

**MULTI-MASTER**  
INDEXABLE SOLID CARBIDE LINE

**40,000**

Indexable Solid Carbide Endmill Options



# Your User-Friendly Way

## ISCAR IBAQUS APP



ISCAR  
**IBAQUS**



ISCAR TOOL ADVISOR

### Your Technical Mentor

- ITA (Iscar Tool Advisor)
- CMS electronic catalog
- Interactive catalog for tablets
- Insert converter
- Product ID
- Machining calculator
- YouTube Tech Talks

### Your Tool Advisor **Genius**

- ITA is the optimal tool advisor based on application parameters and available machine power
- 3 tool options, up to 25 alternative solutions
- Cutting data
- Power consumption
- Cutting time, metal removal rates
- Engineering support and more





# to Connect with **ISCAR**

## ISCAR CMS APP



### ISCAR's Complete Machining Solutions Catalogs

- ★ User-friendly app
- ☁ Online interface updates
- 📄 Web viewer at ISCAR's website



## Machining Cloud APP



### BUILD your Cutting Tool Assemblies with IQ Cloud It's Quick and Easy!

- IQ CLOUD is available through the Machining Cloud app
- Designed for use on desktop computers and popular tablets
- Enables programmers to build and download 3D assembly models



Engineered for  
**MAXIMUM  
MULTI-MASTER  
Performance**



## **MULTI-MASTER**

### **Interchangeable Heads for a Variety of Milling Applications**

MULTI-MASTER is a family of tools with shanks and unique interchangeable heads for a variety of milling applications, including ball nose, straight shoulder, and slitting applications. Indexing is fast and convenient due to the threaded connection. Since the tool is not removed from the machine, there is no setup time for head replacement.

**MULTI-MASTER** is a high-tech substitute for HSS and solid carbide milling cutters. Excellent repeatability is now possible and resharping of tools is no longer needed. **MULTI-MASTER** milling heads feature advanced pressed geometries with sharp ground cutting edges. End milling heads are available in ISCAR grades **IC908**

and **IC903** (submicron substrates with PVD TiAlN coating) enabling high speed machining with excellent toughness and wear resistance.

Slot milling and grooving were designed for precision circular grooves for O-rings and retaining clips, as well as thread milling applications.

The **MULTI-MASTER** system is essential for die and mold production with its long shank options and a high degree of machining efficiency.

ISCAR's **MULTI-MASTER** can reduce your production costs through increased production efficiency.



## MULTI-MASTER Endmill Heads

**MULTI-MASTER** is a family of tools with shanks and interchangeable cutting heads for a variety of machining applications: milling, countersinking, spot and center drilling, and slitting.

A **MULTI-MASTER** head has a cutting part and a back connection with the external thread and the taper, which screws into a shank with the corresponding internal thread and the taper until final securing when the back face of the head cutting part will contact the face of the shank.

This principle of coupling ensures strength and rigid clamping of a wide range of the interchangeable heads. The **MULTI-MASTER** tools meet the requirements of high accuracy because the head geometry is finished by precise grinding and the connection guarantees high concentricity within very close limits. The tools are simple-to-operate because the heads are quickly replaced by easy rotation of an applied key. Moreover, they answer to strict requirements of repeatability, and thus, replacement of the heads does not require additional adjustment.

The **MULTI-MASTER** family features a large variety of heads, shanks and extensions. The basic concept is, when a shank can carry heads of different shapes and accuracy, this allows dramatic increase of tool versatility and will diminish needs for special tools. A large stock of tools is not necessary. Resharpener of tools is no longer needed, because a worn-out cutting head is simply replaced. The family renders a possibility of numerous tools by an unlimited combination of the heads and the shanks, and therefore, excellently answers the demands of die and mold making and reduces procurement cost.

### No setup time advantages





















*Repeatability of an assembled mechanical system with interchangeable elements means that a key parameter of the system remains in agreed limits in case of replacing an interchangeable element of the same type. For the standard **MULTI-MASTER** tools, repeatability in tool length is about 0.04 mm for the milling heads of normal accuracy and about 0.02 mm for the precise milling heads.*

*That is why there is no need for additional adjustment in tool length after replacing a head; and the head can be replaced when a shank remains clamped in a machine tool spindle without new presetting. No setup time for replacement considerably cuts cycle time and is a good source for increasing productivity.*

### Indexable solid carbide tools

*The endmills that are assembled from the **MULTI-MASTER** heads and shanks open 3 doors to saving money and improving productivity. **MULTI-MASTER** modular tools, which are neither solid carbide nor indexable tools in a popular sense, lay in the intermediate field between them. Having a replaceable solid carbide cutting part they relate to a new type of cutting tools: indexable solid tools, unlikely as it may seem with the combination of the words "indexable" and "solid".*

## Indexable Solid Carbide Milling Heads Table of Contents

| Type                 | Helix Angle | No. of Flutes | Diameter Range     | Remarks           | Page |                                                                                                                                                                         |
|----------------------|-------------|---------------|--------------------|-------------------|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| MM HCD               | -           | 2             | 8-20               | for DIN 74 Screw  | 10   |   |
| MM ECF               | -           | 4, 6          | 10-25              |                   | 11   |                                                                                      |
| MM HR                | -           | 2             | 8-20               |                   | 12   |   |
| MM ER                |             |               | 8-12.7             |                   | 12   |                                                                                      |
| MM HDF               | -           | 2             | 9.8-15.7           | Double Chamfering | 13   |                                                                                      |
| MM EDF               | -           | 3             | 9.4, 11.6          |                   | 14   |                                                                                      |
| MM EPG               |             |               | 8                  |                   | 15   |                                                                                      |
| MM ECS               | -           | 2             | 3.28-6.46          | DIN 332           | 17   |                                                                                    |
| MM ECD               |             |               | 6-16               |                   | 18   |                                                                                    |
| MM EFCB              | 30°         | 4             | 11, 14             |                   | 19   |                                                                                    |
| MM TS-N              |             |               | 7.7-13.5           |                   | 21   |                                                                                    |
| MM TS-H              |             |               | 13.5-25            |                   | 22   |                                                                                    |
| MM TS-DG             |             | 4             | 15.88, 19.05, 25.4 |                   | 24   |                                                                                    |
| MM GRIT-16K/P,18K/P  |             |               | 15.7, 17.7         |                   | 25   |                                                                                    |
| MM GRIT-22K/P,28K/P  |             |               | 21.7, 27.7         |                   | 26   |                                                                                    |
| MM GRIT Back Chamfer |             |               | 27.7               |                   | 27   |                                                                                    |
| MM TS-45             |             |               | 7.7                |                   | 28   |                                                                                    |
| MM GRIT-K/P-45A      |             | 3, 4          | 15.7,17.7,21.7     |                   | 28   |                                                                                    |

**E** = Economical



| Type       | Helix Angle | No. of Flutes | Diameter Range | Remarks                | Page |                                                                                                |
|------------|-------------|---------------|----------------|------------------------|------|------------------------------------------------------------------------------------------------|
| MM TRD-M   |             |               | 15.7, 21.7     |                        | 31   |             |
| MM TRD-W   |             |               | 21.7           |                        | 31   |             |
| MT-ISO-MM  |             | 3-6           | 10-16          |                        | 32   |             |
| MT-UN-MM   |             | 3-5           | 10-16          |                        | 33   |             |
| MT-W-MM    |             | 4             | 10, 16         |                        | 34   |             |
| MM FF      | -           | 2             | 10-20          |                        | 37   | <b>E</b>    |
| MM EFF     | -           | 4, 6          | 8-25.4         |                        | 38   |            |
| MM HT      | -           | 2             | 10-20          |                        | 39   | <b>E</b>  |
| MM HT-NCSR | -           | 2             | 12             |                        | 40   |           |
| MM HT-NWFR | -           | 2             | 12             |                        | 40   |           |
| MM ETR     | 30°         | 6             | 8-16           |                        | 41   |           |
| MM HCR     | -           | 2             | 8-16           | General Finishing      | 43   | <b>E</b>  |
| MM HRF     | -           | 2             | 8-16           | General Finishing      | 43   | <b>E</b>  |
| MM HBR     | -           | 2             | 10-25.4        |                        | 44   | <b>E</b>  |
| MM EB      | 30°         | 2, 4          | 6-20           |                        | 45   |           |
| MM EBA     | 45°         | 2             | 8-25           | For Machining Aluminum | 45   |           |
| MM HC      | 10°         | 2             | 7.8-16         |                        | 47   |           |
| MM ECU     | 38°         | 3             | 7.7-19.7       | DIN 6885               | 48   |           |

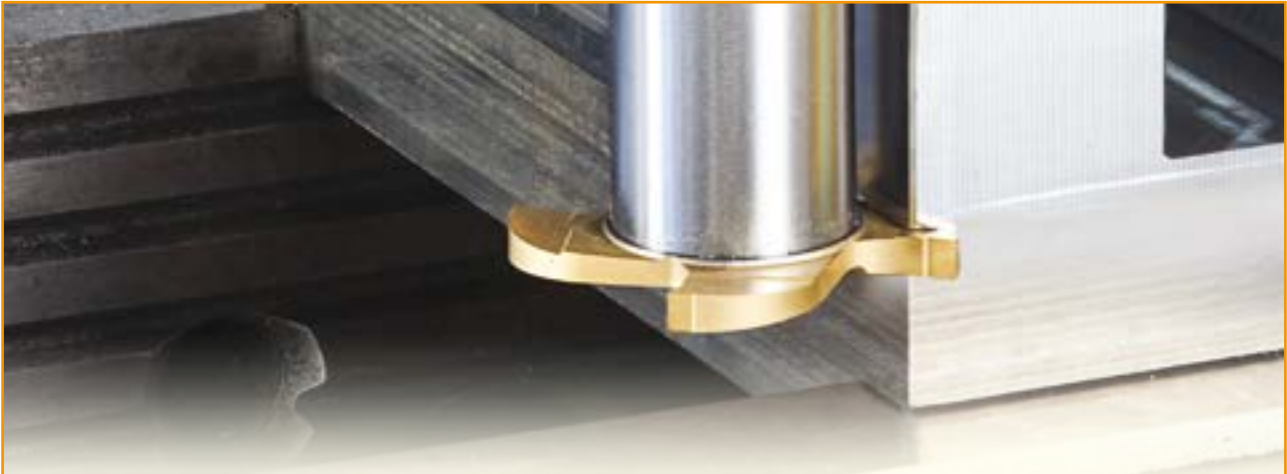
**E** = Economical

## Indexable Solid Carbide Milling Heads Table of Contents

| Type             | Helix Angle | No. of Flutes | Diameter Range | Remarks                                       | Page |                                                                                       |
|------------------|-------------|---------------|----------------|-----------------------------------------------|------|---------------------------------------------------------------------------------------|
| MM EC-3          | 45°         | 3             | 8-12.7         |                                               | 48   |    |
| MM EC-4          | 30°, 45°    | 4             | 6-20           |                                               | 49   |    |
| MM EC-6          | 30°, 45°    | 6             | 8-12.7         |                                               | 50   |    |
| MM EC-D          | 50°         | 6, 8, 10      | 8-20           |                                               | 51   |    |
| MM EC-8/MM EC-10 | 30°, 45°    | 8, 10         | 16-25          |                                               | 51   |    |
| MM ET            |             | 8, 12         | 11-15          |                                               | 52   |    |
| MM EC-CF         | 38°         | 4             | 8-25           | CHATTERFREE                                   | 53   |   |
| MM EC-H-4        | 47°         | 4             | 8-20           |                                               | 54   |  |
| MM EC-H-5        | 35°         | 5             | 8-25           |                                               | 55   |  |
| MM EFS           | 45°         | 4             | 8-25.4         | FINISHRED                                     | 56   |  |
| MM EFS-CF        | 38°         | 4             | 6-25           | FINISHRED<br>CHATTERFREE                      | 57   |  |
| MM ERS           | 45°         | 4, 5, 6       | 8-25.4         |                                               | 58   |  |
| MM ERA           | 45°         | 3             | 8-25           | Rough Machining on Aluminum                   | 58   |  |
| MM EA            | 45°         | 2, 3          | 8-20           | High Speed Machining on Aluminium             | 59   |  |
| MM EA-CF         | 40°         | 3, 4          | 8-25           | High Speed Machining on Aluminum-CHATTER FREE | 60   |  |
| MM EPNC          | -           | 12            | 10, 12         |                                               | 60   |  |
| MM EPX           | -           | 6, 8          | 10, 12         |                                               | 61   |  |



| Type                        | Page |
|-----------------------------|------|
| MM S-A (stepped shanks)     | 63   |
| MM TS-A                     | 64   |
| MM GRT (shanks)             | 65   |
| MM S-A-N                    | 65   |
| MM S-A (straight shanks)    | 66   |
| MM S-B (85° conical shanks) | 66   |
| MM S-D (89° conical shanks) | 67   |
| MM S-ER                     | 68   |
| MM S-ER-H                   | 69   |
| MM S-A-HSK                  | 69   |
| MM S-A-SK                   | 70   |
| MM S-A-C#                   | 70   |
| MM CAB                      | 71   |
| MM CAB-T-T                  | 71   |



**Clamping and Indexing Instructions**



1



2

**MM GRIT**



3



4



1



2

**MM TS...**



3



4



1



2



3



4

Do not apply lubricant to the threaded connection.



| Designation | Thread Size | Key <sup>(1)</sup> | Tightening Torque (Nxcm) |
|-------------|-------------|--------------------|--------------------------|
| MM          | T04         | MM KEY 6x4         | 400                      |
| MM          | T05         | MM KEY 6x4         | 700                      |
| MM          | T06         | MM KEY 8x5         | 1000                     |
| MM          | T08         | MM KEY 10x7        | 1500                     |
| MM          | T10         | MM KEY 13x8        | 2800                     |
| MM          | T12         | MM KEY 16x9        | 2800                     |
| MM          | T15         | MM KEY 20          | 4000                     |

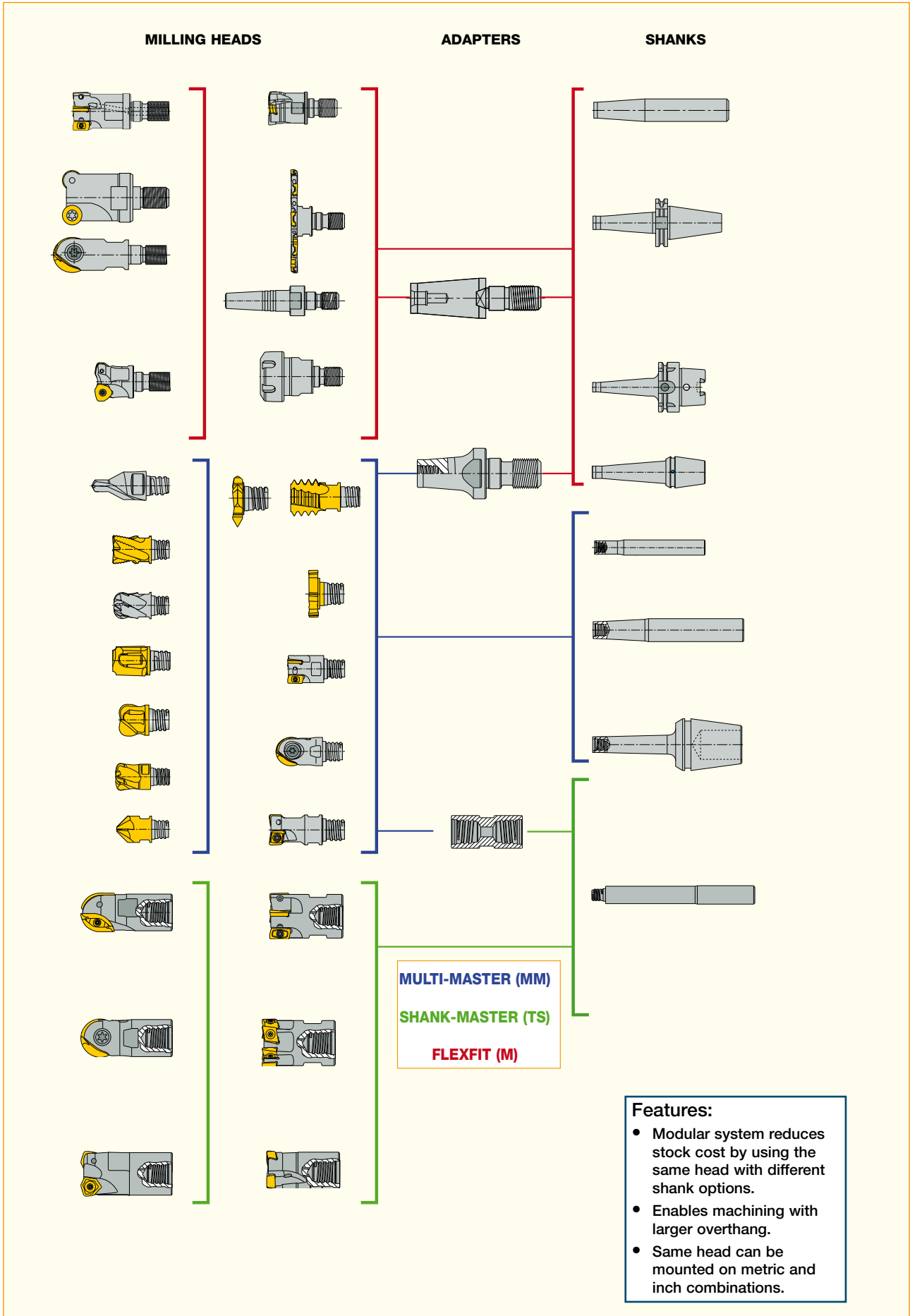
<sup>(1)</sup> Order separately





# MULTI-MASTER, SHANK-MASTER and FLEXFIT Connection Options

Engineered for  
**MAXIMUM**  
**MULTI-MASTER**  
Performance

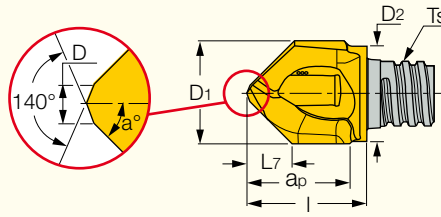
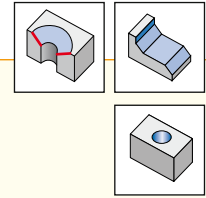


