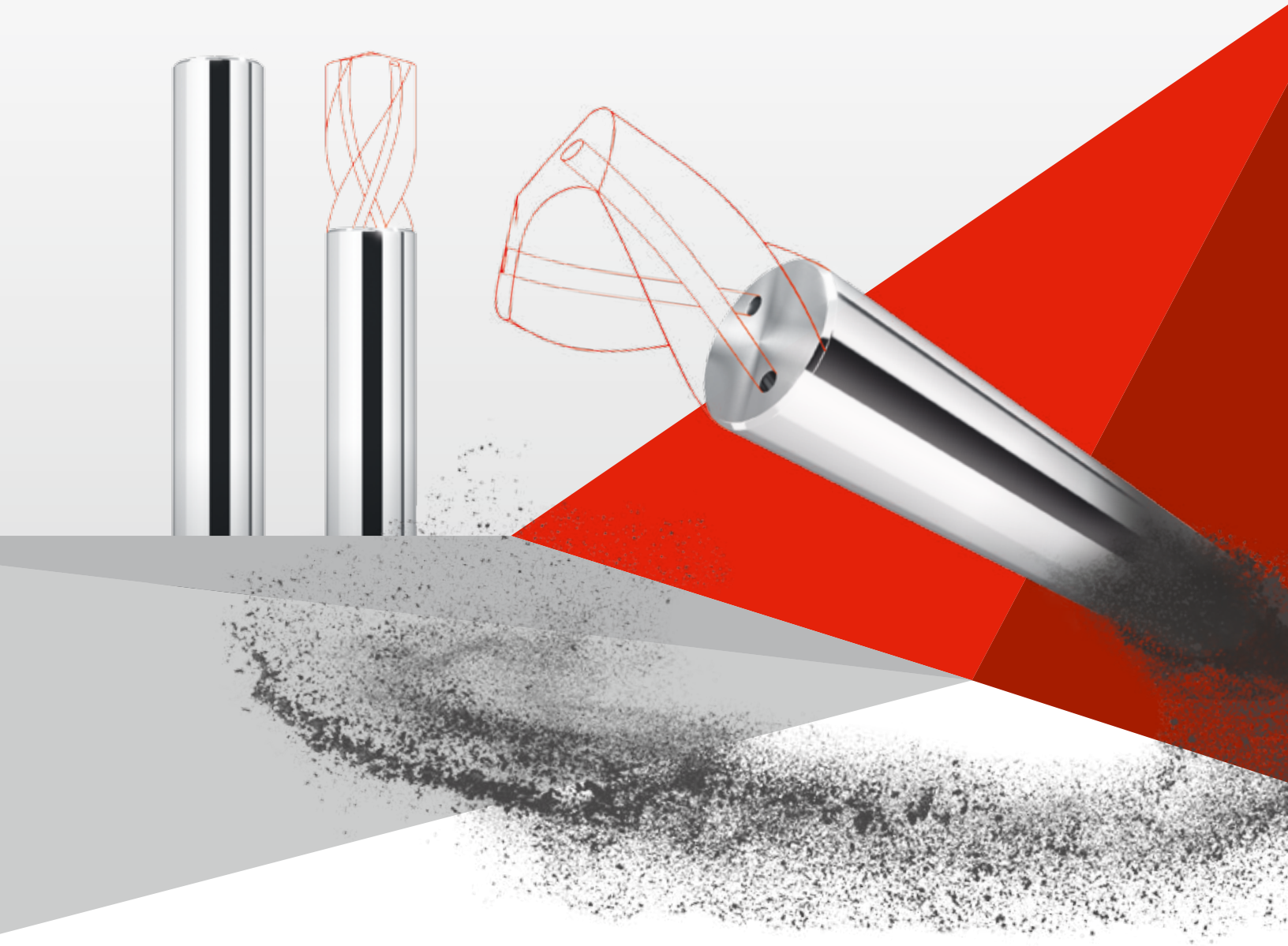
2021 **US**

# Precision Tooling Blanks

by the world market leader

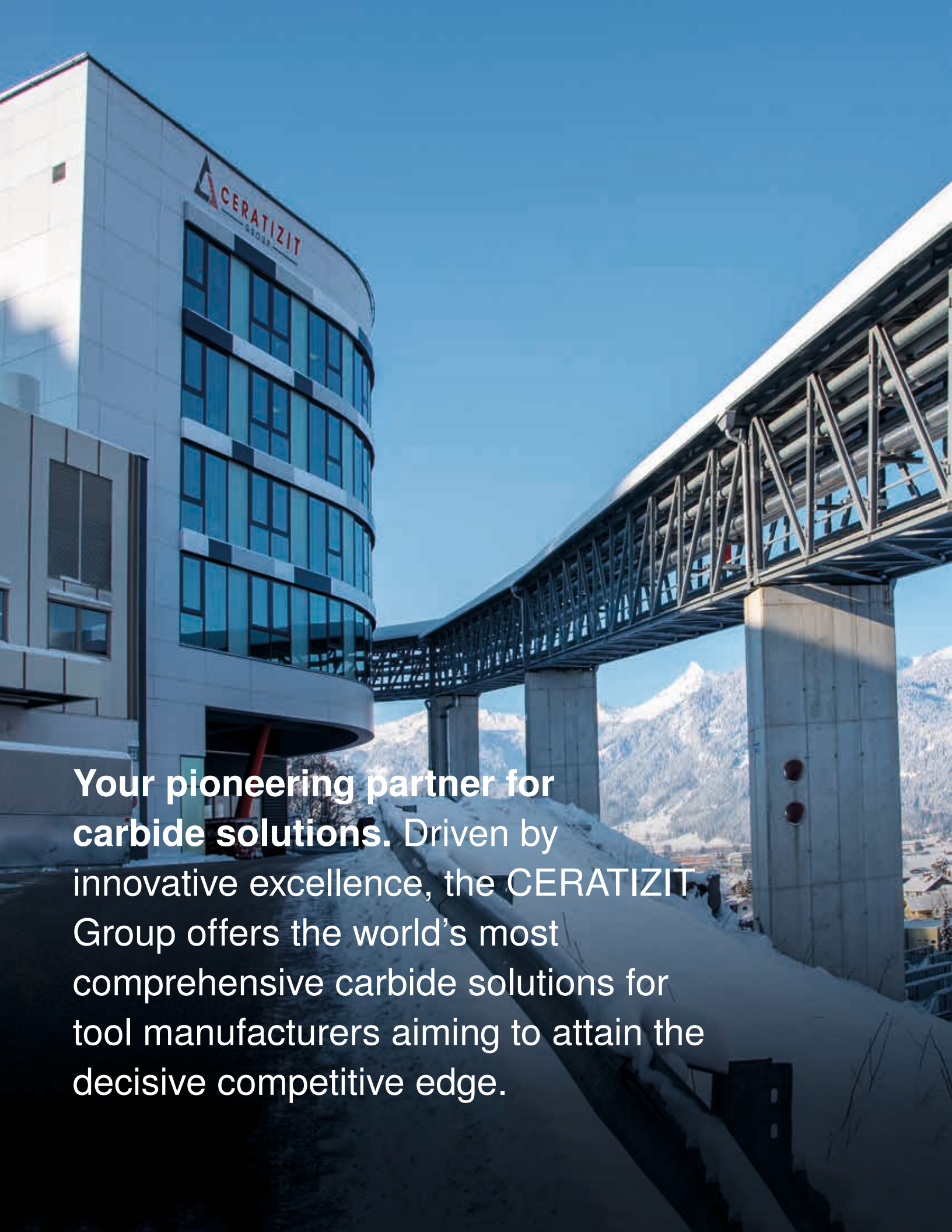


CERATIZIT GROUP

CERATIZIT is a high-technology engineering group specialized in cutting tools and hard material solutions.

## Tooling the Future

ceratizit.com




**Your pioneering partner for carbide solutions.** Driven by innovative excellence, the CERATIZIT Group offers the world's most comprehensive carbide solutions for tool manufacturers aiming to attain the decisive competitive edge.

# Contents

# Dear customer,

CERATIZIT Group develops and produces innovative carbide solutions for tool manufacturers. Based on your requirements and the desired price point, when it comes to tool production you can choose from two different product lines:

## Professional line

Our brand-new professional line has been engineered for material specific applications when standard 10% submicron will not suffice. This high-performance product line consists of our premium grades in various sizes and configurations, all manufactured in our state-of-the-art tool blank production facility in Reutte, Austria. You can choose from 11 standard grades, ranging from ultrafine to submicron and even fine grain compositions. With over 1,300 stock products in 26 different variants, CERATIZIT offers you the largest stock range worldwide for manufacturers of solid carbide tools.

## Elite line

Our K200 grade of the Elite line is the first choice for 80% of the applications and has the most competitive price/performance ratio for end mill blanks in the industry. These products are manufactured in our Taiwan CB-CERATIZIT plant. CB-CERATIZIT has been our reliable joint venture partner for many years.

## World market leader for rods & preforms

Driven by innovative excellence, the CERATIZIT Group offers the world's most comprehensive carbide solutions for tool manufacturers looking for a competitive edge. CERATIZIT can also supply you with individual near net shape preforms and semi-finished tool blanks based on your drawings, with timely deliveries. CERATIZIT offers you a unique product portfolio, with outstanding performance in all aspects - from the development of the product, along with inventory levels and customer service to exceed your expectations.

## Highly developed logistics processes

You can rely on our high level of delivery security and flexible production capacity along with optimally stocked warehouses that ensures your order will always be handled efficiently. You can also order stock products 24/7 through our online E-Techstore, and you can take advantage of the technical expertise from our sales and office staff. With over 50 company sites in Europe, America and Asia, CERATIZIT is ready to serve you at any time throughout the world.

# CERATIZIT Group
For over 95 years,

CERATIZIT has been a pioneer in developing exceptional hard material solutions for cutting tools and wear protection.

The privately owned company, based in Mamer, Luxembourg, develops and manufactures highly specialized cutting tools, indexable inserts and tool blanks made of hard materials as well as wear parts.

The CERATIZIT Group is the global market leader in several wear part application areas, and successfully develops new types of cemented carbide, cermet and ceramic grades which are used for instance in the wood, metal and stone working industries.

## Facts & figures

### Headquarters
Mamer, **Luxembourg**

**30** more than **production sites**

**8** more than **000 employees**

**80** more than **countries in which we are active**

**1** more than **00 000 products**

**1** more than **000 patents & utility models**

**2** more than **00 R&D employees**

**30** % of products **developed in the last 5 years**

**14** more than **innovation awards**

# CERATIZIT worldwide

**CERATIZIT Group**

- Headquarters
- Production & Sales
- Production
- Sales

**CB-CERATIZIT**

- Production & Sales
- Production
- Sales

**PRODUCTION**

Taiwan

# Supreme availability

## Shop conveniently online around the clock

Many of our standard products are available from stock. Well organized warehouses mean that we can respond quickly and reliably to your order, even for large quantities.

Our advanced supply chain management, and flexible production capacity can produce maximum quantities, with a short turnaround time.

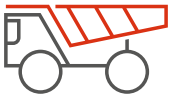
You can also order stock products online around the clock at our E-Techstore.

e-techstore.com

### Your benefits

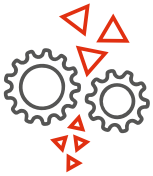
- Live product availability check
- Detailed up-to-date technical information and graphic illustrations
- Fast delivery: orders received by 12:30 p.m. EST and stocked in Kempten, Germany, will ship the same day;
  Orders received by 4:30 p.m. EST and stocked in the US, will ship the same day and the customer will receive the order within 3 working days
- Reliable delivery: we work only with the best and most reliable service providers in the sector

# We manage the entire process chain



### Mineral extraction

- Worldwide extraction of scheelite and wolframite ore with selected business partners to ensure a responsible raw material sourcing



### Preparation and mixing of the raw materials

- Powder and grades manufacturing, management & control

### Forming / pressing

- All existing shaping technologies available (extrusion, direct pressing, isostatic pressing, handshaping)

### Sintering

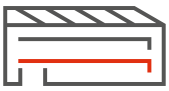
- Several decades of experience in calculating the exact sinter shrinkage, ensuring high quality of the final product

### Surface treatment

- Different finishing available including OD grinding, cutting, chamfering

### Quality assurance

- All products are subject to strict quality control by experienced professionals



### Dispatch

- Automated high-tech shuttle Warehouse

### Recycling (optional)

- We organize the entire process for you and also provide free, quantity-specific collection containers and transport solutions.

# Cemented carbide

## – a composite material with valuable properties

Cemented carbides are composite materials consisting of a hard material and a comparatively soft binder metal, like cobalt (Co). The performance characteristics of cemented carbide are determined by hardness, transverse rupture strength and fracture toughness. With regard to their application, important parameters for the optimization of these characteristics are the cobalt content and the grain size of the metal binder phase. The tungsten carbide grains have an average size of less than 0.2µm up to several micrometers (µm). The cobalt fills the gaps between the carbide grains.

When extremely high toughness is required, the cobalt content can amount to as much as 30%, whereas for maximum wear resistance, the cobalt content is reduced and the grain size decreased to the nanocrystalline range of < 0.2µm. CERATIZIT produces far more than 100 different cemented carbide grades particularly for wear parts and cutting tools, thus offering a customized solution for every application.

# Carbide production

Carbide production at CERATIZIT started in 1929. Thanks to long-standing experience CERATIZIT handles the entire process chain, from the raw material to the dispatching of the finished products to customers. The production process of powder-metallurgical products basically includes the four steps of powder preparation, shaping, sintering and finishing.

APT (ammonium para-tungstate)

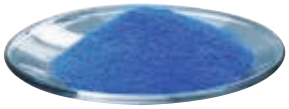
## Tungsten carbide production

The APT (ammonium para-tungstate) is calcined into tungsten oxide under high temperature. Subsequently the oxide is reduced to tungsten metal in a hydrogen atmosphere. The metal powder is then mixed with carbon and carburized under inert atmosphere at high temperatures. The production parameters are decisive for the WC grain size in the sintered carbide.

Yellow tungsten oxide

## Powder preparation

The tungsten carbide is intensely mixed with the binder metal cobalt, nickel or iron, various grain growth inhibitors and special alloys as well as materials, which promote compaction, by wet grinding so that a homogeneous suspension is created. Afterwards, the suspension is dried in a spray tower to produce a granulate with good flow characteristics. This granulate represents the basis for all forming processes.



Blue tungsten oxide

Tungsten

Tungsten carbide

# Pressing – shaping – machining

The objective of the forming process is to obtain a near net shape sample. Pressing is normally carried out at room temperature with pressures reaching up to several tons per square centimeter.

## There are several ways of pressing blanks:

During isostatic cold pressing the powder is filled into an elastic flexible hose and pressed into a compacted form through high liquid pressure. The powder blocks which are produced in this way can then be processed mechanically. All common machining methods like milling, cutting, drilling or turning may be used.

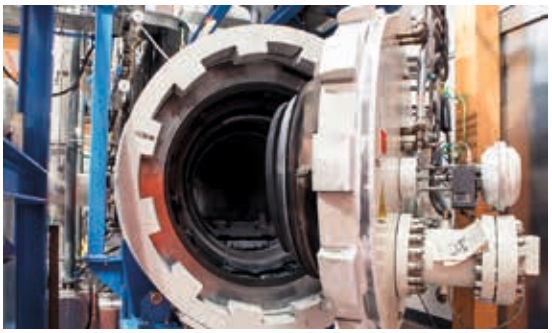
In uniaxial pressing. The pressing tool consists of a die and an upper and a lower punch. The carbide powder is filled into the die and then compacted to create the near net shape geometry of the green compact, which is ejected from the pressing die.

Extrusion pressing is mainly used to produce rectangular bars or cylindrical tool blanks, with or without axial hole(s). A plastifier is added to the powder. The resulting paste is pressed through an extrusion nozzle. Before sintering, the plastifier must be evaporated in special drying furnaces.

Metal Injection Molding (MIM) is a process used to produce more complex forms which cannot be produced by direct pressing. The paste preparation is similar to the extrusion process.

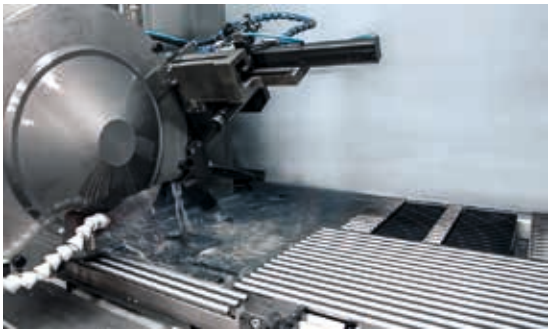
# Sintering

The sintering process converts the blank into a homogeneous and dense cemented carbide with a high level of hardness. The material is sintered at temperatures between 1,300 and 1,500 °C (liquid phase sintering) and sometimes also at high pressure (up to 100 bar). The volume is reduced by up to 50% during this process.



# Finishing – grinding

In order to achieve the final requirements of surface finish, tolerances, etc. carbide parts can undergo a series of finishing processes such as grinding, spark erosion and coating.



The most important grinding procedures for carbide tool blanks are centreless grinding and cylindrical grinding. When producing tool blanks, minimum diameter tolerances and optimal surface quality represent an excellent quality characteristic.

# Grades – composition and properties

## Professional line

| Grade | ISO code* | U.S. code | Binder [m %] | Density [g/cm³] | Hardness [HV30] | Hardness [HRA] | Transverse rupture strength [MPa] | Transverse rupture strength [psi] | $K_{IC}$** (Shetty) [MPa·m$^{1/2}$] |
|---|---|---|---|---|---|---|---|---|---|
| **Ultrafine grades** | | | | | | | | | |
| CTU08L | K10 | C-2 | 4.2 | 15.05 | 2200 | 95.2 | 3700 | 536.600 | 8.4 |
| TSF22 | K10 – K20 | C-2 | 8.2 | 14.55 | 1930 | 93.7 | 4400 | 638.800 | 9.2 |
| TSF44 | K10 – K20 | C-2 | 12.0 | 14.10 | 1730 | 92.7 | 4600 | 667.000 | 9.8 |
| **Submicron grades** | | | | | | | | | |
| CTS12D | K05 – K10 | C-3 | 6.0 | 14.80 | 1820 | 93.1 | 3600 | 522.100 | 9.3 |
| CTS15D | K10 – K30 | C-3 | 7.5 | 14.70 | 1750 | 92.8 | 3700 | 536.000 | 9.5 |
| CTS18D | K20 – K40 | C-2 | 9.0 | 14.55 | 1590 | 91.9 | 3650 | 529.400 | 10.7 |
| CTS20D | K20 – K40 | C-2 | 10.0 | 14.38 | 1600 | 91.9 | 4000 | 580.100 | 10.4 |
| CTS24Z | K20 – K40 | C-2 | 12.0 | 14.10 | 1570 | 91.7 | 4000 | 580.100 | 11.3 |
| CTS30D | K30 – K40 | C-2 | 15.0 | 13.84 | 1400 | 90.4 | 4300 | 623.700 | 13.2 |
| **Fine grades** | | | | | | | | | |
| CTF12E | K15 | C-2 | 6.0 | 14.95 | 1620 | 92.1 | 3000 | 435.100 | 9.9 |
| CTF25E | K30 – K40 | C-2 | 12.5 | 14.15 | 1300 | 89.5 | 3500 | 507.600 | 15.0 |

## Elite line

| Grade | ISO code* | U.S. code | Binder [m %] | Density [g/cm³] | Hardness [HV30] | Hardness [HRA] | Transverse rupture strength [MPa] | Transverse rupture strength [psi] | $K_{IC}$** (Shetty) [MPa·m$^{1/2}$] |
|---|---|---|---|---|---|---|---|---|---|
| **Submicron grades** | | | | | | | | | |
| K200 | K20 – K40 | C-3 | 10.0 | 14.40 | 1510 | 91.3 | 3920 | 568.500 | 10.5 |
| **Fine grades** | | | | | | | | | |
| K100L | K10 – K20 | C-2 | 6.0 | 14.83 | 1650 | 92.2 | 3000 | 435.100 | 9.1 |

* The classification of carbides according to grain size corresponds to the recommendations of the Powder Metallurgy Association.
The standard ISO codes for carbides which were developed for fine to medium grain sizes no longer correspond to today's state of the art. In order to choose the correct grades, only the application data are relevant.

$K_{IC}$**: The measured critical tension intensity factors ($K_{IC}$) depend to a high degree on the sample geometry and sample preparation. A direct comparison with parameters which have been determined by means of a different method is therefore not admissible.

| Grain size classification | | CERATIZIT code |
|---|---|---|
| Average grain size [µm] | Classification | |
| < 0.2 | nano | N |
| 0.2 – < 0.5 | ultrafine | U |
| 0.5 – < 0.8 | submicron | S |
| 0.8 – < 1.3 | fine | F |
| 1.3 – < 2.5 | medium | M |
| 2.5 – < 6.0 | coarse | C |
| > 6.0 | extra-coarse | E |

**Comment:**
The data in this table are typical material parameters. We reserve the right to modify the data due to technical progress or due to further development within our company.

# Carbide grades for biocompatible tools

**in accordance with ISO 10993-5 for the medical and dental industry**

The biocompatibility requirement for medical products increases patient safety. For tools that come into short-term direct contact with body tissue, cell tolerance must be guaranteed.

Testing for in-vitro cytotoxicity in accordance with DIN EN ISO 10993-5 was carried out by an accredited testing laboratory. The following carbide grades were successfully tested for their cell tolerance:

- TSF22
- TSF44
- CTS12D
- CTS15D
- CTS18D
- CTS20D
- CTS24Z

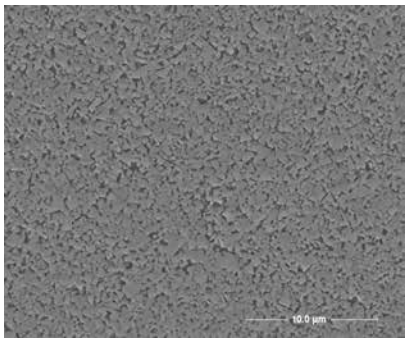
Accreditation number D-PL-19876-01

# Ultrafine grades

**CTU08L:** carbide grade with a typical grain size of 0.2 µm for the machining of materials with a hardness > 65 HRC. Thanks to the high wear resistance also excellent suitability for abrasive fiber composite materials.

**TSF22:** ultrafine carbide grade for HSC machining of tempered steels with a hardness of > 60 HRC and abrasive aluminum alloys.

**TSF44:** ultrafine carbide grade for HSC machining of tempered steels up to 60 HRC, suitable for micro-tools and finishing tools and for a variety of materials.



Picture example

# Submicron grades

**CTS12D:** for machining aluminum alloys, fiber-reinforced plastics (carbon-fiber and glass-fiber reinforced), composite materials, graphite; particularly suitable for diamond coating.

**CTS15D:** for machining grey cast iron, tempered cast iron, non-alloyed steel, non-ferrous metals and plastics.

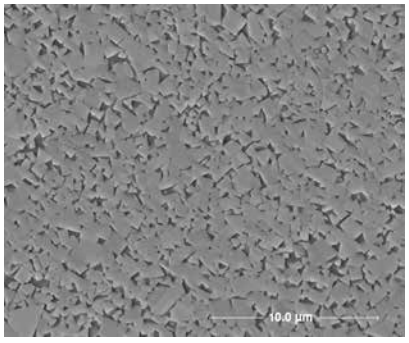
**CTS18D:** for high-performance machining of steel, stainless steel and the machining of difficult materials.

**CTS20D:** for universal machining of alloyed and non-alloyed steels. Suitable for a variety of cutting operations on different materials thanks to its balanced properties. Improved toughness ensures a low risk of cutting edge breakage.

**CTS24Z:** the special high-performance grade for the roughing of titanium and heat-resistant alloys. Even higher fracture toughness than CTS18D and CTS20D, with approximately the same hardness.

**CTS30D:** with extremely high fracture toughness for particularly unstable and difficult applications. A good choice when switching from HSS to carbide.

**K200:** Submicron grade with well-balanced wear resistance and toughness. Particularly suitable for drilling applications.



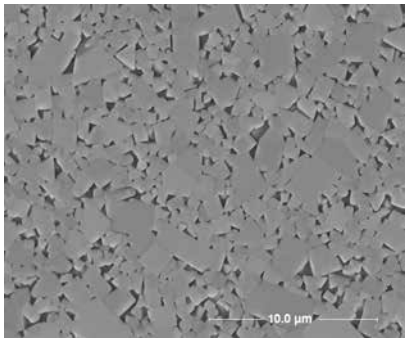
Picture example

# Fine grain grades

**CTF12E:** for gun drills with an adapted relation between hardness and toughness. Suitable also for diamond-coated solid carbide tools.

**CTF25E:** for the production of PCD tools and tool shanks. The increased cobalt content and the coarser grain improve brazability while increasing fracture toughness.

**K100L:** Fine carbide grade for diamond coated tools. For machining graphite, composite material, and high-silicon aluminum alloy.



Picture example

# Designation system

| | |
|---|---|
| **R** | Rods |
| | **R** Raw (unground) |
| | **G** Ground polished |
| | **U** Utility ground |
| | **M** Metric |
| | **I** Imperial |
| | **C** Chamfered |
| | **W** Weldon |
| | **Y** Y-holes |
| | **D** DualBlank |
| **FR** | Flat strips |
| **SR** | Square strips |

| | |
|---|---|
| **00** | Twist/helix angle |
| **15** | **R** Raw (unground) |
| **30** | **G** Ground polished |
| **40** | **M** Matt ground |
| **50** | **B** Standard Drill blank (chamfered & slot) |

| | |
|---|---|
| **GD** | Gun drill rods |
| | **R** Raw (unground) |
| | **V** V-profile |
| | **K** Kidney-shaped hole |
| | **2** hole |
| | **P** head blank |

1 =

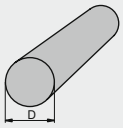
2 =

3 =

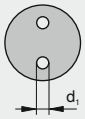
4 =

**Number of coolant holes**

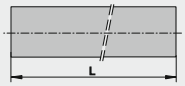
30 GB 2




**Outside diameter [1/100 mm]**




**Diameter of the coolant holes [mm]**

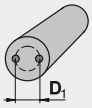



**Rod length [mm]**

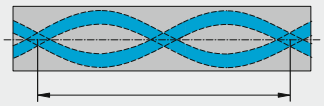
**Diameter tolerance**

# 1000/4,8/1,3/54,4-104 CTS20D h5

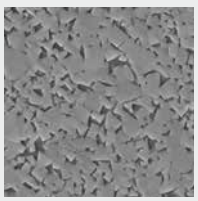
**Pitch circle of the coolant holes [mm]**




**Nominal pitch of the coolant holes [mm]**



**Grade**



# Stock program at a glance

The product map below provides you with a quick overview of the grades and rods which are available in stock.
Other products are available upon request.

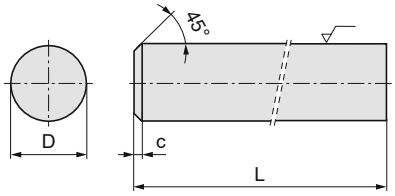
| | | Professional line | | | | | | | | | | Elite line | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Ultra-fine | | | Submicron | | | | | | Fine | Submicron | Fine | |
| | | CTU08L | TSF22 | TSF44 | CTS12D | CTS15D | CTS18D | CTS20D | CTS24Z | CTS30D | CTF12E | K200 | K100L | starting page |
| **End mill blanks, inch** | RGIC | | ■ | ■ | ■ | | | ■ | ■ | | | ■ | ■ | 31 |
| **End mill blanks, metric** | RGMC | ■ | ■ | ■ | | | ■ | ■ | ■ | | | ■ | | 35 |
| **End mill blanks with Weldon shank, metric** | RGMCW | | | | | | | ■ | | | | | | 39 |
| **Precision ground tool blanks, with DualBlank, metric** | RGMCD | | | | | | ■ | ■ | | | | | | 40 |
| **End mill blanks with through-coolant, metric** | RGMCY | | | | | | | ■ | | | | | | 41 |
| **Drill blanks with through-coolant** | ..MB2 | | | | | | | ■ | | | | | | 45 |
| **Drill blanks for micro-drills with through-coolant** | ..G2 SO | | | | | | | ■ | | | | | | 47 |
| **Solid carbide rods, as sintered** | RR | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | 49 |
| **Solid carbide rods, ground, inch** | RGI | | | | | | | ■ | | | | | | 53 |
| **Solid carbide rods, ground, metric** | RGM | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | | 54 |
| **Rods, as sintered, with two helical coolant holes** | ..R2 | | | | ■ | | | ■ | ■ | | | | | 59 |
| **Rods, as sintered, with three helical coolant holes** | ..R3 | | | | | | | ■ | | | | | | 66 |
| **Rods, as sintered, with four helical coolant holes** | ..R4 | | | | | | | ■ | | | | | | 67 |
| **Rods, ground, with two helical coolant holes** | ..G2 | | | | | | | ■ | | | | | | 68 |
| **Rods, ground, with three helical coolant holes** | ..G3 | | | | | | | ■ | | | | | | 70 |
| **Rods, as sintered, with central coolant hole** | 00R1 | | | ■ | | ■ | | ■ | | | | | | 72 |
| **Rods, as sintered, with two straight coolant holes** | 00R2 | | | | | ■ | | ■ | | | | | | 74 |
| **Rods, ground, with central coolant hole** | 00G1 | | | | | ■ | | | | | | | | 77 |
| **Rods, ground, with two straight coolant holes** | 00G2 | | | | | ■ | | | | | | | | 78 |
| **Rods for gun drills with kidney-shaped coolant holes** | GDRK | | | | | | | ■ | | | ■ | | | 80 |
| **Profiled rods for gun drills with kidney-shaped coolant holes** | GDVK | | | | | | | ■ | | | ■ | | | 81 |
| **Profiled rods for gun drills with two coolant holes** | GDV2 | | | | | | | | | | ■ | | | 83 |
| **Profiled tips for gun drills with two coolant holes** | GDV2P | | | | | | | | | | ■ | | | 85 |
| **Flat and square strips** | FR & SR | | | | | | | ■ | | | | | | 87 |
| **Brazing tips to DIN 8011** | DIN 8011 | | | | ■ | | | | | | | | | 90 |

# Elite line

**Exceptional performance & widest application range**

# End mill blanks, with chamfer

## Submicron grades h6 – **INCH**




| D [inch] | L [inch] | Type, description | Dia. tol. [inch] | ISO 286 | c [inch] | K200 |
|---|---|---|---|---|---|---|
| 1/8 | 1.500 | CB-RGIC 1/8-1.50 | +0/-0.0002 | h6 | .016 | ● |
| 1/8 | 2.000 | CB-RGIC 1/8-2.00 | +0/-0.0002 | h6 | .016 | ● |
| 1/8 | 3.000 | CB-RGIC 1/8-3.00 | +0/-0.0002 | h6 | .016 | ● |
| 3/16 | 2.000 | CB-RGIC 3/16-2.00 | +0/-0.0003 | h6 | .016 | ● |
| 3/16 | 2.500 | CB-RGIC 3/16-2.50 | +0/-0.0003 | h6 | .016 | ● |
| 3/16 | 3.000 | CB-RGIC 3/16-3.00 | +0/-0.0003 | h6 | .016 | ● |
| 3/16 | 4.000 | CB-RGIC 3/16-4.00 | +0/-0.0003 | h6 | .016 | ● |
| 1/4 | 2.000 | CB-RGIC 1/4-2.00 | +0/-0.0004 | h6 | .016 | ● |
| 1/4 | 2.500 | CB-RGIC 1/4-2.50 | +0/-0.0004 | h6 | .016 | ● |
| 1/4 | 3.000 | CB-RGIC 1/4-3.00 | +0/-0.0004 | h6 | .016 | ● |
| 1/4 | 4.000 | CB-RGIC 1/4-4.00 | +0/-0.0004 | h6 | .016 | ● |
| 1/4 | 6.000 | CB-RGIC 1/4-6.00 | +0/-0.0004 | h6 | .016 | ● |
| 5/16 | 2.000 | CB-RGIC 5/16-2.00 | +0/-0.0004 | h6 | .024 | ● |
| 5/16 | 2.500 | CB-RGIC 5/16-2.50 | +0/-0.0004 | h6 | .024 | ● |
| 5/16 | 3.000 | CB-RGIC 5/16-3.00 | +0/-0.0004 | h6 | .024 | ● |
| 5/16 | 4.000 | CB-RGIC 5/16-4.00 | +0/-0.0004 | h6 | .024 | ● |
| 5/16 | 6.000 | CB-RGIC 5/16-6.00 | +0/-0.0004 | h6 | .024 | ● |
| 3/8 | 2.000 | CB-RGIC 3/8-2.00 | +0/-0.0004 | h6 | .024 | ● |
| 3/8 | 2.500 | CB-RGIC 3/8-2.50 | +0/-0.0004 | h6 | .024 | ● |
| 3/8 | 3.000 | CB-RGIC 3/8-3.00 | +0/-0.0004 | h6 | .024 | ● |
| 3/8 | 3.500 | CB-RGIC 3/8-3.50 | +0/-0.0004 | h6 | .024 | ● |
| 3/8 | 4.000 | CB-RGIC 3/8-4.00 | +0/-0.0004 | h6 | .024 | ● |
| 3/8 | 5.000 | CB-RGIC 3/8-5.00 | +0/-0.0004 | h6 | .024 | ● |
| 3/8 | 6.000 | CB-RGIC 3/8-6.00 | +0/-0.0004 | h6 | .024 | ● |
| 7/16 | 2.500 | CB-RGIC 7/16-2.50 | +0/-0.0004 | h6 | .024 | ● |
| 7/16 | 2.750 | CB-RGIC 7/16-2.75 | +0/-0.0004 | h6 | .024 | ● |
| 7/16 | 4.000 | CB-RGIC 7/16-4.00 | +0/-0.0004 | h6 | .024 | ● |
| 7/16 | 6.000 | CB-RGIC 7/16-6.00 | +0/-0.0004 | h6 | .024 | ● |

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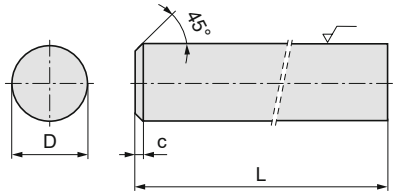
○ Semi-standard ● Standard Other grades and dimensions upon request

