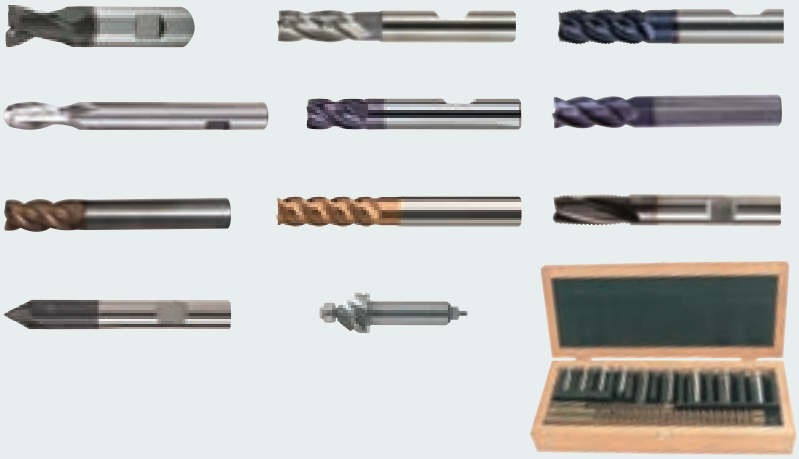

- HSS-keyway milling cutters
  - -finishing cutters
  - -roughing cutters
  - -radius milling cutters
- Solid carbide -universal end milling cutters
  - - end milling cutters RockTec 52 and 65
  - - ALU end milling cutters
  - - roughing cutters
  - - deburrers
  - - profiling cutters
- Broaches

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16.3 – 16.82

- Saw blades HSS/carbide
- Shell end mills
- Profiling cutter with bore
- Indexable inserts -indexable end milling cutters
  - - indexable face/angular milling cutters
  - - indexable angled cutters
  - - indexable disc milling cutters
  - - indexable core drills
- Milling cutting inserts

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17.1 – 17.62

# Our suppliers for MILLING TOOLS:

ATORN®

HHW

CERATIZIT

## Info — Coatings for machining tools

**Advantages:**

- Longer service life
- Higher productivity
- Fewer tool changes
- No emulsion, thanks to dry machining
- High speed machining
- Hard machining
- Lower tool costs

| Coating material | TiN | TiCN | TiAlN | Alcrona | Hardlube | Alu-CC | Rocktec 52 | Rocktec 65 | Ultra-N |
|---|---|---|---|---|---|---|---|---|---|
| Microhardness (HV 0.05) | 2.300 | 3.000 | 3.300 | 3.200 | 3.000 | 4.000 | 3.300 | 3.600 | 3.100 |
| Friction coefficient gg. Steel (dry) | 0,4 | 0,4 | 0,30 - 0,35 | 0,35 | 0,15 - 0,20 | – | 0,4 | 0,4 | – |
| Max. application temperature (°C) | 600 | 400 | 900 | 1.100 | 800 | 800 | 900 | 1.200 | 900 |
| Coating colour | gold-yellow | blue-grey | violet-grey | blue-grey | dark-grey | light transparent | grey-blue | copper-coloured | brownish silver |

| Materials / Coatings | Plastics | Non-ferrous metals | AlSi alloys | Al wrought alloys | Low-alloy steels | High-alloy steels | Hardened steels to 52 HRC | Hardened steels to 65 HRC | Stainless steels | Cast iron | Titanium alloys | Superalloys |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TiN | ■ | | | | ■ | | | | | | | |
| TiCN | ■ | | | | ■ | ■ | | | ■ | ■ | | |
| TiAlN | ■ | | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Alcrona | ■ | | | | ■ | ■ | | | | ■ | | |
| Hardlube | ■ | | ■ | | ■ | ■ | | | ■ | | ■ | ■ |
| Alu-CC | ■ | ■ | ■ | ■ | ■ | ■ | | | ■ | | | |
| Rocktec 52 | | | | | ■ | ■ | ■ | | ■ | ■ | | |
| Rocktec 65 | | | | | | | | ■ | | | ■ | ■ |
| Ultra-N | ■ | ■ | ■ | ■ | | | | | | | | |



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Fax order hotline: +49 6204 739-1217

= Sales are restricted to the packaging units mentioned in the catalogue. Purchase orders must be in units.

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

| Brand | HW | ATORN | ATORN | ATORN | ATORN | ATORN | ATORN | ATORN | ATORN |
|---|---|---|---|---|---|---|---|---|---|
| Standard/DIN | Company standard | Company standard | Company standard | Company standard | Company standard | 327D | 327D | 327D | 327D |
| Number of cutting edges | 1 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 2 |
| Diameter range mm | 3 - 10 | 1 - 20 | 1 - 12 | 2 - 10 | 2 - 8 | 1 - 40 | 1 - 25 | 2,5 - 25 | 2,5 - 20 |
| Cutting material | HSS-E | HSS-E | HSS-E | HSS-E | HSS-E | HSS-E | HSS-E | HSS-E | HSS-E |
| Coating | – | – | TiAN | – | TiAN | – | TiAN | – | TiAN |
| Type | Short | Short | Short | Long | Long | Short | Short | Long | Long |
| Type / profile | W | N | N | N | N | N | N | N | N |
| Catalogue page | 16.15 | 16.16 | 16.16 | 16.16 | 16.16 | 16.17 | 16.17 | 16.17 | 16.17 |
| Article number | 16010 | 16020 | 16022 | 16030 | 16032 | 16060 | 16062 | 16073 | 16074 |

## Application recommendation

● = Well suited ○ = Limited suitability

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Aluminium < 10% Si | ● | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ● |
| Aluminium > 10% Si | ● | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ● |
| Copper | | ○ | ○ | ○ | ○ | ○ | ○ | ○ | |
| Steel < 520N | | ● | ● | ● | ● | ● | ● | ● | |
| Steel < 750N | | ● | ● | ● | ● | ● | ● | ● | |
| Steel < 900N | | ● | ● | ● | ● | ● | ● | ● | |
| Steel < 1100N | | | ● | | ● | | ● | | |
| Steel < 1200N | | | ● | | ● | | ● | | |
| Steel < 1400N | | | | | | | | | |
| VA-steel < 900N | | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| VA-steel > 900N | | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| GG | | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| GGG | | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Titanium | | | | | | | | | |
| Titanium alloy | | | | | | | | | |
| Nickel | | | | | | | | | |
| < 55HRC | | | | | | | | | |
| < 60HRC | | | | | | | | | |
| < 67HRC | | | | | | | | | |
| Plastics | | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |

| Brand | ATORN | ATORN | HW | ATORN | ATORN | ATORN | ATORN | HW | HW | HW |
|---|---|---|---|---|---|---|---|---|---|---|
| Standard/DIN | 844B | 844B | 844B | 844B | 844B | 844B | 844B | 844B | 844B | 844B |
| Number of cutting edges | 3 | 3 | 3 | 3 | 3 | 4 - 6 | 4 - 6 | 4 - 6 | 4 - 6 | 4 - 6 |
| Diameter range mm | 1,5 - 30 | 1,5 - 30 | 4 - 20 | 2 - 20 | 2 - 20 | 2 - 40 | 2 - 32 | 5 - 30 | 6 - 25 | 6 - 25 |
| Cutting material | HSS-E | HSS-E | PM | HSS-E | HSS-E | HSS-E | HSS-E | PM | PM | PM |
| Coating | – | TiAN | TiAN | – | TiAN | – | TiAN | TiAN | – | TiAN |
| Type | Short | Short | Short | Long | Long | Short | Short | Short | Medium | Medium |
| Type / profile | N | N | N | N | N | N | N | N | N | N |
| Catalogue page | 16.18 | 16.18 | 16.18 | 16.19 | 16.19 | 16.20 | 16.20 | 16.20 | 16.21 | 16.21 |
| Article number | 16094 | 16096 | 16100 | 16104 | 16105 | 16120 | 16122 | 16131 | 16143 | 16144 |

## Application recommendation

● = Well suited ○ = Limited suitability

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Aluminium < 10% Si | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Aluminium > 10% Si | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Copper | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Steel < 520N | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Steel < 750N | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Steel < 900N | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Steel < 1100N | | ● | | | ● | ● | | ● | ● | ● |
| Steel < 1200N | | ● | | | ● | ● | | ● | ● | ● |
| Steel < 1400N | | | | | | ● | | ● | ● | |
| VA-steel < 900N | ○ | ○ | ● | ○ | ○ | ○ | ○ | ● | ● | ● |
| VA-steel > 900N | | ○ | ● | ○ | ○ | ○ | ○ | ● | ● | ● |
| GG | ○ | ○ | ● | ○ | ○ | ○ | ○ | ● | ● | ● |
| GGG | ○ | ○ | ● | ○ | ○ | ○ | ○ | ● | ● | ● |
| Titanium | | | ● | | | | | ● | | ● |
| Titanium alloy | | | ● | | | | | ● | | ● |
| Nickel | | | ○ | | | | | ○ | | ○ |
| < 55HRC | | | | | | | | | | |
| < 60HRC | | | | | | | | | | |
| < 67HRC | | | | | | | ○ | ○ | | |
| Plastics | ○ | ○ | | ○ | ○ | ○ | ○ | | ○ | |





= Sales are restricted to the packaging units mentioned in the catalogue. Purchase orders must be in units.

# Overview - HSS-E PM (powder steel) milling cutters (II)



| Brand | ATORN | ATORN | HHW | HHW | HHW | HHW | HHW | HHW | HHW |
|---|---|---|---|---|---|---|---|---|---|
| Standard/DIN | 844B | 844B | Company standard | Company standard | 844B | 844B | 844B | 844B | Company standard |
| |  |  |  |  |  |  |  |  |  |
| Number of cutting edges | 4 - 6 | 4 - 5 | 4 - 6 | 4 - 6 | 6 - 8 | 2 | 3 | 3 | 2 |
| Diameter range mm | 2 - 32 | 2 - 25 | 6 - 25 | 6 - 25 | 30 - 50 | 2 - 22 | 3 - 20 | 3 - 20 | 2 - 20 |
| Cutting material | HSS-E | HSS-E | HSS-E | HSS-E | HSS-E | HSS-E | HSS-E | HSS-E | HSS-E |
| Coating | – | TiAN | – | TiAN | – | – | – | – | – |
| Type | Long | Long | Extra long | Extra long | Short | Short | Short | Long | Short |
| Type / profile | N | N | N | N | N | W | W | W | Radius |
| Catalogue page | 16.21 | 16.21 | 16.22 | 16.22 | 16.22 | 16.22 | 16.23 | 16.23 | 16.23 |
| Article number | 16128 | 16129 | 16133 | 16134 | 16150 | 16153 | 16158 | 16161 | 16170 |
| **Application recommendation** | ● = Well suited | ○ = Limited suitability | | | | | | | |
| Aluminium < 10% Si | ○ | ○ | ○ | ○ | ○ | ● | ● | ● | ○ |
| Aluminium > 10% Si | ○ | ○ | ○ | ○ | ○ | ● | ● | ● | ○ |
| Copper | ○ | ○ | ○ | ○ | ○ | ● | ● | ● | ○ |
| Steel < 520N | ● | ● | ● | ● | ● | | | | ● |
| Steel < 750N | ● | ● | ● | ● | ● | | | | ● |
| Steel < 900N | ● | ● | ● | ● | ● | | | | ● |
| Steel < 1100N | | ● | | ● | | | | | |
| Steel < 1200N | | ● | | ● | | | | | |
| Steel < 1400N | | | | | | | | | |
| VA-steel < 900N | ○ | ○ | ○ | ○ | ○ | | | | ○ |
| VA-steel > 900N | ○ | ○ | ○ | ○ | ○ | | | | ○ |
| GG | ○ | ○ | ○ | ○ | ○ | | | | ○ |
| GGG | ○ | ○ | ○ | ○ | ○ | | | | ○ |
| Titanium | | | | | | | | | |
| Titanium alloy | | | | | | | | | |
| Nickel | | | | | | | | | |
| < 55HRC | | | | | | | | | |
| < 60HRC | | | | | | | | | |
| < 67HRC | | | | | | | | | |
| Plastics | ○ | ○ | ○ | ○ | ○ | | | ○ | ○ |

| Brand | ATORN | ATORN | ATORN | ATORN | HHW | HHW | HHW | HHW | HHW |
|---|---|---|---|---|---|---|---|---|---|
| Standard/DIN | Company standard | Company standard | 844B | 844B | 844B | 844B | 844B | Company standard | Company standard |
| |  |  |  |  |  |  |  |  |  |
| Number of cutting edges | 2 | 2 | 3 | 3 | 4 - 6 | 4 - 6 | 4 - 6 | 4 - 5 | 4 - 5 |
| Diameter range mm | 2 - 30 | 2 - 20 | 6 - 25 | 6 - 25 | 10 - 40 | 10 - 40 | 8 - 36 | 10 - 25 | 6 - 25 |
| Cutting material | HSS-E | HSS-E | HSS-E | HSS-E | HSS-E | HSS-E | HSS-E | HSS-E | HSS-E |
| Coating | – | TiAN | – | TiAN | – | TiAN | – | – | TiAN |
| Type | Long | Long | Short | Short | Short | Short | Long | Special long | Overlong |
| Type / profile | Radius | Radius | NR | NR | NR | NR | NR | NR | NR |
| Catalogue page | 16.24 | 16.24 | 16.24 | 16.24 | 16.25 | 16.25 | 16.25 | 16.26 | 16.26 |
| Article number | 16176 | 16177 | 16183 | 16185 | 16195 | 16198 | 16200 | 16207 | 16209 |
| **Application recommendation** | ● = Well suited | ○ = Limited suitability | | | | | | | |
| Aluminium < 10% Si | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Aluminium > 10% Si | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Copper | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Steel < 520N | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Steel < 750N | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Steel < 900N | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Steel < 1100N | | ● | | ● | | ● | | | ● |
| Steel < 1200N | | ● | | ● | | ● | | | ● |
| Steel < 1400N | | | | | | | | | |
| VA-steel < 900N | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| VA-steel > 900N | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| GG | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| GGG | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Titanium | | | | | | | | | |
| Titanium alloy | | | | | | | | | |
| Nickel | | | | | | | | | |
| < 55HRC | | | | | | | | | |
| < 60HRC | | | | | | | | | |
| < 67HRC | | | | | | | | | |
| Plastics | ○ | | ○ | | ○ | ○ | ○ | ○ | ○ |



= Sales are restricted to the packaging units mentioned in the catalogue. Purchase orders must be in units.

# Overview - HSS-E PM (powder steel) milling cutters (III)

| Brand | HHW | HHW | HHW | HHW | HHW | HHW | HHW | HHW | ATORN | HHW |
|---|---|---|---|---|---|---|---|---|---|---|
| Standard/DIN | 844B | Company standard | 844B | 844B | 844B | 844B | 844B | 844B | 844B | 844B |
| |  |  |  |  |  |  |  |  |  |  |
| Number of cutting edges | 4 - 6 | 6 - 8 | 3 | 3 | 3 | 4 - 6 | 4 - 6 | 4 - 6 | 3 - 6 | 4 - 6 |
| Diameter range mm | 6 - 32 | 30 - 50 | 6 - 20 | 6 - 30 | 6 - 40 | 6 - 25 | 6 - 25 | 6 - 30 | 4 - 25 | 6 - 25 |
| Cutting material | PM | HSS-E | HSS-E | HSS-E | HSS-E | HSS-E | HSS-E | PM | PM | PM |
| Coating | TiCN | – | – | – | TiAN | – | TiAN | TiAN | TiAN | TiAN |
| Type | Short | Short | Short | Short | Short | Short | Short | Short | Short | Medium |
| Type / profile | NR-Pro | NR | WR | NF | NF | HR | HR | HR | HPC | HR |
| Catalogue page | 16.26 | 16.27 | 16.27 | 16.27 | 16.27 | 16.28 | 16.28 | 16.28 | 16.28 | 16.29 |
| Article number | 16203 | 16205 | 16210 | 16220 | 16223 | 16260 | 16262 | 16268 | 16270 | 16271 |

## Application recommendation

● = Well suited ○ = Limited suitability

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Aluminium < 10% Si | ○ | ○ | ● | ○ | ○ | ○ | ○ | ○ | ● | ○ |
| Aluminium > 10% Si | ○ | ○ | ● | ○ | ○ | ○ | ○ | ○ | ● | ○ |
| Copper | ○ | ○ | ● | ○ | ○ | ○ | ○ | ○ | ● | ○ |
| Steel < 520N | ● | ● | | ● | ● | ● | ● | ● | ● | ● |
| Steel < 750N | ● | ● | | ● | ● | ● | ● | ● | ● | ● |
| Steel < 900N | ● | ● | | ● | ● | ● | ● | ● | ● | ● |
| Steel < 1100N | ● | | | | ● | | | ● | ● | ● |
| Steel < 1200N | ● | | | | ● | | | ● | ● | ● |
| Steel < 1400N | ● | | | | | | | | | ● |
| VA-steel < 900N | ● | ○ | | ○ | ○ | ○ | ○ | ○ | ● | ● |
| VA-steel > 900N | ● | ○ | | ○ | ○ | ○ | ○ | ○ | ● | ● |
| GG | ● | ○ | | ○ | ○ | ○ | ○ | ○ | | ● |
| GGG | ● | ○ | | ○ | ○ | ○ | ○ | ○ | | ● |
| Titanium | ● | | | | | | | | ● | ● |
| Titanium alloy | ● | | | | | | | | ● | ● |
| Nickel | ○ | | | | | | | | ● | ○ |
| < 55HRC | | | | | | | | | | |
| < 60HRC | | | | | | | | | | |
| < 67HRC | | | | | | | | | | |
| Plastics | | ○ | ○ | ○ | ○ | ○ | ○ | ○ | | |

| Brand | HHW | HHW | HHW | HHW | HHW | HHW | HHW | HHW | HHW | HHW |
|---|---|---|---|---|---|---|---|---|---|---|
| Standard/DIN | 844B | 844B | 844B | 851 | 850D | 1833C | 1833C | 1833D | 1833D | 651B |
| |  |  |  |  |  |  |  |  |  |  |
| Number of cutting edges | 4 - 5 | 4 - 6 | 3 - 4 | 6 - 8 | 8 - 12 | 6 - 10 | 6 - 10 | 6 - 10 | 6 - 10 | 4 |
| Diameter range mm | 6 - 25 | 6 - 30 | 6 - 25 | 12,5 - 40 | 10,5 - 45,5 | 16 - 32 | 16 - 32 | 16 - 32 | 16 - 32 | 8 - 58 |
| Cutting material | HSS-E | HSS-E | HSS-E | HSS-E | HSS-E | HSS-E | HSS-E | HSS-E | HSS-E | HSS-E |
| Coating | – | TiALN | TiAN | – | – | – | – | – | – | – |
| Type | Long | Long | Short | Short | Short | Short | Short | Short | Short | Short |
| Type / profile | HR | HR | Radius | N | N | H | H | H | H | N |
| Catalogue page | 16.29 | 16.29 | 16.29 | 16.30 | 16.30 | 16.31 | 16.31 | 16.31 | 16.31 | 16.31 |
| Article number | 16277 | 16278 | 16281 | 16370 | 16375 | 16380 | 16381 | 16382 | 16383 | 16385 |

## Application recommendation

● = Well suited ○ = Limited suitability

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Aluminium < 10% Si | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Aluminium > 10% Si | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Copper | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Steel < 520N | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Steel < 750N | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Steel < 900N | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Steel < 1100N | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Steel < 1200N | ● | ● | ● | | | | | | | |
| Steel < 1400N | | | | | | | | | | |
| VA-steel < 900N | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| VA-steel > 900N | ○ | ○ | ○ | ○ | ○ | | ○ | ○ | ○ | ○ |
| GG | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| GGG | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Titanium | | | | | | | | | | |
| Titanium alloy | | | | | | | | | | |
| Nickel | | | | | | | | | | |
| < 55HRC | | | | | | | | | | |
| < 60HRC | | | | | | | | | | |
| < 67HRC | | | | | | | | | | |
| Plastics | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |

# Overview - solid carbide milling cutters (I)



| Brand | HHW | HHW | HHW | HHW | HHW | HHW | HHW | HHW | HHW | HHW | HHW |
|---|---|---|---|---|---|---|---|---|---|---|---|
| |  | | | | | | | | | | |
| Number of cutting edges | 3 | 3 | 2 | 2 | 2 | 3 | 3 | 3 | 4 | 4 | 4 |
| Diameter range mm | 2 - 20 | 1,5 - 16 | 2 - 20 | 2 - 20 | 3 - 20 | 2 - 20 | 2 - 20 | 3 - 20 | 3 - 20 | 3 - 20 | 4 - 20 |
| Cutting material | Solid carbide | Solid carbide | Solid carbide | Solid carbide | Solid carbide | Solid carbide | Solid carbide | Solid carbide | Solid carbide | Solid carbide | Solid carbide |
| Coating | – | TiAN | – | TiAN | TiAN | – | TiAN | TiAN | TiAlCN | TiAN | Nacro |
| Type | Short | Short | Short | Short | Long | Short | Short | Long | Short | Long | Long |
| Type / profile | N | N | N | N | N | N | N | N | H | H | VA-steel |
| Catalogue page | 16.32 | 16.32 | 16.33 | 16.33 | 16.33 | 16.34 | 16.34 | 16.34 | 16.35 | 16.35 | 16.35 |
| Article number | 16500 | 16502 | 16505 | 16507 | 16517 | 16522 | 16524 | 16532 | 16533 | 16534 1.. | 16534 2.. |

## Application recommendation

● = Well suited ○ = Limited suitability

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Aluminium < 10% Si | ○ | ○ | ○ | ○ | | | | | ● | ● | |
| Aluminium > 10% Si | ○ | ○ | ○ | ○ | | | | | ● | ● | |
| Copper | ○ | ○ | ○ | ○ | | | | | ● | ● | |
| Steel < 520N | ● | ● | ● | ● | ● | ● | ● | | ● | ● | ● |
| Steel < 750N | ● | ● | ● | ● | ● | ● | ● | | ● | ● | ● |
| Steel < 900N | ● | ● | ● | ● | ● | ● | ● | | ● | ● | ● |
| Steel < 1100N | ● | ● | ● | ● | ● | ● | ● | | ● | ● | |
| Steel < 1200N | ● | ● | ● | ● | ● | ● | ● | | ● | ● | |
| Steel < 1400N | ● | ● | ● | ● | ● | ● | ● | ● | | | |
| VA-steel < 900N | ○ | ● | ○ | ● | ● | | ● | ● | ○ | ● | ● |
| VA-steel > 900N | ○ | ● | ○ | ● | ● | | ● | ● | ○ | ● | ● |
| GG | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | |
| GGG | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | |
| Titanium | | | | | | | | | ● | ● | |
| Titanium alloy | | | | | | | | | ● | ● | |
| Nickel | | | | | | | | | ● | ● | |
| < 55HRC | | | | | | | | | | | |
| < 60HRC | | | | | | | | | | | |
| < 67HRC | | | | | | | | | | | |
| Plastics | ● | ○ | ● | ○ | ○ | ● | ○ | | | | |

| Brand | HHW | HHW | HHW | ATORN | HHW | ATORN NEW | ATORN NEW | ATORN NEW | ATORN NEW | ATORN NEW | ATORN NEW |
|---|---|---|---|---|---|---|---|---|---|---|---|
| |  | | | | | | | | | | |
| Number of cutting edges | 4 | 4 | 4 | 3 | 4 | 2 | 2 | 2 | 3 | 2 | 2 |
| Diameter range mm | 4 - 20 | 4 - 20 | 6 - 20 | 3 - 20 | 4 - 20 | 0,5 - 4 | 0,5 - 4 | 0,5 - 4 | 3 - 20 | 3 - 20 | 3 - 20 |
| Cutting material | Solid carbide | Solid carbide | Solid carbide | Solid carbide | Solid carbide | Solid carbide | Solid carbide | Solid carbide | Solid carbide | Solid carbide | Solid carbide |
| Coating | TiAN | TiAN | TiAN | TiAN | TiAN | AlCrN | AlCrN | AlCrN | AlCrN | AlCrN | AlCrN |
| Type | Long | Long/released | Long with IK | Short | Long | Mini | Mini | Mini | Short | Short | Long |
| Type / profile | H | H | H/35°/38° | HPC | H/cornerr. | HPC | HPC | HPC | HPC | HPC | HPC |
| Catalogue page | 16.35 | 16.36 | 16.36 | 16.37 | 16.37 | 16.38 | 16.38 | 16.39 | 16.40 | 16.40 | 16.41 |
| Article number | 16534 3.. | 16536 | 16538 | 16535 | 16540 | 16400 | 16401 | 16402 | 16403 | 16405 | 16407 |

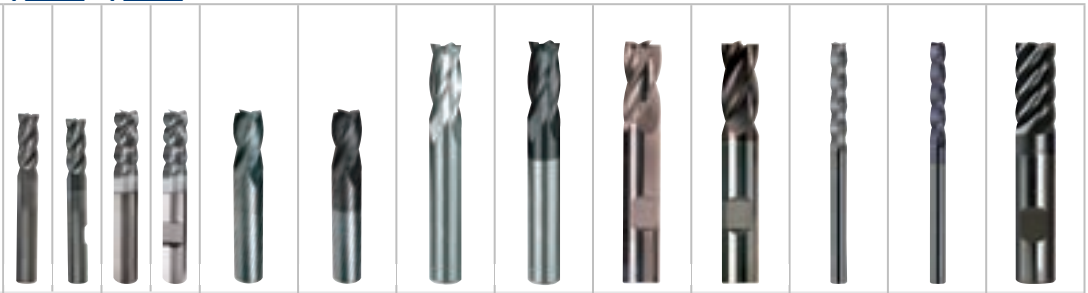
## Application recommendation

● = Well suited ○ = Limited suitability

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Aluminium < 10% Si | ● | ● | ● | ● | ● | | | | | | |
| Aluminium > 10% Si | ● | ● | ● | ● | ● | | | | | | |
| Copper | ● | ● | ● | ● | ● | | | | | | |
| Steel < 520N | ● | ● | ● | ● | ● | | | | | | |
| Steel < 750N | ● | ● | ● | ● | ● | ○ | ○ | ○ | ○ | ○ | ○ |
| Steel < 900N | ● | ● | ● | ● | ● | ○ | ○ | ○ | ○ | ○ | ○ |
| Steel < 1100N | ● | ● | ● | ● | ● | ○ | ○ | ○ | ○ | ○ | ○ |
| Steel < 1200N | ● | ● | ● | ● | ● | ○ | ○ | ○ | ○ | ○ | ○ |
| Steel < 1400N | | | | ● | | | | | | | |
| VA-steel < 900N | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| VA-steel > 900N | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| GG | ● | ● | ● | | ● | | | | | | |
| GGG | ● | ● | ● | | ● | | | | | | |
| Titanium | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Titanium alloy | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Nickel | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| < 55HRC | | | | | | | | | | | |
| < 60HRC | | | | | | | | | | | |
| < 67HRC | | | | | | | | | | | |
| Plastics | | | | | | | | | | | |

# Overview - solid carbide milling cutters (II)



| Brand | ATORN | ATORN | HHW | HHW | HHW | HHW | HHW | HHW | HHW | HHW | HHW |
|---|---|---|---|---|---|---|---|---|---|---|---|
| |  | | | | | | | | | | |
| Number of cutting edges | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 6 - 8 |
| Diameter range mm | 4 - 20 | 4 - 20 | 2 - 20 | 2 - 20 | 4 - 16 | 4 - 20 | 3 - 20 | 3 - 20 | 3 - 12 | 3 - 12 | 6 - 20 |
| Cutting material | Solid carbide | Solid carbide | Solid carbide | Solid carbide | Solid carbide | Solid carbide | Solid carbide | Solid carbide | Solid carbide | Solid carbide | Solid carbide |
| Coating | AlCrN | AlCrN | – | TiAN | – | TiAN | – | TiAN | – | TiAN | TiAN |
| Type | Short | Short | Short | Short | Long | Long | Long | Long | Extra long | Extra long | Long |
| Type / profile | HPC | HPC | N | N | N | N | N | N | N | N | N |
| Catalogue page | 16.41 | 16.42 | 16.43 | 16.43 | 16.43 | 16.43 | 16.44 | 16.44 | 16.44 | 16.44 | 16.45 |
| Article number | 16544 | 16550 | 16537 | 16539 | 16542 | 16543 | 16545 | 16547 | 16548 | 16549 | 16551 |

## Application recommendation

● = Well suited ○ = Limited suitability

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Aluminium < 10% Si | ○ | ● | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Aluminium > 10% Si | ○ | ● | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Copper | ○ | ● | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Steel < 520N | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Steel < 750N | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Steel < 900N | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Steel < 1100N | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Steel < 1200N | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Steel < 1400N | | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| VA-steel < 900N | ● | ● | ○ | ● | ○ | ● | ○ | ○ | ○ | ● | ● |
| VA-steel > 900N | ● | ● | ○ | ● | ○ | ● | ○ | ○ | ○ | ● | ● |
| GG | ○ | | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| GGG | ○ | | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Titanium | | ● | ○ | ● | ○ | ● | ○ | ● | ○ | ● | ● |
| Titanium alloy | | ● | ○ | ● | ○ | ● | ○ | ● | ○ | ● | ● |
| Nickel | | ● | ○ | ● | ○ | ● | ○ | ● | ○ | ● | ● |
| < 55HRC | | | | | | | | | | | ● |
| < 60HRC | | | | | | | | | | | |
| < 67HRC | | | | | | | | | | | |
| Plastics | | | ● | ○ | ● | ○ | ● | ○ | ● | ○ | ○ |

| Brand | HHW | HHW | HHW | HHW | HHW | HHW | ATORN | HHW | HHW | HHW | HHW |
|---|---|---|---|---|---|---|---|---|---|---|---|
| |  | | | | | | | | | | |
| Number of cutting edges | 6 - 8 | 2 | 2 | 4 | 4 | 4 | 4 | 3 | 1 | 4 - 6 | 4 - 6 |
| Diameter range mm | 6 - 20 | 3 - 20 | 2 - 20 | 3 - 20 | 5 - 20 | 3 - 20 | 6 - 20 | 6 - 16 | 3 - 6 | 4 - 20 | 4 - 20 |
| Cutting material | Solid carbide | Solid carbide | Solid carbide | Solid carbide | Solid carbide | Solid carbide | Solid carbide | Solid carbide | Solid carbide | Solid carbide | Solid carbide |
| Coating | TiAN | TiAN | TiAN | TiAN | TiAN | TiAN | TiAN | CALIDA Z | TiAN | – | TiAN |
| Type | Overlong | Short | Long | Short | Long | Long | Long with IK | Short | Short | Short | Short |
| Type / profile | N | Radius | Radius | Radius | NF | HR | HR / IKZ | HPC | N | 90° Deburrer | 90° Deburrer |
| Catalogue page | 16.45 | 16.45 | 16.46 | 16.46 | 16.46 | 16.47 | 16.47 | 16.47 | 16.48 | 16.48 | 16.48 |
| Article number | 16553 | 16557 | 16559 | 16561 | 16565 | 16567 | 16569 | 16564 | 16575 | 16570 | 16571 |

## Application recommendation

● = Well suited ○ = Limited suitability

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Aluminium < 10% Si | ● | ○ | ○ | ○ | ○ | | ○ | ● | ● | ○ | ○ |
| Aluminium > 10% Si | ● | ○ | ○ | ○ | ○ | | ○ | ● | ● | ○ | ○ |
| Copper | ● | ○ | ○ | ○ | ○ | | ○ | ● | ● | ○ | ○ |
| Steel < 520N | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Steel < 750N | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Steel < 900N | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Steel < 1100N | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Steel < 1200N | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Steel < 1400N | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| VA-steel < 900N | ● | ● | ● | ● | ● | ● | ● | | ● | ○ | ● |
| VA-steel > 900N | ● | ● | ● | ● | ● | ● | ● | | ● | ○ | ● |
| GG | ● | ● | ● | ● | ● | ● | ● | | ● | ● | ● |
| GGG | | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Titanium | ● | ● | ● | ● | ● | ● | ● | | | ○ | ● |
| Titanium alloy | ● | ● | ● | ● | ● | ● | ● | | | ○ | ● |
| Nickel | ● | ● | ● | ● | ● | ● | ● | | | ○ | ● |
| < 55HRC | | | | | | | | | | | |
| < 60HRC | | | | | | | | | | | |
| < 67HRC | | | | | | | | | | | |
| Plastics | | ○ | ○ | ○ | ○ | ○ | ○ | | ● | ● | ○ |



= Sales are restricted to the packaging units mentioned in the catalogue. Purchase orders must be in units.

