 102 |
| 10.0                     | 22                   | 72                   | 10                   |       | 103 |
| 12.0                     | 26                   | 83                   | 12                   |       | 104 |
| 16.0                     | 17                   | 100                  | 12                   |       | 106 |
| 20.0                     | 17                   | 100                  | 12                   |       | 107 |



| Al<8%Si | Al>8%Si | Cu alloy | Duro | Thermo | GFRP | CFRP | Aramid | Composite ceramic | Faserplast | Honeycomb |
|---------|---------|----------|------|--------|------|------|--------|-------------------|------------|-----------|
| -       | -       | -        | -    | -      | -    | -    | -      | -                 | -          | 350       |

16916 - 16921

Solid carbide HSC end mill with groove cutter tip

**ATORN®****Design**

- With pyramid cross-toothing with groove cutter tip for drilling, grooving and trimming
- Extremely sharp cutting edges

**Advantage:**

- Can be used for a wide variety of materials

**Applications**

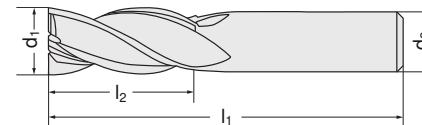
**Fine:** For machining fibre plastics with high fibre content

**Medium:** soft fibre plastics with a tendency to stick

**Coarse:** Sandwich materials and foams

**Quality**

**Surface polished or Dia.HC-coated.**

**NEW****Fine toothing**

| d <sub>1</sub> h10<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub><br>mm | Solid carbide<br>16916 | ... | Solid carbide Dia.HC<br>16919 | ... |
|--------------------------|----------------------|----------------------|----------------------|------------------------|-----|-------------------------------|-----|
| 4.0                      | 15                   | 40                   | 4                    |                        | 105 | 105                           |     |
| 5.0                      | 16                   | 50                   | 5                    |                        | 107 | 107                           |     |
| 6.0                      | 18                   | 50                   | 6                    |                        | 109 | 109                           |     |
| L 6.0                    | 35                   | 75                   | 6                    |                        | 110 | 110                           |     |
| 8.0                      | 25                   | 63                   | 8                    |                        | 111 | 111                           |     |
| L 8.0                    | 40                   | 100                  | 8                    |                        | 112 | 112                           |     |
| 10.0                     | 30                   | 72                   | 10                   |                        | 113 | 113                           |     |
| 12.0                     | 32                   | 83                   | 12                   |                        | 114 | 114                           |     |

**Medium toothing**

| d <sub>1</sub> h10<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub><br>mm | Solid carbide<br>16917 | ... | Solid carbide Dia.HC<br>16920 | ... |
|--------------------------|----------------------|----------------------|----------------------|------------------------|-----|-------------------------------|-----|
| 4.0                      | 15                   | 40                   | 4                    |                        | 105 | 105                           |     |
| 5.0                      | 16                   | 50                   | 5                    |                        | 107 | 107                           |     |
| 6.0                      | 18                   | 50                   | 6                    |                        | 109 | 109                           |     |
| L 6.0                    | 35                   | 75                   | 6                    |                        | 110 | 110                           |     |
| 8.0                      | 25                   | 63                   | 8                    |                        | 111 | 111                           |     |
| L 8.0                    | 40                   | 100                  | 8                    |                        | 112 | 112                           |     |
| 10.0                     | 30                   | 72                   | 10                   |                        | 113 | 113                           |     |
| 12.0                     | 32                   | 83                   | 12                   |                        | 114 | 114                           |     |

**Coarse toothing**

| d <sub>1</sub> h10<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub><br>mm | Solid carbide<br>16918 | ... | Solid carbide Dia.HC<br>16921 | ... |
|--------------------------|----------------------|----------------------|----------------------|------------------------|-----|-------------------------------|-----|
| 4.0                      | 15                   | 40                   | 4                    |                        | 105 | 105                           |     |
| 5.0                      | 16                   | 50                   | 5                    |                        | 107 | 107                           |     |
| 6.0                      | 18                   | 50                   | 6                    |                        | 109 | 109                           |     |
| L 6.0                    | 35                   | 75                   | 6                    |                        | 110 | 110                           |     |
| 8.0                      | 25                   | 63                   | 8                    |                        | 111 | 111                           |     |
| L 8.0                    | 40                   | 100                  | 8                    |                        | 112 | 112                           |     |
| 10.0                     | 30                   | 72                   | 10                   |                        | 113 | 113                           |     |
| 12.0                     | 32                   | 83                   | 12                   |                        | 114 | 114                           |     |

| Al<8%Si | Al>8%Si | Cu alloy | Duro | Thermo | GFRP    | CFRP    | Aramid | Composite ceramic | Faserplast | Honeycomb |
|---------|---------|----------|------|--------|---------|---------|--------|-------------------|------------|-----------|
| -       | -       | -        | -    | -      | 100-150 | 100-200 | 90-140 | -                 | -          | -         |

VHM poliert 16916



VHM

16919



VHM poliert 16917



VHM

16920



VHM poliert 16918



VHM

16921



16925

Solid carbide HSC radius cutter

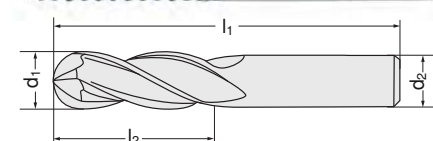
**ATORN®****Design**

- With pyramid cross-toothing for drawing cut
- Extremely sharp toothing

**Applications**

For soft fibre plastics with a tendency to stick.

Face radius for copy machining.

**NEW****Medium toothing**

| d <sub>1</sub> h10<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub><br>mm | Solid carbide Dia.HC<br>16925 | ... |
|--------------------------|----------------------|----------------------|----------------------|-------------------------------|-----|
| 4.0                      | 15                   | 40                   | 4                    |                               | 103 |
| 6.0                      | 18                   | 50                   | 6                    |                               | 107 |
| 8.0                      | 25                   | 63                   | 8                    |                               | 109 |
| L 8.0                    | 40                   | 100                  | 8                    |                               | 110 |
| 10.0                     | 30                   | 72                   | 10                   |                               | 111 |
| 12.0                     | 32                   | 83                   | 12                   |                               | 112 |

| Al<8%Si | Al>8%Si | Cu alloy | Duro | Thermo | GFRP    | CFRP    | Aramid | Composite ceramic | Faserplast | Honeycomb |
|---------|---------|----------|------|--------|---------|---------|--------|-------------------|------------|-----------|
| -       | -       | -        | -    | -      | 100-150 | 100-200 | 90-140 | -                 | -          | -         |

16926 - 16928

## Solid carbide HPC end mill with drill tip

VHM  
poliert

Norm

DIN  
6535  
HA

135°

HSC

Honey  
CombGFK  
CFK

Aramid

Faser  
Plast**ATORN®**

## Design

- With pyramid cross-toothing with extremely sharp cutting edges
- With 135° drill tip for drilling and trimming

## Advantage:

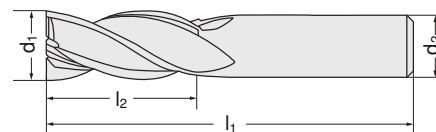
- Can be used for a wide variety of materials

## Applications

**Fine:** For machining fibre plastics with high fibre content

**Medium:** Soft fibre plastics with a tendency to stick

**Coarse:** Sandwich materials and foams

**NEW**

## Fine toothing

| d <sub>1</sub> h10<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub><br>mm | 16926 | ... |
|--------------------------|----------------------|----------------------|----------------------|-------|-----|
| 4.0                      | 15                   | 40                   | 4                    |       | 105 |
| 5.0                      | 16                   | 50                   | 5                    |       | 107 |
| 6.0                      | 18                   | 50                   | 6                    |       | 109 |
| 8.0                      | 25                   | 63                   | 8                    |       | 111 |
| 10.0                     | 30                   | 72                   | 10                   |       | 113 |
| 12.0                     | 32                   | 83                   | 12                   |       | 114 |

16926



## Medium toothing

| d <sub>1</sub> h10<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub><br>mm | 16927 | ... |
|--------------------------|----------------------|----------------------|----------------------|-------|-----|
| 4.0                      | 15                   | 40                   | 4                    |       | 105 |
| 5.0                      | 16                   | 50                   | 5                    |       | 107 |
| 6.0                      | 18                   | 50                   | 6                    |       | 109 |
| 8.0                      | 25                   | 63                   | 8                    |       | 111 |
| 10.0                     | 30                   | 72                   | 10                   |       | 113 |
| 12.0                     | 32                   | 83                   | 12                   |       | 114 |