# MULTI-MASTER

INDEXABLE SOLID CARBIDE LINE

## MM HCD

2 Flute Interchangeable Solid Carbide Heads, for Chamfering, Countersinking and Spot Drilling



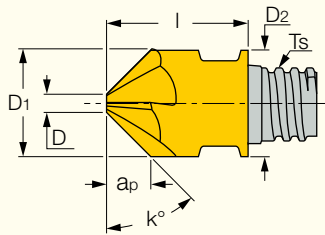
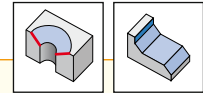
**ECONOMICAL SOLUTION**

| Designation                        | Dimensions     |                     |   |                |                |                |       |    |                |      | IC908 |
|------------------------------------|----------------|---------------------|---|----------------|----------------|----------------|-------|----|----------------|------|-------|
|                                    | D <sub>1</sub> | Dtol <sup>(3)</sup> | Z | a <sub>p</sub> | T <sub>s</sub> | D <sub>2</sub> | l     | a° | L <sub>7</sub> | D    |       |
| MM HCD080-090-2T05 <sup>(1)</sup>  | 8.0            | z9                  | 2 | 7.00           | T05            | 7.60           | 9.75  | 45 | 3.15           | 1.00 | ●     |
| MM HCD083-090-2T05 <sup>(1)</sup>  | 8.3            | z9                  | 2 | 7.50           | T05            | 7.60           | 10.00 | 45 | 3.56           | 1.00 | ●     |
| MM HCD.375-080-2T06                | 9.5            | z9                  | 2 | 9.00           | T06            | 9.20           | 11.80 | 40 | 5.00           | 2.00 | ●     |
| MM HCD100-090-2T06 <sup>(1)</sup>  | 10.0           | z9                  | 2 | 9.00           | T06            | 9.60           | 11.75 | 45 | 4.40           | 1.50 | ●     |
| MM HCD100-060-2T06                 | 10.0           | h10                 | 2 | 9.30           | T06            | 9.60           | 11.75 | 30 | 7.60           | 1.50 | ●     |
| MM HCD100-120-2T06                 | 10.0           | h10                 | 2 | 9.50           | T06            | 9.60           | 12.70 | 60 | 2.70           | 1.50 | ●     |
| MM HCD104-090-2T06 <sup>(1)</sup>  | 10.4           | z9                  | 2 | 9.00           | T06            | 9.60           | 11.75 | 45 | 4.60           | 1.50 | ●     |
| MM HCD120-090-2T08 <sup>(1)</sup>  | 12.0           | z9                  | 2 | 12.00          | T08            | 11.50          | 15.50 | 45 | 5.30           | 1.50 | ●     |
| MM HCD120-060-2T08                 | 12.0           | h10                 | 2 | 11.00          | T08            | 11.50          | 15.40 | 30 | 9.24           | 1.50 | ●     |
| MM HCD120-120-2T08                 | 12.0           | h10                 | 2 | 11.65          | T08            | 11.50          | 15.20 | 60 | 3.50           | 1.50 | ●     |
| MM HCD124-090-2T08 <sup>(1)</sup>  | 12.4           | z9                  | 2 | 11.80          | T08            | 11.50          | 15.50 | 45 | 5.50           | 1.50 | ●     |
| MM HCD.500-080-2T08 <sup>(2)</sup> | 12.7           | z9                  | 2 | 11.10          | T08            | 12.20          | 15.50 | 40 | 6.80           | 1.50 | ●     |
| MM HCD.625-080-2T10                | 15.9           | z9                  | 2 | 15.20          | T10            | 15.00          | 18.80 | 40 | 8.80           | 2.00 | ●     |
| MM HCD160-090-2T10 <sup>(1)</sup>  | 16.0           | z9                  | 2 | 14.90          | T10            | 15.20          | 18.80 | 45 | 7.10           | 1.50 | ●     |
| MM HCD160-060-2T10                 | 16.0           | h10                 | 2 | 16.20          | T10            | 15.20          | 20.20 | 30 | 12.00          | 2.50 | ●     |
| MM HCD160-120-2T10                 | 16.0           | h10                 | 2 | 15.50          | T10            | 15.20          | 19.90 | 60 | 4.40           | 1.50 | ●     |
| MM HCD165-090-2T10 <sup>(1)</sup>  | 16.5           | z9                  | 2 | 14.90          | T10            | 15.20          | 18.80 | 45 | 7.10           | 1.50 | ●     |
| MM HCD.750-080-2T12                | 19.0           | z9                  | 2 | 19.60          | T12            | 18.00          | 24.70 | 40 | 11.00          | 2.00 | ●     |
| MM HCD200-090-2T12 <sup>(1)</sup>  | 20.0           | z9                  | 2 | 18.20          | T12            | 18.30          | 24.70 | 45 | 9.40           | 1.50 | ●     |
| MM HCD200-060-2T12                 | 20.0           | h10                 | 2 | 18.20          | T12            | 18.30          | 24.70 | 30 | 15.50          | 2.50 | ●     |
| MM HCD200-120-2T12                 | 20.0           | h10                 | 2 | 14.65          | T12            | 18.30          | 21.15 | 60 | 5.50           | 1.50 | ●     |

- For shanks, see pages 63-71
- Clamping keys (should be ordered separately), tightening torques and clamping instructions, see page 8.
- Do not apply lubricant to the threaded connection.
- For user guide, see pages 72-84.

<sup>(1)</sup> May be used for F-type (fine) countersink according to DIN 74. <sup>(2)</sup> Countersink according to American National and British standard flat screws. <sup>(3)</sup> D diameter tolerance





| Designation           | Dimensions |                |       |      |                |                |                |       |   | IC908 |
|-----------------------|------------|----------------|-------|------|----------------|----------------|----------------|-------|---|-------|
|                       | K°         | D <sub>1</sub> | Flute | D    | a <sub>p</sub> | T <sub>s</sub> | D <sub>2</sub> | l     |   |       |
| MM ECF120-02/100-4T06 | 30.0       | 10.0           | 4     | 2.00 | 2.30           | T06            | 10.00          | 13.00 | ● |       |
| MM ECF120-02/120-4T08 | 30.0       | 12.0           | 4     | 2.00 | 2.90           | T08            | 12.00          | 16.50 | ● |       |
| MM ECF120-03/160-6T10 | 30.0       | 16.0           | 6     | 3.00 | 3.70           | T10            | 16.00          | 20.50 | ● |       |
| MM ECF120-05/200-6T12 | 30.0       | 20.0           | 6     | 5.00 | 4.30           | T12            | 18.50          | 25.50 | ● |       |
| MM ECF120-06/250-6T15 | 30.0       | 25.0           | 6     | 6.00 | 5.40           | T15            | 25.00          | 25.00 | ● |       |
| MM ECF45-100-4T06     | 45.0       | 10.0           | 4     | 1.95 | 4.00           | T06            | 10.00          | 13.00 | ● |       |
| MM ECF45-120-4T08     | 45.0       | 12.0           | 4     | 1.95 | 5.00           | T08            | 12.00          | 16.50 | ● |       |
| MM ECF45-.500-4T08    | 45.0       | 12.7           | 4     | 1.95 | 5.00           | T08            | 12.70          | 16.50 | ● |       |
| MM ECF45-160-6T10     | 45.0       | 16.0           | 6     | 3.00 | 6.50           | T10            | 16.00          | 20.50 | ● |       |
| MM ECF45-200-6T12     | 45.0       | 20.0           | 6     | 5.00 | 7.50           | T12            | 18.30          | 25.50 | ● |       |
| MM ECF45-250-6T15-M   | 45.0       | 25.0           | 6     | 5.00 | 10.00          | T15            | 25.00          | 25.00 | ● |       |
| MM ECF60-100-4T06     | 60.0       | 10.0           | 4     | 1.60 | 7.30           | T06            | 10.00          | 13.00 | ● |       |
| MM ECF60-02/100-4T06  | 60.0       | 10.0           | 4     | 2.00 | 6.90           | T06            | 10.00          | 13.00 | ● |       |
| MM ECF60-03/120-4T08  | 60.0       | 12.0           | 4     | 3.00 | 7.80           | T08            | 12.00          | 16.50 | ● |       |
| MM ECF60-04/160-6T10  | 60.0       | 16.0           | 6     | 4.00 | 10.00          | T10            | 16.00          | 20.50 | ● |       |
| MM ECF60-05/200-6T12  | 60.0       | 20.0           | 6     | 5.00 | 13.00          | T12            | 18.50          | 25.50 | ● |       |
| MM ECF60-08/250-6T15  | 60.0       | 25.0           | 6     | 8.00 | 14.00          | T15            | 25.00          | 25.00 | ● |       |

• For shanks, see pages 63-71 • For clamping keys (should be ordered separately), tightening torques and clamping instructions, see page 8 • Do not apply lubricant to the threaded connection. • For user guide, see pages 72-84

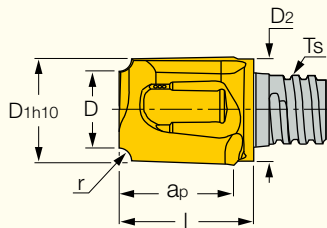
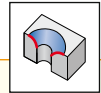


# MULTI-MASTER

INDEXABLE SOLID CARBIDE LINE

## MM HR

Interchangeable 2 Flute Solid Carbide, Corner Rounding Milling Heads



**ECONOMICAL SOLUTION**

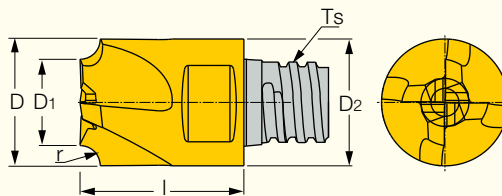
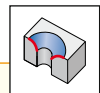
| Designation           | Dimensions     |      |   |      |                |                |                |       |                               | IC908 |
|-----------------------|----------------|------|---|------|----------------|----------------|----------------|-------|-------------------------------|-------|
|                       | D <sub>1</sub> | r    | Z | D    | a <sub>p</sub> | T <sub>s</sub> | D <sub>2</sub> | l     | T <sub>m</sub> <sup>(1)</sup> |       |
| MM HR1.0/047-5.8-2T05 | 8.0            | 1.00 | 2 | 5.80 | 7.50           | T05            | 7.60           | 10.60 | r0.5-3.0                      | ●     |
| MM HR1.6/063-6.8-2T06 | 10.0           | 1.60 | 2 | 6.80 | 9.50           | T06            | 9.60           | 12.50 | r0.5-3.0                      | ●     |
| MM HR2.0/078-6.0-2T06 | 10.0           | 2.00 | 2 | 6.00 | 9.50           | T06            | 9.60           | 12.50 | r0.5-3.0                      | ●     |
| MM HR2.5/094-5.1-2T06 | 10.0           | 2.50 | 2 | 5.10 | 9.50           | T06            | 9.60           | 12.50 | r0.5-3.0                      | ●     |
| MM HR3.0/125-6.5-2T08 | 12.7           | 3.00 | 2 | 6.50 | 12.00          | T08            | 11.50          | 15.60 | r0.5-4.0                      | ●     |
| MM HR4.0/156-4.7-2T08 | 12.7           | 4.00 | 2 | 4.70 | 12.00          | T08            | 11.50          | 15.60 | r0.5-4.0                      | ●     |
| MM HR5.0/188-6.2-2T10 | 16.0           | 5.00 | 2 | 6.20 | 15.00          | T10            | 15.20          | 19.10 | r0.5-5.0                      | ●     |
| MM HR6.0/236-8.0-2T12 | 20.0           | 6.00 | 2 | 8.00 | 7.00           | T12            | 18.30          | 17.40 | r0.5-6.0                      | ●     |

• For shanks, see pages 63-71 • For Clamping keys (should be ordered separately), tightening torques and clamping instructions, see page 8. • Do not apply lubricant to the threaded connection. • For user guide, see pages 72-84.

<sup>(1)</sup> Specially tailored radius range upon request.

## MM ER

Interchangeable 4 Flute Solid Carbide, Corner Rounding Milling Heads



| Designation           | Dimensions |                |       |                               |   |       |                |                | IC908 |
|-----------------------|------------|----------------|-------|-------------------------------|---|-------|----------------|----------------|-------|
|                       | r          | D <sub>1</sub> | D     | T <sub>m</sub> <sup>(1)</sup> | Z | l     | D <sub>2</sub> | T <sub>s</sub> |       |
| MM ER1.0/047-5.8-4T05 | 1.00       | 5.8            | 8.00  | 0.5-1.4                       | 4 | 10.00 | 8.00           | T05            | ●     |
| MM ER1.6/063-6.8-4T06 | 1.60       | 6.8            | 10.00 | 0.5-2.5                       | 4 | 13.00 | 10.00          | T06            | ●     |
| MM ER2.0/078-6.0-4T06 | 2.00       | 6.0            | 10.00 | 0.5-2.5                       | 4 | 13.00 | 10.00          | T06            | ●     |
| MM ER2.5/094-5.1-4T06 | 2.50       | 5.1            | 10.00 | 0.5-2.5                       | 4 | 13.00 | 10.00          | T06            | ●     |
| MM ER3.0/125-6.5-4T08 | 3.00       | 6.5            | 12.70 | 0.5-3.1                       | 4 | 16.50 | 12.70          | T08            | ●     |

• For shanks, see pages 63-71 • For Clamping keys (should be ordered separately), tightening torques and clamping instructions, see page 8. • Do not apply lubricant to the threaded connection. • For user guide, see pages 72-84.

<sup>(1)</sup> Specially tailored radius range upon request.

## Spare Parts



| Designation           | Wrench       |
|-----------------------|--------------|
| MM ER1.0/047-5.8-4T05 | MM KEY 6X4*  |
| MM ER1.6/063-6.8-4T06 | MM KEY 8X5*  |
| MM ER2.0/078-6.0-4T06 | MM KEY 8X5*  |
| MM ER2.5/094-5.1-4T06 | MM KEY 8X5*  |
| MM ER3.0/125-6.5-4T08 | MM KEY 10X7* |

\* (Optional, should be ordered separately)

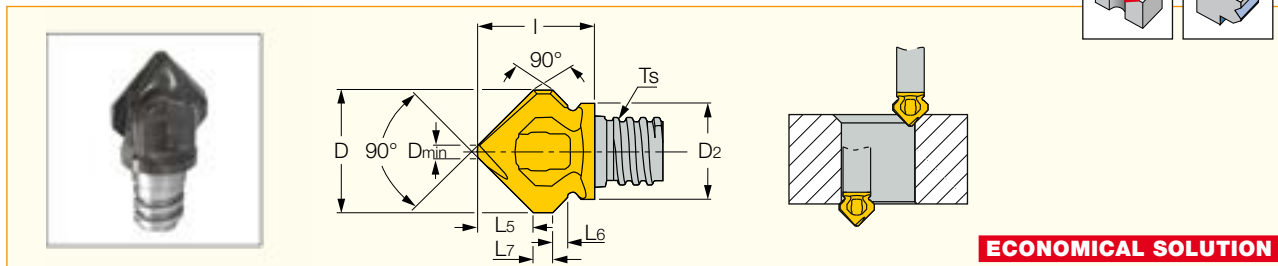
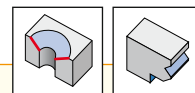
# MULTI-MASTER

INDEXABLE SOLID CARBIDE LINE

## MM HDF

2 Flute Interchangeable Solid Carbide Heads, for Upper and Bottom Chamfering

Engineered for  
**MAXIMUM**  
**MULTI-MASTER**  
Performance



| Designation               | Dimensions |   |                |                |                |                  |                |                |       | IC908 |
|---------------------------|------------|---|----------------|----------------|----------------|------------------|----------------|----------------|-------|-------|
|                           | D          | Z | L <sub>5</sub> | L <sub>6</sub> | L <sub>7</sub> | D <sub>min</sub> | T <sub>s</sub> | D <sub>2</sub> | I     |       |
| <b>MM HDF100-090-2T05</b> | 9.80       | 2 | 4.30           | 0.90           | 2.50           | 1.20             | T05            | 7.60           | 10.80 | ●     |
| <b>MM HDF120-090-2T06</b> | 11.80      | 2 | 5.30           | 1.20           | 2.00           | 1.20             | T06            | 9.30           | 11.20 | ●     |
| <b>MM HDF160-090-2T08</b> | 15.70      | 2 | 7.10           | 2.20           | 2.00           | 1.50             | T08            | 11.50          | 14.00 | ●     |

• For shanks, see pages 63-71 • Clamping keys should be ordered separately • For tightening torques and clamping instructions, see page 8 • Do not apply lubricant to the threaded connection • For user guide, see pages 72-84.

### Spare Parts



| Designation               | Wrench       |
|---------------------------|--------------|
| <b>MM HDF100-090-2T05</b> | MM KEY 8X5*  |
| <b>MM HDF120-090-2T06</b> | MM KEY 10X7* |
| <b>MM HDF160-090-2T08</b> | MM KEY 13X8* |

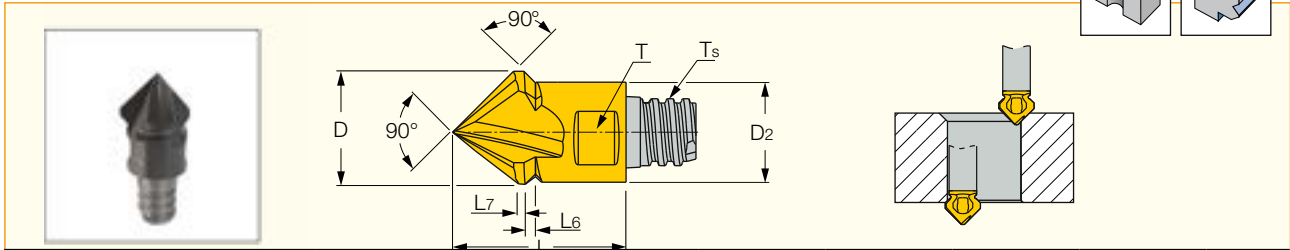
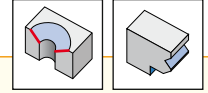
\* (Optional, should be ordered separately)





**MM EDF**

3 Flute Interchangeable Solid Carbide Heads, for Upper and Bottom Chamfering



| Designation                  | Dimensions |                |       |                |                |       |                | IC908 |
|------------------------------|------------|----------------|-------|----------------|----------------|-------|----------------|-------|
|                              | D          | D <sub>2</sub> | Flute | L <sub>6</sub> | L <sub>7</sub> | I     | T <sub>s</sub> |       |
| <b>MM EDF074-090-58-3T04</b> | 7.40       | 5.80           | 3     | 0.90           | 1.00           | 10.00 | T04            | ●     |
| <b>MM EDF094-090-76-3T05</b> | 9.40       | 7.60           | 3     | 0.90           | 1.00           | 12.50 | T05            | ●     |
| <b>MM EDF116-090-95-3T06</b> | 11.60      | 9.60           | 3     | 1.00           | 1.00           | 16.50 | T06            | ●     |

• Suitable for pecking applications. • For shanks, see pages 63-71 • For Clamping keys (should be ordered separately), tightening torques and clamping instructions, see page 8. • Do not apply lubricant to the threaded connection. • For user guide, see pages 72-84.

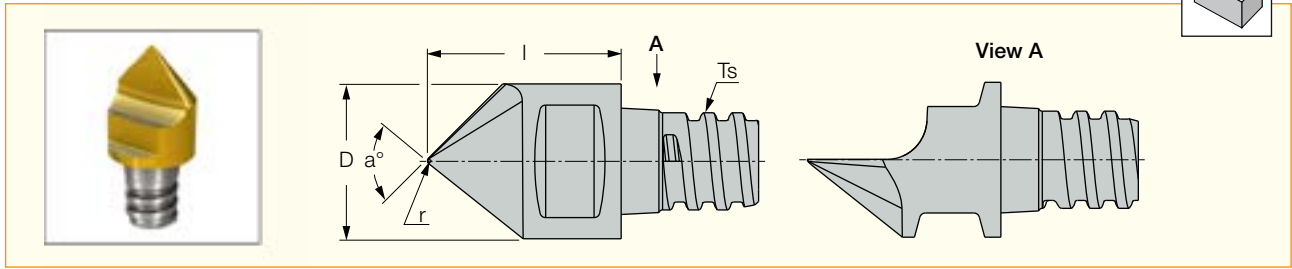


# MULTI-MASTER

INDEXABLE SOLID CARBIDE LINE  
MM EPG

Single-Flute MULTI-MASTER Engraving Tool Head

Engineered for  
**MAXIMUM**  
**MULTI-MASTER**  
Performance



| Designation       | Dimensions |      |    |       |     |   | IC908 |
|-------------------|------------|------|----|-------|-----|---|-------|
|                   | D          | r    | a° | l     | Ts  |   |       |
| MM EPG080/30-1T05 | 8.00       | 0.20 | 30 | 10.00 | T05 | ● |       |
| MM EPG080/45-1T05 | 8.00       | 0.20 | 45 | 10.00 | T05 | ● |       |
| MM EPG080/60-1T05 | 8.00       | 0.20 | 60 | 10.00 | T05 | ● |       |
| MM EPG080/90-1T05 | 8.00       | 0.20 | 90 | 10.00 | T05 | ● |       |

• For shanks, see pages 63-71 • For clamping keys (should be ordered separately), tightening torques and clamping instructions, see page 8 • Do not apply lubricant to the threaded connection

## Spare Parts



|             |             |
|-------------|-------------|
| Designation | Wrench      |
| MM EPG      | MM KEY 6X4* |

\* (Optional, should be ordered separately)



Engineered for  
**MAXIMUM**  
**MULTI-MASTER**  
Performance



## ***MULTI-MASTER***

### **Centering, Spot Drilling and Counter Boring Heads**

The MM ECS MULTI-MASTER centering drills family consists of MM ECS-A... and MM ECS-B... drilling heads.

The MM ECS-A... items feature a cylindrical drill, followed by 60° conical edge and the B-type features an extra 120° protective chamfering facet that produces an improved centering hole geometry which better protects tailstock centers.