# End mill blanks, with chamfer

## Submicron grades h6 – **INCH**




| D [inch] | L [inch] | Type, description | Dia. tol. [inch] | ISO 286 | c [inch] | K200 |
|---|---|---|---|---|---|---|
| 1/2 | 2.500 | CB-RGIC 1/2-2.50 | +0/-0.0004 | h6 | .031 | ● |
| 1/2 | 3.000 | CB-RGIC 1/2-3.00 | +0/-0.0004 | h6 | .031 | ● |
| 1/2 | 3.500 | CB-RGIC 1/2-3.50 | +0/-0.0004 | h6 | .031 | ● |
| 1/2 | 4.000 | CB-RGIC 1/2-4.00 | +0/-0.0004 | h6 | .031 | ● |
| 1/2 | 5.000 | CB-RGIC 1/2-5.00 | +0/-0.0004 | h6 | .031 | ● |
| 1/2 | 6.000 | CB-RGIC 1/2-6.00 | +0/-0.0004 | h6 | .031 | ● |
| 1/2 | 8.000 | CB-RGIC 1/2-8.00 | +0/-0.0004 | h6 | .031 | ● |
| 9/16 | 3.500 | CB-RGIC 9/16-3.50 | +0/-0.0004 | h6 | .031 | ● |
| 9/16 | 4.000 | CB-RGIC 9/16-4.00 | +0/-0.0004 | h6 | .031 | ● |
| 5/8 | 3.000 | CB-RGIC 5/8-3.00 | +0/-0.0004 | h6 | .039 | ● |
| 5/8 | 3.500 | CB-RGIC 5/8-3.50 | +0/-0.0004 | h6 | .039 | ● |
| 5/8 | 4.000 | CB-RGIC 5/8-4.00 | +0/-0.0004 | h6 | .039 | ● |
| 5/8 | 5.000 | CB-RGIC 5/8-5.00 | +0/-0.0004 | h6 | .039 | ● |
| 5/8 | 6.000 | CB-RGIC 5/8-6.00 | +0/-0.0004 | h6 | .039 | ● |
| 5/8 | 8.000 | CB-RGIC 5/8-8.00 | +0/-0.0004 | h6 | .039 | ○ |
| 3/4 | 3.000 | CB-RGIC 3/4-3.00 | +0/-0.0005 | h6 | .039 | ● |
| 3/4 | 4.000 | CB-RGIC 3/4-4.00 | +0/-0.0005 | h6 | .039 | ● |
| 3/4 | 5.000 | CB-RGIC 3/4-5.00 | +0/-0.0005 | h6 | .039 | ● |
| 3/4 | 6.000 | CB-RGIC 3/4-6.00 | +0/-0.0005 | h6 | .039 | ● |
| 3/4 | 7.000 | CB-RGIC 3/4-7.00 | +0/-0.0005 | h6 | .039 | ● |
| 3/4 | 8.000 | CB-RGIC 3/4-8.00 | +0/-0.0005 | h6 | .039 | ● |
| 7/8 | 4.000 | CB-RGIC 7/8-4.00 | +0/-0.0005 | h6 | .039 | ● |
| 1 | 3.000 | CB-RGIC 1-3.00 | +0/-0.0005 | h6 | .039 | ● |
| 1 | 4.000 | CB-RGIC 1-4.00 | +0/-0.0005 | h6 | .039 | ● |
| 1 | 5.000 | CB-RGIC 1-5.00 | +0/-0.0005 | h6 | .039 | ● |
| 1 | 6.000 | CB-RGIC 1-6.00 | +0/-0.0005 | h6 | .039 | ● |
| 1 | 7.000 | CB-RGIC 1-7.00 | +0/-0.0005 | h6 | .039 | ● |
| 1 | 8.000 | CB-RGIC 1-8.00 | +0/-0.0005 | h6 | .039 | ● |

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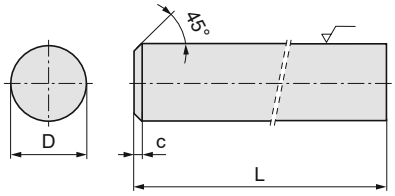
○ Semi-standard ● Standard Other grades and dimensions upon request

# End mill blanks, with chamfer

## Submicron grades h6 – **INCH**

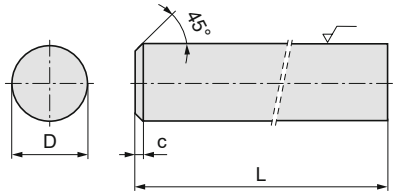



| D [inch] | L [inch] | Type, description | Dia. tol. [inch] | ISO 286 | c [inch] | K200 |
|---|---|---|---|---|---|---|
| 1 1/4 | 4.500 | CB-RGIC 1 1/4-4.50 | +0/-0.0005 | h6 | .039 | ● |
| 1 1/4 | 5.000 | CB-RGIC 1 1/4-5.00 | +0/-0.0005 | h6 | .039 | ● |
| 1 1/4 | 6.000 | CB-RGIC 1 1/4-6.00 | +0/-0.0005 | h6 | .039 | ● |
| 1 1/4 | 7.000 | CB-RGIC 1 1/4-7.00 | +0/-0.0005 | h6 | .039 | ○ |
| 1 1/4 | 8.000 | CB-RGIC 1 1/4-8.00 | +0/-0.0005 | h6 | .039 | ○ |
| 1 1/4 | 9.000 | CB-RGIC 1 1/4-9.00 | +0/-0.0005 | h6 | .039 | ● |

○ Semi-standard ● Standard Other grades and dimensions upon request

# End mill blanks, with chamfer

## Fine grades h6 – **INCH**

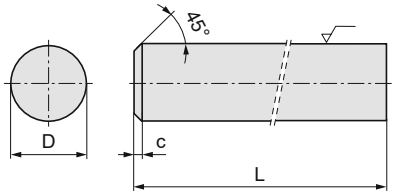



| D [inch] | L [inch] | Type, description | Dia. tol. [inch] | ISO 286 | c [inch] | K100L |
|---|---|---|---|---|---|---|
| 1/8 | 1.500 | CB-RGIC 1/8-1.50 | +0/-0.0002 | h6 | .016 | ● |
| 1/8 | 3.000 | CB-RGIC 1/8-3.00 | +0/-0.0002 | h6 | .016 | ● |
| 3/16 | 2.000 | CB-RGIC 3/16-2.00 | +0/-0.0003 | h6 | .016 | ● |
| 3/16 | 3.000 | CB-RGIC 3/16-3.00 | +0/-0.0003 | h6 | .016 | ● |
| 1/4 | 2.500 | CB-RGIC 1/4-2.50 | +0/-0.0004 | h6 | .016 | ● |
| 1/4 | 3.000 | CB-RGIC 1/4-3.00 | +0/-0.0004 | h6 | .016 | ● |
| 1/4 | 4.000 | CB-RGIC 1/4-4.00 | +0/-0.0004 | h6 | .016 | ● |
| 1/4 | 6.000 | CB-RGIC 1/4-6.00 | +0/-0.0004 | h6 | .016 | ● |
| 3/8 | 2.500 | CB-RGIC 3/8-2.50 | +0/-0.0004 | h6 | .024 | ● |
| 3/8 | 4.000 | CB-RGIC 3/8-4.00 | +0/-0.0004 | h6 | .024 | ● |
| 3/8 | 6.000 | CB-RGIC 3/8-6.00 | +0/-0.0004 | h6 | .024 | ● |
| 1/2 | 3.000 | CB-RGIC 1/2-3.00 | +0/-0.0004 | h6 | .031 | ● |
| 1/2 | 4.000 | CB-RGIC 1/2-4.00 | +0/-0.0004 | h6 | .031 | ● |
| 1/2 | 6.000 | CB-RGIC 1/2-6.00 | +0/-0.0004 | h6 | .031 | ● |

○ Semi-standard ● Standard Other grades and dimensions upon request

# End mill blanks, with chamfer

## Submicron grades h6 – **METRIC**




| D [mm] | L [mm] | Type, description | Dia. tol. [mm] | ISO 286 | c [mm] | DIN 6527 | K200 |
|---|---|---|---|---|---|---|---|
| 3.00 | 38 | CB-RGMC 0300-038 | +0/-0.006 | h6 | .40 | x | ● |
| 4.00 | 51 | CB-RGMC 0400-051 | +0/-0.008 | h6 | .40 | x | ● |
| 5.00 | 51 | CB-RGMC 0500-051 | +0/-0.008 | h6 | .40 | x | ● |
| 6.00 | 51 | CB-RGMC 0600-051 | +0/-0.008 | h6 | .40 | x | ● |
| 6.00 | 55 | CB-RGMC 0600-055 | +0/-0.008 | h6 | .40 | x | ● |
| 6.00 | 58 | CB-RGMC 0600-058 | +0/-0.008 | h6 | .40 | x | ● |
| 6.00 | 100 | CB-RGMC 0600-100 | +0/-0.008 | h6 | .40 | | ● |
| 8.00 | 59 | CB-RGMC 0800-059 | +0/-0.009 | h6 | .60 | x | ● |
| 8.00 | 64 | CB-RGMC 0800-064 | +0/-0.009 | h6 | .60 | x | ● |
| 8.00 | 100 | CB-RGMC 0800-100 | +0/-0.009 | h6 | .60 | | ● |
| 10.00 | 67 | CB-RGMC 1000-067 | +0/-0.009 | h6 | .60 | x | ● |
| 10.00 | 73 | CB-RGMC 1000-073 | +0/-0.009 | h6 | .60 | x | ● |
| 10.00 | 100 | CB-RGMC 1000-100 | +0/-0.009 | h6 | .60 | | ● |
| 12.00 | 74 | CB-RGMC 1200-074 | +0/-0.011 | h6 | .80 | x | ● |
| 12.00 | 84 | CB-RGMC 1200-084 | +0/-0.011 | h6 | .80 | x | ● |
| 12.00 | 100 | CB-RGMC 1200-100 | +0/-0.011 | h6 | .80 | | ● |
| 14.00 | 76 | CB-RGMC 1400-076 | +0/-0.011 | h6 | .80 | x | ● |
| 14.00 | 84 | CB-RGMC 1400-084 | +0/-0.011 | h6 | .80 | x | ● |
| 16.00 | 83 | CB-RGMC 1600-083 | +0/-0.011 | h6 | 1.00 | x | ● |
| 16.00 | 93 | CB-RGMC 1600-093 | +0/-0.011 | h6 | 1.00 | x | ● |
| 16.00 | 120 | CB-RGMC 1600-120 | +0/-0.011 | h6 | 1.00 | | ● |
| 18.00 | 93 | CB-RGMC 1800-093 | +0/-0.011 | h6 | 1.00 | x | ● |
| 20.00 | 93 | CB-RGMC 2000-093 | +0/-0.013 | h6 | 1.00 | x | ● |
| 20.00 | 105 | CB-RGMC 2000-105 | +0/-0.013 | h6 | 1.00 | x | ● |
| 20.00 | 150 | CB-RGMC 2000-150 | +0/-0.013 | h6 | 1.00 | | ● |
| 25.00 | 150 | CB-RGMC 2500-150 | +0/-0.013 | h6 | 1.00 | | ● |

○ Semi-standard ● Standard Other grades and dimensions upon request

# Professional line

**Large selection of grades & designs for material specific applications**

# End mill blanks

CERATIZIT produces coolant hole rods with radial exit points to improve chip removal and cooling of the cutting edge.

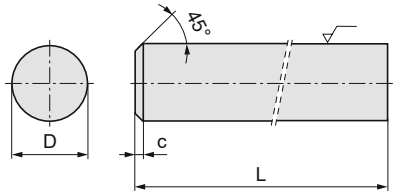
All rods in the family are made from our industry leading premium CTS20D grade to give longer tool life and better edge quality.

In addition to the standard family, we can of course also manufacture specials to suit your needs: changes in diameter, length, number of coolant holes, or exit positions and angles. We can make the blank you need.

Many variations of our end mill blanks are also available in our innovative DualBlank manufacturing technology: a combination of a cost-effective recycled grade in the shaft area and a premium grade in the cutting area. The transition point is of course absolute homogeneous, guaranteeing a high-performance of the tool.

# End mill blanks, with chamfer

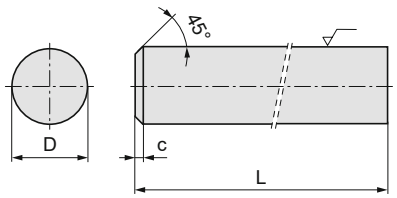
## Ultrafine grades h5 – **INCH**




| D [inch] | L [inch] | Type, description | Dia. tol. [inch] | ISO 286 | c [inch] | TSF22 | TSF44 |
|---|---|---|---|---|---|---|---|
| 1/4 | 2.500 | RGIC 1/4-2.50 | +0 / -0.0002 | h5 | .016 | ● | ● |
| 1/4 | 3.000 | RGIC 1/4-3.00 | +0 / -0.0002 | h5 | .016 | ● | ● |
| 1/4 | 4.000 | RGIC 1/4-4.00 | +0 / -0.0002 | h5 | .016 | ● | ● |
| 5/16 | 2.500 | RGIC 5/16-2.50 | +0 / -0.0002 | h5 | .016 | ● | ● |
| 3/8 | 2.500 | RGIC 3/8-2.50 | +0 / -0.0002 | h5 | .016 | ● | ● |
| 3/8 | 3.000 | RGIC 3/8-3.00 | +0 / -0.0002 | h5 | .016 | ● | ● |
| 1/2 | 3.000 | RGIC 1/2-3.00 | +0 / -0.0002 | h5 | .031 | ● | ● |
| 1/2 | 4.000 | RGIC 1/2-4.00 | +0 / -0.0002 | h5 | .031 | ● | ● |
| 1/2 | 6.000 | RGIC 1/2-6.00 | +0 / -0.0002 | h5 | .031 | ● | ● |
| 5/8 | 3.000 | RGIC 5/8-3.00 | +0 / -0.0002 | h5 | .031 | ● | ● |
| 5/8 | 4.000 | RGIC 5/8-4.00 | +0 / -0.0002 | h5 | .031 | ● | ● |

# End mill blanks, with chamfer

## Submicron grades h5 – **INCH**




| D [inch] | L [inch] | Type, description | Dia. tol. [inch] | ISO 286 | c [inch] | CTS12D | CTS24Z |
|---|---|---|---|---|---|---|---|
| 1/8 | 1.500 | RGIC 1/8-1.50 | +0 / -0.0001 | h5 | .012 | ● | |
| 1/8 | 3.000 | RGIC 1/8-3.00 | +0 / -0.0001 | h5 | .012 | ● | |
| 3/16 | 2.000 | RGIC 3/16-2.00 | +0 / -0.0002 | h5 | .016 | ● | |

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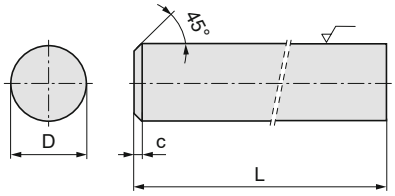
○ Semi-standard ● Standard Other grades and dimensions upon request

# End mill blanks, with chamfer

## Submicron grades h5 – **INCH**

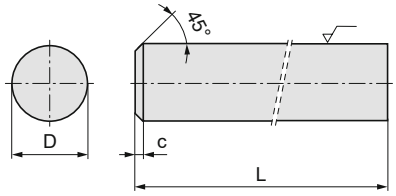



| D [inch] | L [inch] | Type, description | Dia. tol. [inch] | ISO 286 | c [inch] | CTS12D | CTS24Z |
|---|---|---|---|---|---|---|---|
| 3/16 | 3.000 | RGIC 3/16-3.00 | +0 / -0.0002 | h5 | .016 | ● | |
| 1/4 | 2.000 | RGIC 1/4-2.00 | +0 / -0.0002 | h5 | .016 | | ● |
| 1/4 | 2.500 | RGIC 1/4-2.50 | +0 / -0.0002 | h5 | .016 | ● | ● |
| 1/4 | 4.000 | RGIC 1/4-4.00 | +0 / -0.0002 | h5 | .016 | ● | |
| 1/4 | 6.000 | RGIC 1/4-6.00 | +0 / -0.0002 | h5 | .016 | ● | |
| 5/16 | 2.500 | RGIC 5/16-2.50 | +0 / -0.0002 | h5 | .016 | | ● |
| 5/16 | 4.000 | RGIC 5/16-4.00 | +0 / -0.0002 | h5 | .016 | | ○ |
| 3/8 | 2.000 | RGIC 3/8-2.00 | +0 / -0.0002 | h5 | .016 | | ● |
| 3/8 | 2.500 | RGIC 3/8-2.50 | +0 / -0.0002 | h5 | .016 | ● | ● |
| 3/8 | 3.000 | RGIC 3/8-3.00 | +0 / -0.0002 | h5 | .016 | ● | ● |
| 3/8 | 4.000 | RGIC 3/8-4.00 | +0 / -0.0002 | h5 | .016 | ● | ● |
| 3/8 | 6.000 | RGIC 3/8-6.00 | +0 / -0.0002 | h5 | .016 | | ○ |
| 1/2 | 3.000 | RGIC 1/2-3.00 | +0 / -0.0002 | h5 | .031 | ● | ● |
| 1/2 | 4.000 | RGIC 1/2-4.00 | +0 / -0.0002 | h5 | .031 | ● | ● |
| 1/2 | 6.000 | RGIC 1/2-6.00 | +0 / -0.0002 | h5 | .031 | ● | ● |
| 5/8 | 3.000 | RGIC 5/8-3.00 | +0 / -0.0002 | h5 | .031 | ● | ● |
| 5/8 | 3.500 | RGIC 5/8-3.50 | +0 / -0.0002 | h5 | .031 | | ○ |
| 5/8 | 4.000 | RGIC 5/8-4.00 | +0 / -0.0002 | h5 | .031 | ● | ● |
| 5/8 | 6.000 | RGIC 5/8-6.00 | +0 / -0.0002 | h5 | .031 | ● | |
| 3/4 | 4.000 | RGIC 3/4-4.00 | +0 / -0.0004 | h5 | .039 | | ● |
| 3/4 | 5.000 | RGIC 3/4-5.00 | +0 / -0.0004 | h5 | .039 | | ● |
| 3/4 | 6.000 | RGIC 3/4-6.00 | +0 / -0.0004 | h5 | .039 | | ● |
| 3/4 | 8.000 | RGIC 3/4-8.00 | +0 / -0.0004 | h5 | .039 | | ○ |
| 1 | 4.000 | RGIC 1-4.00 | +0 / -0.0004 | h5 | .039 | | ● |
| 1 | 4.500 | RGIC 1-4.50 | +0 / -0.0004 | h5 | .039 | | ● |
| 1 | 5.000 | RGIC 1-5.00 | +0 / -0.0004 | h5 | .039 | | ● |
| 1 | 6.000 | RGIC 1-6.00 | +0 / -0.0004 | h5 | .039 | | ● |
| 1 | 8.000 | RGIC 1-8.00 | +0 / -0.0004 | h5 | .039 | | ● |

○ Semi-standard ● Standard Other grades and dimensions upon request

# End mill blanks, with chamfer

## Submicron grades h6 – **INCH**




| D [inch] | L [inch] | Type, description | Dia. tol. [inch] | ISO 286 | c [inch] | CTS20D |
|---|---|---|---|---|---|---|
| 1/8 | 1.500 | RGIC 1/8-1.50 | +0 / -0.0003 | h6 | .012 | ● |
| 1/8 | 2.000 | RGIC 1/8-2.00 | +0 / -0.0003 | h6 | .012 | ○ |
| 1/8 | 3.000 | RGIC 1/8-3.00 | +0 / -0.0003 | h6 | .012 | ○ |
| 3/16 | 2.000 | RGIC 3/16-2.00 | +0 / -0.0003 | h6 | .016 | ● |
| 3/16 | 2.500 | RGIC 3/16-2.50 | +0 / -0.0003 | h6 | .016 | ● |
| 3/16 | 3.000 | RGIC 3/16-3.00 | +0 / -0.0003 | h6 | .016 | ● |
| 3/16 | 4.000 | RGIC 3/16-4.00 | +0 / -0.0003 | h6 | .016 | ○ |
| 1/4 | 2.000 | RGIC 1/4-2.00 | +0 / -0.0004 | h6 | .016 | ● |
| 1/4 | 2.500 | RGIC 1/4-2.50 | +0 / -0.0004 | h6 | .016 | ● |
| 1/4 | 3.000 | RGIC 1/4-3.00 | +0 / -0.0004 | h6 | .016 | ● |
| 1/4 | 4.000 | RGIC 1/4-4.00 | +0 / -0.0004 | h6 | .016 | ● |
| 1/4 | 6.000 | RGIC 1/4-6.00 | +0 / -0.0004 | h6 | .016 | ○ |
| 5/16 | 2.000 | RGIC 5/16-2.00 | +0 / -0.0004 | h6 | .016 | ● |
| 5/16 | 2.500 | RGIC 5/16-2.50 | +0 / -0.0004 | h6 | .016 | ● |
| 5/16 | 3.000 | RGIC 5/16-3.00 | +0 / -0.0004 | h6 | .016 | ● |
| 5/16 | 4.000 | RGIC 5/16-4.00 | +0 / -0.0004 | h6 | .016 | ● |
| 5/16 | 6.000 | RGIC 5/16-6.00 | +0 / -0.0004 | h6 | .016 | ○ |
| 3/8 | 2.000 | RGIC 3/8-2.00 | +0 / -0.0004 | h6 | .016 | ● |
| 3/8 | 2.500 | RGIC 3/8-2.50 | +0 / -0.0004 | h6 | .016 | ● |
| 3/8 | 3.000 | RGIC 3/8-3.00 | +0 / -0.0004 | h6 | .016 | ● |
| 3/8 | 3.500 | RGIC 3/8-3.50 | +0 / -0.0004 | h6 | .016 | ● |
| 3/8 | 4.000 | RGIC 3/8-4.00 | +0 / -0.0004 | h6 | .016 | ● |
| 3/8 | 5.000 | RGIC 3/8-5.00 | +0 / -0.0004 | h6 | .016 | ○ |
| 3/8 | 6.000 | RGIC 3/8-6.00 | +0 / -0.0004 | h6 | .016 | ● |
| 7/16 | 2.500 | RGIC 7/16-2.50 | +0 / -0.0004 | h6 | .031 | ● |
| 7/16 | 2.750 | RGIC 7/16-2.75 | +0 / -0.0004 | h6 | .031 | ● |
| 7/16 | 4.000 | RGIC 7/16-4.00 | +0 / -0.0004 | h6 | .031 | ● |
| 7/16 | 6.000 | RGIC 7/16-6.00 | +0 / -0.0004 | h6 | .031 | ● |

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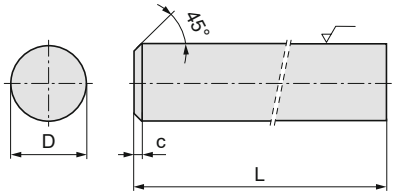
○ Semi-standard ● Standard Other grades and dimensions upon request

# End mill blanks, with chamfer

## Submicron grades h6 – **INCH**

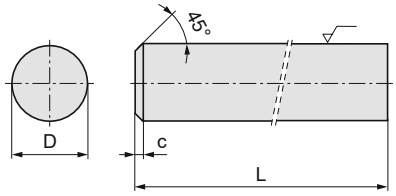



| D [inch] | L [inch] | Type, description | Dia. tol. [inch] | ISO 286 | c [inch] | CTS20D |
|---|---|---|---|---|---|---|
| 1/2 | 2.500 | RGIC 1/2-2.50 | +0 / -0.0004 | h6 | .031 | ● |
| 1/2 | 3.000 | RGIC 1/2-3.00 | +0 / -0.0004 | h6 | .031 | ● |
| 1/2 | 3.500 | RGIC 1/2-3.50 | +0 / -0.0004 | h6 | .031 | ● |
| 1/2 | 4.000 | RGIC 1/2-4.00 | +0 / -0.0004 | h6 | .031 | ● |
| 1/2 | 5.000 | RGIC 1/2-5.00 | +0 / -0.0004 | h6 | .031 | ● |
| 1/2 | 6.000 | RGIC 1/2-6.00 | +0 / -0.0004 | h6 | .031 | ● |
| 1/2 | 8.000 | RGIC 1/2-8.00 | +0 / -0.0004 | h6 | .031 | ○ |
| 9/16 | 3.500 | RGIC 9/16-3.50 | +0 / -0.0004 | h6 | .031 | ● |
| 9/16 | 4.000 | RGIC 9/16-4.00 | +0 / -0.0004 | h6 | .031 | ○ |
| 5/8 | 3.000 | RGIC 5/8-3.00 | +0 / -0.0004 | h6 | .031 | ● |
| 5/8 | 3.500 | RGIC 5/8-3.50 | +0 / -0.0004 | h6 | .031 | ● |
| 5/8 | 4.000 | RGIC 5/8-4.00 | +0 / -0.0004 | h6 | .031 | ● |
| 5/8 | 5.000 | RGIC 5/8-5.00 | +0 / -0.0004 | h6 | .031 | ● |
| 5/8 | 6.000 | RGIC 5/8-6.00 | +0 / -0.0004 | h6 | .031 | ● |
| 3/4 | 3.000 | RGIC 3/4-3.00 | +0 / -0.0005 | h6 | .039 | ● |
| 3/4 | 4.000 | RGIC 3/4-4.00 | +0 / -0.0005 | h6 | .039 | ● |
| 3/4 | 5.000 | RGIC 3/4-5.00 | +0 / -0.0005 | h6 | .039 | ● |
| 3/4 | 6.000 | RGIC 3/4-6.00 | +0 / -0.0005 | h6 | .039 | ● |
| 3/4 | 7.000 | RGIC 3/4-7.00 | +0 / -0.0005 | h6 | .039 | ○ |
| 7/8 | 4.000 | RGIC 7/8-4.00 | +0 / -0.0005 | h6 | .039 | ● |
| 1 | 3.000 | RGIC 1-3.00 | +0 / -0.0005 | h6 | .039 | ○ |
| 1 | 4.000 | RGIC 1-4.00 | +0 / -0.0005 | h6 | .039 | ● |
| 1 | 5.000 | RGIC 1-5.00 | +0 / -0.0005 | h6 | .039 | ● |
| 1 | 6.000 | RGIC 1-6.00 | +0 / -0.0005 | h6 | .039 | ● |
| 1 | 7.000 | RGIC 1-7.00 | +0 / -0.0005 | h6 | .039 | ● |
| 1 | 10.000 | RGIC 1-10.00 | +0 / -0.0005 | h6 | .039 | ○ |
| 1 1/4 | 4.500 | RGIC 1 1/4-4.50 | +0 / -0.0006 | h6 | .039 | ○ |
| 1 1/4 | 6.000 | RGIC 1 1/4-6.00 | +0 / -0.0006 | h6 | .039 | ○ |
| 1 1/4 | 7.500 | RGIC 1 1/4-7.50 | +0 / -0.0006 | h6 | .039 | ○ |

○ Semi-standard ● Standard Other grades and dimensions upon request

# End mill blanks, with chamfer

## Ultrafine grades h5 – **METRIC**




| D [mm] | L [mm] | Type, description | Dia. tol. [mm] | ISO 286 | c [mm] | DIN 6527 | CTU08L | TSF22 | TSF44 |
|---|---|---|---|---|---|---|---|---|---|
| 3.00 | 39 | RGMC 0300-039 | +0/-0.004 | h5 | .30 | x | ○ | ● | ● |
| 3.00 | 40 | RGMC 0300-040 | +0/-0.004 | h5 | .30 | | | ● | |
| 3.00 | 50 | RGMC 0300-050 | +0/-0.004 | h5 | .30 | | | ● | ● |
| 3.00 | 60 | RGMC 0300-060 | +0/-0.004 | h5 | .30 | | | ● | |
| 4.00 | 51 | RGMC 0400-051 | +0/-0.005 | h5 | .40 | x | ● | ● | ● |
| 4.00 | 60 | RGMC 0400-060 | +0/-0.005 | h5 | .40 | | | ● | |
| 4.00 | 75 | RGMC 0400-075 | +0/-0.005 | h5 | .40 | | | ● | |
| 5.00 | 51 | RGMC 0500-051 | +0/-0.005 | h5 | .40 | x | | | ○ |
| 6.00 | 51 | RGMC 0600-051 | +0/-0.005 | h5 | .40 | x | | ● | ● |
| 6.00 | 58 | RGMC 0600-058 | +0/-0.005 | h5 | .40 | x | ● | ● | ● |
| 6.00 | 60 | RGMC 0600-060 | +0/-0.005 | h5 | .40 | | | ● | |
| 6.00 | 65 | RGMC 0600-065 | +0/-0.005 | h5 | .40 | | | ● | |
| 6.00 | 70 | RGMC 0600-070 | +0/-0.005 | h5 | .40 | | | ● | |
| 6.00 | 75 | RGMC 0600-075 | +0/-0.005 | h5 | .40 | | | ● | |
| 6.00 | 80 | RGMC 0600-080 | +0/-0.005 | h5 | .40 | | | ● | |
| 6.00 | 100 | RGMC 0600-100 | +0/-0.005 | h5 | .40 | | | ● | ● |
| 8.00 | 64 | RGMC 0800-064 | +0/-0.006 | h5 | .60 | x | ● | ● | ● |
| 8.00 | 70 | RGMC 0800-070 | +0/-0.006 | h5 | .60 | | | ● | |
| 8.00 | 75 | RGMC 0800-075 | +0/-0.006 | h5 | .60 | | | ● | |
| 8.00 | 100 | RGMC 0800-100 | +0/-0.006 | h5 | .60 | | | ● | ● |
| 8.00 | 120 | RGMC 0800-120 | +0/-0.006 | h5 | .60 | | | ● | ● |
| 10.00 | 67 | RGMC 1000-067 | +0/-0.006 | h5 | .80 | x | | | ● |
| 10.00 | 73 | RGMC 1000-073 | +0/-0.006 | h5 | .80 | x | ● | ● | ● |
| 10.00 | 75 | RGMC 1000-075 | +0/-0.006 | h5 | .80 | | | ● | |
| 10.00 | 80 | RGMC 1000-080 | +0/-0.006 | h5 | .80 | | | ● | |
| 10.00 | 100 | RGMC 1000-100 | +0/-0.006 | h5 | .80 | | | ● | ● |
| 10.00 | 120 | RGMC 1000-120 | +0/-0.006 | h5 | .80 | | | ● | ● |
| 12.00 | 84 | RGMC 1200-084 | +0/-0.008 | h5 | .80 | x | | ● | ● |

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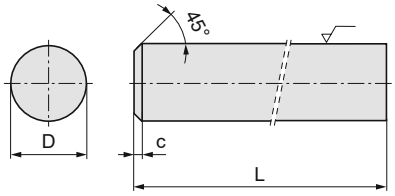
○ Semi-standard ● Standard Other grades and dimensions upon request

# End mill blanks, with chamfer

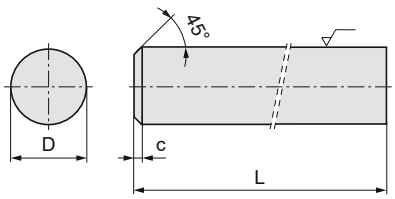
## Ultrafine grades h5 – **METRIC**




| D [mm] | L [mm] | Type, description | Dia. tol. [mm] | ISO 286 | c [mm] | DIN 6527 | CTU08L | TSF22 | TSF44 |
|---|---|---|---|---|---|---|---|---|---|
| 12.00 | 100 | RGMC 1200-100 | +0/-0.008 | h5 | .80 | | | ● | ● |
| 12.00 | 120 | RGMC 1200-120 | +0/-0.008 | h5 | .80 | | | ● | ● |
| 16.00 | 93 | RGMC 1600-093 | +0/-0.008 | h5 | .80 | x | | ● | ● |
| 16.00 | 110 | RGMC 1600-110 | +0/-0.008 | h5 | .80 | | | ● | |
| 16.00 | 120 | RGMC 1600-120 | +0/-0.008 | h5 | .80 | | | | ● |
| 16.00 | 130 | RGMC 1600-130 | +0/-0.008 | h5 | .80 | | | | ● |
| 16.00 | 150 | RGMC 1600-150 | +0/-0.008 | h5 | .80 | | | | ○ |
| 20.00 | 105 | RGMC 2000-105 | +0/-0.009 | h5 | 1.00 | x | | | ● |
| 20.00 | 125 | RGMC 2000-125 | +0/-0.009 | h5 | 1.00 | | | ● | ● |
| 20.00 | 150 | RGMC 2000-150 | +0/-0.009 | h5 | 1.00 | | | | ● |
| 25.00 | 125 | RGMC 2500-125 | +0/-0.009 | h5 | 1.00 | | | | ○ |
| 25.00 | 150 | RGMC 2500-150 | +0/-0.009 | h5 | 1.00 | | | | ○ |

# End mill blanks, with chamfer

## Submicron grades h5 / h6 – **METRIC**




| D [mm] | L [mm] | Type, description | Dia. tol. [mm] | ISO 286 | c [mm] | DIN 6527 | CTS18D | CTS20D | CTS24Z |
|---|---|---|---|---|---|---|---|---|---|
| 3.00 | 39 | RGMC 0300-039 | +0/-0.006 | h6 | .30 | x | | ● | |
| 3.00 | 40 | RGMC 0300-040 | +0/-0.004 | h5 | .30 | | | ● | |

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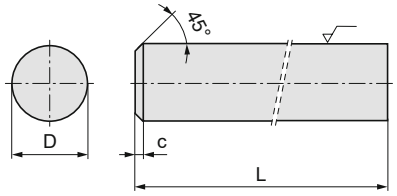
○ Semi-standard ● Standard Other grades and dimensions upon request

