

# hard material matters



**Hard metal for  
the tool and die industry**



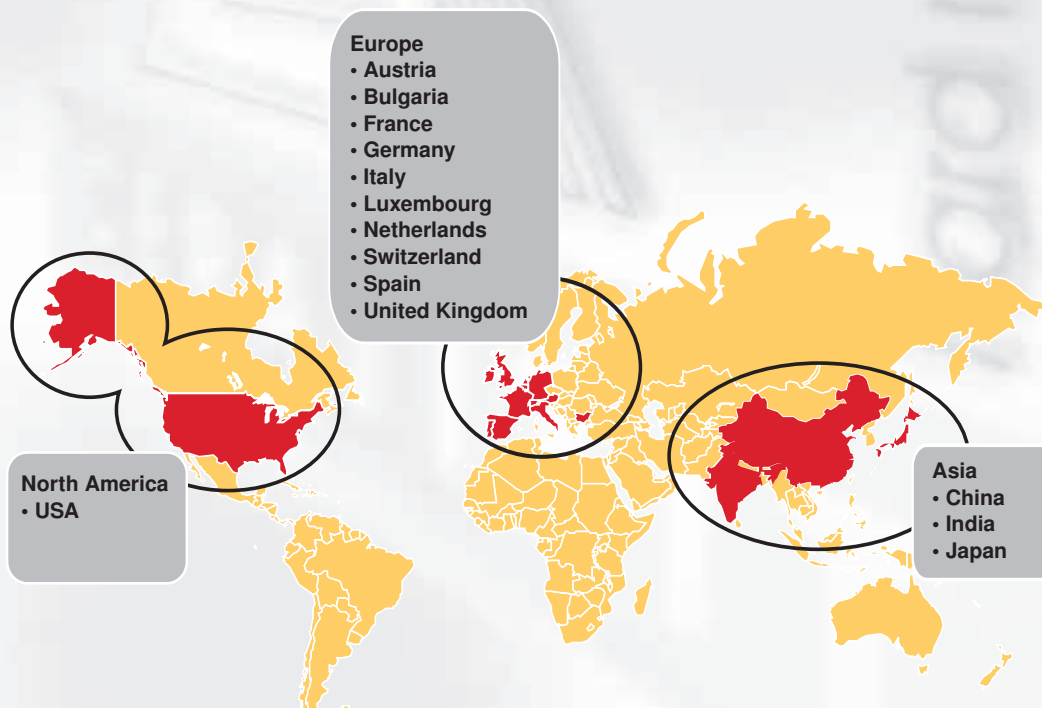
# CERATIZIT - the parent companies



Headquarters and parent company in **MAMER** / Luxembourg

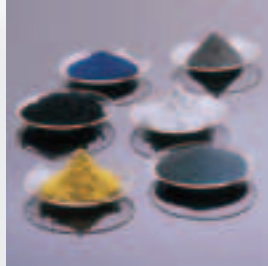


Parent company in **REUTTE** / Austria



Direct sales and distribution partners

# Competence and know-how



We rely on more than 80 years of know-how in the field of powder metallurgy.

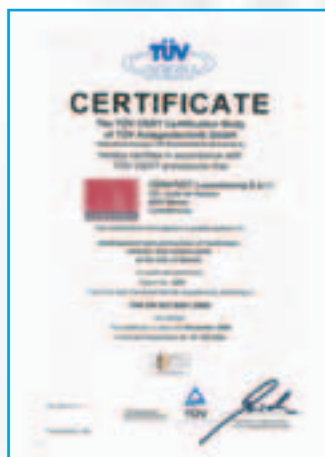
Our new powder preparation department absolutely guarantees availability combined with consistent quality.

Our facilities and production methods represent state-of-the-art technology because only modern and innovative production procedures offer the possibility to fulfil complex tasks economically.



Engineering know-how and competent on site application advice, as well as intensive cooperation with our customers make the difference. Make use of our professional service.

We promote intensive dialogue with our business partners and organize technical seminars - either on site at our customers' or at our company.



Our quality management systems meet the highest standards. We regularly organize audits. This is documented by the ISO9001:2000 certificate.



# Carbide grades

for the tool and die industry

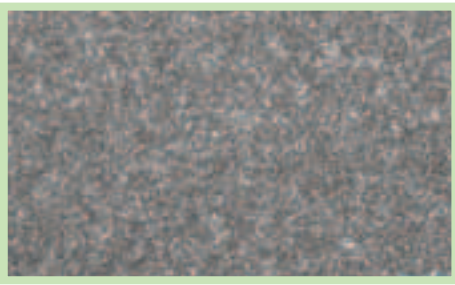
## Composition and properties

| Grade                                    | Code ISO | Code USA | Binder | Hardness |      |      | Transverse Rupture Strength |         | K <sub>IC</sub><br>SEVNB |
|------------------------------------------|----------|----------|--------|----------|------|------|-----------------------------|---------|--------------------------|
|                                          |          |          | (%)    | HV10     | HV30 | HRA  | MPa                         | P.S.I.  | MPa*m <sup>1/2</sup>     |
| CORROSION RESISTANT FINE / MEDIUM GRADES |          |          |        |          |      |      |                             |         |                          |
| CF-H25S                                  | K20-K30  |          | 8.5    | 1640     | 1620 | 92.1 | 2600                        | 377.000 | 10.1                     |
| CF-H40S                                  | K40      | C11/C12  | 12.0   | 1400     | 1380 | 90.3 | 3000                        | 435.000 | 12.0                     |
| MICRO-GRAIN GRADES                       |          |          |        |          |      |      |                             |         |                          |
| TSF44                                    | K10-K30  | C3       | 12.0   | 1760     | 1730 | 92.7 | 4600                        | 667.000 | 7.5                      |
| SMG24                                    |          |          |        | 1720     | 1690 | 92.5 |                             |         |                          |
| SMG44                                    | -        | -        | 22.0   | 1300     | 1290 | 89.4 | 4000                        | 580.000 | 9.1                      |
| SUBMICRON GRADES                         |          |          |        |          |      |      |                             |         |                          |
| TSM20                                    | K10-K30  | C3       | 7.5    | 1750     | 1720 | 92.6 | 3600                        | 522.000 | 8.6                      |
| TSM30                                    | K20-K40  | C2       | 10.0   | 1570     | 1550 | 91.6 | 3700                        | 537.000 | 9.4                      |
| TSM33                                    |          |          |        | 1610     | 1590 | 91.9 |                             |         |                          |
| MG18                                     |          |          |        | 1680     | 1660 | 92.3 |                             |         |                          |
| TSM40                                    | >K40     | C1/C10   | 12.0   | 1480     | 1460 | 90.9 | 4000                        | 580.000 | 9.9                      |
| MG24                                     |          |          |        | 1510     | 1490 | 91.2 |                             |         |                          |
| MG30                                     | >K40     |          | 15.0   | 1360     | 1350 | 90.0 | 3800                        | 551.000 | 11.9                     |
| FINE / MEDIUM GRADES                     |          |          |        |          |      |      |                             |         |                          |
| H20S                                     | K20      | C2       | 6.0    | 1630     | 1610 | 92.0 | 2200                        | 319.000 | 9.9                      |
| H30S                                     | K30      | C1       | 9.0    | 1490     | 1470 | 91.0 | 2800                        | 406.000 | 10.9                     |
| H40S                                     | K40      | C11/C12  | 12.0   | 1350     | 1340 | 89.9 | 3000                        | 435.000 | 12.0                     |
| GC20                                     |          |          |        | 1330     | 1320 | 89.7 |                             |         |                          |
| H50S                                     | >K40     | C13      | 15.0   | 1230     | 1220 | 88.6 | 3100                        | 450.000 | 13.1                     |
| GC30                                     |          |          |        | 1250     | 1240 | 88.8 |                             |         |                          |
| COARSE GRADES                            |          |          |        |          |      |      |                             |         |                          |
| B30S                                     |          |          | 9.0    | 1170     | 1160 | 88.0 | 3000                        | 435.000 | 15.6                     |
| B40S                                     |          |          | 12.0   | 1080     | 1070 | 87.1 | 3075                        | 446.000 | 16.3                     |
| NON-MAGNETIC GRADES                      |          |          |        |          |      |      |                             |         |                          |
| K16NM                                    |          |          | 8.0    | 1300     | 1290 | 89.4 | 2400                        | 348.000 | 10.8                     |
| SILICON NITRIDE                          |          |          |        |          |      |      |                             |         |                          |
| SNC1                                     | CN-K20   |          | 9.0    | 1550     | 1530 | 91.5 | 1100                        | 160.000 | 6.5                      |

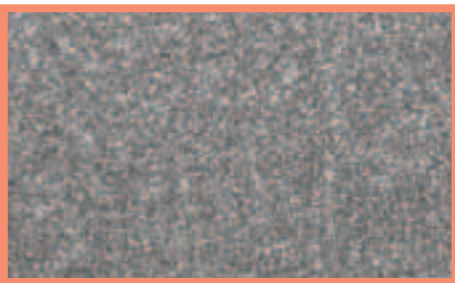
### Comments:

1. 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.
2. K<sub>IC</sub>\*: The measured critical tension intensity factors (K<sub>IC</sub>) 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.