#### **Features**

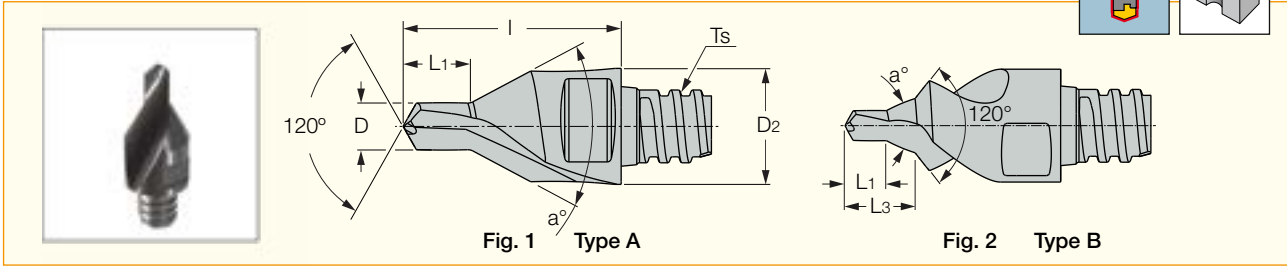
- No need to re-set the tool length after indexing
- High speed and feed capability
- Long tool life

# SOLIDDRILL • MULTI-MASTER

## MM ECS

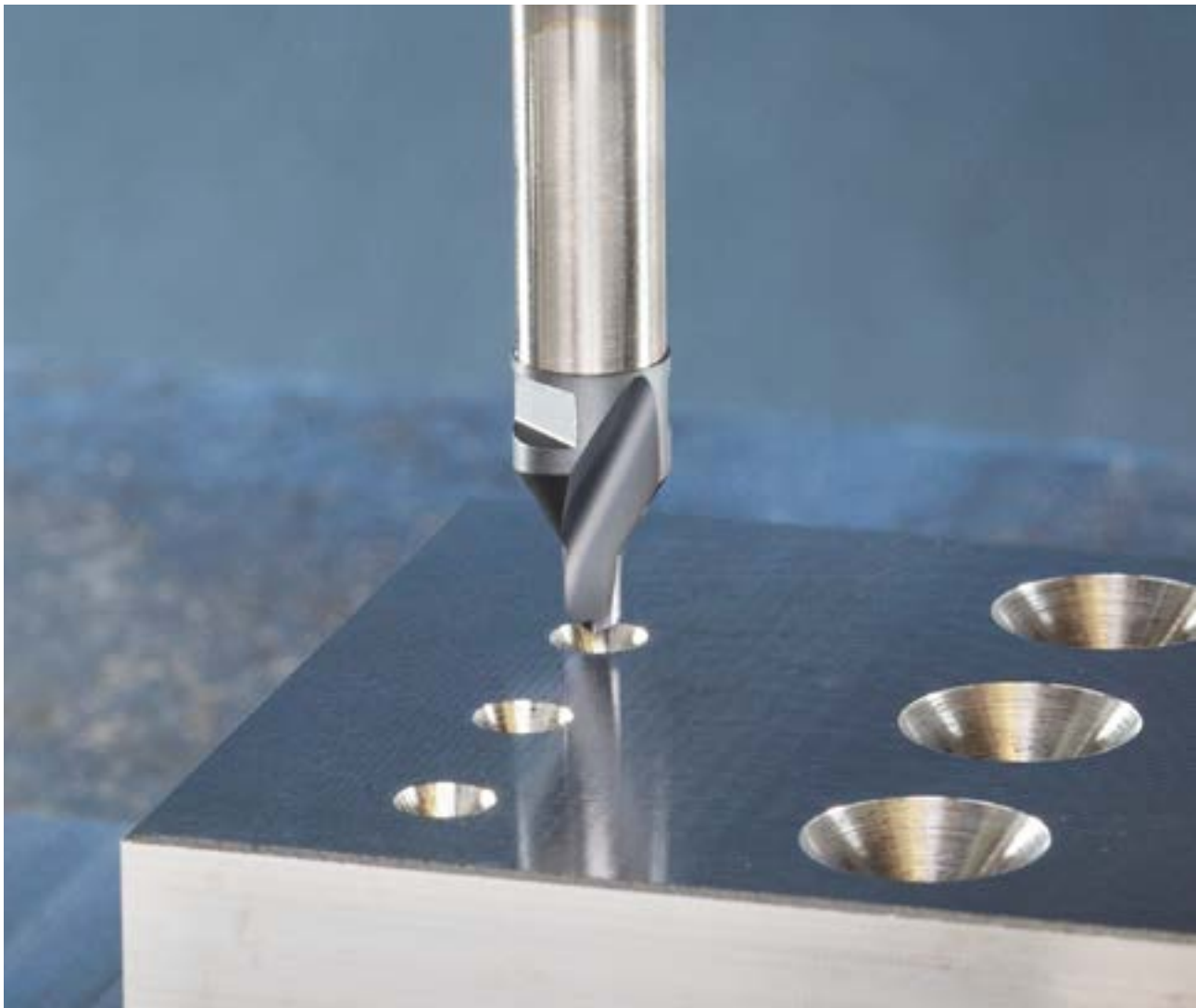
Centering Drill (DIN 332), Interchangeable Solid Carbide Heads

Engineered for  
**MAXIMUM**  
**MULTI-MASTER**  
Performance



| Designation           | Dimensions |                |       |                |                |                |    |      | IC908 |
|-----------------------|------------|----------------|-------|----------------|----------------|----------------|----|------|-------|
|                       | D          | D <sub>2</sub> | I     | L <sub>1</sub> | L <sub>2</sub> | T <sub>s</sub> | a° | Fig. |       |
| MM ECS-A3.15X08-2T05  | 3.28       | 8.00           | 15.00 | 4.6            | -              | T05            | 60 | 1    | ●     |
| MM ECS-A4.00X10-2T06  | 4.12       | 10.00          | 19.00 | 5.9            | -              | T06            | 60 | 1    | ●     |
| MM ECS-A5.00X12-2T08  | 5.13       | 12.00          | 23.00 | 7.2            | -              | T08            | 60 | 1    | ●     |
| MM ECS-A6.30X16-2T10  | 6.46       | 16.00          | 28.00 | 8.9            | -              | T10            | 60 | 1    | ●     |
| MM ECS-B3.15X12-2T08  | 3.24       | 12.00          | 23.00 | 4.4            | 7.40           | T08            | 60 | 2    | ●     |
| MM ECS-B4.00X127-2T08 | 4.09       | 12.70          | 23.00 | 5.6            | 9.50           | T08            | 60 | 2    | ●     |
| MM ECS-B5.00X19-2T12  | 5.09       | 19.10          | 25.50 | 6.9            | 11.70          | T12            | 60 | 2    | ●     |
| MM ECS-B6.30X20-2T12  | 6.41       | 20.00          | 25.50 | 8.6            | 14.50          | T12            | 60 | 2    | ●     |

• For shanks, see pages 63-71 • For Clamping keys (should be ordered separately), tightening torques and clamping instructions, see page 8. • Do not apply lubricant to the threaded connection. • For user guide, see pages 72-84.

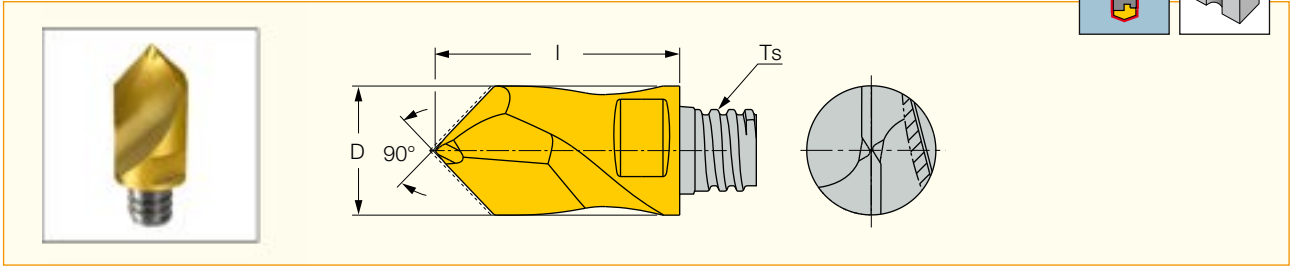
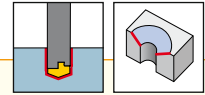




# SOLIDDRILL • MULTI-MASTER

## MM ECD

NC Spotting Drills for Accurately Locating a Hole without Using a Guide Bushing



| Designation       | Dimensions |       |                | IC908 |
|-------------------|------------|-------|----------------|-------|
|                   | D          | I     | T <sub>s</sub> |       |
| MM ECD-06X90-2T04 | 6.00       | 11.00 | T04            | ●     |
| MM ECD-08X90-2T05 | 8.00       | 15.00 | T05            | ●     |
| MM ECD-10X90-2T06 | 10.00      | 19.00 | T06            | ●     |
| MM ECD-12X90-2T08 | 12.00      | 23.00 | T08            | ●     |
| MM ECD-16X90-2T10 | 16.00      | 28.00 | T10            | ●     |

• For shanks, see pages 63-71 • For clamping keys (should be ordered separately), tightening torques and clamping instructions, see page 8 • Do not apply lubricant to the threaded connection

### Spare Parts



| Designation       | Wrench       |
|-------------------|--------------|
| MM ECD-08X90-2T05 | MM KEY 6X4*  |
| MM ECD-10X90-2T06 | MM KEY 8X5*  |
| MM ECD-12X90-2T08 | MM KEY 10X7* |
| MM ECD-16X90-2T10 | MM KEY 13X8* |

\* (Optional, should be ordered separately)

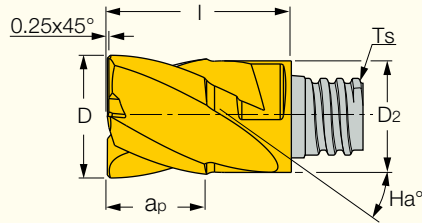


# MULTI-MASTER

INDEXABLE SOLID CARBIDE LINE  
MM EFCB

4 Flute 30° Helix Interchangeable Solid Carbide Heads, for Flat Counter Boring

Engineered for  
**MAXIMUM**  
**MULTI-MASTER**  
Performance



| Designation        | Dimensions |       |       |       |     |       | IC908 | Recommended Machining Data |
|--------------------|------------|-------|-------|-------|-----|-------|-------|----------------------------|
|                    | D          | ap    | l     | D2    | Ts  | Flute |       | fz (mm/t)                  |
| MM EFCB110A08-4T06 | 11.00      | 8.40  | 16.50 | 10.00 | T06 | 4     | ●     | 0.03-0.04                  |
| MM EFCB140A11-4T08 | 14.00      | 11.50 | 28.00 | 12.00 | T08 | 4     | ●     | 0.04-0.05                  |

• 0.06 mm maximum concavity on the tool's bottom • For shanks, see pages 63-71 • For Clamping keys (should be ordered separately), tightening torques and clamping instructions, see page 8. • Do not apply lubricant to the threaded connection. • For user guide, see pages 72-84.

## Spare Parts



| Designation        | Wrench       |
|--------------------|--------------|
| MM EFCB110A08-4T06 | MM KEY 8X5*  |
| MM EFCB140A11-4T08 | MM KEY 10X7* |

\* (Optional, should be ordered separately)



Engineered for  
**MAXIMUM**  
**MULTI-MASTER**  
 Performance



## MULTI-MASTER

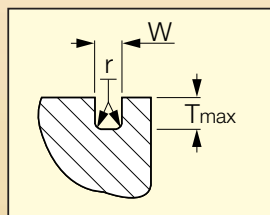
There are two kinds of MULTI-MASTER heads intended for milling slot and grooves: MM GRIT and MM TS. The MM GRIT heads were originally designed for machining internal and external grooves for various O-rings and retaining rings in accordance with international standards - DIN 471 or ANSI B27.7M. The heads feature two types of cutting geometry. The first is the general-duty K-type, which is the first choice for milling steel and cast iron. The second is the P-type, which is recommended for milling soft and gummy materials. The heads of both types are secured in a shank with the use of special clamping keys. The majority of the MM GRIT heads have a straight tooth design with three or four teeth. MM TS heads with six teeth are produced with staggered inclined teeth with larger widths of cut and higher tooth density when compared with MM GRIT heads of similar diameters. In order to improve chip evacuation, increase cutting stability and reduce power consumption, MM TS heads with wide teeth are available with chip splitting grooves. In addition, MM TS heads feature a TORX shaped recess on the head face for clamping the head with the use of a TORX key.

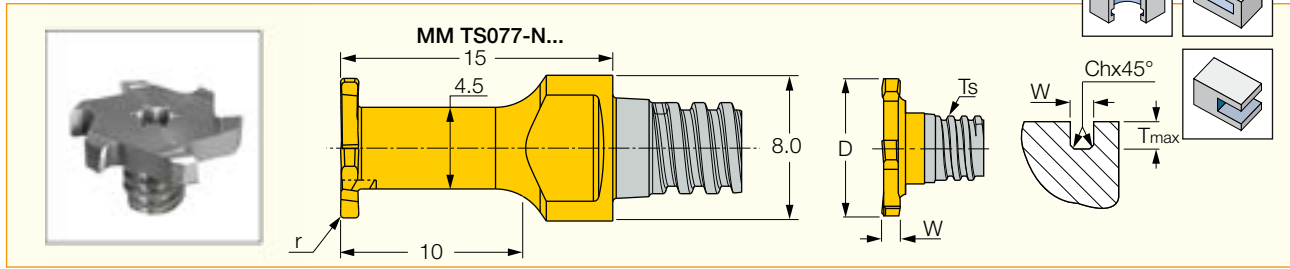


MM GRIT



MM TS





| Designation           | Dimensions         |                    |                  |   |      |      |                | Tough ← Hard |       |       |
|-----------------------|--------------------|--------------------|------------------|---|------|------|----------------|--------------|-------|-------|
|                       | D <sup>-0.05</sup> | W <sup>±0.02</sup> | T <sub>max</sub> | Z | r    | Ch   | T <sub>s</sub> | IC328        | IC928 | IC908 |
| MM TS077-N07A-4T05    | 7.70               | 0.70               | 1.20             | 4 | 0.20 | -    | T05            |              |       | ●     |
| MM TS077-N08A-4T05    | 7.70               | 0.80               | 1.20             | 4 | 0.20 | -    | T05            |              |       | ●     |
| MM TS077-N09A-4T05    | 7.70               | 0.90               | 1.20             | 4 | 0.20 | -    | T05            |              |       | ●     |
| MM TS077-N10A-4T05    | 7.70               | 1.00               | 1.20             | 4 | 0.20 | -    | T05            |              |       | ●     |
| MM TS077-N15A-4T05    | 7.70               | 1.50               | 1.20             | 4 | 0.20 | -    | T05            |              |       | ●     |
| MM TS077-N20A-4T05    | 7.70               | 2.00               | 1.20             | 4 | 0.20 | -    | T05            |              |       | ●     |
| MM TS105-N20D-06T04   | 10.50              | 2.00               | 2.00             | 6 | 0.40 | -    | T04            |              | ●     |       |
| MM TS.500-N062P-06T05 | 12.70              | 1.58               | 2.25             | 6 | -    | 0.15 | T05            | ●            |       |       |
| MM TS.500-N078P-06T05 | 12.70              | 1.98               | 2.25             | 6 | -    | 0.15 | T05            | ●            |       |       |
| MM TS135-N20P-06T05   | 13.50              | 2.00               | 2.65             | 6 | -    | 0.20 | T05            | ●            |       |       |
| MM TS135-N25P-06T05   | 13.50              | 2.50               | 2.65             | 6 | -    | 0.20 | T05            | ●            |       |       |

- For shanks, see pages 63-71
- For tightening torques and clamping instructions, see page 8.
- Do not apply lubricant to the threaded connection
- For user guide, see pages 72-84.

### MM TS077-N...



### Spare Parts



| Designation           | Wrench      |
|-----------------------|-------------|
| MM TS077-N07A-4T05    |             |
| MM TS077-N07A-4T05    | MM KEY 6X4* |
| MM TS077-N08A-4T05    | MM KEY 6X4* |
| MM TS077-N09A-4T05    |             |
| MM TS077-N09A-4T05    | MM KEY 6X4* |
| MM TS077-N10A-4T05    | MM KEY 6X4* |
| MM TS077-N15A-4T05    |             |
| MM TS077-N15A-4T05    | MM KEY 6X4* |
| MM TS077-N20A-4T05    | MM KEY 6X4* |
| MM TS105-N20D-06T04   | T-15/3*     |
| MM TS.500-N062P-06T05 | T-20/3*     |
| MM TS.500-N078P-06T05 | T-20/3*     |
| MM TS135-N20P-06T05   | T-20/3*     |
| MM TS135-N25P-06T05   | T-20/3*     |

\* (Optional, should be ordered separately)

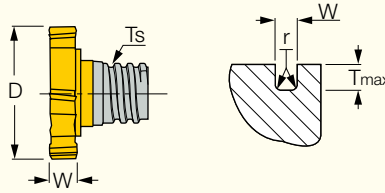
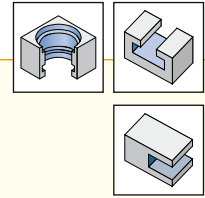


# MULTI-MASTER

INDEXABLE SOLID CARBIDE LINE

## MM TS-H

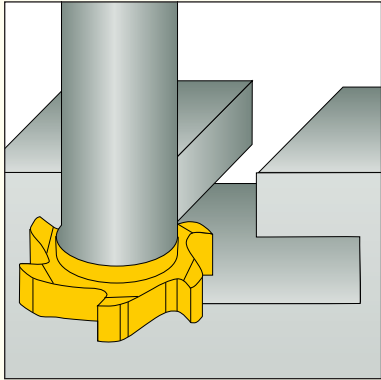
Interchangeable Solid Carbide T-Slot Milling Heads with Various Corner Radius



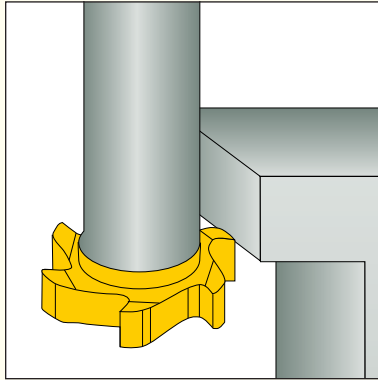
| Designation         | Dimensions         |                    |                  |   |      |                | IC328 | Key       |
|---------------------|--------------------|--------------------|------------------|---|------|----------------|-------|-----------|
|                     | D <sub>-0.05</sub> | W <sub>±0.02</sub> | T <sub>max</sub> | Z | r    | T <sub>s</sub> |       |           |
| MM TS135-H30D-06T05 | 13.50              | 3.00               | 2.65             | 6 | 0.40 | T05            | ●     | T-20/3*   |
| MM TS135-H40D-06T05 | 13.50              | 4.00               | 2.65             | 6 | 0.40 | T05            | ●     | T-20/3*   |
| MM TS165-H40A-06T05 | 16.50              | 4.00               | 4.25             | 6 | 0.20 | T05            | ●     | T-20/3*   |
| MM TS160-H20D-06T06 | 16.00              | 2.00               | 3.00             | 6 | 0.40 | T06            | ●     | T-20/3*   |
| MM TS160-H30D-06T06 | 16.00              | 3.00               | 3.00             | 6 | 0.40 | T06            | ●     | T-25/3*   |
| MM TS160-H40D-06T06 | 16.00              | 4.00               | 3.00             | 6 | 0.40 | T06            | ●     | T-25/3*   |
| MM TS165-H20D-06T06 | 16.50              | 2.00               | 3.25             | 6 | 0.40 | T06            | ●     | T-20/3*   |
| MM TS165-H30D-06T06 | 16.50              | 3.00               | 3.25             | 6 | 0.40 | T06            | ●     | T-25/3*   |
| MM TS165-H40D-06T06 | 16.50              | 4.00               | 3.25             | 6 | 0.40 | T06            | ●     | T-25/3*   |
| MM TS195-H60A-06T06 | 19.50              | 6.00               | 4.45             | 6 | 0.20 | T06            | ●     | T-25/3*   |
| MM TS225-H60A-06T06 | 22.50              | 6.00               | 5.95             | 6 | 0.20 | T06            | ●     | T-25/3*   |
| MM TS195-H40D-06T08 | 19.50              | 4.00               | 3.45             | 6 | 0.40 | T08            | ●     | T-30/3 L* |
| MM TS195-H50D-06T08 | 19.50              | 5.00               | 3.45             | 6 | 0.40 | T08            | ●     | T-30/3 L* |
| MM TS195-H60D-06T08 | 19.50              | 6.00               | 3.45             | 6 | 0.40 | T08            | ●     | T-30/3 L* |
| MM TS225-H40D-06T08 | 22.50              | 4.00               | 4.90             | 6 | 0.40 | T08            | ●     | T-40/3 L* |
| MM TS225-H50D-06T08 | 22.50              | 5.00               | 4.95             | 6 | 0.40 | T08            | ●     | T-40/3 L* |
| MM TS225-H60D-06T08 | 22.50              | 6.00               | 4.95             | 6 | 0.40 | T08            | ●     | T-40/3 L* |
| MM TS225-H80D-06T08 | 22.50              | 8.00               | 4.95             | 6 | 0.40 | T08            | ●     | T-40/3 L* |
| MM TS250-H50D-06T08 | 25.00              | 5.00               | 5.90             | 6 | 0.40 | T08            | ●     | T-50/3 L* |
| MM TS250-H60D-06T08 | 25.00              | 6.00               | 5.90             | 6 | 0.40 | T08            | ●     | T-50/3 L* |
| MM TS250-H80D-06T08 | 25.00              | 8.00               | 5.90             | 6 | 0.40 | T08            | ●     | T-50/3 L* |
| MM TS250-H50D-06T10 | 25.00              | 5.00               | 4.30             | 6 | 0.40 | T10            | ●     | T-50/3 L* |
| MM TS250-H60D-06T10 | 25.00              | 6.00               | 4.30             | 6 | 0.40 | T10            | ●     | T-50/3 L* |
| MM TS250-H80D-06T10 | 25.00              | 8.00               | 4.30             | 6 | 0.40 | T10            | ●     | T-50/3 L* |