# End mill blanks, with chamfer

## Submicron grades h5 / h6 – **METRIC**




| D [mm] | L [mm] | Type, description | Dia. tol. [mm] | ISO 286 | c [mm] | DIN 6527 | CTS18D | CTS20D | CTS24Z |
|---|---|---|---|---|---|---|---|---|---|
| 3.00 | 50 | RGMC 0300-050 | +0/-0.004 | h5 | .30 | | | ● | |
| 3.00 | 60 | RGMC 0300-060 | +0/-0.004 | h5 | .30 | | | ● | |
| 4.00 | 51 | RGMC 0400-051 | +0/-0.008 | h6 | .40 | x | | ● | |
| 4.00 | 60 | RGMC 0400-060 | +0/-0.005 | h5 | .40 | | | ● | |
| 4.00 | 75 | RGMC 0400-075 | +0/-0.005 | h5 | .40 | | | ● | |
| 5.00 | 51 | RGMC 0500-051 | +0/-0.008 | h6 | .40 | x | | ● | |
| 6.00 | 51 | RGMC 0600-051 | +0/-0.008 | h6 | .40 | x | | ● | |
| 6.00 | 55 | RGMC 0600-055 | +0/-0.008 | h6 | .40 | x | | ● | ● |
| 6.00 | 58 | RGMC 0600-058 | +0/-0.008 | h6 | .40 | x | ● | ● | ● |
| 6.00 | 60 | RGMC 0600-060 | +0/-0.005 | h5 | .40 | | | ● | |
| 6.00 | 65 | RGMC 0600-065 | +0/-0.005 | h5 | .40 | | | ● | |
| 6.00 | 70 | RGMC 0600-070 | +0/-0.005 | h5 | .40 | | | ● | |
| 6.00 | 75 | RGMC 0600-075 | +0/-0.005 | h5 | .40 | | | ● | |
| 6.00 | 80 | RGMC 0600-080 | +0/-0.005 | h5 | .40 | | | ● | |
| 6.00 | 100 | RGMC 0600-100 | +0/-0.005 | h5 | .40 | | | ● | |
| 8.00 | 59 | RGMC 0800-059 | +0/-0.009 | h6 | .60 | x | | ● | ● |
| 8.00 | 64 | RGMC 0800-064 | +0/-0.009 | h6 | .60 | x | ● | ● | ● |
| 8.00 | 70 | RGMC 0800-070 | +0/-0.006 | h5 | .60 | | | ● | |
| 8.00 | 75 | RGMC 0800-075 | +0/-0.006 | h5 | .60 | | | ● | |
| 8.00 | 80 | RGMC 0800-080 | +0/-0.006 | h5 | .60 | | | ● | |
| 8.00 | 100 | RGMC 0800-100 | +0/-0.006 | h5 | .60 | | | ● | ● |
| 8.00 | 120 | RGMC 0800-120 | +0/-0.006 | h5 | .60 | | | ● | |
| 10.00 | 67 | RGMC 1000-067 | +0/-0.009 | h6 | .80 | x | | ● | ● |
| 10.00 | 73 | RGMC 1000-073 | +0/-0.009 | h6 | .80 | x | ● | ● | ● |
| 10.00 | 75 | RGMC 1000-075 | +0/-0.006 | h5 | .80 | | | ● | |
| 10.00 | 80 | RGMC 1000-080 | +0/-0.006 | h5 | .80 | | | ● | |
| 10.00 | 90 | RGMC 1000-090 | +0/-0.006 | h5 | .80 | | | ● | |
| 10.00 | 100 | RGMC 1000-100 | +0/-0.006 | h5 | .80 | | | ● | ● |

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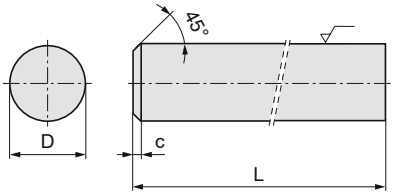
○ Semi-standard ● Standard Other grades and dimensions upon request

# End mill blanks, with chamfer

## Submicron grades h5 / h6 – **METRIC**

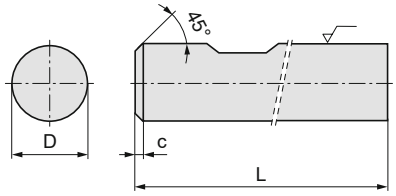



| D [mm] | L [mm] | Type, description | Dia. tol. [mm] | ISO 286 | c [mm] | DIN 6527 | CTS18D | CTS20D | CTS24Z |
|---|---|---|---|---|---|---|---|---|---|
| 10.00 | 120 | RGMC 1000-120 | +0/-0.006 | h5 | .80 | | | ● | |
| 12.00 | 74 | RGMC 1200-074 | +0/-0.011 | h6 | .80 | x | | ● | ● |
| 12.00 | 84 | RGMC 1200-084 | +0/-0.011 | h6 | .80 | x | ● | ● | ● |
| 12.00 | 100 | RGMC 1200-100 | +0/-0.008 | h5 | .80 | | | ● | ● |
| 12.00 | 120 | RGMC 1200-120 | +0/-0.008 | h5 | .80 | | | ● | |
| 14.00 | 76 | RGMC 1400-076 | +0/-0.011 | h6 | .80 | x | | ● | |
| 14.00 | 84 | RGMC 1400-084 | +0/-0.011 | h6 | .80 | x | | ● | ● |
| 16.00 | 83 | RGMC 1600-083 | +0/-0.011 | h6 | .80 | x | | ● | |
| 16.00 | 93 | RGMC 1600-093 | +0/-0.011 | h6 | .80 | x | ● | ● | ● |
| 16.00 | 110 | RGMC 1600-110 | +0/-0.008 | h5 | .80 | | | ● | |
| 16.00 | 120 | RGMC 1600-120 | +0/-0.008 | h5 | .80 | | | ● | ● |
| 16.00 | 130 | RGMC 1600-130 | +0/-0.008 | h5 | .80 | | | ● | |
| 16.00 | 150 | RGMC 1600-150 | +0/-0.008 | h5 | .80 | | | ● | |
| 18.00 | 93 | RGMC 1800-093 | +0/-0.011 | h6 | 1.00 | x | | ● | |
| 20.00 | 93 | RGMC 2000-093 | +0/-0.013 | h6 | 1.00 | x | | ● | |
| 20.00 | 105 | RGMC 2000-105 | +0/-0.013 | h6 | 1.00 | x | ● | ● | ● |
| 20.00 | 125 | RGMC 2000-125 | +0/-0.009 | h5 | 1.00 | | | ● | ● |
| 20.00 | 150 | RGMC 2000-150 | +0/-0.009 | h5 | 1.00 | | | ● | |
| 25.00 | 125 | RGMC 2500-125 | +0/-0.009 | h5 | 1.00 | | | ● | |
| 25.00 | 150 | RGMC 2500-150 | +0/-0.009 | h5 | 1.00 | | | ● | |

○ Semi-standard ● Standard Other grades and dimensions upon request

# End mill blanks, with chamfer, with Weldon shank

## Submicron grades h6 – **METRIC**

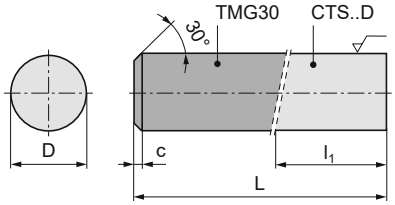



| D [mm] | L [mm] | Type, description | Dia. tol. [mm] | ISO 286 | c [mm] | DIN 6527 | CTS20D |
|---|---|---|---|---|---|---|---|
| 6.00 | 51 | RGMCW 0600-051 | +0/-0.008 | h6 | .40 | x | ● |
| 6.00 | 55 | RGMCW 0600-055 | +0/-0.008 | h6 | .40 | x | ○ |
| 6.00 | 58 | RGMCW 0600-058 | +0/-0.008 | h6 | .40 | x | ● |
| 8.00 | 64 | RGMCW 0800-064 | +0/-0.009 | h6 | .60 | x | ● |
| 10.00 | 67 | RGMCW 1000-067 | +0/-0.009 | h6 | .80 | x | ● |
| 10.00 | 73 | RGMCW 1000-073 | +0/-0.009 | h6 | .80 | x | ● |
| 12.00 | 74 | RGMCW 1200-074 | +0/-0.011 | h6 | .80 | x | ● |
| 12.00 | 84 | RGMCW 1200-084 | +0/-0.011 | h6 | .80 | x | ● |
| 16.00 | 93 | RGMCW 1600-093 | +0/-0.011 | h6 | .80 | x | ● |
| 20.00 | 93 | RGMCW 2000-093 | +0/-0.013 | h6 | 1.00 | x | ○ |
| 20.00 | 105 | RGMCW 2000-105 | +0/-0.013 | h6 | 1.00 | x | ● |

○ Semi-standard ● Standard Other grades and dimensions upon request

# Precision ground tool blanks, with chamfer, DualBlank

## Submicron grades h6 – **METRIC**

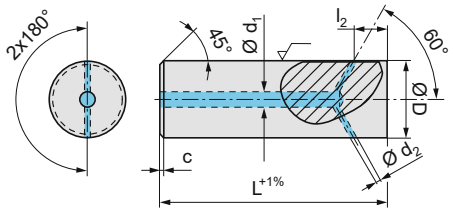



| D [mm] | L [mm] | Type, description | Dia. tol. [mm] | ISO 286 | c [mm] | DIN 6527 | CTS18D | CTS20D |
|---|---|---|---|---|---|---|---|---|
| 6.00 | 58 | RGMCD 0600-058 | +0/-0.008 | h6 | .50 | x | ● | ● |
| 8.00 | 64 | RGMCD 0800-064 | +0/-0.009 | h6 | .70 | x | ● | ● |
| 10.00 | 73 | RGMCD 1000-073 | +0/-0.009 | h6 | .90 | x | ● | ● |
| 12.00 | 84 | RGMCD 1200-084 | +0/-0.011 | h6 | .90 | x | ● | ● |
| 16.00 | 93 | RGMCD 1600-093 | +0/-0.011 | h6 | .90 | x | ● | ● |
| 20.00 | 105 | RGMCD 2000-105 | +0/-0.013 | h6 | 1.10 | x | ● | ● |

○ Semi-standard ● Standard Other grades and dimensions upon request

# End mill blanks, with chamfer, with radial coolant exit holes

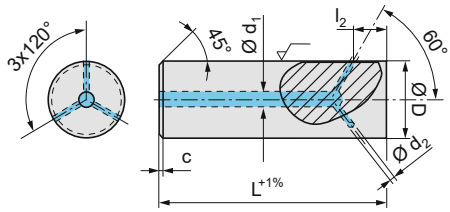
## 2x 180°, Submicron grades h6 – **METRIC**




| D [mm] | L [mm] | Type, description | Dia. tol. [mm] | ISO 286 | $d_1$ [mm] | $d_2$ [mm] | $l_2$ [mm] | c [mm] | CTS20D |
|---|---|---|---|---|---|---|---|---|---|
| 6.00 | 58 | RGMCY2 0600-058 | +0/-0.008 | h6 | 1.20 | .80 | 3.00 | .40 | ○ |
| 8.00 | 64 | RGMCY2 0800-064 | +0/-0.009 | h6 | 1.60 | 1.10 | 4.00 | .60 | ○ |
| 10.00 | 73 | RGMCY2 1000-073 | +0/-0.009 | h6 | 2.00 | 1.40 | 5.00 | .80 | ○ |
| 12.00 | 84 | RGMCY2 1200-084 | +0/-0.011 | h6 | 2.20 | 1.60 | 6.00 | .80 | ○ |
| 14.00 | 84 | RGMCY2 1400-084 | +0/-0.011 | h6 | 2.40 | 1.70 | 7.00 | .80 | ○ |
| 16.00 | 93 | RGMCY2 1600-093 | +0/-0.011 | h6 | 2.60 | 1.90 | 8.00 | .80 | ○ |
| 18.00 | 93 | RGMCY2 1800-093 | +0/-0.011 | h6 | 2.80 | 2.00 | 9.00 | 1.00 | ○ |
| 20.00 | 105 | RGMCY2 2000-105 | +0/-0.013 | h6 | 3.00 | 2.10 | 10.00 | 1.00 | ○ |
| 25.00 | 125 | RGMCY2 2500-125 | +0/-0.013 | h6 | 3.20 | 2.30 | 12.50 | 1.00 | ○ |

# End mill blanks, with chamfer, with radial coolant exit holes

## 3x 120°, Submicron grades h6 – **METRIC**



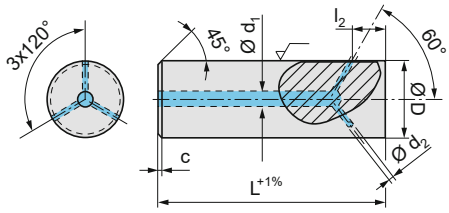

| D [mm] | L [mm] | Type, description | Dia. tol. [mm] | ISO 286 | $d_1$ [mm] | $d_2$ [mm] | $l_2$ [mm] | c [mm] | CTS20D |
|---|---|---|---|---|---|---|---|---|---|
| 6.00 | 58 | RGMCY3 0600-058 | +0/-0.008 | h6 | 1.20 | .70 | 3.00 | .40 | ● |
| 8.00 | 64 | RGMCY3 0800-064 | +0/-0.009 | h6 | 1.60 | .90 | 4.00 | .60 | ● |
| 10.00 | 73 | RGMCY3 1000-073 | +0/-0.009 | h6 | 2.00 | 1.20 | 5.00 | .80 | ● |
| 12.00 | 84 | RGMCY3 1200-084 | +0/-0.011 | h6 | 2.20 | 1.30 | 6.00 | .80 | ● |
| 14.00 | 84 | RGMCY3 1400-084 | +0/-0.011 | h6 | 2.40 | 1.40 | 7.00 | .80 | ● |

→

○ Semi-standard ● Standard Other grades and dimensions upon request

# End mill blanks, with chamfer, with radial coolant exit holes

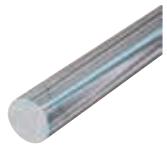
## 3x 120°, Submicron grades h6 – **METRIC**

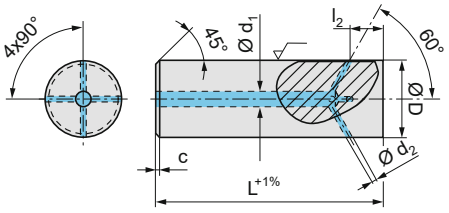



| D [mm] | L [mm] | Type, description | Dia. tol. [mm] | ISO 286 | $d_1$ [mm] | $d_2$ [mm] | $l_2$ [mm] | c [mm] | CTS20D |
|---|---|---|---|---|---|---|---|---|---|
| 16.00 | 93 | RGMCY3 1600-093 | +0/-0.011 | h6 | 2.60 | 1.50 | 8.00 | .80 | ● |
| 18.00 | 93 | RGMCY3 1800-093 | +0/-0.011 | h6 | 2.80 | 1.60 | 9.00 | 1.00 | ● |
| 20.00 | 105 | RGMCY3 2000-105 | +0/-0.013 | h6 | 3.00 | 1.70 | 10.00 | 1.00 | ● |
| 25.00 | 125 | RGMCY3 2500-125 | +0/-0.013 | h6 | 3.20 | 1.80 | 12.50 | 1.00 | ● |

# End mill blanks, with chamfer, with radial coolant exit holes

## 4x 90°, Submicron grades h6 – **METRIC**



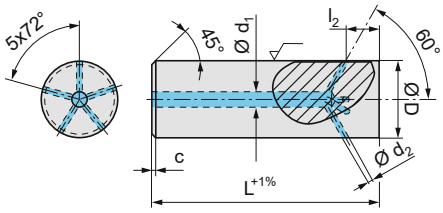



| D [mm] | L [mm] | Type, description | Dia. tol. [mm] | ISO 286 | $d_1$ [mm] | $d_2$ [mm] | $l_2$ [mm] | c [mm] | CTS20D |
|---|---|---|---|---|---|---|---|---|---|
| 6.00 | 58 | RGMCY4 0600-058 | +0/-0.008 | h6 | 1.20 | .60 | 3.00 | .40 | ● |
| 8.00 | 64 | RGMCY4 0800-064 | +0/-0.009 | h6 | 1.60 | .80 | 4.00 | .60 | ● |
| 10.00 | 73 | RGMCY4 1000-073 | +0/-0.009 | h6 | 2.00 | 1.00 | 5.00 | .80 | ● |
| 12.00 | 84 | RGMCY4 1200-084 | +0/-0.011 | h6 | 2.20 | 1.10 | 6.00 | .80 | ● |
| 14.00 | 84 | RGMCY4 1400-084 | +0/-0.011 | h6 | 2.40 | 1.20 | 7.00 | .80 | ● |
| 16.00 | 93 | RGMCY4 1600-093 | +0/-0.011 | h6 | 2.60 | 1.30 | 8.00 | .80 | ● |
| 18.00 | 93 | RGMCY4 1800-093 | +0/-0.011 | h6 | 2.80 | 1.40 | 9.00 | 1.00 | ● |
| 20.00 | 105 | RGMCY4 2000-105 | +0/-0.013 | h6 | 3.00 | 1.50 | 10.00 | 1.00 | ● |
| 25.00 | 125 | RGMCY4 2500-125 | +0/-0.013 | h6 | 3.20 | 1.60 | 12.50 | 1.00 | ● |

○ Semi-standard ● Standard Other grades and dimensions upon request

# End mill blanks, with chamfer, with radial coolant exit holes

## 5x 72°, Submicron grades h6 – **METRIC**




| D [mm] | L [mm] | Type, description | Dia. tol. [mm] | ISO 286 | $d_1$ [mm] | $d_2$ [mm] | $l_2$ [mm] | c [mm] | CTS20D |
|---|---|---|---|---|---|---|---|---|---|
| 6.00 | 58 | RGMCY5 0600-058 | +0/-0.008 | h6 | 1.20 | .50 | 3.00 | .40 | ○ |
| 8.00 | 64 | RGMCY5 0800-064 | +0/-0.009 | h6 | 1.60 | .70 | 4.00 | .60 | ○ |
| 10.00 | 73 | RGMCY5 1000-073 | +0/-0.009 | h6 | 2.00 | .90 | 5.00 | .80 | ○ |
| 12.00 | 84 | RGMCY5 1200-084 | +0/-0.011 | h6 | 2.20 | 1.00 | 6.00 | .80 | ○ |
| 14.00 | 84 | RGMCY5 1400-084 | +0/-0.011 | h6 | 2.40 | 1.10 | 7.00 | .80 | ○ |
| 16.00 | 93 | RGMCY5 1600-093 | +0/-0.011 | h6 | 2.60 | 1.20 | 8.00 | .80 | ○ |
| 18.00 | 93 | RGMCY5 1800-093 | +0/-0.011 | h6 | 2.80 | 1.30 | 9.00 | 1.00 | ○ |
| 20.00 | 105 | RGMCY5 2000-105 | +0/-0.013 | h6 | 3.00 | 1.40 | 10.00 | 1.00 | ○ |
| 25.00 | 125 | RGMCY5 2500-125 | +0/-0.013 | h6 | 3.20 | 1.50 | 12.50 | 1.00 | ○ |

○ Semi-standard ● Standard Other grades and dimensions upon request

# Drill blanks

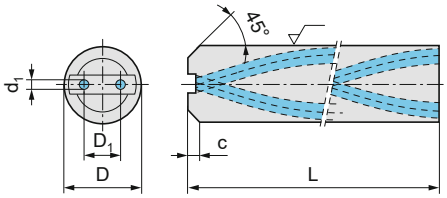
In addition to their geometrical precision thanks to a special grinding surface, our drill blanks are also notable for the improved pull-out resistance of the tool shank. The shank end corresponds to DIN 69090-3 and therefore complies with the standard for cutting tools which are suitable for MQL.

Of course we can also produce carbide rods in other dimensions and grades to order – just get in touch with your contact person at CERATIZIT.

Detailed technical data for our drill blanks can be found in the ‘Information’ section.

# Drill blanks with through-coolant

## 3xD, 5xD – h5

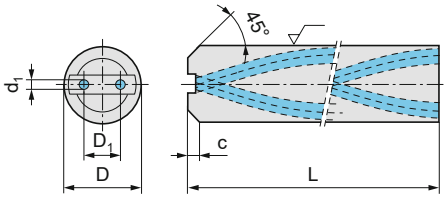



| xD factor | D [mm] | L [mm] | Type, description | Dia. tol. [mm] | ISO 286 | Nominal pitch [mm] | [°] | c [mm] | $D_1$ [mm] | $d_1$ [mm] | CTS20D |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 3 | 6.00 | 63 | 40MB2 0600/1,9/0,7/22,5-063 | +0/-0.005 | h5 | 22.50 | 40.0 | .95 | 1.90 | .70 | ○ |
| 3 | 6.00 | 63 | 46MB2 0600/1,6/0,5/18,0-063 | +0/-0.005 | h5 | 18.00 | 46.3 | .95 | 1.60 | .50 | ○ |
| 3 | 6.00 | 67 | 30MB2 0600/2,7/0,8/32,7-067 | +0/-0.005 | h5 | 32.70 | 30.0 | .95 | 2.70 | .80 | ○ |
| 3 | 6.00 | 67 | 33MB2 0600/2,2/0,9/29,0-067 | +0/-0.005 | h5 | 29.00 | 33.0 | .95 | 2.20 | .90 | ○ |
| 3 | 8.00 | 80 | 30MB2 0800/3,4/1,0/43,5-080 | +0/-0.006 | h5 | 43.50 | 30.0 | 1.25 | 3.40 | 1.00 | ○ |
| 3 | 10.00 | 90 | 30MB2 1000/4,8/1,3/54,0-090 | +0/-0.006 | h5 | 54.40 | 30.0 | 1.35 | 4.80 | 1.30 | ○ |
| 3 | 12.00 | 103 | 30MB2 1200/6,3/1,7/65,3-103 | +0/-0.008 | h5 | 65.30 | 30.0 | 1.75 | 6.30 | 1.70 | ○ |
| 3 | 14.00 | 108 | 30MB2 1400/6,7/1,8/76,2-108 | +0/-0.008 | h5 | 76.20 | 30.0 | 1.95 | 6.70 | 1.80 | ○ |
| 3 | 16.00 | 116 | 30MB2 1600/8,0/2,0/87,1-116 | +0/-0.008 | h5 | 87.10 | 30.0 | 2.45 | 8.00 | 2.00 | ○ |
| 3 | 18.00 | 124 | 30MB2 1800/9,0/2,3/98,0-124 | +0/-0.008 | h5 | 98.00 | 30.0 | 2.75 | 9.00 | 2.30 | ○ |
| 3 | 20.00 | 132 | 30MB2 2000/10,0/2,5/108,8-132 | +0/-0.009 | h5 | 108.80 | 30.0 | 3.25 | 10.00 | 2.50 | ○ |
| | | | | | | | | | | | |
| 5 | 6.00 | 67 | 46MB2 0600/1,6/0,5/18,0-067 | +0/-0.005 | h5 | 18.00 | 46.3 | .95 | 1.60 | .50 | ● |
| 5 | 6.00 | 67 | 40MB2 0600/1,9/0,7/22,5-067 | +0/-0.005 | h5 | 22.50 | 40.0 | .95 | 1.90 | .70 | ● |
| 5 | 6.00 | 75 | 33MB2 0600/2,2/0,9/29,0-075 | +0/-0.005 | h5 | 29.00 | 33.0 | .95 | 2.20 | .90 | ● |
| 5 | 6.00 | 75 | 40MB2 0600/1,9/0,7/22,5-075 | +0/-0.005 | h5 | 22.50 | 40.0 | .95 | 1.90 | .70 | ● |
| 5 | 6.00 | 83 | 30MB2 0600/2,7/0,8/32,7-083 | +0/-0.005 | h5 | 32.70 | 30.0 | .95 | 2.70 | .80 | ● |
| 5 | 8.00 | 92 | 30MB2 0800/3,4/1,0/43,5-092 | +0/-0.006 | h5 | 43.50 | 30.0 | 1.25 | 3.40 | 1.00 | ● |
| 5 | 10.00 | 104 | 30MB2 1000/4,8/1,3/54,0-104 | +0/-0.006 | h5 | 54.40 | 30.0 | 1.35 | 4.80 | 1.30 | ● |
| 5 | 12.00 | 119 | 30MB2 1200/6,3/1,7/65,3-119 | +0/-0.008 | h5 | 65.30 | 30.0 | 1.75 | 6.30 | 1.70 | ● |
| 5 | 14.00 | 125 | 30MB2 1400/6,7/1,8/76,2-125 | +0/-0.008 | h5 | 76.20 | 30.0 | 1.95 | 6.70 | 1.80 | ● |
| 5 | 16.00 | 134 | 30MB2 1600/8,0/2,0/87,1-134 | +0/-0.008 | h5 | 87.10 | 30.0 | 2.45 | 8.00 | 2.00 | ● |
| 5 | 18.00 | 144 | 30MB2 1800/9,0/2,3/98,0-144 | +0/-0.008 | h5 | 98.00 | 30.0 | 2.75 | 9.00 | 2.30 | ● |
| 5 | 20.00 | 154 | 30MB2 2000/10,0/2,5/108,8-154 | +0/-0.009 | h5 | 108.80 | 30.0 | 3.25 | 10.00 | 2.50 | ○ |

○ Semi-standard ● Standard Other grades and dimensions upon request

# Drill blanks with through-coolant

## 8xD, 12xD – h5

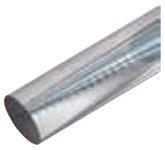


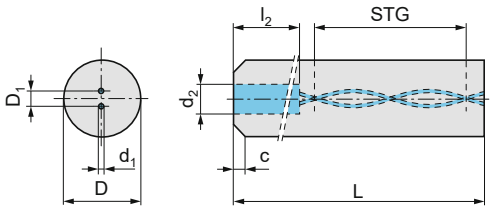

| xD factor | D [mm] | L [mm] | Type, description | Dia. tol. [mm] | ISO 286 | Nominal pitch [mm] | [°] | c [mm] | $D_1$ [mm] | $d_1$ [mm] | CTS20D |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 6.00 | 73 | 46MB2 0600/1,6/0,5/18,0-073 | +0/-0.005 | h5 | 18.00 | 46.3 | .95 | 1.60 | .50 | ○ |
| 8 | 6.00 | 73 | 40MB2 0600/1,9/0,7/22,5-073 | +0/-0.005 | h5 | 22.50 | 40.0 | .95 | 1.90 | .70 | ○ |
| 8 | 6.00 | 82 | 33MB2 0600/2,2/0,9/29,0-082 | +0/-0.005 | h5 | 29.00 | 33.0 | .95 | 2.20 | .90 | ○ |
| 8 | 6.00 | 82 | 40MB2 0600/1,9/0,7/22,5-082 | +0/-0.005 | h5 | 22.50 | 40.0 | .95 | 1.90 | .70 | ○ |
| 8 | 6.00 | 96 | 30MB2 0600/2,7/0,8/32,7-096 | +0/-0.005 | h5 | 32.70 | 30.0 | .95 | 2.70 | .80 | ○ |
| 8 | 8.00 | 115 | 30MB2 0800/3,4/1,0/43,5-115 | +0/-0.006 | h5 | 43.50 | 30.0 | 1.25 | 3.40 | 1.00 | ○ |
| 8 | 10.00 | 143 | 30MB2 1000/4,8/1,3/54,0-143 | +0/-0.006 | h5 | 54.40 | 30.0 | 1.35 | 4.80 | 1.30 | ○ |
| 8 | 12.00 | 163 | 30MB2 1200/6,3/1,7/65,3-163 | +0/-0.008 | h5 | 65.30 | 30.0 | 1.75 | 6.30 | 1.70 | ○ |
| 8 | 14.00 | 179 | 30MB2 1400/6,7/1,8/76,2-179 | +0/-0.008 | h5 | 76.20 | 30.0 | 1.95 | 6.70 | 1.80 | ○ |
| 8 | 16.00 | 204 | 30MB2 1600/8,0/2,0/87,1-204 | +0/-0.008 | h5 | 87.10 | 30.0 | 2.45 | 8.00 | 2.00 | ○ |
| 8 | 18.00 | 223 | 30MB2 1800/9,0/2,3/98,0-223 | +0/-0.008 | h5 | 98.00 | 30.0 | 2.75 | 9.00 | 2.30 | ○ |
| 8 | 20.00 | 244 | 30MB2 2000/10,0/2,5/108,8-244 | +0/-0.009 | h5 | 108.80 | 30.0 | 3.25 | 10.00 | 2.50 | ○ |
| | | | | | | | | | | | |
| 12 | 6.00 | 93 | 40MB2 0600/1,9/0,7/22,5-093 | +0/-0.005 | h5 | 22.50 | 40.0 | .95 | 1.90 | .70 | ○ |
| 12 | 6.00 | 93 | 46MB2 0600/1,6/0,5/18,0-093 | +0/-0.005 | h5 | 18.00 | 46.3 | .95 | 1.60 | .50 | ○ |
| 12 | 6.00 | 103 | 40MB2 0600/1,9/0,7/22,5-103 | +0/-0.005 | h5 | 22.50 | 40.0 | .95 | 1.90 | .70 | ○ |
| 12 | 6.00 | 103 | 33MB2 0600/2,2/0,9/29,0-103 | +0/-0.005 | h5 | 29.00 | 33.0 | .95 | 2.20 | .90 | ○ |
| 12 | 6.00 | 117 | 30MB2 0600/2,7/0,8/32,7-117 | +0/-0.005 | h5 | 32.70 | 30.0 | .95 | 2.70 | .80 | ○ |
| 12 | 8.00 | 147 | 30MB2 0800/3,4/1,0/43,5-147 | +0/-0.006 | h5 | 43.50 | 30.0 | 1.25 | 3.40 | 1.00 | ○ |
| 12 | 10.00 | 163 | 30MB2 1000/4,8/1,3/54,0-163 | +0/-0.006 | h5 | 54.40 | 30.0 | 1.35 | 4.80 | 1.30 | ○ |
| 12 | 12.00 | 205 | 30MB2 1200/6,3/1,7/65,3-205 | +0/-0.008 | h5 | 65.30 | 30.0 | 1.75 | 6.30 | 1.70 | ○ |
| 12 | 14.00 | 231 | 30MB2 1400/6,7/1,8/76,2-231 | +0/-0.008 | h5 | 76.20 | 30.0 | 1.95 | 6.70 | 1.80 | ○ |
| 12 | 16.00 | 261 | 30MB2 1600/8,0/2,0/87,1-261 | +0/-0.008 | h5 | 87.10 | 30.0 | 2.45 | 8.00 | 2.00 | ○ |
| 12 | 18.00 | 286 | 30MB2 1800/9,0/2,3/98,0-286 | +0/-0.008 | h5 | 98.00 | 30.0 | 2.75 | 9.00 | 2.30 | ○ |
| 12 | 20.00 | 311 | 30MB2 2000/10,0/2,5/108,8-311 | +0/-0.009 | h5 | 108.80 | 30.0 | 3.25 | 10.00 | 2.50 | ○ |

○ Semi-standard ● Standard Other grades and dimensions upon request

# Micro-drill blanks with through-coolant

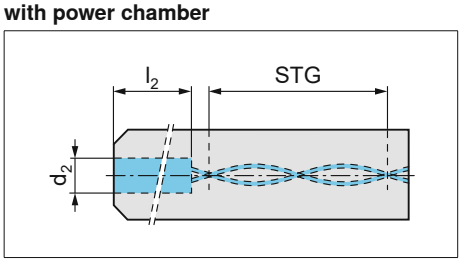
## Blanks for micro-drills h5 – **METRIC**



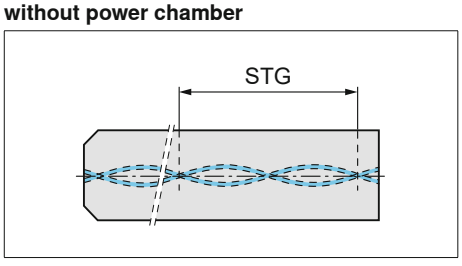



| D [mm] | L [mm] | Type, description | Dia. tol. [mm] | ISO 286 | Nominal pitch [mm] | [°] | c [mm] | $D_1$ [mm] | $d_1$ [mm] | $d_2$ [mm] | $l_2$ [mm] | CTS20D |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3.00 | 55 | 71G2 0300/0,29/0,05/3,2-055 | +0/-0.004 | h5 | 3.20 | 71.2 | .20 | .29 | .05 | .70 | 25 | ○ |
| 3.00 | 60 | 67G2 0300/0,37/0,07/4,0-060 | +0/-0.004 | h5 | 4.00 | 67.0 | .20 | .37 | .07 | .90 | 25 | ● |
| 3.00 | 65 | 62G2 0300/0,47/0,10/5,0-065 | +0/-0.004 | h5 | 5.00 | 62.1 | .20 | .47 | .10 | 1.20 | 25 | ● |
| 3.00 | 75 | 58G2 0300/0,60/0,13/6,0-075 | +0/-0.004 | h5 | 6.00 | 57.5 | .20 | .60 | .13 | 1.50 | 25 | ● |
| 3.00 | 85 | 53G2 0300/0,75/0,16/7,2-085 | +0/-0.004 | h5 | 7.20 | 52.6 | .20 | .75 | .16 | 1.70 | 25 | ● |
| 3.00 | 95 | 46G2 0300/0,90/0,20/9,0-095 | +0/-0.004 | h5 | 9.00 | 46.3 | .20 | .90 | .20 | | | ● |
| 3.00 | 105 | 42G2 0300/1,05/0,25/10,6-105 | +0/-0.004 | h5 | 10.60 | 41.6 | .20 | 1.05 | .25 | | | ● |
| 3.00 | 120 | 37G2 0300/1,25/0,30/12,5-120 | +0/-0.004 | h5 | 12.50 | 37.0 | .20 | 1.25 | .30 | | | ● |
| 3.00 | 140 | 33G2 0300/1,50/0,35/14,5-140 | +0/-0.004 | h5 | 14.50 | 33.0 | .20 | 1.50 | .35 | | | ● |
| | | | | | | | | | | | | |
| 4.00 | 55 | 76G2 0400/0,29/0,05/3,2-055 | +0/-0.005 | h5 | 3.20 | 75.7 | .30 | .29 | .05 | .70 | 25 | ○ |
| 4.00 | 60 | 72G2 0400/0,37/0,07/4,0-060 | +0/-0.005 | h5 | 4.00 | 72.3 | .30 | .37 | .07 | .90 | 25 | ○ |
| 4.00 | 65 | 68G2 0400/0,47/0,10/5,0-065 | +0/-0.005 | h5 | 5.00 | 68.3 | .30 | .47 | .10 | 1.20 | 25 | ● |
| 4.00 | 75 | 64G2 0400/0,60/0,13/6,0-075 | +0/-0.005 | h5 | 6.00 | 64.5 | .30 | .60 | .13 | 1.50 | 25 | ● |
| 4.00 | 85 | 60G2 0400/0,75/0,16/7,2-085 | +0/-0.005 | h5 | 7.20 | 60.2 | .30 | .75 | .16 | 2.00 | 25 | ● |
| 4.00 | 95 | 54G2 0400/0,90/0,20/9,0-095 | +0/-0.005 | h5 | 9.00 | 54.4 | .30 | .90 | .20 | 2.50 | 25 | ● |
| 4.00 | 105 | 50G2 0400/1,05/0,25/10,6-105 | +0/-0.005 | h5 | 10.60 | 49.9 | .30 | 1.05 | .25 | | | ● |
| 4.00 | 120 | 46G2 0400/1,25/0,30/12,0-120 | +0/-0.005 | h5 | 12.00 | 46.3 | .30 | 1.25 | .30 | | | ● |
| 4.00 | 140 | 38G2 0400/1,50/0,35/16,2-140 | +0/-0.004 | h5 | 16.20 | 37.8 | .30 | 1.50 | .35 | | | ● |
| 4.00 | 160 | 35G2 0400/1,70/0,40/18,0-160 | +0/-0.004 | h5 | 18.00 | 34.9 | .30 | 1.70 | .40 | | | ● |
| 4.00 | 180 | 30G2 0400/2,00/0,45/21,8-180 | +0/-0.004 | h5 | 21.80 | 30.0 | .30 | 2.00 | .45 | | | ○ |

**with power chamber**




**without power chamber**




○ Semi-standard ● Standard Other grades and dimensions upon request

# Solid carbide rods

A comprehensive standard range of sintered and ground solid carbide rods in various dimensions is available from stock. Furthermore, you can choose from carbide grades with the most varied characteristics for every application area: from ultrafine grades for the machining of superhard materials, by way of submicron grades for universal application.