16927



## Coarse toothing

| d <sub>1</sub> h10<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub><br>mm | 16928 | ... |
|--------------------------|----------------------|----------------------|----------------------|-------|-----|
| 4.0                      | 15                   | 40                   | 4                    |       | 105 |
| 5.0                      | 16                   | 50                   | 5                    |       | 107 |
| 6.0                      | 18                   | 50                   | 6                    |       | 109 |
| 8.0                      | 25                   | 63                   | 8                    |       | 111 |
| 10.0                     | 30                   | 72                   | 10                   |       | 113 |
| 12.0                     | 32                   | 83                   | 12                   |       | 114 |

16928



| Al<8%Si | Al>8%Si | Cu alloy | Duro | Thermo | GFRP    | CFRP    | Aramid | Composite ceramic | Faserplast | Honeycomb |
|---------|---------|----------|------|--------|---------|---------|--------|-------------------|------------|-----------|
| -       | -       | -        | -    | -      | 100-150 | 100-200 | 90-140 | -                 | -          | -         |

16933

## Solid carbide HSC cutter for aramid

VHM  
poliert

Norm

DIN  
6535  
HA

HSC

Aramid

**ATORN®**

## Design

- With opposing toothing
- Right cutting with right/left-hand spiral
- Extremely sharp cutting edges
- Shearing cut

## Applications

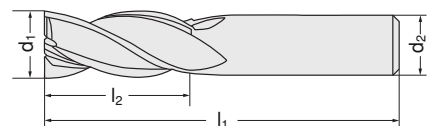
For machining aramid.

## Quality

Surface polished.

**NEW**

16933



| d <sub>1</sub> h10<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | d <sub>2</sub><br>mm | 16933 | ... |
|--------------------------|----------------------|----------------------|----------------------|-------|-----|
| 6.0                      | 20                   | 50                   | 6                    |       | 101 |
| 8.0                      | 22                   | 63                   | 8                    |       | 102 |
| 10.0                     | 25                   | 72                   | 10                   |       | 103 |
| 12.0                     | 30                   | 83                   | 12                   |       | 104 |

| Al<8%Si | Al>8%Si | Cu alloy | Duro | Thermo | GFRP | CFRP | Aramid  | Composite ceramic | Faserplast | Honeycomb |
|---------|---------|----------|------|--------|------|------|---------|-------------------|------------|-----------|
| -       | -       | -        | -    | -      | -    | -    | 100-130 | -                 | -          | -         |

# Interchangeable head milling system

16760 - 16780

Interchangeable head holder

**ATORN®**

Design

- Precision-ground mounts

## Interchangeable head holder, short (steel)

HPC



h6

| Size | Ø <sub>2</sub><br>mm | l <sub>1</sub><br>mm | Clearance Ø<br>mm | l <sub>3</sub><br>mm | 16760 | ... |
|------|----------------------|----------------------|-------------------|----------------------|-------|-----|
| 20   | 10                   | 65                   | 9.6               | 5                    |       | 102 |
| 30   | 12                   | 75                   | 11.6              | 5                    |       | 103 |
| 40   | 16                   | 80                   | 15.4              | 6                    |       | 104 |
| 50   | 20                   | 90                   | 19.2              | 6                    |       | 105 |

## Interchangeable head holder, long (steel)



h6

| Size | Ø <sub>2</sub><br>mm | l <sub>1</sub><br>mm | Clearance Ø<br>mm | l <sub>3</sub><br>mm | 16760 | ... |
|------|----------------------|----------------------|-------------------|----------------------|-------|-----|
| 20   | 10                   | 75                   | 9.6               | 18                   |       | 202 |
| 30   | 12                   | 85                   | 11.6              | 21                   |       | 203 |
| 40   | 16                   | 95                   | 15.4              | 23                   |       | 204 |
| 50   | 20                   | 110                  | 19.2              | 28                   |       | 205 |

## Interchangeable head holder, extra long (solid carbide)



h6

| Size | Ø <sub>2</sub><br>mm | l <sub>1</sub><br>mm | Clearance Ø<br>mm | l <sub>3</sub><br>mm | 16760 | ... |
|------|----------------------|----------------------|-------------------|----------------------|-------|-----|
| 20   | 10                   | 111                  | 9.6               | 56                   |       | 302 |
| 30   | 12                   | 128                  | 11.6              | 63                   |       | 303 |
| 40   | 16                   | 149                  | 15.4              | 79                   |       | 304 |
| 50   | 20                   | 174                  | 19.2              | 94                   |       | 305 |

## Interchangeable head holder, conical 5° (steel)



h6

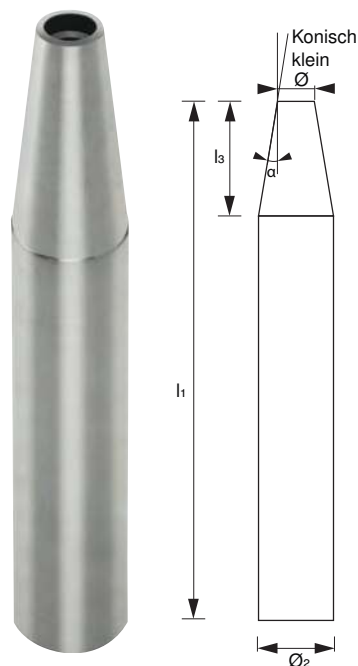
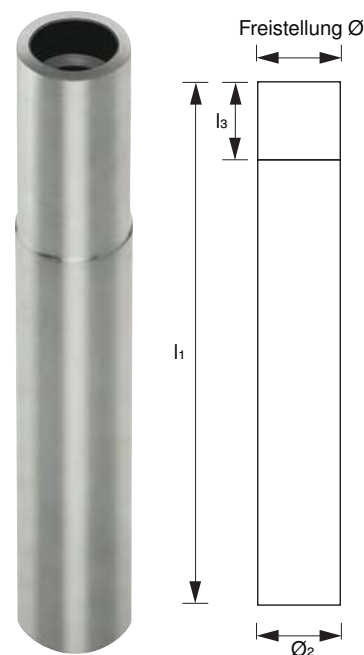
| Size | Ø <sub>2</sub><br>mm | l <sub>1</sub><br>mm | Ø conical small<br>mm | l <sub>3</sub><br>mm | 16761 | ... |
|------|----------------------|----------------------|-----------------------|----------------------|-------|-----|
| 20   | 16                   | 105                  | 9.6                   | 36                   |       | 102 |
| 30   | 20                   | 120                  | 11.6                  | 48                   |       | 103 |
| 40   | 20                   | 135                  | 15.4                  | 26                   |       | 104 |
| 50   | 25                   | 150                  | 19.2                  | 33                   |       | 105 |

## Interchangeable head holder, conical 1° (steel)



h6

| Size | Ø <sub>2</sub><br>mm | l <sub>1</sub><br>mm | Ø conical small<br>mm | l <sub>3</sub><br>mm | 16761 | ... |
|------|----------------------|----------------------|-----------------------|----------------------|-------|-----|
| 20   | 16                   | 110                  | 9.6                   | 36                   |       | 202 |
| 30   | 20                   | 130                  | 11.6                  | 53                   |       | 203 |
| 40   | 20                   | 145                  | 15.4                  | 59                   |       | 204 |
| 50   | 25                   | 180                  | 19.2                  | 74                   |       | 205 |



Continued

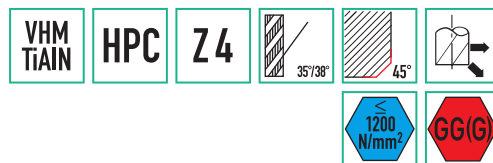
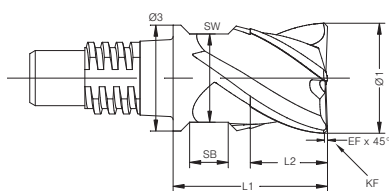
Continued ▶

**ATORN®****Design**

- Solid carbide milling system for replaceable inserts
- High concentricity < 10 µm thanks to conical and flat face