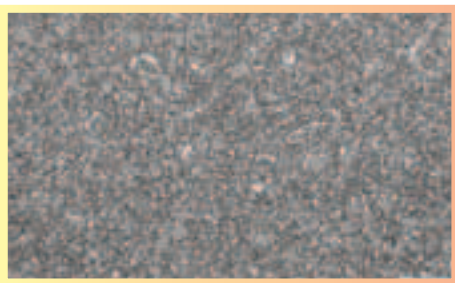
## The basis for optimum quality



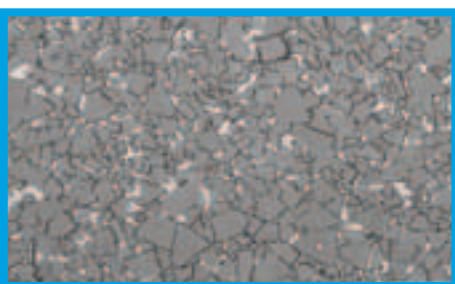
Micro-grain



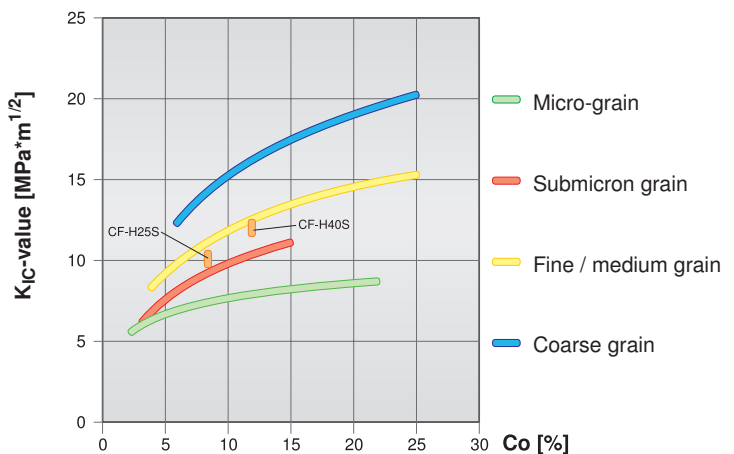
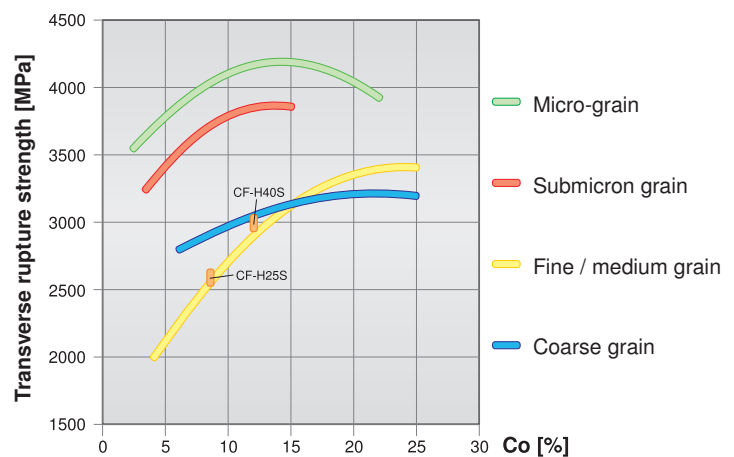
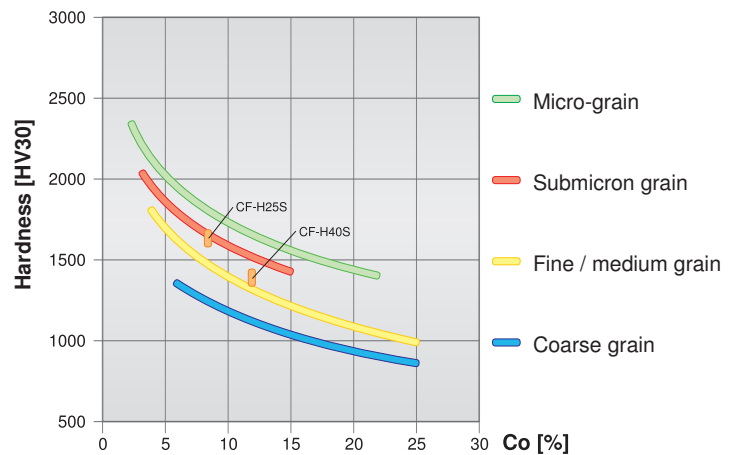
Submicron grain



Fine / medium grain



Coarse grain



Demands on carbide as a material applied in the tool and die industry are enormous. We keep pace with our customers' requirements and we are often even a step ahead of them.

The extensive grade range from CERATIZIT demonstrates the technological edge which combined with years of experience in the sector of powder metallurgy guarantees maximum quality as well as consistency with regard to metallurgy.

Our competitive edge is the prerequisite for your success.

## The new way – corrosion resistant carbide

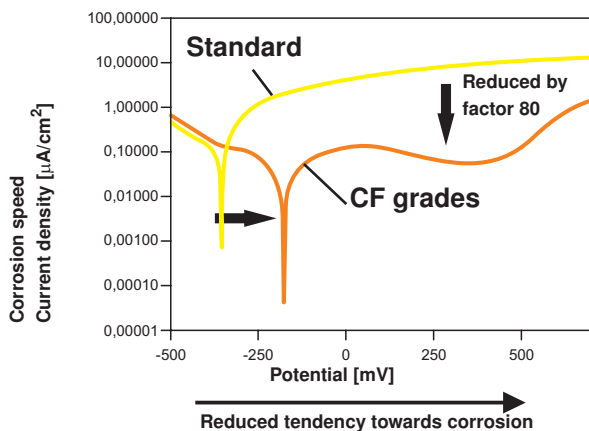
For many years corrosion has been a serious topic in the tool and die industry. Due to this fact erosion times of carbides used to be limited and there was continuous demand for the development of a corrosion resistant carbide.



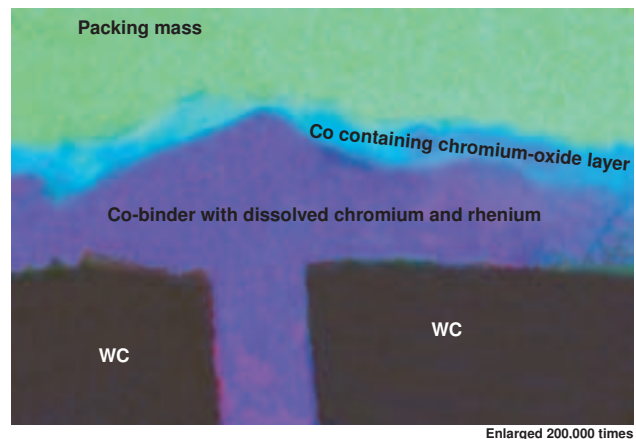
*Typical appearance of corroded surfaces*

CERATIZIT has fulfilled these requirements and proudly presents the patented corrosion resistant carbide grades CF-H40S/HIP and CF-H25S/HIP as standard grades in their product range.

For these grades we have succeeded in reducing the speed of corrosion and the tendency towards corrosion by the factor 80 which means a real revolution for the tool and die industry. In this way considerably longer processing times are possible with maximum process safety at the same time. Is there anything better you could wish for?



*Measured current density potential curves*

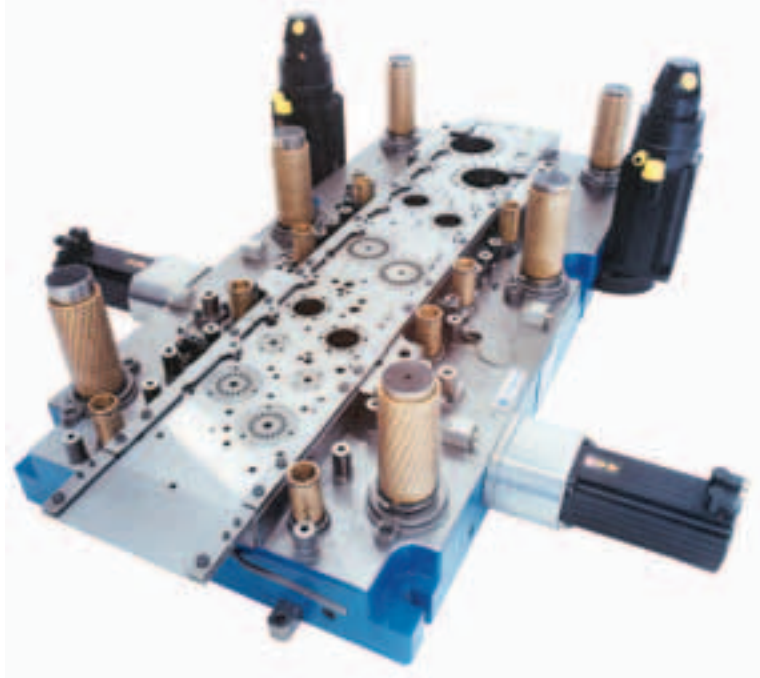


*TEM picture of the protection layer of a carbide grade containing Cr and Re*

You will find more detailed information in our technical article 'Hard metal in the tool-making industry is a question of confidence - The new performance dimension when W-EDM-machining tungsten carbide' - edition 4.