# Overview - solid carbide milling cutters (III)



| Brand | HHW | HHW | HHW | HHW | ATORN | HHW | ATORN | HHW | ATORN | HHW |
|---|---|---|---|---|---|---|---|---|---|---|
| |  |  |  |  |  |  |  |  |  |  |
| Number of cutting edges | 4 - 6 | 2 | 4 | 2 | 2 | 2 | 3 | 4 | 4 | 4 |
| Diameter range mm | 4 - 20 | 3 - 20 | 4 - 16 | 3 - 25 | 0,3 - 20 | 3 - 25 | 3 - 20 | 3 - 25 | 2 - 20 | 3 - 25 |
| Cutting material | Solid carbide | Solid carbide | Solid carbide | Solid carbide | Solid carbide | Solid carbide | Solid carbide | Solid carbide | Solid carbide | Solid carbide |
| Coating | TiAN | – | TiAN | TiAN | TiAN Ultra | TiAN | TiAN Ultra | TiAN | TiAN Ultra | TiAN |
| Type | Short | Short | Long | Short | Depth of clearance | Long | Depth of clearance | Short | Short depth of clearance | Long |
| Type / profile | 60° deburrer | Universal | Deburrer | HSC | HSC | HSC | HPC | HSC | HPC | HSC |
| Catalogue page | 16.48 | 16.49 | 16.49 | 16.72 | 16.72 | 16.73 | 16.73 | 16.74 | 16.74 | 16.75 |
| Article number | 16573 | 16580 | 16583 | 16601 | 16603 | 16604 | 16607 | 16609 | 16110 | 16613 |
| **Application recommendation** | ● = Well suited ○ = Limited suitability | | | | | | | | | |
| Aluminium < 10% Si | ○ | ○ | ○ | | | | | | | |
| Aluminium > 10% Si | ○ | ○ | ○ | | | | | | | |
| Copper | ○ | ○ | ○ | | | | | | | |
| Steel < 520N | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Steel < 750N | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Steel < 900N | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Steel < 1100N | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Steel < 1200N | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Steel < 1400N | ● | ● | ● | ● | ● | | ● | | ● | ● |
| VA-steel < 900N | ● | ○ | ● | | | | | | | |
| VA-steel > 900N | ● | ○ | ● | | | | | | | |
| GG | ● | ● | ● | | ● | | ● | | ● | |
| GGG | ● | ● | ● | | ● | | ● | | ● | |
| Titanium | ● | ○ | ● | ● | ● | | ● | | ● | |
| Titanium alloy | ● | ○ | ● | ● | ● | | ● | | ● | |
| Nickel | ● | ○ | ● | ● | ● | | ● | | ● | |
| < 55HRC | | | | | ○ | ● | ○ | ● | ○ | ● |
| < 60HRC | | | | | | ● | | ● | | ● |
| < 67HRC | | | | | | | | | | |
| Plastics | ○ | ● | ○ | | | | | | | |

| Brand | ATORN | HHW | HHW | HHW | HHW | HHW | HHW | HHW | HHW | HHW |
|---|---|---|---|---|---|---|---|---|---|---|
| |  |  |  |  |  |  |  |  |  |  |
| Number of cutting edges | 6 - 8 | 6 | 2 | 4 | 2 | 4 | 3 - 6 | 3 - 4 | 4 | 2 - 3 |
| Diameter range mm | 4 - 20 | 6 - 25 | 2 - 20 | 2 - 20 | 2 - 12 | 0,5 - 6,0 | 4 - 25 | 6 - 20 | 6 - 12 | 2 - 12 |
| Cutting material | Solid carbide | Solid carbide | Solid carbide | Solid carbide | Solid carbide | Solid carbide | Solid carbide | Solid carbide | Solid carbide | Solid carbide |
| Coating | TiAN Ultra | TiAN | TiAN | TiAN | TiAN | TiAN | TiAN | TiAN | TiAN | Diamond |
| Type | Short depth of clearance | Extra long | Radius long | Radius long | Spheroid extra long | Long | Short | Long | Torus long | Finishing |
| Type / profile | HSC | HSC | HSC | HSC | H | Quarter circle | HR / HSC | HR / HSC | HSC | Graphite |
| Catalogue page | 16.75 | 16.75 | 16.76 | 16.76 | 16.76 | 16.77 | 16.77 | 16.77 | 16.78 | 16.78 |
| Article number | 16616 | 16619 | 16621 | 16625 | 16655 | 16658 | 16650/651 | 16629 | 16637 | 16702 |
| **Application recommendation** | ● = Well suited ○ = Limited suitability | | | | | | | | | |
| Aluminium < 10% Si | | | | | | ● | | ○ | | |
| Aluminium > 10% Si | | | | | | ● | | ○ | | |
| Copper | | | | | | ● | ● | ○ | | ● |
| Steel < 520N | ● | ● | ● | ● | ● | ● | ● | ● | ● | |
| Steel < 750N | ● | ● | ● | ● | ● | ● | ● | ● | ● | |
| Steel < 900N | ● | ● | ● | ● | ● | ● | ● | ● | ● | |
| Steel < 1100N | ● | ● | ● | ● | ● | ● | ● | ● | ● | |
| Steel < 1200N | ● | ● | ● | ● | ● | ● | ● | ● | ● | |
| Steel < 1400N | ● | ● | | ● | ● | ● | ● | ● | ● | |
| VA-steel < 900N | | | | ● | ● | ○ | | ● | | |
| VA-steel > 900N | | | | ● | ● | ○ | | ● | | |
| GG | ● | | | | | ● | ● | ● | | |
| GGG | ● | | | | | ● | ● | ● | | |
| Titanium | ● | | | | | ○ | | ● | | |
| Titanium alloy | ● | | | | | ○ | | ● | | |
| Nickel | ● | | ● | | | ○ | | ● | | |
| < 55HRC | ○ | ● | ● | ○ | ○ | | ● | ● | ● | |
| < 60HRC | | ● | ● | ● | ● | | ● | ○ | ● | |
| < 67HRC | | ○ | | | ○ | | ○ | | | |
| Plastics | | | | | | | | | | |

# Solid carbide aluminium milling cutters - the complete product range for aluminium machining

The perfect combination of carbide, geometry and coating makes ATORN tools top performers. They manufacture more efficiently, produce more parts and thus increase the productivity of your manufacturing operation.

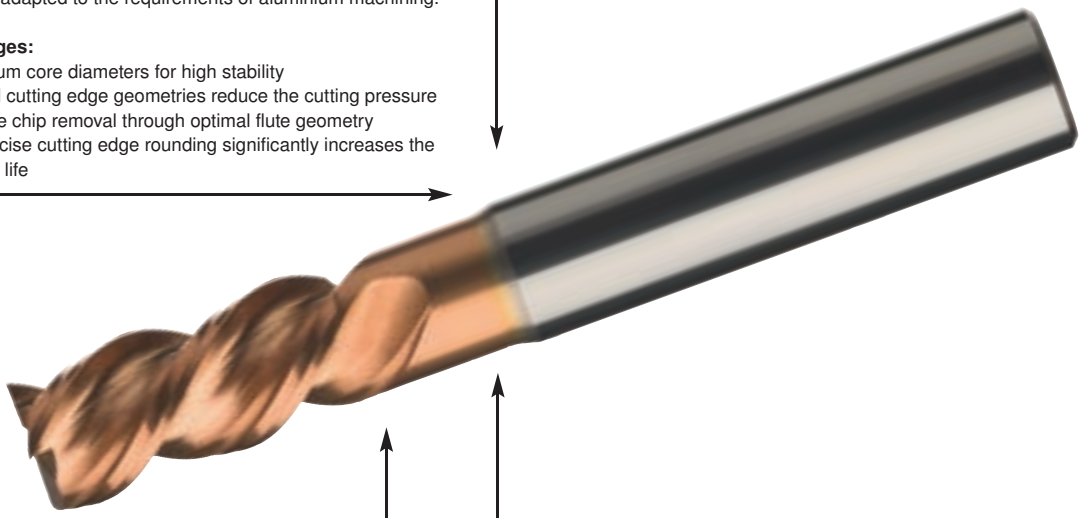
To meet the requirements imposed by aluminium machining, extensive cutting tests were performed, as is the case with all ATORN machining tools. The results determined in these tests flow continuously into tool development. The result is a new generation of tools for high-performance machining of aluminium.

**Performance characteristics of the new machining tools**
- ▶ Short processing times thanks to high implementation parameters
- ▶ Outstanding surface quality
- ▶ No burr formation, or minimised burr formation
- ▶ Also suitable for low-powered machines
- ▶ Long service life through optimal combination of cutting material, coating and geometry
- ▶ Precision through close manufacturing tolerances
- ▶ Outstanding implementation behaviour: Extremely soft cut, optimal chip removal and extremely quiet operation

**Wear-resistant carbide**
The base substrate consists of H10F fine grain solid carbide for aluminium with grain sizes from 0.6 - 0.8 µm. This substrate is particularly wear-resistant, hard, and pressure-resistant. It optimally withstands the dynamic and mechanical loads that occur. This becomes particularly important when vibrations occur that can easily cause nicks on the cutting edges.

**New tool geometry**
Optimal cutting geometry, micro-geometry, and flute geometry are crucial, particularly for aluminium machining. On the basis of numerous machining tests, the geometries have ben reworked and optimally adapted to the requirements of aluminium machining.

**Advantages:**
- ▶ Maximum core diameters for high stability
- ▶ Special cutting edge geometries reduce the cutting pressure
- ▶ Reliable chip removal through optimal flute geometry
- ▶ µm-precise cutting edge rounding significantly increases the service life



**Improved tolerances**
Precision generates quality - one reason why this new tool generation is manufactured with more precise tolerances. All shanks are manufactured in h5 quality and all cutters are manufactured in g7 quality.

**New coating - ULTRA-N**
The new ULTRA-N coating is a zirconium carbon nitride (ZrCN) coating with excellent resistance to corrosion and abrasive wear. Relative to the familiar, light-yellow ZrN coating, it has a higher degree of hardness and abrasion resistance, which is particularly required for machining of aluminium alloys that contain Si. Additional characteristics of the new coating are a lower coefficient of friction and an associated minimal edge build-up tendency.

**Advantages:**
- ▶ Wear resistant
- ▶ High degree of hardness - 3100 HV
- ▶ Excellent bond of the coating
- ▶ Low coefficient of friction of 0.5

**For an overview of solid carbide aluminium milling cutters see catalogue pages 16.10-16.11 ▶**

# Overview - solid carbide milling cutters (I)



| Brand | ATORN | ATORN | ATORN | ATORN | ATORN | ATORN | ATORN | ATORN | ATORN | ATORN |
|---|---|---|---|---|---|---|---|---|---|---|
| |  | | | | | | | | | |
| 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 - 20 | 3 - 20 | 3 - 20 | 3 - 20 | 3 - 20 |
| Cutting material | Solid carbide | Solid carbide | Solid carbide | Solid carbide | Solid carbide | Solid carbide | Solid carbide | Solid carbide | Solid carbide | Solid carbide |
| Coating | ULTRA-N | ULTRA-N | ULTRA-N | Polished | Polished | ULTRA-N | ULTRA-N | Polished | Polished | Polished |
| Type | Shank | Torus | Radius | Single-point | Shank | Shank | Shank | Shank | Shank | Shank |
| Type / profile | Mini | Mini | Mini | Short | Short | Short | Short | Short | Short | Short |
| Catalogue page | 16.50 | 16.50 | 16.50 | 16.51 | 16.51 | 16.51 | 16.51 | 16.52 | 16.52 | 16.52 |
| Article number | 16710 | 16711 | 16712 | 16715 | 16717 | 16718 | 16719 | 16722 | 16724 | 16725 |

## Application recommendation

● = Well suited ○ = Limited suitability

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Aluminium < 10% Si | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Aluminium > 10% Si | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Copper | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Steel < 520N | | | | | | | | | | |
| Steel < 750N | | | | | | | | | | |
| Steel < 900N | | | | | | | | | | |
| Steel < 1100N | | | | | | | | | | |
| Steel < 1200N | | | | | | | | | | |
| Steel < 1400N | | | | | | | | | | |
| VA-steel < 900N | | | | | | | | | | |
| VA-steel > 900N | | | | | | | | | | |
| GG | | | | | | | | | | |
| GGG | | | | | | | | | | |
| Titanium | | | | | | | | | | |
| Titanium alloy | | | | | | | | | | |
| Nickel | | | | | | | | | | |
| < 55HRC | | | | | | | | | | |
| < 60HRC | | | | | | | | | | |
| < 67HRC | | | | | | | | | | |
| Plastics | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |

| Brand | ATORN | ATORN | ATORN | ATORN | ATORN | ATORN | ATORN | ATORN | ATORN | ATORN |
|---|---|---|---|---|---|---|---|---|---|---|
| |  | | | | | | | | | |
| Number of cutting edges | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 4 |
| Diameter range mm | 3 - 30 | 3 - 20 | 3 - 20 | 3 - 20 | 3 - 20 | 3 - 20 | 6 - 20 | 6 - 20 | 6 - 20 | 3 - 20 |
| Cutting material | Solid carbide | Solid carbide | Solid carbide | Solid carbide | Solid carbide | Solid carbide | Solid carbide | Solid carbide | Solid carbide | Solid carbide |
| Coating | ULTRA-N | ULTRA-N | ULTRA-N | Polished | ULTRA-N | ULTRA-N | ULTRA-N | ULTRA-N | ULTRA-N | ULTRA-N |
| Type | Shank | Shank | Shank | Shank | Shank | Shank | Roughing | Roughing | Roughing with IK | Shank |
| Type / profile | Short | Short | Short | Medium | Medium | Medium | Short | Short | Short | Short |
| Catalogue page | 16.52 | 16.52 | 16.53 | 16.53 | 16.53 | 16.53 | 16.54 | 16.54 | 16.54 | 16.54 |
| Article number | 16726 | 16727 | 16728 | 16729 | 16730 | 16731 | 16732 | 16734 | 16735 | 16737 |

## Application recommendation

● = Well suited ○ = Limited suitability

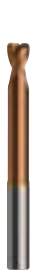
| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Aluminium < 10% Si | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Aluminium > 10% Si | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Copper | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Steel < 520N | | | | | | | | | | |
| Steel < 750N | | | | | | | | | | |
| Steel < 900N | | | | | | | | | | |
| Steel < 1100N | | | | | | | | | | |
| Steel < 1200N | | | | | | | | | | |
| Steel < 1400N | | | | | | | | | | |
| VA-steel < 900N | | | | | | | | | | |
| VA-steel > 900N | | | | | | | | | | |
| GG | | | | | | | | | | |
| GGG | | | | | | | | | | |
| Titanium | | | | | | | | | | |
| Titanium alloy | | | | | | | | | | |
| Nickel | | | | | | | | | | |
| < 55HRC | | | | | | | | | | |
| < 60HRC | | | | | | | | | | |
| < 67HRC | | | | | | | | | | |
| Plastics | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |



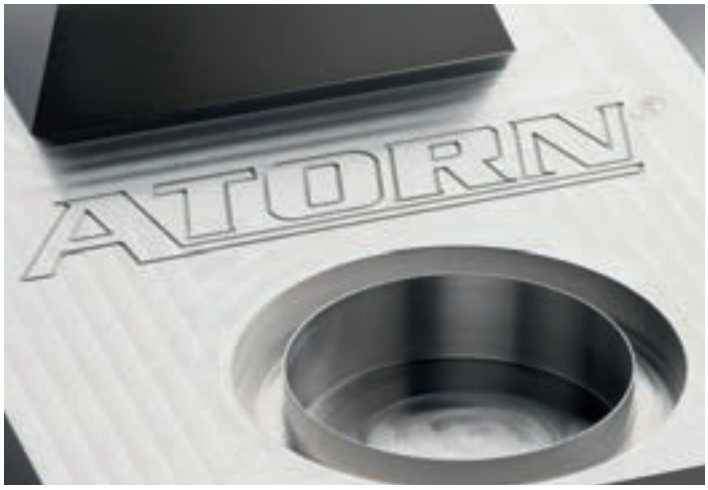
= Sales are restricted to the packaging units mentioned in the catalogue. Purchase orders must be in units.

# Overview - solid carbide milling cutters (II)



| Brand | ATORN | ATORN | ATORN | ATORN | ATORN | ATORN | ATORN | ATORN | ATORN | ATORN |
|---|---|---|---|---|---|---|---|---|---|---|
| |  |  |  |  |  |  |  |  |  |  |
| Number of cutting edges | 4 | 4 | 4 | 4 | 4 | 2 | 2 | 2 | 3 | 3 |
| Diameter range mm | 3 - 20 | 4 - 20 | 6 - 16 | 3 - 20 | 4 - 20 | 3 - 16 | 3 - 16 | 6 - 16 | 5 - 20 | 5 - 20 |
| Cutting material | Solid carbide | Solid carbide | Solid carbide | Solid carbide | Solid carbide | Solid carbide | Solid carbide | Solid carbide | Solid carbide | Solid carbide |
| Coating | ULTRA-N | ULTRA-N | ULTRA-N | ULTRA-N | ULTRA-N | ULTRA-N | ULTRA-N | ULTRA-N | ULTRA-N | ULTRA-N |
| Type | Shank | Shank | Shank | Shank | Shank | Torus | Torus | Torus | Torus | Torus |
| Type / profile | Short | Medium | Long | Short | Medium | Short | Medium | Long | Short | Short |
| Catalogue page | 16.54 | 16.55 | 16.55 | 16.55 | 16.55 | 16.56 | 16.56 | 16.57 | 16.57 | 16.57 |
| Article number | 16738 | 16739 | 16740 | 16741 | 16742 | 16745 | 16746 | 16747 | 16748 | 16749 |
| **Application recommendation** | ● = Well suited ○ = Limited suitability | | | | | | | | | |
| Aluminium < 10% Si | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Aluminium > 10% Si | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Copper | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Steel < 520N | | | | | | | | | | |
| Steel < 750N | | | | | | | | | | |
| Steel < 900N | | | | | | | | | | |
| Steel < 1100N | | | | | | | | | | |
| Steel < 1200N | | | | | | | | | | |
| Steel < 1400N | | | | | | | | | | |
| VA-steel < 900N | | | | | | | | | | |
| VA-steel > 900N | | | | | | | | | | |
| GG | | | | | | | | | | |
| GGG | | | | | | | | | | |
| Titanium | | | | | | | | | | |
| Titanium alloy | | | | | | | | | | |
| Nickel | | | | | | | | | | |
| < 55HRC | | | | | | | | | | |
| < 60HRC | | | | | | | | | | |
| < 67HRC | | | | | | | | | | |
| Plastics | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |

| Brand | ATORN | ATORN | ATORN |
|---|---|---|---|
| |  |  |  |
| Number of cutting edges | 2 | 2 | 2 |
| Diameter range mm | 3 - 16 | 3 - 16 | 3 - 12 |
| Cutting material | Solid carbide | Solid carbide | Solid carbide |
| Coating | ULTRA-N | ULTRA-N | ULTRA-N |
| Type | Radius | Radius | Radius |
| Type / profile | Short | Medium | Long |
| Catalogue page | 16.58 | 16.58 | 16.58 |
| Article number | 16755 | 16756 | 16757 |
| **Application recommendation** | ● = Well suited ○ = Limited suitability | | |
| Aluminium < 10% Si | ● | ● | ● |
| Aluminium > 10% Si | ● | ● | ● |
| Copper | ● | ● | ● |
| Steel < 520N | | | |
| Steel < 750N | | | |
| Steel < 900N | | | |
| Steel < 1100N | | | |
| Steel < 1200N | | | |
| Steel < 1400N | | | |
| VA-steel < 900N | | | |
| VA-steel > 900N | | | |
| GG | | | |
| GGG | | | |
| Titanium | | | |
| Titanium alloy | | | |
| Nickel | | | |
| < 55HRC | | | |
| < 60HRC | | | |
| < 67HRC | | | |
| Plastics | ● | ● | ● |






= Sales are restricted to the packaging units mentioned in the catalogue. Purchase orders must be in units.

# Overview - solid carbide milling cutters for hard machining and high-speed machining (II)



| | ATORN® | ATORN® | ATORN® | ATORN® | ATORN® | ATORN® | ATORN® | ATORN® | ATORN® |
|---|---|---|---|---|---|---|---|---|---|
| | Solid carbide mini end milling cutter Short | Solid carbide mini end milling cutter Long neck | Solid carbide mini torus cutter Long neck | Solid carbide mini radius cutter Short | Solid carbide mini radius cutter Long neck | Solid carbide end milling cutter Standard | Solid carbide end milling cutter Short blade, overlong | Solid carbide end milling cutter Long | Solid carbide torus cutter Standard |
| Art. no. | 16800 | 16801 | 16802 | 16805 | 16806 | 16810 | 16812 | 16813 | 16816 |
| Ø range in mm | 0,1 - 0,9 | 0,2 - 3 | 0,2 - 3 | 0,2 - 0,9 | 0,2 - 3 | 3 - 20 | 3 - 20 | 3 - 20 | 3 - 20 |
| Teeth | 2 | 2 | 2 | 2 | 2 | 4 | 4 | 4 | 4 |
| |  | | | | | | | | |

| Material Rocktec | 52 | 65 | 52 | 65 | 52 | 65 | 52 | 65 | 52 | 65 | 52 | 65 | 52 | 65 | 52 | 65 | 52 | 65 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Steel and cast steel < 700 N/mm² | ● | | ● | | ● | | ● | | ● | | ● | | ● | | ● | | ● | |
| Steel and cast steel 700-1000 N/mm² | ● | | ● | | ● | | ● | | ● | | ● | | ● | | ● | | ● | |
| Steels 1000-1300 N/mm² | ● | | ● | | ● | | ● | | ● | | ● | | ● | | ● | | ● | |
| Steels 1300-1600 N/mm² | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Hardened steels < 52 HRC | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| Hardened cast iron | | ● | | ● | | ● | | ● | | ● | | ● | | ● | | ● | | ● |
| Hardened steels 52-65 HRC | | ● | | ● | | ● | | ● | | ● | | ● | | ● | | ● | | ● |

● = Well suited ○ = Limited suitability

# Overview - solid carbide milling cutters for hard machining and high-speed machining (II)



| ATORN® | ATORN® | ATORN® | ATORN® | ATORN® | ATORN® | ATORN® | ATORN® | ATORN® | ATORN® | ATORN® |
|---|---|---|---|---|---|---|---|---|---|---|
| Solid carbide torus cutter Short blade | Solid carbide torus cutter Long | Solid carbide torus cutter Overlong | Solid carbide multi-tooth milling cutter Standard | Solid carbide multi-tooth milling cutter Long | Solid carbide radius form end mill cutter Standard | Solid carbide radius form end mill cutter Long | Solid carbide radius form end mill cutter Overlong | Solid carbide radius cutter Short | Solid carbide radius cutter Long | Solid carbide high-speed cutter Short blade |
| 16817 | 16818 | 16819 | 16824 | 16825 | 16827 | 16828 | 16829 | 16830 | 16831 | 16832 |
| 3 - 16 | 3 - 16 | 3 - 16 | 3 - 20 | 3 - 20 | 2 - 20 | 2 - 20 | 2 - 20 | 3 - 20 | 3 - 20 | 4 - 12 |
| 4 | 4 | 4 | 6 - 8 | 6 - 8 | 2 | 2 | 2 | 4 | 4 | 4 - 6 |
|  | | | | | | | | | | |
| 52 65 | 52 65 | 52 65 | 52 65 | 52 65 | 52 65 | 52 65 | 52 65 | 52 65 | 52 65 | 65 |
| ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | |
| ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | |
| ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | |
| ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| | ● | | ● | | ● | | ● | | ● | ● |
| | ● | | ● | | ● | | ● | | ● | ● |

● = Well suited ○ = Limited suitability

## 83943 - 83944 SystemBoard (modular system)

**Type**
- Individual fitting through exchangeable inserts (Ø 3-40 mm)
- Frames are ideal for stacking, suitable for warehouse, order picking bins and transport bins.
- Assured protection against damage through extremely high impact-resistance and ductility.
- Excellent dimensional stability under heat (to 120 °C)
- Resistant to solvents, oils and greases

**Use**
Ideal for sorting, ordering and storing. Process optimisation, precise positioning for automation is possible. Order-based stocking for company-internal logistics processes or for external further processing (e.g. cleaning, coating and transport processes). Space-saving storage and provisioning of tools, turned parts or technical parts.

**Quality**
**Polyamide (PA6)**

**83943 101**
**Frame**
**Use**
For accommodation of socket inserts, see cat.-no. 83944.

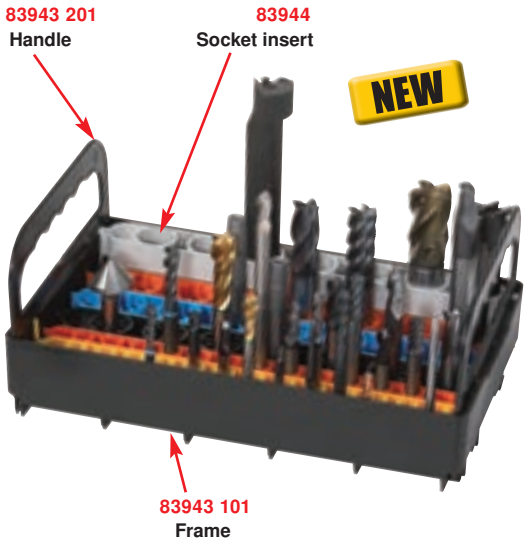
***Note:***
*Optional handles, see cat.-no. 83943 201.*

**83943 201**
**Handle**
**Use**
For frame, see cat.-no. 83943 101.

**83944**
**Socket inserts**
**Type**
- Variable height (25 mm or 40 mm) by simply turning

**Use**
For frame, see cat.-no. 83943 101.

***Note:***
*Ø 3/4, 3/8, 1/2, 1/4 inch available on request.*




| Type | L x W x H mm | Carrying weight max. kg | Colour | 83943 ... |
|---|---|---|---|---|
| Frame with base | 300 x 185 x 57 | - | Black | 101 |
| Handle | - | 8 | Black | 201 |

| Bore Ø mm | Number of bores per socket insert | Max. number of socket 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 |

| Bore Ø mm | Number of bores per socket insert | Max. number of socket 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 |

| Placement area L x W mm | Guidance height mm | Number of placement areas per socket insert | Max. number of socket inserts per frame | 83944 ... |
|---|---|---|---|---|
| 17 x 17 | 8,5 | 28 | 4 | 132 |

## 16005 End Milling Cutter Stands

**Type**
Stand body made of red injection plastics. **Stable, handy, good fit.** Tools with short clamping shank project out of the mounting hole, so that they are **easy to remove.** All holes are open at the bottom, **therefore no blockage, caused by, e.g. chips.** Slightly tapered holes for easy handling of milling cutters. Milling cutters not included.

**16005 101**
**Type**
**Square** (182 x 182 x 30 mm), **with 7 different shank receptacle bores** for accommodating 77 **different** shank milling cutters.

**16005 102-108**
**Type**
**Rectangular** (140 x 70 x 30 mm), **shank mounting boreholes** with the same diameter for storing **milling cutters** with same **shank diameter.**
**Use**
The different stand types can be completed to a stand storage system. Each stand element equipped with **dovetail couplings** on the sides. They provide an invisible connection, therefore combinations look like a one-piece unit.

16005 101

16005 102-108

| Shanking mounting bore mm | Shank milling cutter capacity pcs. | 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 |

## 16900 Cutting rate calculator

ATORN® HHW

**Use**
With the cutting rate calculator (German language) you can quickly and easily find the correct values **for all ATORN and HHW milling cutters and turning tools.**

16900

| n min$^{-1}$ | 16900 ... |
|---|---|
| 10 - 30.000 | 101 |

## 16010 Single-tooth milling cutter

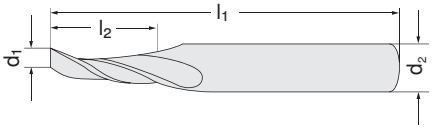
HHW

**Type**
Straight shank, **with only one cutting edge,** sidewise and face cutting.
**Use**
For milling slots in aluminium doors and windows on high-speed milling machines.

**Quality**
**HSS-E (Co5)**

Z1 | HSS Co5 | ALU

16010




| $d_1$ js14 mm | $l_2$ mm | $l_1$ mm | $d_2$ 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 |

| $d_1$ js14 mm | $l_2$ mm | $l_1$ mm | $d_2$ 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-steel<900N | VA-steel>900N | Ti-alloys | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 70 | 60 | 60 | 50 | 40 | 30 | - | - | - | - | - | - | - | - | - | - | - | - |

## 16020 - 16022 Miniature Milling Cutters

Z 3 | ≈ 30° | DIN 1835 B | Uni

ATORN®

**Type**
**Short,** right-hand cut, right-hand helix 30°,
**3 cutting edges, centre cut,** straight shank with driving face in compliance with DIN 1835 B.

***Note:***
*Regrinding milling cutters with low flute diameters is uneconomical. For that reason, it is cheaper to use the miniature milling cutters up to the wear limit and then to throw them away. You are always using brand new milling cutters and are reducing the risk of rejections.*

**16020**
**Quality**
**HSS-E (Co8).**

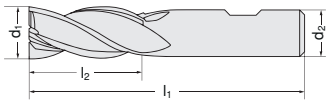
**16022**
**Quality**
**HSS-E (Co8)/TiAlN-coated.**

HSS-E

16020

HSS-E TiAlN

16022




| $d_1$ e8 mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 mm | HSS-E 16020 | ... | HSS-E/TiAlN 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 |

| $d_1$ e8 mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 mm | HSS-E 16020 | ... | HSS-E/TiAlN 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-steel<900N | VA-steel>900N | Ti-alloys | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 Miniature Milling Cutters

Z 3 | ≈ 30° | DIN 1835 B | Uni

ATORN®

**Type**
**Long,** right-hand cut, right-hand helix 30°,
**3 cutting edges, centre cut,** straight shank with driving face in compliance with DIN 1835 B.