**Advantages:**

- Guaranteed repetitive accuracy
- High stability and rigidity due to the pilot and the flat face
- Low-vibration
- Short set-up times

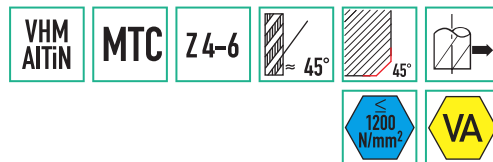
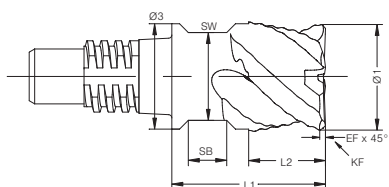
**Solid carbide cutter 35/38°**

16763

| Size | Ø <sub>1</sub><br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | Clearance<br>mm | KF<br>mm | SW x SB<br>mm | Z | 16763 | ... |
|------|----------------------|----------------------|----------------------|-----------------|----------|---------------|---|-------|-----|
| 20   | 10                   | 7                    | 14                   | 9.6             | 0.3      | 8 x 3         | 4 |       | 102 |
| 30   | 12                   | 9                    | 17                   | 11.6            | 0.3      | 10 x 4        | 4 |       | 103 |
| 40   | 16                   | 12                   | 21                   | 15.4            | 0.4      | 13 x 5        | 4 |       | 104 |
| 50   | 20                   | 15                   | 26                   | 19.2            | 0.5      | 16 x 5        | 4 |       | 105 |



| Al<10%Si | Al>10%Si | Cu | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <50HRC | <55HRC | <60HRC | <65HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|----------|----------|----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| -        | -        | -  | 190     | 170     | 150     | 130      | 130      | 110      | -      | -      | -      | -      | 75      | -       | -        | 170   | -       |

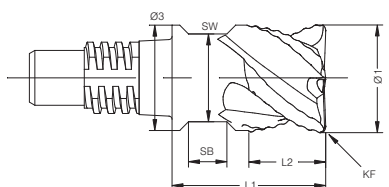
**Solid carbide roughing cutter type NRf**

16764

| Size | Ø <sub>1</sub><br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | Clearance<br>mm | KF<br>mm | SW x SB<br>mm | Z | 16764 | ... |
|------|----------------------|----------------------|----------------------|-----------------|----------|---------------|---|-------|-----|
| 20   | 10                   | 7                    | 14                   | 9.6             | 0.2      | 8 x 3         | 4 |       | 102 |
| 30   | 12                   | 9                    | 17                   | 11.6            | 0.2      | 10 x 4        | 4 |       | 103 |
| 40   | 16                   | 12                   | 21                   | 15.4            | 0.25     | 13 x 5        | 5 |       | 104 |
| 50   | 20                   | 15                   | 26                   | 19.2            | 0.25     | 16 x 5        | 6 |       | 105 |



| Al<10%Si | Al>10%Si | Cu | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <50HRC | <55HRC | <60HRC | <65HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|----------|----------|----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| -        | -        | -  | 190     | 190     | 180     | 125      | 120      | 110      | -      | -      | -      | -      | 90      | 90      | -        | 160   | -       |

**Solid carbide roughing cutter type NR**

16765

| Size | Ø <sub>1</sub><br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | Clearance<br>mm | KF<br>mm | SW x SB<br>mm | Z | 16765 | ... |
|------|----------------------|----------------------|----------------------|-----------------|----------|---------------|---|-------|-----|
| 20   | 10                   | 7                    | 14                   | 9.6             | 0.2      | 8 x 3         | 4 |       | 102 |
| 30   | 12                   | 9                    | 17                   | 11.6            | 0.2      | 10 x 4        | 4 |       | 103 |
| 40   | 16                   | 12                   | 21                   | 15.4            | 0.25     | 13 x 5        | 5 |       | 104 |
| 50   | 20                   | 15                   | 26                   | 19.2            | 0.25     | 16 x 5        | 5 |       | 105 |



| Al<10%Si | Al>10%Si | Cu | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <50HRC | <55HRC | <60HRC | <65HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|----------|----------|----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| -        | -        | -  | -       | 190     | 190     | 180      | 130      | 120      | 110    | -      | -      | -      | 90      | -       | -        | 160   | -       |

Continued ▶

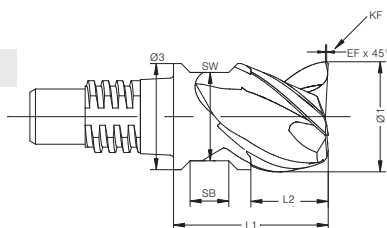
# Interchangeable head milling system

16760 - 16780

## Interchangeable head milling system

Continued

### Solid carbide aluminium cutter



VHM  
ZrN

HPC

Z3

45°

45°

ALU

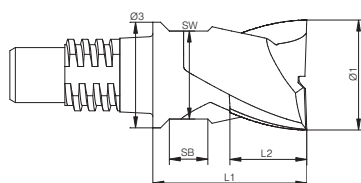
16766



| Size | Ø <sub>1</sub><br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | Clearance<br>mm | KF<br>mm | SW x SB<br>mm | Z | 16766 | ... |
|------|----------------------|----------------------|----------------------|-----------------|----------|---------------|---|-------|-----|
| 20   | 10                   | 7                    | 14                   | 9.6             | 0.2      | 8 x 3         | 3 | 102   |     |
| 30   | 12                   | 9                    | 17                   | 11.6            | 0.2      | 10 x 4        | 3 | 103   |     |
| 40   | 16                   | 12                   | 21                   | 15.4            | 0.2      | 13 x 5        | 3 | 104   |     |
| 50   | 20                   | 15                   | 26                   | 19.2            | 0.2      | 16 x 5        | 3 | 105   |     |

| Al<10%Si | Al>10%Si | Cu  | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <50HRC | <55HRC | <60HRC | <65HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|----------|----------|-----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| 400      | 250      | 160 | 450     | -       | -       | -        | -        | -        | -      | -      | -      | -      | -       | -       | -        | -     | -       |

### Solid carbide square end mill



VHM  
TiAlN

Z2

30°

90°

Uni

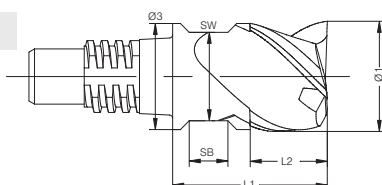
16767



| Size | Ø <sub>1</sub><br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | Clearance<br>mm | SW x SB<br>mm | Z | 16767 | ... |
|------|----------------------|----------------------|----------------------|-----------------|---------------|---|-------|-----|
| 20   | 10                   | 7                    | 14                   | 9.6             | 8 x 3         | 2 | 102   |     |
| 30   | 12                   | 9                    | 17                   | 11.6            | 10 x 4        | 2 | 103   |     |
| 40   | 16                   | 12                   | 21                   | 15.4            | 13 x 5        | 2 | 104   |     |
| 50   | 20                   | 15                   | 26                   | 19.2            | 16 x 5        | 2 | 105   |     |

| Al<10%Si | Al>10%Si | Cu  | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <50HRC | <55HRC | <60HRC | <65HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|----------|----------|-----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| 250      | 200      | 200 | 200     | 220     | 195     | 175      | 165      | 160      | 150    | -      | -      | -      | 120     | -       | -        | 180   | -       |

### Solid carbide end mill



VHM  
TiAlN

Z3

45°

90°

Uni

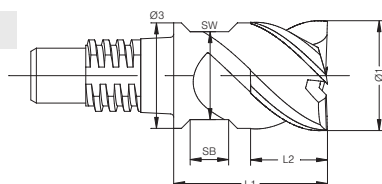
16768



| Size | Ø <sub>1</sub><br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | Clearance<br>mm | SW x SB<br>mm | Z | 16768 | ... |
|------|----------------------|----------------------|----------------------|-----------------|---------------|---|-------|-----|
| 20   | 10                   | 7                    | 14                   | 9.6             | 8 x 3         | 3 | 102   |     |
| 30   | 12                   | 9                    | 17                   | 11.6            | 10 x 4        | 3 | 103   |     |
| 40   | 16                   | 12                   | 21                   | 15.4            | 13 x 5        | 3 | 104   |     |
| 50   | 20                   | 15                   | 26                   | 19.2            | 16 x 5        | 3 | 105   |     |

| Al<10%Si | Al>10%Si | Cu  | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <50HRC | <55HRC | <60HRC | <65HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|----------|----------|-----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| 250      | 200      | 200 | 200     | 220     | 195     | 175      | 165      | 160      | 150    | -      | -      | -      | 120     | -       | -        | 180   | -       |