## Optimum materials achieve optimum results

Carbide grades which are optimally adapted to the many and diverse applications in the field of the tool and die industry represent the basis for your success. Competent advice and joint procedure are our 'secrets' for your success in the market. The demands and requirements you make are challenge, motivation and incentive for us.



### Application fields of carbides

#### Corrosion resistant fine / medium grades

CF grades exhibit excellent corrosion resistance combined with the mechanical and physical properties required in the tool and die industry.

**CF-H25S:** For difficult abrasive materials and wherever there is a tendency for galling  
Good edge stability despite high hardness

**CF-H40S:** Ideal compromise between wear resistance and fracture toughness  
Ideal grade for universal application

#### Micro-grain grades

Thanks to their high transverse rupture strength these grades are particularly suitable for stamping thin sheet metal and foils with extremely thin-walled punches.

#### Submicron grades

For difficult abrasive materials and wherever there is a tendency for galling  
Excellent wear resistance

#### Fine / medium grades

The standard grades for blanking and stamping tools.  
Ideal compromise between wear resistance and fracture toughness with very good edge stability

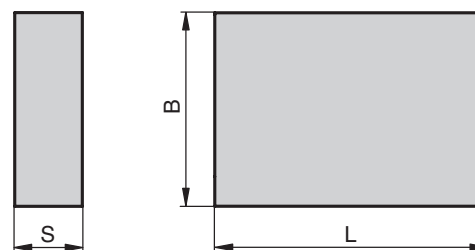
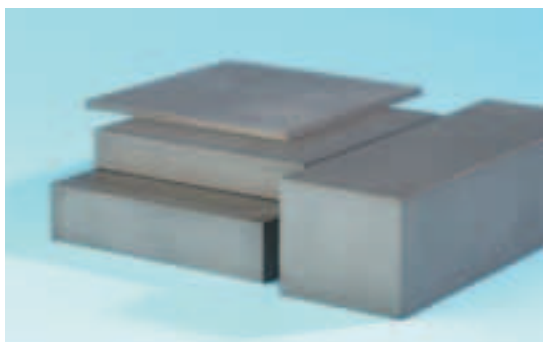
#### Coarse grades

Very high toughness with sufficient hardness for stamping or bending operations  
Particularly suitable for deformation operations

You will find more detailed information about our materials and their applications in our technical article series 'Hard metal in the tool-making industry is a question of confidence' which you can order at any time.

# Carbide blocks for wire erosion

as sintered with grinding allowance on all dimensions  
and positive sintering tolerances



PG 50

| [mm] |      |      | Grade           |              |              |
|------|------|------|-----------------|--------------|--------------|
| L    | B    | S    | CF-H40S/<br>HIP | H40S/<br>HIP | GC20/<br>HIP |
| 100  | 20   | 20   | ●               | ▲            |              |
| 100  | 25   | 25   | ●               | ▲            |              |
| 100  | 72   | 4    | ●               | ▲            |              |
| 100  | 72   | 5    | ●               | ▲            |              |
| 100  | 72   | 6    | ●               | ▲            |              |
| 100  | 72   | 8    | ●               | ▲            |              |
| 100  | 72   | 10   | ●               | ▲            |              |
| 100  | 72   | 12   | ●               | ▲            |              |
| 100  | 72   | 62   | ●               | ▲            |              |
| 100  | 82,5 | 76,5 | ●               | ▲            |              |
| 100  | 100  | 3    | ●               | ▲            |              |
| 100  | 100  | 4    | ●               | ▲            |              |
| 100  | 100  | 5    | ●               | ▲            |              |
| 100  | 100  | 6    | ●               | ▲            |              |
| 100  | 100  | 7    | ●               | ▲            |              |
| 100  | 100  | 8    | ●               | ▲            |              |
| 100  | 100  | 9    | ●               | ▲            |              |
| 100  | 100  | 10   | ●               | ▲            |              |
| 100  | 100  | 11   | ●               | ▲            |              |
| 100  | 100  | 12   | ●               | ▲            |              |
| 100  | 100  | 15   | ●               | ▲            |              |
| 100  | 100  | 16   | ●               | ▲            |              |
| 100  | 100  | 18   | ●               | ▲            |              |
| 100  | 100  | 20   | ●               | ▲            |              |
| 100  | 100  | 22   | ●               | ▲            |              |
| 100  | 100  | 25   | ●               | ▲            |              |
| 100  | 100  | 30   | ●               | ▲            |              |
| 100  | 100  | 50   | ●               | ▲            |              |
| 100  | 100  | 60   | ●               | ▲            |              |
| 100  | 100  | 70   | ●               | ▲            |              |
| 150  | 50   | 42   | ●               | ▲            |              |
| 150  | 70   | 50   | ●               | ▲            |              |
| 150  | 72   | 21   | ●               | ▲            |              |
| 150  | 72   | 26   | ●               | ▲            |              |
| 150  | 72   | 31   | ●               | ▲            |              |
| 150  | 72   | 50   |                 |              | ▲            |
| 150  | 72   | 52   | ●               | ▲            |              |
| 150  | 72   | 62   | ●               | ▲            |              |

| [mm] |     |      | Grade           |              |              |
|------|-----|------|-----------------|--------------|--------------|
| L    | B   | S    | CF-H40S/<br>HIP | H40S/<br>HIP | GC20/<br>HIP |
| 150  | 80  | 45   | ●               | ▲            | ▲            |
| 150  | 80  | 65   | ●               | ▲            | ▲            |
| 150  | 85  | 20   |                 | ▲            |              |
| 150  | 90  | 76,5 | ●               | ▲            |              |
| 150  | 100 | 8    | ●               | ▲            |              |
| 150  | 100 | 12   | ●               | ▲            |              |
| 150  | 100 | 15   |                 |              | ▲            |
| 150  | 100 | 16   | ●               | ▲            |              |
| 150  | 100 | 20   | ●               | ▲            | ▲            |
| 150  | 100 | 22   | ●               | ▲            | ▲            |
| 150  | 100 | 25   | ●               |              | ▲            |
| 150  | 100 | 28   |                 |              | ▲            |
| 150  | 100 | 30   | ●               | ▲            | ▲            |
| 150  | 100 | 32   | ●               | ▲            |              |
| 150  | 100 | 35   | ●               | ▲            |              |
| 150  | 100 | 40   |                 |              | ▲            |
| 150  | 100 | 45   |                 |              | ▲            |
| 150  | 100 | 55   | ●               |              |              |
| 150  | 100 | 66   | ●               |              |              |
| 150  | 100 | 76,5 |                 | ▲            |              |
| 150  | 120 | 40   |                 |              | ▲            |
| 150  | 150 | 22   | ●               | ▲            | ▲            |
| 150  | 150 | 30   | ●               | ▲            | ▲            |
| 190  | 72  | 10   |                 |              | ▲            |
| 190  | 72  | 15   |                 |              | ▲            |
| 190  | 72  | 20   |                 |              | ▲            |
| 190  | 72  | 25   |                 |              | ▲            |
| 190  | 72  | 30   |                 |              | ▲            |
| 190  | 72  | 60   |                 |              | ▲            |
| 200  | 72  | 10   | ●               |              |              |
| 200  | 72  | 15   | ●               |              |              |
| 200  | 72  | 20   | ●               |              |              |
| 200  | 72  | 25   | ●               |              |              |
| 200  | 72  | 30   | ●               |              |              |
| 200  | 72  | 60   | ●               |              |              |
| 250  | 150 | 20   | ●               | ▲            |              |
| 250  | 150 | 26   | ●               | ▲            |              |
| 250  | 150 | 32   | ●               | ▲            |              |