Of course we can also produce carbide rods in other dimensions and grades to order – simply get in touch with your contact person at CERATIZIT.

Detailed technical data for our solid carbide rods can be found in the ‘Information’ section.

# Solid carbide rods, as sintered

## Ultrafine grades – **METRIC**


| D [mm] | L [mm] | Type, description | Dia. tol. [mm] | CTU08L | TSF22 | TSF44 |
|---|---|---|---|---|---|---|
| 3.25 | 330 | RR 0325-330 | -0/+0.20 | ● | ● | ● |
| 4.20 | 330 | RR 0420-330 | -0/+0.20 | ● | ● | ● |
| 5.20 | 330 | RR 0520-330 | -0/+0.25 | ● | ● | ● |
| 6.20 | 330 | RR 0620-330 | -0/+0.25 | ● | ● | ● |
| 8.20 | 330 | RR 0820-330 | -0/+0.30 | ● | ● | ● |
| 10.20 | 330 | RR 1020-330 | -0/+0.30 | ● | ● | ● |
| 12.20 | 330 | RR 1220-330 | -0/+0.30 | ● | ● | ● |
| 14.20 | 330 | RR 1420-330 | -0/+0.30 | | ● | ● |
| 16.20 | 330 | RR 1620-330 | -0/+0.45 | | ● | ● |
| 18.20 | 330 | RR 1820-330 | -0/+0.45 | | ● | ○ |
| 20.20 | 330 | RR 2020-330 | -0/+0.45 | | ● | ● |
| 25.20 | 330 | RR 2520-330 | -0/+0.65 | | ● | ● |
| 32.20 | 330 | RR 3220-330 | -0/+0.65 | | | ● |

○ Semi-standard ● Standard Other grades and dimensions upon request

# Solid carbide rods, as sintered

## Submicron grades – **METRIC**


| D [mm] | L [mm] | Type, description | Dia. tol. [mm] | CTS12D | CTS15D | CTS18D | CTS20D | CTS24Z | CTS30D |
|---|---|---|---|---|---|---|---|---|---|
| 1.15 | 330 | RR 0115-330 | -0/+0.15 | | | | ● | | |
| 1.65 | 330 | RR 0165-330 | -0/+0.15 | ● | | | ● | | |
| 1.80 | 330 | RR 0180-330 | -0/+0.15 | | | | ● | | |
| 2.20 | 330 | RR 0220-330 | -0/+0.20 | ● | | | ● | | |
| 2.70 | 330 | RR 0270-330 | -0/+0.20 | | | | ● | | |
| 3.25 | 330 | RR 0325-330 | -0/+0.20 | ● | ● | ● | ● | ● | |
| 3.70 | 330 | RR 0370-330 | -0/+0.20 | | | | ● | | |
| 4.20 | 330 | RR 0420-330 | -0/+0.20 | ● | ● | ● | ● | ● | |
| 4.70 | 330 | RR 0470-330 | -0/+0.20 | | | | ● | | |
| 5.20 | 330 | RR 0520-330 | -0/+0.25 | ● | ● | | ● | | |
| 5.70 | 330 | RR 0570-330 | -0/+0.25 | | | | ● | | |
| 6.20 | 330 | RR 0620-330 | -0/+0.25 | ● | ● | ● | ● | ● | ● |
| 6.55 | 330 | RR 0655-330 | -0/+0.25 | | | | ● | | |
| 6.70 | 330 | RR 0670-330 | -0/+0.25 | | ○ | | ● | | |
| 7.20 | 330 | RR 0720-330 | -0/+0.30 | | | | ● | | |
| 7.70 | 330 | RR 0770-330 | -0/+0.30 | | | | ● | | |
| 8.20 | 330 | RR 0820-330 | -0/+0.30 | ● | ● | ● | ● | ● | ● |
| 8.70 | 330 | RR 0870-330 | -0/+0.30 | | | | ● | | |
| 9.20 | 330 | RR 0920-330 | -0/+0.30 | | | | ● | | |
| 9.70 | 330 | RR 0970-330 | -0/+0.30 | | | | ● | | |
| 10.20 | 330 | RR 1020-330 | -0/+0.30 | ● | ● | ● | ● | ● | ● |
| 10.70 | 330 | RR 1070-330 | -0/+0.30 | | | | ● | | |
| 11.20 | 330 | RR 1120-330 | -0/+0.30 | | | | ● | | |
| 11.70 | 330 | RR 1170-330 | -0/+0.30 | | | | ● | | |
| 12.20 | 330 | RR 1220-330 | -0/+0.30 | ● | ● | ● | ● | ● | ● |
| 12.70 | 330 | RR 1270-330 | -0/+0.30 | | ● | | ● | | |
| 13.00 | 330 | RR 1300-330 | -0/+0.30 | | | | ○ | | |
| 13.20 | 330 | RR 1320-330 | -0/+0.30 | | | | ● | | |

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○ Semi-standard ● Standard Other grades and dimensions upon request

# Solid carbide rods, as sintered

## Submicron grades – **METRIC**


| D [mm] | L [mm] | Type, description | Dia. tol. [mm] | CTS12D | CTS15D | CTS18D | CTS20D | CTS24Z | CTS30D |
|---|---|---|---|---|---|---|---|---|---|
| 14.20 | 330 | RR 1420-330 | -0/+0.30 | ● | ● | ● | ● | ● | |
| 14.70 | 330 | RR 1470-330 | -0/+0.30 | | | | ● | | |
| 15.20 | 330 | RR 1520-330 | -0/+0.30 | | | | ● | | |
| 16.20 | 330 | RR 1620-330 | -0/+0.45 | ● | ● | ● | ● | ● | ● |
| 17.20 | 330 | RR 1720-330 | -0/+0.45 | | | | ● | | |
| 18.20 | 330 | RR 1820-330 | -0/+0.45 | ● | ● | | ● | ● | |
| 19.20 | 330 | RR 1920-330 | -0/+0.45 | | | | ● | | |
| 20.20 | 330 | RR 2020-330 | -0/+0.45 | ● | ● | ● | ● | ● | ● |
| 21.20 | 330 | RR 2120-330 | -0/+0.55 | | | | ● | | |
| 22.20 | 330 | RR 2220-330 | -0/+0.55 | | | | ● | | |
| 23.20 | 330 | RR 2320-330 | -0/+0.55 | | | | ● | | |
| 24.20 | 330 | RR 2420-330 | -0/+0.55 | | | | ● | | |
| 25.20 | 330 | RR 2520-330 | -0/+0.65 | | ● | ● | ● | ● | ○ |
| 25.80 | 330 | RR 2580-330 | -0/+0.65 | | | | ○ | | |
| 26.20 | 330 | RR 2620-330 | -0/+0.65 | | | | ● | | |
| 28.20 | 330 | RR 2820-330 | -0/+0.65 | | | | ● | | |
| 30.20 | 330 | RR 3020-330 | -0/+0.65 | | | | ● | | |
| 32.20 | 330 | RR 3220-330 | -0/+0.65 | | | ○ | ● | | |
| 34.20 | 330 | RR 3420-330 | -0/+0.65 | | | | ● | | |
| 36.20 | 330 | RR 3620-330 | -0/+0.65 | | | | ● | | |
| 38.20 | 330 | RR 3820-330 | -0/+0.70 | | | | ○ | | |
| 40.20 | 330 | RR 4020-330 | -0/+0.70 | | | | ● | | |
| 42.20 | 330 | RR 4220-330 | -0/+0.70 | | | | ● | | |
| 46.20 | 330 | RR 4620-330 | -0/+0.70 | | | | ● | | |

○ Semi-standard ● Standard Other grades and dimensions upon request

# Solid carbide rods, as sintered

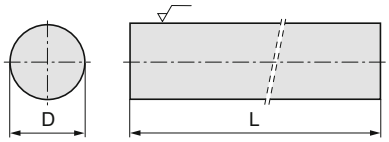
## Fine grades – **METRIC**


| D [mm] | L [mm] | Type, description | Dia. tol. [mm] | CTF12E |
|---|---|---|---|---|
| 3.25 | 330 | RR 0325-330 | -0/+0.20 | ● |
| 6.20 | 330 | RR 0420-330 | -0/+0.20 | ● |
| 5.20 | 330 | RR 0520-330 | -0/+0.25 | ● |
| 6.20 | 330 | RR 0620-330 | -0/+0.25 | ● |
| 8.20 | 330 | RR 0820-330 | -0/+0.30 | ● |
| 10.20 | 330 | RR 1020-330 | -0/+0.30 | ● |
| 12.20 | 330 | RR 1220-330 | -0/+0.30 | ● |
| 14.20 | 330 | RR 1420-330 | -0/+0.30 | ○ |
| 16.20 | 330 | RR 1620-330 | -0/+0.45 | ● |
| 18.20 | 330 | RR 1820-330 | -0/+0.45 | ○ |

○ Semi-standard ● Standard Other grades and dimensions upon request

# Solid carbide rods, ground

## Submicron grades h6 – **INCH**

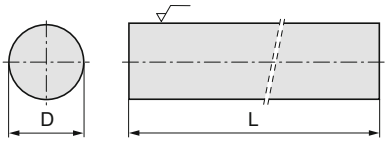



| D [inch] | L [inch] | Type, description | Dia. tol. [inch] | ISO 286 | CTS20D |
|---|---|---|---|---|---|
| 1/8 | 13.000 | RGI 1/8-13.00 | +0/-0,0003 | h6 | ● |
| 3/16 | 13.000 | RGI 3/16-13.00 | +0/-0,0003 | h6 | ● |
| 1/4 | 13.000 | RGI 1/4-13.00 | +0/-0,0004 | h6 | ● |
| 5/16 | 13.000 | RGI 5/16-13.00 | +0/-0,0004 | h6 | ● |
| 3/8 | 13.000 | RGI 3/8-13.00 | +0/-0,0004 | h6 | ● |
| 7/16 | 13.000 | RGI 7/16-13.00 | +0/-0,0004 | h6 | ● |
| 1/2 | 13.000 | RGI 1/2-13.00 | +0/-0,0004 | h6 | ● |
| 5/8 | 13.000 | RGI 5/8-13.00 | +0/-0,0004 | h6 | ● |
| 3/4 | 13.000 | RGI 3/4-13.00 | +0/-0,0005 | h6 | ● |
| 1 | 13.000 | RGI 1-13.00 | +0/-0,0005 | h6 | ● |

○ Semi-standard ● Standard Other grades and dimensions upon request

# Solid carbide rods, ground

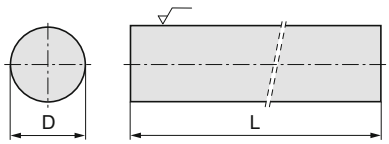
## Ultrafine grades h5 – **METRIC**




| D [mm] | L [mm] | Type, description | Dia. tol. [mm] | ISO 286 | TSF44 | TSF22 |
|---|---|---|---|---|---|---|
| 2.00 | 330 | RGM 0200-330 | +0/-0.004 | h5 | ● | |
| 3.00 | 330 | RGM 0300-330 | +0/-0.004 | h5 | ● | ● |
| 4.00 | 330 | RGM 0400-330 | +0/-0.005 | h5 | ● | ● |
| 5.00 | 330 | RGM 0500-330 | +0/-0.005 | h5 | ● | ● |
| 6.00 | 330 | RGM 0600-330 | +0/-0.005 | h5 | ● | ● |
| 8.00 | 330 | RGM 0800-330 | +0/-0.006 | h5 | ● | ● |
| 10.00 | 330 | RGM 1000-330 | +0/-0.006 | h5 | ● | ● |
| 12.00 | 330 | RGM 1200-330 | +0/-0.008 | h5 | ● | ● |
| 14.00 | 330 | RGM 1400-330 | +0/-0.008 | h5 | ● | ○ |
| 16.00 | 330 | RGM 1600-330 | +0/-0.008 | h5 | ● | ● |
| 20.00 | 330 | RGM 2000-330 | +0/-0.009 | h5 | ● | ● |
| 25.00 | 330 | RGM 2500-330 | +0/-0.009 | h5 | ● | ● |

# Solid carbide rods, ground

## Submicron grades h6 – **METRIC**




| D [mm] | L [mm] | Type, description | Dia. tol. [mm] | ISO 286 | CTS12D | CTS15D | CTS18D | CTS20D | CTS24Z | CTS30D |
|---|---|---|---|---|---|---|---|---|---|---|
| 1.00 | 330 | RGM 0100-330 | +0/-0.006 | h6 | | | | ● | | |
| 1.50 | 330 | RGM 0150-330 | +0/-0.006 | h6 | | | | ● | | |

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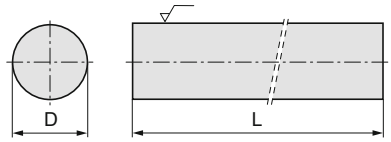
○ Semi-standard ● Standard Other grades and dimensions upon request

# Solid carbide rods, ground

## Submicron grades h6 – **METRIC**




| D [mm] | L [mm] | Type, description | Dia. tol. [mm] | ISO 286 | CTS12D | CTS15D | CTS18D | CTS20D | CTS24Z | CTS30D |
|---|---|---|---|---|---|---|---|---|---|---|
| 2.00 | 330 | RGM 0200-330 | +0/-0.006 | h6 | | | | ● | | |
| 2.50 | 330 | RGM 0250-330 | +0/-0.006 | h6 | | ● | | ● | | |
| 3.00 | 330 | RGM 0300-330 | +0/-0.006 | h6 | ● | | | ● | | |
| 3.50 | 330 | RGM 0350-330 | +0/-0.008 | h6 | | | | ● | | |
| 4.00 | 330 | RGM 0400-330 | +0/-0.008 | h6 | ● | | | ● | | |
| 4.50 | 330 | RGM 0450-330 | +0/-0.008 | h6 | | | | ● | | |
| 5.00 | 330 | RGM 0500-330 | +0/-0.008 | h6 | | | | ● | | |
| 5.50 | 330 | RGM 0550-330 | +0/-0.008 | h6 | | | | ● | | |
| 6.00 | 330 | RGM 0600-330 | +0/-0.008 | h6 | ● | ● | ● | ● | ● | ○ |
| 6.50 | 330 | RGM 0650-330 | +0/-0.009 | h6 | | | | ● | | |
| 7.00 | 330 | RGM 0700-330 | +0/-0.009 | h6 | | | | ● | | |
| 7.50 | 330 | RGM 0750-330 | +0/-0.009 | h6 | | | | ● | | |
| 8.00 | 330 | RGM 0800-330 | +0/-0.009 | h6 | ● | ● | ● | ● | ● | ○ |
| 8.50 | 330 | RGM 0850-330 | +0/-0.009 | h6 | | | | ● | | |
| 9.00 | 330 | RGM 0900-330 | +0/-0.009 | h6 | | | | ● | | |
| 9.50 | 330 | RGM 0950-330 | +0/-0.009 | h6 | | | | ● | | |
| 10.00 | 330 | RGM 1000-330 | +0/-0.009 | h6 | ● | ● | ● | ● | ● | ○ |
| 11.00 | 330 | RGM 1100-330 | +0/-0.011 | h6 | | | | ● | | |
| 12.00 | 330 | RGM 1200-330 | +0/-0.011 | h6 | ● | ● | ● | ● | ● | ○ |
| 13.00 | 330 | RGM 1300-330 | +0/-0.011 | h6 | | | | ● | | |
| 14.00 | 330 | RGM 1400-330 | +0/-0.011 | h6 | ● | | | ● | | |
| 15.00 | 330 | RGM 1500-330 | +0/-0.011 | h6 | | | | ● | | |
| 16.00 | 330 | RGM 1600-330 | +0/-0.011 | h6 | ● | ● | ● | ● | ● | ○ |
| 18.00 | 330 | RGM 1800-330 | +0/-0.011 | h6 | | ● | | ● | | |
| 19.00 | 330 | RGM 1900-330 | +0/-0.013 | h6 | | | | ● | | |
| 20.00 | 330 | RGM 2000-330 | +0/-0.013 | h6 | ● | ● | ● | ● | ● | ○ |
| 22.00 | 330 | RGM 2200-330 | +0/-0.013 | h6 | | | | ● | | |
| 24.00 | 330 | RGM 2400-330 | +0/-0.013 | h6 | | | | ● | | |

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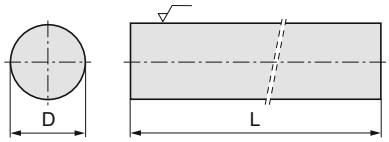
○ Semi-standard ● Standard Other grades and dimensions upon request

# Solid carbide rods, ground

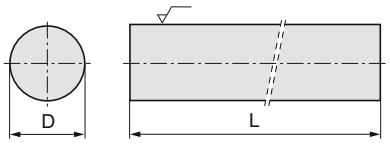
## Submicron grades h6 – **METRIC**




| D [mm] | L [mm] | Type, description | Dia. tol. [mm] | ISO 286 | CTS12D | CTS15D | CTS18D | CTS20D | CTS24Z | CTS30D |
|---|---|---|---|---|---|---|---|---|---|---|
| 25.00 | 330 | RGM 2500-330 | +0/-0.013 | h6 | | | ● | ● | ● | ○ |
| 28.00 | 330 | RGM 2800-330 | +0/-0.013 | h6 | | | | ● | | |
| 30.00 | 330 | RGM 3000-330 | +0/-0.013 | h6 | | | | ● | | |
| 32.00 | 330 | RGM 3200-330 | +0/-0.016 | h6 | | | ● | ● | | |
| 38.00 | 330 | RGM 3800-330 | +0/-0.016 | h6 | | | | ○ | | |
| 40.00 | 330 | RGM 4000-330 | +0/-0.016 | h6 | | | | ● | | |

# Solid carbide rods, ground

## Fine grades h6 – **METRIC**




| D [mm] | L [mm] | Type, description | Dia. tol. [mm] | ISO 286 | CTF12E |
|---|---|---|---|---|---|
| 3.00 | 330 | RGM 0300-330 | +0/-0.004 | h6 | ○ |
| 4.00 | 330 | RGM 0400-330 | +0/-0.008 | h6 | ● |
| 6.00 | 330 | RGM 0600-330 | +0/-0.008 | h6 | ● |
| 8.00 | 330 | RGM 0800-330 | +0/-0.009 | h6 | ● |
| 10.00 | 330 | RGM 1000-330 | +0/-0.009 | h6 | ● |
| 12.00 | 330 | RGM 1200-330 | +0/-0.011 | h6 | ● |
| 14.00 | 330 | RGM 1400-330 | +0/-0.011 | h6 | ○ |
| 16.00 | 330 | RGM 1600-330 | +0/-0.011 | h6 | ○ |

○ Semi-standard ● Standard Other grades and dimensions upon request

# Rods with helical coolant holes

Our range of sintered and ground rods with helical coolant holes supports the production of drills in a diameter range from 3 mm to 35 mm.

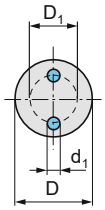
Our rods with helical coolant holes are available in the proven CTS20D grade for the universal machining of steel, stainless steel or heat-resistant alloys, and now also in CTS12D and the new high-performance grade CTS24Z for the machining of difficult materials like titanium or Inconel. Having virtually the same hardness, CTS24Z is even tougher than our proven CTS18D and CTS20D grades. This extreme toughness offers maximum protection against breakage and ensures consistent performance of your tools.

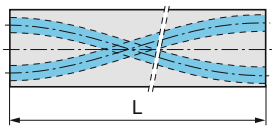
Of course we can also produce carbide rods in other dimensions and grades to order – just get in touch with your contact person at CERATIZIT.

Detailed technical data for our rods with helical coolant holes can be found in the ‘Information’ section.

# Rods with two helical coolant holes

## As sintered, ≤ 22°



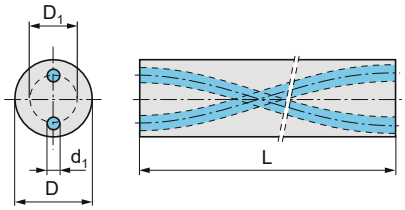




| D [mm] | L [mm] | Type, description | Nominal pitch [mm] | [°] | $D_1$ [mm] | $d_1$ [mm] | CTS20D | CTS12D |
|---|---|---|---|---|---|---|---|---|
| 6.30 | 415 | 22R2 0630/1,9/0,6/46,9-415 | 46.90 | 21.9 | 1.90 | .60 | ● | |
| 6.30 | 330 | 15R2 0630/2,6/0,7/70,35-330 | 70.35 | 15.0 | 2.60 | .70 | ● | ○ |
| 6.30 | 415 | 15R2 0630/2,6/0,7/70,35-415 | 70.35 | 15.0 | 2.60 | .70 | ● | |
| 8.30 | 415 | 20R2 0830/3,3/1,0/70,34-415 | 70.34 | 19.7 | 3.30 | 1.00 | ● | |
| 8.30 | 330 | 15R2 0830/3,6/1,25/93,8-330 | 93.80 | 15.0 | 3.60 | 1.25 | ● | ○ |
| 8.30 | 415 | 15R2 0830/3,6/1,25/93,8-415 | 93.80 | 15.0 | 3.60 | 1.25 | ● | |
| 8.30 | 330 | 15R2 0830/3,6/1,25/93,8-330 | 93.80 | 15.0 | 3.60 | 1.25 | | |
| 10.30 | 415 | 19R2 1030/4,40/1,20/93,80-415 | 93.80 | 18.5 | 4.40 | 1.20 | ● | |
| 10.30 | 330 | 15R2 1030/4,80/1,40/117,25-330 | 117.25 | 15.0 | 4.80 | 1.40 | ● | ○ |
| 10.30 | 415 | 15R2 1030/4,80/1,40/117,25-415 | 117.25 | 15.0 | 4.80 | 1.40 | ● | |
| 12.30 | 415 | 18R2 1230/5,40/1,50/117,25-415 | 117.25 | 17.8 | 5.40 | 1.50 | ● | |
| 12.30 | 330 | 15R2 1230/6,25/1,55/140,70-330 | 140.70 | 15.0 | 6.25 | 1.55 | ● | ○ |
| 12.30 | 415 | 15R2 1230/6,25/1,55/140,70-415 | 140.70 | 15.0 | 6.25 | 1.55 | ● | |
| 14.30 | 330 | 15R2 1430/6,70/1,90/164,14-330 | 164.14 | 15.0 | 6.70 | 1.90 | ● | ○ |
| 14.30 | 415 | 15R2 1430/6,70/1,90/164,14-415 | 164.14 | 15.0 | 6.70 | 1.90 | ● | |
| 16.30 | 330 | 15R2 1630/8,0/2,10/187,59-330 | 187.59 | 15.0 | 8.00 | 2.10 | ● | ○ |
| 18.30 | 330 | 15R2 1830/9,0/2,3/211,0-330 | 211.00 | 15.0 | 9.00 | 2.30 | ● | ○ |
| 20.30 | 330 | 15R2 2030/10,0/2,50/234,49-330 | 234.49 | 15.0 | 10.00 | 2.50 | ● | ○ |
| 22.30 | 330 | 15R2 2230/12,0/2,5/257,94-330 | 257.94 | 15.0 | 12.00 | 2.50 | ● | |

○ Semi-standard ● Standard Other grades and dimensions upon request

# Rods with two helical coolant holes

## As sintered, 23° – 49°




| D [mm] | L [mm] | Type, description | Nominal pitch [mm] | [°] | $D_1$ [mm] | $d_1$ [mm] | CTS12D | CTS20D | CTS24Z |
|---|---|---|---|---|---|---|---|---|---|
| 3.30 | 330 | 40R2 0330/0,3/0,15/11,2-330 | 11.20 | 40.1 | .30 | .15 | | ● | |
| 3.30 | 330 | 49R2 0330/0,55/0,20/8,2-330 | 8.20 | 49.0 | .55 | .20 | | ● | |
| 3.30 | 330 | 39R2 0330/0,8/0,23/11,5-330 | 11.50 | 39.3 | .80 | .23 | | ● | |
| 3.30 | 330 | 34R2 0330/1,1/0,35/14,0-330 | 14.00 | 34.0 | 1.10 | .35 | | ● | |
| 3.30 | 330 | 30R2 0330/1,4/0,35/16,32-330 | 16.32 | 30.0 | 1.40 | .35 | | ● | |
| 4.30 | 330 | 46R2 0430/1,0/0,3/12,0-330 | 12.00 | 46.3 | 1.00 | .30 | | ● | |
| 4.30 | 330 | 38R2 0430/1,2/0,35/16,2-330 | 16.20 | 37.8 | 1.20 | .35 | | ● | |
| 4.30 | 330 | 35R2 0430/1,6/0,45/18,0-330 | 18.00 | 34.9 | 1.60 | .45 | | ● | |
| 4.30 | 330 | 30R2 0430/2,1/0,45/21,8-330 | 21.80 | 30.0 | 2.10 | .45 | | ● | |
| 5.30 | 330 | 33R2 0530/2,2/0,6/24,5-330 | 24.50 | 32.7 | 2.20 | .60 | | ● | |
| 6.30 | 330 | 46R2 0630/1,6/0,5/18,0-330 | 18.00 | 46.3 | 1.60 | .50 | ● | ● | ● |
| 6.30 | 350 | 46R2 0630/1,6/0,5/18,0-350 | 18.00 | 46.3 | 1.60 | .50 | | ● | |
| 6.30 | 330 | 40R2 0630/1,9/0,7/22,5-330 | 22.50 | 40.0 | 1.90 | .70 | ● | ● | ● |
| 6.30 | 350 | 40R2 0630/1,9/0,7/22,5-350 | 22.50 | 40.0 | 1.90 | .70 | | ● | |
| 6.30 | 330 | 30R2 0630/2,0/0,9/32,7-330 | 32.70 | 30.0 | 2.00 | .90 | | ● | |
| 6.30 | 330 | 30R2 0630/2,2/0,7/32,7-330 | 32.70 | 30.0 | 2.20 | .70 | | ● | |
| 6.30 | 350 | 30R2 0630/2,2/0,7/32,7-350 | 32.70 | 30.0 | 2.20 | .70 | | ● | |
| 6.30 | 330 | 30R2 0630/2,7/0,8/32,7-330 | 32.70 | 30.0 | 2.70 | .80 | ○ | ● | ● |
| 6.30 | 330 | 30R2 0630/3,0/0,9/32,7-330 | 32.70 | 30.0 | 3.00 | .90 | | ● | |
| 6.80 | 330 | 30R2 0680/2,7/0,8/35,4-330 | 35.40 | 28.0 | 2.70 | .80 | ○ | | |
| 6.80 | 330 | 30R2 0680/3,3/0,9/35,4-330 | 35.40 | 28.0 | 3.30 | .90 | | ○ | |
| 7.30 | 330 | 30R2 0730/3,5/1,0/38,1-330 | 38.10 | 30.0 | 3.50 | 1.00 | | ● | |
| 8.30 | 330 | 43R2 0830/2,3/0,7/27,2-330 | 27.20 | 42.7 | 2.30 | .70 | | ● | |
| 8.30 | 330 | 40R2 0830/2,9/0,7/30,0-330 | 30.00 | 40.0 | 2.90 | .70 | ● | ● | ● |
| 8.30 | 350 | 36R2 0830/3,3/1,0/35,0-350 | 35.00 | 35.7 | 3.30 | 1.00 | | ● | |
| 8.30 | 330 | 36R2 0830/3,3/1,0/35,0-330 | 35.00 | 35.7 | 3.30 | 1.00 | | ● | |
| 8.30 | 350 | 30R2 0830/3,4/1,0/43,5-350 | 43.50 | 30.0 | 3.40 | 1.00 | | ● | |
| 8.30 | 330 | 30R2 0830/3,4/1,0/43,5-330 | 43.50 | 30.0 | 3.40 | 1.00 | ● | ● | ● |

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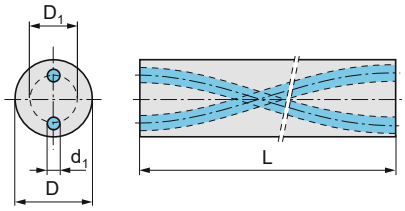
○ Semi-standard ● Standard Other grades and dimensions upon request

# Rods with two helical coolant holes

## As sintered, 23° – 49°




| D [mm] | L [mm] | Type, description | Nominal pitch [mm] | [°] | $D_1$ [mm] | $d_1$ [mm] | CTS12D | CTS20D | CTS24Z |
|---|---|---|---|---|---|---|---|---|---|
| 8.30 | 330 | 30R2 0830/4,1/1,2/43,5-330 | 43.50 | 30.0 | 4.10 | 1.20 | | ● | |
| 9.30 | 330 | 30R2 0930/4,35/1,0/49,0-330 | 49.00 | 30.0 | 4.35 | 1.00 | | ● | |
| 9.80 | 330 | 30R2 0980/4,8/1,3/51,7-330 | 51.70 | 28.7 | 4.80 | 1.30 | | ○ | |
| 10.30 | 330 | 40R2 1030/2,7/0,8/37,0-330 | 37.00 | 40.0 | 2.70 | .80 | ● | ● | ● |
| 10.30 | 330 | 34R2 1030/3,9/1,1/46,0-330 | 46.00 | 34.3 | 3.90 | 1.10 | | ● | |
| 10.30 | 330 | 34R2 1030/4,4/1,15/46,0-330 | 46.00 | 34.3 | 4.40 | 1.15 | | ● | |
| 10.30 | 330 | 30R2 1030/4,8/1,3/54,4-330 | 54.40 | 30.0 | 4.80 | 1.30 | ● | ● | ● |
| 10.30 | 330 | 33R2 1030/5,0/1,2/49,0-330 | 49.00 | 32.7 | 5.00 | 1.20 | | ● | |
| 11.30 | 330 | 40R2 1130/3,2/0,8/41,2-330 | 41.20 | 40.0 | 3.20 | .80 | | ● | |
| 11.30 | 330 | 30R2 1130/5,5/1,5/59,9-330 | 59.90 | 30.0 | 5.50 | 1.50 | | ● | |
| 11.80 | 330 | 30R2 1180/5,5/1,5/62,6-330 | 62.60 | 28.9 | 5.50 | 1.50 | | ○ | |
| 12.30 | 330 | 39R2 1230/3,5/1,0/46,3-330 | 46.30 | 39.2 | 3.50 | 1.00 | | ● | |
| 12.30 | 330 | 40R2 1230/4,0/0,9/44,9-330 | 44.90 | 40.0 | 4.00 | .90 | ● | ● | ● |
| 12.30 | 330 | 33R2 1230/5,0/1,35/57,0-330 | 57.00 | 33.5 | 5.00 | 1.35 | | ● | |
| 12.30 | 250 | 33R2 1230/5,4/1,5/57,0-250 | 57.00 | 33.5 | 5.40 | 1.50 | | ● | |
| 12.30 | 330 | 33R2 1230/5,4/1,5/57,0-330 | 57.00 | 33.5 | 5.40 | 1.50 | | ● | |
| 12.30 | 330 | 32R2 1230/6,0/1,5/59,9-330 | 59.90 | 32.2 | 6.00 | 1.50 | | ● | |
| 12.30 | 250 | 30R2 1230/6,3/1,7/65,3-250 | 65.30 | 30.0 | 6.30 | 1.70 | | ● | |
| 12.30 | 330 | 30R2 1230/6,3/1,7/65,3-330 | 65.30 | 30.0 | 6.30 | 1.70 | ● | ● | ● |
| 13.30 | 330 | 40R2 1330/4,4/1,0/48,7-330 | 48.70 | 40.0 | 4.40 | 1.00 | | ● | |
| 13.30 | 330 | 30R2 1330/6,5/1,6/70,7-330 | 70.70 | 30.0 | 6.50 | 1.60 | | ● | |
| 14.30 | 330 | 40R2 1430/4,6/1,3/52,4-330 | 52.40 | 40.0 | 4.60 | 1.30 | ● | ● | ● |
| 14.30 | 330 | 34R2 1430/6,0/1,6/65,0-330 | 65.00 | 34.1 | 6.00 | 1.60 | | ● | |
| 14.30 | 330 | 30R2 1430/6,7/1,8/76,2-330 | 76.20 | 30.0 | 6.70 | 1.80 | ● | ● | ● |
| 14.30 | 330 | 30R2 1430/7,0/2,0/76,2-330 | 76.20 | 30.0 | 7.00 | 2.00 | | ● | |
| 14.30 | 330 | 30R2 1430/7,6/2,0/76,2-330 | 76.20 | 30.0 | 7.60 | 2.00 | | ● | |
| 15.30 | 330 | 30R2 1530/7,6/2,0/81,6-330 | 81.60 | 30.0 | 7.60 | 2.00 | | ● | |
| 16.30 | 330 | 40R2 1630/5,5/1,2/59,9-330 | 59.90 | 40.0 | 5.50 | 1.20 | ● | ● | ● |

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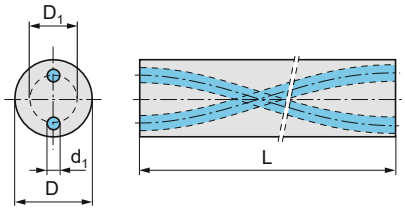
○ Semi-standard ● Standard Other grades and dimensions upon request