### Solid carbide end mill



VHM  
TiAlN

Z4

45°

90°

Uni

16769



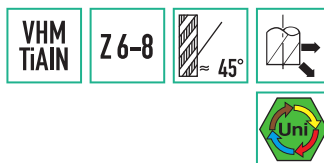
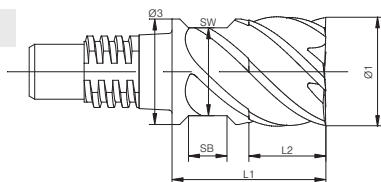
| Size | Ø <sub>1</sub><br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | Clearance<br>mm | SW x SB<br>mm | Z | 16769 | ... |
|------|----------------------|----------------------|----------------------|-----------------|---------------|---|-------|-----|
| 20   | 10                   | 7                    | 14                   | 9.6             | 8 x 3         | 4 | 102   |     |
| 30   | 12                   | 9                    | 17                   | 11.6            | 10 x 4        | 4 | 103   |     |
| 40   | 16                   | 12                   | 21                   | 15.4            | 13 x 5        | 4 | 104   |     |
| 50   | 20                   | 15                   | 26                   | 19.2            | 16 x 5        | 4 | 105   |     |

| Al<10%Si | Al>10%Si | Cu  | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <50HRC | <55HRC | <60HRC | <65HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|----------|----------|-----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| 250      | 200      | 200 | 200     | 220     | 195     | 175      | 165      | 160      | 150    | -      | -      | -      | 120     | -       | -        | 180   | -       |

Continued

Continued

## Solid carbide finishing cutters



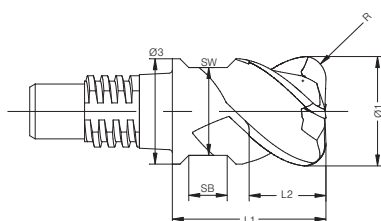
16770

| Size | Ø <sub>1</sub><br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | Clearance<br>mm | SW x SB<br>mm | Z | 16770 | ... |
|------|----------------------|----------------------|----------------------|-----------------|---------------|---|-------|-----|
| 20   | 10                   | 7                    | 14                   | 9.6             | 8 x 3         | 6 |       | 102 |
| 30   | 12                   | 9                    | 17                   | 11.6            | 10 x 4        | 6 |       | 103 |
| 40   | 16                   | 12                   | 21                   | 15.4            | 13 x 5        | 6 |       | 104 |
| 50   | 20                   | 15                   | 26                   | 19.2            | 16 x 5        | 8 |       | 105 |



| Al<10%Si | Al>10%Si | Cu  | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <50HRC | <55HRC | <60HRC | <65HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|----------|----------|-----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| -        | -        | 200 | 220     | 195     | 175     | 165      | 160      | 150      | -      | -      | -      | -      | 120     | -       | -        | 180   | -       |

## Solid carbide torus milling cutters



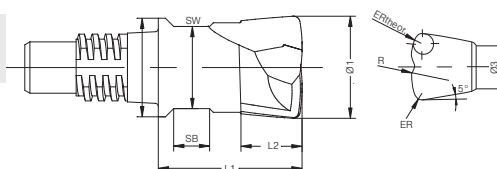
16771

| Size | Ø <sub>1</sub> x R<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | Clearance<br>mm | SW x SB<br>mm | Z | 16771 | ... |
|------|--------------------------|----------------------|----------------------|-----------------|---------------|---|-------|-----|
| 20   | 10 x 0.5                 | 7                    | 14                   | 9.6             | 8 x 3         | 4 |       | 106 |
| 20   | 10 x 1.0                 | 7                    | 14                   | 9.6             | 8 x 3         | 4 |       | 107 |
| 20   | 10 x 1.5                 | 7                    | 14                   | 9.6             | 8 x 3         | 4 |       | 108 |
| 20   | 10 x 2.0                 | 7                    | 14                   | 9.6             | 8 x 3         | 4 |       | 109 |
| 30   | 12 x 0.5                 | 9                    | 17                   | 11.6            | 10 x 4        | 4 |       | 110 |
| 30   | 12 x 1.0                 | 9                    | 17                   | 11.6            | 10 x 4        | 4 |       | 111 |
| 30   | 12 x 1.5                 | 9                    | 17                   | 11.6            | 10 x 4        | 4 |       | 112 |
| 30   | 12 x 2.0                 | 9                    | 17                   | 11.6            | 10 x 4        | 4 |       | 113 |
| 40   | 16 x 0.5                 | 12                   | 21                   | 15.4            | 13 x 5        | 4 |       | 114 |
| 40   | 16 x 1.0                 | 12                   | 21                   | 15.4            | 13 x 5        | 4 |       | 115 |
| 40   | 16 x 1.5                 | 12                   | 21                   | 15.4            | 13 x 5        | 4 |       | 116 |
| 40   | 16 x 2.0                 | 12                   | 21                   | 15.4            | 13 x 5        | 4 |       | 117 |
| 50   | 20 x 1.0                 | 15                   | 26                   | 19.2            | 16 x 5        | 4 |       | 118 |



| Al<10%Si | Al>10%Si | Cu | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <50HRC | <55HRC | <60HRC | <65HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|----------|----------|----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| HPC      |          |    |         |         |         |          |          |          |        |        |        |        |         |         |          |       |         |
| -        | -        | -  | 195     | 185     | 180     | 150      | 140      | 130      | -      | -      | -      | -      | -       | -       | -        | -     | -       |
| HSC      |          |    |         |         |         |          |          |          |        |        |        |        |         |         |          |       |         |
| -        | -        | -  | 350     | 330     | 320     | 270      | 250      | 230      | -      | -      | -      | -      | -       | -       | -        | -     | -       |

## Solid carbide high-feed milling cutter



16772

| Size | Ø <sub>1</sub><br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | Clearance<br>mm | ER<br>mm | R<br>mm | ERtheor.<br>mm | SW x SB<br>mm | Z | 16772 | ... |
|------|----------------------|----------------------|----------------------|-----------------|----------|---------|----------------|---------------|---|-------|-----|
| 20   | 10                   | 7                    | 14                   | 9.6             | 0.64     | 15      | 0.9            | 8 x 3         | 2 |       | 102 |
| 30   | 12                   | 9                    | 17                   | 11.6            | 0.75     | 15      | 1.1            | 10 x 4        | 2 |       | 103 |
| 40   | 16                   | 12                   | 21                   | 15.4            | 1.06     | 25      | 1.45           | 13 x 5        | 2 |       | 104 |
| 50   | 20                   | 15                   | 26                   | 19.2            | 1.25     | 50      | 1.65           | 16 x 5        | 2 |       | 105 |



| Al<10%Si | Al>10%Si | Cu | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <50HRC | <55HRC | <60HRC | <65HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|----------|----------|----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| -        | -        | -  | 200     | 180     | 150     | 130      | 125      | 120      | 95     | 90     | 70     | -      | -       | -       | -        | -     | -       |

Continued

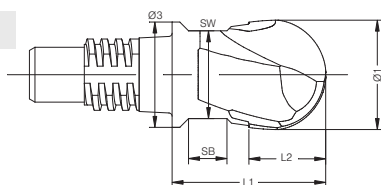
# Interchangeable head milling system

16760 - 16780

## Interchangeable head milling system

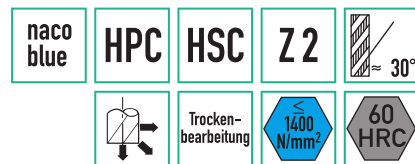
Continued

### Solid carbide radius cutter



| Size | Ø <sub>1</sub><br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | Clearance<br>mm | SW x SB<br>mm | Z | 16773 | ... |
|------|----------------------|----------------------|----------------------|-----------------|---------------|---|-------|-----|
| 20   | 10                   | 7                    | 14                   | 9.6             | 8 x 3         | 2 |       | 102 |
| 30   | 12                   | 9                    | 17                   | 11.6            | 10 x 4        | 2 |       | 103 |
| 40   | 16                   | 12                   | 21                   | 15.4            | 13 x 5        | 2 |       | 104 |
| 50   | 20                   | 15                   | 26                   | 19.2            | 16 x 5        | 2 |       | 105 |