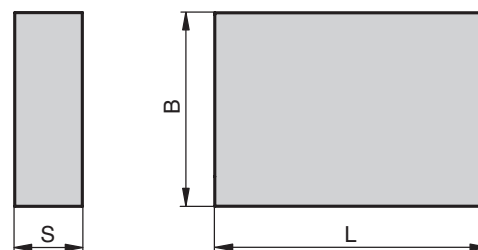
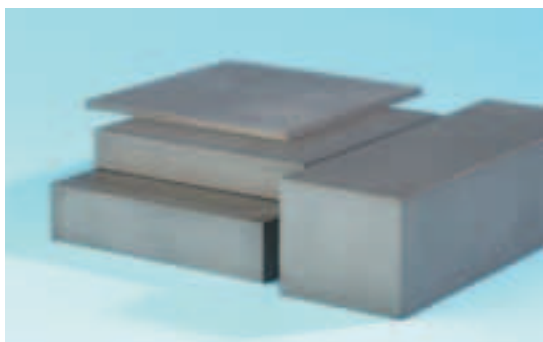
● = stock item

▲ = limited stock or upon request

Other grades and dimensions upon request

# Carbide blocks for wire erosion

as sintered with grinding allowance on all dimensions  
and positive sintering tolerances

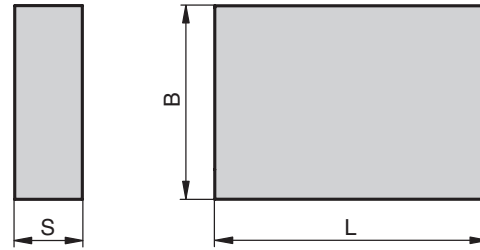
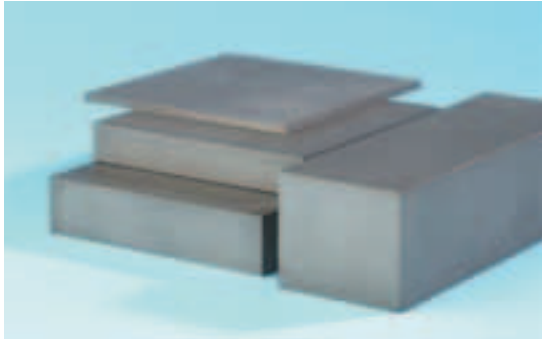


PG 50

| [mm] |     |     | Grade           |               |              |              |              |
|------|-----|-----|-----------------|---------------|--------------|--------------|--------------|
| L    | B   | S   | CF-H25S/<br>HIP | TSM30/<br>HIP | MG18/<br>HIP | MG24/<br>HIP | MG30/<br>HIP |
| 100  | 100 | 1   |                 |               | ▲            |              |              |
| 100  | 100 | 1,5 |                 |               | ▲            |              |              |
| 100  | 100 | 2   |                 |               | ▲            |              |              |
| 100  | 100 | 2,5 |                 |               | ▲            |              |              |
| 100  | 100 | 3   | ●               | ▲             | ▲            |              |              |
| 100  | 100 | 3,5 |                 |               | ▲            |              |              |
| 100  | 100 | 4   | ●               | ▲             | ▲            |              | ▲            |
| 100  | 100 | 4,5 |                 |               | ▲            |              |              |
| 100  | 100 | 5   | ●               | ▲             | ▲            |              | ▲            |
| 100  | 100 | 6   | ●               | ▲             | ▲            |              |              |
| 100  | 100 | 7   | ●               | ▲             | ▲            |              | ▲            |
| 100  | 100 | 8   | ●               | ▲             |              |              | ▲            |
| 100  | 100 | 9   | ●               | ▲             | ▲            |              |              |
| 100  | 100 | 10  | ●               | ▲             |              |              | ▲            |
| 100  | 100 | 11  | ●               | ▲             |              |              |              |
| 100  | 100 | 12  | ●               | ▲             |              |              |              |
| 100  | 100 | 13  |                 |               | ▲            |              | ▲            |
| 100  | 100 | 15  | ●               | ▲             |              |              |              |
| 100  | 100 | 16  |                 |               | ▲            |              | ▲            |
| 100  | 100 | 18  | ●               | ▲             |              |              |              |
| 100  | 100 | 20  | ●               | ▲             |              |              |              |
| 100  | 100 | 25  | ●               | ▲             |              |              | ▲            |
| 100  | 100 | 30  | ●               |               |              |              |              |
| 100  | 100 | 35  | ●               |               |              |              |              |
| 120  | 72  | 62  | ●               | ▲             |              |              |              |
| 150  | 70  | 42  | ●               | ▲             |              |              |              |
| 150  | 70  | 50  | ●               | ▲             |              |              |              |
| 150  | 72  | 20  | ●               | ▲             |              |              |              |
| 150  | 72  | 52  | ●               | ▲             |              | ▲            | ▲            |
| 150  | 72  | 62  |                 |               |              |              | ▲            |
| 150  | 75  | 3   | ●               | ▲             |              |              |              |
| 150  | 75  | 4   | ●               | ▲             |              |              |              |
| 150  | 75  | 5   | ●               | ▲             |              |              |              |
| 150  | 75  | 6   | ●               | ▲             |              |              |              |
| 150  | 75  | 8   | ●               | ▲             |              |              |              |
| 150  | 75  | 10  | ●               | ▲             |              |              |              |
| 150  | 75  | 12  | ●               | ▲             |              |              |              |
| 150  | 75  | 16  | ●               | ▲             |              |              |              |
| 150  | 75  | 20  | ●               | ▲             |              |              |              |

# Carbide blocks for wire erosion

as sintered with grinding allowance on all dimensions  
and positive sintering tolerances



PG 50

| [mm] |     |    | Grade           |               |              |              |              |
|------|-----|----|-----------------|---------------|--------------|--------------|--------------|
| L    | B   | S  | CF-H25S/<br>HIP | TSM30/<br>HIP | MG18/<br>HIP | MG24/<br>HIP | MG30/<br>HIP |
| 150  | 75  | 22 | ●               | ▲             |              |              |              |
| 150  | 75  | 24 | ●               | ▲             |              |              |              |
| 150  | 75  | 28 | ●               | ▲             |              |              |              |
| 150  | 80  | 20 |                 |               |              |              | ▲            |
| 150  | 80  | 25 |                 |               |              |              | ▲            |
| 150  | 80  | 30 |                 |               |              |              | ▲            |
| 150  | 80  | 40 |                 |               |              |              | ▲            |
| 150  | 80  | 65 |                 |               |              |              | ▲            |
| 150  | 100 | 15 |                 |               |              |              | ▲            |
| 150  | 100 | 20 |                 |               |              |              | ▲            |
| 150  | 100 | 25 |                 |               |              |              | ▲            |
| 150  | 100 | 28 |                 |               |              |              | ▲            |
| 150  | 100 | 30 |                 |               |              |              | ▲            |
| 150  | 100 | 40 |                 |               |              |              | ▲            |
| 190  | 56  | 5  |                 |               |              | ▲            |              |
| 190  | 56  | 6  |                 |               |              | ▲            |              |
| 190  | 56  | 8  |                 |               |              | ▲            |              |
| 190  | 56  | 10 |                 |               |              | ▲            |              |
| 190  | 56  | 30 |                 |               |              | ▲            |              |
| 190  | 72  | 2  |                 |               |              | ▲            | ▲            |
| 190  | 72  | 3  |                 |               |              | ▲            | ▲            |
| 190  | 72  | 4  |                 |               |              | ▲            | ▲            |
| 190  | 72  | 5  |                 |               |              | ▲            | ▲            |
| 190  | 72  | 6  |                 |               |              | ▲            | ▲            |
| 190  | 72  | 7  |                 |               |              | ▲            | ▲            |
| 190  | 72  | 8  |                 |               | ▲            | ▲            | ▲            |
| 190  | 72  | 9  |                 |               |              | ▲            | ▲            |
| 190  | 72  | 10 |                 |               | ▲            | ▲            | ▲            |
| 190  | 72  | 12 |                 |               |              | ▲            | ▲            |
| 190  | 72  | 15 |                 |               | ▲            | ▲            | ▲            |
| 190  | 72  | 16 |                 |               |              | ▲            | ▲            |
| 190  | 72  | 18 |                 |               |              | ▲            | ▲            |
| 190  | 72  | 20 |                 |               | ▲            | ▲            | ▲            |
| 190  | 72  | 22 |                 |               |              | ▲            | ▲            |
| 190  | 72  | 25 |                 |               | ▲            | ▲            | ▲            |
| 190  | 72  | 28 |                 |               |              | ▲            | ▲            |
| 190  | 72  | 30 |                 |               |              | ▲            | ▲            |
| 190  | 72  | 40 |                 |               | ▲            | ▲            |              |

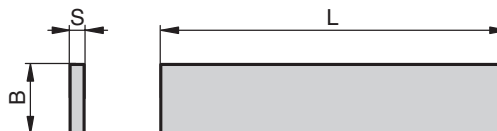
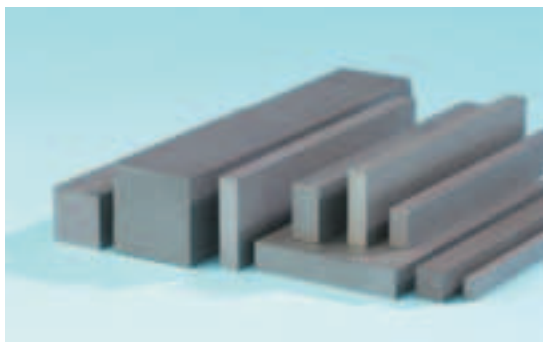
● = stock item