- For tightening torques and clamping instructions, see page 8.
  - Do not apply lubricant to the threaded connection
  - For shanks, see pages 63-71.
  - For user guide, see pages 72-84.
  - Inserts in 5 mm and wider feature chip splitting edges
- \* (Optional, should be ordered separately)

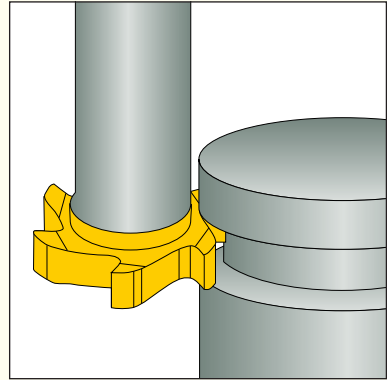




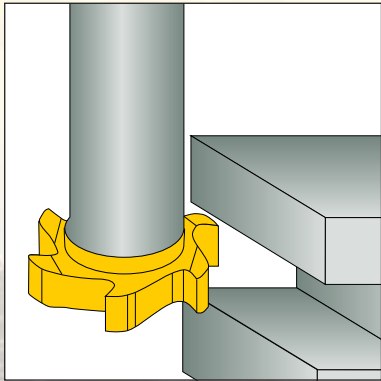
**T Slot**



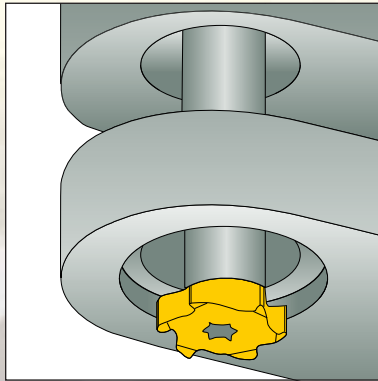
**Bottom Deburring**



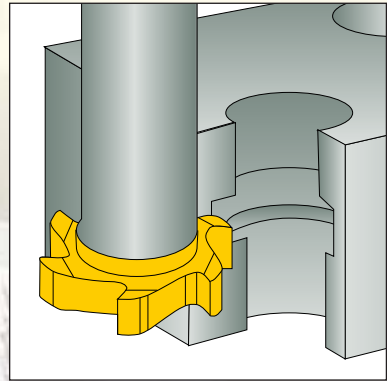
**Circular Groove**



**Straight Groove**



**Bottom Circular Groove**



**Internal Circular Groove**

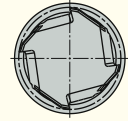
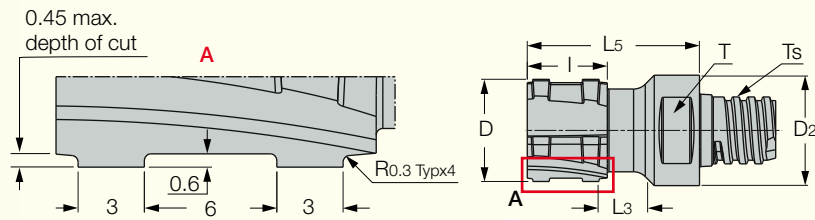
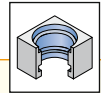


# MULTI-MASTER

INDEXABLE SOLID CARBIDE LINE

## MM TS-DG

Double-Groove Internal Grooving Heads with Threaded Connection, for Tube Sheets of Heat Exchangers



| Designation         | Dimensions                    |       |                |   |                |                |       |                |                  | IC908 |
|---------------------|-------------------------------|-------|----------------|---|----------------|----------------|-------|----------------|------------------|-------|
|                     | D <sub>d</sub> <sup>(1)</sup> | D     | T <sub>s</sub> | Z | L <sub>5</sub> | L <sub>3</sub> | I     | D <sub>2</sub> | T <sup>(2)</sup> |       |
| MM TS155-04T10-8238 | 15.88                         | 15.50 | T10            | 4 | 30.20          | 8.40           | 14.10 | 16.00          | 13.0             | ●     |
| MM TS185-04T12-8239 | 19.05                         | 18.50 | T12            | 4 | 31.20          | 8.80           | 14.50 | 20.00          | 16.0             | ●     |
| MM TS245-04T15-8240 | 25.40                         | 24.50 | T15            | 4 | 37.40          | 11.00          | 14.40 | 23.90          | 20.0             | ●     |

• For shanks, see pages 63-71 • For Clamping keys (should be ordered separately), tightening torques and clamping instructions, see page 8. • Do not apply lubricant to the threaded connection. • For user guide, see pages 72-84.

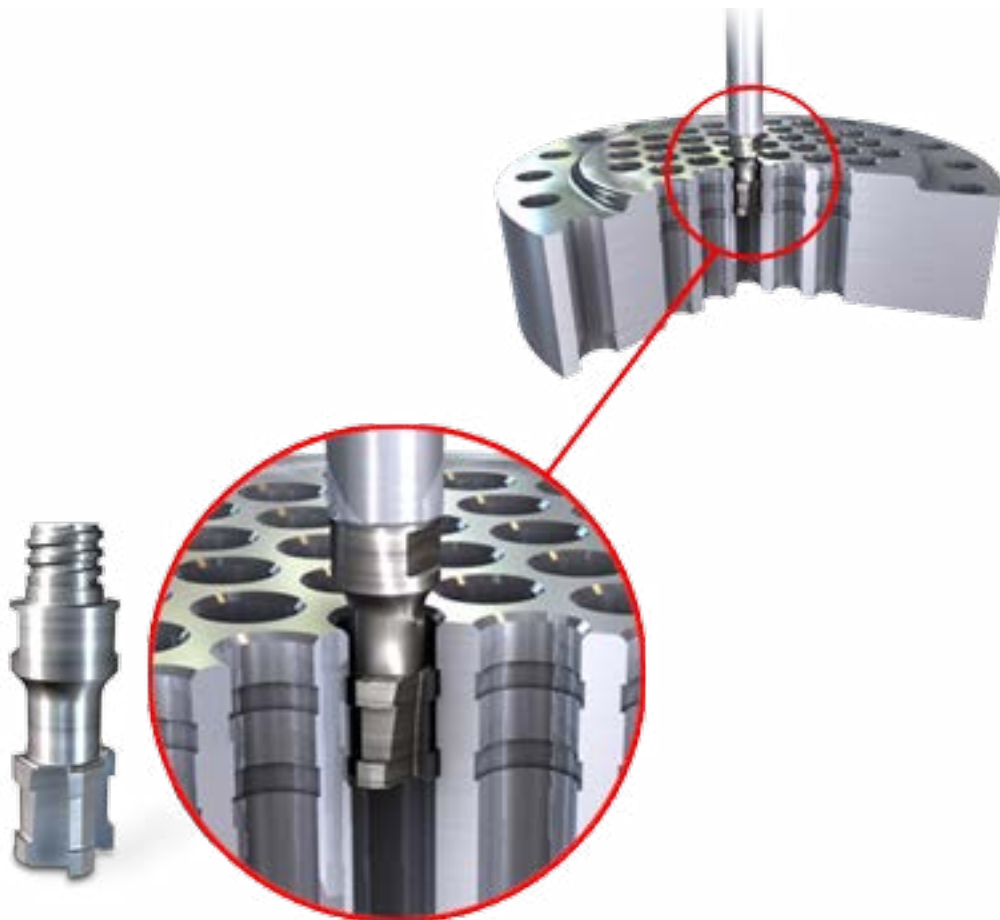
<sup>(1)</sup> For minimum tube outer diameter. <sup>(2)</sup> Clamping wrench size

### Spare Parts



| Designation         | Wrench       |
|---------------------|--------------|
| MM TS155-04T10-8238 | MM KEY 13X8* |
| MM TS185-04T12-8239 | MM KEY 16X9* |
| MM TS245-04T15-8240 | MM KEY 20*   |

\* (Optional, should be ordered separately)



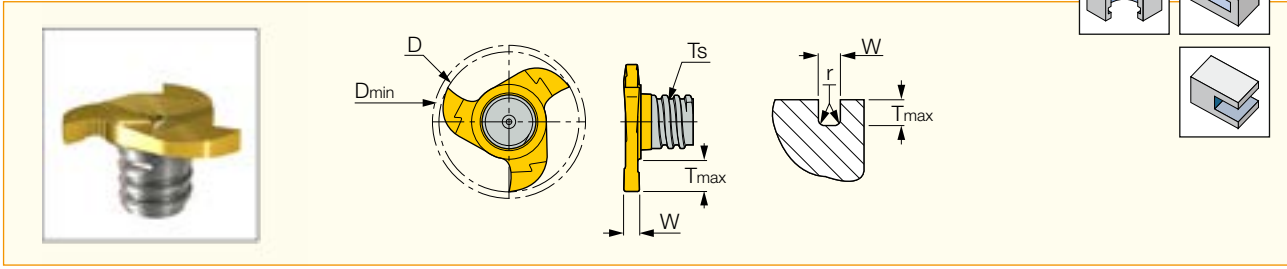
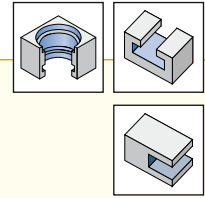
# MULTI-MASTER

INDEXABLE SOLID CARBIDE LINE

## MM GRIT-16K/P,18K/P

Interchangeable Solid Carbide Small Diameter Groove Milling Heads

Engineered for  
**MAXIMUM**  
**MULTI-MASTER**  
Performance



| Designation                          | Dimensions |              |            |   |      |                  |          | IC528 |
|--------------------------------------|------------|--------------|------------|---|------|------------------|----------|-------|
|                                      | D          | W $\pm 0.02$ | T $_{max}$ | Z | r    | D $_{min}^{(2)}$ | T $_{s}$ |       |
| MM GRIT 16K-1.50-0.10                | 15.70      | 1.50         | 2.80       | 3 | 0.10 | 16.00            | T06      | ●     |
| MM GRIT 16P-1.50-0.10                | 15.70      | 1.50         | 2.80       | 3 | 0.10 | 16.00            | T06      | ●     |
| MM GRIT 16K-1.57-0.20                | 15.70      | 1.57         | 2.80       | 3 | 0.20 | 16.00            | T06      | ●     |
| MM GRIT 16K-2.00-0.20                | 15.70      | 2.00         | 2.80       | 3 | 0.20 | 16.00            | T06      | ●     |
| MM GRIT 16P-2.20-1.10                | 15.70      | 2.20         | 2.80       | 3 | 1.10 | 16.00            | T06      | ●     |
| MM GRIT 16K-2.39-0.20                | 15.70      | 2.39         | 2.80       | 3 | 0.20 | 16.00            | T06      | ●     |
| MM GRIT 16K-2.50-0.20                | 15.70      | 2.50         | 2.80       | 3 | 0.20 | 16.00            | T06      | ●     |
| MM GRIT 16K-3.00-0.20                | 15.70      | 3.00         | 2.80       | 3 | 0.20 | 16.00            | T06      | ●     |
| MM GRIT 16P-3.00-0.20                | 15.70      | 3.00         | 2.80       | 3 | 0.20 | 16.00            | T06      | ●     |
| MM GRIT 16K-3.17-0.20                | 15.70      | 3.17         | 2.80       | 3 | 0.20 | 16.00            | T06      | ●     |
| MM GRIT 18K-1.20-0.05 <sup>(1)</sup> | 17.70      | 1.20         | 3.80       | 3 | 0.05 | 18.00            | T06      | ●     |
| MM GRIT 18P-1.20-0.60                | 17.70      | 1.20         | 3.80       | 3 | 0.60 | 18.00            | T06      | ●     |
| MM GRIT 18K-1.40-0.05 <sup>(1)</sup> | 17.70      | 1.40         | 3.80       | 3 | 0.05 | 18.00            | T06      | ●     |
| MM GRIT 18K-1.50-0.10                | 17.70      | 1.50         | 3.80       | 3 | 0.10 | 18.00            | T06      | ●     |
| MM GRIT 18K-1.57-0.20                | 17.70      | 1.57         | 3.80       | 3 | 0.20 | 18.00            | T06      | ●     |
| MM GRIT 18K-1.70-0.05 <sup>(1)</sup> | 17.70      | 1.70         | 3.80       | 3 | 0.05 | 18.00            | T06      | ●     |
| MM GRIT 18K-2.00-0.20                | 17.70      | 2.00         | 3.80       | 3 | 0.20 | 18.00            | T06      | ●     |
| MM GRIT 18P-2.00-1.00                | 17.70      | 2.00         | 3.80       | 3 | 1.00 | 18.00            | T06      | ●     |
| MM GRIT 18P-2.20-1.10                | 17.70      | 2.20         | 3.80       | 3 | 1.10 | 18.00            | T06      | ●     |
| MM GRIT 18K-2.39-0.20                | 17.70      | 2.39         | 3.80       | 3 | 0.20 | 18.00            | T06      | ●     |
| MM GRIT 18K-2.50-0.20                | 17.70      | 2.50         | 3.80       | 3 | 0.20 | 18.00            | T06      | ●     |
| MM GRIT 18K-3.00-0.20                | 17.70      | 3.00         | 3.80       | 3 | 0.20 | 18.00            | T06      | ●     |
| MM GRIT 18P-3.00-1.50                | 17.70      | 3.00         | 3.80       | 3 | 1.50 | 18.00            | T06      | ●     |
| MM GRIT 18K-3.17-0.20                | 17.70      | 3.17         | 3.80       | 3 | 0.20 | 18.00            | T06      | ●     |

• Recommended for O-rings and retaining rings. • MM EGR clamping key is supplied with each MM GRT... shank. • Modification options on request. • Do not apply lubricant to the threaded connection. • Tightening torque: 1000 N x cm • For clamping instructions, see page 8. • For user guide, see pages 72-84. • For shanks, see pages 63-71. • K - For general steel machining. • P - Positive geometry for soft and gummy materials.

<sup>(1)</sup> For circle clips according to DIN 471/472 and ANSI B27.7M <sup>(2)</sup> Minimum bore diameter

### Spare Parts



| Designation         | Clamping Key  |
|---------------------|---------------|
| MM GRIT-16K/P,18K/P | MM EGR 16-18* |

\* (Optional, should be ordered separately)







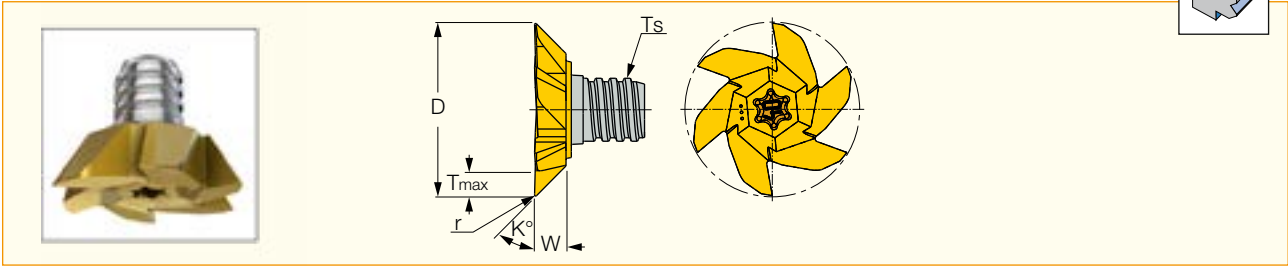
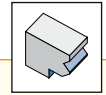
# MULTI-MASTER

INDEXABLE SOLID CARBIDE LINE

## MM GRIT Back Chamfer

Interchangeable Solid Carbide Back Chamfering Heads

Engineered for  
**MAXIMUM**  
**MULTI-MASTER**  
Performance



| Designation          | Dimensions |      |                  |       |      |                |   | IC528 |
|----------------------|------------|------|------------------|-------|------|----------------|---|-------|
|                      | D          | K°   | T <sub>max</sub> | W     | r    | T <sub>s</sub> | Z |       |
| MM GRIT 28K-45D-6T10 | 27.70      | 45.0 | 4.00             | 5.00  | 0.20 | T10            | 6 | ●     |
| MM GRIT 28K-60D-6T10 | 27.70      | 60.0 | 4.00             | 7.80  | 0.20 | T10            | 6 | ●     |
| MM GRIT 28K-75D-6T10 | 27.70      | 75.0 | 2.20             | 10.10 | 0.20 | T10            | 6 | ●     |



MM GRIT 28K-75D-6T10



MM GRIT 28K-60D-6T10



MM GRIT 28K-45D-6T10

### Spare Parts



| Designation          | Key       |
|----------------------|-----------|
| MM GRIT Back Chamfer | T-40/3 L* |

\* (Optional, should be ordered separately)

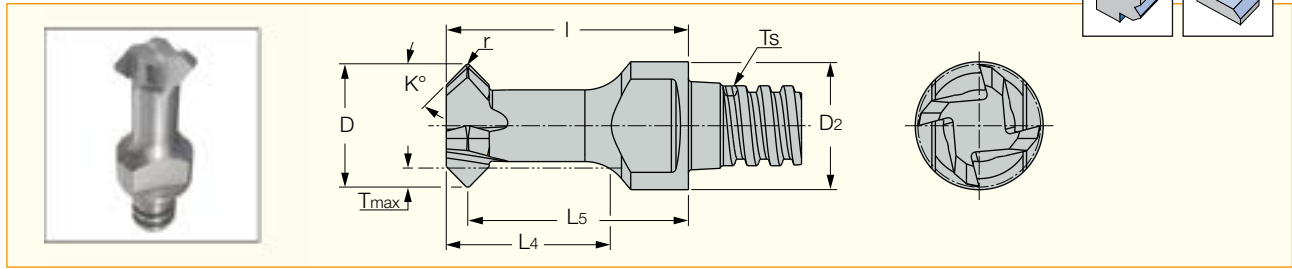
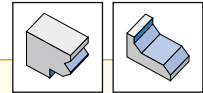