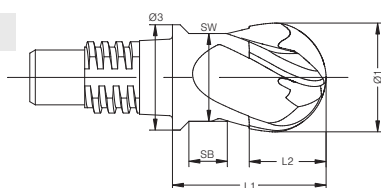
| Al<10%Si | Al>10%Si | Cu | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <50HRC | <55HRC | <60HRC | <65HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|----------|----------|----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| -        | -        | -  | 570     | 450     | 350     | 300      | 270      | 240      | 180    | 160    | 150    | -      | -       | -       | -        | -     | -       |



16773

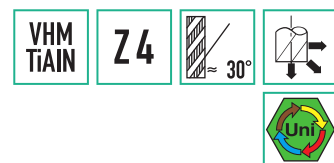


### Solid carbide full radius cutter



| Size | Ø <sub>1</sub><br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | Clearance<br>mm | SW x SB<br>mm | Z | 16774 | ... |
|------|----------------------|----------------------|----------------------|-----------------|---------------|---|-------|-----|
| 20   | 10                   | 7                    | 14                   | 9.6             | 8 x 3         | 4 |       | 102 |
| 30   | 12                   | 9                    | 17                   | 11.6            | 10 x 4        | 4 |       | 103 |
| 40   | 16                   | 12                   | 21                   | 15.4            | 13 x 5        | 4 |       | 104 |
| 50   | 20                   | 15                   | 26                   | 19.2            | 16 x 5        | 4 |       | 105 |

| Al<10%Si | Al>10%Si | Cu  | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <50HRC | <55HRC | <60HRC | <65HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|----------|----------|-----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| -        | -        | 200 | 220     | 195     | 175     | 165      | 160      | 150      | -      | -      | -      | -      | 120     | -       | -        | 180   | -       |



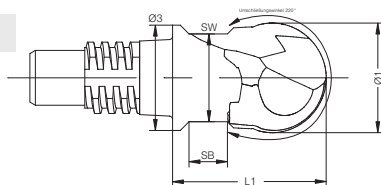
16774



### Solid carbide ball head cutter

Design

- Enclosing angle 220°



| Size | Ø <sub>1</sub><br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | Clearance<br>mm | SW x SB<br>mm | Z | 16775 | ... |
|------|----------------------|----------------------|----------------------|-----------------|---------------|---|-------|-----|
| 20   | 10                   | 7                    | 14                   | 9.6             | 8 x 3         | 2 |       | 102 |
| 30   | 12                   | 9                    | 17                   | 11.6            | 10 x 4        | 2 |       | 103 |
| 40   | 16                   | 12                   | 21                   | 15.4            | 13 x 5        | 2 |       | 104 |
| 50   | 20                   | 15                   | 26                   | 19.2            | 16 x 5        | 2 |       | 105 |

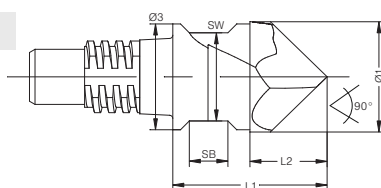
| Al<10%Si | Al>10%Si | Cu | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <50HRC | <55HRC | <60HRC | <65HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|----------|----------|----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| -        | -        | -  | 450     | 350     | 300     | 250      | 210      | 170      | 120    | 90     | 70     | -      | -       | -       | -        | -     | -       |



16775

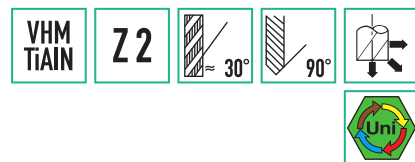


### Solid carbide multi-mill



| Size | Ø <sub>1</sub><br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | Clearance<br>mm | SW x SB<br>mm | Z | 16776 | ... |
|------|----------------------|----------------------|----------------------|-----------------|---------------|---|-------|-----|
| 20   | 10                   | 7                    | 14                   | 9.6             | 8 x 3         | 2 |       | 102 |
| 30   | 12                   | 9                    | 17                   | 11.6            | 10 x 4        | 2 |       | 103 |
| 40   | 16                   | 12                   | 21                   | 15.4            | 13 x 5        | 2 |       | 104 |
| 50   | 20                   | 15                   | 26                   | 19.2            | 16 x 5        | 2 |       | 105 |

| Al<10%Si | Al>10%Si | Cu  | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <50HRC | <55HRC | <60HRC | <65HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|----------|----------|-----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| 300      | 280      | 200 | 120     | 105     | 90      | 75       | 70       | 65       | -      | -      | -      | -      | 80      | -       | -        | 120   | -       |



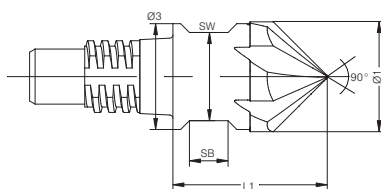
16776



Continued

Continued

## Solid carbide deburring tool

VHM  
TiAlN

Z 6



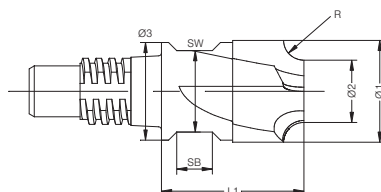
16777



| Size | Ø <sub>1</sub><br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | Clearance<br>mm | SW x SB<br>mm | Z | 16777 | ... |
|------|----------------------|----------------------|----------------------|-----------------|---------------|---|-------|-----|
| 20   | 10                   | 7                    | 14                   | 9.6             | 8 x 3         | 6 |       | 102 |
| 30   | 12                   | 9                    | 17                   | 11.6            | 10 x 4        | 6 |       | 103 |
| 40   | 16                   | 12                   | 21                   | 15.4            | 13 x 5        | 6 |       | 104 |
| 50   | 20                   | 15                   | 26                   | 19.2            | 16 x 5        | 6 |       | 105 |

| Al<10%Si | Al>10%Si | Cu  | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <50HRC | <55HRC | <60HRC | <65HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|----------|----------|-----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| 300      | 280      | 300 | 190     | 170     | 160     | 150      | 130      | 120      | -      | -      | -      | -      | 110     | 75      | -        | -     | -       |

## Solid carbide quarter circle cutter

VHM  
TiAlN

Z 4



16778

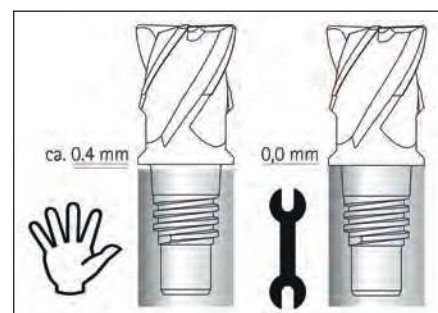


| Size | Ø <sub>1</sub> x R<br>mm | l <sub>2</sub><br>mm | l <sub>1</sub><br>mm | Clearance<br>mm | SW x SB<br>mm | Z | 16778 | ... |
|------|--------------------------|----------------------|----------------------|-----------------|---------------|---|-------|-----|
| 20   | 10 x 1.5                 | 7                    | 14                   | 9.6             | 8 x 3         | 4 |       | 103 |
| 20   | 10 x 2.0                 | 7                    | 14                   | 9.6             | 8 x 3         | 4 |       | 104 |
| 30   | 12 x 2.5                 | 9                    | 17                   | 11.6            | 10 x 4        | 4 |       | 105 |
| 30   | 12 x 3.0                 | 9                    | 17                   | 11.6            | 10 x 4        | 4 |       | 106 |
| 40   | 16 x 3.5                 | 12                   | 21                   | 15.4            | 13 x 5        | 4 |       | 107 |
| 40   | 16 x 4.0                 | 12                   | 21                   | 15.4            | 13 x 5        | 4 |       | 108 |
| 40   | 16 x 4.5                 | 12                   | 21                   | 15.4            | 13 x 5        | 4 |       | 109 |
| 50   | 20 x 5.0                 | 15                   | 26                   | 19.2            | 13 x 5        | 4 |       | 110 |
| 50   | 20 x 6.0                 | 15                   | 26                   | 19.2            | 16 x 5        | 4 |       | 111 |

| Al<10%Si | Al>10%Si | Cu  | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <50HRC | <55HRC | <60HRC | <65HRC | VA<900N | VA>900N | Ti alloy | GG(G) | Plastic |
|----------|----------|-----|---------|---------|---------|----------|----------|----------|--------|--------|--------|--------|---------|---------|----------|-------|---------|
| 300      | 280      | 300 | 190     | 170     | 160     | 150      | 130      | 120      | -      | -      | -      | -      | 110     | 75      | -        | -     | -       |

## Installation instructions:

- Clean the interface on the milling head and on the tool holder
- Screw the milling head clockwise and hand-tighten into the interchangeable head holder (note: Caution risk of injury — use cut protection gloves when installing)
- Tighten the milling head with the torque wrench and the specified torques (see table) form-fit.