# Rods with two helical coolant holes

## As sintered, 23° – 49°




| D [mm] | L [mm] | Type, description | Nominal pitch [mm] | [°] | $D_1$ [mm] | $d_1$ [mm] | CTS12D | CTS20D | CTS24Z |
|---|---|---|---|---|---|---|---|---|---|
| 16.30 | 330 | 35R2 1630/7,0/2,0/73,0-330 | 73.00 | 34.6 | 7.00 | 2.00 | | ● | |
| 16.30 | 330 | 30R2 1630/8,0/2,0/87,1-330 | 87.10 | 30.0 | 8.00 | 2.00 | ● | ● | ● |
| 16.30 | 280 | 30R2 1630/8,0/2,0/87,1-280 | 87.10 | 30.0 | 8.00 | 2.00 | | ● | |
| 16.30 | 330 | 30R2 1630/8,0/2,0/87,1-330 | 87.10 | 30.0 | 8.00 | 2.00 | | | |
| 16.30 | 330 | 32R2 1630/8,4/2,0/81,6-330 | 81.60 | 31.6 | 8.40 | 2.00 | | ● | |
| 16.30 | 330 | 30R2 1630/8,6/2,5/87,1-330 | 87.10 | 30.0 | 8.60 | 2.50 | | ● | |
| 17.30 | 330 | 40R2 1730/5,75/1,3/63,6-330 | 63.60 | 40.0 | 5.75 | 1.30 | | ● | |
| 17.30 | 330 | 30R2 1730/8,9/2,5/92,5-330 | 92.50 | 30.0 | 8.90 | 2.50 | | ● | |
| 18.30 | 330 | 40R2 1830/5,6/1,6/68,0-330 | 68.00 | 39.7 | 5.60 | 1.60 | ● | ● | ● |
| 18.30 | 330 | 40R2 1830/6,3/1,7/68,0-330 | 68.00 | 39.7 | 6.30 | 1.70 | | ● | |
| 18.30 | 330 | 35R2 1830/7,75/2,2/82,0-330 | 82.00 | 34.6 | 7.75 | 2.20 | | ● | |
| 18.30 | 330 | 30R2 1830/9,3/2,7/98,0-330 | 98.00 | 30.0 | 9.30 | 2.70 | ● | ● | ● |
| 19.80 | 330 | 30R2 1980/9,6/2,4/106,1-330 | 106.10 | 29.4 | 9.60 | 2.40 | | ○ | |
| 20.30 | 330 | 37R2 2030/6,5/1,7/84,3-330 | 84.30 | 36.7 | 6.50 | 1.70 | | ● | |
| 20.30 | 330 | 40R2 2030/7,1/1,5/74,9-330 | 74.90 | 40.0 | 7.10 | 1.50 | ● | ● | ● |
| 20.30 | 330 | 30R2 2030/10,0/2,5/108,8-330 | 108.80 | 30.0 | 10.00 | 2.50 | ● | ● | ● |
| 20.30 | 330 | 30R2 2030/10,7/3,2/108,8-330 | 108.80 | 30.0 | 10.70 | 3.20 | | ● | |
| 21.30 | 330 | 30R2 2130/10,65/2,0/114,2-330 | 114.20 | 30.0 | 10.65 | 2.00 | | ● | |
| 21.30 | 330 | 30R2 2130/11,5/3,2/114,2-330 | 114.20 | 30.0 | 11.50 | 3.20 | | ○ | |
| 22.30 | 330 | 40R2 2230/7,7/1,7/82,4-330 | 82.40 | 40.0 | 7.70 | 1.70 | | ● | |
| 22.30 | 330 | 33R2 2230/10,0/2,50/108,0-330 | 108.00 | 32.6 | 10.00 | 2.50 | | ● | |
| 22.30 | 330 | 30R2 2230/11,3/2,0/119,7-330 | 119.70 | 30.0 | 11.30 | 2.00 | | ● | |
| 22.30 | 330 | 30R2 2230/11,5/3,4/119,7-330 | 119.70 | 30.0 | 11.50 | 3.40 | | ○ | |
| 25.30 | 330 | 40R2 2530/7,7/1,75/93,6-330 | 93.60 | 40.0 | 7.70 | 1.75 | | ● | ● |
| 25.30 | 330 | 33R2 2530/12,0/3,2/119,0-330 | 119.00 | 33.0 | 12.00 | 3.20 | | ● | ● |
| 28.30 | 330 | 39R2 2830/9,0/2,0/107,7-330 | 107.70 | 39.2 | 9.00 | 2.00 | | ● | |
| 28.30 | 330 | 29R2 2830/14,8/2,5/159,0-330 | 159.00 | 29.0 | 14.80 | 2.50 | | ● | |
| 30.30 | 330 | 39R2 3030/10,0/2,0/116,0-330 | 116.00 | 39.1 | 10.00 | 2.00 | | ● | |

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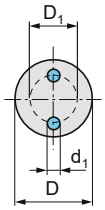
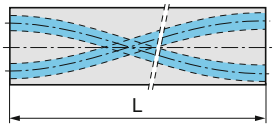
○ Semi-standard ● Standard Other grades and dimensions upon request

# Rods with two helical coolant holes

## As sintered, 23° – 49°



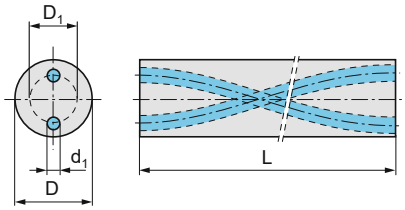




| D [mm] | L [mm] | Type, description | Nominal pitch [mm] | [°] | $D_1$ [mm] | $d_1$ [mm] | CTS12D | CTS20D | CTS24Z |
|---|---|---|---|---|---|---|---|---|---|
| 30.30 | 330 | 29R2 3030/16,0/2,5/172,0-330 | 172.00 | 28.7 | 16.00 | 2.50 | | ● | |
| 32.30 | 330 | 40R2 3230/11,0/2,0/119,8-330 | 119.80 | 40.0 | 11.00 | 2.00 | | ● | |
| 32.30 | 330 | 29R2 3230/17,0/3,0/177,8-330 | 177.80 | 29.5 | 17.00 | 3.00 | | ● | |
| 35.30 | 330 | 30R2 3530/18,0/3,0/189,5-330 | 189.50 | 30.0 | 18.00 | 3.00 | | ● | |

○ Semi-standard ● Standard Other grades and dimensions upon request

# Rods with two helical coolant holes

## As sintered, extra-long, 23° – 49°

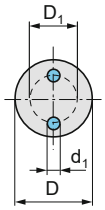


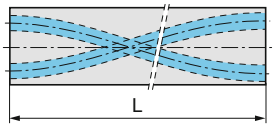

| D [mm] | L [mm] | Type, description | Nominal pitch [mm] | [°] | $D_1$ [mm] | $d_1$ [mm] | CTS20D |
|---|---|---|---|---|---|---|---|
| 6.30 | 430 | 46R2 0630/1,6/0,5/18,0-430 | 18.00 | 46.3 | 1.60 | .50 | ● |
| 6.30 | 430 | 40R2 0630/1,9/0,7/22,5-430 | 22.50 | 40.0 | 1.90 | .70 | ● |
| 6.30 | 430 | 30R2 0630/2,2/0,7/32,7-430 | 32.70 | 30.0 | 2.20 | .70 | ● |
| 6.30 | 430 | 30R2 0630/3,0/0,9/32,7-430 | 32.70 | 30.0 | 3.00 | .90 | ● |
| 8.30 | 430 | 30R2 0830/3,4/1,0/43,5-430 | 43.50 | 30.0 | 3.40 | 1.00 | ● |
| 10.30 | 430 | 30R2 1030/4,8/1,3/54,4-430 | 54.40 | 30.0 | 4.80 | 1.30 | ● |
| 10.30 | 530 | 30R2 1030/4,8/1,3/54,4-530 | 54.40 | 30.0 | 4.80 | 1.30 | ● |
| 12.30 | 430 | 30R2 1230/6,3/1,7/65,3-430 | 65.30 | 30.0 | 6.30 | 1.70 | ● |
| 12.30 | 530 | 30R2 1230/6,3/1,7/65,3-530 | 65.30 | 30.0 | 6.30 | 1.70 | ● |
| 14.30 | 430 | 30R2 1430/6,7/1,8/76,2-430 | 76.20 | 30.0 | 6.70 | 1.80 | ● |
| 14.30 | 530 | 30R2 1430/6,7/1,8/76,2-530 | 76.20 | 30.0 | 6.70 | 1.80 | ● |
| 16.30 | 430 | 30R2 1630/8,0/2,0/87,1-430 | 87.10 | 30.0 | 8.00 | 2.00 | ● |
| 16.30 | 530 | 30R2 1630/8,0/2,0/87,1-530 | 87.10 | 30.0 | 8.00 | 2.00 | ● |
| 18.30 | 530 | 30R2 1830/9,3/2,7/98,0-530 | 98.00 | 30.0 | 9.30 | 2.70 | ● |
| 18.30 | 430 | 30R2 1830/9,3/2,7/98,0-430 | 98.00 | 30.0 | 9.30 | 2.70 | ● |
| 20.30 | 430 | 30R2 2030/10,0/2,5/108,8-430 | 108.80 | 30.0 | 10.00 | 2.50 | ● |
| 20.30 | 530 | 30R2 2030/10,0/2,5/108,8-530 | 108.80 | 30.0 | 10.00 | 2.50 | ● |
| 25.30 | 530 | 33R2 2530/12,0/3,2/119,0-530 | 119.00 | 33.4 | 12.00 | 3.20 | ● |
| 25.30 | 430 | 33R2 2530/12,0/3,2/119,0-430 | 119.00 | 33.4 | 12.00 | 3.20 | ● |

○ Semi-standard ● Standard Other grades and dimensions upon request

# Rods with two helical coolant holes

## As sintered, ≥ 50°



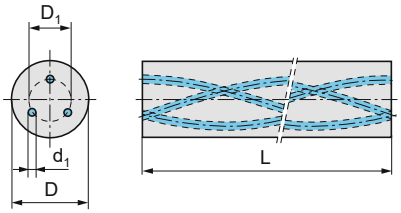




| D [mm] | L [mm] | Type, description | Nominal pitch [mm] | [°] | $D_1$ [mm] | $d_1$ [mm] | CTS20D |
|---|---|---|---|---|---|---|---|
| 10.30 | 330 | 50R2 1030/2,3/0,7/26,0-330 | 26.00 | 50.4 | 2.30 | .70 | ● |
| 12.30 | 330 | 51R2 1230/2,3/0,7/30,1-330 | 30.10 | 51.4 | 2.30 | .70 | ● |
| 13.30 | 330 | 50R2 1330/2,6/0,7/34,0-330 | 34.00 | 50.2 | 2.60 | .70 | ● |
| 16.30 | 330 | 50R2 1630/3,7/1,0/42,0-330 | 42.00 | 50.1 | 3.70 | 1.00 | ● |
| 20.30 | 330 | 50R2 2030/4,4/1,2/52,7-330 | 52.70 | 50.0 | 4.40 | 1.20 | ● |

○ Semi-standard ● Standard Other grades and dimensions upon request

# Rods with three helical coolant holes

## As sintered

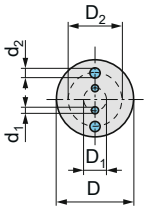


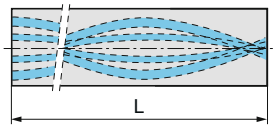

| D [mm] | L [mm] | Type, description | Nominal pitch [mm] | [°] | $D_1$ [mm] | $d_1$ [mm] | CTS20D |
|---|---|---|---|---|---|---|---|
| 6.30 | 330 | 30R3 0630/3,0/0,6/32,7-330 | 32.70 | 31.2 | 3.00 | .60 | ● |
| 8.30 | 330 | 40R3 0830/2,9/0,7/30,0-330 | 30.00 | 40.0 | 2.90 | .70 | ● |
| 8.30 | 330 | 30R3 0830/4,0/0,75/43,5-330 | 43.50 | 30.0 | 4.00 | .75 | ● |
| 10.30 | 330 | 40R3 1030/3,5/0,75/37,0-330 | 37.00 | 40.3 | 3.50 | .75 | ● |
| 10.30 | 330 | 30R3 1030/4,9/1,0/54,4-330 | 54.40 | 30.0 | 4.90 | 1.00 | ● |
| 12.30 | 330 | 40R3 1230/4,0/0,9/44,9-330 | 44.90 | 40.0 | 4.00 | .90 | ● |
| 12.30 | 330 | 30R3 1230/6,0/1,1/65,3-330 | 65.30 | 30.0 | 6.00 | 1.10 | ● |
| 14.30 | 330 | 40R3 1430/4,65/1,2/52,4-330 | 52.40 | 40.0 | 4.65 | 1.20 | ● |
| 14.30 | 330 | 30R3 1430/7,1/1,3/76,2-330 | 76.20 | 30.0 | 7.10 | 1.30 | ● |
| 16.30 | 330 | 40R3 1630/5,5/1,2/59,9-330 | 59.90 | 40.0 | 5.50 | 1.20 | ● |
| 16.30 | 330 | 30R3 1630/8,3/1,5/87,0-330 | 87.00 | 30.0 | 8.30 | 1.50 | ● |
| 18.30 | 330 | 40R3 1830/6,25/1,5/67,4-330 | 67.40 | 40.0 | 6.25 | 1.50 | ● |
| 18.30 | 330 | 30R3 1830/9,6/1,7/98,0-330 | 98.00 | 30.0 | 9.60 | 1.70 | ● |
| 20.30 | 330 | 40R3 2030/7,1/1,5/74,9-330 | 74.90 | 40.0 | 7.10 | 1.50 | ● |
| 20.30 | 330 | 30R3 2030/10,4/2,0/108,8-330 | 108.80 | 30.0 | 10.40 | 2.00 | ● |
| 22.30 | 330 | 40R3 2230/7,7/1,7/82,4-330 | 82.40 | 40.0 | 7.70 | 1.70 | ● |
| 22.30 | 330 | 30R3 2230/10,7/2,0/119,7-330 | 119.70 | 30.0 | 10.70 | 2.00 | ● |
| 25.30 | 330 | 40R3 2530/8,1/1,7/93,6-330 | 93.60 | 40.0 | 8.10 | 1.70 | ● |
| 25.30 | 330 | 33R3 2530/11,5/2,2/119,0-330 | 119.00 | 33.4 | 11.50 | 2.20 | ● |

○ Semi-standard ● Standard Other grades and dimensions upon request

# Rods with four helical coolant holes

## As sintered



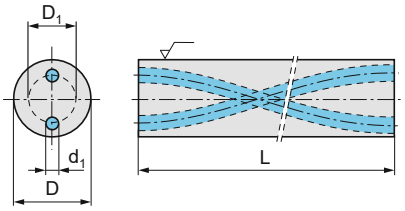




| D [mm] | L [mm] | Type, description | Nominal pitch [mm] | [°] | $D_1$ [mm] | $d_1$ [mm] | $D_2$ [mm] | $d_2$ [mm] | CTS20D |
|---|---|---|---|---|---|---|---|---|---|
| 8.30 | 330 | 33R4 0830/1,9/3,9/0,4/0,8/38-330 | 38.10 | 33.4 | 1.90 | .40 | 3.90 | .80 | ● |
| 8.30 | 330 | 30R4 0830/2,2/4,5/0,45/0,9/44-330 | 43.50 | 29.7 | 2.20 | .45 | 4.50 | .90 | ○ |
| 10.30 | 330 | 33R4 1030/2,5/5,1/0,5/1,0/49-330 | 49.00 | 32.7 | 2.50 | .50 | 5.10 | 1.00 | ● |
| 10.30 | 330 | 30R4 1030/2,8/5,7/0,6/1,1/54-330 | 54.40 | 30.0 | 2.80 | .60 | 5.70 | 1.10 | ● |
| 12.30 | 330 | 32R4 1230/3,1/6,3/0,7/1,2/60-330 | 59.90 | 32.2 | 3.10 | .70 | 6.30 | 1.20 | ● |
| 12.30 | 330 | 30R4 1230/3,4/6,9/0,7/1,4/65-330 | 65.30 | 30.0 | 3.40 | .70 | 6.90 | 1.40 | ● |
| 14.30 | 330 | 32R4 1430/3,6/7,5/0,8/1,5/71-330 | 70.70 | 31.9 | 3.60 | .80 | 7.50 | 1.50 | ● |
| 14.30 | 330 | 30R4 1430/3,9/8,1/0,8/1,6/76-330 | 76.20 | 30.0 | 3.90 | .80 | 8.10 | 1.60 | ● |
| 16.30 | 330 | 30R4 1630/4,4/9,0/0,9/1,8/87-330 | 87.10 | 30.0 | 4.40 | .90 | 9.00 | 1.80 | ● |
| 18.30 | 330 | 30R4 1830/5,0/10,2/1,0/2,0/98-330 | 98.00 | 30.0 | 5.00 | 1.00 | 10.20 | 2.00 | ● |
| 20.30 | 330 | 30R4 203/5,6/11,4/1,2/2,3/109-330 | 108.80 | 30.0 | 5.60 | 1.20 | 11.40 | 2.30 | ● |
| 22.30 | 330 | 30R4 223/6,1/12,6/1,2/2,5/120-330 | 119.70 | 30.0 | 6.10 | 1.20 | 12.60 | 2.50 | ○ |
| 25.30 | 330 | 29R4 253/6,9/14,1/1,4/2,8/139-330 | 139.30 | 29.4 | 6.90 | 1.40 | 14.10 | 2.80 | ● |

○ Semi-standard ● Standard Other grades and dimensions upon request

# Rods with two helical coolant holes

## Ground h6, ≤ 22°

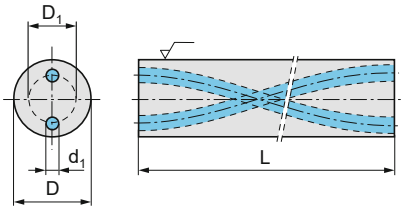



| D [mm] | L [mm] | Type, description | Dia. tol. [mm] | ISO 286 | Nominal pitch [mm] | [°] | $D_1$ [mm] | $d_1$ [mm] | CTS20D |
|---|---|---|---|---|---|---|---|---|---|
| 6.00 | 330 | 15G2 0600/2,6/0,7/70,35-330 | +0/-0.008 | h6 | 70.35 | 15.0 | 2.60 | .70 | ● |
| 8.00 | 330 | 15G2 0800/3,6/1,25/93,8-330 | +0/-0.009 | h6 | 93.80 | 15.0 | 3.60 | 1.25 | ● |
| 10.00 | 330 | 15G2 1000/4,80/1,40/117,25-330 | +0/-0.009 | h6 | 117.25 | 15.0 | 4.80 | 1.40 | ● |
| 12.00 | 330 | 15G2 1200/6,25/1,55/140,70-330 | +0/-0.011 | h6 | 140.70 | 15.0 | 6.25 | 1.55 | ● |
| 14.00 | 330 | 15G2 1400/6,70/1,90/164,14-330 | +0/-0.011 | h6 | 164.14 | 15.0 | 6.70 | 1.90 | ● |
| 16.00 | 330 | 15G2 1600/8,0/2,10/187,59-330 | +0/-0.011 | h6 | 187.59 | 15.0 | 8.00 | 2.10 | ● |
| 18.00 | 330 | 15G2 1800/9,0/2,3/211,0-330 | +0/-0.011 | h6 | 211.00 | 15.0 | 9.00 | 2.30 | ● |
| 20.00 | 330 | 15G2 2000/10,0/2,50/234,49-330 | +0/-0.013 | h6 | 234.49 | 15.0 | 10.00 | 2.50 | ● |

○ Semi-standard ● Standard Other grades and dimensions upon request

# Rods with two helical coolant holes

## Ground h6, 23° – 49°

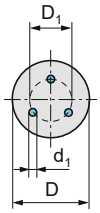


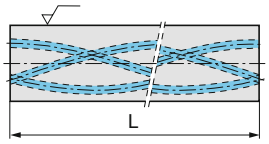

| D [mm] | L [mm] | Type, description | Dia. tol. [mm] | ISO 286 | Nominal pitch [mm] | [°] | $D_1$ [mm] | $d_1$ [mm] | CTS20D |
|---|---|---|---|---|---|---|---|---|---|
| 6.00 | 330 | 40G2 0600/1,9/0,7/22,5-330 | +0/-0.008 | h6 | 22.50 | 40.0 | 1.90 | .70 | ● |
| 6.00 | 330 | 30G2 0600/3,0/0,9/32,7-330 | +0/-0.008 | h6 | 32.70 | 30.0 | 3.00 | .90 | ● |
| 8.00 | 330 | 43G2 0800/2,3/0,7/27,2-330 | +0/-0.009 | h6 | 27.20 | 42.7 | 2.30 | .70 | ● |
| 8.00 | 330 | 30G2 0800/3,4/1,0/43,5-330 | +0/-0.009 | h6 | 43.50 | 30.0 | 3.40 | 1.00 | ● |
| 10.00 | 330 | 40G2 1000/2,7/0,8/37,0-330 | +0/-0.009 | h6 | 37.00 | 40.0 | 2.70 | .80 | ● |
| 10.00 | 330 | 30G2 1000/4,8/1,3/54,4-330 | +0/-0.009 | h6 | 54.40 | 30.0 | 4.80 | 1.30 | ● |
| 12.00 | 330 | 39G2 1200/3,5/1,0/46,3-330 | +0/-0.011 | h6 | 46.30 | 39.0 | 3.50 | 1.00 | ● |
| 12.00 | 330 | 30G2 1200/6,3/1,7/65,3-330 | +0/-0.011 | h6 | 65.30 | 30.0 | 6.30 | 1.70 | ● |
| 14.00 | 330 | 40G2 1400/4,6/1,3/52,4-330 | +0/-0.011 | h6 | 52.40 | 40.0 | 4.60 | 1.30 | ● |
| 14.00 | 330 | 30G2 1400/6,7/1,8/76,2-330 | +0/-0.011 | h6 | 76.20 | 30.0 | 6.70 | 1.80 | ● |
| 16.00 | 330 | 40G2 1600/5,5/1,2/59,9-330 | +0/-0.011 | h6 | 59.90 | 40.0 | 5.50 | 1.20 | ● |
| 16.00 | 330 | 30G2 1600/8,0/2,0/87,1-330 | +0/-0.011 | h6 | 87.10 | 30.0 | 8.00 | 2.00 | ● |
| 18.00 | 330 | 40G2 1800/6,3/1,7/68,0-330 | +0/-0.011 | h6 | 68.00 | 39.7 | 6.30 | 1.70 | ● |
| 18.00 | 330 | 30G2 1800/9,3/2,7/98,0-330 | +0/-0.011 | h6 | 98.00 | 30.0 | 9.30 | 2.70 | ● |
| 20.00 | 330 | 40G2 2000/7,1/1,5/74,9-330 | +0/-0.013 | h6 | 74.90 | 40.0 | 7.10 | 1.50 | ● |
| 20.00 | 330 | 30G2 2000/10,0/2,5/108,8-330 | +0/-0.013 | h6 | 108.80 | 30.0 | 10.00 | 2.50 | ● |
| 25.00 | 330 | 40G2 2500/7,7/1,75/93,6-330 | +0/-0.013 | h6 | 93.60 | 40.0 | 7.70 | 1.75 | ● |
| 25.00 | 330 | 33G2 2500/12,0/3,2/119,0-330 | +0/-0.013 | h6 | 119.00 | 33.4 | 12.0 | 3.20 | ● |
| 32.00 | 330 | 40G2 3200/11,0/2,0/119,8-330 | +0/-0.016 | h6 | 119.80 | 40.0 | 11.00 | 2.00 | ● |
| 32.00 | 330 | 29G2 3200/17,0/3,0/177,8-330 | +0/-0.016 | h6 | 177.80 | 29.5 | 17.00 | 3.00 | ● |

○ Semi-standard ● Standard Other grades and dimensions upon request

# Rods with three helical coolant holes

## Ground h6




| D [mm] | L [mm] | Type, description | Dia. tol. [mm] | ISO 286 | Nominal pitch [mm] | [°] | $D_1$ [mm] | $d_1$ [mm] | CTS20D |
|---|---|---|---|---|---|---|---|---|---|
| 6.00 | 330 | 30G3 0600/3,0/0,6/32,7-330 | +0/-0.008 | h6 | 32.70 | 30.0 | 3.00 | .60 | ● |
| 8.00 | 330 | 30G3 0800/4,0/0,75/43,5-330 | +0/-0.009 | h6 | 43.50 | 30.0 | 4.00 | .75 | ● |
| 10.00 | 330 | 30G3 1000/4,9/1,0/54,4-330 | +0/-0.009 | h6 | 54.40 | 30.0 | 4.90 | 1.00 | ● |
| 12.00 | 330 | 30G3 1200/6,0/1,1/65,3-330 | +0/-0.011 | h6 | 65.30 | 30.0 | 6.00 | 1.10 | ● |
| 14.00 | 330 | 30G3 1400/7,1/1,3/76,2-330 | +0/-0.011 | h6 | 76.20 | 30.0 | 7.10 | 1.30 | ● |
| 16.00 | 330 | 30G3 1600/8,3/1,5/87,0-330 | +0/-0.011 | h6 | 87.00 | 30.0 | 8.30 | 1.50 | ● |
| 18.00 | 330 | 30G3 1800/9,6/1,7/98,0-330 | +0/-0.011 | h6 | 98.00 | 30.0 | 9.60 | 1.70 | ● |
| 20.00 | 330 | 30G3 2000/10,4/2,0/108,8-330 | +0/-0.013 | h6 | 108.80 | 30.0 | 10.40 | 2.00 | ● |
| 25.00 | 330 | 33G3 2500/11,5/2,2/119,0-330 | +0/-0.013 | h6 | 119.00 | 33.0 | 11.50 | 2.20 | ● |

○ Semi-standard ● Standard Other grades and dimensions upon request

# Rods with straight coolant holes

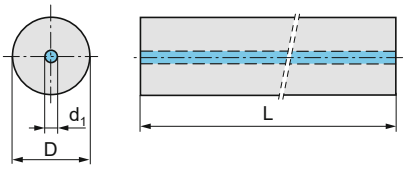
Our standard range includes sintered and ground rods with one central or two straight coolant holes.

Of course we can also produce carbide rods in other dimensions and grades to order – just get in touch with your contact person at CERATIZIT.

Detailed technical data for our rods with straight coolant holes can be found in the ‘Information’ section.

# Rods with central coolant hole

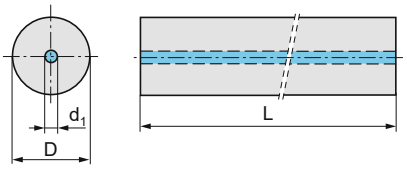
## As sintered, ultra-fine grades




| D [mm] | L [mm] | Type, description | $d_1$ [mm] | TSF44 |
|---|---|---|---|---|
| 6.45 | 330 | 00R1 0645/1,0-330 | 1.00 | ● |
| 8.55 | 330 | 00R1 0855/1,3-330 | 1.30 | ● |
| 10.55 | 330 | 00R1 1055/1,3-330 | 1.30 | ● |
| 10.55 | 330 | 00R1 1055/2,0-330 | 2.00 | ● |
| 12.55 | 330 | 00R1 1255/2,0-330 | 2.00 | ● |
| 14.70 | 330 | 00R1 1470/2,0-330 | 2.00 | ● |
| 16.70 | 330 | 00R1 1670/2,0-330 | 2.00 | ● |
| 20.70 | 330 | 00R1 2070/3,0-330 | 3.00 | ● |

# Rods with central coolant hole

## As sintered, submicron grades




| D [mm] | L [mm] | Type, description | $d_1$ [mm] | CTS15D | CTS20D |
|---|---|---|---|---|---|
| 4.95 | 330 | 00R1 0495/0,6-330 | .60 | ● | |
| 6.30 | 330 | 00R1 0630/1,0-330 | 1.00 | | ● |
| 6.45 | 330 | 00R1 0645/1,0-330 | 1.00 | ● | |
| 8.30 | 330 | 00R1 0830/1,3-330 | 1.30 | | ● |
| 8.55 | 330 | 00R1 0855/1,3-330 | 1.30 | ● | |
| 8.55 | 330 | 00R1 0855/2,0-330 | 2.00 | ● | |

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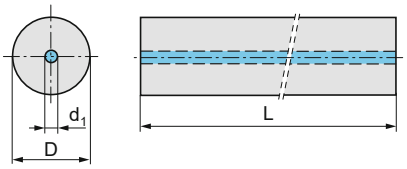
○ Semi-standard ● Standard Other grades and dimensions upon request

# Rods with central coolant hole

## As sintered, submicron grades

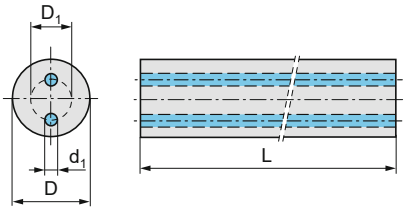



| D [mm] | L [mm] | Type, description | $d_1$ [mm] | CTS15D | CTS20D |
|---|---|---|---|---|---|
| 10.30 | 330 | 00R1 1030/2,0-330 | 2.00 | | ● |
| 10.55 | 330 | 00R1 1055/1,3-330 | 1.30 | ● | |
| 10.55 | 330 | 00R1 1055/2,0-330 | 2.00 | ● | |
| 11.30 | 330 | 00R1 1130/2,0-330 | 2.00 | | ● |
| 12.30 | 330 | 00R1 1230/2,0-330 | 2.00 | | ● |
| 12.55 | 330 | 00R1 1255/2,0-330 | 2.00 | ● | |
| 13.30 | 330 | 00R1 1330/2,0-330 | 2.00 | | ● |
| 14.30 | 330 | 00R1 1430/2,0-330 | 2.00 | | ● |
| 14.70 | 330 | 00R1 1470/2,0-330 | 2.00 | ● | |
| 16.30 | 330 | 00R1 1630/2,0-330 | 2.00 | | ● |
| 16.70 | 330 | 00R1 1670/2,0-330 | 2.00 | ● | |
| 18.30 | 330 | 00R1 1830/3,0-330 | 3.00 | | ● |
| 18.70 | 330 | 00R1 1870/3,0-330 | 3.00 | ● | |
| 20.30 | 330 | 00R1 2030/3,0-330 | 3.00 | | ● |
| 20.70 | 330 | 00R1 2070/3,0-330 | 3.00 | ● | |
| 25.30 | 330 | 00R1 2530/3,0-330 | 3.00 | | ● |
| 28.30 | 330 | 00R1 2830/4,0-330 | 4.00 | | ● |
| 30.30 | 330 | 00R1 3030/5,0-330 | 5.00 | | ● |
| 32.30 | 330 | 00R1 3230/5,0-330 | 5.00 | | ● |

○ Semi-standard ● Standard Other grades and dimensions upon request

# Rods with two straight coolant holes

## As sintered, submicron grades




| D [mm] | L [mm] | Type, description | $D_1$ [mm] | $d_1$ [mm] | CTS15D | CTS20D |
|---|---|---|---|---|---|---|
| 3.30 | 330 | 00R2 0330/1,1/0,425-330 | 1.10 | .43 | ● | |
| 4.20 | 330 | 00R2 0420/1,1/0,45-330 | 1.10 | .45 | ● | |
| 5.20 | 330 | 00R2 0520/2,0/0,9-330 | 2.00 | .90 | ○ | ○ |
| 6.20 | 330 | 00R2 0620/1,1/0,5-330 | 1.10 | .50 | ● | |
| 6.20 | 330 | 00R2 0620/1,5/0,9-330 | 1.50 | .90 | ● | |
| 6.20 | 330 | 00R2 0620/1,7/0,6-330 | 1.70 | .60 | ● | ● |
| 6.20 | 330 | 00R2 0620/2,0/0,9-330 | 2.00 | .90 | ● | ● |
| 6.20 | 330 | 00R2 0620/2,3/0,9-330 | 2.30 | .90 | ● | |
| 6.20 | 330 | 00R2 0620/2,6/0,9-330 | 2.60 | .90 | | ● |
| 6.20 | 330 | 00R2 0620/3,0/1,2-330 | 3.00 | 1.20 | ● | |
| 7.20 | 330 | 00R2 0720/2,0/0,9-330 | 2.00 | .90 | ○ | ○ |
| 7.20 | 330 | 00R2 0720/3,0/0,9-330 | 3.00 | .90 | | ● |
| 8.20 | 330 | 00R2 0820/2,0/0,9-330 | 2.00 | .90 | ● | ● |
| 8.20 | 330 | 00R2 0820/2,6/0,9-330 | 2.60 | .90 | ● | |
| 8.20 | 330 | 00R2 0820/2,6/1,2-330 | 2.60 | 1.20 | | ● |
| 8.20 | 330 | 00R2 0820/3,4/1,0-330 | 3.40 | 1.00 | | ● |
| 8.20 | 330 | 00R2 0820/3,5/1,5-330 | 3.50 | 1.50 | ● | |
| 8.20 | 330 | 00R2 0820/4,0/0,9-330 | 4.00 | .90 | ● | ● |
| 9.20 | 330 | 00R2 0920/2,6/1,2-330 | 2.60 | 1.20 | | ● |
| 9.20 | 330 | 00R2 0920/3,5/1,5-330 | 3.50 | 1.50 | ● | |
| 9.20 | 330 | 00R2 0920/3,8/1,2-330 | 3.80 | 1.20 | | ● |
| 9.20 | 330 | 00R2 0920/4,0/1,3-330 | 4.00 | 1.30 | ● | |
| 10.20 | 330 | 00R2 1020/2,0/1,0-330 | 2.00 | 1.00 | ● | |
| 10.20 | 330 | 00R2 1020/2,6/1,2-330 | 2.60 | 1.20 | | ● |
| 10.20 | 330 | 00R2 1020/2,8/1,0-330 | 2.80 | 1.00 | ● | |
| 10.20 | 330 | 00R2 1020/3,5/1,5-330 | 3.50 | 1.50 | ● | |
| 10.20 | 330 | 00R2 1020/4,2/1,4-330 | 4.20 | 1.40 | ● | ● |
| 10.20 | 330 | 00R2 1020/5,0/1,2-330 | 5.00 | 1.20 | ● | |

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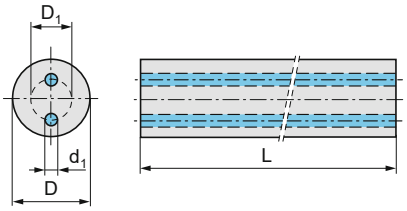
○ Semi-standard ● Standard Other grades and dimensions upon request

# Rods with two straight coolant holes

## As sintered, submicron grades




| D [mm] | L [mm] | Type, description | $D_1$ [mm] | $d_1$ [mm] | CTS15D | CTS20D |
|---|---|---|---|---|---|---|
| 10.20 | 330 | 00R2 1020/5,2/1,4-330 | 5.20 | 1.40 | ● | |
| 12.20 | 330 | 00R2 1220/2,6/1,2-330 | 2.60 | 1.20 | ● | |
| 12.20 | 330 | 00R2 1220/3,5/1,5-330 | 3.50 | 1.50 | ● | ● |
| 12.20 | 330 | 00R2 1220/4,8/1,5-330 | 4.80 | 1.50 | ● | |
| 12.20 | 330 | 00R2 1220/5,0/2,0-330 | 5.00 | 2.00 | ● | ● |
| 12.20 | 330 | 00R2 1220/6,0/1,5-330 | 6.00 | 1.50 | ● | |
| 13.20 | 330 | 00R2 1320/5,4/2,0-330 | 5.40 | 2.00 | | ○ |
| 14.20 | 330 | 00R2 1420/3,5/1,5-330 | 3.50 | 1.50 | | ● |
| 14.20 | 330 | 00R2 1420/5,0/2,0-330 | 5.00 | 2.00 | ● | ● |
| 14.20 | 330 | 00R2 1420/5,0/1,7-330 | 5.00 | 1.70 | ● | |
| 14.20 | 330 | 00R2 1420/5,8/2,0-330 | 5.80 | 2.00 | | ● |
| 14.20 | 330 | 00R2 1420/7,0/2,0-330 | 7.00 | 2.00 | ● | |
| 15.20 | 330 | 00R2 1520/5,0/2,0-330 | 5.00 | 2.00 | ● | |
| 16.20 | 330 | 00R2 1620/3,5/1,5-330 | 3.50 | 1.50 | ● | |
| 16.20 | 330 | 00R2 1620/5,0/1,5-330 | 5.00 | 1.50 | ● | |
| 16.20 | 330 | 00R2 1620/5,0/2,0-330 | 5.00 | 2.00 | ● | ● |
| 16.20 | 400 | 00R2 1620/6,2/2,0-400 | 6.20 | 2.00 | ● | |
| 16.20 | 330 | 00R2 1620/6,6/2,5-330 | 6.60 | 2.50 | | ● |
| 16.20 | 330 | 00R2 1620/8,0/2,0-330 | 8.00 | 2.00 | ● | |
| 16.20 | 415 | 00R2 1620/8,0/2,0-415 | 8.00 | 2.00 | ● | |
| 18.20 | 330 | 00R2 1820/5,0/2,0-330 | 5.00 | 2.00 | ● | |
| 18.20 | 330 | 00R2 1820/6,0/2,0-330 | 6.00 | 2.00 | ● | ● |
| 18.20 | 330 | 00R2 1820/7,5/2,5-330 | 7.50 | 2.50 | | ● |
| 18.20 | 330 | 00R2 1820/9,0/2,0-330 | 9.00 | 2.00 | ● | ● |
| 19.20 | 330 | 00R2 1920/7,9/2,5-330 | 7.90 | 2.50 | | ○ |
| 20.20 | 330 | 00R2 2020/3,5/1,5-330 | 3.50 | 1.50 | ● | |
| 20.20 | 330 | 00R2 2020/6,0/2,0-330 | 6.00 | 2.00 | | ● |
| 20.20 | 330 | 00R2 2020/6,2/2,0-330 | 6.20 | 2.00 | ● | |