# MULTI-MASTER

INDEXABLE SOLID CARBIDE LINE

## MM TS-45

Interchangeable Solid Carbide Small Diameter 45° Chamfering Heads



| Dimensions                  |      |      |                  |      |   |       |                |                |                |                | IC908 |
|-----------------------------|------|------|------------------|------|---|-------|----------------|----------------|----------------|----------------|-------|
| Designation                 | D    | K°   | T <sub>max</sub> | r    | Z | I     | T <sub>s</sub> | D <sub>2</sub> | L <sub>4</sub> | L <sub>5</sub> |       |
| <b>MM TS077-45-20A-4T05</b> | 7.70 | 45.0 | 1.20             | 0.20 | 4 | 15.20 | T05            | 8.00           | 10.3           | 13.85          | ●     |

- For Clamping keys (should be ordered separately), tightening torques and clamping instructions, see page 8
- Do not apply lubricant to the threaded connection

### Spare Parts

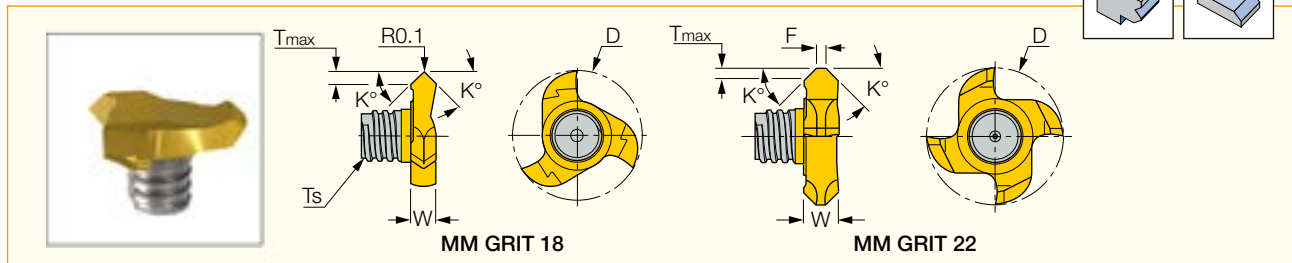
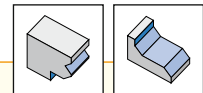


| Designation     | Wrench      |
|-----------------|-------------|
| <b>MM TS-45</b> | MM KEY 6X4* |

\* (Optional, should be ordered separately)

## MM GRIT-K/P-45A

Interchangeable Solid Carbide Small Diameter 45° Chamfering Heads



| Dimensions             |       |      |                  |      |      |                |   |               |   | IC528 |
|------------------------|-------|------|------------------|------|------|----------------|---|---------------|---|-------|
| Designation            | D     | K°   | T <sub>max</sub> | F    | W    | T <sub>s</sub> | Z | Clamping Key  |   |       |
| <b>MM GRIT 18K-45A</b> | 17.70 | 45.0 | 1.40             | -    | 3.40 | T06            | 3 | MM EGR 16-18* | ● |       |
| <b>MM GRIT 18P-45A</b> | 17.70 | 45.0 | 1.40             | -    | 3.40 | T06            | 3 | MM EGR 16-18* | ● |       |
| <b>MM GRIT 22K-45A</b> | 21.70 | 45.0 | 1.70             | 1.50 | 5.50 | T08            | 4 | MM EGR 20-22* | ● |       |
| <b>MM GRIT 22P-45A</b> | 21.70 | 45.0 | 1.70             | 1.50 | 5.50 | T08            | 4 | MM EGR 20-22* | ● |       |
| <b>MM GRIT 28K-45A</b> | 27.70 | 45.0 | 4.00             | 0.50 | 9.80 | T10            | 6 | T-40/3 L*     | ● |       |

- Use carbide shanks for groove milling heads.
- Each MM GRT shank is supplied with MM EGR clamping key.
- Keys for other milling heads must be ordered separately.
- MM GRT. shanks serve mainly for MM GRIT.. slitting heads.
- K-Type - For general steel machining.
- P-Type - Positive geometry for soft and gummy materials.
- For user guide, see pages 72-84.

Engineered for  
**MAXIMUM**  
**MULTI-MATERIAL**  
Performance





Engineered for  
**MAXIMUM**  
**MULTI-MASTER**  
Performance



## **MULTI-MASTER**

### **Thread Milling Heads**

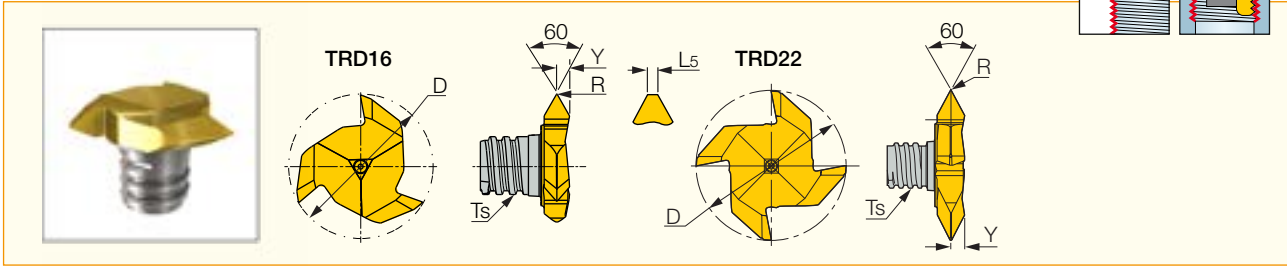
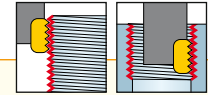
MULTI-MASTER thread milling heads can be used on any of the large variety of MULTI-MASTER steel, carbide and heavy metal shanks with the proper thread connection size. Another advantage is that the thread milling head can be replaced on the machine without having to set-up the edge location; a substantial time saver.

Available are 60 and 55° partial profile thread milling heads and ISO, UN and Whitworth standard profiles for external and internal thread milling applications.



## MM TRD-M

Interchangeable Solid Carbide Milling Heads, for 60° Partial Profile Thread Milling



| Dimensions            |       |   |                  |                  |                  |                |     |                |                               |                  |                |   | IC528 |
|-----------------------|-------|---|------------------|------------------|------------------|----------------|-----|----------------|-------------------------------|------------------|----------------|---|-------|
| Designation           | D     | Z | P <sub>min</sub> | P <sub>max</sub> | R                | L <sub>s</sub> | Y   | T <sub>s</sub> | T <sub>h</sub> <sup>(1)</sup> | D <sub>min</sub> | Standard       |   |       |
| MM TRD16-M60-05P-3T06 | 15.70 | 3 | 0.50             | 2.00             | - <sup>(2)</sup> | 0.05           | 1.2 | T06            | M20                           | 19.05            | ISO 68, DIN 13 | ● |       |
| MM TRD16-M60-15P-3T06 | 15.70 | 3 | 1.50             | 2.00             | 0.05             | -              | 1.2 | T06            | M22                           | 19.05            | ISO 68, DIN 13 | ● |       |
| MM TRD22-M60-30P-4T08 | 21.70 | 4 | 3.00             | 4.50             | 0.20             | -              | 2.8 | T08            | M36                           | 31.00            | ISO 68, DIN 13 | ● |       |

• For shanks, see pages 63-71 • For clamping instructions, see page 8. • Do not apply lubricant to the threaded connection.

<sup>(1)</sup> Smallest possible thread <sup>(2)</sup> Flat

### Spare Parts

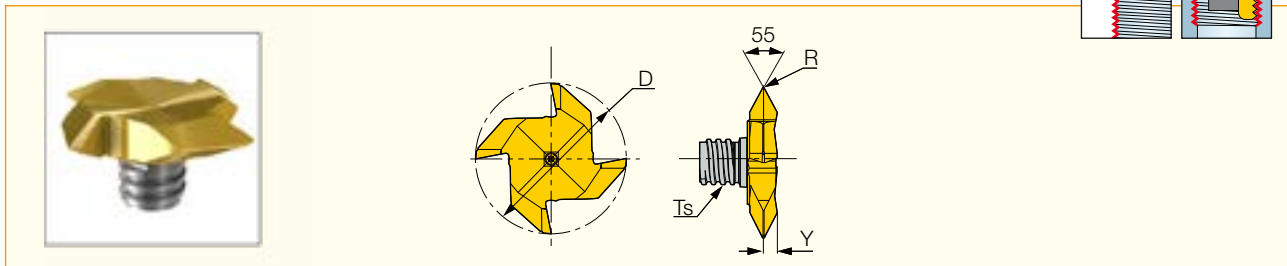
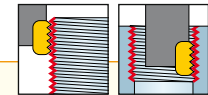


| Designation           | Clamping Key  |
|-----------------------|---------------|
| MM TRD16-M60-05P-3T06 | MM EGR 16-18* |
| MM TRD16-M60-15P-3T06 | MM EGR 16-18* |
| MM TRD22-M60-30P-4T08 | MM EGR 20-22* |

\* (Optional, should be ordered separately)

## MM TRD-W

Interchangeable Solid Carbide Milling Heads, for 55° Partial Profile Thread Milling



| Dimensions            |       |   |      |     |                    |                    |                |                |                  |                      |   | IC528 |
|-----------------------|-------|---|------|-----|--------------------|--------------------|----------------|----------------|------------------|----------------------|---|-------|
| Designation           | D     | Z | R    | Y   | TPI <sub>max</sub> | TPI <sub>min</sub> | T <sub>s</sub> | T <sub>h</sub> | D <sub>min</sub> | Standard             |   |       |
| MM TRD22-W55-14P-4T08 | 21.70 | 4 | 0.20 | 2.4 | 14                 | 11                 | T08            | G3/4           | 24.20            | DIN ISO 228, B.S. 84 | ● |       |

• For shanks, see pages 63-71 • For clamping instructions, see page 8. • Do not apply lubricant to the threaded connection.

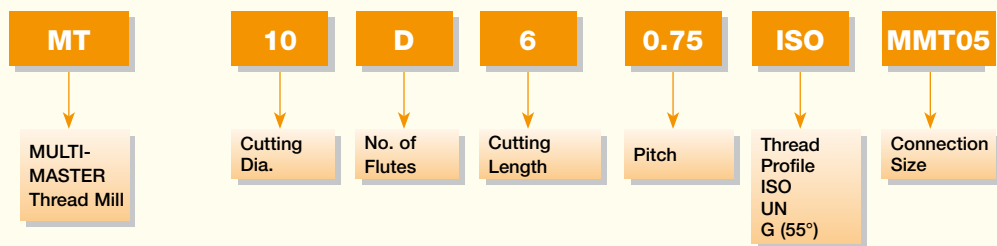
### Spare Parts



| Designation | Clamping Key  |
|-------------|---------------|
| MM TRD-W    | MM EGR 20-22* |

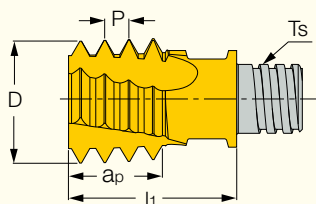


## Identification Code



## MT-ISO-MM

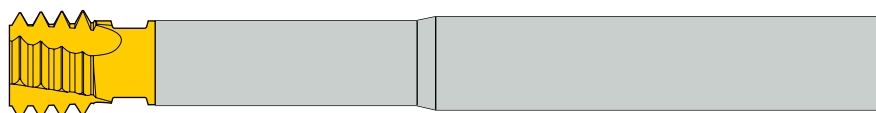
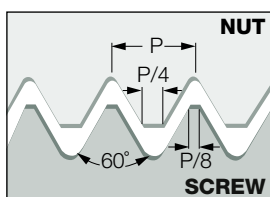
Carbide Milling Heads with a Threaded Connection for Internal ISO Metric Thread



Application: General engineering

| Designation           | Dimensions |          |        |       |       |                |                |                |   | IC908 |
|-----------------------|------------|----------|--------|-------|-------|----------------|----------------|----------------|---|-------|
|                       | Pitch      | M Coarse | M Fine | D     | Flute | a <sub>p</sub> | l <sub>1</sub> | T <sub>s</sub> |   |       |
| MT 10D6 0.75ISO-MMT05 | 0.75       | -        | ≥12    | 10.00 | 4     | 6.00           | 12.75          | T05            | ● |       |
| MT 10D6 1.0ISO-MMT05  | 1.00       | -        | ≥12    | 10.00 | 4     | 6.00           | 12.75          | T05            | ● |       |
| MT 10D6 1.5ISO-MMT05  | 1.50       | -        | ≥14    | 10.00 | 4     | 6.00           | 12.75          | T05            | ● |       |
| MT 12D7 1.5ISO-MMT06  | 1.50       | -        | ≥16    | 12.00 | 4     | 7.50           | 17.05          | T06            | ● |       |
| MT 12D8 2.0ISO-MMT06  | 2.00       | M16      | ≥17    | 12.00 | 4     | 8.00           | 17.05          | T06            | ● |       |
| MT 16F12 1.5ISO-MMT08 | 1.50       | -        | ≥20    | 16.00 | 6     | 12.00          | 20.85          | T08            | ● |       |
| MT 16E12 2.0ISO-MMT08 | 2.00       | -        | ≥19    | 16.00 | 5     | 12.00          | 20.85          | T08            | ● |       |
| MT 15E12 2.5ISO-MMT08 | 2.50       | M20      | ≥22    | 15.40 | 5     | 12.50          | 20.85          | T08            | ● |       |
| MT 16C12 3.0ISO-MMT08 | 3.00       | M24      | ≥25    | 16.00 | 3     | 12.00          | 20.85          | T08            | ● |       |

• For shanks, see pages 63-71 • For Clamping keys (should be ordered separately), tightening torques and clamping instructions, see page 8. • Do not apply lubricant to the threaded connection



## Clamping Wrench

| Designation | Thread Size | Key <sup>(1)</sup> | Tightening Torque (NxcM) |
|-------------|-------------|--------------------|--------------------------|
| MM... T05   | T05         | MM KEY 6x4         | 700                      |
| MM... T06   | T06         | MM KEY 8x5         | 1000                     |
| MM... T08   | T08         | MM KEY 10x7        | 1500                     |

<sup>(1)</sup> Order separately

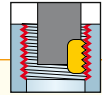
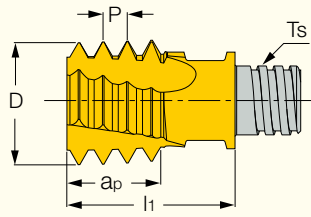
# SOLIDTHREAD • MULTI-MASTER

INDEXABLE SOLID CARBIDE LINE

## MT-UN-MM

Carbide Milling Heads with a Threaded Connection, for Internal UN Thread Profile

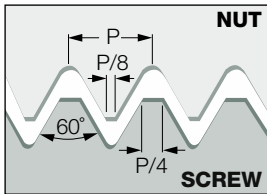
Engineered for  
**MAXIMUM**  
**MULTI-MASTER**  
Performance



Application: General engineering

| Designation         | Dimensions |     |          |             |       |       |       |       |       |   | IC908 |
|---------------------|------------|-----|----------|-------------|-------|-------|-------|-------|-------|---|-------|
|                     | TPI        | UNC | UNF      | UNEF        | D     | Flute | $a_p$ | $l_1$ | $T_s$ |   |       |
| MT 10D6 24UN-MMT05  | 24.0       | -   | -        | 9/16-5/8    | 10.00 | 4     | 5.30  | 12.75 | T05   | ● |       |
| MT 10D6 20UN-MMT05  | 20.0       | -   | 1/2      | -           | 10.00 | 4     | 5.10  | 12.75 | T05   | ● |       |
| MT 10D5 18UN-MMT05  | 18.0       | -   | 9/16-5/8 | 1 1/8-1 5/8 | 10.00 | 4     | 5.60  | 12.75 | T05   | ● |       |
| MT 12D8 16UN-MMT06  | 16.0       | -   | 3/4      | -           | 12.00 | 4     | 8.00  | 17.05 | T06   | ● |       |
| MT 16E12 14UN-MMT08 | 14.0       | -   | 7/8      | -           | 16.00 | 5     | 12.70 | 20.85 | T08   | ● |       |
| MT 16E12 12UN-MMT08 | 12.0       | -   | 1-1 1/2  | -           | 16.00 | 5     | 12.70 | 20.85 | T08   | ● |       |
| MT 15D12 10UN-MMT08 | 10.0       | 3/4 | -        | -           | 15.30 | 4     | 12.70 | 20.85 | T08   | ● |       |
| MT 16C11 9UN-MMT08  | 9.0        | 7/8 | -        | -           | 16.00 | 3     | 11.30 | 20.85 | T08   | ● |       |
| MT 16C12 8UN-MMT08  | 8.0        | 1.0 | -        | -           | 16.00 | 3     | 12.70 | 20.85 | T08   | ● |       |

• For shanks, see pages 63-71 • For Clamping keys (should be ordered separately), tightening torques and clamping instructions, see page 8. • Do not apply lubricant to the threaded connection

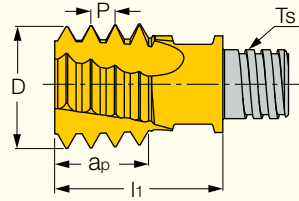
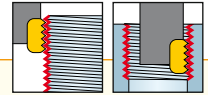


# SOLIDTHREAD • MULTI-MASTER

INDEXABLE SOLID CARBIDE LINE

## MT-W-MM

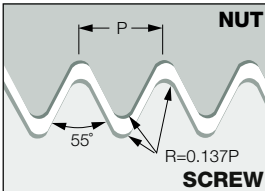
Carbide Milling Heads with a Threaded Connection, for Internal and External 55° BSW Thread Profile



Application: General engineering fittings and pipe couplings

| Designation        | Dimensions |          |       |       |       |       |       | IC908 |
|--------------------|------------|----------|-------|-------|-------|-------|-------|-------|
|                    | TPI        | BSP      | D     | Flute | $a_p$ | $l_1$ | $T_s$ |       |
| MT 10D6 19W-MMT05  | 19.0       | G1/4-3/8 | 10.00 | 4     | 5.30  | 12.75 | T05   | ●     |
| MT 16D12 14W-MMT08 | 14.0       | G1/2-7/8 | 16.00 | 4     | 12.70 | 20.85 | T08   | ●     |
| MT 16D11 11W-MMT08 | 11.0       | G>=1     | 16.00 | 4     | 11.60 | 20.85 | T08   | ●     |

• For shanks, see pages 63-71 • For Clamping keys (should be ordered separately), tightening torques and clamping instructions, see page 8. • Do not apply lubricant to the threaded connection



Engineered for  
**MAXIMUM**  
**MULTI-MASTER**  
Performance



Engineered for  
**MAXIMUM**  
**MULTI-MASTER**  
Performance



## **Tools for High Feed Milling (HFM)**

In high feed milling, a shallow depth of cut combined with an appropriate cutting geometry allows for considerable increase in feed per tooth. In addition, such a combination minimizes the radial component of a cutting force and maximizes its axial component. Therefore, the resultant force of the components acts towards the spindle axis of a machine tool. Consequently, it causes substantial vibration reduction and correspondingly stability of milling.

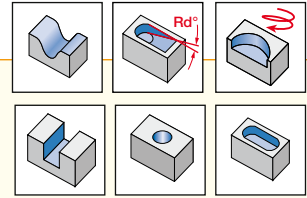
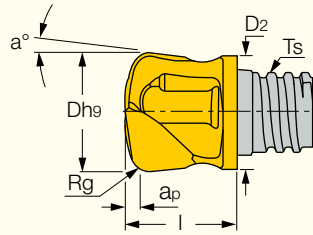


# MULTI-MASTER • SOLID<sup>FEED</sup> MILL

INDEXABLE SOLID CARBIDE LINE  
MM FF

2 Flute FEEDMILL Interchangeable Solid Carbide Heads,  
for Milling at Very Fast Feed and Small D.O.C.

Engineered for  
**MAXIMUM**  
**MULTI-MASTER**  
Performance



**ECONOMICAL SOLUTION**

| Designation                  | Dimensions |       |                |                               |                |                |       |    |                  | Tough ↔ Hard |       | Recommended Machining Data<br><br>f <sub>z</sub><br>(mm/t) |
|------------------------------|------------|-------|----------------|-------------------------------|----------------|----------------|-------|----|------------------|--------------|-------|------------------------------------------------------------|
|                              | D          | Flute | a <sub>p</sub> | R <sub>g</sub> <sup>(1)</sup> | T <sub>s</sub> | D <sub>2</sub> | l     | a° | R <sub>d</sub> ° | IC908        | IC903 |                                                            |
| <b>MM FF100R1.5-L12-2T06</b> | 10.00      | 2     | 0.60           | 2.00                          | T06            | 9.60           | 12.50 | 7  | 7.0              | ●            |       | 0.30-0.60                                                  |
| <b>MM FF120R2.0-2T08</b>     | 12.00      | 2     | 0.68           | 2.50                          | T08            | 11.50          | 11.10 | 7  | 7.0              | ●            | ●     | 0.50-1.00                                                  |
| <b>MM FF500R08-L59-2T08</b>  | 12.70      | 2     | 0.68           | 2.50                          | T08            | 11.50          | 15.00 | 5  | 7.0              | ●            |       | 0.50-1.00                                                  |
| <b>MM FF160R2.0-2T10</b>     | 16.00      | 2     | 1.10           | 3.00                          | T10            | 15.20          | 13.50 | 7  | 7.0              | ●            |       | 0.55-1.10                                                  |
| <b>MM FF200R2.0-2T12</b>     | 20.00      | 2     | 1.50           | 3.40                          | T12            | 18.30          | 17.40 | 5  | 7.0              | ●            |       | 0.75-1.50                                                  |

• For shanks, see pages 63-71 • For Clamping keys (should be ordered separately), tightening torques and clamping instructions, see page 8. • Do not apply lubricant to the threaded connection. • For user guide, see pages 72-84.