▲ = limited stock or upon request

Other grades and dimensions upon request

# Carbide blocks for wire erosion

as sintered with grinding allowance on all dimensions  
and positive sintering tolerances

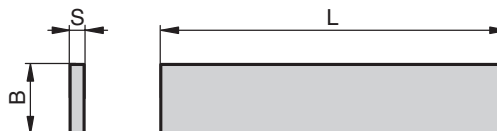
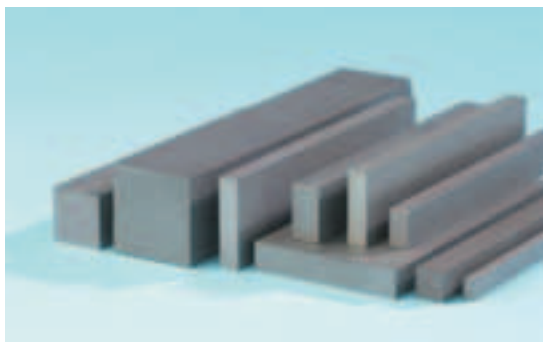


PG C1

| Type,<br>description | [mm] |     | Grade                 |                        |                       |
|----------------------|------|-----|-----------------------|------------------------|-----------------------|
|                      | B    | S   | H40S/HIP<br>L = 80 mm | TSM30/HIP<br>L = 75 mm | MG30/HIP<br>L = 72 mm |
| CTSS 2,5 x 2,5 x L   | 2,5  | 2,5 | ●                     | ●                      | ▲                     |
| CTSS 4,5 x 2,5 x L   | 4,5  | 2,5 | ●                     | ●                      | ▲                     |
| CTSS 5,5 x 2,5 x L   | 5,5  | 2,5 | ●                     | ●                      |                       |
| CTSS 6,5 x 2,5 x L   | 6,5  | 2,5 | ●                     | ●                      | ▲                     |
| CTSS 8,5 x 2,5 x L   | 8,5  | 2,5 | ●                     | ●                      | ▲                     |
| CTSS 10,5 x 2,5 x L  | 10,5 | 2,5 | ●                     | ●                      | ▲                     |
| CTSS 12,5 x 2,5 x L  | 12,5 | 2,5 | ●                     | ●                      |                       |
| CTSS 14,5 x 2,5 x L  | 14,5 | 2,5 | ●                     | ●                      |                       |
| CTSS 16,5 x 2,5 x L  | 16,5 | 2,5 | ●                     | ●                      |                       |
| CTSS 3,5 x 3,5 x L   | 3,5  | 3,5 | ●                     | ●                      |                       |
| CTSS 4,5 x 3,5 x L   | 4,5  | 3,5 |                       |                        | ▲                     |
| CTSS 5,5 x 3,5 x L   | 5,5  | 3,5 | ●                     | ●                      | ▲                     |
| CTSS 6,5 x 3,5 x L   | 6,5  | 3,5 | ●                     | ●                      | ▲                     |
| CTSS 7,5 x 3,5 x L   | 7,5  | 3,5 |                       |                        | ▲                     |
| CTSS 8,5 x 3,5 x L   | 8,5  | 3,5 | ●                     | ●                      | ▲                     |
| CTSS 10,5 x 3,5 x L  | 10,5 | 3,5 | ●                     | ●                      | ▲                     |
| CTSS 12,5 x 3,5 x L  | 12,5 | 3,5 | ●                     | ●                      | ▲                     |
| CTSS 14,5 x 3,5 x L  | 14,5 | 3,5 | ●                     | ●                      | ▲                     |
| CTSS 18,5 x 3,5 x L  | 18,5 | 3,5 | ●                     | ●                      |                       |
| CTSS 20,5 x 3,5 x L  | 20,5 | 3,5 | ●                     | ●                      |                       |
| CTSS 4,5 x 4,5 x L   | 4,5  | 4,5 | ●                     | ●                      | ▲                     |
| CTSS 5,5 x 4,5 x L   | 5,5  | 4,5 |                       |                        | ▲                     |
| CTSS 6,5 x 4,5 x L   | 6,5  | 4,5 | ●                     | ●                      | ▲                     |
| CTSS 7,5 x 4,5 x L   | 7,5  | 4,5 |                       |                        | ▲                     |
| CTSS 8,5 x 4,5 x L   | 8,5  | 4,5 | ●                     | ●                      | ▲                     |
| CTSS 10,5 x 4,5 x L  | 10,5 | 4,5 | ●                     | ●                      | ▲                     |
| CTSS 12,5 x 4,5 x L  | 12,5 | 4,5 | ●                     | ●                      | ▲                     |
| CTSS 14,5 x 4,5 x L  | 14,5 | 4,5 |                       |                        | ▲                     |
| CTSS 16,5 x 4,5 x L  | 16,5 | 4,5 | ●                     | ●                      |                       |
| CTSS 20,5 x 4,5 x L  | 20,5 | 4,5 | ●                     | ●                      |                       |
| CTSS 25,5 x 4,5 x L  | 25,5 | 4,5 | ●                     | ●                      |                       |
| CTSS 35,5 x 4,5 x L  | 35,5 | 4,5 |                       | ●                      |                       |
| CTSS 5,5 x 5,5 x L   | 5,5  | 5,5 | ●                     | ●                      | ▲                     |
| CTSS 7,5 x 5,5 x L   | 7,5  | 5,5 |                       |                        | ▲                     |
| CTSS 8,5 x 5,5 x L   | 8,5  | 5,5 | ●                     | ●                      | ▲                     |

# Square and rectangular rods for punches

## as sintered with positive sintering tolerances



PG C1

| Type,<br>description | [mm] |     | Grade                 |                        |                       |
|----------------------|------|-----|-----------------------|------------------------|-----------------------|
|                      | B    | S   | H40S/HIP<br>L = 80 mm | TSM30/HIP<br>L = 75 mm | MG30/HIP<br>L = 72 mm |
| CTSS 10,5 x 5,5 x L  | 10,5 | 5,5 | ●                     | ●                      | ▲                     |
| CTSS 12,5 x 5,5 x L  | 12,5 | 5,5 | ●                     | ●                      | ▲                     |
| CTSS 16,5 x 5,5 x L  | 16,5 | 5,5 | ●                     | ●                      |                       |
| CTSS 20,5 x 5,5 x L  | 20,5 | 5,5 | ●                     | ●                      |                       |
| CTSS 30,5 x 5,5 x L  | 30,5 | 5,5 | ●                     | ●                      |                       |
| CTSS 35,5 x 5,5 x L  | 35,5 | 5,5 |                       | ●                      |                       |
| CTSS 6,5 x 6,5 x L   | 6,5  | 6,5 | ●                     | ●                      | ▲                     |
| CTSS 7,5 x 6,5 x L   | 7,5  | 5,5 |                       |                        | ▲                     |
| CTSS 8,5 x 6,5 x L   | 8,5  | 6,5 | ●                     | ●                      | ▲                     |
| CTSS 9,5 x 6,5 x L   | 9,5  | 6,5 |                       |                        | ▲                     |
| CTSS 10,5 x 6,5 x L  | 10,5 | 6,5 | ●                     | ●                      | ▲                     |
| CTSS 12,5 x 6,5 x L  | 12,5 | 6,5 | ●                     | ●                      | ▲                     |
| CTSS 14,5 x 6,5 x L  | 14,5 | 6,5 |                       |                        | ▲                     |
| CTSS 16,5 x 6,5 x L  | 16,5 | 6,5 | ●                     | ●                      | ▲                     |
| CTSS 20,5 x 6,5 x L  | 20,5 | 6,5 | ●                     | ●                      |                       |
| CTSS 25,5 x 6,5 x L  | 25,5 | 6,5 | ●                     | ●                      |                       |
| CTSS 30,5 x 6,5 x L  | 30,5 | 6,5 | ●                     | ●                      |                       |
| CTSS 35,5 x 6,5 x L  | 35,5 | 6,5 |                       | ●                      |                       |
| CTSS 7,5 x 7,5 x L   | 7,5  | 7,5 | ●                     | ●                      | ▲                     |
| CTSS 10,5 x 7,5 x L  | 10,5 | 7,5 | ●                     | ●                      |                       |
| CTSS 15,5 x 7,5 x L  | 15,5 | 7,5 | ●                     | ●                      |                       |
| CTSS 18,5 x 7,5 x L  | 18,5 | 7,5 | ●                     | ●                      |                       |
| CTSS 20,5 x 7,5 x L  | 20,5 | 7,5 | ●                     | ●                      |                       |
| CTSS 8,5 x 8,5 x L   | 8,5  | 8,5 | ●                     | ●                      | ▲                     |
| CTSS 9,5 x 8,5 x L   | 9,5  | 8,5 |                       |                        | ▲                     |
| CTSS 10,5 x 8,5 x L  | 10,5 | 8,5 | ●                     | ●                      | ▲                     |
| CTSS 12,5 x 8,5 x L  | 12,5 | 8,5 | ●                     | ●                      | ▲                     |
| CTSS 14,5 x 8,5 x L  | 14,5 | 8,5 |                       |                        | ▲                     |
| CTSS 16,5 x 8,5 x L  | 16,5 | 8,5 | ●                     | ●                      | ▲                     |
| CTSS 18,5 x 8,5 x L  | 18,5 | 8,5 |                       |                        | ▲                     |
| CTSS 20,5 x 8,5 x L  | 20,5 | 8,5 | ●                     | ●                      |                       |
| CTSS 25,5 x 8,5 x L  | 25,5 | 8,5 | ●                     | ●                      |                       |
| CTSS 30,5 x 8,5 x L  | 30,5 | 8,5 | ●                     | ●                      |                       |
| CTSS 35,5 x 8,5 x L  | 35,5 | 8,5 |                       | ●                      |                       |