***Note:***
*Regrinding milling cutters with low flute diameters is uneconomical. For that reason, it is cheaper to use the miniature milling cutters up to the wear limit and then to throw them away. You are always using brand new milling cutters and are reducing the risk of rejections.*

**16030**
**Quality**
**HSS-E (Co8).**

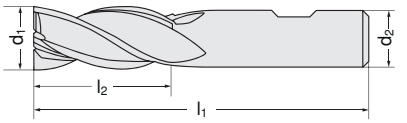
**16032**
**Quality**
**HSS-E (Co8)/TiAlN-coated.**

HSS-E

16030

HSS-E TiAlN

16032




| $d_1$ e8 mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 mm | HSS-E 16030 | ... | HSS-E/TiAlN 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 |

| $d_1$ e8 mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 mm | HSS-E 16030 | ... | HSS-E/TiAlN 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-steel<900N | VA-steel>900N | Ti-alloys | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 Keyway Milling Cutters

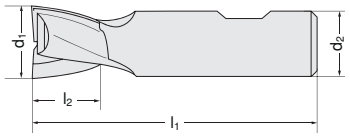
Z 2 | DIN 327D | ≈ 30° | N | DIN 1835 B | Uni

ATORN®

**Type**
**Short,** right-hand cut, straight shank with driving face in compliance with DIN 1835 B. Right-hand helix approx. 30°,**2 cutting edges, centre cut.**

**16060**
**HSS-E (Co8).**

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




HSS-E

HSS-E TiAlN

16060

16062

| d1 e8 mm | l2 mm | l1 mm | d2 h6 mm | d3 mm | HSS-E 16060 | ... | HSS-E/TiAlN 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 mm | l2 mm | l1 mm | d2 h6 mm | d3 mm | HSS-E 16060 | ... | HSS-E/TiAlN 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 | | |
| 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 | | |
| 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 | | |
| 28,0 | 26 | 102 | 25 | - | | 247 | | |
| 30,0 | 26 | 102 | 25 | - | | 248 | | |
| 32,0 | 32 | 112 | 32 | 31,0 | | 249 | | |
| 36,0 | 32 | 112 | 32 | - | | 251 | | |
| 40,0 | 38 | 130 | 40 | 39,0 | | 252 | | |

| | Al<10% Si | Al>10%Si | Cu | St<520N | St<750 N | St<900N | St<1100 N | St<1200 N | St<1400 N | <50HRC | <55HRC | <60HRC | <67HRC | VA-steel<900N | VA-steel>900 N | Ti-alloy | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 Keyway Milling Cutters

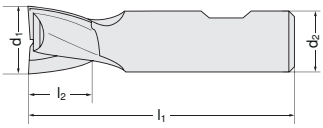
Z 2 | DIN 327D | ≈ 30° | N | DIN 1835 B | Uni

ATORN®

**Type**
**Long,** right-hand cut, right-hand helix approx. 30°, **2 cutting edges,** above 4,0 mm Ø **centre cut.** With eccentric relief, above Ø 10,0mm with double relief. Straight shank with driving face in compliance with DIN 1835 B.
**Advantage:**
No radially ground land, therefore better support and free cut.

**16073**
**HSS-E (Co8).**

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




HSS-E

HSS-E TiAlN

16073

16074

| d1 e8 mm | l2 mm | l1 mm | d2 h6 mm | HSS-E 16073 | ... | HSS-E/TiAlN 16074 | ... |
|---|---|---|---|---|---|---|---|
| 2,5 | 8 | 56 | 6 | | 201 | | 201 |
| 3,0 | 8 | 56 | 6 | | 202 | | 202 |
| 3,5 | 10 | 59 | 6 | | 203 | | |
| 4,0 | 11 | 63 | 6 | | 204 | | 204 |
| 4,5 | 11 | 63 | 6 | | 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 | | |
| 7,0 | 16 | 80 | 10 | | 210 | | 210 |

| d1 e8 mm | l2 mm | l1 mm | d2 h6 mm | HSS-E 16073 | ... | HSS-E/TiAlN 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 | | |
| 24,0 | 45 | 166 | 25 | | 221 | | |
| 25,0 | 45 | 166 | 25 | | 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-steel<900N | VA-steel>900N | Ti-alloys | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 | - |

# Keyway Milling Cutters

## 16094 - 16100 Keyway Milling Cutters

Z 3 | DIN 844B | ≈ 30° | N | DIN 1835 B | Uni

**Type**
**- Short**
- Right-hand cut
- Right-hand helix approx. 30°
**- 3 cutting edges**
**- Centre cut**
- Straight shank with driving face in compliance with DIN 1835 B.

**Advantage:**
No radially ground land, therefore better support and free cut.

**16094**
ATORN®
**Quality**
**HSS-E (Co8).**

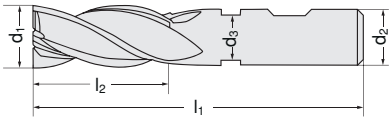
**16096**
ATORN®
**Quality**
**HSS-E (Co8)/TiAlN-coated.**

**16100**
HW
**Use**
Also suitable for dry machining.
**Quality**
**HSS-E powder steel/TiAlN-coated.**

16094
HSS-E


16096
HSS-E TiAlN


16100
HSS-E-PM TiAlN


| $d_1$ e8 mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 mm | $d_3$ mm | HSS-E 16094 ... | HSS-E/TiAlN 16096 ... | HSS-E-PM/TiAlN 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<750 N | St<900N | St<1100 N | St<1200 N | St<1400 N | <50HRC | <55HRC | <60HRC | <67HRC | VA-steel<900N | VA-steel>900 N | Ti-alloy | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **16094** | 70 | 60 | 60 | 50 | 40 | 40 | 30 | 20 | - | - | - | - | - | 20 | 15 | 10 | 4 | - |
| **16096** | 100 | 90 | 90 | 80 | 65 | 65 | 45 | 30 | - | - | - | - | - | 30 | 20 | - | 65 | - |
| **16100** | 140-250 | 120-140 | 90-120 | 80-90 | 70-80 | 55-65 | 50-60 | 40-50 | - | - | - | - | - | 40-45 | 35-40 | - | 80-90 | 80-120 |

Z 3 | DIN 844B | ≈ 30° | N | DIN 1835 B | Uni

ATORN®

**Type**
**- Long**
- Right-hand cut
- Right-hand helix approx. 30°
**- 3 cutting edges, centre cut**
- Straight shank with driving face in compliance with DIN 1835 B.

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

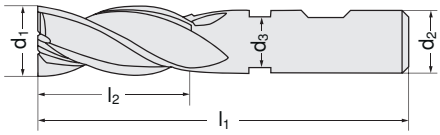
**16105**
**Quality**
**HSS-E (Co8)/TiAlN-coated.**

16104

HSS-E

16105

HSS-E TiAlN




| $d_1$ e8 mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 mm | $d_3$ mm | HSS-E 16104 ... | HSS-E/TiAlN 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-steel<900N | VA-steel>900N | Ti-alloys | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **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-code system

With the **HHW** colour-code system you can identify the materials for which the tool is suitable at first glance. In most catalogue areas the **HHW** colour code system additionally informs you of the application data for the respective tool. The **HHW** colour code system is logically structured based on the Key to Steel. Thus you can find the appropriate tools before processing and save 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**
**Solid carbide types**
**Coating**

| Designation | W±0,1 mm | R±0,05 mm | | PMK H 42 coated 18674 ... |
|---|---|---|---|---|
| GTN-2 | 2,2 | 0,16 | 10 pcs. | 113 |
| GTN-3 | 3,1 | 0,20 | 10 pcs. | 114 |

# End Milling Cutters

## 16120 - 16131 End Milling Cutters

Z 4-6 | DIN 844B | ≈ 35° | N | DIN 1835 B | Uni

**Type**
**- Short**
- Right-hand cut
- Right-hand helix approx. 35°
**- 4-6 cutting edges, centre cut**
- Straight shank with driving face in compliance with DIN 1835 B.

**16120**
ATORN®
**Quality**
**HSS-E (Co8).**

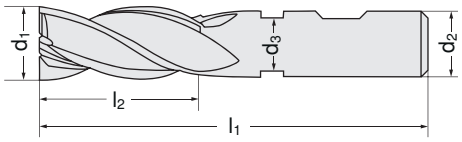
**16122**
ATORN®
**Quality**
**HSS-E (Co8)/TiAlN-coated.**

**16131**
HW
**Use**
Also suitable for dry machining.
**Quality**
**HSS-E-PM/TiAlN-coated.**

16120
HSS-E


16122
HSS-E TiAlN


16131
HSS-E-PM TiAlN


| | | | | | | HSS-E | | HSS-E/TiAlN | | HSS-E-PM/TiAlN | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $d_1$ k10 mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 mm | $d_3$ mm | Z | 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 | | 301 |
| **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-steel<900N | VA-steel>900N | Ti-alloys | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **16120** | | | | | | | | | | | | | | | | | |
| 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 |
| **16122** | | | | | | | | | | | | | | | | | |
| 70-200 | 40-150 | 40-150 | 75-85 | 45-55 | 40-60 | 20-50 | 12-40 | - | - | - | - | - | 5-28 | 3-25 | - | 40-70 | 80-10 |
| **16131** | | | | | | | | | | | | | | | | | |
| 140-250 | 120-140 | 90-120 | 80-90 | 70-80 | 55-65 | 50-60 | 40-50 | | - | - | - | - | 40-45 | 35-40 | - | 80-90 | 80-120 |

## 16143 - 16144 End Milling Cutters

Z 4-6 | DIN 844B | ≈ 40° | N | DIN 1835 B | Uni

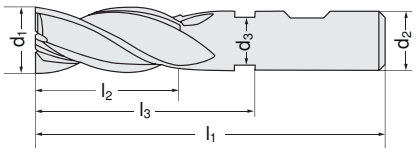
**Type**
**- Medium long**
- Right-hand cut
- Right-hand helix approx. 40°
**- Centre cut**
**- 4-6 cutting edges**
- With eccentric relief
- With released straight shank with driving face in compliance with DIN 1835 B.

**16143**
**Quality**
**HSS-E-PM.**

**16144**
**Quality**
**HSS-E-PM/TiAlN-coated.**

HSS-E PM — 16143

HSS-E-PM TiAlN — 16144




| $d_1$ k10 mm | $l_2$ mm | $l_3$ mm | $l_1$ mm | $d_2$ h6 mm | $d_3$ mm | Z | HSS-E-PM 16143 | ... | HSS-E-PM/TiAlN 16144 | ... |
|---|---|---|---|---|---|---|---|---|---|---|
| **6,0** | 19 | 27 | 63 | 6 | 5,5 | 4 | | 104 | | 104 |
| **8,0** | 28 | 38 | 78 | 10 | 7,5 | 4 | | 106 | | 106 |
| **10,0** | 35 | 44 | 84 | 10 | 9,5 | 4 | | 108 | | 108 |
| **12,0** | 40 | 52 | 97 | 12 | 11,5 | 4 | | 110 | | 110 |
| **16,0** | 48 | 60 | 108 | 16 | 15,5 | 5 | | 112 | | 112 |
| **20,0** | 60 | 72 | 122 | 20 | 19,5 | 6 | | 114 | | 114 |
| **25,0** | 68 | 92 | 144 | 25 | 24,5 | 6 | | 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-steel<900N | VA-steel>900N | Ti-alloys | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **16143** | | | | | | | | | | | | | | | | | |
| 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 |
| **16144** | | | | | | | | | | | | | | | | | |
| 70-200 | 40-150 | 40-150 | 75-85 | 45-55 | 40-60 | 20-50 | 12-40 | - | - | - | - | - | 5-28 | 3-25 | - | 40-70 | 80-100 |

## 16128 - 16129 End Milling Cutters

Z 4-6 | DIN 844B | ≈ 30° | N | DIN 1835 B | Uni

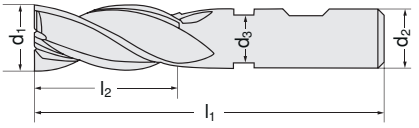
**Type**
**- Long**
- Right-hand cut
- Right-hand helix approx. 30°
**- 4-6 cutting edges, centre cut**
- Straight shank with driving face in compliance with DIN 1835 B
- Starting from 25 mm shank Ø with two driving faces

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

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

HSS-E — 16128

HSS-E TiAlN — 16129




| $d_1$ mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 mm | $d_3$ mm | Z | HSS-E 16128 | ... | HSS-E/TiAlN 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 |

| $d_1$ mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 mm | $d_3$ mm | Z | HSS-E 16128 | ... | HSS-E/TiAlN 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-steel<900N | VA-steel>900N | Ti-alloys | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **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 | - |



= Sales are restricted to the packaging units mentioned in the catalogue. Purchase orders must be in units.

## 16133 - 16134 End Milling Cutters

Z 4-6 | ≈ 30° | N | DIN 1835 B | Uni | HSS-E | HSS-E TiAlN

**Type**
**- Extra long**
**- Straight face**
- Right-hand helix approx. 30°
- Straight shank with driving face in compliance with DIN 1835 B.

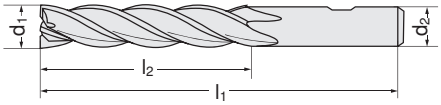
**16133**
**Quality**
**HSS-E (Co5)**

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

16133

16134

| $d_1$ k10 mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 mm | Z | HSS-E 16133 ... | HSS-E/TiAlN 16134 ... |
|---|---|---|---|---|---|---|
| **6,0** | 56 | 100 | 6 | 4 | 206 | 206 |
| **8,0** | 70 | 115 | 10 | 4 | 208 | 208 |
| **10,0** | 75 | 121 | 10 | 4 | 210 | 210 |
| **12,0** | 85 | 130 | 12 | 4 | 212 | 212 |
| **16,0** | 90 | 145 | 16 | 4 | 216 | 216 |
| **20,0** | 110 | 180 | 20 | 5 | 220 | 220 |
| **25,0** | 125 | 200 | 25 | 6 | 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-steel<900N | VA-steel>900N | Ti-alloys | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **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 | - |

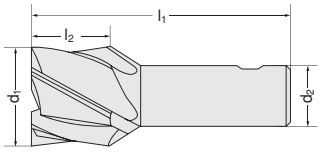
## 16150 End Milling Cutters

Z 6-8 | DIN 844B | ≈ 30° | N | HSS-E | DIN 1835 B | Uni

**Type**
**Short type, 6-8 cutting edges.** With eccentric relief. Straight shank with driving face in compliance with DIN 1835 B. Multi-fluted milling cutters, free in centre on face. Right-hand helix 30°.

**Use**
**For normal to solid materials.**
**Quality**
**HSS-E (Co8).**

16150




| $d_1$ k10 mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 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-steel<900N | VA-steel>900N | Ti-alloys | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 Milling Cutters

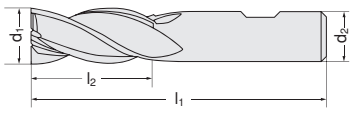
Z 2 | DIN 844B | ≈ 42° | W | HSS-E | DIN 1835 B | ALU

**Type**
**- Short**
- Right-hand helix approx. 42°
**- 2 cutting edges, centre cut**
- Straight shank with driving face in compliance with DIN 1835 B.

**Use**
For soft to ductile, long-chipping materials such as aluminium and copper alloys.

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

16153




| $d_1$ e8 mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 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 |

| $d_1$ e8 mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 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-steel<900N | VA-steel>900N | Ti-alloys | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 70 | 60 | 60 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

## 16158 - 16161 End Milling Cutters

Z 3 | DIN 844B | ≈ 35° | W | HSS-E | DIN 1835 B | ALU

**Type**
- Right-hand cut
- Right-hand helix approx. 35°
- **3 cutting edges**
- **Centre cut**
- With eccentric relief
- **With released shank with driving face** in compliance with DIN 1835 B.

**Use**
For soft through ductile, long-chipping materials such as aluminium and copper alloys.

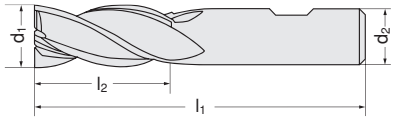
**Quality**
**HSS-E (Co8).**

**16158**
**Short type.**

**16161**
**Long type.**

16158

16161




| | | short | | long | | short | | long | |
|---|---|---|---|---|---|---|---|---|---|
| $d_1$ e8 mm | $d_2$ h6 mm | $l_2$ mm | $l_1$ mm | $l_2$ mm | $l_1$ mm | 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-steel<900N | VA-steel>900N | Ti-alloys | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 60-70 | 50-60 | 50-60 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 60-100 |

## 16170 Radius Milling Cutters

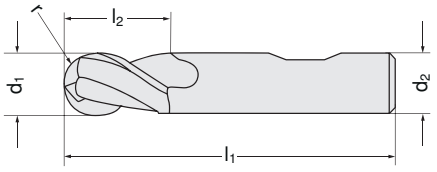
Z 2 | ≈ 30° | HSS-E | DIN 1835 B | Uni

**Type**
- **Short**
- With transverse radius
- Right-hand cut
- Right-hand helix to 6,0 mm Ø 40°, from 8,0 mm Ø 30°
- **2 cutting edges**
- **Centre cut**
- Radius tolerance +/– 0,04 mm.
- Straight shank with driving face in compliance with DIN 1835 B

**Advantage:**
No radially ground land, therefore better support and free cut.

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

16170




| $d_1$ h10 mm | radius mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 mm | 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-steel<900N | VA-steel>900N | Ti-alloys | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 Milling Cutters

Z 2 | ≈ 30° | DIN 1835 B | Uni

ATORN®

**Type**
**- Long**
- With transverse radius
- Right-hand cut
- Right-hand helix approx. 30°
**- 2 cutting edges**
**- Centre cut**
- Radius tolerance +/– 0,04 mm.
- Straight shank with driving face in compliance with DIN 1835 B.

**16176**
**Quality**
**HSS-E (Co8).**

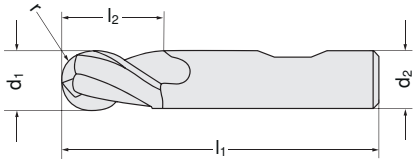
**16177**
**Quality**
**HSS-E (Co8)/TiAlN-coated.**

HSS-E

16176

HSS-E TiAlN

16177




| $d_1$ e8 mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 mm | HSS-E 16176 | ... | HSS-E/TiAlN 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 |

| $d_1$ e8 mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 mm | HSS-E 16176 | ... | HSS-E/TiAlN 16177 | ... |
|---|---|---|---|---|---|---|---|
| **12,0** | 53 | 110 | 12 | | 211 | | 211 |
| **16,0** | 63 | 123 | 16 | | 215 | | 215 |
| **18,0** | 69 | 123 | 16 | | 217 | | |
| **20,0** | 75 | 141 | 20 | | 219 | | 219 |
| **25,0** | 90 | 166 | 25 | | 222 | | |
| **30,0** | 90 | 166 | 25 | | 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-steel<900N | VA-steel>900N | Ti-alloys | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **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 Roughing End Milling Cutters

Z 3 | DIN 844B | ≈ 30° | NR | DIN 1835 B | Uni

ATORN®

**Type**
**- Short**
**- 3 cutting edges**
**- Centre cut**
- Right-hand helix approx. 30°
- Straight shank with driving face in compliance with DIN 1835 B.

**16183**
**Quality**
**HSS-E (Co8).**

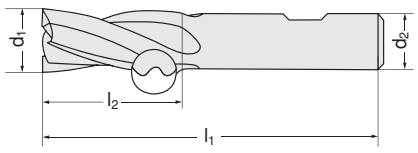
**16185**
**Quality**
**HSS-E (Co8)/TiAlN-coated.**

HSS-E

16183

HSS-E TiAlN

16185




| $d_1$ js12 mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 mm | HSS-E 16183 | ... | HSS-E/TiAlN 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 |

| $d_1$ js12 mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 mm | HSS-E 16183 | ... | HSS-E/TiAlN 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-steel<900N | VA-steel>900N | Ti-alloys | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **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 Roughing End Milling Cutters

Z 4-6 | DIN 844B | ≈ 30° | NR | DIN 1835 B | Uni

**Type**
**- Short**
- Right-hand cut
- Right-hand helix approx. 30°
**- 4-6 cutting edges**
**- Centre cut up to Ø 20 mm**
above that free in centre
- Straight shank with driving face in compliance with DIN 1835 B
- With eccentric relief

**16195**
**Quality**
**HSS-E (Co8).**

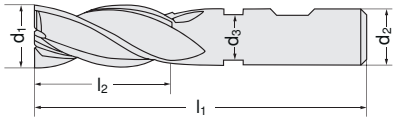
**16198**
**Quality**
**HSS-E (Co8)/TiAlN-coated.**

16195

HSS-E

16198

HSS-E TiAlN




| $d_1$ js12 mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 mm | $d_3$ mm | Z | HSS-E 16195 | ... | HSS-E/TiAlN 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 |

| $d_1$ js12 mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 mm | $d_3$ mm | Z | HSS-E 16195 | ... | HSS-E/TiAlN 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 | 32 | 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-steel<900N | VA-steel>900N | Ti-alloys | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **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 | - |

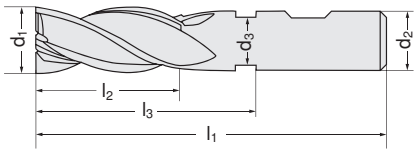
## 16200 Roughing End Milling Cutters

Z 4-6 | DIN 844B | ≈ 30° | NR | HSS-E | DIN 1835 B | Uni

**Type**
**- Long**
- Right-hand cut
- With roughing teeth
- Right-hand helix approx. 30°
**- 4-6 cutting edges**
**- Centre cut to Ø 32 mm**
- Straight shank with driving face in compliance with DIN 1835 B.
- With eccentric relief, above Ø 10,0 mm with double relief.

**Quality**
**HSS-E (Co5)**

16200




| $d_1$ k12 mm | $l_2$ mm | $l_3$ mm | $l_1$ mm | $d_2$ h6 mm | $d_3$ 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 |

| $d_1$ k12 mm | $l_2$ mm | $l_3$ mm | $l_1$ mm | $d_2$ h6 mm | $d_3$ 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-steel<900N | VA-steel>900N | Ti-alloys | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 |

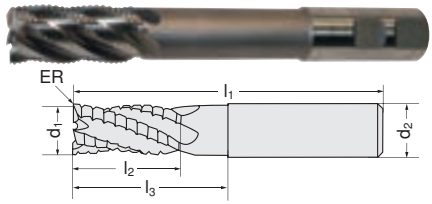
## 16207 Roughing End Milling Cutters

Z 4-5 | ≈ 35° | NR | HSS-E | DIN 1835 B | Uni

**Type**
**- Special (Long Fellow)**
- Right-hand cut
- Right-hand helix approx. 35°
**- 4-5 cutting edges**
**- Centre cut**
- Straight shank with driving face in compliance with DIN 1835 B.

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

16207




| $d_1$ mm | $l_2$ mm | $l_3$ mm | $l_1$ mm | $d_2$ mm | $d_3$ mm | ER mm | Z | 16207 ... |
|---|---|---|---|---|---|---|---|---|
| **10,0** | 22 | 55 | 95 | 10 | 8 | 1,5 | 4 | 110 |
| **12,0** | 26 | 80 | 125 | 12 | 10 | 1,6 | 4 | 113 |
| **16,0** | 32 | 90 | 138 | 16 | 14 | 2,0 | 4 | 117 |

| $d_1$ mm | $l_2$ mm | $l_3$ mm | $l_1$ mm | $d_2$ mm | $d_3$ mm | ER mm | Z | 16207 ... |
|---|---|---|---|---|---|---|---|---|
| **20,0** | 40 | 100 | 150 | 20 | 18 | 2,5 | 4 | 121 |
| **20,0** | 40 | 135 | 185 | 20 | 18 | 2,5 | 4 | 122 |
| **25,0** | 50 | 140 | 196 | 25 | 23 | 2,5 | 5 | 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-steel<900N | VA-steel>900N | Ti-alloys | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 70-120 | 40-70 | 40-70 | 28-32 | 25-30 | 18-25 | 16-22 | - | - | - | - | - | - | 5-15 | 3-12 | 3-12 | 30-50 | 50-70 |

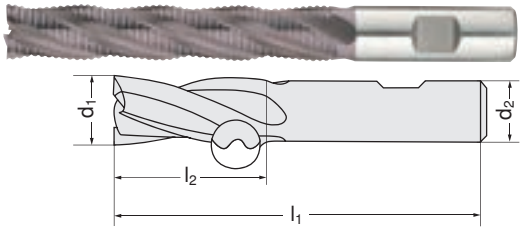
## 16209 Roughing End Milling Cutters

Z 4-5 | ≈ 30° | NR | HSS-E TiAlN | DIN 1835 B | Uni

**Type**
**- Overlong**
- Right-hand cut
- Right-hand helix approx. 30°
**- 4-5 cutting edges**
- Straight shank with driving face in compliance with DIN 1835 B.

**Quality**
**HSS-E/TiAlN.**

16209




| $d_1$ mm | $l_2$ mm | $l_1$ mm | $d_2$ mm | Z | 16209 ... |
|---|---|---|---|---|---|
| **6,0** | 56 | 100 | 6 | 4 | 106 |
| **8,0** | 70 | 115 | 10 | 4 | 108 |
| **10,0** | 75 | 121 | 10 | 4 | 110 |
| **12,0** | 85 | 130 | 12 | 4 | 112 |

| $d_1$ mm | $l_2$ mm | $l_1$ mm | $d_2$ mm | Z | 16209 ... |
|---|---|---|---|---|---|
| **16,0** | 90 | 145 | 16 | 4 | 116 |
| **20,0** | 110 | 180 | 20 | 4 | 120 |
| **25,0** | 125 | 200 | 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-steel<900N | VA-steel>900N | Ti-alloys | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 70-200 | 40-150 | 40-150 | 75-85 | 45-55 | 40-60 | 20-50 | 12-40 | - | - | - | - | - | 5-28 | 3-25 | - | 40-70 | 80-100 |

## 16203 Roughing End Milling Cutters

Z 4-6 | DIN 844B | ≈ 30° | NR-Pro | HSS-E-PM TiCN | DIN 1835 B | ≤ 1200 N/mm² | ≤ 1200 N/mm² | Ti/Ni

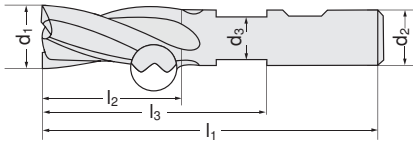
**Type**
**- Short**
- Right-hand cut
- Right-hand helix approx. 30°
**- 4-6 cutting edges**
**- Centre cut**
- With released shank with driving face in compliance with DIN 1835 B.

**Use**
For all stainless steels, normal steels **to 1200 N/mm²** strength, pure titanium, annealed titanium alloys, high-temperature alloys.

**Quality**
**HSS-E-PM/TiCN-coated.**

***Note:***
*Optimised wear resistance thanks to an even distribution of forces at the knurl.*

16203


| $d_1$ mm | $l_2$ mm | $l_3$ mm | $l_1$ mm | $d_2$h6 mm | $d_3$ mm | Z | 16203 ... |
|---|---|---|---|---|---|---|---|
| **6,0** | 13 | 21 | 57 | 6 | 5,5 | 4 | 101 |
| **8,0** | 19 | 29 | 69 | 10 | 7,5 | 4 | 103 |
| **10,0** | 22 | 32 | 72 | 10 | 9,5 | 4 | 105 |
| **12,0** | 26 | 38 | 83 | 12 | 11,5 | 4 | 107 |
| **16,0** | 32 | 44 | 92 | 16 | 15,5 | 4 | 111 |

| $d_1$ mm | $l_2$ mm | $l_3$ mm | $l_1$ mm | $d_2$h6 mm | $d_3$ mm | Z | 16203 ... |
|---|---|---|---|---|---|---|---|
| **18,0** | 32 | 44 | 92 | 16 | 15,5 | 4 | 113 |
| **20,0** | 38 | 54 | 104 | 20 | 19,5 | 4 | 115 |
| **25,0** | 45 | 65 | 121 | 25 | 24,5 | 5 | 118 |
| **32,0** | 53 | 73 | 133 | 32 | 31,5 | 6 | 125 |

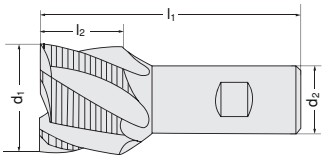
| Al<10%Si | Al>10%Si | Cu | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA-steel<900N | VA-steel>900N | Ti-alloys | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| - | - | - | 85-90 | 75-80 | 70-85 | 30-35 | 24-28 | - | - | - | - | - | 24-28 | 18-22 | 8-12 | 45-50 | - |

## 16205 Roughing End Milling Cutters

Z 6-8 | ≈ 35° | NR | HSS-E | DIN 1835 B | Uni

**Type**
**Short, 6-8 cutting edges,** straight shank with driving face in compliance with DIN 1835 B. Relief-ground knurl profile, right-hand helix 35°. Roughing teeth.

**Quality**
**HSS-E (Co5)**


| $d_1$ k12 mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 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-steel<900N | VA-steel>900N | Ti-alloys | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 |

## 16210 Roughing End Milling Cutters

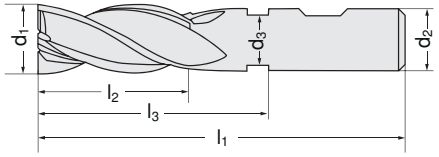
Z 3 | DIN 844B | ≈ 40° | WR | HSS-E | DIN 1835 B

**Type**
**Short,** right-hand cut, right-hand helix approx. 40°, **3 cutting edges, centre cut.** Straight shank with driving face in compliance with DIN 1835 B.

**Use**
For soft to ductile, long-chipping materials such as aluminium and copper alloys.
**Quality**
**HSS-E (Co8).**

ALU

16210




| $d_1$ k12 mm | $l_2$ mm | $l_3$ mm | $l_1$ mm | $d_2$ h6 mm | $d_3$ mm | 16210 | ... |
|---|---|---|---|---|---|---|---|
| **6,0** | 13 | 21 | 57 | 6 | 5,5 | | 101 |
| **8,0** | 19 | 29 | 69 | 10 | 7,5 | | 102 |
| **10,0** | 22 | 32 | 72 | 10 | 9,5 | | 103 |
| **12,0** | 26 | 38 | 83 | 12 | 11,5 | | 104 |
| **16,0** | 32 | 44 | 92 | 16 | 15,5 | | 106 |
| **20,0** | 38 | 54 | 104 | 20 | 19,5 | | 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-steel<900N | VA-steel>900N | Ti-alloys | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 110-130 | 70-110 | 45-60 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 60-100 |

## 16220 - 16223 Roughing/Finishing End Milling Cutters

Z 3 | DIN 844B | ≈ 30° | NF | DIN 1835 B

**Type**
**- Short**
**- 3 cutting edges**
- Right-hand cut
**- Centre cut**
- Right-hand helix approx. 30°
- Straight shank with driving face in compliance with DIN 1835 B.
- With eccentric relief, above Ø 10,0 mm with double relief.

**16220**
**Quality**
**HSS-E (Co8).**

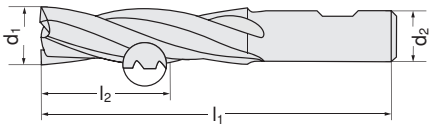
**16223**
**Quality**
**HSS-E (Co8)/TiAlN-coated.**

HSS-E | Uni

16220

HSS-E TiAlN | Uni

16223




| $d_1$ k10 mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 mm | HSS-E 16220 | ... | HSS-E/TiAlN 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 |

| $d_1$ k10 mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 mm | HSS-E 16220 | ... | HSS-E/TiAlN 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-steel<900N | VA-steel>900N | Ti-alloys | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **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 | - |





= Sales are restricted to the packaging units mentioned in the catalogue. Purchase orders must be in units.