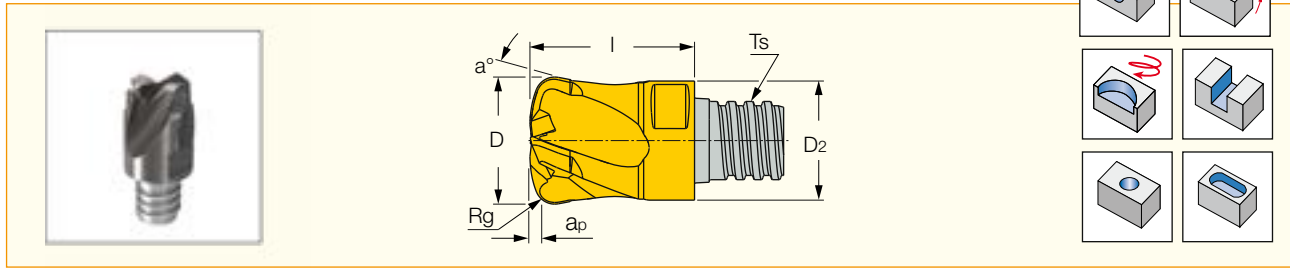
<sup>(1)</sup> Radius for programming



# MULTI-MASTER • SOLID<sup>FEED</sup> MILL

INDEXABLE SOLID CARBIDE LINE  
MM EFF

4, 6 Flute Solid Carbide Heads for Milling at Very Fast Feed and Small D.O.C.



| Designation                          | Dimensions |   |                |                |                |       |    |                               | Tough ↔ Hard |       | Recommended Machining Data<br>f <sub>z</sub> (mm/t) |
|--------------------------------------|------------|---|----------------|----------------|----------------|-------|----|-------------------------------|--------------|-------|-----------------------------------------------------|
|                                      | D          | Z | a <sub>p</sub> | T <sub>s</sub> | D <sub>2</sub> | l     | a° | R <sub>g</sub> <sup>(3)</sup> | IC908        | IC903 |                                                     |
| MM EFF080T3R1.62-4T05                | 8.00       | 4 | 0.40           | T05            | 7.50           | 10.00 | 7  | 1.62                          |              | ●     | 0.12-0.48                                           |
| MM EFF100T4R2.01-4T06                | 10.00      | 4 | 0.50           | T06            | 9.50           | 13.00 | 7  | 2.01                          |              | ●     | 0.16-0.57                                           |
| MM EFF120T4R1.8-4T08H <sup>(1)</sup> | 12.00      | 4 | 0.60           | T08            | 11.50          | 16.50 | 7  | 1.80                          | ●            |       | 0.16-0.67                                           |
| MM EFF120T4R2.47-4T08                | 12.00      | 4 | 0.60           | T08            | 11.50          | 16.50 | 7  | 2.47                          |              | ●     | 0.16-0.67                                           |
| MM EFF127T4R2.59-4T08                | 12.70      | 4 | 0.60           | T08            | 12.20          | 16.50 | 7  | 2.59                          |              | ●     | 0.16-0.67                                           |
| MM EFF160T5R2.2-4T10H <sup>(1)</sup> | 16.00      | 4 | 0.80           | T10            | 15.40          | 20.50 | 7  | 2.20                          | ●            |       | 0.20-0.75                                           |
| MM EFF160T5R3.25-4T10                | 16.00      | 4 | 0.80           | T10            | 15.40          | 20.50 | 7  | 3.25                          |              | ●     | 0.20-0.75                                           |
| MM EFF200T6R4.02-4T12                | 20.00      | 4 | 1.00           | T12            | 18.45          | 25.50 | 7  | 4.02                          |              | ●     | 0.20-0.90                                           |
| MM EFF250A7R3.1-6T15 <sup>(2)</sup>  | 25.00      | 6 | 1.20           | T15            | 23.90          | 25.00 | 7  | 3.10                          |              | ●     | 0.25-1.00                                           |
| MM EFF254A7R3.63-6T15 <sup>(2)</sup> | 25.40      | 6 | 1.20           | T15            | 23.90          | 25.00 | 7  | 3.10                          |              | ●     | 0.25-1.00                                           |

• For shanks, see pages 63-71 • For Clamping keys (should be ordered separately), tightening torques and clamping instructions, see page 8. • Do not apply lubricant to the threaded connection. • For user guide, see pages 72-84.

<sup>(1)</sup> With a central coolant hole <sup>(2)</sup> Cannot be used for plunging application <sup>(3)</sup> Radius for programming

## Machining Recommendations

| VDI 3323 | Material Group <sup>(1)</sup> | Vc (m/min) | Fz (mm/t) vs. Tool Diameter (mm) |                |      |      |      |      |      |      |
|----------|-------------------------------|------------|----------------------------------|----------------|------|------|------|------|------|------|
|          |                               |            | a <sub>p</sub>                   | a <sub>e</sub> | 8    | 10   | 12   | 16   | 20   | 25   |
| P        | 1                             | 180        | 0.045xD                          | 0.7xD          | 0.48 | 0.57 | 0.67 | 0.75 | 0.90 | 1.00 |
|          | 2                             | 160        | 0.045xD                          | 0.7xD          | 0.48 | 0.57 | 0.67 | 0.75 | 0.90 | 1.00 |
|          | 3                             | 160        | 0.045xD                          | 0.7xD          | 0.48 | 0.57 | 0.67 | 0.75 | 0.90 | 1.00 |
|          | 4                             | 160        | 0.045xD                          | 0.7xD          | 0.48 | 0.57 | 0.67 | 0.75 | 0.90 | 1.00 |
|          | 5                             | 150        | 0.045xD                          | 0.7xD          | 0.43 | 0.50 | 0.57 | 0.65 | 0.75 | 0.87 |
|          | 6                             | 150        | 0.045xD                          | 0.7xD          | 0.33 | 0.40 | 0.48 | 0.57 | 0.67 | 0.78 |
|          | 7                             | 140        | 0.045xD                          | 0.7xD          | 0.33 | 0.40 | 0.48 | 0.57 | 0.67 | 0.78 |
|          | 8                             | 140        | 0.045xD                          | 0.7xD          | 0.30 | 0.35 | 0.43 | 0.52 | 0.60 | 0.70 |
|          | 9                             | 140        | 0.045xD                          | 0.7xD          | 0.30 | 0.35 | 0.43 | 0.52 | 0.60 | 0.70 |
|          | 10                            | 130        | 0.04xD                           | 0.6xD          | 0.28 | 0.33 | 0.38 | 0.48 | 0.57 | 0.67 |
|          | 11                            | 120        | 0.04xD                           | 0.6xD          | 0.25 | 0.30 | 0.35 | 0.43 | 0.52 | 0.62 |
|          | 12                            | 120        | 0.04xD                           | 0.6xD          | 0.30 | 0.35 | 0.43 | 0.52 | 0.60 | 0.70 |
|          | 13                            | 120        | 0.04xD                           | 0.6xD          | 0.30 | 0.35 | 0.43 | 0.52 | 0.60 | 0.70 |
| K        | 15-16                         | 180        | A <sub>pmax</sub>                | 0.7xD          | 0.45 | 0.52 | 0.60 | 0.70 | 0.80 | 0.90 |
|          | 17-18                         | 160        | A <sub>pmax</sub>                | 0.7xD          | 0.38 | 0.45 | 0.52 | 0.60 | 0.70 | 0.80 |
| H        | 38.1 <sup>(2)</sup>           | 100        | 0.035xD                          | 0.45xD         | 0.20 | 0.25 | 0.33 | 0.40 | 0.48 | 0.55 |
|          | 38.2 <sup>(3)</sup>           | 80         | 0.03xD                           | 0.3xD          | 0.16 | 0.22 | 0.30 | 0.38 | 0.45 | 0.52 |
|          | 39 <sup>(4)</sup>             | 60         | 0.02xD                           | 0.25xD         | 0.12 | 0.16 | 0.16 | 0.20 | 0.20 | 0.25 |

<sup>(1)</sup> ISCAR material group in accordance with VDI 3323 standard

<sup>(2)</sup> 45-49 HRC

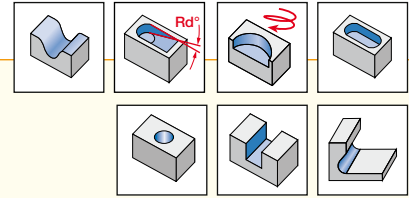
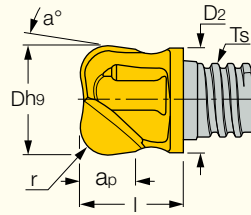
<sup>(3)</sup> 50-55 HRC

<sup>(4)</sup> 56-63 HRC

a<sub>p</sub> - Depth of cut

a<sub>e</sub> - Width of cut





**ECONOMICAL SOLUTION**

| Designation          | Dimensions |       |       |      |                   |     |       |       |    | Tough ← Hard |       |
|----------------------|------------|-------|-------|------|-------------------|-----|-------|-------|----|--------------|-------|
|                      | D          | Flute | ap    | r    | Tm <sup>(1)</sup> | Ts  | D2    | l     | a° | IC908        | IC903 |
| MM HT100C08R0.5-2T06 | 10.00      | 2     | 7.00  | 0.50 | r0-1.0            | T06 | 9.60  | 12.45 | 5  | ●            |       |
| MM HT100C08R1.0-2T06 | 10.00      | 2     | 7.00  | 1.00 | r0-1.0            | T06 | 9.60  | 12.45 | 5  | ●            |       |
| MM HT100N06R2.0-2T06 | 10.00      | 2     | 6.00  | 2.00 | r0-3.0            | T06 | 9.60  | 12.40 | 7  | ●            |       |
| MM HT100N07R0.5-2T06 | 10.00      | 2     | 6.90  | 0.50 | r0-1.0            | T06 | 9.60  | 11.20 | 5  |              | ●     |
| MM HT100N07R1.0-2T06 | 10.00      | 2     | 6.90  | 1.00 | r0-1.0            | T06 | 9.60  | 11.20 | 5  |              | ●     |
| MM HT100N07R2.0-2T06 | 10.00      | 2     | 6.90  | 2.00 | r0-3.0            | T06 | 9.60  | 11.20 | 5  |              | ●     |
| MM HT100N07R3.0-2T06 | 10.00      | 2     | 6.90  | 3.00 | r2.7-4.0          | T06 | 9.60  | 11.20 | 5  |              | ●     |
| MM HT120N06R3.0-2T06 | 12.00      | 2     | 5.40  | 3.00 | r2.7-4.0          | T06 | 9.10  | 9.10  | 7  | ●            |       |
| MM HT120N06R4.0-2T06 | 12.00      | 2     | 5.10  | 4.00 | r2.7-4.0          | T06 | 11.50 | 9.10  | 7  | ●            |       |
| MM HT120N06R1.6-2T08 | 12.00      | 2     | 5.70  | 1.60 | r1.3-r2.7         | T08 | 11.50 | 11.10 | 7  | ●            | ●     |
| MM HT120N06R2.0-2T08 | 12.00      | 2     | 5.90  | 2.00 | r1.3-2.7          | T08 | 11.50 | 11.10 | 7  | ●            | ●     |
| MM HT120N06R2.5-2T08 | 12.00      | 2     | 5.50  | 2.50 | r1.3-4.0          | T08 | 11.50 | 11.10 | 7  | ●            |       |
| MM HT120N06R3.0-2T08 | 12.00      | 2     | 5.50  | 3.00 | r2.7-4.4          | T08 | 11.50 | 11.10 | 7  | ●            | ●     |
| MM HT120N06R4.0-2T08 | 12.00      | 2     | 5.60  | 4.00 | r2.7-4.4          | T08 | 11.50 | 11.10 | 7  | ●            |       |
| MM HT160N07R2.0-2T10 | 16.00      | 2     | 6.90  | 2.00 | r1.5-4.0          | T10 | 15.20 | 13.10 | 7  | ●            |       |
| MM HT160N07R3.0-2T10 | 16.00      | 2     | 7.20  | 3.00 | r1.5-4.0          | T10 | 15.20 | 13.40 | 7  | ●            |       |
| MM HT160N07R4.0-2T10 | 16.00      | 2     | 7.10  | 4.00 | r1.5-4.0          | T10 | 15.20 | 13.40 | 7  | ●            |       |
| MM HT160N08R5.0-2T10 | 16.00      | 2     | 8.00  | 5.00 | r2.7-4.4          | T10 | 15.20 | 20.20 | 7  | ●            | ●     |
| MM HT200N11R3.0-2T12 | 20.00      | 2     | 10.80 | 3.00 | r3.0-8.0          | T12 | 18.30 | 17.00 | 7  | ●            |       |
| MM HT200N11R4.0-2T12 | 20.00      | 2     | 11.10 | 4.00 | r3.0-8.0          | T12 | 18.30 | 17.30 | 7  | ●            |       |
| MM HT200N11R5.0-2T12 | 20.00      | 2     | 11.10 | 5.00 | r3.0-8.0          | T12 | 18.30 | 17.30 | 7  | ●            |       |
| MM HT200N11R6.0-2T12 | 20.00      | 2     | 11.00 | 6.00 | r3.0-8.0          | T12 | 18.30 | 17.30 | 7  | ●            |       |
| MM HT200N11R8.0-2T12 | 20.00      | 2     | 10.90 | 8.00 | r3.0-8.0          | T12 | 18.30 | 17.30 | 7  | ●            |       |

• For shanks, see pages 63-71 • For Clamping keys (should be ordered separately), tightening torques and clamping instructions, see page 8. • Do not apply lubricant to the threaded connection. • For user guide, see pages 72-84.

<sup>(1)</sup> Specially tailored radius range upon request

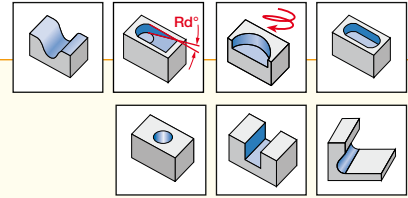
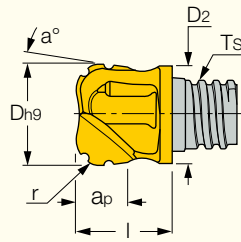


# MULTI-MASTER

INDEXABLE SOLID CARBIDE LINE

## MM HT-NCSR

2 Flute Chip Splitting Toroidal, Solid Carbide Milling Heads



**ECONOMICAL SOLUTION**

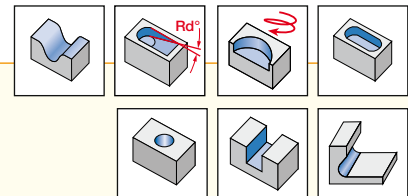
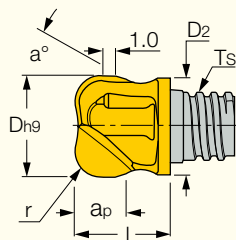
| Designation                 | Dimensions |       |       |      |             |       |       |       |           | IC908 |
|-----------------------------|------------|-------|-------|------|-------------|-------|-------|-------|-----------|-------|
|                             | D          | Flute | $a_p$ | r    | $T_m^{(1)}$ | $T_s$ | $D_2$ | l     | $a^\circ$ |       |
| <b>MM HT120NCSR3.0-2T08</b> | 12.00      | 2     | 5.50  | 3.00 | r2.7-4.4    | T08   | 11.50 | 11.10 | 7         | ●     |

• For shanks, see pages 63-71 • For Clamping keys (should be ordered separately), tightening torques and clamping instructions, see page 8. • Do not apply lubricant to the threaded connection. • For user guide, see pages 72-84.

<sup>(1)</sup> Specially tailored radius range, available upon request.

## MM HT-NWFR

2 Flute Toroidal Solid Carbide Milling Heads with a Side Tangential Wiper

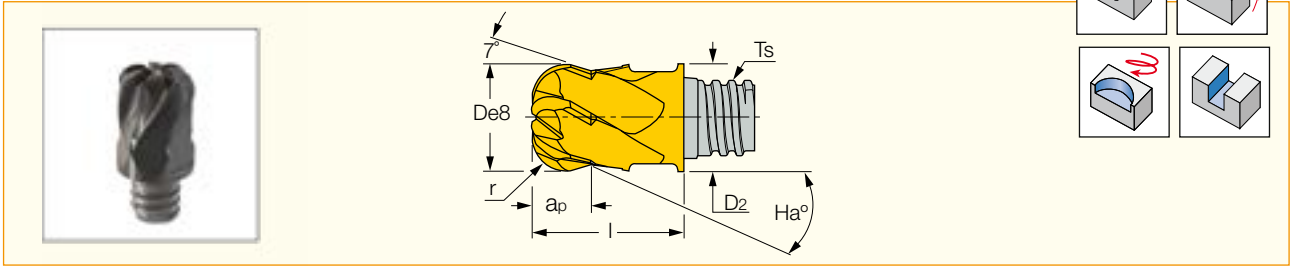


**ECONOMICAL SOLUTION**

| Designation                 | Dimensions |       |       |      |             |       |       |       |           | IC908 |
|-----------------------------|------------|-------|-------|------|-------------|-------|-------|-------|-----------|-------|
|                             | D          | Flute | $a_p$ | r    | $T_m^{(1)}$ | $T_s$ | $D_2$ | l     | $a^\circ$ |       |
| <b>MM HT120NWFR3.0-2T08</b> | 12.00      | 2     | 5.30  | 3.00 | r2.7-4.4    | T08   | 11.50 | 11.10 | 7         | ●     |

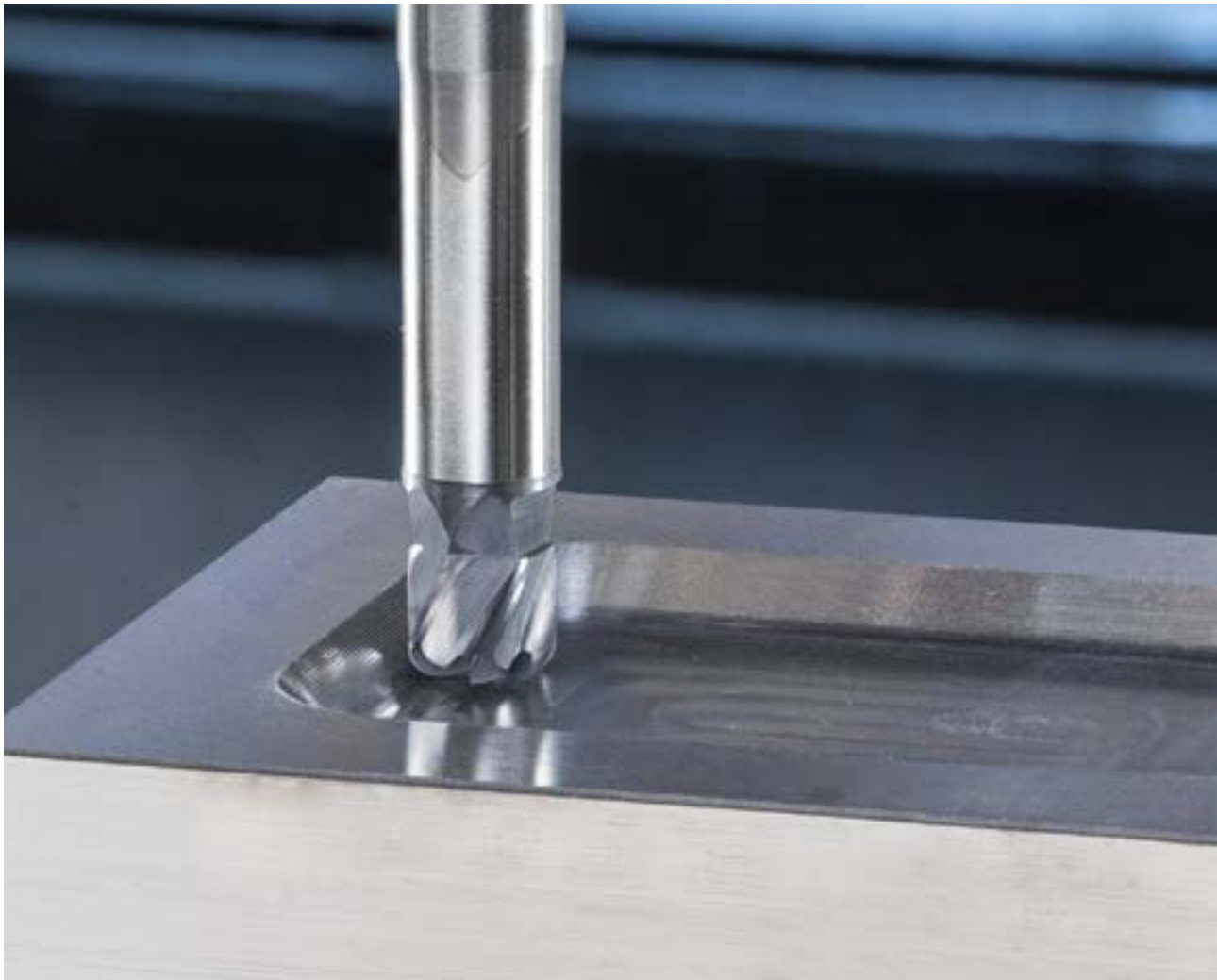
• For shanks, see pages 63-71 • For Clamping keys (should be ordered separately), tightening torques and clamping instructions, see page 8. • Do not apply lubricant to the threaded connection. • For user guide, see pages 72-84.