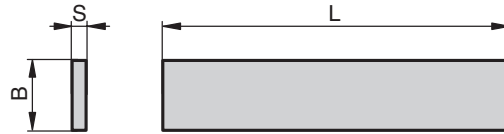
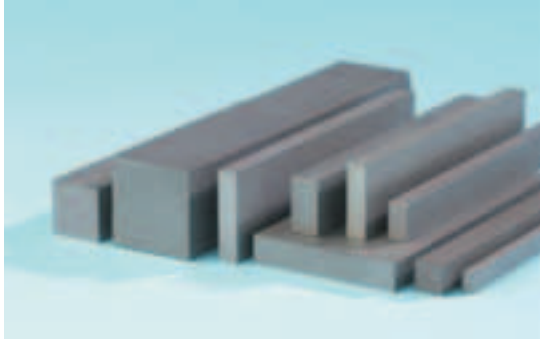
● = stock item

▲ = limited stock or upon request

Other grades and dimensions upon request

# Square and rectangular rods for punches

## as sintered with positive sintering tolerances



PG C1

| Type,<br>description | [mm] |      | Grade                 |                        |                       |
|----------------------|------|------|-----------------------|------------------------|-----------------------|
|                      | B    | S    | H40S/HIP<br>L = 80 mm | TSM30/HIP<br>L = 75 mm | MG30/HIP<br>L = 72 mm |
| CTSS 9,5 x 9,5 x L   | 9,5  | 9,5  |                       |                        | ▲                     |
| CTSS 10,5 x 9,5 x L  | 10,5 | 9,5  |                       |                        | ▲                     |
| CTSS 12,5 x 9,5 x L  | 12,5 | 9,5  |                       |                        | ▲                     |
| CTSS 14,5 x 9,5 x L  | 14,5 | 9,5  |                       |                        | ▲                     |
| CTSS 16,5 x 9,5 x L  | 16,5 | 9,5  |                       |                        | ▲                     |
| CTSS 18,5 x 9,5 x L  | 18,5 | 9,5  |                       |                        | ▲                     |
| CTSS 20,5 x 9,5 x L  | 20,5 | 9,5  |                       |                        | ▲                     |
| CTSS 10,5 x 10,5 x L | 10,5 | 10,5 | ●                     | ●                      | ▲                     |
| CTSS 12,5 x 10,5 x L | 12,5 | 10,5 | ●                     | ●                      | ▲                     |
| CTSS 14,5 x 10,5 x L | 14,5 | 10,5 |                       |                        | ▲                     |
| CTSS 15,5 x 10,5 x L | 15,5 | 10,5 | ●                     | ●                      |                       |
| CTSS 16,5 x 10,5 x L | 16,5 | 10,5 |                       |                        | ▲                     |
| CTSS 18,5 x 10,5 x L | 18,5 | 10,5 |                       |                        | ▲                     |
| CTSS 20,5 x 10,5 x L | 20,5 | 10,5 | ●                     | ●                      | ▲                     |
| CTSS 25,5 x 10,5 x L | 25,5 | 10,5 | ●                     | ●                      |                       |
| CTSS 30,5 x 10,5 x L | 30,5 | 10,5 | ●                     | ●                      |                       |
| CTSS 12,5 x 12,5 x L | 12,5 | 12,5 | ●                     | ●                      | ▲                     |
| CTSS 14,5 x 12,5 x L | 14,5 | 12,5 |                       |                        | ▲                     |
| CTSS 15,5 x 12,5 x L | 15,5 | 12,5 | ●                     | ●                      |                       |
| CTSS 16,5 x 12,5 x L | 16,5 | 12,5 |                       |                        | ▲                     |
| CTSS 18,5 x 12,5 x L | 18,5 | 12,5 |                       |                        | ▲                     |
| CTSS 20,5 x 12,5 x L | 20,5 | 12,5 | ●                     | ●                      | ▲                     |
| CTSS 22,5 x 12,5 x L | 22,5 | 12,5 |                       |                        | ▲                     |
| CTSS 25,5 x 12,5 x L | 25,5 | 12,5 | ●                     | ●                      |                       |
| CTSS 14,5 x 14,5 x L | 14,5 | 14,5 | ●                     |                        | ▲                     |
| CTSS 16,5 x 14,5 x L | 16,5 | 14,5 |                       |                        | ▲                     |
| CTSS 18,5 x 14,5 x L | 18,5 | 14,5 |                       |                        | ▲                     |
| CTSS 20,5 x 14,5 x L | 20,5 | 14,5 | ●                     | ●                      | ▲                     |
| CTSS 22,5 x 14,5 x L | 22,5 | 14,5 |                       |                        | ▲                     |
| CTSS 24,5 x 14,5 x L | 24,5 | 14,5 |                       |                        | ▲                     |
| CTSS 25,5 x 14,5 x L | 25,5 | 14,5 | ●                     | ●                      |                       |
| CTSS 26,5 x 14,5 x L | 26,5 | 14,5 | ●                     | ●                      |                       |
| CTSS 16,5 x 16,5 x L | 16,5 | 16,5 | ●                     |                        |                       |
| CTSS 18,5 x 18,5 x L | 18,5 | 18,5 | ●                     |                        |                       |
| CTSS 20,5 x 20,5 x L | 20,5 | 20,5 | ●                     |                        |                       |

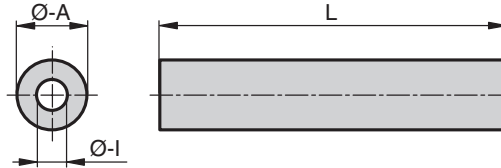
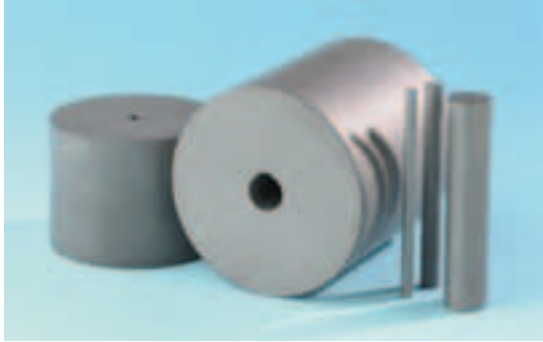
● = stock item