## 16260 - 16268 Roughing End Milling Cutters

Z 4-6 | DIN 844B | ≈ 35° | HR | DIN 1835 B | Uni

**Type**
**- Short**
**- 4-6 cutting edges**
- With eccentric relief
- With released shank with driving face in compliance with DIN 1835 B.
- Fine roughing profile
- Right-hand cut with centre cut
- Right-hand helix approx. 35°

**16260**
**Quality**
**HSS-E (Co8).**

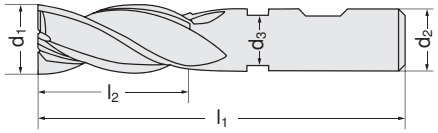
**16262**
**Quality**
**HSS-E (Co8)/TiAlN-coated.**

**16268**
**Use**
Also suitable for dry machining.
**Quality**
**HSS-E-PM/TiAlN-coated.**

16260
HSS-E

16262
HSS-E TiAlN

16268
HSS-E-PM TiAlN




| $d_1$ k12 mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 mm | $d_3$ mm | Z | HSS-E 16260 | ... | HSS-E/TiAlN 16262 | ... | HSS-E-PM/TiAlN 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-steel<900N | VA-steel>900N | Ti-alloys | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **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 Roughing End Milling Cutters

Z 3-6 | HPC | DIN 844B | ≈ 45° | 45° | HR | HSS-E-PM TiAlN | DIN 1835 B | VA

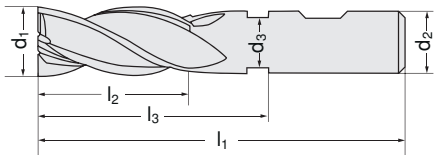
ATORN®

**Type**
- With high-performance roughing teeth

**Use**
For roughing applications where the most rigorous requirements are imposed on service life.

**Quality**
**HSS-E-PM/TiAlN-coated.**

16270




| $d_1$ js12 mm | $l_2$ mm | $l_3$ mm | $l_1$ mm | $d_2$ h6 mm | $d_3$ mm | Z | 16270 | ... |
|---|---|---|---|---|---|---|---|---|
| **4,0** | 11 | 19 | 55 | 6 | 3,8 | 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-steel<900N | VA-steel>900N | Ti-alloy | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 200-450 | 120-140 | 60-80 | 80-90 | 70-80 | 50-70 | 40-50 | 30-40 | 30-35 | - | - | - | - | 40-45 | 40-45 | 16-30 | - | - |

## 16271 Roughing End Milling Cutters

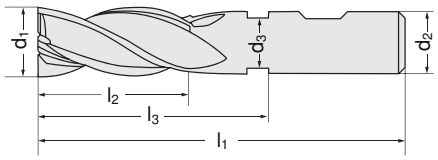
Z 4-6 | DIN 844B | ≈ 35° | HR | HSS-E-PM TiAlN | DIN 1835 B | Uni

**Type**
**Medium length, 4-6 cutting edges, centre cut.**
With eccentric relief. With released shank with driving face in compliance with DIN 1835 B, right-hand cut, right-hand helix 35°.

**Quality**
**HSS-E-PM/TiAlN-coated.**

16271

| $d_1$ h10 mm | $l_2$ mm | $l_3$ mm | $l_1$ mm | $d_2$ h6 mm | $d_3$ mm | Z | 16271 ... |
|---|---|---|---|---|---|---|---|
| **6,0** | 19 | 27 | 63 | 6 | 5,5 | 4 | 104 |
| **8,0** | 28 | 38 | 78 | 10 | 7,5 | 4 | 106 |
| **10,0** | 35 | 44 | 84 | 10 | 9,5 | 4 | 108 |
| **12,0** | 40 | 52 | 97 | 12 | 11,5 | 4 | 110 |
| **16,0** | 48 | 60 | 108 | 16 | 15,5 | 5 | 112 |
| **20,0** | 60 | 72 | 122 | 20 | 19,5 | 5 | 114 |
| **25,0** | 68 | 88 | 144 | 25 | 24,5 | 6 | 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-steel<900N | VA-steel>900N | Ti-alloys | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 80-150 | 70-80 | 50-70 | 50-55 | 40-50 | 30-40 | 30-35 | 25-30 | - | - | - | - | - | 25-27 | 20-25 | - | 35-55 | 50-70 |

## 16277 - 16278 Roughing End Milling Cutters

DIN 844B | ≈ 30° | HR | DIN 1835 B | Uni

**Type**
**Long type, 3-6 cutting edges, centre cut** up to Ø 20 mm; above that free in centre. Straight shank with driving face in compliance with DIN 1835 B, fine roughing profile, right-hand helix 30°.

**16277**
**Quality**
**HSS-E (Co8).**

HSS-E

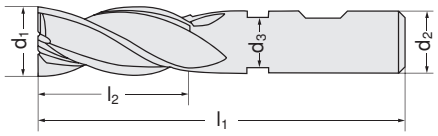
16277

**16278**
**Quality**
**HSS-E (Co8)/TiAlN-coated.**

HSS-E TiAlN

16278

| | | | | | | HSS-E | | HSS-E/TiAlN | |
|---|---|---|---|---|---|---|---|---|---|
| $d_1$ js12 mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 mm | $d_3$ mm | Z | 16277 | ... | 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-steel<900N | VA-steel>900N | Ti-alloys | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **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 Roughing End Milling Cutters

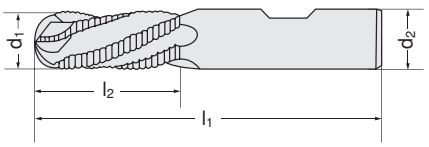
Z 3-4 | DIN 844B | ≈ 35° | HR | HSS-E TiAlN | DIN 1835 B | Uni

**Type**
**Short type, 3 -4 cutting edges, centre cut.**
Straight shank with driving face in compliance with DIN 1835 B, fine roughing profile, right-hand helix 35°.

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

16281

| $d_1$ js12 mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 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-steel<900N | VA-steel>900N | Ti-alloys | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 100 | 90 | 90 | 80 | 65 | 65 | 45 | 30 | - | - | - | - | - | 30 | 20 | 15 | 65 | - |



= Sales are restricted to the packaging units mentioned in the catalogue. Purchase orders must be in units.

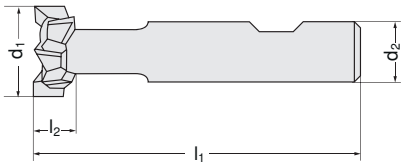
## 16370 T-Slot Milling Cutters

Z 6-8 | DIN 851 | N | HSS-E | DIN 1835 B | ≤ 1000 N/mm²

**Type**
**- Type N**
**- 6-8 cutting edges**
- Right-hand cut
- Cross-toothed
- Cuts on the perimeter and on the face
- Straight shank with driving face in compliance with DIN 1835 B.

**Use**
For milling T-slots in compliance with DIN 650.
**Quality**
**HSS-E (Co5)**

16370




| For T-slots Nominal dimension | $d_1$ d11 mm | $l_2$ d11 mm | $l_1$ mm | $d_2$ h6 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 | 6 | 207 |
| **16,0** | 28,0 | 12 | 85 | 16 | 6 | 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 | 8 | 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-steel<900N | VA-steel>900N | Ti-alloys | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 75-150 | 30-75 | 30-45 | 40-45 | 30-35 | 28-30 | 25-28 | - | - | - | - | - | - | 20-23 | 18-20 | 10-20 | 22-35 | 60-120 |

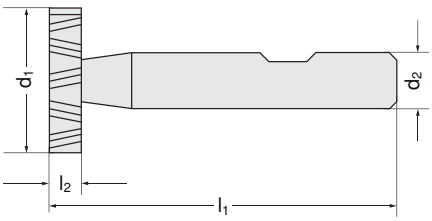
## 16375 Woodruff keyway milling cutters

Z 6-12 | DIN 850D | HSS-E | DIN 1835 B | ≤ 1000 N/mm²

**Type**
**- 6-12 cutting edges**
- Right-hand cut
- Cross-toothed
- Perimeter cutting
- Straight shank with driving face in compliance with DIN 1835 B.

**Use**
For milling grooves for woodruff keys in compliance with DIN 6888.
**Quality**
**HSS-E (Co5)**

16375




| $d_1$ h12 x $l_2$ e8 mm | for Woodruff keys width x height mm | $l_1$ mm | $d_2$ h6 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-steel<900N | VA-steel>900N | Ti-alloys | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 Single-angle milling cutters

Z 10-12 | H | HSS-E | DIN 1835 B | ≤ 1000 N/mm²

**Type**
- Straight shank with driving face in compliance with DIN 1835 B.
- Right-hand cut
- **10-12 cutting edges**
- Angle tolerance +/-30°

**Use**
For milling angled slots (slide guides, etc.).

**Quality**
**HSS-E (Co5)**

**16380**
**Type**
- **Shape C**
- Flute taper in the direction of the shank
- Cuts on the perimeter and on the front face
- **a = 45°**

DIN 1833C


16380

**16381**
**Type**
- **Shape C**
- Flute taper in the direction of the shank
- Cuts on the perimeter and on the face
- **a = 60°**

DIN 1833C


16381

**16382**
**Type**
- **Shape D**
- Flute taper in the direction of the front face
- Only perimeter cutting
- **a = 45°**

DIN 1833D

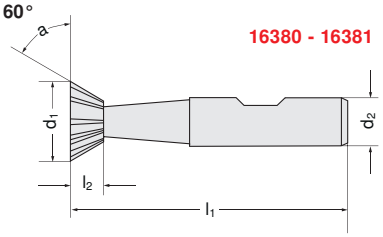

16382

**16383**
**Type**
- **Shape D**
- Flute taper in the direction of the front face
- Only perimeter cutting
- **a = 60°**

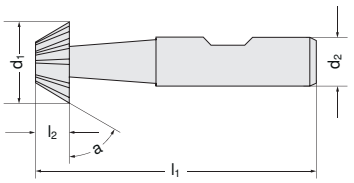
DIN 1833D


16383

16380 - 16381




16382 - 16383




| | 45° | 60° | | | | 45° / C | | 60° / C | | 45° / D | | 60° / D | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $d_1$ mm | $l_2$ mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 mm | Z | 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-steel<900N | VA-steel>900N | Ti-alloys | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 Milling Cutters

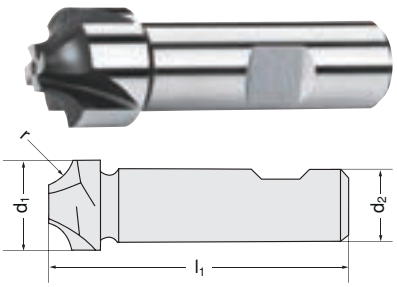
Z 4 | DIN 6518B | HSS-E | DIN 1835 B | ≤ 1000 N/mm²

**Type**
**Concave** (quarter circle cutter), straight shank with driving face in compliance with DIN 1835 B. Right-hand cut, **4 cutting edges.**

**Use**
For materials **to approx. 1000 N/mm²** strength.

**Quality**
**HSS-E (Co5)**

16385




| r h11 mm | $d_1$ mm | $d_3$ js14 mm | $l_1$ mm | $d_2$ h6 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 mm | $d_1$ mm | $d_3$ js14 mm | $l_1$ mm | $d_2$ h6 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-steel<900N | VA-steel>900N | Ti-alloys | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 75-150 | 30-75 | 30-45 | 40-45 | 30-35 | 28-30 | 25-28 | - | - | - | - | - | - | 20-23 | 18-20 | 10-20 | 22-35 | 60-120 |



= Sales are restricted to the packaging units mentioned in the catalogue. Purchase orders must be in units.

## 16500 - 16502 Solid Carbide Mini Milling Cutters

Z 3 | ≈ 30° | DIN 6535 HB | Uni

**Type**
**- Short**
- Right-hand cut
**- 3 cutting edges**
- Right-hand helix approx. 30°
**- Centre cut**
- Eccentric relief
- Straight shank with driving face similar to DIN 6535 HB

**16500**
**Quality**
**Universal carbide quality finest grit (P 20 - K 40)**

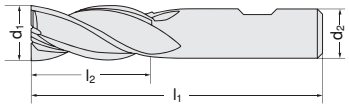
**16502**
**Quality**
**Universal carbide quality finest grit (P 20 - K 40) TiAlN-coated.**

VHM

16500

VHM TiAlN

16502




*Note:*
*Regrinding milling cutters with low flute diameters is uneconomical. For that reason, it is cheaper to use the milling cutters up to the wear limit and then to throw them away. You are always using brand new milling cutters and are reducing the risk of rejections.*

| | | | | Solid carbide | | Solid carbide/TiAlN | |
|---|---|---|---|---|---|---|---|
| $d_1$ e8 mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 mm | 16500 | ... | 16502 | ... |
| 1,50 | 4 | 35 | 6 | | | | 100 |
| 2,00 | 4 | 35 | 6 | | 101 | | 101 |
| 2,50 | 4 | 35 | 6 | | 113 | | 113 |
| 3,00 | 5 | 36 | 6 | | 102 | | 102 |
| 3,50 | 5 | 36 | 6 | | 114 | | 114 |
| 4,00 | 7 | 38 | 6 | | 103 | | 103 |
| 4,50 | 7 | 38 | 6 | | | | 115 |
| 5,00 | 8 | 39 | 6 | | 104 | | 104 |
| 5,50 | 8 | 39 | 6 | | 116 | | 116 |

| | | | | Solid carbide | | Solid carbide/TiAlN | |
|---|---|---|---|---|---|---|---|
| $d_1$ e8 mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 mm | 16500 | ... | 16502 | ... |
| 6,00 | 8 | 39 | 6 | | 105 | | 105 |
| 8,00 | 11 | 43 | 8 | | 106 | | 106 |
| 10,00 | 13 | 50 | 10 | | 107 | | 107 |
| 12,00 | 15 | 55 | 12 | | 108 | | 108 |
| 14,00 | 15 | 58 | 14 | | 109 | | 109 |
| 16,00 | 18 | 62 | 16 | | 110 | | 110 |
| 18,00 | 20 | 70 | 18 | | 111 | | |
| 20,00 | 22 | 75 | 20 | | 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-steel<900N | VA-steel>900N | Ti-alloys | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **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 Keyway Milling Cutters

Z 2 | ≈ 30° | DIN 6535 HA | Uni

**Type**
**Short,** right-hand cut, **2 cutting edges,** right-hand helix approx. 30°, **centre cut,** with smooth straight shank in compliance with DIN 6535 HA.

**16505**
**Quality**
**Universal carbide quality finest grit (P 20 - K 40).**

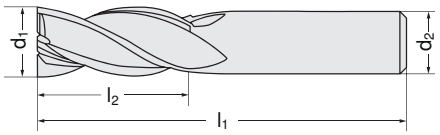
**16507**
**Quality**
**Universal carbide quality finest grit (P 20 - K 40) TiAlN-coated.**

VHM

16505

VHM TiAlN

16507




| $d_1$ h10 mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 mm | Solid carbide 16505 ... | Solid carbide/TiAlN 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 |
| **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 |

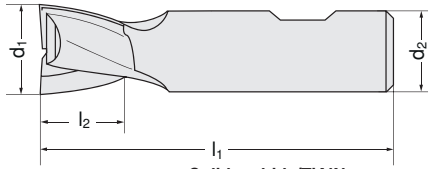
| Al<10%Si | Al>10%Si | Cu | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA-steel<900N | VA-steel>900N | Ti-alloys | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **16505** | | | | | | | | | | | | | | | | | |
| 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 | - |

## 16517 Solid Carbide Keyway Milling Cutters

Z 2 | ≈ 30° | VHM TiAlN | DIN 6535 HB | Uni

**Type**
**Long,** right-hand cut, **2 cutting edges,** right-hand helix approx. 30°, spiral flutes, **centre cut,** with driving face in compliance with DIN 6535 HB.
**Quality**
**Universal carbide quality finest grit (P 20 - K 40) TiAlN-coated.**

16517




| $d_1$ h10 mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 mm | Solid carbide/TiAlN 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 |

| $d_1$ h10 mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 mm | Solid carbide/TiAlN 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-steel<900N | VA-steel>900N | Ti-alloys | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| - | - | - | 100 | 80 | 80 | 65 | 50 | 50 | - | - | - | - | 65 | 50 | - | - | - |



= Sales are restricted to the packaging units mentioned in the catalogue. Purchase orders must be in units.

## 16522 - 16524 Solid Carbide Keyway Milling Cutters

Z 3 | ≈ 30° | DIN 6535 HA | Uni

HW

**Type**
**Short,** right-hand cut, **3 cutting edges,** right-hand helix approx. 30°, spiral flutes, **centre cut,** with smooth straight shank in compliance with DIN 6535 HA.

**16522**
**Quality**
**Universal carbide quality finest grit (P 20 - K 40).**

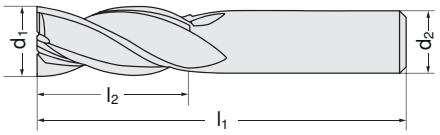
**16524**
**Quality**
**Universal carbide quality finest grit (P 20 - K 40)**
**TiAlN-coated.**

16522

VHM

16524

VHM TiAlN




| $d_1$ h10 mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 mm | Solid carbide 16522 | ... | Solid carbide/TiAlN 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 |

| $d_1$ h10 mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 mm | Solid carbide 16522 | ... | Solid carbide/TiAlN 16524 | ... |
|---|---|---|---|---|---|---|---|
| **9,0** | 20 | 60 | 9,0 | | 108 | | 108 |
| **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-steel<900N | VA-steel>900N | Ti-alloys | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 16522 | | | | | | | | | | | | | | | | | |
| - | - | - | 120 | 100 | 90 | 80 | 70 | 60 | - | - | - | - | - | - | - | 85 | - |
| 16524 | | | | | | | | | | | | | | | | | |
| - | - | - | 150 | 130 | 120 | 100 | 90 | 80 | - | - | - | - | 105 | 80 | - | 110 | - |

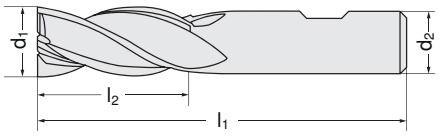
## 16532 Solid Carbide Keyway Milling Cutters

Z 3 | ≈ 45° | VHM TiAlN | DIN 6535 HB | Uni

HW

**Type**
**Long,** right-hand cut, **3 cutting edges,** right-hand helix approx. 45°, spiral flutes, **centre cut,** straight shank with driving face in compliance with DIN 6535 HB.
**Quality**
**Universal carbide quality finest grit (P 20 - K 40)**
**TiAlN-coated.**

16532

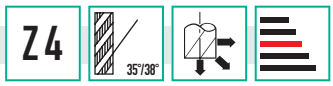



| $d_1$ h10 mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 mm | 16532 | ... |
|---|---|---|---|---|---|
| **3,0** | 7 | 57 | 6 | | 101 |
| **3,5** | 7 | 57 | 6 | | 102 |
| **4,0** | 8 | 57 | 6 | | 103 |
| **4,5** | 8 | 57 | 6 | | 104 |
| **5,0** | 10 | 57 | 6 | | 105 |
| **6,0** | 10 | 57 | 6 | | 106 |
| **7,0** | 13 | 63 | 8 | | 107 |
| **8,0** | 16 | 63 | 8 | | 108 |

| $d_1$ h10 mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 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-steel<900N | VA-steel>900N | Ti-alloys | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 230 | 200 | 180 | 150 | 130 | 120 | 100 | 90 | 80 | - | - | - | - | 105 | 80 | 40 | 110 | - |

## 16533 - 16534 SC end milling cutter 35/38° G2



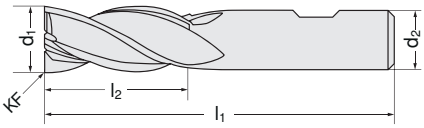

**Type**
**4 cutting edges, centre cut,** right-hand helix, unequal **pitch (35/38°).** Optimised chip compartment. Up to 80% longer service life. Up to 60% better feed. Roughing and finishing with a single tool. Vibration-free.
**Use**
**Unequal lead of helix** causes, quite **low-vibration operation** and good surface quality. **High machining capacity.**
**Quality**
**Universal carbide quality finest grit (P 20 - K 40)**
**TiAlN-coated.**
**Type VA-steel: Nacro-coated.**


16533


16534 103-120


16534 204-220


16534 304-320




| short | | | | | short / 6535HB | |
|---|---|---|---|---|---|---|
| $d_1$ mm | $l_2$ mm | $l_1$ mm | $d_2$ mm | KF mm | 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 | | | | | long / 6535HB | | VA-steel / 6535HB | | long / 6535HA | |
|---|---|---|---|---|---|---|---|---|---|---|
| $d_1$ mm | $l_2$ mm | $l_1$ mm | $d_2$ mm | KF mm | 16534 | ... | 16534 | ... | 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-steel<900N | VA-steel>900N | Ti-alloys | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **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 | - | - |



= Sales are restricted to the packaging units mentioned in the catalogue. Purchase orders must be in units.

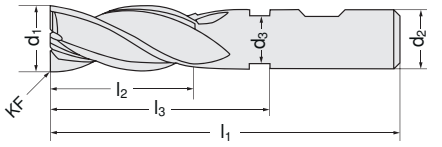
## 16536 Solid carbide end milling cutter 35/38 ° HPC G2 with released shank

Z 4 | HPC | 35°/38° | VHM TiAlN | DIN 6535 HB | Uni

**Type**
**long.** With released straight shank with driving face in compliance with DIN 6535 HB. **4 cutting edges, centre cut,** right-hand helix, **uneven (35/38°).** Optimised chip compartment. Up to 80% longer service life. Up to 60% better feed. Roughing and finishing with a single tool.
**Use**
**For materials up to HRC 52.**
**Unequal lead of helix** causes, quite **low-vibration operation** and good surface quality.
**High machining performance.**

**Quality**
**Universal carbide quality finest grit (P 20 - K 40) TiAlN-coated.**

16536




| $d_1$ mm | $d_3$ mm | $l_2$ mm | $l_1$ mm | $d_2$ mm | $l_3$ mm | KF 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 |

| $d_1$ mm | $d_3$ mm | $l_2$ mm | $l_1$ mm | $d_2$ mm | $l_3$ mm | KF 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-steel<900N | VA-steel>900N | Ti-alloys | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **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 | - | - |

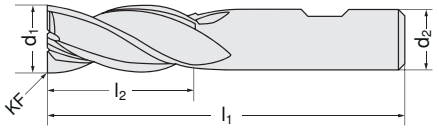
## 16538 Solid carbide end milling cutter 35/38° HPC with IKZ

Z 4 | HPC | 35°/38° | H | VHM TiAlN | DIN 6535 HB | Uni

**Type**
**Type H, long.** Straight shank with driving face in compliance with DIN 6535 HB. **4 cutting edges, centre cut,** right-hand helix, **uneven (35/38°).** Optimised chip compartment.
Up to 80% longer service life.
Up to 60% better feed.
Roughing and finishing with a single tool.

**Use**
**For materials up to HRC 52.**
**Unequal lead of helix** causes, quite **low-vibration operation** and good surface quality.
**High machinining capacity**.
**Quality**
**Universal carbide quality finest grit (P 20 - K 40) TiAlN-coated.**

16538




| $d_1$ mm | $l_2$ mm | $l_1$ mm | $d_2$ mm | KF 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 |

| $d_1$ mm | $l_2$ mm | $l_1$ mm | $d_2$ mm | KF 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-steel<900N | VA-steel>900N | Ti-alloys | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **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 | - | - |

## 16535 Solid carbide end milling cutter HPC 41/43/45°

Z 3 | HPC | 41°/43°/45° | VHM TiAlN | ≤ 1400 N/mm² | VA | GG(G) | Ti/Ni

ATORN®

**Type**
With micro corner protection.
**Advantage:**
- Optimised chip removal
- Up to 60% higher feed rates
- Up to 4x the service life
- Optimum surface quality

**Use**
For roughing and finishing.

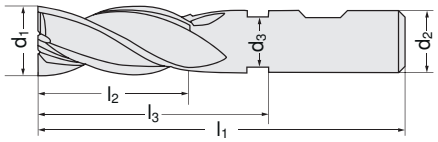
**Quality**
**Universal carbide quality finest grit (P 20 - K 40) TiAlN-coated.**

DIN 6535 HA

16535 203-220

DIN 6535 HB

16535 303-320




| $d_1$ mm | $l_2$ mm | $l_3$ mm | $l_1$ mm | $d_2$ mm | $d_3$ mm | 6535HA 16535 ... | 6535HB 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-steel<900N | VA-steel>900N | Ti-alloys | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **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 | - |

## 16540 Solid carbide milling cutter 35/38° HPC G2 with corner radius

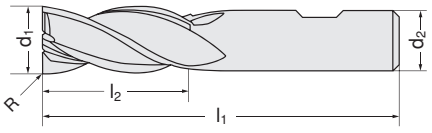
Z 4 | HPC | 35°/38° | H | VHM TiAlN | DIN 6535 HB | Uni

HW

**Type**
**Type H, long.** Straight shank with driving face in compliance with DIN 6535 HB. **4 cutting edges, centre cut,** right-hand helix, **uneven (35/38°).**
Optimised chip compartment.
Up to 80% longer service life.
Up to 60% better feed.
Roughing and finishing with a single tool.

**Use**
**For materials up to HRC 52.**
**Unequal lead of helix** causes, quite **low-vibration operation** and good surface quality. **High machining performance.**
**Quality**
**Universal carbide quality finest grit (P 20 - K 40) TiAlN-coated.**

16540




| $d_1$ mm | $l_2$ mm | $l_1$ mm | $d_2$ mm | corner radius 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 |

| $d_1$ mm | $l_2$ mm | $l_1$ mm | $d_2$ mm | corner radius 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-steel<900N | VA-steel>900N | Ti-alloys | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **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 | - | - |

## 16400 Miniature End Milling Cutters Ultra MS

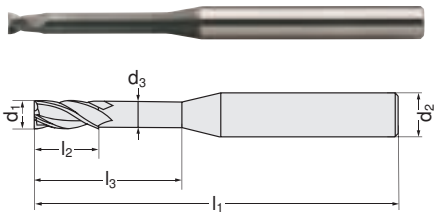
Z 2 | HPC | DIN 6535 HA | VHM AlCrN | 90° | max. | VA | Ti/Ni

NEW

ATORN®

**Type**
Solid carbide milling cutter with AlCrN coating.
**Use**
Particularly well-suited for machining rust-resistant and acid-resistant steels, titanium and nickel alloys, bronze brass and steel to 1300 N/mm².
**Advantage:**
Maximum machining capacity.

16400




| $d_1$ mm | $l_2$ mm | $l_1$ mm | $l_3$ mm | $d_3$ mm | $d_2$ 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 |

| $d_1$ mm | $l_2$ mm | $l_1$ mm | $l_3$ mm | $d_3$ mm | $d_2$ 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-steel<900N | VA-steel>900N | Ti<700N | Ti>700N | Ni-Co<700N | Ni-Co<1200N | Ni-basis alloy |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| - | - | - | 40-130 | 40-130 | 40-130 | 40-80 | 20-60 | 20-60 | 25-80 | 20-40 | 25-80 | 20-40 | 20-30 |

## 16401 Miniature Torus Miling Cutters Ultra MS

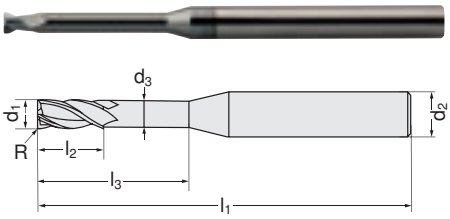
Z 2 | HPC | DIN 6535 HA | R | VHM AlCrN | max. | VA | Ti/Ni

NEW

ATORN®

**Type**
Solid carbide torus milling cutter with AlCrN coating.
**Use**
Particularly well-suited for machining rust-resistant and acid-resistant steels, titanium and nickel alloys, bronze brass and steel to 1300 N/mm².
**Advantage:**
Maximum machining capacity.

16401




Continuation ▶

| $d_1$ mm | $l_2$ mm | $l_1$ mm | $l_3$ mm | $d_3$ mm | $d_2$ mm | R 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 |
| **1,5** | 2,3 | 60 | 20,0 | 1,45 | 4 | 0,20 | | 124 |

| $d_1$ mm | $l_2$ mm | $l_1$ mm | $l_3$ mm | $d_3$ mm | $d_2$ mm | R mm | 16401 | ... |
|---|---|---|---|---|---|---|---|---|
| **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-steel<900N | VA-steel>900N | Ti<700N | Ti>700N | Ni-Co<700N | Ni-Co<1200N | Ni-basis alloy |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| - | - | - | 40-130 | 40-130 | 40-130 | 40-80 | 20-60 | 20-60 | 25-80 | 20-40 | 25-80 | 20-40 | 20-30 |

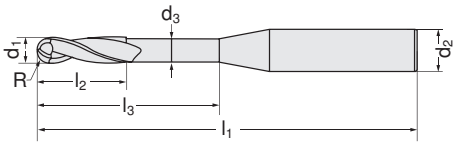
## 16402 Miniature Radius Milling Cutter Ultra MS

Z 2 | HPC | DIN 6535 HA | VHM AlCrN | max. | VA | Ti/Ni | NEW

16402

ATORN®

**Type**
Solid carbide radius milling cutter with AlCrN coating.
**Use**
Particularly well-suited for machining rust-resistant and acid-resistant steels, titanium and nickel alloys, bronze brass and steel to 1300 N/mm².
**Advantage:**
Maximum machining capacity.




| $d_1$ mm | $l_2$ mm | $l_1$ mm | $l_3$ mm | $d_3$ mm | $d_2$ mm | R 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,-5 | 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 |

| $d_1$ mm | $l_2$ mm | $l_1$ mm | $l_3$ mm | $d_3$ mm | $d_2$ mm | R 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-steel<900N | VA-steel>900N | Ti<700N | Ti>700N | Ni-Co<700N | Ni-Co<1200N | Ni-basis 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 keyway milling cutter Ultra MS

Z 3 | HPC | 90° | VHM AlCrN | max. | VA | Ti/Ni | NEW

ATORN®

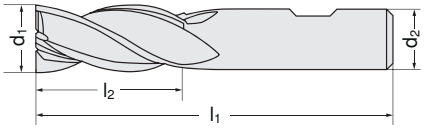
**Type**
Solid carbide keyway milling cutter with AlCrN coating.
**Use**
Particularly well-suited for machining rust-resistant and acid-resistant steels, titanium and nickel alloys, bronze brass and steel to 1300 N/mm².
**Advantage:**
Maximum machining capacity.

DIN 6535 HA

16403 101-109

DIN 6535 HB

16403 201-209




| $d_1$ mm | $l_2$ mm | $l_1$ mm | $d_2$ mm | DIN 6535 HA 16403 ... | DIN 6535 HB 16403 ... |
|---|---|---|---|---|---|
| **3,0** | 9 | 50 | 6 | 101 | 201 |
| **4,0** | 12 | 50 | 6 | 102 | 202 |
| **5,0** | 15 | 50 | 6 | 103 | 203 |
| **6,0** | 16 | 50 | 6 | 104 | 204 |
| **8,0** | 20 | 64 | 8 | 105 | 205 |
| **10,0** | 22 | 70 | 10 | 106 | 206 |
| **12,0** | 25 | 75 | 12 | 107 | 207 |
| **16,0** | 32 | 90 | 16 | 108 | 208 |
| **20,0** | 38 | 100 | 20 | 109 | 209 |

| Al<14%Si | Brass | Bronze | St<700N | St<900N | St<1000N | St<1300N | VA-steel<900N | VA-steel>900N | Ti<700N | Ti>700N | Ni-Co<700N | Ni-Co<1200N | Ni-basis 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

Z 2 | HPC | VHM AlCrN | max. | VA | Ti/Ni | NEW

ATORN®

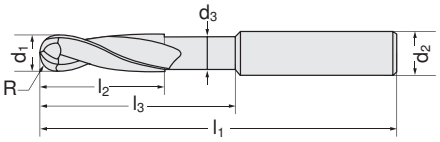
**Type**
Solid carbide radius milling cutter with AlCrN coating.
**Use**
Particularly well-suited for machining rust-resistant and acid-resistant steels, titanium and nickel alloys, bronze brass and steel to 1300 N/mm².
**Advantage:**
Maximum machining capacity.