Single open-end wrench



Plug-in tool



Torque wrench

| Size<br>mm | SW<br>mm | Torque<br>Nm | 16779 | ... | 16780 | ... | 55780 | ... |
|------------|----------|--------------|-------|-----|-------|-----|-------|-----|
| 20         | 8        | 13           |       | 102 |       | 102 |       | 202 |
| 30         | 10       | 25           |       | 103 |       | 103 |       | 202 |
| 40         | 13       | 30           |       | 104 |       | 104 |       | 202 |
| 50         | 16       | 40           |       | 105 |       | 105 |       | 202 |

## Design

- Double-edged (art. no. 16750 139-152 single-edged)
- Clamping shank 6 mm
- Start-up pin hardened

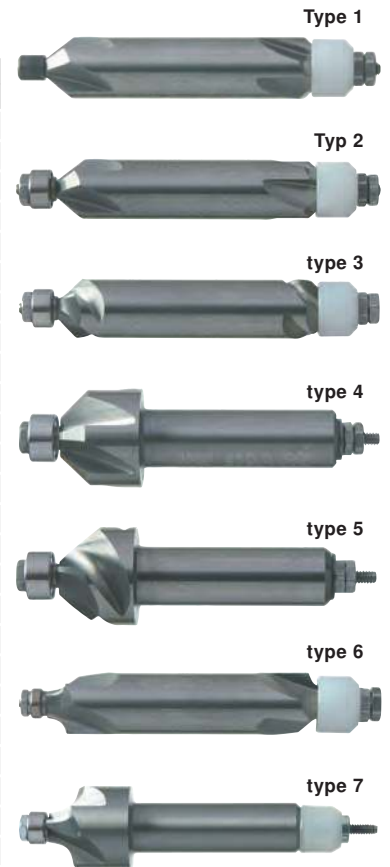
## Applications

For edge and contour deburring tools.  
Chip angle 0° for short-chipping, hard materials.  
Chip angle 6° for tough materials.  
Chip angle 12° for tough to soft materials.  
Chip angle 30° for soft materials.

## Quality

Universal carbide ultra-fine grain.

| Type | Applications/Design                       | D x L<br>mm | Tip angle/<br>Radius | Z | Chip<br>angle | Coating   | 16750 | ... |
|------|-------------------------------------------|-------------|----------------------|---|---------------|-----------|-------|-----|
| 1    | with rotating start-up pin (Ø 2.5 mm)     | 6 x 34      | 90°                  | 4 | 0°            | TiAIN     | 102   |     |
| 2    | with ball bearing start roller (Ø 3.0 mm) | 6 x 34      | 90°                  | 4 | 0°            | -         | 103   |     |
| 2    | with ball bearing start roller (Ø 4.0 mm) | 6 x 34      | 90°                  | 4 | 0°            | TiAIN     | 106   |     |
| 2    | with ball bearing start roller (Ø 4.0 mm) | 6 x 34      | 90°                  | 6 | 0°            | -         | 111   |     |
| 2    | with ball bearing start roller (Ø 4.0 mm) | 6 x 34      | 90°                  | 6 | 0°            | TiAIN     | 112   |     |
| 1    | with rotating start-up pin (Ø 2.5 mm)     | 6 x 34      | 90°                  | 4 | 6°            | TiAIN     | 114   |     |
| 2    | with ball bearing start roller (Ø 3.0 mm) | 6 x 34      | 90°                  | 4 | 6°            | TiAIN     | 116   |     |
| 2    | with ball bearing start roller (Ø 4.0 mm) | 6 x 34      | 90°                  | 4 | 6°            | -         | 117   |     |
| 2    | with ball bearing start roller (Ø 3.0 mm) | 6 x 34      | 90°                  | 4 | 12°           | -         | 122   |     |
| 2    | with ball bearing start roller (Ø 4.0 mm) | 6 x 34      | 90°                  | 4 | 12°           | -         | 125   |     |
| 3    | with rotating start-up pin (Ø 2.5 mm)     | 6 x 34      | 90°                  | 3 | 30°           | TiAIN-ALU | 130   |     |
| 3    | with ball bearing start roller (Ø 3.0 mm) | 6 x 34      | 90°                  | 3 | 30°           | -         | 131   |     |
| 3    | with ball bearing start roller (Ø 4.0 mm) | 6 x 34      | 90°                  | 3 | 30°           | -         | 134   |     |
| 4    | with ball bearing start roller (Ø 4.0 mm) | 10 x 34     | 90°                  | 6 | 0°            | -         | 137   |     |
| 4    | with ball bearing start roller (Ø 5.0 mm) | 10 x 34     | 90°                  | 6 | 0°            | -         | 139   |     |
| 4    | with ball bearing start roller (Ø 5.0 mm) | 10 x 34     | 90°                  | 6 | 0°            | TiAIN     | 140   |     |
| 4    | with ball bearing start roller (Ø 4.0 mm) | 10 x 34     | 90°                  | 3 | 6°            | -         | 141   |     |
| 4    | with ball bearing start roller (Ø 5.0 mm) | 10 x 34     | 90°                  | 3 | 6°            | TiAIN     | 144   |     |
| 5    | with ball bearing start roller (Ø 4.0 mm) | 10 x 34     | 90°                  | 3 | 30°           | -         | 145   |     |
| 6    | with ball bearing start roller (Ø 3.0 mm) | 6 x 34      | R 0.5 mm             | 3 | 0°            | -         | 151   |     |
| 6    | with ball bearing start roller (Ø 3.0 mm) | 6 x 34      | R 1.0 mm             | 3 | 0°            | -         | 152   |     |
| 6    | with ball bearing start roller (Ø 3.0 mm) | 6 x 34      | R 1.5 mm             | 3 | 0°            | -         | 153   |     |
| 7    | with ball bearing start roller (Ø 4.0 mm) | 10 x 34     | R 2.0 mm             | 3 | 0°            | -         | 154   |     |
| 7    | with ball bearing start roller (Ø 4.0 mm) | 10 x 34     | R 2.5 mm             | 3 | 0°            | -         | 155   |     |
| 7    | with ball bearing start roller (Ø 4.0 mm) | 10 x 34     | R 3.0 mm             | 3 | 0°            | -         | 156   |     |
| 7    | with ball bearing start roller (Ø 4.0 mm) | 10 x 34     | R 3.0 mm             | 3 | 0°            | -         | 156   |     |