▲ = limited stock or upon request

Other grades and dimensions upon request

# Die bushes and powder compacting dies

## as sintered with positive sintering tolerances



PG C3 / PG G2

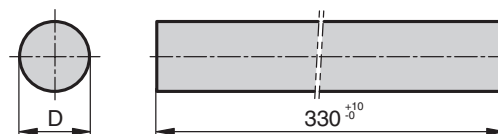
| Type,<br>description | [mm] |     |     | Grade    |
|----------------------|------|-----|-----|----------|
|                      | Ø-A  | Ø-I | L   | H40S/HIP |
| CTSB-0601-110        | 6    | 1   | 110 | ●        |
| CTSB-0801-110        | 8    | 1   | 110 | ●        |
| CTSB-1001-110        | 10   | 1   | 110 | ●        |
| CTSB-1202-110        | 12   | 2   | 110 | ●        |
| CTSB-1402-110        | 14   | 2   | 110 | ●        |
| CTSB-1602-110        | 16   | 2   | 110 | ●        |
| CTSB-1802-110        | 18   | 2   | 110 | ●        |
| CTSB-2002-110        | 20   | 2   | 110 | ●        |
| CTSB-2202-110        | 22   | 2   | 110 | ●        |
| PPWM-025003125       | 25   | 3   | 125 | ●        |
| PPWM-030003125       | 30   | 3   | 125 | ●        |
| PPWM-035003125       | 35   | 3   | 125 | ●        |
| PPWM-040008120       | 40   | 8   | 120 | ●        |
| PPWM-050008120       | 50   | 8   | 120 | ●        |
| PPWM-060008120       | 60   | 8   | 120 | ●        |
| PPWM-070008120       | 70   | 8   | 120 | ●        |
| PPWM-075010050       | 75   | 10  | 50  | ●        |
| PPWM-075010070       | 75   | 10  | 70  | ●        |
| PPWM-080010058       | 80   | 10  | 58  | ●        |
| PPWM-080010120       | 80   | 10  | 120 | ●        |
| PPWM-080020120       | 80   | 20  | 120 | ●        |
| PPWM-090010058       | 90   | 10  | 58  | ●        |
| PPWM-090010120       | 90   | 10  | 120 | ●        |
| PPWM-095010050       | 95   | 10  | 50  | ●        |
| PPWM-095010070       | 95   | 10  | 70  | ●        |
| PPWM-100020060       | 100  | 20  | 60  | ●        |
| PPWM-100020120       | 100  | 20  | 120 | ●        |
| PPWM-110020060       | 110  | 20  | 60  | ●        |
| PPWM-110020120       | 110  | 20  | 120 | ●        |
| PPWM-120040060       | 120  | 40  | 60  | ●        |
| PPWM-120040120       | 120  | 40  | 120 | ●        |
| PPWM-130040060       | 130  | 40  | 60  | ●        |
| PPWM-130040120       | 130  | 40  | 120 | ●        |
| PPWM-150060120       | 150  | 60  | 120 | ●        |
| PPWM-180100050       | 180  | 100 | 50  | ●        |

● = stock item

Other grades and dimensions upon request

# Sintered rods

Length: 330 mm



PG 04 / PG 88

| Type,<br>description | [mm]  |          | Grade |       |       |
|----------------------|-------|----------|-------|-------|-------|
|                      | D     | Tol.     | H40S  | TSM20 | TSM33 |
| RR 0115-330          | 1,15  |          | ●     |       | ●     |
| RR 0165-330          | 1,65  | -0/+0,15 | ●     |       | ●     |
| RR 0180-330          | 1,80  |          | ●     |       | ●     |
| RR 0220-330          | 2,20  |          | ●     | ●     | ●     |
| RR 0270-330          | 2,70  | -0/+0,20 | ●     |       | ●     |
| RR 0325-330          | 3,25  | -0/+0,10 | ●     | ●     | ●     |
| RR 0370-330          | 3,70  |          | ●     |       | ●     |
| RR 0420-330          | 4,20  | -0/+0,20 | ●     | ●     | ●     |
| RR 0470-330          | 4,70  |          | ●     |       | ●     |
| RR 0520-330          | 5,20  |          | ●     |       | ●     |
| RR 0570-330          | 5,70  |          | ●     |       | ●     |
| RR 0620-330          | 6,20  | -0/+0,25 | ●     | ●     | ●     |
| RR 0670-330          | 6,70  |          | ●     |       | ●     |
| RR 0720-330          | 7,20  |          | ●     |       | ●     |
| RR 0770-330          | 7,70  |          | ●     |       | ●     |
| RR 0820-330          | 8,20  |          | ●     | ●     | ●     |
| RR 0870-330          | 8,70  |          | ●     |       | ●     |
| RR 0920-330          | 9,20  |          | ●     |       | ●     |
| RR 0970-330          | 9,70  |          | ●     |       | ●     |
| RR 1020-330          | 10,20 |          | ●     | ●     | ●     |
| RR 1070-330          | 10,70 |          | ●     |       | ●     |
| RR 1120-330          | 11,20 | -0/+0,30 | ●     |       | ●     |
| RR 1170-330          | 11,70 |          | ●     |       | ●     |
| RR 1220-330          | 12,20 |          | ●     | ●     | ●     |
| RR 1270-330          | 12,70 |          | ●     |       | ●     |
| RR 1320-330          | 13,20 |          | ●     |       | ●     |
| RR 1420-330          | 14,20 |          | ●     | ●     | ●     |
| RR 1470-330          | 14,70 |          | ●     |       | ●     |
| RR 1520-330          | 15,20 |          | ●     |       | ●     |

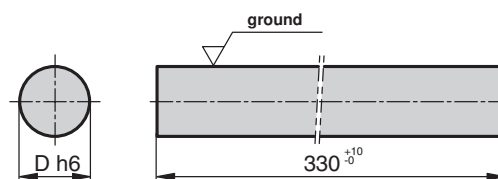
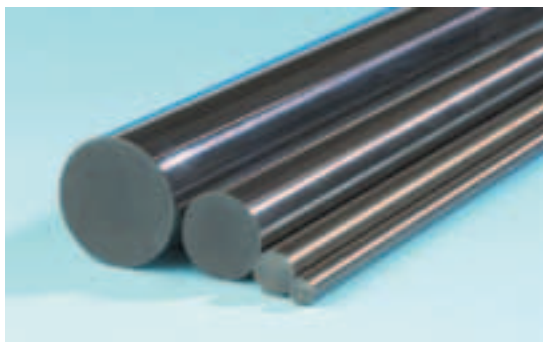
| Type,<br>description | [mm]  |          | Grade |       |       |
|----------------------|-------|----------|-------|-------|-------|
|                      | D     | Tol.     | H40S  | TSM20 | TSM33 |
| RR 1620-330          | 16,20 |          | ●     | ●     | ●     |
| RR 1720-330          | 17,20 |          | ●     |       | ●     |
| RR 1820-330          | 18,20 | -0/+0,45 | ●     | ●     | ●     |
| RR 1920-330          | 19,20 |          | ●     |       | ●     |
| RR 2020-330          | 20,20 |          | ●     | ●     | ●     |
| RR 2120-330          | 21,20 |          | ●     |       | ●     |
| RR 2220-330          | 22,20 | -0/+0,55 | ●     |       | ●     |
| RR 2320-330          | 23,20 |          |       |       | ●     |
| RR 2420-330          | 24,20 |          | ●     |       | ●     |
| RR 2520-330          | 25,20 |          | ●     | ●     | ●     |
| RR 2620-330          | 26,20 |          |       |       | ●     |
| RR 2820-330          | 28,20 | -0/+0,65 | ●     |       | ●     |
| RR 3020-330          | 30,20 |          | ●     |       | ●     |
| RR 3220-330          | 32,20 |          |       |       | ●     |

● = stock item

Other grades and dimensions upon request

# Ground rods h6

Length: 330 mm



PG 0E / PG 30

| Type,<br>description | [mm]  |           | Grade |       |
|----------------------|-------|-----------|-------|-------|
|                      | D     | Tol.      | H40S  | TSM33 |
| RG 0100-330          | 1,00  | +0/-0,006 | ▲     | ●     |
| RG 0150-330          | 1,50  |           | ▲     | ▲     |
| RG 0200-330          | 2,00  |           | ▲     | ●     |
| RG 0250-330          | 2,50  |           | ▲     | ▲     |
| RG 0300-330          | 3,00  |           | ▲     | ●     |
| RG 0350-330          | 3,50  | +0/-0,008 | ▲     | ▲     |
| RG 0400-330          | 4,00  |           | ▲     | ●     |
| RG 0450-330          | 4,50  |           | ▲     | ▲     |
| RG 0500-330          | 5,00  |           | ▲     | ●     |
| RG 0550-330          | 5,50  |           | ▲     | ▲     |
| RG 0600-330          | 6,00  | +0/-0,009 | ▲     | ●     |
| RG 0650-330          | 6,50  |           | ▲     | ▲     |
| RG 0700-330          | 7,00  |           | ▲     | ▲     |
| RG 0750-330          | 7,50  |           | ▲     | ▲     |
| RG 0800-330          | 8,00  |           | ▲     | ●     |
| RG 0850-330          | 8,50  | +0/-0,013 | ▲     | ▲     |
| RG 0900-330          | 9,00  |           | ▲     | ▲     |
| RG 0950-330          | 9,50  |           |       | ▲     |
| RG 1000-330          | 10,00 |           | ▲     | ●     |

| Type,<br>description | [mm]  |           | Grade |       |
|----------------------|-------|-----------|-------|-------|
|                      | D     | Tol.      | H40S  | TSM33 |
| RG 1050-330          | 10,50 | +0/-0,011 | ▲     | ▲     |
| RG 1100-330          | 11,00 |           | ▲     | ▲     |
| RG 1150-330          | 11,50 |           | ▲     | ▲     |
| RG 1200-330          | 12,00 |           | ▲     | ●     |
| RG 1250-330          | 12,50 |           | ▲     | ▲     |
| RG 1300-330          | 13,00 | +0/-0,016 | ▲     | ▲     |
| RG 1350-330          | 13,50 |           | ▲     | ▲     |
| RG 1400-330          | 14,00 |           | ▲     | ●     |
| RG 1450-330          | 14,50 |           | ▲     | ▲     |
| RG 1500-330          | 15,00 |           |       | ●     |
| RG 1550-330          | 15,50 | +0/-0,013 |       | ▲     |
| RG 1600-330          | 16,00 |           | ▲     | ●     |
| RG 1800-330          | 18,00 |           | ▲     | ●     |
| RG 2000-330          | 20,00 |           | ▲     | ●     |
| RG 2200-330          | 22,00 |           | ▲     | ●     |
| RG 2400-330          | 24,00 | +0/-0,016 | ▲     | ●     |
| RG 2500-330          | 25,00 |           |       | ●     |
| RG 2800-330          | 28,00 |           |       | ●     |
| RG 3000-330          | 30,00 |           |       | ●     |
| RG 3200-330          | 32,00 |           |       | ●     |