<sup>(1)</sup> Specially tailored radius range, available upon request.



| Designation                  | Dimensions |       |       |      |     |       |       |      |     | Tough ↔ Hard |       |
|------------------------------|------------|-------|-------|------|-----|-------|-------|------|-----|--------------|-------|
|                              | D          | Flute | ap    | r    | Ts  | D2    | l     | Ha°  | Rd° | IC908        | IC903 |
| <b>MM ETR080A04R2.0-6T05</b> | 8.00       | 6     | 5.00  | 2.00 | T05 | 7.70  | 10.00 | 30.0 | 9.0 | ●            |       |
| <b>MM ETR080A4R05CF-6T05</b> | 8.00       | 6     | 4.00  | 0.50 | T05 | 7.70  | 0.00  | 10.0 | 9.0 |              | ●     |
| <b>MM ETR080A4R10CF-6T05</b> | 8.00       | 6     | 4.00  | 1.00 | T05 | 7.70  | 0.00  | 10.0 | 9.0 |              | ●     |
| <b>MM ETR100A05R3.0-6T06</b> | 10.00      | 6     | 7.00  | 3.00 | T06 | 9.60  | 13.00 | 30.0 | 9.0 | ●            |       |
| <b>MM ETR100A5R05CF-6T06</b> | 10.00      | 6     | 5.00  | 0.50 | T06 | 9.60  | 0.00  | 13.0 | 9.0 |              | ●     |
| <b>MM ETR100A5R10CF-6T06</b> | 10.00      | 6     | 5.00  | 1.00 | T06 | 9.60  | 0.00  | 13.0 | 9.0 |              | ●     |
| <b>MM ETR120A07R4.0-6T08</b> | 12.00      | 6     | 9.00  | 4.00 | T08 | 11.70 | 16.50 | 30.0 | 9.0 | ●            |       |
| <b>MM ETR120A7R05CF-6T08</b> | 12.00      | 6     | 7.00  | 0.50 | T08 | 12.00 | 0.00  | 17.0 | 9.0 |              | ●     |
| <b>MM ETR120A7R10CF-6T08</b> | 12.00      | 6     | 7.00  | 1.00 | T08 | 12.00 | 0.00  | 17.0 | 9.0 |              | ●     |
| <b>MM ETR160A09R5.0-6T10</b> | 16.00      | 6     | 12.00 | 5.00 | T10 | 15.30 | 20.50 | 30.0 | 9.0 | ●            |       |

• For shanks, see pages 63-71 • For Clamping keys (should be ordered separately), tightening torques and clamping instructions, see page 8. • Do not apply lubricant to the threaded connection. • For user guide, see pages 72-84.





Engineered for  
**MAXIMUM**  
**MULTI-MASTER**  
 Performance



# MULTI-MASTER

## Interchangeable Ball Nose Milling Heads

The **MULTI-MASTER** family offers a wide range of ball nose milling heads with various dimensions, shapes and accuracy. The heads combined with shanks, extensions and reducers allow for assembly of numerous ball nose endmill cutters that meet the requirements of the die and mold maker.

There are two main types of ball nose heads: Multi-flute MM EB... heads and 2 flute "economy" MM H...heads (table below).

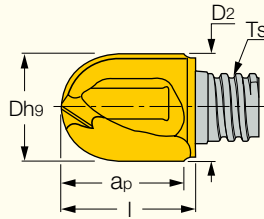
The cutting geometry of MM EB... heads is not different from the solid carbide ball nose cutters; however the heads usually have smaller cutting lengths. The approach to finding cutting data for MM EB... heads is the same as the method for the solid cutters.

MM H... ball nose heads are called "economy", but not due to lesser accuracy. On the contrary, high-precision MM HBR... and MM HRF... heads have very closed diameter tolerances (h7).

The **MULTI-MASTER** milling heads feature the combination of negative rake angles near the head tip with positive rake angles along the most part of the spheric cutting edge in MM HCR... heads, increased area of the spheric edge in bulb-type MM HBR... heads and others. A tooth of the head is extremely strong and successfully stands up against considerable loading; which is important for rough profiling and milling hardened steel. However, the helix angle of the heads is much less when compared with the solid carbide ball nose cutters and MM EB... heads.

Ball Nose Heads of MULTI-MASTER Family

| Head   | Cutting Edge |          | Rake Face | Number of Flutes | Ø tol. | Head Ø, mm |   |    |    |    | Main Milling Application |                             |
|--------|--------------|----------|-----------|------------------|--------|------------|---|----|----|----|--------------------------|-----------------------------|
|        | Spherical    | Cylindr. |           |                  |        | 6          | 8 | 10 | 12 | 16 |                          | 20                          |
| MM HCR | 180°         | yes      | sintered  | 2                | h9     |            |   |    |    |    |                          | rough to finish             |
| MM HRF |              |          | h7        |                  |        |            |   |    |    |    |                          |                             |
| MM HBR | ~240°        | no       | ground    |                  | h7     |            |   |    |    |    |                          | finish + milling hard steel |
| MM EB  | 180°         | yes      |           | 2; 4             | e8     |            |   |    |    |    |                          | rough to finish             |



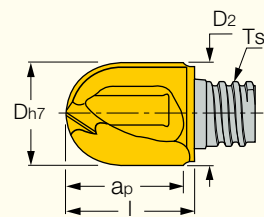
**ECONOMICAL SOLUTION**

| Designation            | Dimensions |       |                |                |                |       | IC908 |
|------------------------|------------|-------|----------------|----------------|----------------|-------|-------|
|                        | D          | Flute | a <sub>p</sub> | T <sub>s</sub> | D <sub>2</sub> | l     |       |
| <b>MM HCR080-2T05</b>  | 8.00       | 2     | 7.80           | T05            | 7.60           | 9.95  | ●     |
| <b>MM HCR100-2T06</b>  | 10.00      | 2     | 10.00          | T06            | 9.60           | 12.35 | ●     |
| <b>MM HCR120-2T08</b>  | 12.00      | 2     | 11.45          | T08            | 11.50          | 15.30 | ●     |
| <b>MM HCR.500-2T08</b> | 12.70      | 2     | 12.90          | T08            | 12.20          | 16.40 | ●     |
| <b>MM HCR160-2T10</b>  | 16.00      | 2     | 15.80          | T10            | 15.20          | 19.10 | ●     |

• For shanks, see pages 63-71 • For Clamping keys (should be ordered separately), tightening torques and clamping instructions, see page 8. • Do not apply lubricant to the threaded connection. • For user guide, see pages 72-84.

**MM HRF**

Interchangeable 2 Flute Solid Carbide Ball Nose Finish Milling Heads



| Designation           | Dimensions |       |                |                |                |       | Tough ↔ Hard |       |
|-----------------------|------------|-------|----------------|----------------|----------------|-------|--------------|-------|
|                       | D          | Flute | a <sub>p</sub> | T <sub>s</sub> | D <sub>2</sub> | l     | IC908        | IC903 |
| <b>MM HRF080-2T05</b> | 8.00       | 2     | 7.60           | T05            | 7.60           | 9.95  |              | ●     |
| <b>MM HRF100-2T06</b> | 10.00      | 2     | 10.20          | T06            | 9.60           | 12.35 | ●            | ●     |
| <b>MM HRF120-2T08</b> | 12.00      | 2     | 11.50          | T08            | 11.50          | 15.30 |              | ●     |
| <b>MM HRF160-2T10</b> | 16.00      | 2     | 15.80          | T10            | 15.20          | 19.10 |              | ●     |

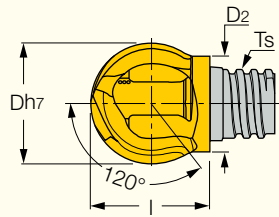
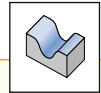
• For shanks, see pages 63-71 • For Clamping keys (should be ordered separately), tightening torques and clamping instructions, see page 8. • Do not apply lubricant to the threaded connection. • For user guide, see pages 72-84.

# MULTI-MASTER

INDEXABLE SOLID CARBIDE LINE

## MM HBR

Interchangeable 2 Flute High Precision, Ball Nose Solid Carbide Milling Heads



**ECONOMICAL SOLUTION**

| Designation     | Dimensions |       |                |                |       |   | IC908 |
|-----------------|------------|-------|----------------|----------------|-------|---|-------|
|                 | D          | Flute | T <sub>s</sub> | D <sub>2</sub> | l     |   |       |
| MM HBR080-2T04  | 8.00       | 2     | T04            | 5.80           | 8.22  | ● |       |
| MM HBR100-2T05  | 10.00      | 2     | T05            | 7.60           | 10.00 | ● |       |
| MM HBR120-2T06  | 12.00      | 2     | T06            | 9.60           | 11.60 | ● |       |
| MM HBR.500-2T06 | 12.70      | 2     | T06            | 9.60           | 12.25 | ● |       |
| MM HBR160-2T08  | 16.00      | 2     | T08            | 11.50          | 15.40 | ● |       |
| MM HBR200-2T10  | 20.00      | 2     | T10            | 15.20          | 18.40 | ● |       |
| MM HBR250-2T12  | 25.00      | 2     | T12            | 18.30          | 23.20 | ● |       |
| MM HBR1.00-2T12 | 25.40      | 2     | T12            | 18.30          | 23.40 | ● |       |

- For shanks, see pages 63-71
- For tightening torques and clamping instructions, see page 8.
- Do not apply lubricant to the threaded connection.
- For user guide, see pages 72-84.

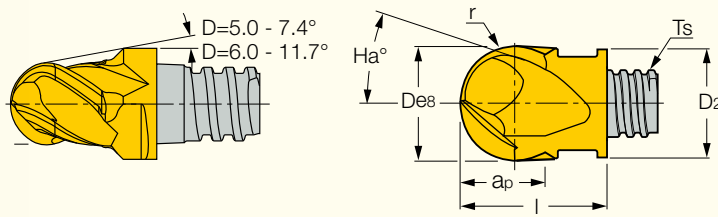
### Spare Parts



| Designation     | Wrench       |
|-----------------|--------------|
| MM HBR080-2T04  | MM KEY 6X4*  |
| MM HBR100-2T05  | MM KEY 6X4*  |
| MM HBR120-2T06  | MM KEY 10X7* |
| MM HBR.500-2T06 | MM KEY 10X7* |
| MM HBR160-2T08  | MM KEY 13X8* |
| MM HBR200-2T10  | MM KEY 13X8* |
| MM HBR250-2T12  | MM KEY 16X9* |
| MM HBR1.00-2T12 | MM KEY 16X9* |

\* (Optional, should be ordered separately)





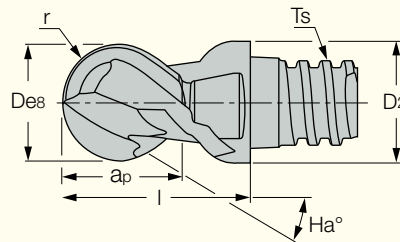
| Designation                        | Dimensions |       |       |       |       |       |       |             | IC908 |
|------------------------------------|------------|-------|-------|-------|-------|-------|-------|-------------|-------|
|                                    | D          | Flute | $a_p$ | r     | $T_s$ | $D_2$ | l     | $H_a^\circ$ |       |
| MM EB050E07-4T05                   | 5.00       | 4     | 7.00  | 2.49  | T05   | 8.00  | 15.00 | 38.0        | ●     |
| MM EB060E05-4T05                   | 6.00       | 4     | 5.00  | 2.99  | T05   | 8.00  | 10.00 | 38.0        | ●     |
| MM EB080A05-2T05                   | 8.00       | 2     | 5.00  | 3.98  | T05   | 7.70  | 10.00 | 30.0        | ●     |
| MM EB080A05-4T05                   | 8.00       | 4     | 5.00  | 3.98  | T05   | 7.70  | 10.00 | 30.0        | ●     |
| MM EB100A07-2T06                   | 10.00      | 2     | 7.00  | 4.98  | T06   | 9.60  | 13.00 | 30.0        | ●     |
| MM EB100A07-4T06                   | 10.00      | 4     | 7.00  | 4.98  | T06   | 9.60  | 13.00 | 30.0        | ●     |
| MM EB120A09-2T08                   | 12.00      | 2     | 9.00  | 5.98  | T08   | 11.70 | 16.50 | 30.0        | ●     |
| MM EB120H09CF-3T08I <sup>(1)</sup> | 12.00      | 3     | 9.00  | 5.98  | T08   | 11.70 | 16.50 | 38.0        | ●     |
| MM EB120A09-4T08                   | 12.00      | 4     | 9.00  | 5.98  | T08   | 11.70 | 16.50 | 30.0        | ●     |
| MM EB.500A37-2T08                  | 12.70      | 2     | 9.50  | 6.33  | T08   | 12.40 | 16.50 | 30.0        | ●     |
| MM EB.500A37-4T08                  | 12.70      | 4     | 9.50  | 6.33  | T08   | 12.40 | 16.50 | 30.0        | ●     |
| MM EB160A09-2T10                   | 16.00      | 2     | 9.00  | 7.98  | T10   | 15.30 | 20.50 | 30.0        | ●     |
| MM EB160A12-4T10                   | 16.00      | 4     | 12.00 | 7.98  | T10   | 15.30 | 20.50 | 30.0        | ●     |
| MM EB200A15-4T12                   | 20.00      | 4     | 15.00 | 9.97  | T12   | 18.30 | 25.50 | 30.0        | ●     |
| MM EB250A22-4T15                   | 25.00      | 4     | 22.00 | 12.47 | T15   | 23.90 | 37.00 | 30.0        | ●     |

• For shanks, see pages 63-71 • For Clamping keys (should be ordered separately), tightening torques and clamping instructions, see page 8. • Do not apply lubricant to the threaded connection. • For user guide, see pages 72-84.

<sup>(1)</sup> With coolant holes directed to each flute

**MM EBA**

2 Flute High Precision, Interchangeable Solid Carbide Ball Nose Heads, for Machining Aluminum



**ALUMINUM**



| Designation        | Dimensions |       |       |       |              |       |       |       |             |   | IC08 |
|--------------------|------------|-------|-------|-------|--------------|-------|-------|-------|-------------|---|------|
|                    | D          | Flute | $a_p$ | r     | $r_{stoler}$ | $T_s$ | $D_2$ | l     | $H_a^\circ$ |   |      |
| MM EBA080B05-2T05  | 8.00       | 2     | 5.00  | 3.98  | 0.010        | T05   | 7.70  | 10.00 | 45.0        | ● |      |
| MM EBA100B07-2T06  | 10.00      | 2     | 7.00  | 4.98  | 0.010        | T06   | 9.60  | 13.00 | 45.0        | ● |      |
| MM EBA120B09-2T08  | 12.00      | 2     | 9.00  | 5.98  | 0.012        | T08   | 11.50 | 16.50 | 45.0        | ● |      |
| MM EBA.500B37-2T08 | 12.70      | 2     | 9.50  | 6.35  | 0.012        | T08   | 12.40 | 16.50 | 45.0        | ● |      |
| MM EBA160B12-2T10  | 16.00      | 2     | 12.00 | 7.98  | 0.012        | T10   | 15.30 | 20.50 | 45.0        | ● |      |
| MM EBA200B15-2T12  | 20.00      | 2     | 15.00 | 9.97  | 0.012        | T12   | 18.30 | 25.50 | 45.0        | ● |      |
| MM EBA250B22-2T15  | 25.00      | 2     | 22.00 | 12.50 | 0.012        | T15   | 23.90 | 37.00 | 45.0        | ● |      |

• For shanks, see pages 63-71 • For Clamping keys (should be ordered separately), tightening torques and clamping instructions, see page 8. • Do not apply lubricant to the threaded connection. • For user guide, see pages 72-84.

Engineered for  
**MAXIMUM**  
**MULTI-MASTER**  
Performance



## 90° Endmill Cutting Heads

There are two kinds of the small-diameter (8-25 mm) MULTI-MASTER heads for square shoulder milling.

The first, which is designated MM EC..., has exactly the same cutting geometry (number of flutes, helix angle, etc.) as the solid carbide endmills. The only difference is a smaller cutting length: normally, it does not exceed a head diameter. Naturally, the cutting data for MM EC... heads is the same as for the 90° solid carbide endmills.

The second, "economy" type, designated MM HC... features only two flutes and a lesser helix angle. Being pressed and sintered to shape and size, the cutting geometry of the heads of this type is merely finished by grinding. Due to the high-impact structure of a pressed tooth, the heads run at feeds per tooth that are significantly

greater than in the case of solid carbide endmills or MM EC... heads, so despite only two teeth, the feed speed is the same as for multi-flute mills or heads.

The mentioned strength property allows even a slight increase of cutting speed relative to the solid carbide tools/heads for the same tool life period.

This property makes MM HC... heads to be an attractive economical solution especially in rough milling and slot drilling.