## Recommendations for the use of solid carbide form milling cutter art. no. 16750

| Type | MILLING CUTTER | Steel           |             |                                              |                                  | Copper alloys/<br>cast iron |                                  |           | Stainless steel          |                                     |                                   | Aluminium              |                                   | Plastics               |                      |
|------|----------------|-----------------|-------------|----------------------------------------------|----------------------------------|-----------------------------|----------------------------------|-----------|--------------------------|-------------------------------------|-----------------------------------|------------------------|-----------------------------------|------------------------|----------------------|
|      |                | Hardened steels | Tool steels | Case-hardening steels<br>Heat-treated steels | Carbon steel<br>(short-chipping) | Copper, soft<br>brass, soft | Nickel-<br>brass, hard<br>Bronze | Cast iron | Soft,<br>tough varieties | High-strength,<br>brittle varieties | Carbon alloy (short-<br>chipping) | Soft,<br>long-chipping | Carbon alloy (short-<br>chipping) | Soft,<br>long-chipping | Hard, short-chipping |
| 1    | 16750 102      | ++              | ++          |                                              | ++                               |                             | ++                               | ++        |                          |                                     |                                   |                        |                                   |                        |                      |
| 2    | 16750 103      |                 |             |                                              | ++                               |                             | ++                               | +         |                          |                                     |                                   |                        | ++                                |                        | ++                   |
| 2    | 16750 106      | ++              | ++          |                                              | ++                               |                             | ++                               | ++        |                          |                                     |                                   |                        |                                   |                        |                      |
| 2    | 16750 111      |                 |             |                                              | ++                               |                             | ++                               | +         |                          |                                     |                                   |                        | +                                 |                        | ++                   |
| 1    | 16750 112      | ++              | ++          |                                              | ++                               |                             | ++                               | ++        |                          |                                     |                                   |                        |                                   |                        |                      |
| 1    | 16750 114      |                 |             | ++                                           | ++                               |                             | ++                               |           |                          | ++                                  | ++                                |                        |                                   |                        |                      |
| 2    | 16750 116      |                 |             | ++                                           | ++                               |                             | ++                               |           |                          | ++                                  | ++                                |                        |                                   |                        |                      |
| 2    | 16750 117      |                 |             |                                              | ++                               |                             | ++                               |           |                          |                                     | ++                                |                        | ++                                |                        | ++                   |
| 2    | 16750 122      |                 |             |                                              | ++                               | +                           | ++                               |           | +                        |                                     | +                                 | +                      | ++                                | +                      | ++                   |
| 2    | 16750 125      |                 |             |                                              | ++                               | +                           | ++                               |           | +                        |                                     | +                                 | +                      |                                   | +                      | ++                   |
| 3    | 16750 130      |                 |             |                                              |                                  | ++                          |                                  |           |                          |                                     |                                   | ++                     | ++                                | ++                     | ++                   |
| 3    | 16750 131      |                 |             |                                              |                                  | ++                          |                                  |           | +                        |                                     |                                   | ++                     | ++                                | ++                     | ++                   |
| 3    | 16750 134      |                 |             |                                              |                                  | ++                          |                                  |           | +                        |                                     |                                   | ++                     | ++                                | ++                     | ++                   |
| 4    | 16750 137      |                 |             |                                              | ++                               |                             | ++                               | +         |                          |                                     |                                   |                        | +                                 |                        |                      |
| 4    | 16750 139      |                 |             |                                              | ++                               |                             | ++                               | +         |                          |                                     |                                   |                        | +                                 |                        |                      |
| 4    | 16750 140      | ++              | +           |                                              | ++                               |                             | ++                               | ++        |                          |                                     |                                   |                        |                                   |                        |                      |
| 4    | 16750 141      |                 |             |                                              | ++                               |                             | ++                               |           | +                        |                                     | +                                 | +                      | ++                                | +                      | ++                   |
| 4    | 16750 144      |                 |             | ++                                           | ++                               |                             | ++                               |           | ++                       |                                     | ++                                |                        |                                   |                        |                      |
| 5    | 16750 145      |                 |             |                                              |                                  | ++                          |                                  |           | +                        |                                     |                                   | ++                     | ++                                | ++                     | ++                   |
| 6    | 16750 151      | +               | ++          | ++                                           | ++                               | ++                          | ++                               | ++        | +                        | ++                                  | ++                                | ++                     | ++                                | ++                     | ++                   |
| 6    | 16750 152      | +               | ++          | ++                                           | ++                               | ++                          | ++                               | ++        | +                        | ++                                  | ++                                | ++                     | ++                                | ++                     | ++                   |
| 6    | 16750 153      |                 | +           | ++                                           | ++                               | ++                          | ++                               | ++        | +                        | ++                                  | ++                                | ++                     | ++                                | ++                     | ++                   |
| 7    | 16750 154      |                 | +           | ++                                           | ++                               | ++                          | ++                               | ++        | +                        | ++                                  | ++                                | ++                     | ++                                | ++                     | ++                   |
| 7    | 16750 155      |                 | +           | +                                            | ++                               | ++                          | ++                               | ++        | +                        | ++                                  | ++                                | +                      | ++                                | ++                     | ++                   |
| 7    | 16750 156      |                 | +           | +                                            | ++                               | ++                          | ++                               | ++        | +                        | +                                   | ++                                | +                      | ++                                | ++                     | ++                   |

++ Ideal + Limited suitability

# 16880

# Push-type broach (keyways broach) sets

## Design

Chip angle 8–10°.

Each broach **complete with inserts**

(e.g. for 3 strokes = 2 inserts).

Delivered in wooden case.

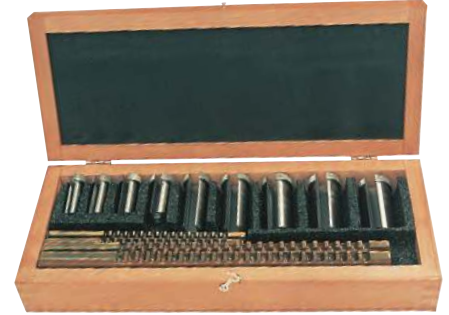
## Applications

For the production of **keyways in accordance with DIN 6885**. For cast iron, steel, brass and aluminium. Use especially on manually operated arbor presses. Short sweeping time (60 seconds), low set-up time and easy handling. Clear specification of a groove for hole and the groove depth through the guide bush and inserts.

## Quality

HSS.

16880



| Set size | Broaches                                      | Guide bush Ø (d <sub>1</sub> ) mm | for holes Ø mm | Sweeping length mm | 16880 | ... |
|----------|-----------------------------------------------|-----------------------------------|----------------|--------------------|-------|-----|
| 210      | 2 pcs. RD I (b <sub>1</sub> = 2/3 mm)         | 6/ 7/8/9/10                       | 6–10           | 6–30               |       | 101 |
| 218      | 2 pcs. RD II (b <sub>1</sub> = 4/5 mm)        | 12/14/15/ 16                      | 12–28          | 8–43               |       | 202 |
|          | 2 pcs. RD III (b <sub>1</sub> = 6/8 mm)       | 18/20/22/24/25                    |                | 10–64              |       |     |
| 240      | 2 pcs. RD I (b <sub>1</sub> = 2/3 mm)         | 8/10                              | 8–36           | 6–30               |       | 203 |
|          | 2 pcs. RD II (b <sub>1</sub> = 4/5 mm)        | 12/14/15/16                       |                | 8–43               |       |     |
|          | 2 pcs. RD III (b <sub>1</sub> = 6/8 mm)       | 18/20/22/24/25/28/30              |                | 10–64              |       |     |
| 224      | 3 pcs. RD IV (b <sub>1</sub> = 10 / 12/14 mm) | 32/35/38/40/42/45/50              | 34–48          | 20–150             |       | 204 |
| 212      | 2 pcs. RD V (b <sub>1</sub> = 16/18 mm)       | 52/55/58/60/65                    | 54–64          | 20–150             |       | 205 |

# 16881

# Push-type broach (keyways broaches)

## Design

Chip angle 8–10°.

Each broach **complete with inserts**

(e.g. for 3 strokes = 2 inserts).

Art. no. 16881 101 without insert.

Delivery without guide bushes

(see art. no. 16882).

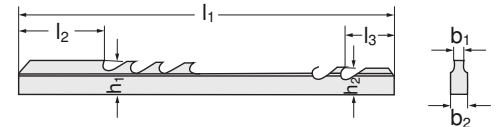
## Applications

For the production of **keyways in accordance with DIN 6885**. For cast iron, steel, brass and aluminium. Use especially on manually operated arbor presses. Short sweeping time (60 seconds), low set-up time and easy handling. Clear specification of a groove for hole and the groove depth through the guide bush and inserts.

## Quality

HSS.