DIN 6535 HA

16405 101-109

DIN 6535 HB

16405 201-209




| $d_1$ mm | $l_2$ mm | $l_1$ mm | $l_3$ mm | $d_3$ mm | $d_2$ mm | R mm | DIN 6535 HA 16405 ... | DIN 6535 HB 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-steel<900N | VA-steel>900N | Ti<700N | Ti>700N | Ni-Co<700N | Ni-Co<1200N | Ni-basis 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 Milling Cutters Long Ultra MS

Z 2 | HPC | VHM AlCrN | max. | VA | Ti/Ni

ATORN®

**Type**
Solid carbide radius milling cutter with AlCrN coating.
**Use**
Particularly well-suited for machining rust-resistant and acid-resistant steels, titanium and nickel alloys, bronze brass and steel to 1300 N/mm².
**Advantage:**
Maximum machining capacity.

NEW

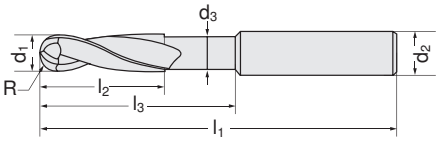
16407 101-109

DIN 6535 HA

16407 201-209

DIN 6535 HB

| $d_1$ mm | $l_2$ mm | $l_1$ mm | $l_3$ mm | $d_3$ mm | $d_2$ mm | R mm | DIN 6535 HA 16407 ... | DIN 6535 HB 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-steel<900N | VA-steel>900N | Ti<700N | Ti>700N | Ni-Co<700N | Ni-Co<1200N | Ni-basis 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 Milling Cutters Ultra MS

Z 4 | 35°/38° | HPC | 45° | VHM AlCrN | max. | VA | Ti/Ni

ATORN®

**Type**
Solid carbide milling cutters for roughing and finishing with unequal pitch and unequal helix.
**Use**
Particularly well-suited for machining rust-resistant and acid-resistant steels, titanium and nickel alloys, bronze brass and steel to 1300 N/mm².
**Advantage:**
Maximum machining capacity with extremely quiet operation.

NEW

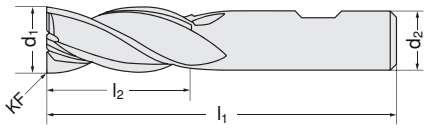
16544 101-108

DIN 6535 HA

16544 201-208

DIN 6535 HB

| $d_1$ mm | KF mm | $l_1$ mm | $l_2$ mm | $d_2$ mm | DIN 6535HA 16544 ... | DIN 6535HB 16544 ... |
|---|---|---|---|---|---|---|
| **4** | 0,1 | 57 | 11 | 6 | 101 | 201 |
| **5** | 0,1 | 57 | 13 | 6 | 102 | 202 |
| **6** | 0,1 | 57 | 13 | 6 | 103 | 203 |
| **8** | 0,2 | 64 | 20 | 8 | 104 | 204 |
| **10** | 0,2 | 72 | 22 | 10 | 105 | 205 |
| **12** | 0,2 | 83 | 26 | 12 | 106 | 206 |
| **16** | 0,3 | 92 | 32 | 16 | 107 | 207 |
| **20** | 0,4 | 104 | 38 | 20 | 108 | 208 |




| Al<14%Si | Brass | Bronze | St<700N | St<900N | St<1000N | St<1300N | VA-steel<900N | VA-steel>900N | Ti<700N | Ti>700N | Ni-Co<700N | Ni-Co<1200N | Ni-basis 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 Cutters Ultra MS

Z 4 | 35°/38° | HPC | R | VHM AlCrN | max. | VA | Ti/Ni

ATORN®

NEW

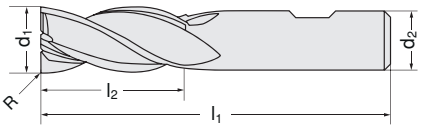
**Type**
Solid carbide torus milling cutter for roughing and finishing with unequal pitch and unequal helix.
**Use**
Particularly well-suited for machining rust-resistant and acid-resistant steels, titanium and nickel alloys, bronze brass and steel to 1300 N/mm².
**Advantage:**
Maximum machining capacity with extremely quiet operation.

DIN 6535 HA

16550 301-321

DIN 6535 HB

16550 401-421




| $d_1$ mm | R mm | $l_1$ mm | $l_2$ mm | $d_2$ mm | DIN 6535HA 16550 ... | DIN 6535HB 16550 ... |
|---|---|---|---|---|---|---|
| 4 | 0,3 | 57 | 11 | 6 | 301 | 401 |
| 4 | 0,5 | 57 | 11 | 6 | 302 | 402 |
| 5 | 0,3 | 57 | 13 | 6 | 303 | 403 |
| 5 | 0,5 | 57 | 13 | 6 | 304 | 404 |
| 6 | 0,3 | 57 | 13 | 6 | 305 | 405 |
| 6 | 0,5 | 57 | 13 | 6 | 306 | 406 |
| 6 | 1,0 | 57 | 13 | 6 | 307 | 407 |
| 8 | 0,5 | 64 | 20 | 8 | 308 | 408 |
| 8 | 1,0 | 64 | 20 | 8 | 309 | 409 |
| 10 | 0,5 | 72 | 22 | 10 | 310 | 410 |
| 10 | 1,0 | 72 | 22 | 10 | 311 | 411 |
| 12 | 0,5 | 83 | 26 | 12 | 312 | 412 |
| 12 | 1,0 | 83 | 26 | 12 | 313 | 413 |
| 12 | 2,0 | 83 | 26 | 12 | 314 | 414 |
| 12 | 3,0 | 83 | 26 | 12 | 315 | 415 |
| 16 | 1,0 | 92 | 32 | 16 | 316 | 416 |
| 16 | 2,0 | 92 | 32 | 16 | 317 | 417 |
| 16 | 3,0 | 92 | 32 | 16 | 318 | 418 |
| 20 | 1,0 | 104 | 38 | 20 | 319 | 419 |
| 20 | 2,0 | 104 | 38 | 20 | 320 | 420 |
| 20 | 3,0 | 104 | 38 | 20 | 321 | 421 |

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

## 16537 - 16539 Solid Carbide Keyway Milling Cutters

Z 4 | ≈ 30° | DIN 6535 HA | Uni

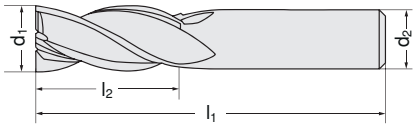
**Type**
**Short,** right-hand cut, **4 cutting edges,** right-hand helix approx. 30°, **centre cut,** with smooth shank in compliance with DIN 6535 HA.

16537

VHM

16539

VHM TiAlN




| | | | | Solid carbide | | Solid carbide/TiAlN | |
|---|---|---|---|---|---|---|---|
| $d_1$ h10 mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 mm | 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 |

| | | | | Solid carbide | | Solid carbide/TiAlN | |
|---|---|---|---|---|---|---|---|
| $d_1$ h10 mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 mm | 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-steel<900N | VA-steel>900N | Ti-alloys | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **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 Keyway Milling Cutters

Z 4 | ≈ 30° | DIN 6535 HA | Uni

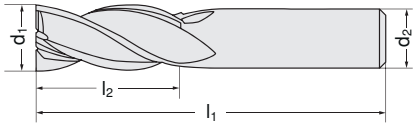
**Type**
**Long,** right-hand cut, **4 cutting edges,** right-hand helix approx. 30°, **centre cut,** with smooth shank in compliance with DIN 6535 HA.

16542

VHM

16543

VHM TiAlN




| | | | | Solid carbide | | Solid carbide/TiAlN | |
|---|---|---|---|---|---|---|---|
| $d_1$ h10 mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 mm | 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 |

| | | | | Solid carbide | | Solid carbide/TiAlN | |
|---|---|---|---|---|---|---|---|
| $d_1$ h10 mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 mm | 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-steel<900N | VA-steel>900N | Ti-alloys | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **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 | - |

## 16545 - 16547 Solid Carbide Keyway Milling Cutters

Z 4 | ≈ 30° | DIN 6535 HB | Uni

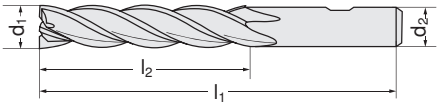
**Type**
**Long,** right-hand cut, **4 cutting edges,** right-hand helix approx. 30°, spiral flutes, **centre cut,** straight shank with driving face in compliance with DIN 6535 HB.

16545

VHM

16547

VHM TiAlN




| $d_1$ h10 mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 mm | Solid carbide 16545 | ... | Solid carbide/TiAlN 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 |

| $d_1$ h10 mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 mm | Solid carbide 16545 | ... | Solid carbide/TiAlN 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-steel<900N | VA-steel>900N | Ti-alloys | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 | - |

## 16548 - 16549 Solid Carbide Keyway Milling Cutters

Z 4 | ≈ 30° | DIN 6535 HA | Uni

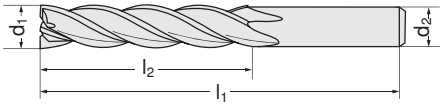
**Type**
**Overlong,** right-hand cut, **4 cutting edges,** right-hand helix approx. 30°, spiral flutes, **centre cut,** with smooth shank in compliance with DIN 6535 HA.

16548

VHM

16549

VHM TiAlN




| $d_1$ h10 mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 mm | Solid carbide 16548 | ... | Solid carbide/TiAlN 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 |

| $d_1$ h10 mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 mm | Solid carbide 16548 | ... | Solid carbide/TiAlN 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-steel<900N | VA-steel>900N | Ti-alloys | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 | - |

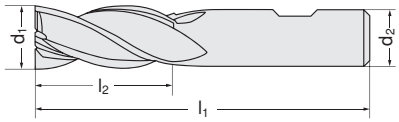
## 16551 Solid Carbide End Milling Cutters

Z 6-8 | ≈ 45° | VHM TiAlN | DIN 6535 HB | Uni

**Type**
- Right-hand cut
- Straight shank with driving face in compliance with DIN 6535 HB.
- Right-hand helix approx. 45°
- **6-8 cutting edges**

**Use**
For circumference milling as finishing working step for producing highest surface quality (face cutting only at low cutting depths).

16551




| $d_1$ e8 mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 mm | Z | 16551 ... |
|---|---|---|---|---|---|
| **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 |

| $d_1$ e8 mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 mm | Z | 16551 ... |
|---|---|---|---|---|---|
| **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-steel<900N | VA-steel>900N | Ti-alloys | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| - | - | - | 180 | 140 | 130 | 120 | 110 | 100 | - | - | - | - | 100 | 80 | - | 180 | - |

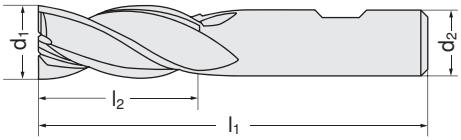
## 16553 Solid Carbide End Milling Cutters

Z 6-8 | ≈ 45° | VHM TiAlN | DIN 6535 HB | Uni

**Type**
- Right-hand cut
- Straight shank with driving face in compliance with DIN 6535 HB.
- Right-hand helix approx. 45°
- Eccentric relief for more stabile cutting edges
- **6-8 cutting edges**

**Use**
For circumference milling as the finishing working step for the production of a high quality surface. Especially suitable for machining deep and/or hard-to-reach places.

16553




| $d_1$ e8 mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 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 |

| $d_1$ e8 mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 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-steel<900N | VA-steel>900N | Ti-alloys | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| - | - | - | 180 | 140 | 130 | 120 | 110 | 100 | - | - | - | - | 100 | 80 | - | 180 | - |

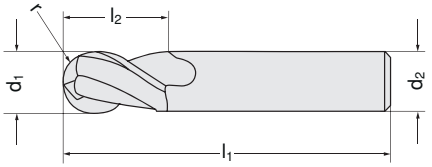
## 16557 Solid Carbide Radius Milling Cutters

Z 2 | ≈ 30° | VHM TiAlN | DIN 6535 HA | Uni

**Type**
- **Short**
- 2 cutting edges
- **Centre cut**
- Right-hand helix approx. 30°.
- With smooth shank in compliance with DIN 6535 HA.

**Quality**
**Universal carbide quality finest grit (P 20 - K 40) TiAlN-coated.**

16557




| $d_1$ e8 mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 mm | 16557 ... |
|---|---|---|---|---|
| **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 |

| $d_1$ e8 mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 mm | 16557 ... |
|---|---|---|---|---|
| **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-steel<900N | VA-steel>900N | Ti-alloys | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 230 | 200 | 180 | 150 | 130 | 120 | 100 | 90 | 80 | - | - | - | - | 105 | 80 | 40 | 110 | - |

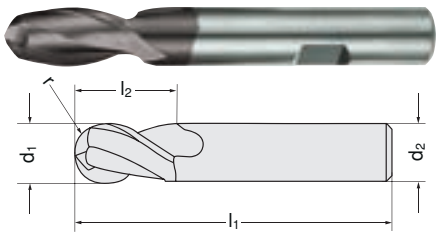
## 16559 Solid Carbide Radius Milling Cutters

Z 2 | ≈ 30° | VHM TiAlN | DIN 6535 HA | Uni

**Type**

**Long, 2 cutting edges, centre cut,** right-hand helix approx. 30°. With straight shank with driving face in compliance with DIN 6535 HB. Ø 2 mm with smooth straight shank in compliance with DIN 6535 HA.

16559




| $d_1$ e8 mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 mm | 16559 ... |
|---|---|---|---|---|
| 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 |

| $d_1$ e8 mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 mm | 16559 ... |
|---|---|---|---|---|
| 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-steel<900N | VA-steel>900N | Ti-alloys | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 230 | 200 | 180 | 150 | 130 | 120 | 100 | 90 | 80 | - | - | - | - | 105 | 80 | 40 | 110 | - |

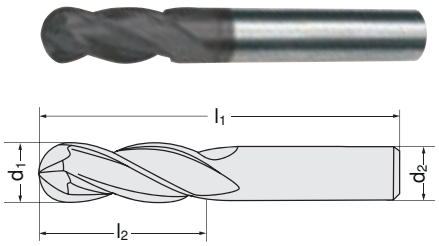
## 16561 Solid Carbide Radius Milling Cutters

Z 4 | ≈ 30° | VHM TiAlN | DIN 6535 HA | Uni

**Type**

**Short, 4 cutting blades, centre cut,**
Right-hand helix 30°. With smooth shank in compliance with DIN 6535 HA.

16561




| $d_1$ e8 mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 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 |

| $d_1$ e8 mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 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-steel<900N | VA-steel>900N | Ti-alloys | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| - | - | - | 150 | 130 | 120 | 100 | 90 | 80 | - | - | - | - | 105 | 80 | 40 | 110 | - |

## 16565 Solid Carbide Roughing/Finishing Cutters

Z 4 | ≈ 30° | VHM TiAlN | DIN 6535 HB | Uni

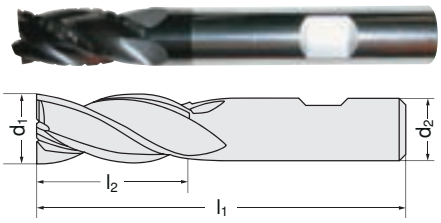
**Type**

**With ground-in chip breakers, centre cut,** 30° spiral for high roughing performance.
With straight shank with driving face in compliance with DIN 6535 HB.

**Use**

For roughing and finishing steel with extreme feeds. Very smooth and quiet running due to the reduction of the cutting load by means of the special chip breakers.

16565




| $d_1$ h10 mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 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 |

| $d_1$ h10 mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 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-steel<900N | VA-steel>900N | Ti-alloys | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| - | - | - | 120 | 105 | 90 | 70 | 40-60 | - | - | - | - | - | 95 | 70 | - | - | - |



= Sales are restricted to the packaging units mentioned in the catalogue. Purchase orders must be in units.

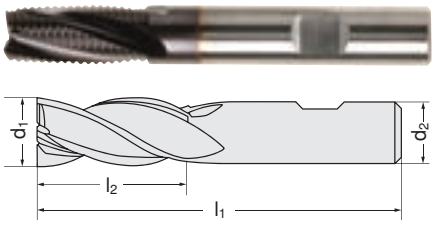
## 16567 Solid Carbide Roughing End Milling Cutters

Z 4 | ≈ 25° | HR | VHM TiAlN | DIN 6535 HB | Uni

**Type**
**- Long**
**- 4 cutting edges**
**- Centre cut**
- Right-hand helix 25°.
- Fine knurled profile
- Straight shank with driving face in compliance with DIN 6535 HB.

**Use**
**For materials up to HRC 45.**
Very good cutting performance thanks to roughing teeth. Universal use, also suitable for stainless steel, aluminium, non-ferrous metals and cast materials.

16567




| $d_1$ h10 mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 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 |
| **8,0** | 16 | 63 | 8 | 105 |

| $d_1$ h10 mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 mm | 16567 ... |
|---|---|---|---|---|
| **10,0** | 22 | 72 | 10 | 106 |
| **12,0** | 26 | 83 | 12 | 107 |
| **16,0** | 32 | 92 | 16 | 108 |
| **20,0** | 38 | 104 | 20 | 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-steel<900N | VA-steel>900N | Ti-alloys | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 300 | 220 | - | 120 | 105 | 90 | 70 | 40-60 | - | - | - | - | - | 70-90 | 50-70 | 30-60 | 80-100 | - |

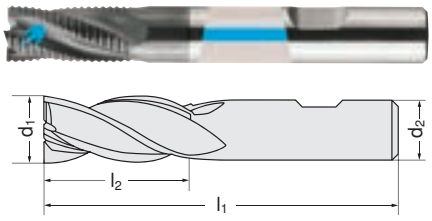
## 16569 Solid carbide roughing end milling cutters with IKZ

Z 4 | ≈ 25° | HR | VHM TiAlN | DIN 6535 HB | Uni

**Type**
**- Long**
**- Centre cut**
- Right-hand helix 25°.
- With internal cooling in the flute
- Fine knurled profile
- Straight shank with driving face in compliance with DIN 6535 HB.

**Use**
**For materials up to HRC 45.** Universal implementation. The coolant is guided directly to the flutes. This results in long service life and complete removal of the chips. This is very important when milling into solid material or milling of pockets.

16569




| $d_1$ h10 mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 mm | 16569 ... |
|---|---|---|---|---|
| **6,0** | 13 | 57 | 6 | 101 |
| **8,0** | 16 | 63 | 8 | 102 |
| **10,0** | 22 | 72 | 10 | 103 |

| $d_1$ h10 mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 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-steel<900N | VA-steel>900N | Ti-alloy | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 300 | 220 | - | 120 | 105 | 90 | 70 | 40-60 | - | - | - | - | - | 70-90 | 50-70 | 30-60 | 80-100 | - |

## 16564 Solid carbide 3D aluminium roughing end milling cutters

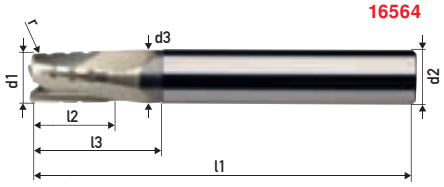
Z 3 | HPC | ≈ 7° | VHM CALIDAZ | DIN 6535 HA | ALU

**Type**
**Centre cut,** with undercut, defined edge rounding. With straight shank in accordance with DIN 6535 HA.
**Advantages:** Through the optimised flute geometry (flat spirals of 7°, reinforced core, defined corner radius, chip crusher, for generating discontinuous chips, as well as defined edge rounding) in the range from Vc= 1000-1600 m/min can be achieved with this tool.

**Use**
Especially for machining of NF metals.
Suitable for roughing.
**Quality**
**Multi-layer PVD-coating CALIDA Z (titanium-free).**

***Note:***
*Ensure stable machine conditions, fixed workpiece clamping, as well as adequate coolant supply.*

16564




| $d_1$e8 mm | $l_2$ mm | $l_3$ mm | $l_1$ mm | r mm | Z | $d_2$h5 mm | $d_3$ mm | 16564 ... |
|---|---|---|---|---|---|---|---|---|
| **6,0** | 8 | 21 | 57 | 0,6 | 3 | 6 | 5,7 | 106 |
| **8,0** | 10 | 27 | 63 | 0,8 | 3 | 8 | 7,7 | 108 |
| **10,0** | 12 | 32 | 72 | 1,0 | 3 | 10 | 9,7 | 110 |
| **12,0** | 16 | 38 | 83 | 1,2 | 3 | 12 | 11,7 | 112 |
| **16,0** | 20 | 44 | 92 | 1,6 | 3 | 16 | 15,7 | 116 |

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

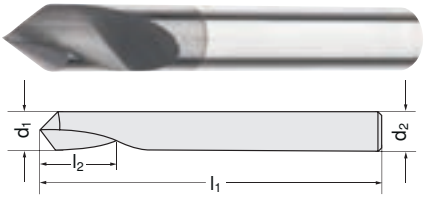
## 16575 Solid carbide engraver's milling cutter 60°

Z 1 | 60° | N | VHM TiAlN | DIN 6535 HA | Norm | Uni

**Type**
**1 cutting edge.** With smooth straight shank in compliance with DIN 6535 HA.

**Use**
For engraving contours.

16575




| $d_1$ h6 mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 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-steel<900N | VA-steel>900N | Ti-alloy | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 Deburrers 90°

Z 4-6 | 90° | DIN 6535 HA | DIN 6535 HB | Uni

ATORN®

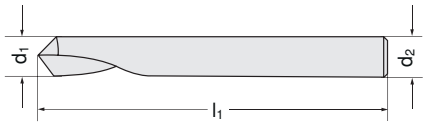
**Type**
**Short, 4-6 cutting edges.** With reinforced straight shank with driving face in compliance with DIN 6535 HB (with Weldon). Ø 4 mm with smooth straight shank in compliance with DIN 6535 HA.

VHM

16570

VHM TiAlN

16571




| $d_1$ h10 mm | $l_1$ mm | $d_2$ h6 mm | Z | Solid carbide 16570 ... | Solid carbide/TiAlN 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 |

| $d_1$ h10 mm | $l_1$ mm | $d_2$ h6 mm | Z | Solid carbide 16570 ... | Solid carbide/TiAlN 16571 ... |
|---|---|---|---|---|---|
| **12,0** | 78 | 12 | 6 | 105 | 105 |
| **16,0** | 92 | 16 | 6 | 106 | 106 |
| **20,0** | 104 | 20 | 6 | 107 | 107 |

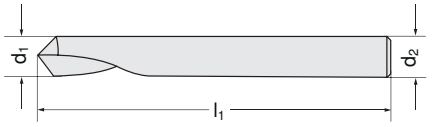
| Al<10%Si | Al >10% Si | Cu | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA-steel<900N | VA-steel>900N | Ti-alloy | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **16570** | | | | | | | | | | | | | | | | | |
| 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 Solid Carbide Deburrers 60°

Z 4-6 | 60° | VHM TiAlN | DIN 6535 HA | DIN 6535 HB | Uni

**Type**
**Short, 4-6 cutting edges.** With reinforced straight shank with driving face in compliance with DIN 6535 HB (with Weldon). Ø 4 mm with smooth straight shank in compliance with DIN 6535 HA.

16573




| $d_1$ h10 mm | $l_1$ mm | $d_2$ h6 mm | Z | Solid carbide/TiAlN 16573 ... |
|---|---|---|---|---|
| **4,0** | 54 | 4 | 4 | 101 |
| **6,0** | 57 | 6 | 4 | 102 |
| **8,0** | 63 | 8 | 5 | 103 |

| $d_1$ h10 mm | $l_1$ mm | $d_2$ h6 mm | Z | Solid carbide/TiAlN 16573 ... |
|---|---|---|---|---|
| **10,0** | 72 | 10 | 6 | 104 |
| **12,0** | 83 | 12 | 6 | 105 |
| **16,0** | 92 | 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-steel<900N | VA-steel>900N | Ti-alloys | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 280-350 | 200-250 | 150-180 | 120-140 | 110-120 | 100-110 | 70-80 | 60-70 | - | - | - | - | - | 80-120 | 60-90 | 30-60 | 80-120 | - |

## 16580 Solid Carbide Universal Milling Cutters

Z 2 | ≈ 25° | N | VHM | DIN 6535 HA | Uni

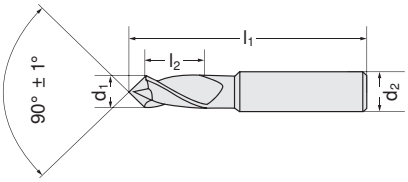
**Type**
**Short, 2 cutting edges, point angle 90°(+/–1°),**
25° right-hand helix, straight shank shape A.
**Use**
A new concept of shank cutting tools with focus on versatility. Allows up to 8 processes with just one tool.

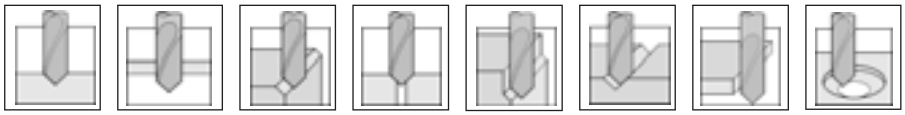
**Quality**
**Solid carbide**

***Note:***
*$d_1$ 3-10 mm = h9,*
*$d_1$ 12-20 mm = d9.*

**(1)** = Centring,
**(2)** = Drilling,
**(3)** = Combined milling/chamfering,
**(4)** = Countersinking,
**(5)** = Landing,
**(6)** = Milling of V-slots,
**(7)** = Circumference milling,
**(8)** = Face milling/Circular milling

16580




Solid carbide

| $d_1$ mm | $l_1$ mm | $l_2$ mm | $d_2$ h6 mm | 16580 | ... |
|---|---|---|---|---|---|
| **3,0** | 57 | 6 | 4 | | 101 |
| **4,0** | 57 | 8 | 5 | | 102 |
| **5,0** | 57 | 10 | 6 | | 103 |
| **6,0** | 70 | 12 | 8 | | 104 |
| **8,0** | 80 | 16 | 10 | | 105 |

Solid carbide

| $d_1$ mm | $l_1$ mm | $l_2$ mm | $d_2$ h6 mm | 16580 | ... |
|---|---|---|---|---|---|
| **10,0** | 90 | 18 | 12 | | 106 |
| **12,0** | 90 | 20 | 12 | | 107 |
| **16,0** | 92 | 26 | 16 | | 108 |
| **20,0** | 110 | 32 | 20 | | 109 |

| Al<10%Si | Al>10%Si | Cu | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <50HRC | <55HRC | <60HRC | <67HRC | VA-steel<900N | VA-steel>900N | Ti-alloys | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 |

## 16583 Solid carbide two-way deburrers

Z 4 | VHM TiAlN | DIN 6535 HA | Uni

**Type**
**4 cutting edges, 45°.** With smooth straight shank in compliance with DIN 6535 HA.
**Use**
For forward/reverse deburring and chamfering.