**Diameter tolerance:** according to DIN ISO 286/h6

**Surface quality:**  $R_a < 0,05 \mu\text{m}$  polished-ground

● = stock item

▲ = limited stock or upon request

Other grades and dimensions upon request

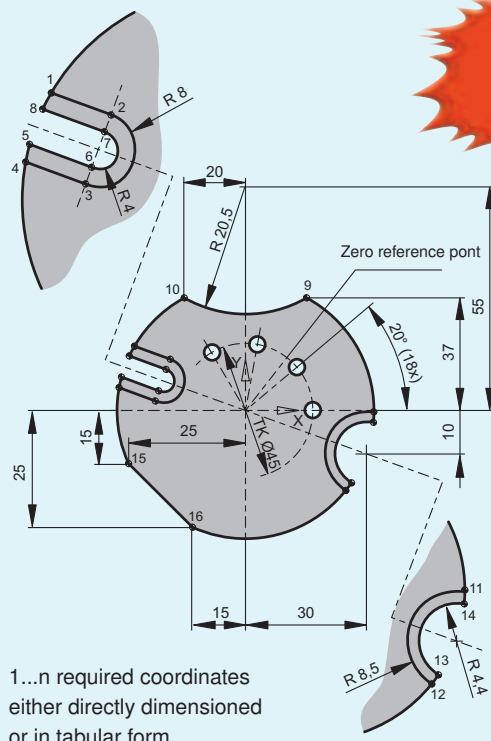
# Advice concerning construction

## The correct way to the correct size

For the tool and die industry we exclusively deliver sintered parts which are produced on our state-of-the-art machines by the CERATIZIT skilled workers. It is therefore necessary to speak the same 'language' with regard to the dimensions indicated in the drawings in order to manufacture products correctly (see illustrations below). In this context, it is a big advantage for you that you can illustrate the hole specifications etc. in a simplified way. The part will then be supplied in accordance with the appropriate tables.

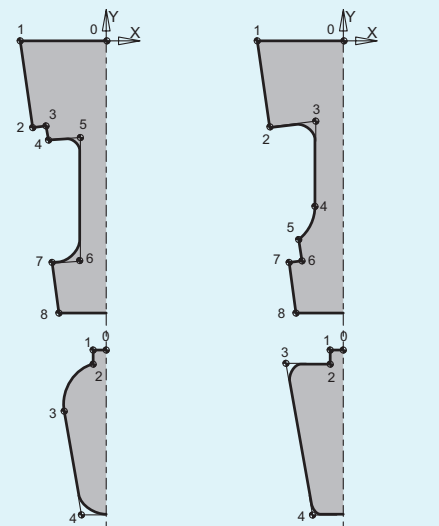
The way of transmitting the drawing represents a significant factor with regard to the time taken to process an order and the quality that is achieved. This is why we are going to benefit to a larger degree from drawing transmission via e-mail. The file format should be .dwg or .dxf and large data amounts should be zipped.

### Round part with holes



Send your drawing via e-mail as .dwg or .dxf-file to [drawing@ceratizit.com](mailto:drawing@ceratizit.com)

### Punches and segments



#### Detail coordinates for radii

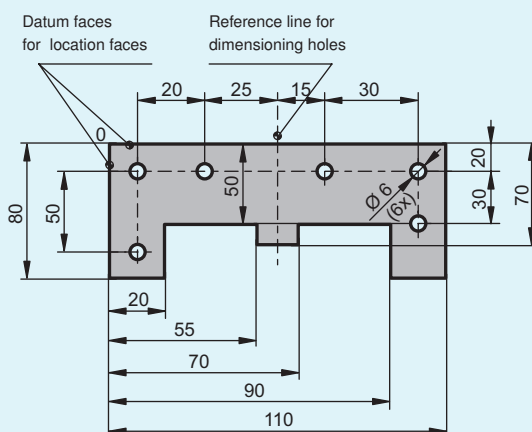
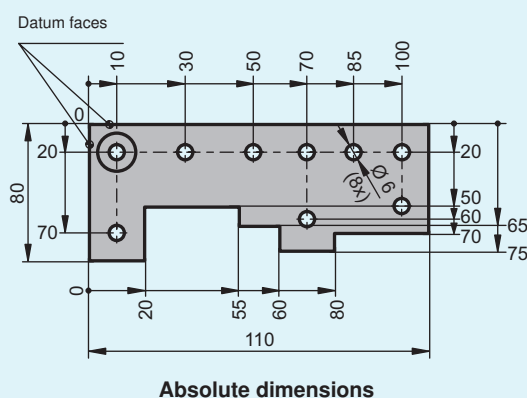
R = tangential

R ≠ tangential

1...n required coordinates either directly dimensioned or in tabular form

Theoretical point of intersection

### Blocks with holes



# Advice concerning construction

## Thread in sintered version

| Thread | Max. length |
|--------|-------------|
| M4     | 16          |
| M5     | 20          |
| M6     | 20          |
| M8     | 30          |
| M10    | 30          |

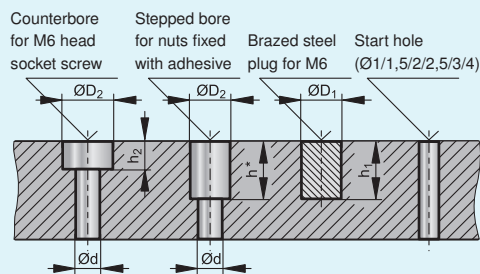
## Holes in sintered blanking parts

Simplified illustration for use with your order drawing

Socket head screw M6 Nut M6xh\* Steel plug M6 Start hole  $\varnothing 2$



## Supplied as follows:

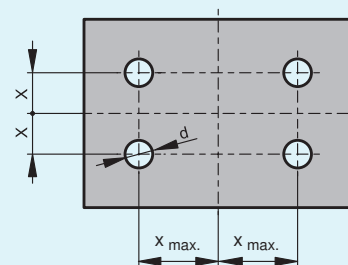
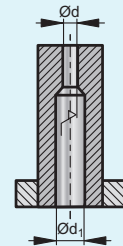


| Thread | Steel plugs for threads |       | Bores for socket head screws |       |                 |       | As required by customer |
|--------|-------------------------|-------|------------------------------|-------|-----------------|-------|-------------------------|
|        | $\varnothing D_1$       | $h_1$ | $\varnothing D_2$            | $h_2$ | $\varnothing d$ | $h^*$ |                         |
| M 4    | 8                       | 14    | 9,0                          | 5,0   | 5,5             |       |                         |
| M 5    | 10                      | 18    | 11,0                         | 6,5   | 6,5             |       |                         |
| M 6    | 10                      | 21    | 12,5                         | 7,5   | 8,0             |       |                         |
| M 8    | 14                      | 24    | 16,5                         | 10,0  | 11,0            |       |                         |
| M 10   | 16                      | 28    | 20,0                         | 12,0  | 13,5            |       |                         |

## Stepped holes ( $\varnothing d_f$ )

with grinding allowance on  $\varnothing d$ !

| $\varnothing d_f$ | $\varnothing d$ | $\varnothing d_1$ |
|-------------------|-----------------|-------------------|
| $\leq 4$          | $d_f - 1,0$     | 6,5               |
| $> 4 \leq 6$      | $d_f - 1,0$     | 8,0               |
| $> 6 \leq 10$     | $d_f - 1,5$     | 12,0              |



## Dowel holes

(Finished dimensions  $d_f = 4,0/5,0/6,0/7,0/8,0/10,0$ )

| $X_{max.}$      | $d$         |
|-----------------|-------------|
| $\leq 40$       | $d_f - 0,5$ |
| $> 40 \leq 100$ | $d_f - 1,0$ |
| $> 100$         | $d_f - 1,5$ |

## Through holes

| $d$        | Increment |
|------------|-----------|
| $< 7,0$    | 0,5       |
| $\geq 7,0$ | 1,0       |

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We reserve the right to make technical changes for improvement of the product.