16881



| Type   | b <sub>1</sub> mm | b <sub>2</sub> mm | L <sub>1</sub> mm | L <sub>2</sub> mm | L <sub>3</sub> mm | h <sub>1</sub> mm | h <sub>2</sub> mm | Groove depth mm | for holes Ø mm | Sweeping length mm | Number of strokes | Tolerance mm | 16881 | ... |
|--------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-----------------|----------------|--------------------|-------------------|--------------|-------|-----|
| RD I   | 2                 | 3.18              | 133               | 32                | 15                | 6.18              | 5.00              | 1.10            | 6–8            | 6–30               | 1                 | +/-0.011     | 101   |     |
| RD I   | 3                 | 3.18              | 133               | 32                | 15                | 5.75              | 4.85              | 1.50            | 8–10           | 6–30               | 2                 | +/-0.012     | 102   |     |
| RD II  | 4                 | 6.35              | 178               | 48                | 23                | 9.90              | 8.77              | 1.90            | 10–12          | 8–43               | 2                 | +/-0.015     | 103   |     |
| RD II  | 5                 | 6.35              | 178               | 49                | 22                | 10.03             | 8.59              | 2.40            | 12–17          | 8–43               | 2                 | +/-0.015     | 104   |     |
| RD III | 5                 | 9.53              | 302               | 65                | 23                | 16.39             | 14.95             | 2.40            | 17–22          | 10–64              | 2                 | +/-0.015     | 105   |     |
| RD III | 6                 | 9.53              | 302               | 65                | 26                | 16.55             | 14.87             | 2.90            | 17–22          | 10–64              | 2                 | +/-0.015     | 106   |     |
| RD III | 8                 | 9.53              | 302               | 65                | 23                | 16.64             | 14.55             | 3.50            | 22–30          | 10–64              | 2                 | +/-0.018     | 107   |     |
| RD IV  | 10                | 14.29             | 352               | 65                | 33                | 23.99             | 22.29             | 3.50            | 30–38          | 20–150             | 3                 | +/-0.018     | 108   |     |
| RD IV  | 12                | 14.29             | 352               | 65                | 35                | 23.74             | 22.05             | 3.50            | 38–44          | 20–150             | 3                 | +/-0.021     | 109   |     |
| RD IV  | 14                | 14.29             | 352               | 65                | 33                | 23.69             | 21.71             | 4.00            | 44–50          | 20–150             | 3                 | +/-0.021     | 110   |     |
| RD V   | 16                | 19.05             | 387               | 48                | 40                | 24.24             | 22.47             | 4.50            | 50–58          | 20–150             | 4                 | +/-0.021     | 111   |     |
| RD V   | 18                | 19.05             | 387               | 48                | 41                | 24.06             | 22.22             | 4.60            | 58–65          | 20–150             | 4                 | +/-0.021     | 112   |     |
| RD VI  | 20                | 25.4              | 489               | 65                | 39                | 31.80             | 30.11             | 5.10            | 65–75          | 20–150             | 5                 | +/-0.026     | 113   |     |
| RD VI  | 22                | 25.4              | 489               | 65                | 39                | 31.54             | 29.99             | 5.60            | 75–85          | 20–150             | 5                 | +/-0.026     | 114   |     |
| RD VI  | 24                | 25.4              | 489               | 65                | 37                | 31.17             | 29.66             | 5.60            | 85–95          | 20–150             | 5                 | +/-0.026     | 115   |     |
| RD VI  | 25                | 25.4              | 489               | 65                | 39                | 30.98             | 29.46             | 5.60            | 85–95          | 20–150             | 5                 | +/-0.026     | 116   |     |

## 16882

## Guide bushes

## Design

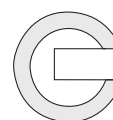
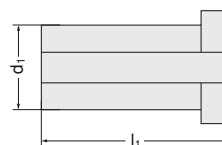
Bore tolerance H 7.

Up to RD III 36 x 65 mm with collar.

## Applications

For push-type broaches (keyways broaches)

art. no. 16881.



16882

| For type | d <sub>1</sub> x l <sub>1</sub><br>mm | 16882 | ... |
|----------|---------------------------------------|-------|-----|
| RD I     | 6 x 32                                | 101   |     |
| RD I     | 7 x 32                                | 102   |     |
| RD I     | 8 x 32                                | 103   |     |
| RD I     | 9 x 32                                | 104   |     |
| RD I     | 10 x 32                               | 105   |     |
| RD II    | 11 x 46                               | 110   |     |
| RD II    | 12 x 46                               | 111   |     |
| RD II    | 13 x 46                               | 112   |     |
| RD II    | 14 x 46                               | 113   |     |
| RD II    | 15 x 46                               | 114   |     |
| RD II    | 16 x 46                               | 115   |     |
| RD II    | 17 x 46                               | 116   |     |
| RD II    | 18 x 46                               | 117   |     |
| RD II    | 19 x 46                               | 118   |     |
| RD III   | 17 x 65                               | 130   |     |
| RD III   | 18 x 65                               | 131   |     |
| RD III   | 19 x 65                               | 132   |     |
| RD III   | 20 x 65                               | 133   |     |
| RD III   | 22 x 65                               | 135   |     |
| RD III   | 24 x 65                               | 137   |     |

| For type | d <sub>1</sub> x l <sub>1</sub><br>mm | 16882 | ... |
|----------|---------------------------------------|-------|-----|
| RD III   | 25 x 65                               | 138   |     |
| RD III   | 26 x 65                               | 139   |     |
| RD III   | 27 x 65                               | 140   |     |
| RD III   | 28 x 65                               | 141   |     |
| RD III   | 30 x 65                               | 142   |     |
| RD III   | 32 x 65                               | 143   |     |
| RD III   | 34 x 65                               | 144   |     |
| RD III   | 35 x 65                               | 145   |     |
| RD III   | 36 x 65                               | 146   |     |
| RD IV    | 32 x 102                              | 150   |     |
| RD IV    | 34 x 102                              | 151   |     |
| RD IV    | 35 x 102                              | 152   |     |
| RD IV    | 36 x 102                              | 153   |     |
| RD IV    | 38 x 102                              | 154   |     |
| RD IV    | 40 x 102                              | 155   |     |
| RD IV    | 42 x 102                              | 156   |     |
| RD IV    | 44 x 102                              | 157   |     |
| RD IV    | 45 x 127                              | 158   |     |
| RD IV    | 46 x 127                              | 159   |     |
| RD IV    | 48 x 127                              | 160   |     |

| For type | d <sub>1</sub> x l <sub>1</sub><br>mm | 16882 | ... |
|----------|---------------------------------------|-------|-----|
| RD IV    | 50 x 127                              | 161   |     |
| RD IV    | 52 x 127                              | 162   |     |
| RD IV    | 54 x 127                              | 163   |     |
| RD IV    | 55 x 127                              | 164   |     |
| RD IV    | 56 x 127                              | 165   |     |
| RD V     | 52 x 127                              | 175   |     |
| RD V     | 54 x 127                              | 176   |     |
| RD V     | 55 x 127                              | 177   |     |
| RD V     | 56 x 127                              | 178   |     |
| RD V     | 58 x 127                              | 179   |     |
| RD V     | 60 x 154                              | 180   |     |
| RD V     | 62 x 154                              | 181   |     |
| RD V     | 64 x 154                              | 182   |     |
| RD V     | 65 x 154                              | 183   |     |
| RD V     | 66 x 154                              | 184   |     |
| RD V     | 68 x 154                              | 185   |     |
| RD V     | 70 x 154                              | 186   |     |
| RD V     | 72 x 154                              | 187   |     |
| RD VI    | 70 x 154                              | 193   |     |

## 16883

## Replacement inserts for push-type broaches

## Applications

For push-type broaches (keyways broaches)

art. no. 16881.



16883

| Size<br>mm | Thickness<br>mm | For type | 16883 | ... |
|------------|-----------------|----------|-------|-----|
| 3          | 0.787           | I        | 101   |     |
| 4          | 0.965           | II       | 102   |     |
| 5          | 1.270           | II       | 103   |     |
| 5          | 1.194           | III      | 104   |     |
| 6          | 1.575           | III      | 105   |     |

| Size<br>mm | Thickness<br>mm | For type | 16883 | ... |
|------------|-----------------|----------|-------|-----|
| 8          | 1.981           | III      | 106   |     |
| 10         | 1.422           | IV       | 107   |     |
| 12         | 1.422           | IV       | 108   |     |
| 14         | 1.575           | IV       | 109   |     |
| 16         | 1.575           | V        | 110   |     |

| Size<br>16883 | Thickness<br>mm | For type<br>mm | ... |
|---------------|-----------------|----------------|-----|
| 18            | 1.575           | V              | 111 |
| 20            | 1.575           | VI             | 112 |
| 22            | 1.575           | VI             | 113 |
| 24            | 1.575           | VI             | 114 |
| 25            | 1.575           | VI             | 115 |