16583 101-102

16583 103-106


DIN 6535 HA

| $d_1$ h10 mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 mm | AP 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

| $d_1$ h10 mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 mm | AP 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-steel<900N | VA-steel>900N | Ti-alloys | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 300 | 250 | 250 | 90-120 | 80-120 | 80-100 | 50-80 | 40-70 | 30-35 | - | - | - | - | 80-120 | 60-90 | 30-60 | 50-100 | - |

## 16710 Solid Carbide Miniature End Milling Cutters

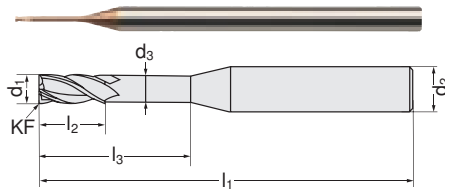
Z 2 | HSC | DIN 6535 HA | 45° | ≈ 30° | VHM ZrCN Ultra-N | max. | ALU | CU | MS | Kunst-stoffe

ATORN®

**Type**
- With edge chamfer

| $d_1$ (e8) mm | $l_2$ mm | $l_1$ mm | $l_3$ mm | $d_3$ mm | $d_2$ (h5) mm | KF 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 |

16710




| Al<10%Si | Al >10%Si | Cu long-chipping | Cu short-chipping | Thermosetting plastics | Thermoplastics | CFRP, GRP |
|---|---|---|---|---|---|---|
| 400-450 | 180-320 | 250-420 | 180-320 | 300-450 | 400-550 | 250-420 |

## 16711 Solid Carbide Miniaturetorus Milling Cutters

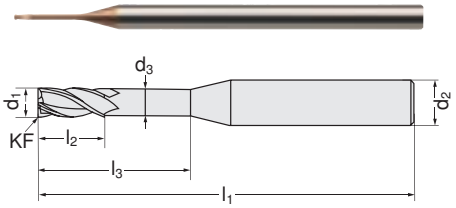
Z 2 | HSC | DIN 6535 HA | R | ≈ 30° | VHM ZrCN Ultra-N | max. | ALU | CU | MS | Kunst-stoffe

ATORN®

**Type**
Radius tolerance 0/-0,015

| $d_1$ (e8) mm | $l_2$ mm | $l_1$ mm | $l_3$ mm | $d_3$ mm | $d_2$ (h5) mm | R 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 |

16711




| Al<10%Si | Al >10%Si | Cu long-chipping | Cu short-chipping | Thermosetting plastics | Thermoplastics | CFRP, GRP |
|---|---|---|---|---|---|---|
| 400-450 | 180-320 | 250-420 | 180-320 | 300-450 | 400-550 | 250-420 |

## 16712 Solid Carbide Miniature Radius Milling Cutters

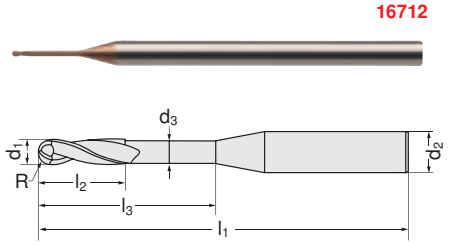
Z 2 | HSC | DIN 6535 HA | ≈ 30° | VHM ZrCN Ultra-N | max. | ALU | CU | MS | Kunst-stoffe

ATORN®

**Type**
Radius tolerance +/-0,01

| $d_1$ (h9) mm | $l_2$ mm | $l_1$ mm | $l_3$ mm | $d_3$ mm | $d_2$ (h5) mm | R 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 |

16712




| Al<10%Si | Al >10%Si | Cu long-chipping | Cu short-chipping | Thermosetting plastics | Thermoplastics | CFRP, GRP |
|---|---|---|---|---|---|---|
| 400-450 | 180-320 | 250-420 | 180-320 | 300-450 | 400-550 | 250-420 |

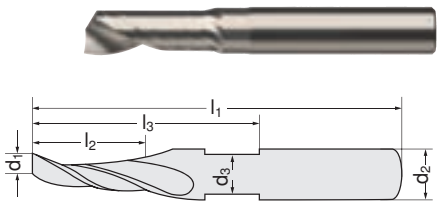
## 16715 Solid Carbide Single-Tooth Milling Cutters

ATORN®

Z 1 | HSC | DIN 6535 HA | 90° | ≈ 30° | VHM poliert | max. | ALU | CU | MS | Kunst-stoffe

| $d_1$ (h9) mm | $l_2$ mm | $l_1$ mm | $l_3$ mm | $d_3$ mm | $d_2$ (h5) 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 |

16715




| Al<10%Si | Al >10%Si | Cu long-chipping | Cu short-chipping | Thermosetting plastics | Thermoplastics | CFRP, GRP |
|---|---|---|---|---|---|---|
| 350-500 | 150-250 | 200-350 | 150-250 | 250-400 | 350-500 | 200-350 |

## 16717 Solid Carbide End Milling Cutters

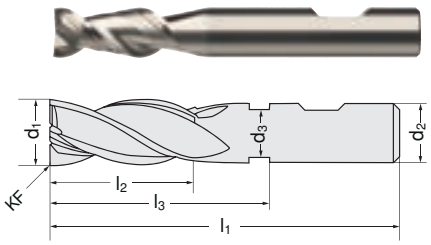
ATORN®

Z 2 | HSC | DIN 6535 HB | 45° | ≈ 45° | VHM poliert | max. | ALU | CU | MS | Kunst-stoffe

**Type**
- With edge chamfer

| $d_1$ (h9) mm | $l_2$ mm | $l_1$ mm | $l_3$ mm | $d_3$ mm | $d_2$ (h5) mm | KF 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 |

16717




| Al<10%Si | Al >10%Si | Cu long-chipping | Cu short-chipping | Thermosetting plastics | Thermoplastics | CFRP, GRP |
|---|---|---|---|---|---|---|
| 300-400 | 120-200 | 160-300 | 120-200 | 200-250 | 300-400 | 160-300 |

## 16718 - 16719 Solid Carbide End Milling Cutters

ATORN®

Z 2 | HSC | 45° | ≈ 45° | VHM ZrCN Ultra-N | max. | ALU | CU | MS | Kunst-stoffe

**Type**
- With edge chamfer

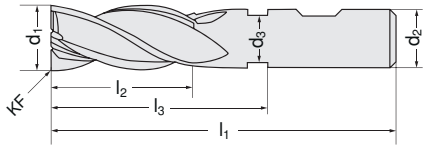
| $d_1$ (h9) mm | $l_2$ mm | $l_1$ mm | $l_3$ mm | $d_3$ mm | $d_2$ (h5) mm | KF mm | 16718 ... | 16719 ... |
|---|---|---|---|---|---|---|---|---|
| **3,0** | 8 | 57 | 18 | 2,9 | 6 | 0,1 | 101 | 101 |
| **4,0** | 11 | 57 | 18 | 3,9 | 6 | 0,1 | 102 | 102 |
| **5,0** | 13 | 57 | 20 | 4,9 | 6 | 0,1 | 103 | 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 |

DIN 6535 HA

16718

DIN 6535 HB

16719




| Al<10%Si | Al >10%Si | Cu long-chipping | Cu short-chipping | Thermosetting plastics | Thermoplastics | CFRP, GRP |
|---|---|---|---|---|---|---|
| 350-500 | 150-250 | 200-350 | 150-250 | 250-400 | 250-500 | 200-350 |

## 16722 - 16724 Solid Carbide End Milling Cutters

ATORN®

**Type**
- With edge chamfer

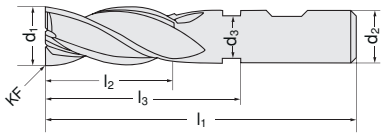
Z 3 | HSC | 45° | ≈ 45° | VHM poliert | max. | ALU | CU | MS | Kunststoffe

DIN 6535 HA

16722

DIN 6535 HB

16724




| $d_1$ (h9) mm | $l_2$ mm | $l_1$ mm | $l_3$ mm | $d_3$ mm | $d_2$ (h5) mm | KF 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 | Thermosetting plastics | Thermoplastics | CFRP, GRP |
|---|---|---|---|---|---|---|
| 300-450 | 125-200 | 175-300 | 175-300 | 200-350 | 300-450 | 175-300 |

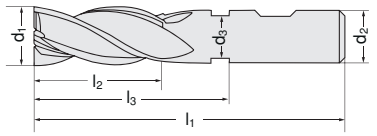
## 16725 Solid Carbide End Milling Cutters

Z 3 | HSC | DIN 6535 HB | 90° | ≈ 45° | VHM poliert | max. | ALU | CU | MS | Kunststoffe

ATORN®

**Type**
**- Sharp-edged**

16725




| $d_1$ (h9) mm | $l_2$ mm | $l_1$ mm | $l_3$ mm | $d_3$ mm | $d_2$ (h5) 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 | Thermosetting plastics | Thermoplastics | CFRP, GRP |
|---|---|---|---|---|---|---|
| 300-450 | 125-200 | 175-300 | 175-300 | 200-350 | 300-450 | 175-300 |

## 16726 - 16727 Solid Carbide End Milling Cutters

Z 3 | HPC | 45° | ≈ 45° | VHM ZrCN Ultra-N | max. | ALU | CU | MS | Kunststoffe

ATORN®

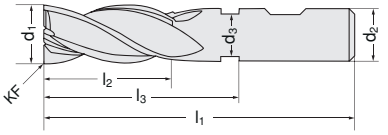
**Type**
- With edge chamfer

DIN 6535 HA

16726

DIN 6535 HB

16727




| $d_1$ (h9) mm | $l_2$ mm | $l_1$ mm | $l_3$ mm | $d_3$ mm | $d_2$ (h5) mm | KF 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 | Thermosetting plastics | Thermoplastics | CFRP, GRP |
|---|---|---|---|---|---|---|
| 350-500 | 150-250 | 200-350 | 150-250 | 250-400 | 350-500 | 200-350 |





= Sales are restricted to the packaging units mentioned in the catalogue. Purchase orders must be in units.

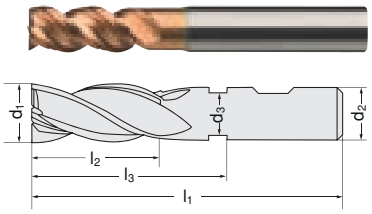
## 16728 Solid Carbide End Milling Cutters

ATORN®

**Type**
**- Sharp-edged**

| $d_1$ (h9) mm | $l_2$ mm | $l_1$ mm | $l_3$ mm | $d_3$ mm | $d_2$ (h5) 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 |

16728




| Al<10%Si | Al >10%Si | Cu long-chipping | Cu short-chipping | Thermosetting plastics | Thermoplastics | CFRP, GRP |
|---|---|---|---|---|---|---|
| 350-500 | 150-250 | 200-350 | 150-250 | 250-400 | 350-500 | 200-350 |

## 16729 - 16730 Solid Carbide End Milling Cutters

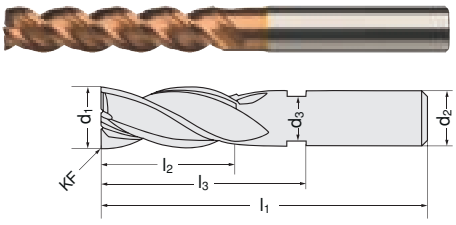
ATORN®

**Type**
- With edge chamfer

| $d_1$ (h9) mm | $l_2$ mm | $l_1$ mm | $l_3$ mm | $d_3$ mm | $d_2$ (h5) mm | KF 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 |

16729

16730




| Al<10%Si | Al >10%Si | Cu long-chipping | Cu short-chipping | Thermosetting plastics | Thermoplastics | CFRP, GRP |
|---|---|---|---|---|---|---|
| 300-450 | 125-200 | 175-300 | 175-300 | 200-350 | 300-450 | 175-300 |

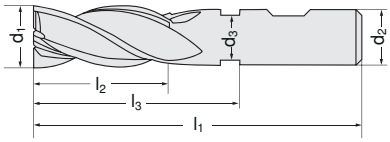
## 16731 Solid Carbide End Milling Cutters

ATORN®

**Type**
**- Sharp-edged**

| $d_1$ (h9) mm | $l_2$ mm | $l_1$ mm | $l_3$ mm | $d_3$ mm | $d_2$ (h5) 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 |

16731




| Al<10%Si | Al >10%Si | Cu long-chipping | Cu short-chipping | Thermosetting plastics | Thermoplastics | CFRP, GRP |
|---|---|---|---|---|---|---|
| 350-500 | 150-250 | 200-350 | 150-250 | 250-400 | 350-500 | 200-350 |



= Sales are restricted to the packaging units mentioned in the catalogue. Purchase orders must be in units.

## 16732 - 16734 Solid Carbide Roughing End Milling Cutters

Z 3 | HPC | 45° | ≈ 40° | VHM ZrCN Ultra-N | max. | ALU | CU | MS | Kunst-stoffe

ATORN®

**Type**
- With edge chamfer

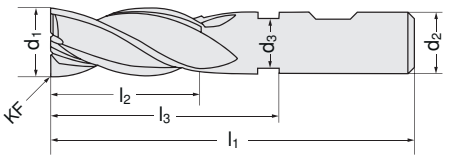
DIN 6535 HA

16732

DIN 6535 HB

16734

| $d_1$ (h9) mm | $l_2$ mm | $l_1$ mm | $l_3$ mm | $d_3$ mm | $d_2$ (h5) mm | KF 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 | Thermosetting plastics | Thermoplastics | CFRP, GRP |
|---|---|---|---|---|---|---|
| 350-500 | 150-250 | 200-350 | 150-250 | 250-400 | 350-500 | 200-350 |

## 16735 SC roughing end milling cutter with ICF

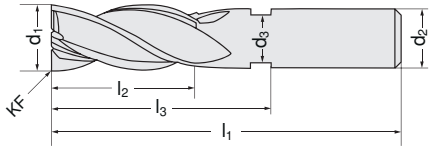
Z 3 | HPC | DIN 6535 HA | 45° | ≈ 40° | VHM ZrCN Ultra-N | ALU | CU | MS | Kunst-stoffe

ATORN®

**Type**
- With edge chamfer

16735

| $d_1$ (h9) mm | $l_2$ mm | $l_1$ mm | $l_3$ mm | $d_3$ mm | $d_2$ (h5) mm | KF 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 | Thermosetting plastics | Thermoplastics | CFRP, GRP |
|---|---|---|---|---|---|---|
| 350-500 | 150-250 | 200-350 | 150-250 | 250-400 | 350-500 | 200-350 |

## 16737 - 16738 Solid Carbide End Milling Cutters

Z 4 | HPC | 45° | ≈ 45° | VHM ZrCN Ultra-N | max. | ALU | CU | MS | Kunst-stoffe

ATORN®

**Type**
- With edge chamfer

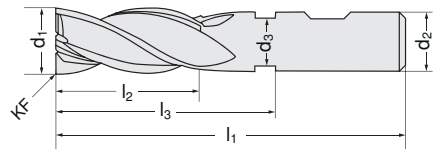
DIN 6535 HA

16737

DIN 6535 HB

16738

| $d_1$ (h9) mm | $l_2$ mm | $l_1$ mm | $l_3$ mm | $d_3$ mm | $d_2$ (h5) mm | KF 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 | Thermosetting plastics | Thermoplastics | CFRP, GRP |
|---|---|---|---|---|---|---|
| 350-500 | 150-250 | 200-350 | 150-250 | 250-400 | 350-500 | 200-350 |

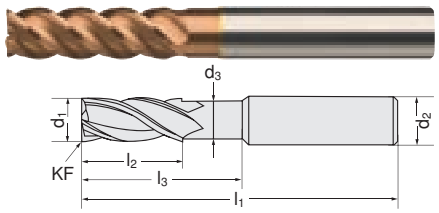
## 16739 Solid Carbide End Milling Cutters

ATORN®

**Type**
- With edge chamfer

| $d_1$ (h9) mm | $l_2$ mm | $l_1$ mm | $l_3$ mm | $d_3$ mm | $d_2$ (h5) mm | KF 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 |

16739




| Al<10%Si | Al >10%Si | Cu long-chipping | Cu short-chipping | Thermosetting plastics | Thermoplastics | CFRP, GRP |
|---|---|---|---|---|---|---|
| 350-500 | 150-250 | 200-350 | 150-250 | 250-400 | 350-500 | 200-350 |

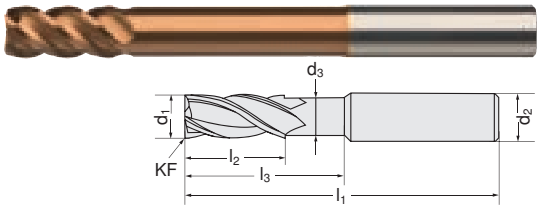
## 16740 Solid Carbide End Milling Cutters

ATORN®

**Type**
- With edge chamfer

| $d_1$ (h9) mm | $l_2$ mm | $l_1$ mm | $l_3$ mm | $d_3$ mm | $d_2$ (h5) mm | KF 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 |

16740




| Al<10%Si | Al >10%Si | Cu long-chipping | Cu short-chipping | Thermosetting plastics | Thermoplastics | CFRP, GRP |
|---|---|---|---|---|---|---|
| 300-450 | 125-200 | 175-300 | 125-200 | 225-350 | 300-450 | 175-300 |

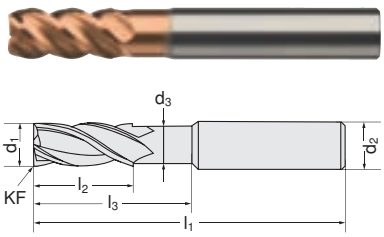
## 16741 Solid Carbide End Milling Cutters HPC

ATORN®

**Type**
- With edge chamfer

| $d_1$ (h9) mm | $l_2$ mm | $l_1$ mm | $l_3$ mm | $d_3$ mm | $d_2$ (h5) mm | KF 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 |

16741




| Al<10%Si | Al >10%Si | Cu long-chipping | Cu short-chipping | Thermosetting plastics | Thermoplastics | CFRP, GRP |
|---|---|---|---|---|---|---|
| 350-500 | 150-250 | 200-350 | 150-250 | 250-400 | 350-500 | 200-350 |

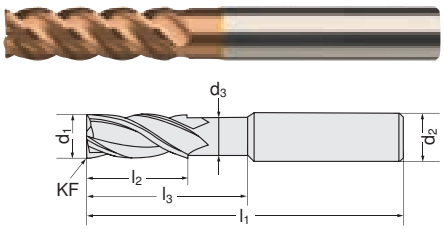
## 16742 Solid Carbide End Milling Cutters HPC

ATORN®

**Type**
- With edge chamfer

| $d_1$ (h9) mm | $l_2$ mm | $l_1$ mm | $l_3$ mm | $d_3$ mm | $d_2$ (h5) mm | KF 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 |

16742




| Al<10%Si | Al >10%Si | Cu long-chipping | Cu short-chipping | Thermosetting plastics | Thermoplastics | CFRP, GRP |
|---|---|---|---|---|---|---|
| 350-500 | 150-250 | 200-350 | 150-250 | 250-400 | 350-500 | 200-350 |

## 16745 Solid Carbide Torus Milling Cutters

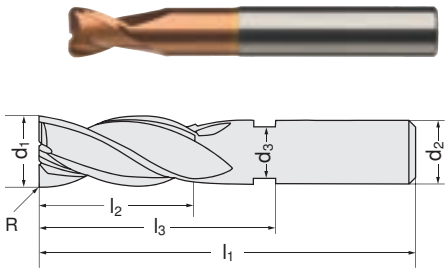
ATORN®

**Type**
Radius tolerance +/-0,015

Z 2 | DIN 6535 HA | R | ≈ 30° | VHM ZrCN Ultra-N | max. | ALU | CU | MS | Kunststoffe

| $d_1$ (e8) mm | $l_2$ mm | $l_1$ mm | $l_3$ mm | $d_3$ mm | $d_2$ (h5) mm | R 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 |

16745




| Al<10%Si | Al >10%Si | Cu long-chipping | Cu short-chipping | Thermosetting plastics | Thermoplastics | CFRP, GRP |
|---|---|---|---|---|---|---|
| 375-550 | 175-275 | 225-375 | 175-275 | 275-450 | 375-550 | 225-375 |

## 16746 Solid Carbide Torus Milling Cutters

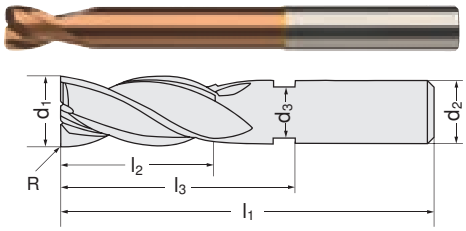
ATORN®

**Type**
Radius tolerance +/-0,015

Z 2 | DIN 6535 HA | R | ≈ 30° | VHM ZrCN Ultra-N | max. | ALU | CU | MS | Kunststoffe

| $d_1$ (e8) mm | $l_2$ mm | $l_1$ mm | $l_3$ mm | $d_3$ mm | $d_2$ (h5) mm | R 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 |

16746




| Al<10%Si | Al >10%Si | Cu long-chipping | Cu short-chipping | Thermosetting plastics | Thermoplastics | CFRP, GRP |
|---|---|---|---|---|---|---|
| 375-550 | 175-275 | 225-375 | 175-275 | 275-450 | 375-550 | 225-375 |

## 16747 Solid Carbide Torus Milling Cutters

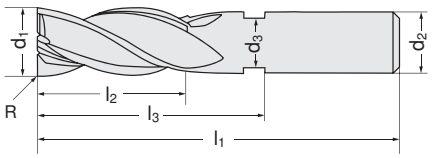
ATORN®

**Type**
Radius tolerance +/-0,015

Z 2 | DIN 6535 HA | R | ≈ 30° | VHM ZrCN Ultra-N | max. | ALU | CU | MS | Kunst-stoffe

16747

| $d_1$ (e8) mm | $l_2$ mm | $l_1$ mm | $l_3$ mm | $d_3$ mm | $d_2$ (h5) mm | R 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 | Thermosetting plastics | Thermoplastics | CFRP, GRP |
|---|---|---|---|---|---|---|
| 350-500 | 150-250 | 200-350 | 150-250 | 250-400 | 350-500 | 200-350 |

## 16748 - 16749 Solid Carbide Torus Milling Cutters

ATORN®

**Type**
Radius tolerance +/-0,015

Z 3 | HPC | R | ≈ 45° | VHM ZrCN Ultra-N | max. | ALU | CU | MS | Kunst-stoffe

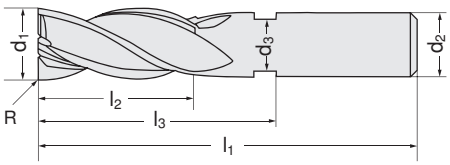
| $d_1$ (h9) mm | $l_2$ mm | $l_1$ mm | $l_3$ mm | $d_3$ mm | $d_2$ (h5) mm | R mm | 16748 ... | 16749 ... |
|---|---|---|---|---|---|---|---|---|
| **5,0** | 13 | 57 | 18 | 4,7 | 6 | 0,5 | 101 | 101 |
| **5,0** | 13 | 57 | 18 | 4,7 | 6 | 1,0 | 102 | 102 |
| **6,0** | 13 | 57 | 18 | 5,6 | 6 | 0,5 | 103 | 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

DIN 6535 HA

16749

DIN 6535 HB




| Al<10%Si | Al>10%Si | Cu long-chipping | Cu short-chipping | Thermosetting plastics | Thermoplastics | CFRP GRP |
|---|---|---|---|---|---|---|
| 375-550 | 175-275 | 225-375 | 175-275 | 275-450 | 375-550 | 225-375 |

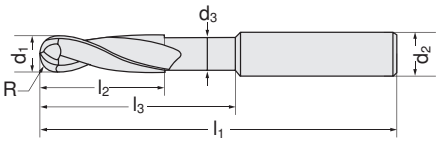
## 16755 Solid Carbide Radius Milling Cutters

ATORN®

**Type**
Radius tolerance +/-0,015

Z 2 | DIN 6535 HA | ≈ 45° | VHM ZrCN Ultra-N | max. | ALU | CU | MS | Kunststoffe

16755




| $d_1$ (e8) mm | $l_2$ mm | $l_1$ mm | $l_3$ mm | $d_3$ mm | $d_2$ (h5) mm | R 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 | Thermosetting plastics | Thermoplastics | CFRP, GRP |
|---|---|---|---|---|---|---|
| 400-550 | 180-320 | 250-420 | 180-320 | 300-450 | 400-550 | 250-420 |

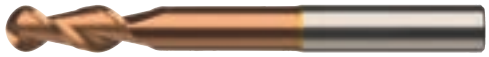
## 16756 Solid Carbide Radius Milling Cutters

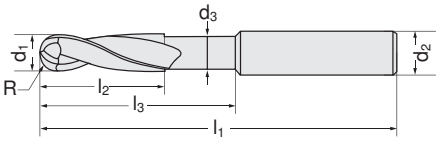
ATORN®

**Type**
Radius tolerance +/-0,015

Z 2 | DIN 6535 HA | ≈ 45° | VHM ZrCN Ultra-N | max. | ALU | CU | MS | Kunststoffe

16756






| $d_1$ (e8) mm | $l_2$ mm | $l_1$ mm | $l_3$ mm | $d_3$ mm | $d_2$ (h5) mm | R 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 | Thermosetting plastics | Thermoplastics | CFRP, GRP |
|---|---|---|---|---|---|---|
| 400-550 | 180-320 | 250-420 | 180-320 | 300-450 | 400-550 | 250-420 |

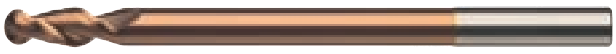
## 16757 Solid Carbide Radius Milling Cutters

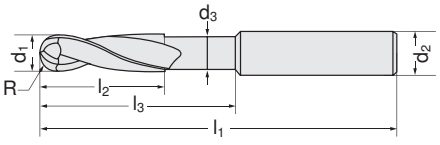
ATORN®

**Type**
Radius tolerance +/-0,015

Z 2 | HPC | DIN 6535 HA | ≈ 45° | VHM ZrCN Ultra-N | max. | ALU | CU | MS | Kunststoffe

16757






| $d_1$ (e8) mm | $l_2$ mm | $l_1$ mm | $l_3$ mm | $d_3$ mm | $d_2$ (h5) mm | R 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 | Thermosetting plastics | Thermoplastics | CFRP, GRP |
|---|---|---|---|---|---|---|
| 350-500 | 150-250 | 200-350 | 150-250 | 250-400 | 350-500 | 200-350 |

## Info — Heavy-duty milling

Heavy-duty machining is the machining of hardened materials with a hardness of 52 - 65 HRC. Advantages are reduced costs and shorter machining times which may be achieved with heavy-duty milling. Special HSC milling strategies, high surface quality and the elimination of quench distortion make this procedure an interesting possibility for an ever-growing market. Additional advantages are: working steps such as multiple clamping and time-consuming polishing are no longer necessary, saving great amounts of money **- cost benefit for your production!**

We have designed our **ATORN programme** with these machining process in mind. In terms of selection, material, and geometry, this programme leaves nothing to be desired. It is geared towards extremely high requirements.

The **ATORN heavy-duty milling tools**offer you the best conditions for an efficient heavy-duty machining. Different geometries have been perfectly adapted to different milling procedures. The carbide used stands out because of its high hardness and extreme toughness.

With the special edge treatment, as well as the new coatings **RockTec 52** and **RockTec 65** the longest service results for the **ATORN tools.**

**RockTec 52**

| | |
|---|---|
| Universal implementation: | 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 milling and HSC milling: | to 65 HRC |
| Tolerance, radius correction: | +/- 0,01 mm |
| Coating type: | New generation multilayer |
| Micro-hardness: | 3600 HV |
| Max. application temperature: | < 1200 °C |
| Longest service life for dry milling | |

**The expansive programme which satisfies the highest requirements**

## 16800 — Solid Carbide Miniature End Milling Cutters


ATORN®

**Type**
**- Short**
- Right-hand cut
- 2 cutting edges
- Right-hand helix 40°
- With smooth straight shank in compliance with DIN 6535 HA.


16800 101-109


16800 301-309

| | | | | RockTec 52 | | RockTec 65 | |
|---|---|---|---|---|---|---|---|
| $d_1$ mm | $l_2$ mm | $l_1$ mm | $d_2$ (h6) mm | 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 |

**16800**

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

## 16801 Solid Carbide Miniature End Milling Cutters

Z 2 | ≈ 40° | VHM RockTec | DIN 6535 HA

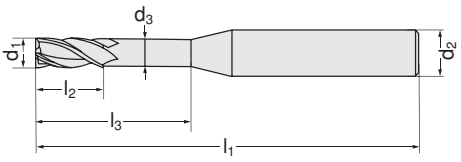
ATORN®

**Type**
**- Long**
- Right-hand cut

- 2 cutting edges
- Right-hand helix 40°
- With smooth straight shank in compliance with DIN 6535 HA.

≤ 1600 N/mm² | 52 HRC — 16801 101-154

65 HRC — 16801 301-354




| $d_1$ mm | $l_2$ mm | $l_3$ mm | $l_1$ mm | $d_3$ mm | $d_2$ (h6) mm | RockTec 52 16801 ... | RockTec 65 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 |

**16801**

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



= Sales are restricted to the packaging units mentioned in the catalogue. Purchase orders must be in units.

# 16802 Solid Carbide Miniature End Milling Cutters

Z 2 | ≈ 40° | VHM RockTec | DIN 6535 HA

≤ 1600 N/mm² | 52 HRC

16802 101-154

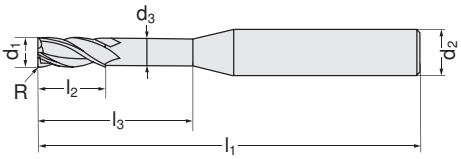
65 HRC

16802 301-354

ATORN®

**Type**
**- Long**
**- With corner radius**
- Right-hand cut

- 2 cutting edges
- Right-hand helix 40°
- With smooth straight shank in compliance with DIN 6535 HA.




| | | | | | | | RockTec 52 | | RockTec 65 | |
|---|---|---|---|---|---|---|---|---|---|---|
| $d_1$ mm | R mm | $l_2$ mm | $l_3$ mm | $l_1$ mm | $d_3$ mm | $d_2$ (h6) mm | 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 |

**16803 Solid Carbide Miniature Torus Milling Cutters**

| Al<10%Si | Al>10%Si | Cu | St<520N | St<750N | St<900N | St<1100N | St<1200N | St >1400N | >45HRC | < 52HRC | < 58HRC | < 65HRC | VA-steel<900N | VA-steel >900N | Ti | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **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 Miniature Milling Cutters With Ball End

## 16805 Solid Carbide Miniature Milling Cutters With Ball End

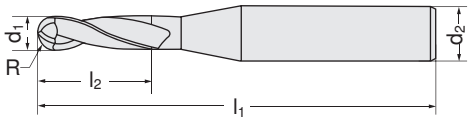
Z 2 | ≈ 30° | VHM RockTec | DIN 6535 HA

ATORN®

**Type**
**- Short**
- Right-hand cut
- 2 cutting edges
- Right-hand helix 30°
- With smooth straight shank in compliance with DIN 6535 HA.

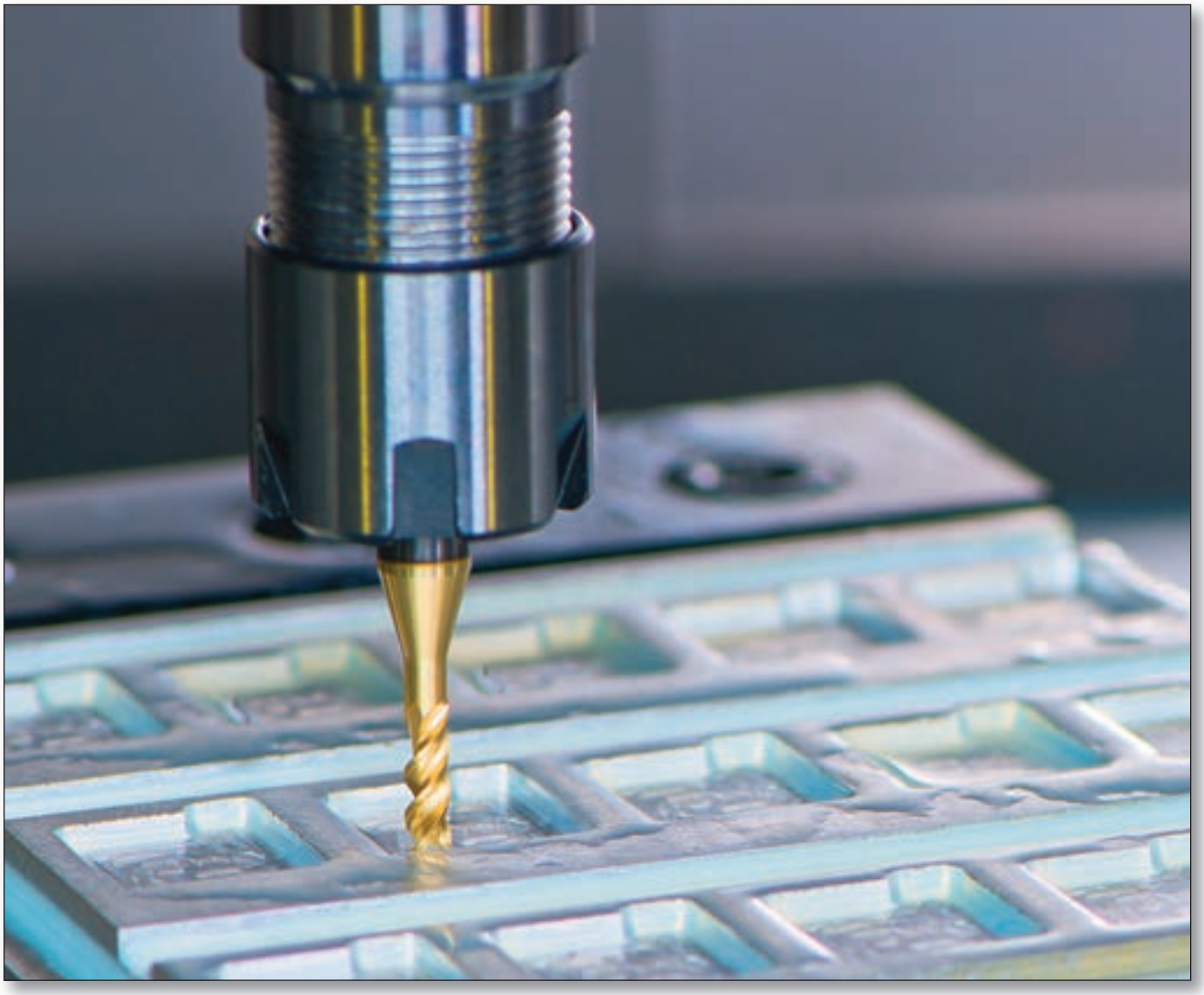
≤ 1600 N/mm² | 52 HRC — 16805 101-108

65 HRC — 16805 301-308




| $d_1$ mm | R mm | $l_2$ mm | $l_1$ mm | $d_2$ (h6) mm | RockTec 52 16805 ... | RockTec 65 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-steel<900N | VA-steel >900N | Ti | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **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 | - | - | - | - | - |



# 16806 Solid Carbide Miniature Milling Cutters With Ball End

Z 2 | ≈ 30° | VHM RockTec | DIN 6535 HA

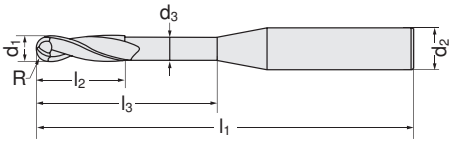
ATORN®

**Type**
**- Long**
- Right-hand cut

- 2 cutting edges
- Right-hand helix 30°
- With smooth straight shank in compliance with DIN 6535 HA.