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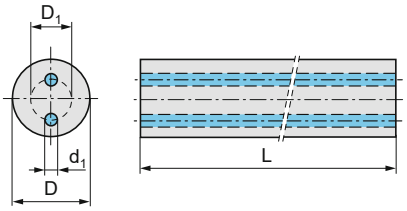
○ Semi-standard ● Standard Other grades and dimensions upon request

# Rods with two straight coolant holes

## As sintered, submicron grades

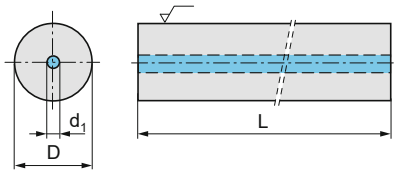



| D [mm] | L [mm] | Type, description | $D_1$ [mm] | $d_1$ [mm] | CTS15D | CTS20D |
|---|---|---|---|---|---|---|
| 20.20 | 330 | 00R2 2020/8,2/2,5-330 | 8.20 | 2.50 | ● | |
| 20.20 | 330 | 00R2 2020/10,0/2,5-330 | 10.00 | 2.50 | ● | |
| 21.20 | 330 | 00R2 2120/7,0/2,3-330 | 7.00 | 2.30 | | ● |
| 22.20 | 330 | 00R2 2220/7,0/2,3-330 | 7.00 | 2.30 | | ● |
| 22.20 | 330 | 00R2 2220/10,5/3,0-330 | 10.50 | 3.00 | | ● |
| 25.30 | 330 | 00R2 2530/6,2/2,0-330 | 6.20 | 2.00 | ● | ● |
| 25.30 | 330 | 00R2 2530/8,0/2,0-330 | 8.00 | 2.00 | ● | |
| 25.30 | 330 | 00R2 2530/10,0/2,5-330 | 10.00 | 2.50 | ● | |
| 25.30 | 330 | 00R2 2530/12,0/3,0-330 | 12.00 | 3.00 | ● | ● |
| 26.30 | 330 | 00R2 2630/7,5/2,0-330 | 7.50 | 2.00 | | ● |
| 26.30 | 330 | 00R2 2630/12,0/3,0-330 | 12.00 | 3.00 | | ● |
| 28.30 | 330 | 00R2 2830/13,0/3,0-330 | 13.00 | 3.00 | | ● |
| 30.30 | 330 | 00R2 3030/13,0/3,0-330 | 13.00 | 3.00 | | ● |
| 32.30 | 330 | 00R2 3230/9,0/2,2-330 | 9.00 | 2.20 | | ● |
| 32.30 | 330 | 00R2 3230/13,8/3,0-330 | 13.80 | 3.00 | | ● |
| 34.30 | 330 | 00R2 3430/13,8/3,0-330 | 13.80 | 3.00 | | ● |

○ Semi-standard ● Standard Other grades and dimensions upon request

# Rods with central coolant hole

## Ground, submicron grades h6

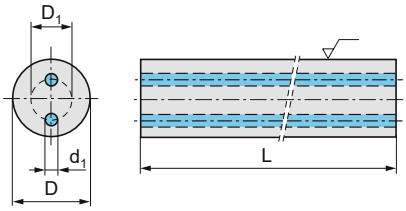



| D [mm] | L [mm] | Type, description | Dia. tol. [mm] | ISO 286 | $d_1$ [mm] | CTS15D |
|---|---|---|---|---|---|---|
| 6.00 | 330 | 00G1 0600/1,0-330 | +0/-0.008 | h6 | 1.00 | ● |
| 8.00 | 330 | 00G1 0800/1,3-330 | +0/-0.009 | h6 | 1.30 | ● |
| 10.00 | 330 | 00G1 1000/2,0-330 | +0/-0.009 | h6 | 2.00 | ● |
| 12.00 | 330 | 00G1 1200/2,0-330 | +0/-0.011 | h6 | 2.00 | ● |
| 14.00 | 330 | 00G1 1400/2,0-330 | +0/-0.011 | h6 | 2.00 | ● |
| 16.00 | 330 | 00G1 1600/2,0-330 | +0/-0.011 | h6 | 2.00 | ● |
| 16.00 | 330 | 00G1 1600/3,0-330 | +0/-0.011 | h6 | 3.00 | ● |
| 20.00 | 330 | 00G1 2000/3,0-330 | +0/-0.013 | h6 | 3.00 | ● |
| 25.00 | 330 | 00G1 2500/3,0-330 | +0/-0.013 | h6 | 3.00 | ● |
| 32.00 | 330 | 00G1 3200/5,0-330 | +0/-0.016 | h6 | 5.00 | ● |

○ Semi-standard ● Standard Other grades and dimensions upon request

# Rods with two straight coolant holes

## Ground, submicron grades h6




| D [mm] | L [mm] | Type, description | Dia. tol. [mm] | ISO 286 | $D_1$ [mm] | $d_1$ [mm] | CTS15D |
|---|---|---|---|---|---|---|---|
| 6.00 | 330 | 00G2 0600/1,5/0,9-330 | +0/-0.008 | h6 | 1.50 | .90 | ● |
| 6.00 | 330 | 00G2 0600/3,0/1,2-330 | +0/-0.008 | h6 | 3.00 | 1.20 | ● |
| 8.00 | 330 | 00G2 0800/2,0/0,9-330 | +0/-0.009 | h6 | 2.00 | .90 | ● |
| 8.00 | 330 | 00G2 0800/4,0/0,9-330 | +0/-0.009 | h6 | 4.00 | .90 | ● |
| 10.00 | 330 | 00G2 1000/2,8/1,0-330 | +0/-0.009 | h6 | 2.80 | 1.00 | ● |
| 10.00 | 330 | 00G2 1000/5,2/1,4-330 | +0/-0.009 | h6 | 5.20 | 1.40 | ● |
| 12.00 | 330 | 00G2 1200/3,5/1,5-330 | +0/-0.011 | h6 | 3.50 | 1.50 | ● |
| 12.00 | 330 | 00G2 1200/6,0/1,5-330 | +0/-0.011 | h6 | 6.00 | 1.50 | ● |
| 14.00 | 330 | 00G2 1400/5,0/1,7-330 | +0/-0.011 | h6 | 5.00 | 1.70 | ● |
| 14.00 | 330 | 00G2 1400/7,0/2,0-330 | +0/-0.011 | h6 | 7.00 | 2.00 | ● |
| 16.00 | 330 | 00G2 1600/5,0/1,5-330 | +0/-0.011 | h6 | 5.00 | 1.50 | ● |
| 16.00 | 330 | 00G2 1600/8,0/2,0-330 | +0/-0.011 | h6 | 8.00 | 2.00 | ● |
| 18.00 | 330 | 00G2 1800/6,0/2,0-330 | +0/-0.011 | h6 | 6.00 | 2.00 | ● |
| 18.00 | 330 | 00G2 1800/9,0/2,0-330 | +0/-0.011 | h6 | 9.00 | 2.00 | ● |
| 20.00 | 330 | 00G2 2000/6,2/2,0-330 | +0/-0.013 | h6 | 6.20 | 2.00 | ● |
| 20.00 | 330 | 00G2 2000/10,0/2,5-330 | +0/-0.013 | h6 | 10.00 | 2.50 | ● |
| 25.00 | 330 | 00G2 2500/6,2/2,0-330 | +0/-0.013 | h6 | 6.20 | 2.00 | ● |
| 25.00 | 330 | 00G2 2500/8,0/2,0-330 | +0/-0.013 | h6 | 8.00 | 2.00 | ● |
| 25.00 | 330 | 00G2 2500/12,0/3,0-330 | +0/-0.013 | h6 | 12.00 | 3.00 | ● |

○ Semi-standard ● Standard Other grades and dimensions upon request

# Tool blanks for gun drills

We offer a complete stock range of rods and tips for the production of solid carbide or brazed gun drills. These include rods with a kidney-shaped coolant hole, profiled rods with one or two coolant holes and profiled tips with two coolant holes.

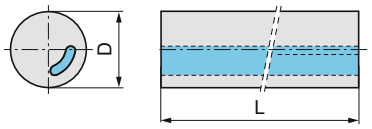
Our blanks for gun drills are available in the proven CTS20D grade for the universal machining of steel, stainless steel or heat-resistant alloys: some dimensions can also be ordered in grade CTF12E, a fine-grain grade specifically for gun drills with an optimized balance between hardness and toughness.

Of course we can also produce carbide rods in other dimensions and grades to order – just get in touch with your contact person at CERATIZIT.

Detailed technical data for our gun drill blanks can be found in the ‘Information’ section.

# Rods for gun drills, with kidney-shaped coolant hole

## Submicron grades



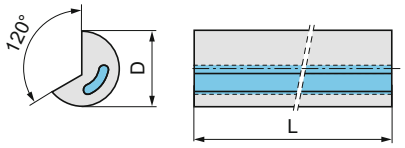

Technical drawings upon request

| D [mm] | L [mm] | Type, description | Dia. tol. [mm] | CTS20D | CTF12E |
|---|---|---|---|---|---|
| 2.40 | 310 | GDRK 0240-310 | ±0.15 | ● | ● |
| 2.60 | 310 | GDRK 0260-310 | ±0.15 | ● | ○ |
| 2.90 | 310 | GDRK 0290-310 | ±0.15 | ● | ● |
| 3.15 | 310 | GDRK 0315-310 | ±0.15 | ○ | ○ |
| 3.45 | 310 | GDRK 0345-310 | ±0.15 | ● | ○ |
| 3.50 | 310 | GDRK 0350-310 | ±0.15 | ● | ○ |
| 3.90 | 310 | GDRK 0390-310 | ±0.15 | ● | ○ |
| 4.40 | 310 | GDRK 0440-310 | ±0.15 | ● | ● |
| 4.90 | 310 | GDRK 0490-310 | ±0.15 | ● | ○ |
| 5.50 | 310 | GDRK 0550-310 | ±0.15 | ● | ● |
| 6.00 | 310 | GDRK 0600-310 | ±0.15 | ● | ○ |
| 6.50 | 310 | GDRK 0650-310 | ±0.15 | ● | ● |
| 7.10 | 310 | GDRK 0710-310 | ±0.15 | ○ | ○ |
| 7.60 | 310 | GDRK 0760-310 | ±0.15 | ○ | ○ |
| 8.10 | 310 | GDRK 0810-310 | ±0.15 | ○ | ○ |
| 8.30 | 310 | GDRK 0830-310 | ±0.15 | ● | ○ |
| 8.70 | 310 | GDRK 0870-310 | ±0.15 | ○ | ○ |
| 9.20 | 310 | GDRK 0920-310 | ±0.15 | ○ | ○ |
| 10.60 | 310 | GDRK 1060-310 | ±0.15 | ○ | ○ |
| 11.30 | 310 | GDRK 1130-310 | ±0.15 | ○ | ○ |

○ Semi-standard ● Standard Other grades and dimensions upon request

# Profiled rods for gun drills, with kidney-shaped coolant hole

## 120°, submicron grades



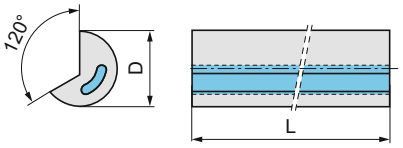

Technical drawings upon request

| D [mm] | L [mm] | Type, description | Dia. tol. [mm] | CTS20D |
|---|---|---|---|---|
| 2.40 | 310 | GDVK 0240-310 | ±0.15 | ○ |
| 2.60 | 310 | GDVK 0260-310 | ±0.15 | ○ |
| 2.90 | 310 | GDVK 0290-310 | ±0.15 | ○ |
| 3.15 | 310 | GDVK 0315-310 | ±0.15 | ○ |
| 3.45 | 310 | GDVK 0345-310 | ±0.15 | ● |
| 3.90 | 310 | GDVK 0390-310 | ±0.15 | ● |
| 4.40 | 310 | GDVK 0440-310 | ±0.15 | ● |
| 4.90 | 310 | GDVK 0490-310 | ±0.15 | ● |
| 5.50 | 310 | GDVK 0550-310 | ±0.15 | ● |
| 6.00 | 310 | GDVK 0600-310 | ±0.15 | ● |
| 6.50 | 310 | GDVK 0650-310 | ±0.15 | ● |
| 7.10 | 310 | GDVK 0710-310 | ±0.15 | ● |
| 7.60 | 310 | GDVK 0760-310 | ±0.15 | ○ |
| 8.10 | 310 | GDVK 0810-310 | ±0.15 | ○ |
| 8.70 | 310 | GDVK 0870-310 | ±0.15 | ● |
| 9.20 | 310 | GDVK 0920-310 | ±0.15 | ○ |

○ Semi-standard ● Standard Other grades and dimensions upon request

# Profiled rods for gun drills, with kidney-shaped coolant hole

## 120°, fine grain grades



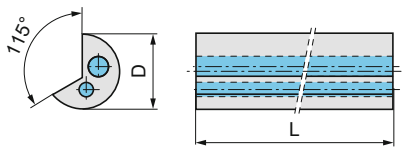

Technical drawings upon request

| D [mm] | L [mm] | Type, description | Dia. tol. [mm] | CTF12E |
|---|---|---|---|---|
| 2.40 | 310 | GDVK 0240-310 | ±0.15 | ● |
| 2.60 | 310 | GDVK 0260-310 | ±0.15 | ● |
| 2.90 | 310 | GDVK 0290-310 | ±0.15 | ● |
| 3.15 | 310 | GDVK 0315-310 | ±0.15 | ● |
| 3.45 | 310 | GDVK 0345-310 | ±0.15 | ● |
| 3.90 | 310 | GDVK 0390-310 | ±0.15 | ● |
| 4.40 | 310 | GDVK 0440-310 | ±0.15 | ● |
| 4.90 | 310 | GDVK 0490-310 | ±0.15 | ● |
| 5.50 | 310 | GDVK 0550-310 | ±0.15 | ● |
| 6.00 | 310 | GDVK 0600-310 | ±0.15 | ● |
| 6.50 | 310 | GDVK 0650-310 | ±0.15 | ● |
| 7.10 | 310 | GDVK 0710-310 | ±0.15 | ● |
| 7.60 | 310 | GDVK 0760-310 | ±0.15 | ● |
| 8.10 | 310 | GDVK 0810-310 | ±0.15 | ● |
| 8.70 | 310 | GDVK 0870-310 | ±0.15 | ● |
| 9.20 | 310 | GDVK 0920-310 | ±0.15 | ● |

○ Semi-standard ● Standard Other grades and dimensions upon request

# Profiled rods for gun drills, with kidney-shaped coolant hole

## 115°, fine grain grades



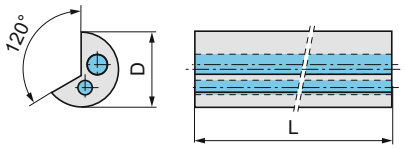

Technical drawings upon request

| D [mm] | L [mm] | Type, description | Dia. tol. [mm] | CTF12E |
|---|---|---|---|---|
| 13.50 | 310 | GDV2 1350/115-310 | ±0.20 | ○ |
| 13.90 | 310 | GDV2 1390/115-310 | ±0.20 | ○ |
| 14.50 | 310 | GDV2 1450/115-310 | ±0.20 | ● |
| 15.50 | 310 | GDV2 1550/115-310 | ±0.20 | ● |
| 16.50 | 310 | GDV2 1650/115-310 | ±0.20 | ● |
| 17.50 | 310 | GDV2 1750/115-310 | ±0.20 | ● |
| 18.60 | 310 | GDV2 1860/115-310 | ±0.20 | ● |
| 19.60 | 310 | GDV2 1960/115-310 | ±0.25 | ● |
| 20.60 | 310 | GDV2 2060/115-310 | ±0.25 | ● |
| 21.60 | 310 | GDV2 2160/115-310 | ±0.25 | ● |

○ Semi-standard ● Standard Other grades and dimensions upon request

# Rods for gun drills, with kidney-shaped coolant hole

## 120°, fine grain grades



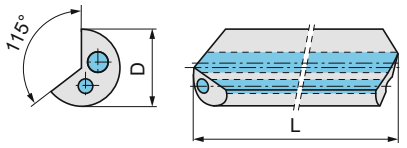

Technical drawings upon request

| D [mm] | L [mm] | Type, description | Dia. tol. [mm] | CTF12E |
|---|---|---|---|---|
| 5.50 | 310 | GDV2 0550-310 | ±0.15 | ○ |
| 6.00 | 310 | GDV2 0600-310 | ±0.15 | ○ |
| 6.50 | 310 | GDV2 0650-310 | ±0.15 | ● |
| 7.10 | 310 | GDV2 0710-310 | ±0.15 | ● |
| 7.60 | 310 | GDV2 0760-310 | ±0.15 | ● |
| 8.10 | 310 | GDV2 0810-310 | ±0.15 | ● |
| 8.70 | 310 | GDV2 0870-310 | ±0.15 | ● |
| 9.20 | 310 | GDV2 0920-310 | ±0.15 | ● |
| 9.70 | 310 | GDV2 0970-310 | ±0.15 | ● |
| 10.80 | 310 | GDV2 1080-310 | ±0.15 | ● |
| 11.30 | 310 | GDV2 1130-310 | ±0.15 | ● |
| 11.80 | 310 | GDV2 1180-310 | ±0.15 | ● |
| 12.30 | 310 | GDV2 1230-310 | ±0.15 | ● |
| 12.80 | 310 | GDV2 1280-310 | ±0.15 | ● |

○ Semi-standard ● Standard Other grades and dimensions upon request

# Profiled tips for gun drills, with two coolant holes

## 115°, fine-grain grades




Technical drawings upon request

| D [mm] | L [mm] | Type, description | Dia. tol. [mm] | CTF12E |
|---|---|---|---|---|
| 13.50 | 40 | GDV2P 1350-040 | ±0.20 | ● |
| 14.50 | 40 | GDV2P 1450-040 | ±0.20 | ● |
| 15.50 | 40 | GDV2P 1550-040 | ±0.20 | ● |
| 16.50 | 40 | GDV2P 1650-040 | ±0.20 | ● |
| 17.50 | 40 | GDV2P 1750-040 | ±0.20 | ● |
| 18.60 | 40 | GDV2P 1860-040 | ±0.25 | ● |
| 19.60 | 45 | GDV2P 1960-045 | ±0.25 | ● |
| 20.60 | 45 | GDV2P 2060-045 | ±0.25 | ● |
| 21.60 | 45 | GDV2P 2160-045 | ±0.25 | ● |
| 22.60 | 50 | GDV2P 2260-050 | ±0.25 | ● |
| 23.60 | 50 | GDV2P 2360-050 | ±0.25 | ● |
| 24.60 | 55 | GDV2P 2460-055 | ±0.25 | ● |
| 25.60 | 55 | GDV2P 2560-055 | ±0.25 | ● |
| 26.60 | 55 | GDV2P 2660-055 | ±0.25 | ● |
| 27.20 | 55 | GDV2P 2720-055 | ±0.25 | ● |
| 28.70 | 65 | GDV2P 2870-065 | ±0.25 | ● |
| 30.80 | 65 | GDV2P 3080-065 | ±0.25 | ● |
| 33.10 | 65 | GDV2P 3310-065 | ±0.25 | ● |
| 36.10 | 75 | GDV2P 3610-075 | ±0.25 | ● |
| 39.10 | 75 | GDV2P 3910-075 | ±0.25 | ● |
| 40.00 | 80 | GDV2P 4000-080 | ±0.30 | ○ |
| 42.00 | 80 | GDV2P 4200-080 | ±0.30 | ● |
| 45.00 | 80 | GDV2P 4500-080 | ±0.30 | ○ |

○ Semi-standard ● Standard Other grades and dimensions upon request

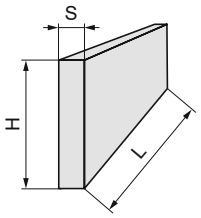
# Strips

Our flat and square strips, in the proven CTS20D grade and in a wide variety of dimensions, are available directly from stock. Of course we can also produce carbide strips in other dimensions and grades to order – just get in touch with your contact person at CERATIZIT.

Detailed technical data for our flat and square strips can be found in the ‘Information’ section.

# Flat strips

## Submicron grade

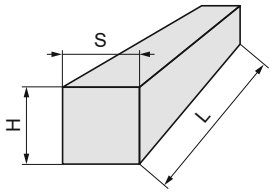



| Type, description | H [mm] | S [mm] | L [mm] | CTS20D |
|---|---|---|---|---|
| FR 0230/0530-330 | 5.30 | 2.30 | 330 | ● |
| FR 0230/0630-330 | 6.30 | 2.30 | 330 | ● |
| FR 0230/0830-330 | 8.30 | 2.30 | 330 | ● |
| FR 0230/1030-330 | 10.30 | 2.30 | 330 | ● |
| FR 0230/1630-330 | 16.30 | 2.30 | 330 | ● |
| FR 0330/0430-330 | 4.30 | 3.30 | 330 | ● |
| FR 0330/0530-330 | 5.30 | 3.30 | 330 | ● |
| FR 0330/0630-330 | 6.30 | 3.30 | 330 | ● |
| FR 0330/0830-330 | 8.30 | 3.30 | 330 | ● |
| FR 0330/1030-330 | 10.30 | 3.30 | 330 | ● |
| FR 0330/1230-330 | 12.30 | 3.30 | 330 | ● |
| FR 0330/1630-330 | 16.30 | 3.30 | 330 | ● |
| FR 0330/2030-330 | 20.30 | 3.30 | 330 | ● |
| FR 0430/0630-330 | 6.30 | 4.30 | 330 | ● |
| FR 0430/0830-330 | 8.30 | 4.30 | 330 | ● |
| FR 0430/1030-330 | 10.30 | 4.30 | 330 | ● |
| FR 0430/1330-330 | 13.30 | 4.30 | 330 | ● |
| FR 0430/1630-330 | 16.30 | 4.30 | 330 | ● |
| FR 0430/2030-330 | 20.30 | 4.30 | 330 | ● |
| FR 0530/1030-330 | 10.30 | 5.30 | 330 | ● |
| FR 0530/1330-330 | 13.30 | 5.30 | 330 | ● |
| FR 0630/1030-330 | 10.30 | 6.30 | 330 | ● |
| FR 0630/1330-330 | 13.30 | 6.30 | 330 | ● |
| FR 0830/1230-330 | 12.30 | 8.30 | 330 | ● |
| FR 0830/1630-330 | 16.30 | 8.30 | 330 | ● |
| FR 1030/1630-330 | 16.30 | 10.30 | 330 | ● |

○ Semi-standard ● Standard Other grades and dimensions upon request

# Square strips

## Submicron grade



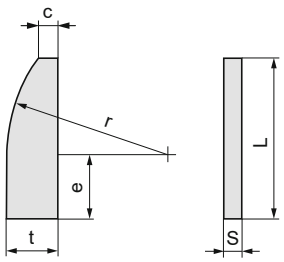

| Type, description | H [mm] | S [mm] | L [mm] | CTS20D |
|---|---|---|---|---|
| SR 0330-330 | 3.30 | 3.30 | 330 | ● |
| SR 0430-330 | 4.30 | 4.30 | 330 | ● |
| SR 0530-330 | 5.30 | 5.30 | 330 | ● |
| SR 0830-330 | 8.30 | 8.30 | 330 | ● |
| SR 1030-330 | 10.30 | 10.30 | 330 | ● |

○ Semi-standard ● Standard Other grades and dimensions upon request

# Brazing tips

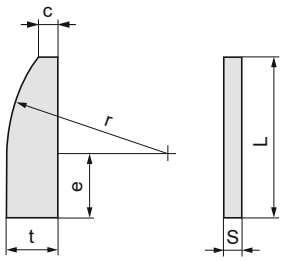
Our brazing tips are characterized by very good brazability and can be supplied upon request in the most common DIN dimensions. Our stock range includes DIN 8011 brazing tips in grade CTS12D.

# Brazing tips to DIN 8011




| Type, description | L [mm] | e [mm] | S [mm] | r [mm] | c [mm] | t [mm] | CTS12D |
|---|---|---|---|---|---|---|---|
| DIN 8011 R 12 | 12 | 5.00 | .80 | 25.00 | .80 | 2.00 | ○ |
| DIN 8011 R 16 | 16 | 7.10 | 1.20 | 25.00 | 1.00 | 2.50 | ● |
| DIN 8011 R 19 | 19 | 9.00 | 1.40 | 25.00 | 1.00 | 3.00 | ● |
| DIN 8011 R 22 | 22 | 11.20 | 1.80 | 25.00 | 1.40 | 3.50 | ● |
| DIN 8011 R 25 | 25 | 15.00 | 2.20 | 25.00 | 1.40 | 4.00 | ● |
| DIN 8011 R 30 | 30 | 18.00 | 2.80 | 25.00 | 1.40 | 5.00 | ● |

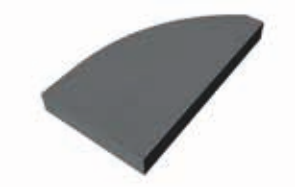
# Brazing tips to DIN 8011

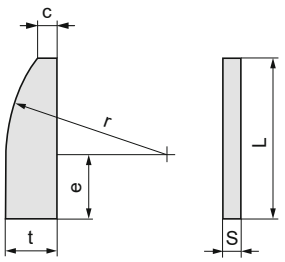



| Type, description | L [mm] | e [mm] | S [mm] | r [mm] | c [mm] | t [mm] | CTS12D |
|---|---|---|---|---|---|---|---|
| DIN 8011 T 12 | 12 | 4.50 | 1.20 | 15.00 | 1.00 | 3.00 | ○ |
| DIN 8011 T 16 | 16 | 7.50 | 1.60 | 15.00 | 1.00 | 3.50 | ○ |
| DIN 8011 T 19 | 19 | 7.50 | 2.00 | 25.00 | 1.80 | 4.50 | ● |
| DIN 8011 T 22 | 22 | 9.50 | 2.50 | 25.00 | 2.50 | 5.60 | ● |
| DIN 8011 T 25 | 25 | 10.00 | 2.80 | 25.00 | 3.00 | 8.00 | ● |

○ Semi-standard ● Standard Other grades and dimensions upon request

# Brazing tips to DIN 8011






| Type, description | L [mm] | e [mm] | S [mm] | r [mm] | c [mm] | t [mm] | CTS12D |
|---|---|---|---|---|---|---|---|
| DIN 8011 U 12 | 12 | 1.40 | 1.20 | 15.00 | 1.00 | 5.60 | ○ |
| DIN 8011 U 16 | 16 | 4.00 | 1.60 | 15.00 | 1.00 | 6.70 | ○ |
| DIN 8011 U 19 | 19 | 2.50 | 2.00 | 25.00 | 1.80 | 8.00 | ● |
| DIN 8011 U 22 | 22 | 2.80 | 2.50 | 25.00 | 2.50 | 11.20 | ● |
| DIN 8011 U 25 | 25 | 4.00 | 2.80 | 25.00 | 3.00 | 14.00 | ● |

○ Semi-standard ● Standard Other grades and dimensions upon request

# Special products

In addition to our standard program, we also offer individual solutions for our rods. Thanks to our comprehensive manufacturing possibilities we can also implement your most demanding requirements. Whether special coolant hole profiles, large helix angles or other characterized versions, see for yourself and benefit from our expertise.

In our up-to-date grinding department, we also produce semi-finished ground articles, in high volumes as well as in small batches.

# Available types

▲ Broad selection of diameters and grades starting at 0.016 inch, e.g. for erosion electrodes up to 3.15 inch for special tools. For semi-finished tools bigger than that we offer customized preforms.

▲ Solid carbide or coolant hole rods up to a meter in length are no problem for us. Close tolerance production techniques of spiral through hole rod minimize the risk of grinding through into the coolant channels. Using leading-edge technologies we are also able to deliver coolant hole rod with pre-formed flutes if required.

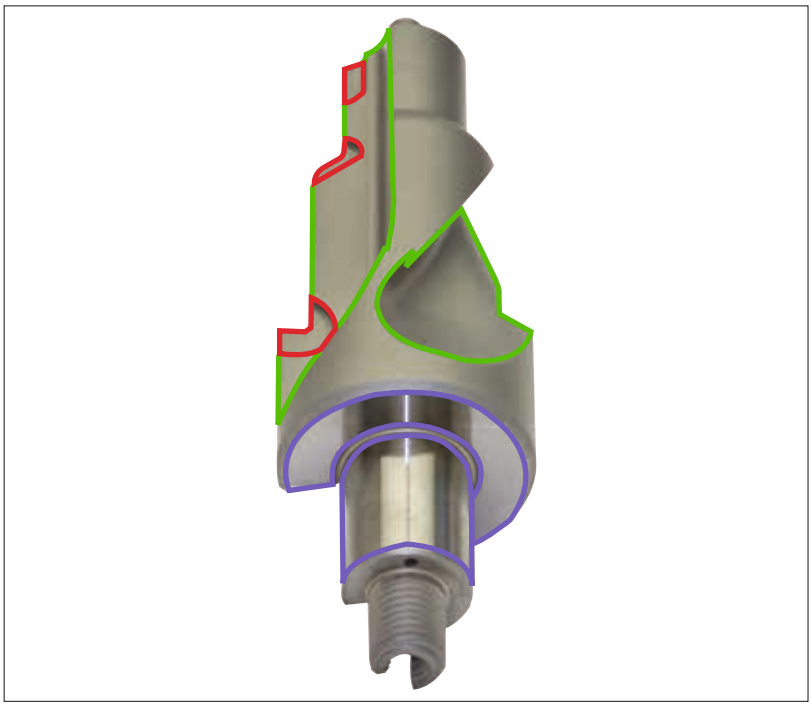
▲ Increasingly, tool producers rely on prefabricated semi-finished products. In this context we offer ground cut-to-lengths in a variety of versions. For example steps, tapers, cones, male or female centers, ball noses, chamfers, recesses, ground holes and many others.

▲ Thanks to our modern extrusion processes we can offer you a variety of coolant hole profiles.

# Preforms

In addition to our comprehensive range of rods, we also offer various types of preforms for rotary cutting tools. The products include both blanks and semi-finished tools for solid carbide and PCD tools, exchangeable head systems and tool shanks. Years of experience in the field of blank machining combined with a state-of-the-art production plant make it possible for us to produce the most complex, near net shape geometries with short delivery times. In particular for tool shanks and PCD tool bodies, we have developed the new grade CTF25E which is ideal even for the most sophisticated tool versions with narrow shapes and critical transitions.

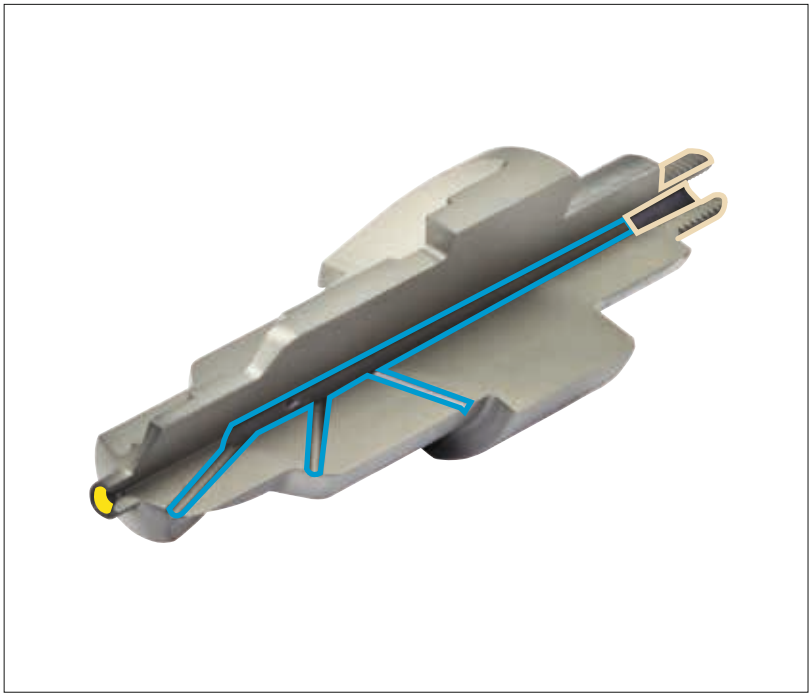
# Available types



Based on your drawings of blanks or finished parts, we are able to produce outside diameters of up to approx. 11.81 inch and lengths of approx. 19.68 inch. Ideally, you should provide us with digital drawings or 3-D models (.stp, .prt,…).

- ▲ Diameter as sintered up to around 19.68 inch
- ▲ Lengths up to around 11.81 inch

- Preformed seats for PCD inserts
- Straight and helical chip flutes
- Ground shanks



- External and internal thread
- Coolant holes
- As sintered male or female centers

Our preformed chip flutes and insert seats with optimized machining allowance make it possible to save production costs thanks to reduced grinding times in tool production.

Individually designed coolant exit holes can be formed into the blank.

- Axial holes from Ø .025 inch
- Radial exit holes from Ø .019 inch and greater
- Smaller holes available depending on the depth and upon request

- Outside and inside threads
- Metric ISO threads, as sintered, tolerance class 8H
- UN threads, as sintered
- Special threads upon request
- Ground threads are possible upon request

- Female and male centers
- Female centers to DIN 332
- As sintered centers (form 'R' preferred)
- Upon request ground version also available

- Upon request ground version also available, for example ground shank to h6

Do not hesitate to contact us with questions about possible variations. We will be pleased to help you design blanks for cost-efficient production of precision tools.