< 1600 N/mm² | 52 HRC — 16806 101-153

65 HRC — 16806 301-353




| | | | | | | | RockTec 52 | | RockTec 65 | |
|---|---|---|---|---|---|---|---|---|---|---|
| $d_1$ mm | R mm | $l_2$ mm | $l_3$ mm | $l_1$ mm | $d_3$ mm | $d_2$ (h6) mm | 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 |

**16806 Solid Carbide Miniature Milling Cutters**

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

= Sales are restricted to the packaging units mentioned in the catalogue. Purchase orders must be in units.

## 16810 Solid Carbide End Milling Cutters

Z 4 | ≈ 40° | VHM RockTec | DIN 6535 HA

ATORN®

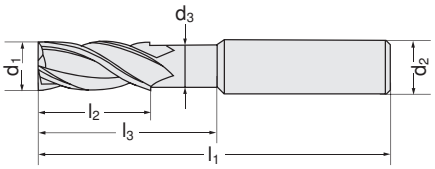
**Type**
**- Short**
- With undercut
- Right-hand cut
- 4 cutting edges
- Right-hand helix 40°
- With smooth straight shank in compliance with DIN 6535 HA.

≤ 1600 N/mm² | 52 HRC

16810 101-109

65 HRC

16810 301-309




| $d_1$ (e8) mm | $l_2$ mm | $l_3$ mm | $l_1$ mm | $d_3$ mm | $d_2$ (h6) mm | RockTec 52 16810 ... | RockTec 65 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-steel<900N | VA-steel >900N | Ti | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **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 | - | - | - | - | - |

## 16812 Solid Carbide End Milling Cutters

Z 4 | ≈ 40° | VHM RockTec | DIN 6535 HA

ATORN®

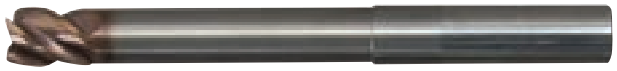
**Type**
**- Long**
- With undercut
- Right-hand cut
- 4 short cutting edges
- Right-hand helix 40°
- With smooth straight shank in compliance with DIN 6535 HA.

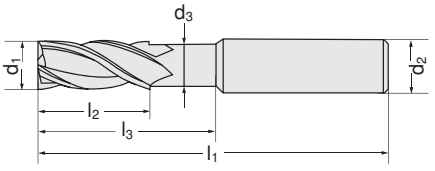
≤ 1600 N/mm² | 52 HRC

16812 101-109

65 HRC

16812 301-309






| $d_1$ (e8) mm | $l_2$ mm | $l_3$ mm | $l_1$ mm | $d_3$ mm | $d_2$ (h6) mm | RockTec 52 16812 ... | RockTec 65 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-steel<900N | VA-steel >900N | Ti | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **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 | - | - | - | - | - |

## 16813 Solid Carbide End Milling Cutters

Z 4 | ≈ 40° | VHM RockTec | DIN 6535 HA | ≤ 1600 N/mm² | 52 HRC | 65 HRC

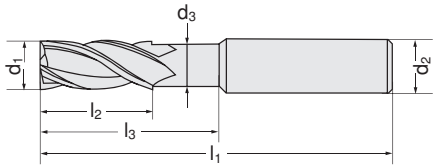
ATORN®

**Type**
**- Extra long**
- With undercut
- Right-hand cut
- 4 short cutting edges
- Right-hand helix 40°
- With smooth straight shank in compliance with DIN 6535 HA.

16813 101-109

16813 301-309

| $d_1$ (e8) mm | $l_2$ mm | $l_3$ mm | $l_1$ mm | $d_3$ mm | $d_2$ (h6) mm | RockTec 52 16813 ... | RockTec 65 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-steel<900N | VA-steel >900N | Ti | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **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 | - | - | - | - | - |

## 16816 Solid Carbide Torus Milling Cutters

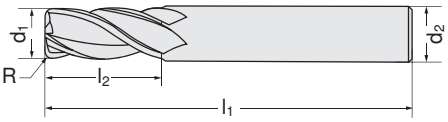
Z 4 | R | ≈ 40° | VHM RockTec | DIN 6535 HA | ≤ 1600 N/mm² | 52 HRC | 65 HRC

ATORN®

**Type**
**- Short**
- Right-hand cut
- 4 cutting edges
- Right-hand helix 40°
- With smooth straight shank in compliance with DIN 6535 HA.

16816 101-128

16816 301-328




| $d_1$ (e8) mm | R mm | $l_2$ mm | $l_1$ mm | $d_2$ (h6) mm | RockTec 52 16816 ... | RockTec 65 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 |

Continuation ▶

## 16816 Solid Carbide Torus Milling Cutters

Z 4 | R | ≈ 40° | VHM RockTec | DIN 6535 HA

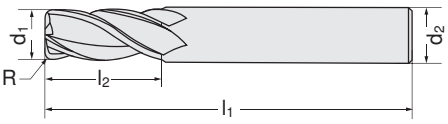
≤ 1600 N/mm² | 52 HRC

Continuation ▶

16816 101-128

65 HRC

16816 301-328




| $d_1$ (e8) mm | R mm | $l_2$ mm | $l_1$ mm | $d_2$ (h6) mm | RockTec 52 16816 ... | RockTec 65 16816 ... |
|---|---|---|---|---|---|---|
| **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-steel<900N | VA-steel >900N | Ti | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **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 | - | - | - | - | - |

## 16817 Solid Carbide Torus Milling Cutters

Z 4 | R | ≈ 45° | VHM RockTec | DIN 6535 HA

ATORN®

**Type**

**- Short**

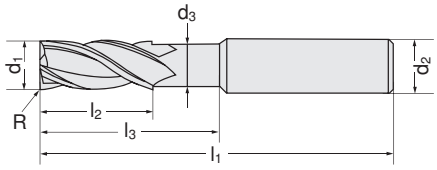
- With undercut
- Right-hand cut
- 4 short cutting edges
- Right-hand helix 45°
- With smooth straight shank in compliance with DIN 6535 HA.

≤ 1600 N/mm² | 52 HRC

16817 101-116

65 HRC

16817 301-316




| $d_1$ (e8) mm | R mm | $l_2$ mm | $l_3$ mm | $l_1$ mm | $d_3$ mm | $d_2$ (h6) mm | RockTec 52 16817 ... | RockTec 65 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-steel<900N | VA-steel >900N | Ti | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **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 | - | - | - | - | - |



= Sales are restricted to the packaging units mentioned in the catalogue. Purchase orders must be in units.

## 16818 Solid Carbide Torus Milling Cutters

Z 4 | R | ≈ 40° | VHM RockTec | DIN 6535 HA

ATORN®

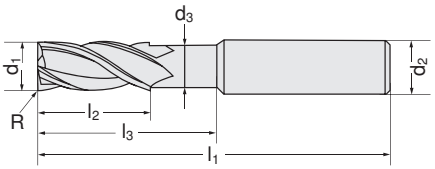
**Type**
**- Long**
- With undercut
- Right-hand cut
- 4 short cutting edges
- Right-hand helix 40°
- With smooth straight shank in compliance with DIN 6535 HA.

≤ 1600 N/mm² | 52 HRC | 65 HRC

16818 101-116

16818 301-316

| $d_1$ (e8) mm | R mm | $l_2$ mm | $l_3$ mm | $l_1$ mm | $d_3$ mm | $d_2$ (h6) mm | RockTec 52 16818 ... | RockTec 65 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-steel<900N | VA-steel >900N | Ti | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **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

Z 4 | R | ≈ 40° | VHM RockTec | DIN 6535 HA

ATORN®

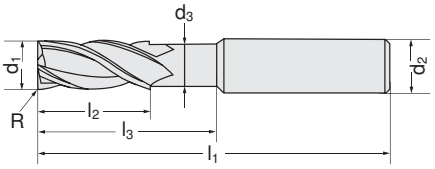
**Type**
**- Extra long**
- With undercut
- Right-hand cut
- 4 short cutting edges
- Right-hand helix 40°
- With smooth straight shank in compliance with DIN 6535 HA.

≤ 1600 N/mm² | 52 HRC | 65 HRC

16819 101-116

16819 301-316

| $d_1$ (e8) mm | R mm | $l_2$ mm | $l_3$ mm | $l_1$ mm | $d_3$ mm | $d_2$ (h6) mm | RockTec 52 16819 ... | RockTec 65 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-steel<900N | VA-steel >900N | Ti | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **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 multiple teeth milling cutter

Z 6-8 | ≈ 50° | VHM RockTec | DIN 6535 HA

ATORN®

**Type**
**- Short**
- With undercut
- Right-hand cut
- 6-8 cutting edges
- Right-hand helix 50°
- With smooth straight shank in compliance with DIN 6535 HA.

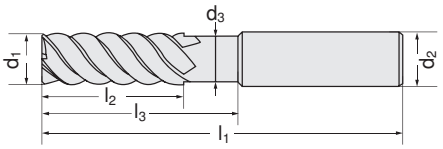
≤ 1600 N/mm² | 52 HRC

16824 101-109

65 HRC

16824 301-309

| $d_1$ (e8) mm | $l_2$ mm | $l_3$ mm | $l_1$ mm | $d_3$ mm | $d_2$ (h6) mm | Z | RockTec 52 16824 ... | RockTec 65 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-steel<900N | VA-steel >900N | Ti | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **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 multiple teeth milling cutter

Z 6-8 | ≈ 50° | VHM RockTec | DIN 6535 HA

ATORN®

**Type**
**- Long**
- With undercut
- Right-hand cut
- 6-8 cutting edges
- Right-hand helix 50°
- With smooth straight shank in compliance with DIN 6535 HA.

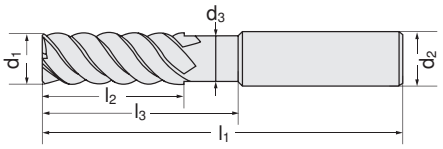
≤ 1600 N/mm² | 52 HRC

16825 101-109

65 HRC

16825 301-309

| $d_1$ (e8) mm | $l_2$ mm | $l_3$ mm | $l_1$ mm | $d_3$ mm | $d_2$ (h6) mm | Z | RockTec 52 16825 ... | RockTec 65 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-steel<900N | VA-steel >900N | Ti | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **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 Milling Cutters

Z 2 | ≈ 30° | VHM RockTec | DIN 6535 HA

ATORN®

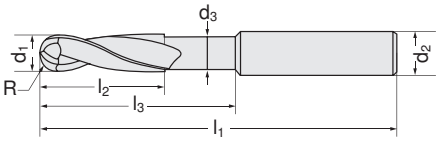
**Type**
**- Short**
- With undercut
- Right-hand cut
- 2 cutting edges
- Right-hand helix 30°
- With smooth straight shank in compliance with DIN 6535 HA.

≤ 1600 N/mm² | 52 HRC

16827 101-111

65 HRC

16827 301-311




| | | | | | | | RockTec 52 | | RockTec 65 | |
|---|---|---|---|---|---|---|---|---|---|---|
| $d_1$ mm | R mm | $l_2$ mm | $l_3$ mm | $l_1$ mm | $d_3$ mm | $d_2$ (h6) mm | 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-steel<900N | VA-steel >900N | Ti | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **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 Milling Cutters

Z 2 | ≈ 30° | VHM RockTec | DIN 6535 HA

ATORN®

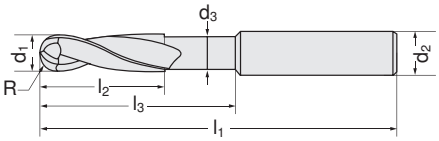
**Type**
**- Long**
- With undercut
- Right-hand cut
- 2 cutting edges
- Right-hand helix 30°
- With smooth straight shank in compliance with DIN 6535 HA.

≤ 1600 N/mm² | 52 HRC

16828 101-111

65 HRC

16828 301-311




| | | | | | | | RockTec 52 | | RockTec 65 | |
|---|---|---|---|---|---|---|---|---|---|---|
| $d_1$ (e8) mm | R mm | $l_2$ mm | $l_3$ mm | $l_1$ mm | $d_3$ mm | $d_2$ (h6) mm | 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-steel<900N | VA-steel >900N | Ti | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **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 Milling Cutters

Z 2 | ≈ 30° | VHM RockTec | DIN 6535 HA

ATORN®

**Type**
**- Extra long**
- With undercut
- Right-hand cut
- 2 cutting edges
- Right-hand helix 30°
- With smooth straight shank in compliance with DIN 6535 HA.

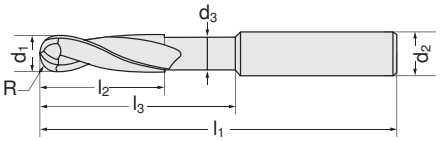
≤ 1600 N/mm² | 52 HRC

16829 101-111

65 HRC

16829 301-311

| | | | | | | | RockTec 52 | | RockTec 65 | |
|---|---|---|---|---|---|---|---|---|---|---|
| $d_1$ mm | R mm | $l_2$ mm | $l_3$ mm | $l_1$ mm | $d_3$ mm | $d_2$ (h6) mm | 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-steel<900N | VA-steel >900N | Ti | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **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 | - | - | - | - | - |

## 16830 Solid Carbide Radius Milling Cutters

Z 4 | ≈ 30° | VHM RockTec | DIN 6535 HA

ATORN®

**Type**
**- Short**
- With undercut
- Right-hand cut
- 4 cutting edges
- Right-hand helix 30°
- With smooth straight shank in compliance with DIN 6535 HA.

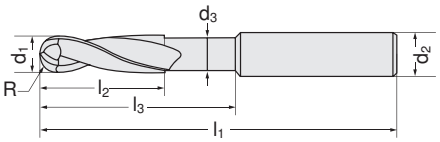
≤ 1600 N/mm² | 52 HRC

16830 103-111

65 HRC

16830 303-311

| | | | | | | | RockTec 52 | | RockTec 65 | |
|---|---|---|---|---|---|---|---|---|---|---|
| $d_1$ (e8) mm | R mm | $l_2$ mm | $l_3$ mm | $l_1$ mm | $d_3$ mm | $d_2$ (h6) mm | 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-steel<900N | VA-steel >900N | Ti | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **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 Milling Cutters

Z 4 | ≈ 30° | VHM RockTec | DIN 6535 HA

ATORN®

**Type**

**- Long**

- With undercut
- Right-hand cut
- 4 cutting edges
- Right-hand helix 30°
- With smooth straight shank in compliance with DIN 6535 HA.

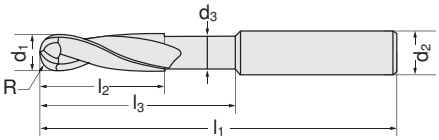
≤ 1600 N/mm² | 52 HRC

16831 103-111

65 HRC

16831 303-311

| $d_1$ (e8) mm | R mm | $l_2$ mm | $l_3$ mm | $l_1$ mm | $d_3$ mm | $d_2$ (h6) mm | RockTec 52 16831 ... | RockTec 65 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-steel<900N | VA-steel >900N | Ti | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **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-speed cutter

Z 4-6 | R | VHM RockTec | DIN 6535 HA

ATORN®

**Type**

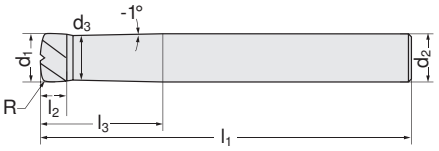
- 4 or 6 flute high feed-rate milling cutter with a TiSi-based PVD coating
- Short flutes for increased stability, longer service life, greater stock-removal capacity and higher feed-rates

**Use**

For roughing tasks in the area off tool construction and mould construction and in general machine construction, also for dry milling or with air cooling.

65 HRC

16832




| $d_1$ (e8) mm | R mm | $l_2$ mm | $l_3$ mm | $l_1$ mm | $d_3$ mm | $d_2$ (h6) mm | Z | RockTec 65 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 |

**Rocktec 65**

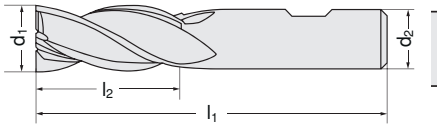
| Al<10%Si | Al>10%Si | Cu | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA-steel<900N | VA-steel>900N | Ti | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| - | - | - | - | - | - | - | - | 160 | 160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

## 16601 Solid Carbide End Milling Cutters

Z 2 | HSC | ≈ 30° | VHM TiAlN | DIN 6535 HB | 60 HRC

**Type**
**Short, right-hand cut, 2 cutting edges,** right-hand helix, **centre cut.** With clamping surface in accordance with DIN 6535 HB.

16601




| $d_1$ e8 mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 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 |
| **6,5** | 16 | 60 | 8 | 108 |
| **8,0** | 19 | 60 | 8 | 111 |

| $d_1$ e8 mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 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-steel<900N | VA-steel>900N | Ti-alloys | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| - | - | - | 150-190 | 140-170 | 130-160 | 100-120 | 90-110 | 60-90 | 55-65 | 50-55 | 40-55 | - | - | - | - | - | - |

## 16603 Solid carbide HSC end milling cutters

Z 2 | 45° | HSC | ≈ 30° | TiAlN Ultra | DIN 6535 HA | DIN 6535 HB | Uni

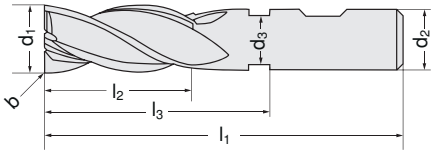
ATORN®

**Type**
**With undercut. 2 cutting edges,** 1 flute cutting over centre. 30° right-hand helix. Best chip removal thanks to extremely smooth surface.
**Quality**
**solid carbide Ultra-finest grit/TiAlN-Ultra-coated.**

16603 117-144

**16603 101-116**
**Type**
With smooth straight shank in compliance with DIN 6535 HA.

**16603 117-144**
**Type**
With clamping surface in accordance with DIN 6535 HB.




| $d_1$ e8 mm | $d_2$ h5 mm | $d_3$ mm | $l_1$ mm | $l_3$ mm | $l_2$ mm | b x 45° mm | 16603 ... |
|---|---|---|---|---|---|---|---|
| **0,3** | 3 | - | 38 | - | 1 | 0,1 | 101 |
| **0,5** | 3 | - | 38 | - | 1,5 | 0,1 | 103 |
| **0,8** | 3 | - | 38 | - | 2 | 0,1 | 106 |
| **1,0** | 3 | - | 50 | - | 3 | 0,1 | 108 |
| **1,2** | 3 | - | 50 | - | 4 | 0,1 | 110 |
| **1,4** | 3 | - | 50 | - | 4 | 0,1 | 111 |
| **1,5** | 3 | - | 50 | - | 4 | 0,1 | 112 |
| **1,6** | 3 | - | 50 | - | 4 | 0,1 | 113 |
| **2,0** | 3 | - | 50 | - | 5 | 0,1 | 115 |
| **2,5** | 3 | - | 50 | - | 6 | 0,1 | 116 |
| **2,8** | 6 | 2,6 | 57 | 15 | 8 | 0,1 | 117 |
| **3,0** | 6 | 2,8 | 57 | 15 | 8 | 0,1 | 118 |
| **3,8** | 6 | 3,6 | 57 | 15 | 11 | 0,1 | 119 |
| **4,0** | 6 | 3,8 | 57 | 15 | 11 | 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 |
| **5,8** | 6 | 5,6 | 57 | 21 | 13 | 0,1 | 123 |

| $d_1$ e8 mm | $d_2$ h5 mm | $d_3$ mm | $l_1$ mm | $l_3$ mm | $l_2$ mm | b x 45° mm | 16603 ... |
|---|---|---|---|---|---|---|---|
| **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 |

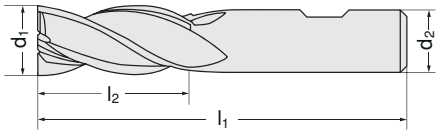
| Al<10%Si | Al>10%Si | Cu | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <50HRC | <55HRC | <60HRC | <67HRC | VA-steel<900N | VA-steel>900N | Ti-alloys | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 400-500 | 200-400 | 100-140 | 110-160 | 90-140 | 80-120 | 80-100 | 80-90 | - | - | - | - | - | 70-80 | 55-70 | 20-50 | 90-155 | - |

## 16604 Solid Carbide End Milling Cutters

Z 2 | HSC | ≈ 30° | VHM TiAlN | DIN 6535 HB | 60 HRC

**Type**
**Long, right-hand cut, 2 cutting edges,** right-hand helix, centre cut.
**Quality**
**Universal carbide quality finest grit (P 20 - K 40)**
**TiAlN-coated.**

16604




| $d_1$ e8 mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 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 |

| $d_1$ e8 mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 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-steel<900N | VA-steel>900N | Ti alloys | GG(G) | plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| - | - | - | 150-190 | 140-170 | 130-160 | 100-120 | 90-110 | 60-90 | 55-65 | 50-55 | 40-55 | - | - | - | - | - | - |

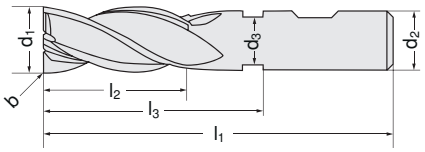
## 16607 Solid Carbide HSC End Milling Cutters

Z 3 | 45° | HPC | ≈ 45° | TiAlN Ultra | DIN 6535 HB | Uni

ATORN®

**Type**
**With undercut. 3 cutting edges,** 1 flute cutting over centre. 45° right-hand helix. With clamping surface in accordance with DIN 6535 HB. Best chip removal thanks to extremely smooth surface.
**Quality**
**solid carbide Ultra-finest grit/TiAlN-Ultra-coated.**

16607




| $d_1$ e8 mm | $d_2$ h5 mm | d3 mm | l1 mm | l3 mm | l2 mm | b x 45° mm | 16607 ... |
|---|---|---|---|---|---|---|---|
| **3,0** | 6 | 2,8 | 57 | 15 | 8 | 0,1 | 101 |
| **3,5** | 6 | 3,3 | 57 | 15 | 11 | 0,1 | 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 | 0,1 | 110 |
| **8,0** | 8 | 7,7 | 63 | 27 | 21 | 0,1 | 111 |

| $d_1$ e8 mm | $d_2$ h5 mm | d3 mm | l1 mm | l3 mm | l2 mm | b x 45° mm | 16607 ... |
|---|---|---|---|---|---|---|---|
| **8,5** | 10 | 8,3 | 72 | 32 | 21 | 0,1 | 112 |
| **9,0** | 10 | 8,8 | 72 | 32 | 21 | 0,1 | 113 |
| **9,5** | 10 | 9,3 | 72 | 32 | 22 | 0,1 | 114 |
| **10,0** | 10 | 9,8 | 72 | 32 | 22 | 0,1 | 115 |
| **11,0** | 12 | 10,8 | 83 | 32 | 26 | 0,1 | 116 |
| **12,0** | 12 | 11,8 | 83 | 38 | 26 | 0,1 | 117 |
| **14,0** | 14 | 13,8 | 83 | 38 | 26 | 0,1 | 118 |
| **16,0** | 16 | 15,7 | 92 | 44 | 36 | 0,1 | 119 |
| **18,0** | 18 | 17,7 | 92 | 44 | 36 | 0,1 | 120 |
| **20,0** | 20 | 19,7 | 104 | 54 | 41 | 0,1 | 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-steel<900N | VA-steel>900N | Ti alloys | GG(G) | plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 400-500 | 200-400 | 100-140 | 110-160 | 90-140 | 80-120 | 80-100 | 80-90 | - | - | - | - | - | 70-80 | 55-70 | 20-50 | 90-155 | - |

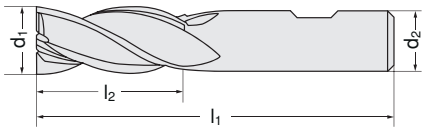
## 16609 Solid Carbide End Milling Cutters

Z 4 | HSC | ≈ 30° | VHM TiAlN | DIN 6535 HB | 60 HRC

HW

**Type**
**Short,** right-hand cut, **4 cutting edges,**
Right-hand helix, **centre cut.** With clamping surface in compliance with DIN 6535 HB.
**Quality**
**Universal carbide quality finest grit (P 20 - K 40)**
**TiAlN-coated.**

16609




| $d_1$ e8 mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 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 |

| $d_1$ e8 mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 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-steel<900N | VA-steel>900N | Ti-alloys | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 400 | 300 | 250 | 300 | 250 | 200 | 180 | 160 | 140 | 80 | 60 | 40 | - | 120 | 100 | 60 | 180 | - |

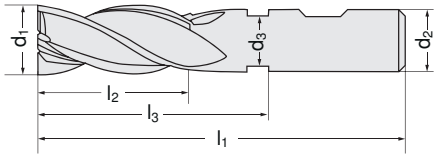
## 16610 Solid Carbide HSC End Milling Cutters

Z 4 | HPC | ≈ 30° | TiAlN Ultra | DIN 6535 HA | DIN 6535 HB | Uni

ATORN®

**Type**
**Short with undercut, 4 cutting edges,** 2 flutes cutting to the centre. 30° right-hand helix. Best chip removal thanks to extremely smooth surface.
**Quality**
**solid carbide Ultra-finest grit/TiAlN-Ultra-coated.**

16610




**16610 102-104**
**Type**
**Without undercut,** with smooth straight shank in compliance with DIN 6535 HA.

**16610 105**
**Type**
**With undercut** and smooth straight shank in compliance with DIN 6535 HA.

**16610 106-120**
**Type**
**With undercut** and clamping surface in compliance with DIN 6535 HB.

| $d_1$ e8 mm | $d_2$ h5 mm | $d_3$ mm | $l_1$ mm | $l_3$ mm | $l_2$ 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 | 9,6 | 73 | 31 | 25 | 110 |
| **12,0** | 12 | 11,6 | 84 | 37 | 28 | 112 |
| **16,0** | 16 | 15,5 | 93 | 43 | 35 | 116 |
| **20,0** | 20 | 19,5 | 104 | 52 | 40 | 120 |

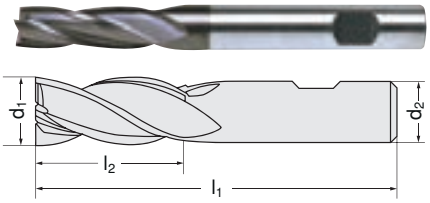
| Al<10%Si | Al>10%Si | Cu | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <50HRC | <55HRC | <60HRC | <67HRC | VA-steel<900N | VA-steel>900N | Ti alloys | GG(G) | plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 400-500 | 200-400 | 100-140 | 110-160 | 90-140 | 80-120 | 80-100 | 80-90 | - | - | - | - | - | 70-80 | 55-70 | 20-50 | 90-155 | - |

## 16613 Solid Carbide End Milling Cutters

Z 4 | HSC | ≈ 30° | VHM TiAlN | DIN 6535 HB | 60 HRC

16613

**Type**
**Long, centre cut.**
**Quality**
**Universal carbide quality finest grit**
**(P 20 - K 40) TiAlN-coated.**




| $d_1$ mm | $l_2$ mm | $l_1$ mm | $d_2$ 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 |

| $d_1$ mm | $l_2$ mm | $l_1$ mm | $d_2$ 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-steel<900N | VA-steel>900N | Ti-alloys | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| - | - | - | 300 | 250 | 200 | 180 | 160 | 140 | 80 | 60 | 40 | - | - | - | - | - | - |

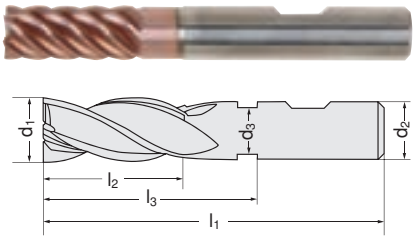
## 16616 Solid Carbide End Milling Cutters

Z 6-8 | HSC | ≈ 45° | TiAlN Ultra | DIN 6535 HB | Uni

ATORN®

16616

**Type**
**Short, with undercut. 6-8 cutting edges,** 2 flutes cutting to the centre. 45° right-hand helix. With clamping surface in accordance with DIN 6535 HB. Best chip removal thanks to extremely smooth surface.
**Quality**
**Solid carbide Ultra-finest grit/TiAlN-Ultra-coated.**




| $d_1$ e8 mm | $d_2$ h5 mm | $d_3$ mm | $l_1$ mm | $l_3$ mm | $l_2$ mm | Z | 16616 ... |
|---|---|---|---|---|---|---|---|
| **4,0** | 6 | 3,7 | 57 | 19 | 11 | 6 | 201 |
| **5,0** | 6 | 4,7 | 57 | 19 | 13 | 6 | 202 |
| **6,0** | 6 | 5,7 | 57 | 19 | 13 | 6 | 203 |
| **8,0** | 8 | 7,7 | 63 | 25 | 19 | 6 | 204 |
| **10,0** | 10 | 9,7 | 72 | 30 | 22 | 6 | 205 |
| **12,0** | 12 | 11,5 | 83 | 36 | 26 | 6 | 206 |
| **16,0** | 16 | 15,5 | 92 | 42 | 32 | 6 | 208 |
| **18,0** | 18 | 17,5 | 92 | 42 | 32 | 8 | 209 |
| **20,0** | 20 | 19,5 | 104 | 52 | 38 | 8 | 210 |

| Al<10%Si | Al>10%Si | Cu | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1300N | <50HRC | <55HRC | <60HRC | <67HRC | VA-steel<900N | VA-steel>900N | Ti alloys | GG(G) | plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| - | - | - | 130-180 | 110-170 | 130-140 | 120-130 | 110-120 | 90-100 | - | - | - | - | 80-110 | 80-110 | - | 130-220 | - |

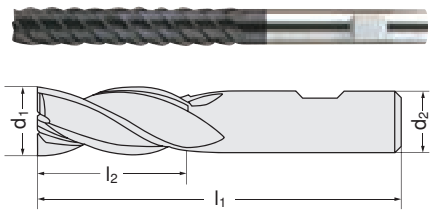
## 16619 Solid Carbide End Milling Cutters

Z 6 | HSC | ≈ 45° | VHM TiAlN | DIN 6535 HB | 60 HRC

16619

**Type**
**Extra long,** right-hand cut, **6 cutting edges.** Right-hand helix approx. 45°. With clamping surface in accordance with DIN 6535 HB.
**Use**
For circumference milling as finishing working step for producing highest surface quality (face cutting only at low cutting depths).

**Quality**
**Universal carbide quality finest grit**
**(P 20 - K 40) TiAlN-coated.**




| $d_1$ e8 mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 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 |

| $d_1$ e8 mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 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-steel<900N | VA-steel>900N | Ti-alloys | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| - | - | - | 300 | 250 | 200 | 180 | 160 | 140 | 80 | 60 | 40 | - | - | - | - | - | - |



= Sales are restricted to the packaging units mentioned in the catalogue. Purchase orders must be in units.

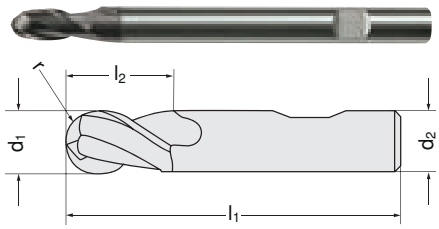
## 16621 Solid Carbide Radius Milling Cutters

Z 2 | HSC | ≈ 30° | VHM TiAlN | DIN 6535 HB | 60 HRC

**Type**
**- Long**
- Right-hand cut
**- 2 cutting edges**
- Right-hand helix
**- Centre cut**
- Radius tolerance +/– 0,02 mm.
- With clamping surface in accordance with DIN 6535 HB.