# Grades: composition and properties

An extensive stock of the most important grades makes shortest delivery times for customized blanks possible.

## Submicron grade

| Grade | ISO code | U.S. code | Binder [m %] | Density [g/cm$^3$] | Hardness HV30 | Hardness HRA | Transverse rupture strength [MPa] | Transverse rupture strength [psi] | $K_{IC}$ (Shetty) [MPa·m $^{½}$] |
|---|---|---|---|---|---|---|---|---|---|
| CTS12D | K05 – K10 | C-3 | 6.0 | 14.80 | 1820 | 93.1 | 3600 | 522.100 | 9.3 |
| CTS15D | K10 – K30 | C-3 | 7.5 | 14.70 | 1750 | 92.8 | 3700 | 536.000 | 9.5 |
| CTS20D | K20 – K40 | C-2 | 10.0 | 14.38 | 1600 | 91.9 | 4000 | 580.100 | 10.4 |

## Fine grain grade

| Grade | ISO code | U.S. code | Binder [m %] | Density [g/cm$^3$] | Hardness HV30 | Hardness HRA | Transverse rupture strength [MPa] | Transverse rupture strength [psi] | $K_{IC}$ (Shetty) [MPa·m $^{½}$] |
|---|---|---|---|---|---|---|---|---|---|
| CTF25E | K30 – K40 | C-2 | 12.5 | 14.15 | 1300 | 89.5 | 3500 | 507.600 | 15.0 |

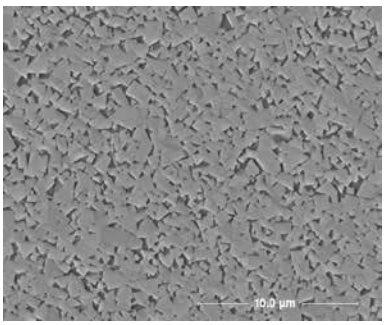
Our CTF25E fine-grain grade has been specially designed for PCD tools and tool shanks.

The coarser grain structure combined with higher cobalt content provides this grade with increased resistance to breakage and excellent brazability.

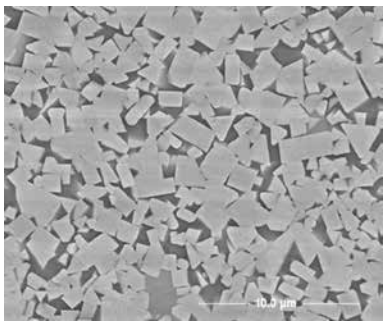
### CTF25E vs. CTS20D

| | CTS20D | CTF25E |
|---|---|---|
| ▲ Grain size: | submicron | fine grain |
| ▲ Cobalt content: | 10.0% | 12.5% |
| ▲ Additives: | 1.15% | 1.2% |
| ▲ Hardness: | 1600 HV30 | 1300 HV30 |
| ▲ Transverse rupture strength: | 4000 MPa | 3500 MPa |
| ▲ Fracture toughness $K_{IC}$: | 10.4 MPa·m$^{0,5}$ | 15 MPa·m$^{0,5}$ |

CTS20D



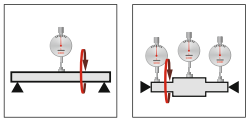

CTF25E



Of course we also offer preforms in all other 'Round Tool Materials' grades upon request.

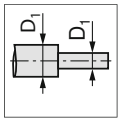
# Specifications

## Straightness



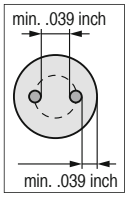
| max. deflection [inch] |
|---|
| .012 |

## Diameter steps




| Different diameters, dia. steps |
|---|
| $D_1 - D_2 \geq .039$ inch |

## Wall thicknesses




| Min. wall thicknesses and hole distances |
|---|
| ≥ .039 inch |

## Tolerance table for preforms

### Diameters for preforms

| Nominal Ø [inch] | Blank tolerance incl. grinding allowance [inch] | Sintering tolerance [±] |
|---|---|---|
| < .787 | .022 | ±0.15 |
| > .787 – 1.378 | .024 | ±0.20 |
| > 1.378 – 1.772 | .026 | ±0.25 |
| > 1.772 – 2.165 | .028 | ±0.30 |
| > 2.165 – 2.756 | .033 | ±0.35 |
| > 2.756 – 3.937 | .035 | ±0.40 |
| > 3.937 – 5.906 | .039 | ±0.50 |

Example of a finished diameter .866 inch with grinding allowance:

Finished dimension Ø .866 inch
Grinding allowance +.024 inch
**Blank dimensions Ø .890 ±.008 inch**

### Lengths for preforms

| Length [inch] | Blank tolerance incl. grinding allowance [inch] | Sintering tolerance [±] |
|---|---|---|
| L | 0.5% L + .016 | ±0.5% L |

Example of a finished length 5.906 inch with grinding allowance:

Finished dimension 5.906 inch
Grinding allowance +.045 inch
**Blank dimensions 5.951 ±.030 inch**

→ For further information go to page 102.

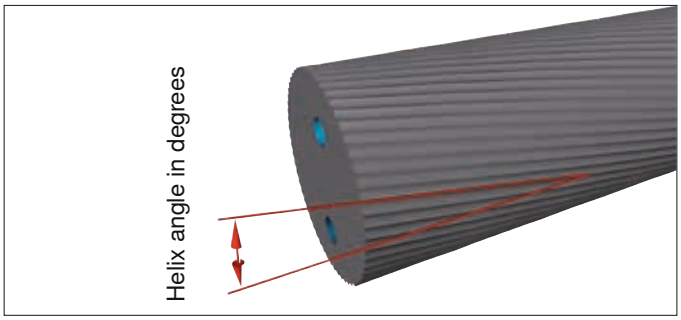
# Technical information

**In this section you can find additional information on technical product specifications and carbide properties. Specifications for preforms can be found at the end of the ‘Preforms’ section.**

# Specifications – Pitch classification

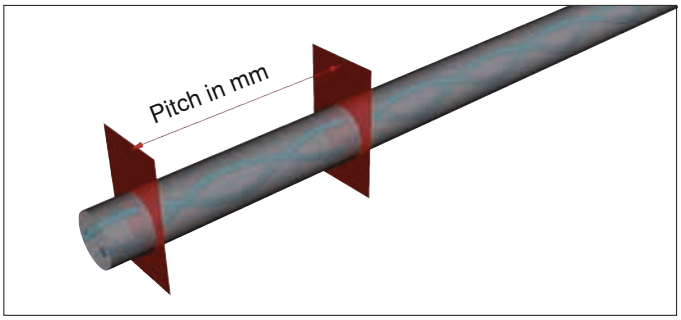
## Definition of the helix angle

The helix angle indicates the torsion of the coolant holes in relation to the nominal diameter. In this context it has to be taken into account that the angle decreases depending on the diameter steps. For this reason, rods with 40° coolant holes are used for step drills in order to achieve an optimal spiral flute helix angle of 25 to 30°.




## Definition of pitch

The pitch is the length of a complete 360° rotation of the coolant holes. This value is independent of the diameter or the diameter steps. The CERATIZIT designation system for coolant hole rods includes both the helix angle in degrees and the pitch of the helix in millimeters.




## Conversion helix angle/pitch:

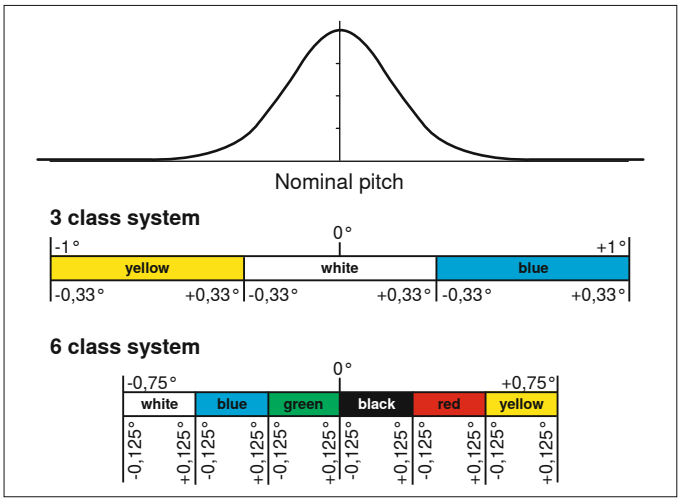
Conversion pitch to angle: $\alpha = \tan^{-1} \frac{d \times \pi}{Stg}$

Conversion angle to pitch: $Stg = \frac{d \times \pi}{\tan \alpha}$

| | |
|---|---|
| Stg. | pitch |
| d | nominal diameter |
| α | helix angle |

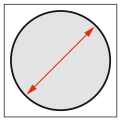
## Pitch classification

In order to guarantee the closest pitch tolerances, our carbide rods with helical coolant holes are divided into tolerance classes. For this purpose all rods are measured and assigned to the respective class, which is indicated on the product label 108.



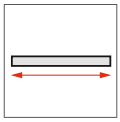
# Specifications – Parameters

## Outside diameter



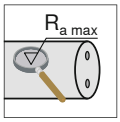
Measured outside diameter of the round rod.

## Length



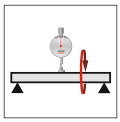
Measured length of the round rod.

## Surface



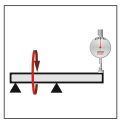

The surface quality describes the state of the surface. For ground rods the surface value is indicated as maximum average roughness value $R_a$ (DIN EN ISO 4287:1998).

## Straightness



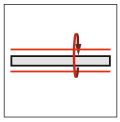
Maximum deflection of a rotating rod which lies on two contact points, measured in the middle of the rod. The distance between the two contact points is 300 mm. When the rod is longer or shorter than 330 mm the contact width corresponds to the rod length minus 10 mm.

## Concentricity



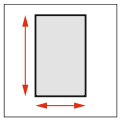
Maximum deflection of a rod. Contact point A is 5 mm before the chamfer. Contact point B is in the middle of the rod. The measurement is carried out 2 mm from the end.

## Cylindricity



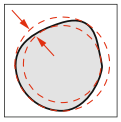
The cylindricity describes the tolerance field of an ideal cylinder inside which the skin surface of the rod should be.

## Width, height



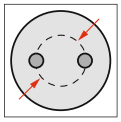
Lateral length of square and rectangular strips

## Roundness



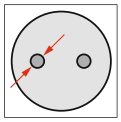
Roundness is the radial distance of two concentric circles which include the circumference line of the round rod's section. (DIN ISO 1101).

## Pitch circle diameter



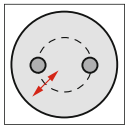
The pitch circle is defined as the circle which goes through two or three center points of coolant holes.

## Hole diameter



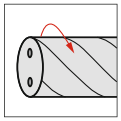
The hole diameter is the diameter of the coolant holes inside the rod.

## Excentricity



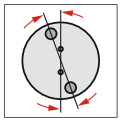
Excentricity means the deviation of the pitch circle center point or, in case of a coolant hole, the deviation of the coolant hole center point from the center point of the rod.

## Helix angle



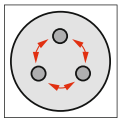
The helix angle is the angle between the longitudinal axis and the helix line.

## Torsion



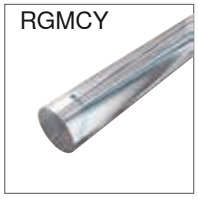
Maximum difference of the angle of the two imaginary lines which go through the center point of the coolant holes which are on the pitch circle.

## Pitch error



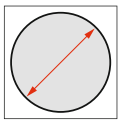
For rods with three helical coolant holes the section surface is divided into three circle sectors which go through the center point of the coolant holes. The pitch error is the difference of the angles between the circle sectors.

# Specifications – End mill blanks



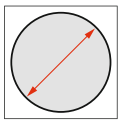

## Outside diameter

metric



| Outside diameter [mm] | Tolerance h6 [mm] | Tolerance h5 [mm] |
|---|---|---|
| 1.0 – 3.0 | +0/-0.006 | +0/-0.004 |
| 3.1 – 6.0 | +0/-0.008 | +0/-0.005 |
| 6.1 – 10.0 | +0/-0.009 | +0/-0.006 |
| 10.1 – 18.0 | +0/-0.011 | +0/-0.008 |
| 18.1 – 30.0 | +0/-0.013 | +0/-0.009 |
| 30.1 – 40.0 | +0/-0.016 | +0/-0.011 |

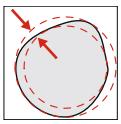
inch



| Outside diameter [inch] | Tolerance h6 [inch] | Tolerance h5 [inch] |
|---|---|---|
| 0 – 0.118 | +0/-0.0002 | +0/-0.0001 |
| 0.1181 – 0.236 | +0/-0.0003 | +0/-0.0002 |
| 0.2361 – 0.394 | +0/-0.0004 | +0/-0.0002 |
| 0.3941 – 0.709 | +0/-0.0004 | +0/-0.0003 |
| 0.7091 – 1.181 | +0/-0.0005 | +0/-0.0004 |

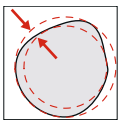
## Roundness

metric



| Outside diameter [mm] | Tolerance h6 [mm] | Tolerance h5 [mm] |
|---|---|---|
| 1.0 – 3.0 | +0/+0.003 | +0/+0.002 |
| 3.1 – 6.0 | +0/+0.003 | +0/+0.002 |
| 6.1 – 10.0 | +0/+0.003 | +0/+0.002 |
| 10.1 – 25.0 | +0/+0.004 | +0/+0.002 |

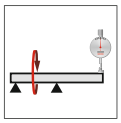
inch



| Outside diameter [inch] | Tolerance h6 [inch] | Tolerance h5 [inch] |
|---|---|---|
| 0 – 0.118 | 0.00011 | 0.00011 |
| 0.1181 – 0.236 | 0.00015 | 0.00011 |
| 0.2361 – 0.394 | 0.00019 | 0.00011 |
| 0.3941 – 0.709 | 0.00023 | 0.00015 |
| 0.7091 – 1.181 | 0.00031 | 0.00019 |

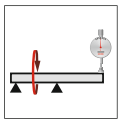
## Run-out

metric



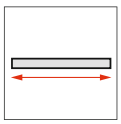
| Outside diameter | max. concentricity [µm] starting length [mm] | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| [mm] | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 110 | 140 |
| 3.0 | 5 | 5 | 6 | 7 | - | - | - | - | - |
| 4.0 – 5.0 | 5 | 5 | 6 | 6 | 7 | - | - | - | - |
| 6.0 | 4 | 5 | 5 | 6 | 6 | 7 | 8 | - | - |
| 8.0 – 10.0 | 4 | 4 | 4 | 5 | 5 | 5 | 6 | 7 | - |
| 12.0 – 14.0 | 3 | 4 | 4 | 4 | 4 | 5 | 5 | 6 | - |
| 16.0 – 20.0 | 3 | 4 | 4 | 4 | 4 | 4 | 5 | 5 | 6 |
| 25.0 | 3 | 4 | 4 | 4 | 4 | 4 | 5 | 5 | 6 |

inch



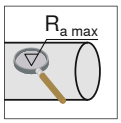
| Outside diameter | maximum concentricity [inch] starting length [inch] | | |
|---|---|---|---|
| [inch] | 1.500 – 2.500 | 2.501 – 3.500 | 3.501 – 8.000 |
| 0.1250 – 0.1874 | 0.0002 | 0.0003 | n/a |
| 0.1875 – 1.000 | 0.0002 | 0.0003 | 0.0004 |
| 1.0001 – 1.250 | 0.0002 | 0.0003 | 0.0004 |

## Length



| Type | Total length tolerance |
|---|---|
| RGIC, RGMC | +0% /+1% |

## Surface finish

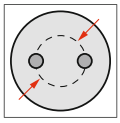



| $Ra_{max}$ [µm] |
|---|
| 0.05 |

# Specifications – Drill blanks

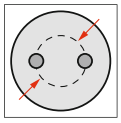


## Pitch circle diameter of DIN drill blanks



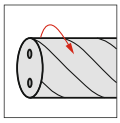
| Pitch circle diameter [mm] | Tolerance [mm] |
|---|---|
| 1.6 – 6.3 | +/-0.20 |
| 6.7 – 8.0 | +/-0.25 |
| 9.0 – 10.0 | +/-0.30 |

## Pitch circle diameter for micro-drill blanks



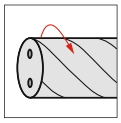
| Pitch circle diameter [mm] | Tolerance [mm] |
|---|---|
| 0.29 | +/-0.03 |
| 0.30 – 1.05 | +/-0.05 |
| 1.06 – 2.0 | +/-0.08 |

## Helix angle for DIN drill blanks



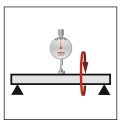
| Total tolerance class [°] | Number of classes | Tolerance class [°] |
|---|---|---|
| +/-1 | 3 | +/-0.33 |

## Helix angle for micro-drill blanks



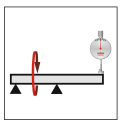
| Total tolerance class [°] | Number of classes | Tolerance class [°] |
|---|---|---|
| +/-0.75 | 6 | +/-0.125 |

## Straightness of DIN drill blanks



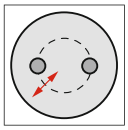
| Outside diameter [mm] | Deflection [µm] with length [mm] 63–66 | 67–81 | 82–114 | 115–133 | 134–162 | 163–310 |
|---|---|---|---|---|---|---|
| 6.0 | 10 | 15 | 30 | 40 | – | – |
| 8.0 | – | 15 | 20 | 40 | 40 | – |
| 10.0 | – | – | 20 | 30 | 40 | 50 |
| 12.0 | – | – | 20 | 30 | 30 | 50 |
| 14.0 | – | – | 20 | 30 | 30 | 50 |
| 16.0 | – | – | – | 20 | 30 | 50 |
| 18.0 | – | – | – | 20 | 30 | 50 |
| 20.0 | – | – | – | 20 | 30 | 50 |

## Run-out of micro-drill blanks



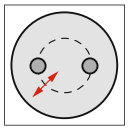
| Outside diameter [mm] | Deflection [µm] with length [mm] 55–65 | 66–85 | 86–105 | 106–180 |
|---|---|---|---|---|
| 3.0 | 5 | 8 | 20 | 20 |
| 4.0 | – | 8 | 15 | 20 |

## Excentricity of DIN drill blanks



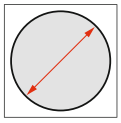
| Pitch circle diameter [mm] | max. excentricity [mm] |
|---|---|
| 1.6 – 3.4 | 0.10 |
| 4.8 | 0.15 |
| 6.3 – 6.7 | 0.18 |
| 8.0 – 10.0 | 0.20 |

## Excentricity of micro-drill blanks



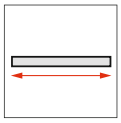
| Pitch circle diameter [mm] | max. excentricity [mm] |
|---|---|
| 0.29 | 0.025 |
| 0.30 – 0.59 | 0.035 |
| 0.6 – 1.5 | 0.040 |
| 1.51 – 2.00 | 0.050 |

## Outside diameter



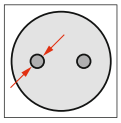
| Outside diameter [mm] | Tolerance h5 [mm] |
|---|---|
| 3.0 | +0/-0.004 |
| 3.1 – 6.0 | +0/-0.005 |
| 6.1 – 10.0 | +0/-0.006 |
| 10.1 – 18.0 | +0/-0.008 |
| 18.1 – 30.0 | +0/-0.009 |

## Length



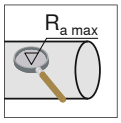
| Tolerance |
|---|
| +0%/+1% |

## Hole diameter



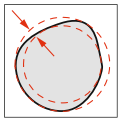
| Hole diameter [mm] | Tolerance [mm] |
|---|---|
| 0.05 | +/-0.010 |
| 0.06 – 0.20 | +/-0.015 |
| 0.21 – 0.45 | +/-0.030 |
| 0.5 – 1.3 | +/-0.050 |
| 1.31 – 2.50 | +/-0.075 |

## Surface finish



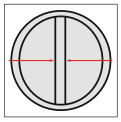

| Product | $Ra_{max}$ [µm] |
|---|---|
| DIN drill blanks | Ground mat, 0.05 - 0.1 |
| Micro-drill blanks | 0.05 |

## Roundness



| Outside diameter [mm] | Tolerance [mm] |
|---|---|
| 3.0 – 6.0 | 0.002 |
| 8.0 – 10.0 | 0.003 |
| 12.0 – 18.0 | 0.004 |
| 20.0 | 0.005 |

## Cross groove profile for DIN drill blanks

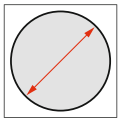


| Outside diameter [mm] | Cross groove width [mm] | | Cross groove depth [mm] | |
|---|---|---|---|---|
| 6 | 1.5 | +/-0.1 | 0.30 | +/-0.05 |
| 8 | 1.5 | +/-0.1 | 0.40 | +/-0.05 |
| 10 | 2.0 | +/-0.1 | 0.50 | +/-0.10 |
| 12 | 2.0 | +/-0.1 | 0.60 | +/-0.10 |
| 14 | 2.5 | +/-0.1 | 0.80 | +/-0.10 |
| 16 | 2.5 | +/-0.1 | 1.10 | +/-0.10 |
| 18 | 3.0 | +/-0.1 | 1.30 | +/-0.10 |
| 20 | 3.0 | +/-0.1 | 1.60 | +/-0.10 |

# Specifications – Solid carbide rods

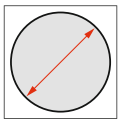

## Outside diameter

as sintered



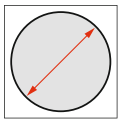
| Outside diameter [mm] | Tolerance [mm] |
|---|---|
| 0.8 – 2.1 | +0/+0.15 |
| 2.2 – 4.7 | +0/+0.20 |
| 4.8 – 6.7 | +0/+0.25 |
| 6.8 – 15.2 | +0/+0.30 |
| 15.3 – 20.2 | +0/+0.45 |
| 20.3 – 24.2 | +0/+0.55 |
| 24.3 – 36.2 | +0/+0.65 |
| 36.3 – 46.2 | +0/+0.70 |

ground, metric



| Outside diameter [mm] | Tolerance h6 [mm] | Tolerance h5 [mm] |
|---|---|---|
| 1.0 – 3.0 | +0/-0.006 | +0/-0.004 |
| 3.1 – 6.0 | +0/-0.008 | +0/-0.005 |
| 6.1 – 10.0 | +0/-0.009 | +0/-0.006 |
| 10.1 – 18.0 | +0/-0.011 | +0/-0.008 |
| 18.1– 30 | +0/-0.013 | +0/-0.009 |
| 30.1 – 40 | +0/-0.016 | +0/-0.011 |

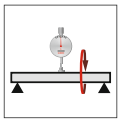
ground, inch



| Outside diameter [inch] | Tolerance h6 [inch] | Tolerance h5 [inch] |
|---|---|---|
| 0 – 0.118 | +0/-0.0002 | +0/-0.0001 |
| 0.1181 – 0.236 | +0/-0.0003 | +0/-0.0002 |
| 0.2361 – 0.394 | +0/-0.0004 | +0/-0.0002 |
| 0.3941 – 0.709 | +0/-0.0004 | +0/-0.0003 |
| 0.7091 – 1.181 | +0/-0.0005 | +0/-0.0004 |

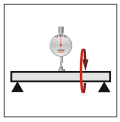
## Straightness

as sintered



| Outside diameter [mm] | max. deflection [mm] |
|---|---|
| 0.8 – 3.2 | 1.2 |
| 3.25 – 46.2 | 0.5 |

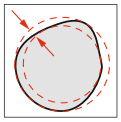
ground



| Outside diameter [mm] | max. deflection [mm] |
|---|---|
| 1.0 – 2.9 | 1.20 |
| 3.0 – 5.9 | 0.15 |
| 6.0 – 7.9 | 0.12 |
| 8.0 – 9.9 | 0.10 |
| 10.0 – 11.9 | 0.08 |
| 12.0 – 19.9 | 0.05 |
| 20.0 – 40.0 | < 0.05 |

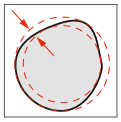
## Roundness

as sintered



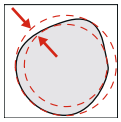
| Outside diameter [mm] | Tolerance [mm] |
|---|---|
| 0.8 – 5.7 | 0.05 |
| 5.8 – 7.7 | 0.08 |
| 7.8 – 12.7 | 0.10 |
| 12.8 – 30.2 | 0.13 |
| 30.3 – 46.2 | 0.16 |

ground, metric



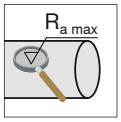
| Outside diameter [mm] | Tolerance h6 [mm] | h5 [mm] |
|---|---|---|
| 1.0 – 3.0 | 0.003 | 0.003 |
| 3.1 – 6.0 | 0.004 | 0.003 |
| 6.1 – 10.0 | 0.005 | 0.003 |
| 10.1 – 30.0 | 0.006 | 0.004 |
| 30.1 – 40.0 | 0.008 | 0.005 |

ground, inch



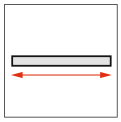
| Outside diameter [inch] | Tolerance h6 [inch] | h5 [inch] |
|---|---|---|
| 0 – 0.118 | 0.00011 | 0.00011 |
| 0.1181 – 0.236 | 0.00015 | 0.00011 |
| 0.2361 – 0.394 | 0.00019 | 0.00011 |
| 0.3941 – 0.709 | 0.00023 | 0.00015 |
| 0.7091 – 1.181 | 0.00031 | 0.00019 |

## Surface finish




| Executions | $Ra_{max}$ [µm] |
|---|---|
| as sintered | as sintered |
| ground | 0.05 |

## Length

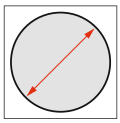


| Tolerance [mm] | [inch] |
|---|---|
| +0/+10 | -0/+0.394 |

# Specifications – Rods with helical coolant holes

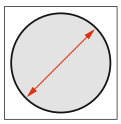

## Outside diameter

as sintered



| Outside diameter [mm] | Tolerance core diameter [mm] | Tolerance outside diameter [mm] |
|---|---|---|
| 3.3 – 4.3 | +0.10/+0.20 | +0.20/+0.60 |
| 4.4 – 8.3 | +0.10/+0.30 | +0.20/+0.70 |
| 8.4 – 10.3 | +0.10/+0.35 | +0.20/+0.75 |
| 10.4 – 12.3 | +0.10/+0.40 | +0.25/+0.80 |
| 12.4 – 14.3 | +0.10/+0.40 | +0.30/+0.80 |
| 14.4 – 16.3 | +0.10/+0.45 | +0.35/+0.95 |
| 16.4 – 18.3 | +0.10/+0.50 | +0.40/+1.00 |
| 18.4 – 20.3 | +0.10/+0.55 | +0.40/+1.05 |
| 20.4 – 22.3 | +0.10/+0.60 | +0.45/+1.10 |
| 22.4 – 35.3 | +0.10/+0.60 | +0.50/+1.10 |

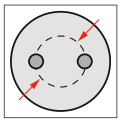
ground



| Outside diameter [mm] | Tolerance [mm] |
|---|---|
| 6.0 | +0/-0.008 |
| 6.1 – 10.0 | +0/-0.009 |
| 10.1 – 18.0 | +0/-0.011 |
| 18.1 – 30.0 | +0/-0.013 |
| 30.1 – 32.0 | +0/-0.016 |

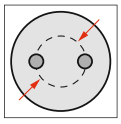
## Pitch circle diameter

as sintered



| Outside diameter [mm] | Tolerance [mm] |
|---|---|
| 3.3 | +/-0.10 |
| 3.4 – 4.3 | +/-0.15 |
| 4.4 – 12.3 | +/-0.20 |
| 12.4 – 18.3 | +/-0.25 |
| 18.4 – 35.3 | +/-0.30 |

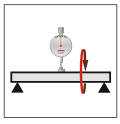
ground



| Outside diameter [mm] | Tolerance [mm] |
|---|---|
| 6.0 – 12.0 | +/-0.20 |
| 12.1 – 18.0 | +/-0.25 |
| 18.1 – 32.0 | +/-0.30 |

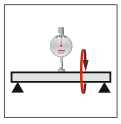
## Straightness

as sintered



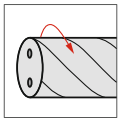
| Length [mm] | max. deflection [mm] |
|---|---|
| 250 – 280 | 0.40 |
| > 280 | 0.50 |

ground



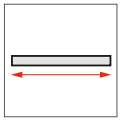
| Outside diameter [mm] | max. deflection [mm] |
|---|---|
| 6.0 – 7.9 | 0.12 |
| 8.0 – 9.9 | 0.10 |
| 10.0 – 11.9 | 0.08 |
| 12.0 – 19.9 | 0.05 |
| 20.0 – 32.0 | < 0.05 |

## Helix angle



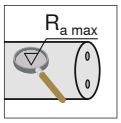
| Product group | Total tolerance class [°] | Number of classes | Tolerance class [°] |
|---|---|---|---|
| Standard | +/-1 | 3 | +/-0.333 |
| Ø 3.3 – 4.3 | +/-0,75 | 6 | +/-0.125 |
| extra-long, 3 holes | +/-0.75 | 6 | +/-0.125 |

## Length



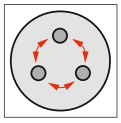
| Total length tolerance [mm] |
|---|
| +0/+10 |

## Surface finish



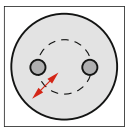

| Executions | $R_{a\ max.}$ [µm] |
|---|---|
| as sintered | as sintered |
| ground | 0.05 |

## Pitch error



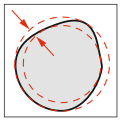
| max. pitch error with ..R3 [°] |
|---|
| +/-3.0 |

## Excentricity



| Outside diameter [mm] | Tolerance [mm] |
|---|---|
| 3.3 | 0.04 |
| 3.4 – 4.3 | 0.05 |
| 4.4 – 8.3 | 0.10 |
| 8.4 – 10.3 | 0.15 |
| 10.4 – 14.3 | 0.18 |
| 14.4 – 35.3 | 0.20 |

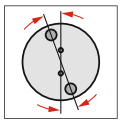
## Roundness



| Outside diameter [mm] | Tolerance [mm] |
|---|---|
| 6.0 | 0.004 |
| 6.1 – 10.0 | 0.005 |
| 10.1 – 30.0 | 0.006 |
| 30.1 – 32.0 | 0.008 |

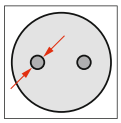
## Torsion

as sintered



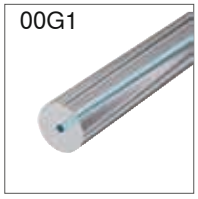
| max. torsion with ..R4 [°] |
|---|
| 2.0 |

## Hole diameter



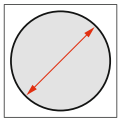
| Outside diameter [mm] | Hole diameter [mm] | Tolerance [mm] |
|---|---|---|
| 3.3 – 4.3 | ≤ 1.00 | +/-0.030 |
| 3.3 – 4.3 | ≥ 1.01 | +/-0.050 |
| 4.4 – 35.3 | 0.40 – 1.30 | +/-0.050 |
| 4.4 – 35.3 | 1.31 – 2.50 | +/-0.075 |
| 4.4 – 35.3 | 2.51 – 5.00 | +/-0.100 |

# Specifications – Rods with straight coolant holes



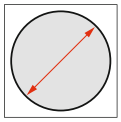

## Outside diameter

as sintered



| Outside diameter [mm] | Tolerance [mm] |
|---|---|
| 3.3 | +0/+0.20 |
| 3.4 – 5.0 | +0/+0.30 |
| 5.1 – 6.5 | +0/+0.35 |
| 6.6 – 15.2 | +0/+0.40 |
| 15.3 – 20.7 | +0/+0.55 |
| 20.8 – 22.2 | +0/+0.65 |
| 22.3 – 34.3 | +0/+0.75 |

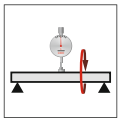
ground



| Outside diameter [mm] | Tolerance [mm] |
|---|---|
| 4.0 – 6.0 | +0/-0.008 |
| 6.1 – 10.0 | +0/-0.009 |
| 10.1 – 18.0 | +0/-0.011 |
| 18.1 – 30.0 | +0/-0.013 |
| 30.1 – 32.0 | +0/-0.016 |

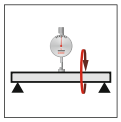
## Straightness

as sintered



| max. deflection [mm] |
|---|
| 0.50 |

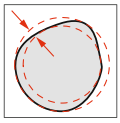
ground



| Outside diameter [mm] | max. deflection [mm] |
|---|---|
| 4.0 – 5.9 | 0.15 |
| 6.0 – 7.9 | 0.12 |
| 8.0 – 9.9 | 0.10 |
| 10.0 – 11.9 | 0.08 |
| 12.0 – 19.9 | 0.05 |
| 20.0 – 32.0 | < 0.05 |

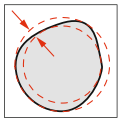
## Roundness

as sintered



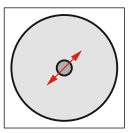
| Outside diameter [mm] | Tolerance [mm] |
|---|---|
| 3.3 – 5.7 | 0.05 |
| 6.2 – 7.7 | 0.08 |
| 8.2 – 12.7 | 0.10 |
| 13.2 – 30.2 | 0.13 |
| 30.3 – 34.3 | 0.16 |

ground

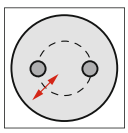


| Outside diameter [mm] | Tolerance [mm] |
|---|---|
| 4.0 – 6.0 | 0.004 |
| 6.1 – 10.0 | 0.005 |
| 10.1 – 30.0 | 0.006 |
| 30.1 – 32.0 | 0.008 |

## Excentricity

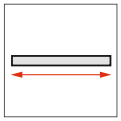


| Outside diameter [mm] | Tolerance [mm] |
|---|---|
| 3.3 – 3.9 | 0.025 |
| 4.0 – 5.9 | 0.050 |
| 6.0 – 7.9 | 0.100 |
| 8.0 – 10.9 | 0.120 |
| 11.0 – 24.9 | 0.150 |
| 25.0 – 34.3 | 0.200 |



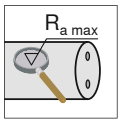
| Outside diameter [mm] | Tolerance [mm] |
|---|---|
| 3.3 – 3.9 | 0.025 |
| 4.0 – 5.9 | 0.050 |
| 6.0 – 7.9 | 0.100 |
| 8.0 – 10.9 | 0.120 |
| 11.0 – 24.9 | 0.150 |
| 25.0 – 34.3 | 0.200 |

## Length



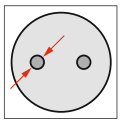
| Total length tolerance [mm] |
|---|
| +0/+10 |

## Surface finish



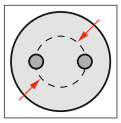

| Executions | $R_{a\ max.}$ [µm] |
|---|---|
| as sintered | as sintered |
| ground | 0.05 |