**Quality**
**Universal carbide quality finest grit (P 20 - K 40) TiAlN-coated.**

16621




| $d_1$ e8 mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 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 |

| $d_1$ e8 mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 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-steel<900N | VA-steel>900N | Ti-alloys | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| - | - | - | 300 | 250 | 200 | 180 | 160 | 140 | 80 | 60 | 40 | - | 120 | 100 | 60 | 180 | - |

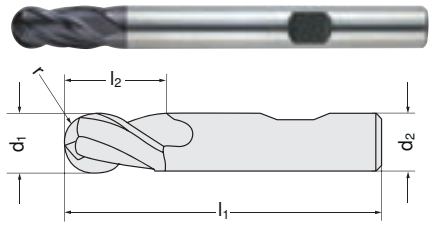
## 16625 Solid Carbide Radius Milling Cutters

Z 4 | HSC | ≈ 30° | VHM TiAlN | DIN 6535 HB | 60 HRC

**Type**
**- Long**
- Right-hand cut
**- 4 cutting edges**
- Right-hand helix
**- Centre cut**
- Radius tolerance +/– 0,02 mm.
- With clamping surface in accordance with DIN 6535 HB.

**Quality**
**Universal carbide quality finest grit (P 20 - K 40) TiAlN-coated.**

16625




| $d_1$ e8 mm | $l_2$ mm | $l_1$ mm | $d_2$ 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 |

| $d_1$ e8 mm | $l_2$ mm | $l_1$ mm | $d_2$ 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-steel<900N | VA-steel>900N | Ti-alloys | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| - | - | - | 300 | 250 | 200 | 180 | 160 | 140 | 80 | 60 | 40 | - | - | - | - | - | - |

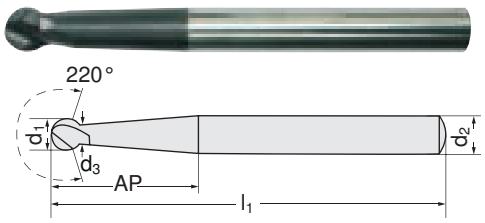
## 16655 SC ball-head milling cutter

Z 2 | H | VHM TiAlN | DIN 6535 HA | 65 HRC

**Type**
**- Extra long**
**- 2 cutting edges**
**- Centre cut**
- Spheroid to 220°
- Increased high-running accuracy
- With smooth straight shank in compliance with DIN 6535 HA.

**Use**
For heavy-duty machining, 3D profile milling of high-strength material, and for milling of hardened steel up to HRC 65.
**Quality**
**Universal carbide quality finest grit (P 20 - K 40) TiAlN-coated.**

16655




| $d_1$ mm | $d_2$ mm | $d_3$ mm | AP mm | $l_1$ mm | 16655 ... |
|---|---|---|---|---|---|
| **2,0** | 6 | 1,8 | 10 | 80 | 102 |
| **3,0** | 6 | 2,8 | 15 | 80 | 103 |
| **4,0** | 6 | 3,8 | 20 | 80 | 104 |
| **5,0** | 6 | 4,7 | 25 | 90 | 105 |

| $d_1$ mm | $d_2$ mm | $d_3$ mm | AP mm | $l_1$ mm | 16655 ... |
|---|---|---|---|---|---|
| **6,0** | 6 | 5,7 | 30 | 100 | 106 |
| **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-steel<900N | VA-steel>900N | Ti-alloys | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| - | - | - | 140-160 | 120-140 | 100-120 | 70-80 | 60-70 | 70 | 65 | 50 | 30 | 30 | - | - | - | - | - |

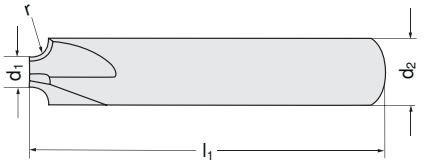
## 16658 Solid carbide quarter circle cutter

Z 4 | VHM TiAlN | DIN 6535 HA | 45 HRC | Uni

**Type**
**4 cutting blades,** straight flute.
With smooth straight shank in compliance with DIN 6535 HA. Radius tolerance +/– 0,01 mm.

**Use**
**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 quality finest grit (P 20 - K 40)**
**TiAlN-coated.**

16658




| Radius | $d_1$ mm | $l_1$ mm | $d_2$ mm | 16658 ... |
|---|---|---|---|---|
| 0,5 | 7 | 70 | 8 | 105 |
| 1,0 | 6 | 70 | 8 | 110 |
| 1,5 | 7 | 75 | 10 | 115 |
| 2,0 | 6 | 75 | 10 | 120 |
| 2,5 | 7 | 75 | 12 | 125 |
| 3,0 | 6 | 75 | 12 | 130 |
| 3,5 | 9 | 80 | 16 | 135 |
| 4,0 | 8 | 80 | 16 | 140 |
| 4,5 | 7 | 80 | 16 | 145 |
| 5,0 | 10 | 80 | 20 | 150 |
| 6,0 | 8 | 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-steel<900N | VA-steel>900N | Ti-alloys | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 | - |

## 16650 - 16651 Solid Carbide Roughing End Milling Cutters Quickmax

Z 3-6 | HSC | HR | VHM TiAlN | 50 HRC | Uni

**Type**
**Short, 3 -6 cutting edges, centre cut.** Right-hand helix 45°. Great cutting capacity. With protective chamfer, special roughing profile. Long service life. Quick chip removal. Extremely sturdy cutting edges. Great stability.
**Use**
Alloyed steels, stainless steel, titanium, Inconel.

**Quality**
**Universal carbide quality finest grit (P 20 - K 40)**
**TiAlN-coated.**

**16650**
With smooth straight shank in compliance with DIN 6535 HA.

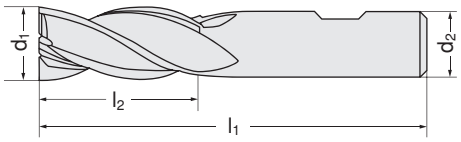
**16651**
With clamping surface in accordance with DIN 6535 HB.

16650

DIN 6535 HA

16651

DIN 6535 HB




| | | | | | DIN 6535 HA | | DIN 6535 HB | |
|---|---|---|---|---|---|---|---|---|
| $d_1$ mm | $l_2$ mm | $l_1$ mm | $d_2$ 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-steel<900N | VA-steel>900N | Ti-alloys | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| - | - | - | 140-160 | 100-140 | 90-120 | 90 | 80 | 60 | 60 | 50 | - | - | 100 | 90 | 70 | 80 | - |

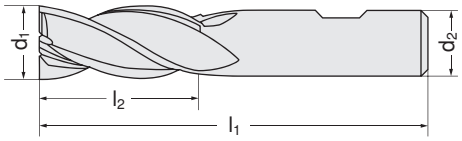
## 16629 Solid Carbide Roughing End Milling Cutters

Z 3-4 | HSC | HR | VHM TiAlN | DIN 6535 HB | 60 HRC | Uni

**Type**
**Long,** relief-ground, fine knurl profile, right-hand cut with **centre cut. 3-4 cutting edges.** With clamping surface in accordance with DIN 6535 HB.

**Quality**
**Universal carbide quality finest grit (P 20 - K 40)**
**TiAlN-coated.**

16629




| $d_1$ e8 mm | $l_2$ mm | $l_1$ mm | $d_2$ h6 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 |
| 18,0 | 32 | 92 | 18 | 4 | 109 |
| 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-steel<900N | VA-steel>900N | Ti-alloys | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 400 | 300 | 250 | 300 | 250 | 200 | 180 | 160 | 140 | 80 | 60 | 40 | - | 120 | 100 | 60 | 180 | - |

## 16637 Solid Carbide Torus Milling Cutters

Z 4 | HSC | VHM TiAlN | DIN 6535 HB | 65 HRC

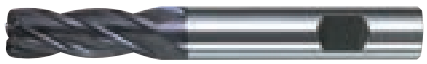
**Type** 16637

With clamping surface in accordance with DIN 6535 HB. **Long,** right-hand cut, **4 cutting edges with corer radius (1).**

**Quality**

**Universal carbide quality finest grit (P 20 - K 40) TiAlN-coated.**

(1)



| $d_1$ e8 mm | $l_2$ mm | $l_1$ mm | $d_2$ 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 1,5 | 25 | 70 | 8 | 105 |
| 8 x R 2 | 25 | 70 | 8 | 106 |
| 10 x R 0,5 | 30 | 90 | 10 | 107 |

| $d_1$ e8 mm | $l_2$ mm | $l_1$ mm | $d_2$ mm | 16637 ... |
|---|---|---|---|---|
| 10 x R 1 | 30 | 90 | 10 | 108 |
| 10 x R 1,5 | 30 | 90 | 10 | 109 |
| 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 1,5 | 30 | 90 | 12 | 113 |
| 12 x R 2 | 30 | 90 | 12 | 114 |

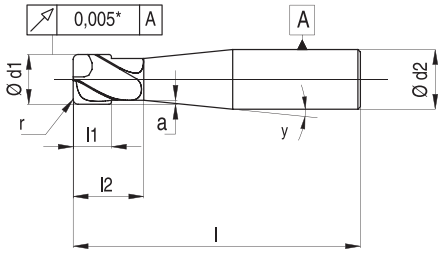
| Al<10%Si | Al>10%Si | Cu | St<520N | St<750N | St<900N | St<1100N | St<1200N | St<1400N | <45HRC | <55HRC | <60HRC | <67HRC | VA-steel<900N | VA-steel>900N | Ti-alloys | GG(G) | Plastics |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 400 | 300 | 250 | 300 | 250 | 200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

## 16702 Solid Carbide End Milling Cutters for Graphite

Z 2-3 | VHM | DIN 6535 HA | Graphit

**Type** 16702

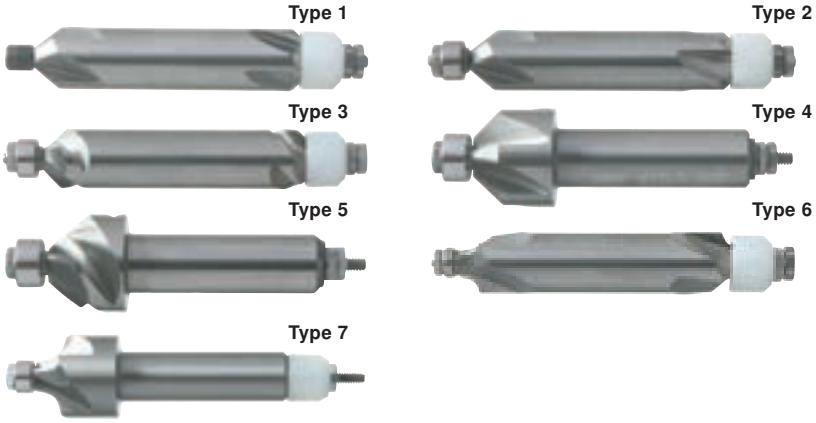
**Long and extra long,** right-hand cut,
**2-3 cutting edges,** right-hand helix approx. 40°,
centre cut, with smooth straight shank in compliance with DIN 6535 HA.




| $d_1$ g7 mm | r mm | $d_2$ h5 mm | l mm | $l_1$ mm | | y (°) | 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-steel<900N | VA-steel>900N | Ti alloys | GG(G) | graphite |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 200 |

**Type**
Double flute (cat.-no. 16750 139-152 single flute).
Clamping shank 6 mm. Pilot hardened.
**Use**
For edge and contour deburring machines.
Rake angle 0° for short-chipping, hard materials.
Rake angle 6° for strength-hard materials.
Rake angle 12° for ductile up to soft materials.
Rake angle 30° for soft materials.
**Quality**
**Universal carbide quality finest grit.**




| Type | Application / Type | D x L mm | Point angle/ Radius | Z | Rake angle | Coating | 16750 ... |
|---|---|---|---|---|---|---|---|
| 1 | with synchronous rotation thrust pin (Ø 2.5 mm) | 6 x 34 | 90° | 4 | 0° | – | 101 |
| 1 | with synchronous rotation thrust pin (Ø 2.5 mm) | 6 x 34 | 90° | 4 | 0° | TiAlN | 102 |
| 2 | with ball bearing starter roller (Ø 3.0 mm) | 6 x 34 | 90° | 4 | 0° | – | 103 |
| 2 | with ball bearing starter roller (Ø 3.0 mm) | 6 x 34 | 90 ° | 4 | 0° | TiAlN | 104 |
| 2 | with ball bearing starter roller (Ø 4.0 mm) | 6 x 34 | 90 ° | 4 | 0° | TiAlN | 106 |
| 1 | with synchronous rotation thrust pin (Ø 2.5 mm) | 6 x 34 | 90° | 6 | 0° | – | 107 |
| 1 | with synchronous rotation thrust pin (Ø 2.5 mm) | 6 x 34 | 90° | 6 | 0° | TiAlN | 108 |
| 2 | with ball bearing starter roller (Ø 3.0 mm) | 6 x 34 | 90° | 6 | 0° | – | 109 |
| 2 | with ball bearing starter roller (Ø 3.0 mm) | 6 x 34 | 90° | 6 | 0° | TiAlN | 110 |
| 2 | with ball bearing starter roller (Ø 4.0 mm) | 6 x 34 | 90° | 6 | 0° | – | 111 |
| 2 | with ball bearing starter roller (Ø 4.0 mm) | 6 x 34 | 90 ° | 6 | 0° | TiAlN | 112 |
| 1 | with synchronous rotation thrust pin (Ø 2.5 mm) | 6 x 34 | 90° | 4 | 6° | – | 113 |
| 1 | with synchronous rotation thrust pin (Ø 2.5 mm) | 6 x 34 | 90° | 4 | 6° | TiAlN | 114 |
| 2 | with ball bearing starter roller (Ø 3.0 mm) | 6 x 34 | 90° | 4 | 6° | – | 115 |
| 2 | with ball bearing starter roller (Ø 3.0 mm) | 6 x 34 | 90 ° | 4 | 6° | TiAlN | 116 |
| 2 | with ball bearing starter roller (Ø 4.0 mm) | 6 x 34 | 90° | 4 | 6° | – | 117 |
| 2 | with ball bearing starter roller (Ø 4.0 mm) | 6 x 34 | 90° | 4 | 6° | TiAlN | 118 |
| 1 | with synchronous rotation thrust pin (Ø 2.5 mm) | 6 x 34 | 90° | 4 | 12° | – | 119 |
| 1 | with synchronous rotation thrust pin (Ø 2.5 mm) | 6 x 34 | 90° | 4 | 12° | TiAlN | 120 |
| 1 | with synchronous rotation thrust pin (Ø 2.5 mm) | 6 x 34 | 90° | 3 | 12° | TiAlN-ALU | 121 |
| 2 | with ball bearing starter roller (Ø 3.0 mm) | 6 x 34 | 90° | 4 | 12° | – | 122 |
| 2 | with ball bearing starter roller (Ø 3.0 mm) | 6 x 34 | 90° | 4 | 12° | TiAlN | 123 |
| 2 | with ball bearing starter roller (Ø 3.0 mm) | 6 x 34 | 90° | 3 | 12° | TiAlN-ALU | 124 |
| 2 | with ball bearing starter roller (Ø 4.0 mm) | 6 x 34 | 90° | 4 | 12° | – | 125 |
| 2 | with ball bearing starter roller (Ø 4,0 mm) | 6 x 34 | 90° | 4 | 12° | TiAlN | 126 |
| 2 | with ball bearing starter roller (Ø 4.0 mm) | 6 x 34 | 90° | 3 | 12° | TiAlN-ALU | 127 |
| 3 | with synchronous rotation thrust pin (Ø 2.5 mm) | 6 x 34 | 90° | 3 | 30° | – | 128 |
| 3 | with synchronous rotation thrust pin (Ø 2.5 mm) | 6 x 34 | 90° | 3 | 30° | TiAlN | 129 |
| 3 | with synchronous rotation thrust pin (Ø 2.5 mm) | 6 x 34 | 90° | 3 | 30° | TiAlN-ALU | 130 |
| 3 | with ball bearing starter roller (Ø 3.0 mm) | 6 x 34 | 90° | 3 | 30° | – | 131 |
| 3 | with ball bearing starter roller (Ø 3,0 mm) | 6 x 34 | 90° | 3 | 30° | TiAlN | 132 |
| 3 | with ball bearing starter roller (Ø 3.0 mm) | 6 x 34 | 90° | 3 | 30° | TiAlN-ALU | 133 |
| 3 | with ball bearing starter roller (Ø 4.0 mm) | 6 x 34 | 90° | 3 | 30° | – | 134 |
| 3 | with ball bearing starter roller (Ø 4.0 mm) | 6 x 34 | 90° | 3 | 30° | TiAlN | 135 |
| 3 | with ball bearing starter roller (Ø 4.0 mm) | 6 x 34 | 90° | 3 | 30° | TiAlN-ALU | 136 |
| 4 | with ball bearing starter roller (Ø 4.0 mm) | 10 x 34 | 90° | 6 | 0° | – | 137 |
| 4 | with ball bearing starter roller (Ø 4.0 mm) | 10 x 34 | 90° | 6 | 0° | TiAlN | 138 |
| 4 | with ball bearing starter roller (Ø 5.0 mm) | 10 x 34 | 90° | 6 | 0° | – | 139 |
| 4 | with ball bearing starter roller (Ø 5.0 mm) | 10 x 34 | 90° | 6 | 0° | TiAlN | 140 |
| 4 | with ball bearing starter roller (Ø 4.0 mm) | 10 x 34 | 90° | 3 | 6° | – | 141 |
| 4 | with ball bearing starter roller (Ø 4.0 mm) | 10 x 34 | 90° | 3 | 6° | TiAlN | 142 |
| 4 | with ball bearing starter roller (Ø 5.0 mm) | 10 x 34 | 90° | 3 | 6° | – | 143 |
| 4 | with ball bearing starter roller (Ø 5.0 mm) | 10 x 34 | 90° | 3 | 6° | TiAlN | 144 |
| 5 | with ball bearing starter roller (Ø 4.0 mm) | 10 x 34 | 90° | 3 | 30° | – | 145 |
| 5 | with ball bearing starter roller (Ø 4.0 mm) | 10 x 34 | 90° | 3 | 30° | TiAlN | 146 |
| 5 | with ball bearing starter roller (Ø 4.0 mm) | 10 x 34 | 90° | 3 | 30° | TiAlN-ALU | 147 |
| 5 | with ball bearing starter roller (Ø 5.0 mm) | 10 x 34 | 90° | 3 | 30° | – | 148 |
| 5 | with ball bearing starter roller (Ø 5.0 mm) | 10 x 34 | 90° | 3 | 30° | TiAlN | 149 |
| 5 | with ball bearing starter roller (Ø 5.0 mm) | 10 x 34 | 90° | 3 | 30° | TiAlN-ALU | 150 |

Continuation ▶

Continuation ▶

| Type | Application / Type | D x L mm | Point angle/ Radius | Z | Rake angle | Coating | 16750 | ... |
|---|---|---|---|---|---|---|---|---|
| 6 | with ball bearing starter roller (Ø 3.0 mm) | 6 x 34 | R 0,5° | 3 | 0° | – | | 151 |
| 6 | with ball bearing starter roller (Ø 3.0 mm) | 6 x 34 | R 1,0 mm | 3 | 0° | – | | 152 |
| 6 | with ball bearing starter roller (Ø 3.0 mm) | 6 x 34 | R 1,5 mm | 3 | 0° | – | | 153 |
| 7 | with ball bearing starter roller (Ø 4.0 mm) | 10 x 34 | R 2,0 mm | 3 | 0° | – | | 154 |
| 7 | with ball bearing starter roller (Ø 4.0 mm) | 10 x 34 | R 2,5 mm | 3 | 0° | – | | 155 |
| 7 | with ball bearing starter roller (Ø 4.0 mm) | 10 x 34 | R 3,0 mm | 3 | 0° | – | | 156 |



**Suitability recommendations for SC form end milling cutter cat.-no. 16750** ++ suitable + partially suitable

| typ | MILLING CUTTERS | steel | | | | copper alloys/ cast iron | | | stainless steel | | | aluminium | | plastics | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | hardened steel | tool steel | case-hardened steel tempered steel cast steel | Free cutting steel (short-chipping) | copper soft brass soft | German silver Brass hard Bronze | cast iron | soft, ductile materials | high-strength, brittle materials | Free cutting alloy (short-chipping) | soft, long-chipping | Free cutting alloy (short-chipping) | soft, long-chipping | hard, short-chipping |
| 1 | 16750 101 | | | | ++ | | ++ | + | | | | | ++ | | ++ |
| 1 | 16750 102 | ++ | ++ | | ++ | | ++ | ++ | | | | | | | |
| 2 | 16750 103 | | | | ++ | | ++ | + | | | | | ++ | | ++ |
| 2 | 16750 104 | ++ | ++ | | ++ | | ++ | ++ | | | | | | | |
| 2 | 16750 105 | | | | ++ | | ++ | + | | | | | ++ | | ++ |
| 2 | 16750 106 | ++ | ++ | | ++ | | ++ | ++ | | | | | | | |
| 1 | 16750 107 | | | | ++ | | ++ | + | | | | | + | | ++ |
| 1 | 16750 108 | ++ | ++ | | ++ | | ++ | ++ | | | | | | | |
| 2 | 16750 109 | | | | ++ | | ++ | + | | | | | + | | ++ |
| 2 | 16750 110 | ++ | ++ | | ++ | | ++ | ++ | | | | | | | |
| 2 | 16750 111 | | | | ++ | | ++ | + | | | | | + | | ++ |
| 2 | 16750 112 | ++ | ++ | | ++ | | ++ | ++ | | | | | | | |
| 1 | 16750 113 | | | | ++ | | ++ | | | | ++ | | ++ | | ++ |
| 1 | 16750 114 | | | ++ | ++ | | ++ | | | ++ | ++ | | | | |
| 2 | 16750 115 | | | | ++ | | ++ | | | | ++ | | ++ | | ++ |
| 2 | 16750 116 | | | ++ | ++ | | ++ | | | ++ | ++ | | | | |
| 2 | 16750 117 | | | | ++ | | ++ | | | | ++ | | ++ | | ++ |
| 2 | 16750 118 | | | ++ | ++ | | ++ | | | ++ | ++ | | | | |
| 1 | 16750 119 | | | | ++ | + | ++ | | + | | + | + | ++ | + | ++ |
| 1 | 16750 120 | | | ++ | ++ | | ++ | | ++ | ++ | + | | | | |
| 1 | 16750 121 | | | | ++ | + | ++ | | | | | + | ++ | + | ++ |
| 2 | 16750 122 | | | | ++ | + | ++ | | + | | + | + | ++ | + | ++ |
| 2 | 16750 123 | | | ++ | ++ | | ++ | | ++ | ++ | + | | | | |
| 2 | 16750 124 | | | | ++ | + | ++ | | | | | + | ++ | + | ++ |
| 2 | 16750 125 | | | | ++ | + | ++ | | + | | + | + | | + | ++ |
| 2 | 16750 126 | | | ++ | ++ | | ++ | | ++ | ++ | + | | | | |
| 2 | 16750 127 | | | | ++ | + | ++ | | | | | + | ++ | + | ++ |
| 3 | 16750 128 | | | | | ++ | | | + | | | ++ | ++ | ++ | ++ |
| 3 | 16750 129 | | | + | | | | | ++ | | | | | | |
| 3 | 16750 130 | | | | | ++ | | | | | | ++ | ++ | ++ | ++ |
| 3 | 16750 131 | | | | | ++ | | | + | | | ++ | ++ | ++ | ++ |
| 3 | 16750 132 | | | + | | | | | ++ | | | | | | |
| 3 | 16750 133 | | | | | ++ | | | | | | ++ | ++ | ++ | ++ |
| 3 | 16750 134 | | | | | ++ | | | + | | | ++ | ++ | ++ | ++ |
| 3 | 16750 135 | | | + | | | | | ++ | | | | | | |
| 3 | 16750 136 | | | | | ++ | | | | | | ++ | ++ | ++ | ++ |
| 4 | 16750 137 | | | | ++ | | ++ | + | | | | | + | | |
| 4 | 16750 138 | ++ | + | | ++ | | ++ | ++ | | | | | | | |
| 4 | 16750 139 | | | | ++ | | ++ | + | | | | | + | | |
| 4 | 16750 140 | ++ | + | | ++ | | ++ | ++ | | | | | | | |
| 4 | 16750 141 | | | | ++ | | ++ | | + | | + | + | ++ | + | ++ |
| 4 | 16750 142 | | | ++ | ++ | | ++ | | ++ | | ++ | | | | |
| 4 | 16750 143 | | | | ++ | | ++ | | + | | + | + | ++ | + | ++ |
| 4 | 16750 144 | | | ++ | ++ | | ++ | | ++ | | ++ | | | | |
| 5 | 16750 145 | | | | | ++ | | | + | | | ++ | ++ | ++ | ++ |
| 5 | 16750 146 | | | ++ | + | | | | ++ | | ++ | | | | |
| 5 | 16750 147 | | | | | ++ | | | | | | ++ | ++ | ++ | ++ |
| 5 | 16750 148 | | | | | ++ | | | + | | | ++ | ++ | ++ | ++ |
| 5 | 16750 149 | | | ++ | + | | | | ++ | | ++ | | | | |
| 5 | 16750 150 | | | | | ++ | | | | | | ++ | ++ | ++ | ++ |
| 6 | 16750 151 | + | ++ | ++ | ++ | ++ | ++ | ++ | + | ++ | ++ | ++ | ++ | ++ | ++ |
| 6 | 16750 152 | + | ++ | ++ | ++ | ++ | ++ | ++ | + | ++ | ++ | ++ | ++ | ++ | ++ |
| 6 | 16750 153 | | + | ++ | ++ | ++ | ++ | ++ | + | ++ | ++ | ++ | ++ | ++ | ++ |
| 7 | 16750 154 | | + | ++ | ++ | ++ | ++ | ++ | + | ++ | ++ | ++ | ++ | ++ | ++ |
| 7 | 16750 155 | | + | + | ++ | ++ | ++ | ++ | + | ++ | ++ | + | ++ | ++ | ++ |
| 7 | 16750 156 | | + | + | ++ | ++ | ++ | ++ | + | + | ++ | + | ++ | ++ | ++ |

## 16880 Sets of Push Broaches (Keyway Broaches)

**Type**
**Rake angle 8-10°.**
Each broach **comes with bases**
(e.g. 3 strokes= 2 bases). Delivered in wooden box.
**Use**
For machining keyways in **compliance with DIN 6885.** For cast iron, steel, brass and aluminium. Specially for use in hand-operated arbor presses. Short broaching time (60 seconds), short set-up time and easy to use. Guide bushes and bases are used to precisely align keyways with the borehole and to determine the proper depth.

**Quality**
**HSS.**

16880

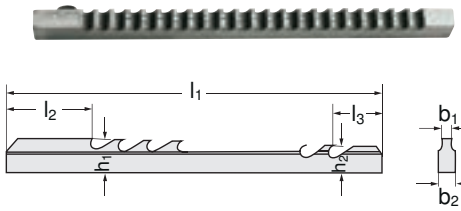
| Set size | Broaches | Guide bush Ø ($d_1$) mm | For bore Ø mm | Broaching length mm | 16880 ... |
|---|---|---|---|---|---|
| **210** | 2 pcs. RD I ($b_1$ = 2 / 3 mm) | 6 / 7 / 8 / 9 / 10 | 6 - 10 | 6 - 30 | 101 |
| **218** | 2 pcs. RD II ( b1 = 4 / 5 mm) | 12 / 14 / 15 /16 | 12 - 28 | 8 - 43 | 202 |
| | 2 pcs. RD III ($b_1$ = 6 / 8 mm) | 18 / 20 / 22 / 24 / 25 | | 10 - 64 | |
| **240** | 2 pcs. RD I (b1 = 2 / 3 mm) | 8 / 10 | 8 - 36 | 6 - 30 | 203 |
| | 2 pcs. RD II ($b_1$ = 4 / 5 mm) | 12 / 14 / 15 / 16 | | 8 - 43 | |
| | 2 pcs. RD III ($b_1$ = 6 / 8 mm) | 18 / 20 / 22 / 24 / 25 / 28 / 30 | | 10 - 64 | |
| **224** | 3 pcs. RDI V (b1 = 10 /1 2 / 14 mm) | 32 / 35 / 38 / 40 / 42 / 45 / 50 | 34 - 48 | 20 - 150 | 204 |
| **212** | 2 pcs. RD V (b1 = 16 / 18 mm) | 52 / 55 / 58 / 60 / 65 | 54 - 64 | 20 - 150 | 205 |

## 16881 Push Broaches (Keyway Broaches)

**Type**
**Rake angle 8-10°.**
Each broach **comes with bases**
(e.g. 3 strokes= 2 bases).
cat.-no. 16881 101 without base.
Guide bushes not included (see cat.-no. 16882).
**Use**
For machining keyways in **compliance with DIN 6885.** For cast iron, steel, brass and aluminium. Specially for use in hand-operated arbor presses. Short broaching time (60seconds), short set-up time and easy to use. Guide bushes and bases are used to precisely align keyways with the borehole and to determine the proper depth.

**Quality**
**HSS.**

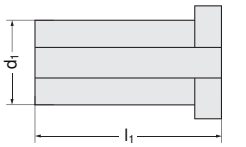
16881




| Type | $b_1$ mm | $b_2$ mm | $l_1$ mm | $l_2$ mm | $l_3$ mm | $h_1$ mm | $h_2$ mm | keyway depth mm | for boreholes Ø mm | broach 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 | 9,63 | 302 | 65 | 23 | 16,39 | 14,95 | 2,40 | 17 - 22 | 10 - 64 | 2 | +/-0,015 | 105 |
| **RD III** | 6 | 9,63 | 302 | 65 | 26 | 16,55 | 14,87 | 2,90 | 17 - 22 | 10 - 64 | 2 | +/-0,015 | 106 |
| **RD III** | 8 | 9,63 | 302 | 65 | 23 | 16,64 | 14,55 | 3,50 | 22 - 30 | 10 - 64 | 2 | +/-0,018 | 107 |
| **RD IV** | 10 | 14,29 | 340 | 65 | 33 | 23,99 | 22,29 | 3,50 | 30 - 38 | 20 - 150 | 3 | +/-0,018 | 108 |
| **RD IV** | 12 | 14,29 | 340 | 65 | 35 | 23,74 | 22,05 | 3,50 | 38 - 44 | 20 - 150 | 3 | +/-0,021 | 109 |
| **RD IV** | 14 | 14,29 | 340 | 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

**Type**
Hole tolerance H 7.
Up to RD III 36 x 65 mm with collar.
**Use**
For push broaches (keyway broaches) cat.-no. 16881.




16882

| for type | $d_1$ x $l_1$ 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 | $d_1$ x $l_1$ 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 | $d_1$ x $l_1$ 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 Bases for Push Broaches

**Use**
For push broaches (keyway broaches) cat.-no. 16881.

16883

| Size mm | thickness 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 | 1,448 | III | 105 |

| Size mm | thickness mm | for type | 16883 ... |
|---|---|---|---|
| 8 | 1,879 | III | 106 |
| 10 | 1,422 | IV | 107 |
| 12 | 1,492 | IV | 108 |
| 14 | 1,575 | IV | 109 |
| 16 | 1,575 | V | 110 |

| Size mm | thickness mm | for type | 16883 ... |
|---|---|---|---|
| 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 |