## Hole diameter



| Product group | Hole diameter [mm] | Tolerance [mm] |
|---|---|---|
| central coolant hole | 0.10 – 0.50 | +0.05 |
| | 0.51 – 1.30 | +0.10 |
| | 1.31 – 2.50 | +0.15 |
| | 2.51 – 5.00 | +0.20 |
| two coolant holes | 0.10 – 0.50 | +/-0.025 |
| | 0.51 – 1.30 | +/-0.050 |
| | 1.31 – 2.50 | +/-0.075 |
| | 2.51 – 5.00 | +/-0.100 |

## Pitch circle diameter



| Outside diameter [mm] | Tolerance [mm] |
|---|---|
| 3.3 – 3.9 | +/-0.05 |
| 4.0 – 5.9 | +/-0.10 |
| 6.0 – 14.9 | +/-0.20 |
| 15.0 – 20.9 | +/-0.25 |
| 21.0 – 34.3 | +/-0.30 |

# Mechanical Properties of Carbide

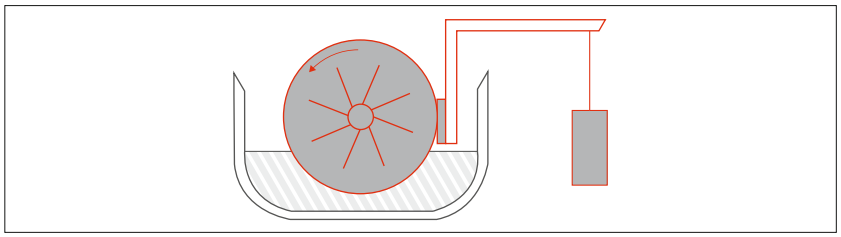


Figure 1: test assembly for the determination of wear resistance according to ASTM B611-85

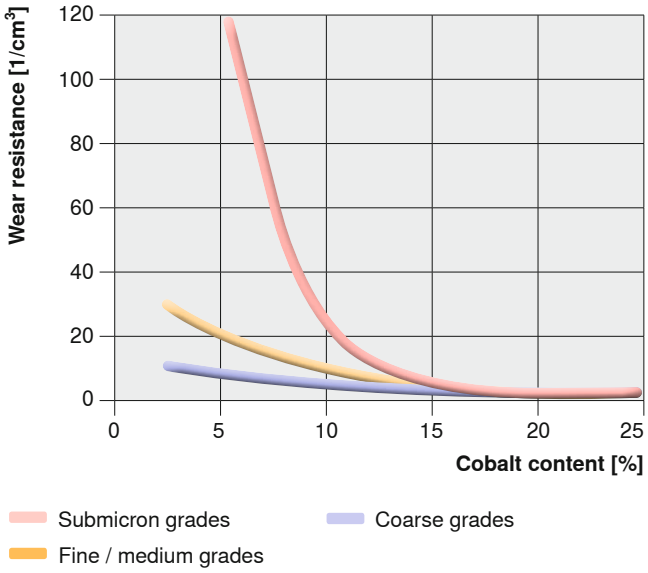



Figure 2: wear resistance in relation to the cobalt content and grain size

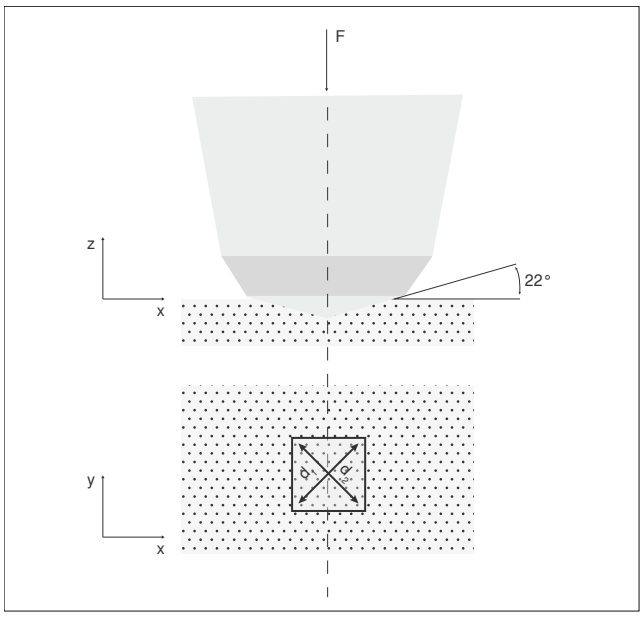



Figure 3: Vickers hardness test according to ISO 3878

**Wear resistance**

The most important property of carbide is wear resistance. This property – or, to be precise, this combination of properties – refers to the surface of the component. When two surfaces rub against each other, material is removed from both of them. Under low stress the material removed consists of single grains or particles. This phenomenon is called ‚scoring'. In cases of high stress, the material removed consists of grain clusters and is called ‚abrasion'. The concept of wear is very complex and depends on many variables. Wear resistance is mainly tested using the ASTM B611-85 method. In this method a carbide piece is pressed onto a rotating steel disk using a lever. The rotating steel disk is the carrier for the abrasive material, which together with the material that is subject to analysis is transported from a tank below the container directly to the contact zone (see figure 1). The abrasive material consists of water and aluminum oxide (corundum). Wear resistance is determined by measuring the volume of material removed from the carbide piece while the revolution number, test time and the force applied at 90° on the steel disk are held at consistent levels. A gravimetric evaluation is carried out, with the volume removal indicated in $mm^3$. As shown in figure 2, wear resistance increases the finer the grain and the lower the cobalt content.

**Hardness**

Hardness is a material's mechanical resistance to another, harder, material which penetrates it. The hardness is normally determined based on the Vickers hardness test according to ISO 3878. In this test a 136° pyramidal diamond indenter is pressed onto a work piece with a determined test force. The size of the indent is determined optically by measuring the two diagonals of the square indent produced by the applied force (F). The impression surface is calculated with formula 1 (see fig. 3). When introducing this test method the obsolete unit ‚kilopond' was used for the test force. Therefore in the formula the factor 0.102 is used for conversion. The standardized indication of the Vickers hardness, for example, is as follows:

**620 HV 30**

Parameters:
- 620 = hardness
- HV = test procedure
- 30 = test force in kilopond

$$HV = \frac{0.102 \times 2 \times F \times \sin\frac{136^\circ}{2}}{d^2} \approx 0.1891 \frac{F}{d^2}$$

Formula 1: calculation of the Vickers hardness (ISO 3878)

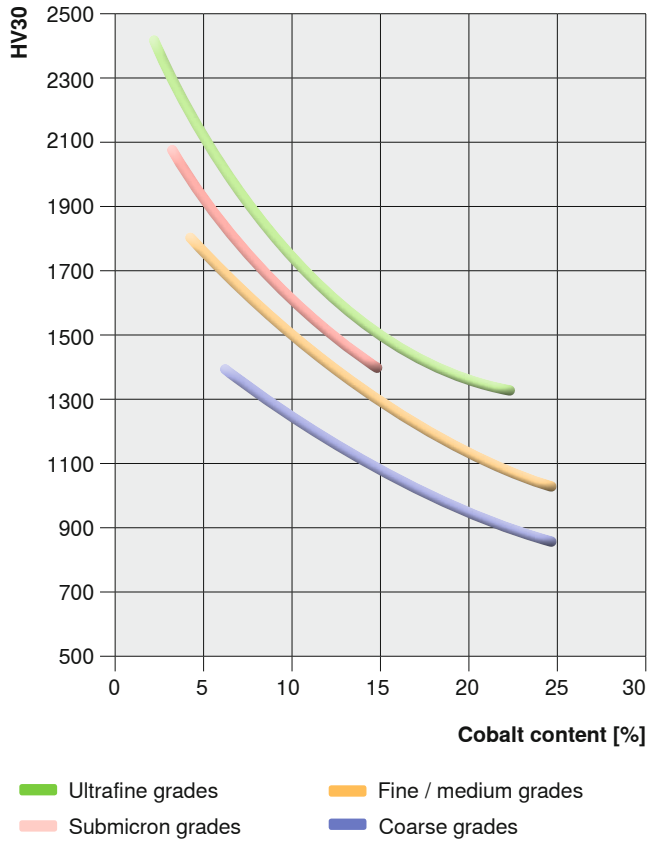



Figure 4: hardness in relation to the cobalt content and grain size

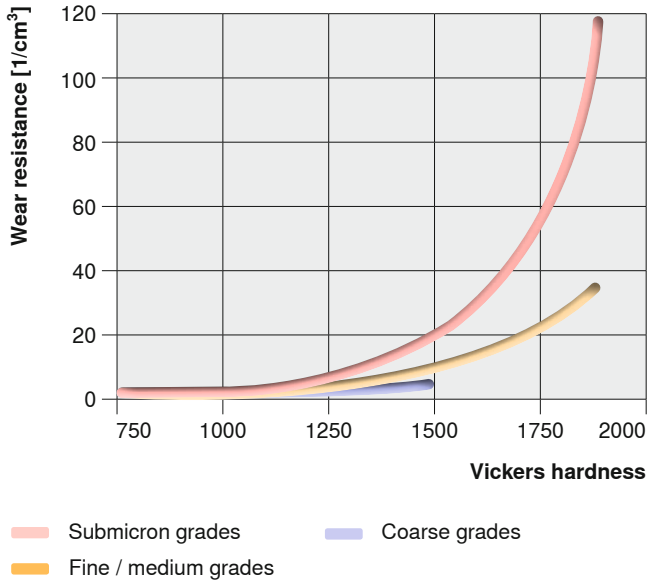



Figure 5: wear resistance in function of hardness with different grain sizes

Another method for determining hardness is the Rockwell procedure (ISO 3738). It is similar to the Vickers procedure but uses a diamond brale indenter. Here, the depth of penetration is used as the degree of hardness. There is no theoretical basis for a conversion between the two procedures. In order to create a comparison a determinate test must be carried out. Like wear resistance, hardness also increases with a smaller grain size and lower cobalt content (see figure 4). As wear resistance and hardness show similar behavior with regard to cobalt content and grain size, hardness is often used as a reference for wear resistance. Furthermore, the Vickers procedure is easier and quicker than ASTM B611-85. Nevertheless, the relation of hardness and wear resistance is exponential and also depends on the grain size (see figure 5).

$$K_{IC} = 0.15 \sqrt{\frac{HV30}{\sum L}} \quad \left[\frac{MN}{m^{\frac{3}{2}}}\right]$$

Formula 2: calculation of the critical tension intensity factor $K_{IC}$

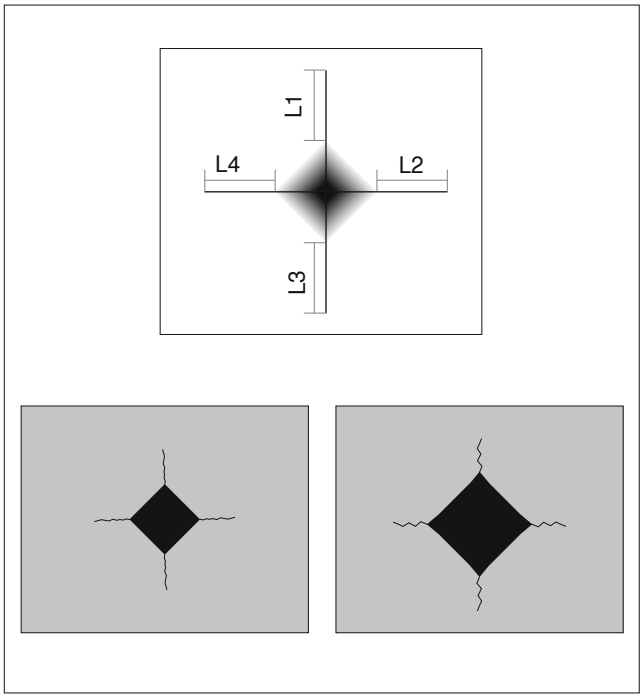



Figure 6: Palmqvist method for the determination of fracture toughness

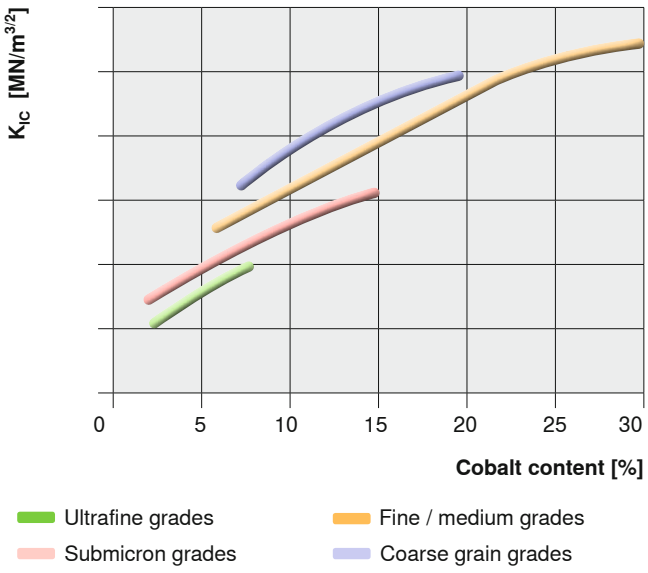



Figure 7: fracture toughness in relation to the grain size and the cobalt content

**Toughness**

When a material is exposed to external static or dynamic stress, this leads to mechanical tensions. In many cases, particularly with impact loads, both the strength and ductility of the material have to be taken into account. These two properties represent the basis for the concept of toughness, which is defined as the capacity to resist fracture or rupture growth. Fracture in this context means the complete separation of the material into at least two parts. There are numerous possibilities to define or determine toughness, transverse rupture strength or fracture toughness. In the definition above, the integrated product of force and deformation until fracture occurs is used as the toughness value. In the case of carbide, the Palmqvist method is frequently applied to determine the toughness as a critical tension intensity factor $K_{IC}$. For this purpose, the crack length of a Vickers hardness indent is used to deduce the fracture toughness (see figure 6). This is then converted into the tension intensity factor using formula 2. As can be seen in figure 7, toughness increases with the metal binder content and growing grain size. Compared to other metal materials, carbide can be found in the lower part of the toughness range, about the same as hardened steel.

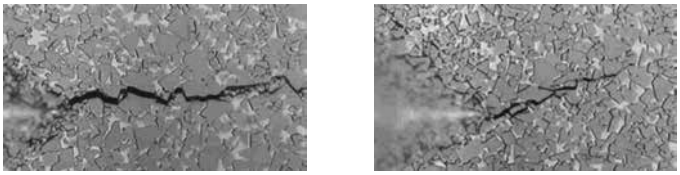


Figure 8: crack propagation in large grain sizes; larger crack propagation requires higher fracture energy - higher toughness

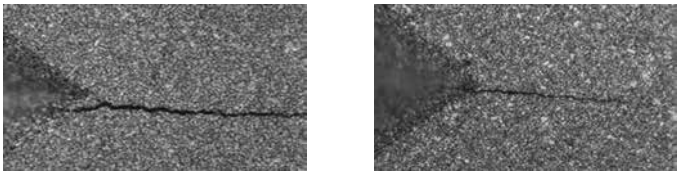


Figure 9: crack propagation in small grain sizes; direct, shorter crack propagation – requires lower fracture energy -– lower toughness

By definition, carbide is to be considered a brittle material as there is basically no plastic deformation prior to fracture. This is confirmed by examination of surfaces where breakage occurred. Various carbides, however, show very big differences in terms of toughness which can be best explained by taking a look at the microstructure. Cracks inside the carbide grains may occur just like intergranular fractures and shear fractures in the binder metal. Generally the number of grain cracks rises with increasing grain size, and the number of shear fractures when raising the binder content. In terms of fracture energy, the main contribution to toughness comes from the length of the rupture in the metal binder (see figures 8 and 9).

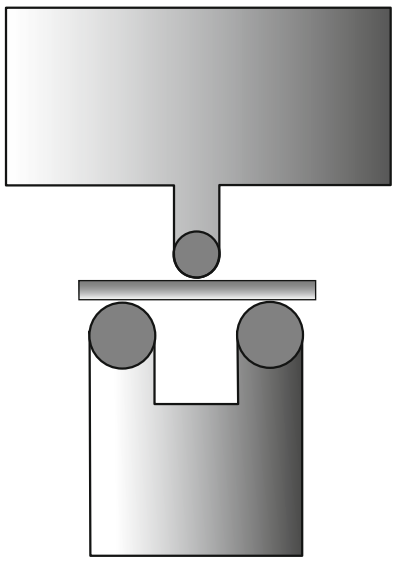


Figure 10: illustration of a transverse rupture strength test

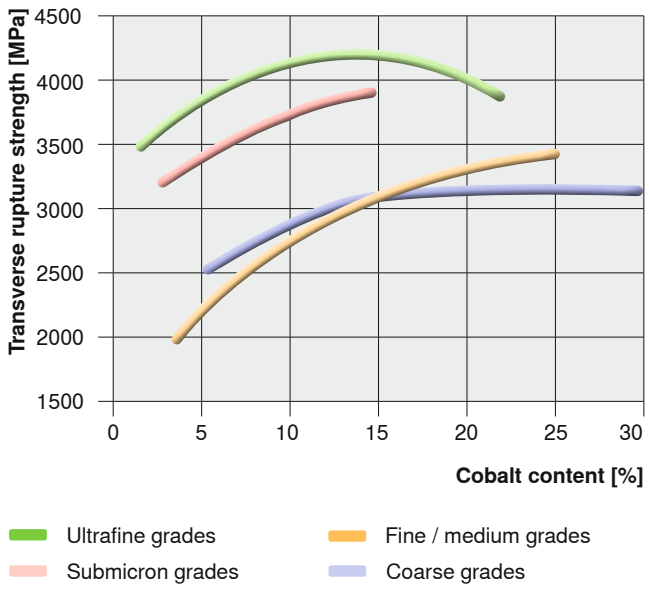



Figure 11: transverse rupture strength in relation to the grain size and the cobalt content

**Mechanical strength**

Every material has defects such as inclusions and micro-ruptures. For brittle materials such as hardened steels or carbide the mechanical strength is limited by the number and size of these defects. In this context the mechanical strength depends on the volume, as with a growing material volume the probability of a large defect rises. Depending on the type of stress, various types of strength are distinguished.

**Transverse rupture strength**

Testing the transverse rupture strength is the easiest and most common procedure of analyzing the mechanical strength of carbide. According to the standardized ISO 3327 procedure a test material of a certain length is placed on a surface and put under stress in the middle until it breaks (see figure 10). The transverse rupture strength (T.R.S.) is then the average value of several tests. The maximum value is achieved with a cobalt content of around 14% by weight and grain sizes of around 0.2 – 0.5$\mu$m.

The very low plastic deformation is normally not taken into account as it occurs only in the toughest carbides. Transverse rupture strength decreases with increasing temperature.

Furthermore, the carbides show creep values when they are subjected to stress or to high temperatures for a long time. The transverse rupture strength is decisively influenced by the number and size of defects in the structure or on the surface. Fractures always occur at the weakest point of the structure, which is also where the largest defect is. A high number of defects therefore increases the probability that one of these defects causes a premature fracture on the point with the highest stress. As the quality demands in the field of carbide manufacturing are high, impurities or defects can be minimized and thus, the risk of breakage reduced.

**Tensile strength**

When testing the tensile strength of brittle materials it is difficult to measure exact results. A precise result depends on both the perfect preparation of the test materials as well as on the additional stress present on the mounting fixtures. Applying the Weibull theory, however, the tensile strength can be deducted from the values of the transverse rupture strength.

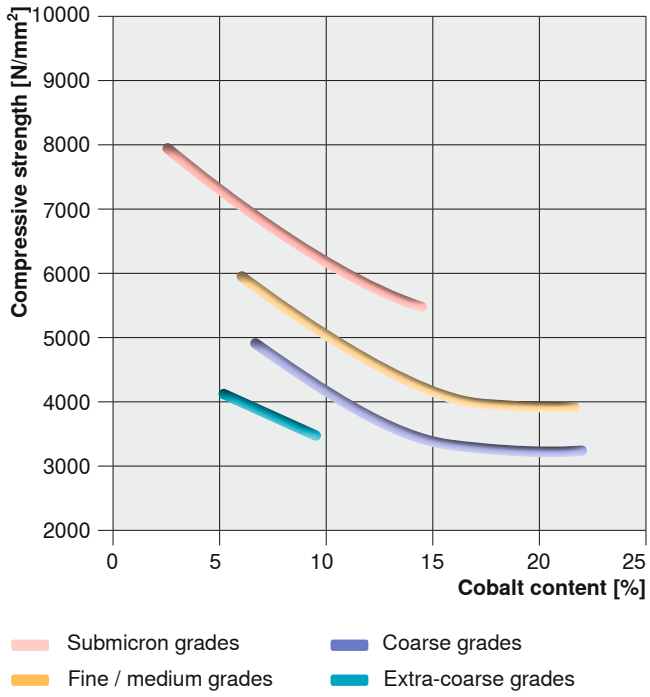



Figure 12: compressive strength in relation to the grain size and the cobalt content

**Compressive strength**

One of the most remarkable properties of carbide is the extremely high compressive strength under uniaxial stress. This valuable property is used in virtually all application fields (cutting edges with high compressive strength in all machining processes, pressing and drawing dies, rolls, anvils and dies for the production of synthetic diamonds, etc.). The tension of this kind of stress doesn‘t actually cause fracture due to pressure but due to tension: a shear fracture. A suitable procedure for determining compressive strength can be found in ISO 4506. To achieve precise values for carbide, the test piece‘s geometry must be changed so that the effects of the edges and contact, which occur in a simple cylindrical test piece, are eliminated. Elastic deformation is produced under initial load; however, before fracture a degree of plastic deformation results. Figure 12 shows the compressive strength of various grain sizes in relation to the cobalt content.

The compressive strength increases when the metal binder content decreases and the grain size is reduced. A small grain carbide grade with a low metal binder content typically has a compressive strength of almost 7,000 N/mm$^2$. The compressive strength decreases when the temperature increases. The degree of plastic deformation increases notably with the temperature, so that the results are variable when temperatures are high.

**Shear strength**

The implementation of pure shear tests is very difficult. However, numerous things speak for the fact that the shear strength is somewhat higher than the compressive strength.

**Fatigue strength**

The fatigue strength of carbide is above 2 million pulsating compressive loads at around 65 to 85% of the static compressive strength. The compressive fatigue strength increases with a decreasing cobalt content and with decreasing grain size.

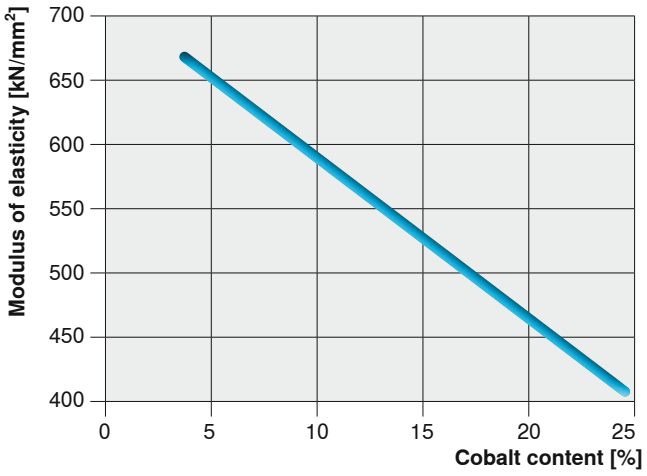



Figure 13: modulus of elasticity of WC-Co carbides

| Property | from | to |
|---|---|---|
| Hardness [HV30] | 1300 | 2200 |
| Transverse rupture strength [MPa] | 2000 | 4600 |
| Fracture toughness [MPa y · $m^{1/2}$] | 8.4 | 15 |

Figure 14: properties of CERATIZIT round rods and preforms

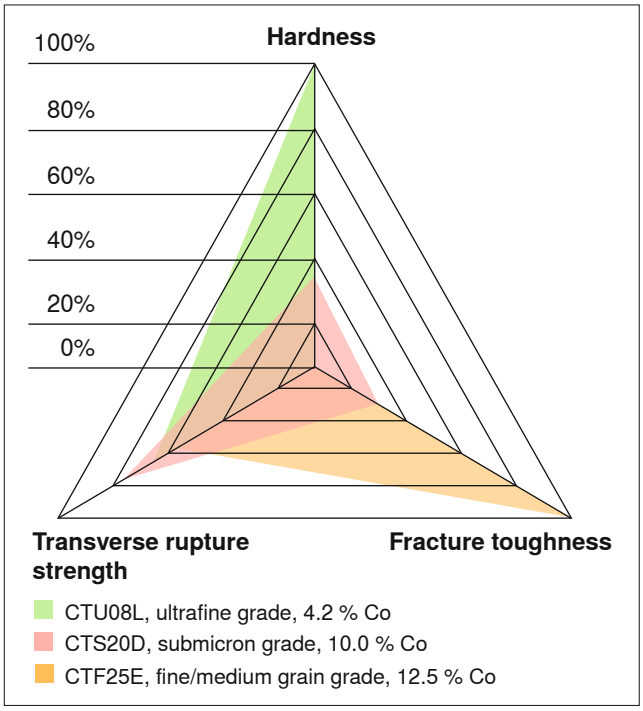



Figure 15: tension fields of three CERATIZIT grades, 0% – lowest value of all grades, 100% – highest value of all grades

**Modulus of elasticity, shear modulus, Poisson's ratio**

The modulus of elasticity indicates the resistance of a material against elastic deformation and is higher the more rigid a material is. In the case of carbide the modulus of elasticity is 2 to 3 times higher than in steel and increases linearly with decreasing metal binder content. See fig. 13: additives of γ-phase reduce the modulus of elasticity. An exact determination of the modulus of elasticity based on the tension-expansion diagram is difficult. Therefore, for reliable results resonance measurements of transverse and longitudinal waves are carried out according to ISO 3312. The shear module is determined in the same way with the help of torsional vibration. By determining the modulus of elasticity and the shear module the Poisson's ratio can be calculated.

**Influence of the grain size and the cobalt content on the most important properties**

The most important mechanical properties of the carbide, such as hardness, transverse rupture strength and fracture toughness, are determined by the grain size of the tungsten carbide and cobalt content. Figure 14 shows the properties of CERATIZIT round rods and preforms. Sporadically it can be sustained that through smaller grain sizes higher hardness and transverse rupture strength can be achieved. At the same time, however, fracture toughness decreases. By increasing the cobalt content hardness is reduced, while the transverse rupture strength and fracture toughness are raised. Based on this fact a compromise between hardness and fracture toughness can be made. Figure 15 shows three different CERATIZIT grades and their hardness, fracture toughness and transverse rupture strength. 0% is the lowest value and 100% the highest value of all CERATIZIT grades.

# Physical Properties of Carbide

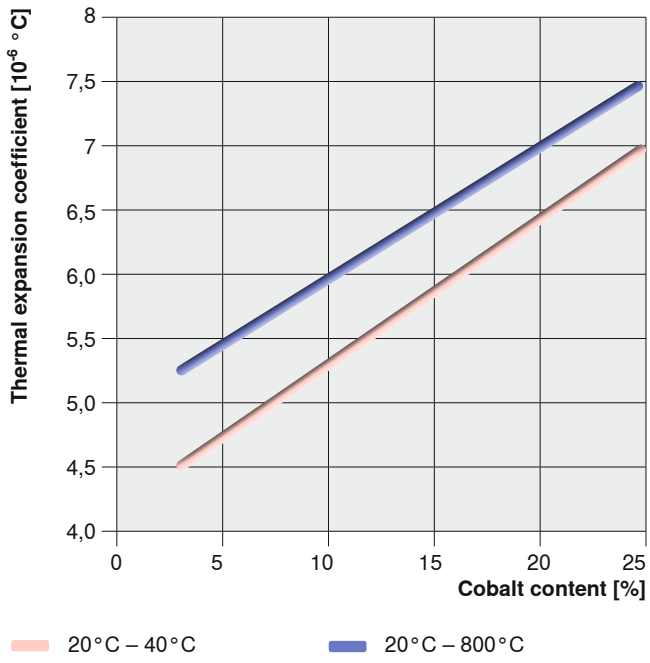



Figure 16: thermal expansion in function of the cobalt content for two temperature intervals

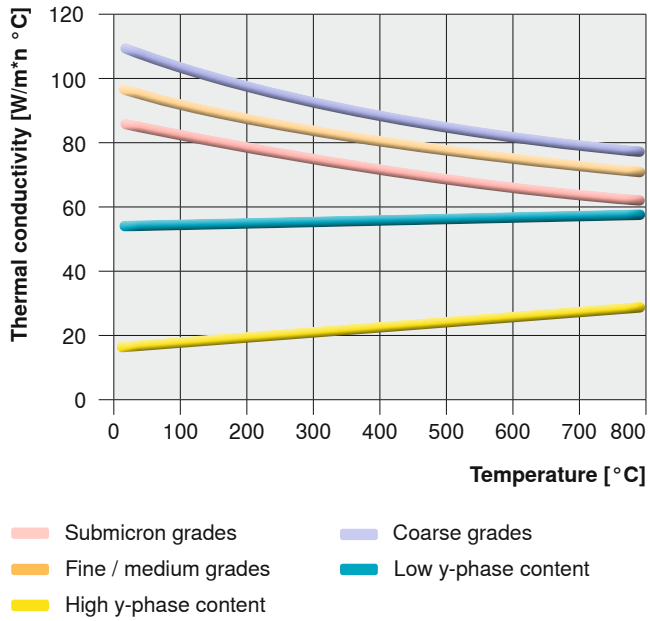



Figure 17: thermal conductivity in relation to the temperature of various micro-structures and grain sizes

**Density**
The density of carbide is determined according to ISO 3369 and varies strongly depending on the composition of the carbide grade. Grades with a very high WC content have the highest density. Grades with high titanium carbide content and a high binder content have the lowest density. Typically it can however, be assumed that the density is around 50 to 100% higher than that of steel.

**Thermal expansion**
As tungsten carbide has a very low thermal expansion coefficient, the values for carbide compared to steel are very low. For carbide grades which contain titanium carbide the values are somewhat higher than for the pure WC-Co carbides. Figure 16 shows the thermal expansion in relation to the cobalt content can be seen.

**Thermal conductivity**
The thermal conductivity is of great significance for carbide applications, as it determines the temperature in the wear areas and has a large influence on the carbide's thermal fatigue resistance and resistance to thermal fluctuations resistance. The thermal conductivity of WC-Co carbide is around twice that of unalloyed steels. It is only slightly influenced by the cobalt content and the grain size, while γ-phases like titanium carbide or tantalum carbide have an impact. Titanium carbide strongly reduces the thermal conductivity. Therefore, for milling grades tantalum carbide is mostly used as γ-phase (see figure 17).

**Specific thermal capacity**
The specific thermal capacity is the quantity of heat which is necessary to heat up 1 kg of a material by 1 °C. In application technology it is equally as important as thermal conductivity, because during the machining processes the heat has to be taken away from the cutting edge. Through a high thermal capacity the surrounding area is less hot as it can absorb more energy.

**Specific electric resistance**
WWC-Co carbides have a low specific resistance of around 20μΩ cm and, as such, are good conductors of electricity. Carbides with γ-phases have a higher specific resistance.

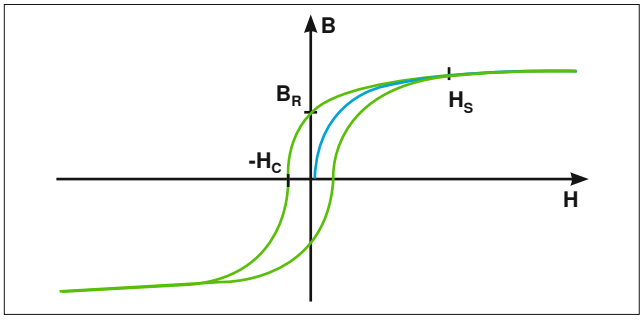



Figure 18: hysteresis curve of a ferromagnetic material

**Magnetic saturation & coercive field strength**
Carbides with cobalt as a metal binder are ferromagnetic. If a ferromagnetic material is exposed to a magnetic field strength H, the magnetic flux density B in this material increases (figure 18, blue line). The flux density decreases when the field strength rises, until maximum saturation is achieved. This maximum flux density is defined as magnetic saturation (4πσ). When the external field strength is removed, the flux density in the material is reduced along the upper green line to a certain residual magnetism (BR), the so called 'remanence'. The higher the remanence is, the better a material can be magnetized and the remanence can only be eliminated when the material is subjected to an inverse field. The inverse field strength HC which is necessary to reduce the magnetic flux density to zero, or to 'de-magnetize' the material, is defined as coercive field strength.

The finer the magnetic field lines of the metal binder phase in the carbide, the higher the coercive field strength. This means that the coercive field strength provides information about the state of the metal binder phase. The metal binder phase becomes finer with smaller tungsten carbide grains and lower binder content. As described under 1.1.2, the smaller the grains and the lower the metal binder content, the higher the hardness of the structure. In this way an accordant correlation between coercive field strength and hardness can be seen. In practical applications this represents a non-destructive measuring method for the hardness.
The magnetic saturation of carbide also depends on the content and the state of the cobalt binder. When one of these parameters is known, information can be given about the other parameters. In this context the carbon content of the carbide has a decisive influence on the magnetic state of the cobalt.
The magnetic saturation provides information about the carburization of the carbide. This measuring method represents an important tool for checking the production quality.

**Permeability**
Magnetic permeability means the penetrability of materials for magnetic fields. Although carbide is ferromagnetic, the magnetic permeability values are low. They increase equally along with the magnetic saturation and with the cobalt content and amount to around 5 H/m with 20 vol.%. Compared to this, vacuum has a magnetic permeability of 1 H/m and iron between 300 and 10,000 H/m.

# Corrosion Resistance of Carbide

| Chemical compounds | Resistance |
|---|---|
| Acetone | high resistance |
| Ethanol | high resistance |
| Sodium hydroxide | high resistance |
| All acids | low resistance |
| Tap water | high resistance |
| Petroleum | high resistance |

Figure 19: some chemical compounds and the corresponding resistance of carbide

According to DIN EN ISO 8044 corrosion is a reaction of a metal material with its environment, which causes a measurable modification of the material and may lead to a reduced performance of the metal element or the entire system. In most cases the reaction is electrochemical in nature or in some cases chemical or metalphysical in nature. In carbides, corrosion causes a reduction of the surface of the binder phase, thus on the surface there remains only a carbide ‚skeleton'. The bond between carbide grains next to each other is very weak, so the rate of destruction increases correspondingly. When the metal binder content is low the carbide ‚skeleton' is more pronounced. Consequently, this type of carbide grade shows higher wear resistance and corrosion resistance than carbides with a higher metal binder content. In practical applications, however, this is not sufficient to significantly increase the service life. Due to their limited corrosion resistance pure WC-Co carbides are often not suitable for application fields with difficult corrosion conditions. Typically, it can be assumed that WC-Co carbides down to pH 7 are corrosion-resistant.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