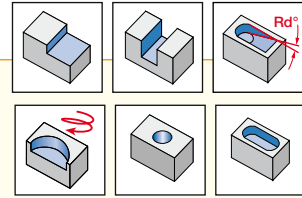
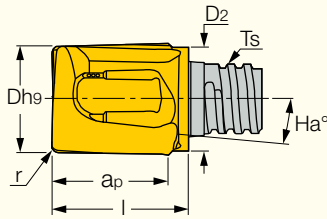


# MULTI-MASTER

INDEXABLE SOLID CARBIDE LINE  
MM HC

Interchangeable Solid Carbide Slot Drill Milling Heads with Two 10° Helix Flutes

Engineered for  
**MAXIMUM**  
**MULTI-MASTER**  
Performance



**ECONOMICAL SOLUTION**

| Designation           | Dimensions |       |                |      |                |                |       |                  |                                  | Tough ↔ Hard |       | Recommended Machining Data<br><br>f <sub>z</sub><br>(mm/t) |
|-----------------------|------------|-------|----------------|------|----------------|----------------|-------|------------------|----------------------------------|--------------|-------|------------------------------------------------------------|
|                       | D          | Flute | a <sub>p</sub> | r    | T <sub>s</sub> | D <sub>2</sub> | l     | H <sub>a</sub> ° | T <sub>m</sub> ( <sup>1)</sup> ) | IC908        | IC903 |                                                            |
| MM HC078C08R0.2-2T05  | 7.80       | 2     | 7.70           | 0.20 | T05            | 7.60           | 10.00 | 10.0             | r0-2.0                           | ●            |       | 0.03-0.09                                                  |
| MM HC080C08R0.4-2T05  | 8.00       | 2     | 7.70           | 0.40 | T05            | 7.60           | 10.00 | 10.0             | r0-2.0                           | ●            | ●     | 0.03-0.09                                                  |
| MM HC080C08R1.0-2T05  | 8.00       | 2     | 7.70           | 1.00 | T05            | 7.60           | 10.00 | 10.0             | r0-2.0                           | ●            | ●     | 0.03-0.09                                                  |
| MM HC080C08R2.0-2T05  | 8.00       | 2     | 7.70           | 2.00 | T05            | 7.60           | 10.00 | 10.0             | r0-2.0                           | ●            | ●     | 0.03-0.09                                                  |
| MM HC098C10R0.3-2T06  | 9.80       | 2     | 9.00           | 0.30 | T06            | 9.60           | 12.35 | 10.0             | r0-3.0                           | ●            |       | 0.03-0.10                                                  |
| MM HC100C10R0.4-2T06  | 10.00      | 2     | 9.00           | 0.40 | T06            | 9.60           | 12.35 | 10.0             | r0-3.0                           | ●            | ●     | 0.03-0.10                                                  |
| MM HC100C10R1.0-2T06  | 10.00      | 2     | 9.00           | 1.00 | T06            | 9.60           | 12.35 | 10.0             | r0-3.0                           | ●            | ●     | 0.03-0.10                                                  |
| MM HC100C10R2.0-2T06  | 10.00      | 2     | 9.00           | 2.00 | T06            | 9.60           | 12.35 | 10.0             | r0-3.0                           | ●            | ●     | 0.03-0.10                                                  |
| MM HC117C13R0.3-2T08  | 11.70      | 2     | 10.00          | 0.30 | T08            | 11.50          | 14.20 | 10.0             | r0-3.0                           | ●            |       | 0.04-0.11                                                  |
| MM HC120C13R0.4-2T08  | 12.00      | 2     | 10.00          | 0.40 | T08            | 11.50          | 14.20 | 10.0             | r0-3.0                           | ●            | ●     | 0.04-0.11                                                  |
| MM HC120C13R1.0-2T08  | 12.00      | 2     | 10.00          | 1.00 | T08            | 11.50          | 14.20 | 10.0             | r0-3.0                           | ●            | ●     | 0.04-0.11                                                  |
| MM HC120C13R2.0-2T08  | 12.00      | 2     | 10.00          | 2.00 | T08            | 11.50          | 14.20 | 10.0             | r0-3.0                           | ●            | ●     | 0.04-0.11                                                  |
| MM HC.500C55R016-2T08 | 12.70      | 2     | 11.00          | 0.40 | T08            | 11.50          | 15.25 | 10.0             | r0-3.2                           | ●            |       | 0.04-0.11                                                  |
| MM HC140C11R0.4-2T08  | 14.00      | 2     | 11.60          | 0.40 | T08            | 11.50          | 15.05 | 10.0             | r0-4.0                           | ●            |       | 0.04-0.12                                                  |
| MM HC157C16R0.3-2T10  | 15.70      | 2     | 15.00          | 0.30 | T10            | 15.20          | 19.05 | 10.0             | r0-4.0                           | ●            |       | 0.05-0.13                                                  |
| MM HC160C16R0.4-2T10  | 16.00      | 2     | 14.90          | 0.40 | T10            | 15.20          | 19.05 | 10.0             | r0-4.0                           | ●            | ●     | 0.05-0.13                                                  |
| MM HC160C16R0.8-2T10  | 16.00      | 2     | 14.90          | 0.80 | T10            | 15.15          | 19.05 | 10.0             | r0-4.0                           | ●            | ●     | 0.05-0.13                                                  |

• For shanks, see pages 63-71 • For Clamping keys (should be ordered separately), tightening torques and clamping instructions, see page 8. • Do not apply lubricant to the threaded connection. • For user guide, see pages 72-84.

(<sup>1)</sup> Specially tailored radius range, available upon request.

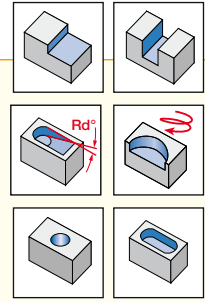
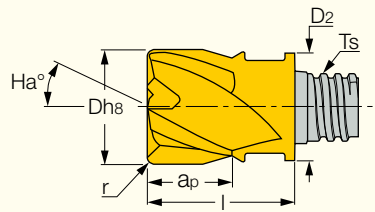


# MULTI-MASTER

INDEXABLE SOLID CARBIDE LINE

## MM ECU

3 Flute Undersized Interchangeable Solid Carbide Heads for Keyways (DIN 6885)

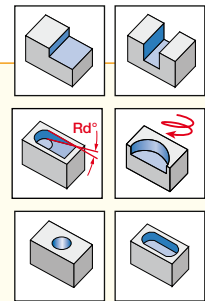
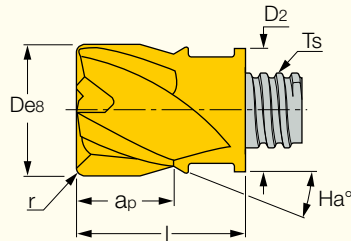


| Designation           | Dimensions |       |       |      |       |       |       |               | IC908 | Recommended Machining Data |
|-----------------------|------------|-------|-------|------|-------|-------|-------|---------------|-------|----------------------------|
|                       | D          | Flute | $a_p$ | r    | $T_s$ | $D_2$ | l     | $H_{a^\circ}$ |       | $f_z$ (mm/t)               |
| MM ECU077E04R020-3T05 | 7.70       | 3     | 4.00  | 0.20 | T05   | 7.70  | 10.00 | 38.0          | ●     | 0.03-0.08                  |
| MM ECU097E05R030-3T06 | 9.70       | 3     | 5.00  | 0.30 | T06   | 9.60  | 13.00 | 38.0          | ●     | 0.03-0.09                  |
| MM ECU117E07R030-3T08 | 11.70      | 3     | 7.00  | 0.30 | T08   | 11.50 | 16.50 | 38.0          | ●     | 0.03-0.10                  |
| MM ECU157E08R030-3T10 | 15.70      | 3     | 8.00  | 0.30 | T10   | 15.30 | 20.50 | 38.0          | ●     | 0.04-0.12                  |
| MM ECU197E12R040-3T12 | 19.70      | 3     | 12.00 | 0.40 | T12   | 18.30 | 25.50 | 38.0          | ●     | 0.05-0.13                  |

• For shanks, see pages 63-71 • For Clamping keys (should be ordered separately), tightening torques and clamping instructions, see page 8. • Do not apply lubricant to the threaded connection. • For user guide, see pages 72-84.

## MM EC-3

3 Flute 45° Helix, Interchangeable Solid Carbide Endmill Heads



| Designation                         | Dimensions |       |       |      |       |       |       |               | IC908 | Recommended Machining Data |
|-------------------------------------|------------|-------|-------|------|-------|-------|-------|---------------|-------|----------------------------|
|                                     | D          | Flute | $a_p$ | r    | $T_s$ | $D_2$ | l     | $H_{a^\circ}$ |       | $f_z$ (mm/t)               |
| MM EC080B05R000-3T05                | 8.00       | 3     | 5.00  | 0.00 | T05   | 7.70  | 10.00 | 45.0          | ●     | 0.03-0.09                  |
| MM EC100B07R000-3T06                | 10.00      | 3     | 7.00  | 0.00 | T06   | 9.60  | 13.00 | 45.0          | ●     | 0.03-0.10                  |
| MM EC100B12R000-3T06                | 10.00      | 3     | 12.00 | 0.00 | T06   | 9.60  | 19.00 | 45.0          | ●     | 0.03-0.10                  |
| MM EC120B09R000-3T08 <sup>(1)</sup> | 12.00      | 3     | 9.00  | 0.00 | T08   | 11.70 | 16.50 | 45.0          | ●     | 0.04-0.11                  |
| MM EC120B09R000-3T08                | 12.00      | 3     | 9.00  | 0.00 | T08   | 11.70 | 16.50 | 45.0          | ●     | 0.04-0.11                  |
| MM EC.500B37R000-3T08               | 12.70      | 3     | 9.50  | 0.00 | T08   | 12.40 | 16.50 | 45.0          | ●     | 0.05-0.10                  |
| MM EC.500B37R015-3T08               | 12.70      | 3     | 9.50  | 0.40 | T08   | 12.40 | 16.50 | 45.0          | ●     | 0.05-0.10                  |
| MM EC.500B37R031-3T08               | 12.70      | 3     | 9.50  | 0.80 | T08   | 12.40 | 16.50 | 45.0          | ●     | 0.05-0.10                  |
| MM EC.500B37R062-3T08               | 12.70      | 3     | 9.50  | 1.60 | T08   | 12.40 | 16.50 | 45.0          | ●     | 0.05-0.10                  |

• For shanks, see pages 63-71 • For Clamping keys (should be ordered separately), tightening torques and clamping instructions, see page 8. • Do not apply lubricant to the threaded connection. • For user guide, see pages 72-84.

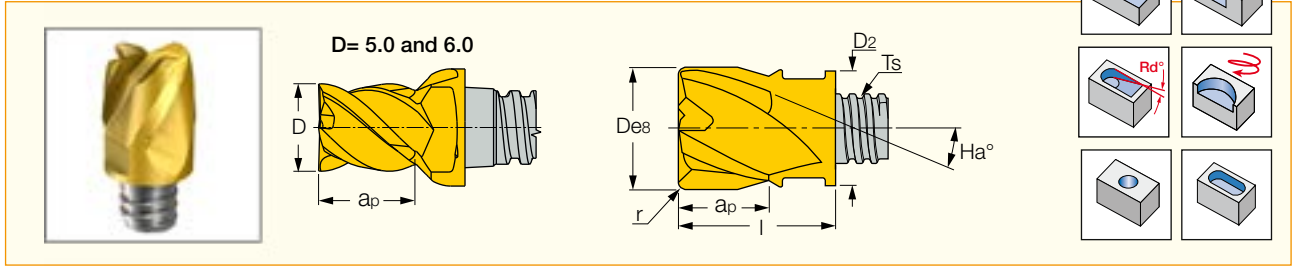
<sup>(1)</sup> With coolant holes directed to each flute

# MULTI-MASTER

INDEXABLE SOLID CARBIDE LINE  
MM EC-4

4 Flute Interchangeable Solid Carbide Endmill Heads,  
30° and 45° Helix, Various Corner Radii

Engineered for  
**MAXIMUM**  
**MULTI-MASTER**  
Performance



| Designation          | Dimensions |      |      |       |       |     |       |       |           | IC908     | Recommended Machining Data |
|----------------------|------------|------|------|-------|-------|-----|-------|-------|-----------|-----------|----------------------------|
|                      | D          | r    | Ha°  | Flute | ap    | Ts  | D2    | l     | fz (mm/t) |           |                            |
| MM EC050B07R000-4T05 | 5.00       | 0.00 | 45.0 | 4     | 7.00  | T05 | 8.00  | 15.00 | ●         | 0.02-0.06 |                            |
| MM EC060B05R000-4T05 | 6.00       | 0.00 | 45.0 | 4     | 5.00  | T05 | 8.00  | 10.00 | ●         | 0.03-0.07 |                            |
| MM EC060B04R0.5-4T04 | 6.00       | 0.50 | 45.0 | 4     | 4.00  | T04 | 5.80  | 8.50  | ●         | 0.02-0.04 |                            |
| MM EC080B05R000-4T05 | 8.00       | 0.00 | 45.0 | 4     | 5.00  | T05 | 7.70  | 10.00 | ●         | 0.03-0.09 |                            |
| MM EC080B09R000-4T05 | 8.00       | 0.00 | 45.0 | 4     | 9.00  | T05 | 7.70  | 15.00 | ●         | 0.03-0.09 |                            |
| MM EC080A05R0.5-4T05 | 8.00       | 0.50 | 30.0 | 4     | 5.00  | T05 | 7.70  | 10.00 | ●         | 0.03-0.09 |                            |
| MM EC080A09R0.5-4T05 | 8.00       | 0.50 | 30.0 | 4     | 9.00  | T05 | 7.70  | 15.00 | ●         | 0.03-0.09 |                            |
| MM EC080B05R0.5-4T05 | 8.00       | 0.50 | 45.0 | 4     | 5.00  | T05 | 7.70  | 10.00 | ●         | 0.03-0.09 |                            |
| MM EC080A05R1.0-4T05 | 8.00       | 1.00 | 30.0 | 4     | 5.00  | T05 | 7.70  | 10.00 | ●         | 0.03-0.09 |                            |
| MM EC080B05R1.0-4T05 | 8.00       | 1.00 | 45.0 | 4     | 5.00  | T05 | 7.70  | 10.00 | ●         | 0.03-0.09 |                            |
| MM EC080A05R1.5-4T05 | 8.00       | 1.50 | 30.0 | 4     | 5.00  | T05 | 7.70  | 10.00 | ●         | 0.03-0.09 |                            |
| MM EC080B05R1.5-4T05 | 8.00       | 1.50 | 45.0 | 4     | 5.00  | T05 | 7.70  | 10.00 | ●         | 0.03-0.09 |                            |
| MM EC100B07R000-4T06 | 10.00      | 0.00 | 45.0 | 4     | 7.00  | T06 | 9.60  | 13.00 | ●         | 0.03-0.10 |                            |
| MM EC100B12R000-4T06 | 10.00      | 0.00 | 45.0 | 4     | 12.00 | T06 | 9.60  | 19.00 | ●         | 0.03-0.10 |                            |
| MM EC100A07R0.5-4T06 | 10.00      | 0.50 | 30.0 | 4     | 7.00  | T06 | 9.60  | 13.00 | ●         | 0.03-0.10 |                            |
| MM EC100B07R0.5-4T06 | 10.00      | 0.50 | 45.0 | 4     | 7.00  | T06 | 9.60  | 13.00 | ●         | 0.03-0.10 |                            |
| MM EC100A07R1.0-4T06 | 10.00      | 1.00 | 30.0 | 4     | 7.00  | T06 | 9.60  | 13.00 | ●         | 0.03-0.10 |                            |
| MM EC100B07R1.0-4T06 | 10.00      | 1.00 | 45.0 | 4     | 7.00  | T06 | 9.60  | 13.00 | ●         | 0.03-0.10 |                            |
| MM EC120B09R000-4T08 | 12.00      | 0.00 | 45.0 | 4     | 9.00  | T08 | 11.70 | 16.50 | ●         | 0.04-0.11 |                            |
| MM EC120B14R000-4T08 | 12.00      | 0.00 | 45.0 | 4     | 14.00 | T08 | 11.70 | 23.00 | ●         | 0.04-0.11 |                            |
| MM EC120A09R0.5-4T08 | 12.00      | 0.50 | 30.0 | 4     | 9.00  | T08 | 11.70 | 16.50 | ●         | 0.04-0.11 |                            |
| MM EC120B09R0.5-4T08 | 12.00      | 0.50 | 45.0 | 4     | 9.00  | T08 | 11.70 | 16.50 | ●         | 0.04-0.11 |                            |
| MM EC120A09R1.0-4T08 | 12.00      | 1.00 | 30.0 | 4     | 9.00  | T08 | 11.70 | 16.50 | ●         | 0.04-0.11 |                            |
| MM EC120B09R1.0-4T08 | 12.00      | 1.00 | 45.0 | 4     | 9.00  | T08 | 11.70 | 16.50 | ●         | 0.04-0.11 |                            |
| MM EC160B12R000-4T10 | 16.00      | 0.00 | 45.0 | 4     | 12.00 | T10 | 15.30 | 20.50 | ●         | 0.05-0.13 |                            |
| MM EC160A12R0.5-4T10 | 16.00      | 0.50 | 30.0 | 4     | 12.00 | T10 | 15.30 | 20.50 | ●         | 0.05-0.13 |                            |
| MM EC160B12R0.5-4T10 | 16.00      | 0.50 | 45.0 | 4     | 12.00 | T10 | 15.30 | 20.50 | ●         | 0.05-0.13 |                            |
| MM EC160A12R1.0-4T10 | 16.00      | 1.00 | 30.0 | 4     | 12.00 | T10 | 15.30 | 20.50 | ●         | 0.05-0.13 |                            |
| MM EC160B12R1.0-4T10 | 16.00      | 1.00 | 45.0 | 4     | 12.00 | T10 | 15.30 | 20.50 | ●         | 0.05-0.13 |                            |
| MM EC160A12R1.5-4T10 | 16.00      | 1.50 | 30.0 | 4     | 12.00 | T10 | 15.30 | 20.50 | ●         | 0.05-0.13 |                            |
| MM EC160B12R1.5-4T10 | 16.00      | 1.50 | 45.0 | 4     | 12.00 | T10 | 15.30 | 20.50 | ●         | 0.05-0.13 |                            |
| MM EC160A12R2.0-4T10 | 16.00      | 2.00 | 30.0 | 4     | 12.00 | T10 | 15.30 | 20.50 | ●         | 0.05-0.13 |                            |
| MM EC160B12R2.0-4T10 | 16.00      | 2.00 | 45.0 | 4     | 12.00 | T10 | 15.30 | 20.50 | ●         | 0.05-0.13 |                            |
| MM EC160A12R3.0-4T10 | 16.00      | 3.00 | 30.0 | 4     | 12.00 | T10 | 15.30 | 20.50 | ●         | 0.05-0.13 |                            |
| MM EC160B12R3.0-4T10 | 16.00      | 3.00 | 45.0 | 4     | 12.00 | T10 | 15.30 | 20.50 | ●         | 0.05-0.13 |                            |
| MM EC160A12R4.0-4T10 | 16.00      | 4.00 | 30.0 | 4     | 12.00 | T10 | 15.30 | 20.50 | ●         | 0.05-0.13 |                            |
| MM EC160B12R4.0-4T10 | 16.00      | 4.00 | 45.0 | 4     | 12.00 | T10 | 15.30 | 20.50 | ●         | 0.05-0.13 |                            |
| MM EC200B15R000-4T12 | 20.00      | 0.00 | 45.0 | 4     | 15.00 | T12 | 18.30 | 25.50 | ●         | 0.05-0.13 |                            |
| MM EC200A15R0.5-4T12 | 20.00      | 0.50 | 30.0 | 4     | 15.00 | T12 | 18.30 | 25.50 | ●         | 0.05-0.13 |                            |
| MM EC200A15R1.0-4T12 | 20.00      | 1.00 | 30.0 | 4     | 15.00 | T12 | 18.30 | 25.50 | ●         | 0.05-0.13 |                            |
| MM EC200A15R2.0-4T12 | 20.00      | 2.00 | 30.0 | 4     | 15.00 | T12 | 18.30 | 25.50 | ●         | 0.05-0.13 |                            |
| MM EC200A15R3.0-4T12 | 20.00      | 3.00 | 30.0 | 4     | 15.00 | T12 | 18.30 | 25.50 | ●         | 0.05-0.13 |                            |

• For shanks, see pages 63-71 • For Clamping keys (should be ordered separately), tightening torques and clamping instructions, see page 8. • Do not apply lubricant to the threaded connection. • For user guide, see pages 72-84.

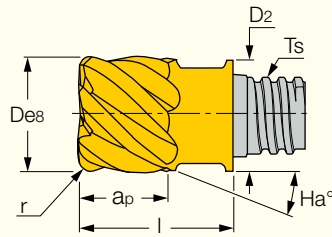
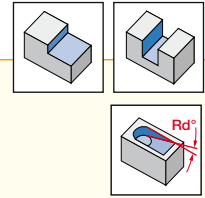


# MULTI-MASTER

INDEXABLE SOLID CARBIDE LINE

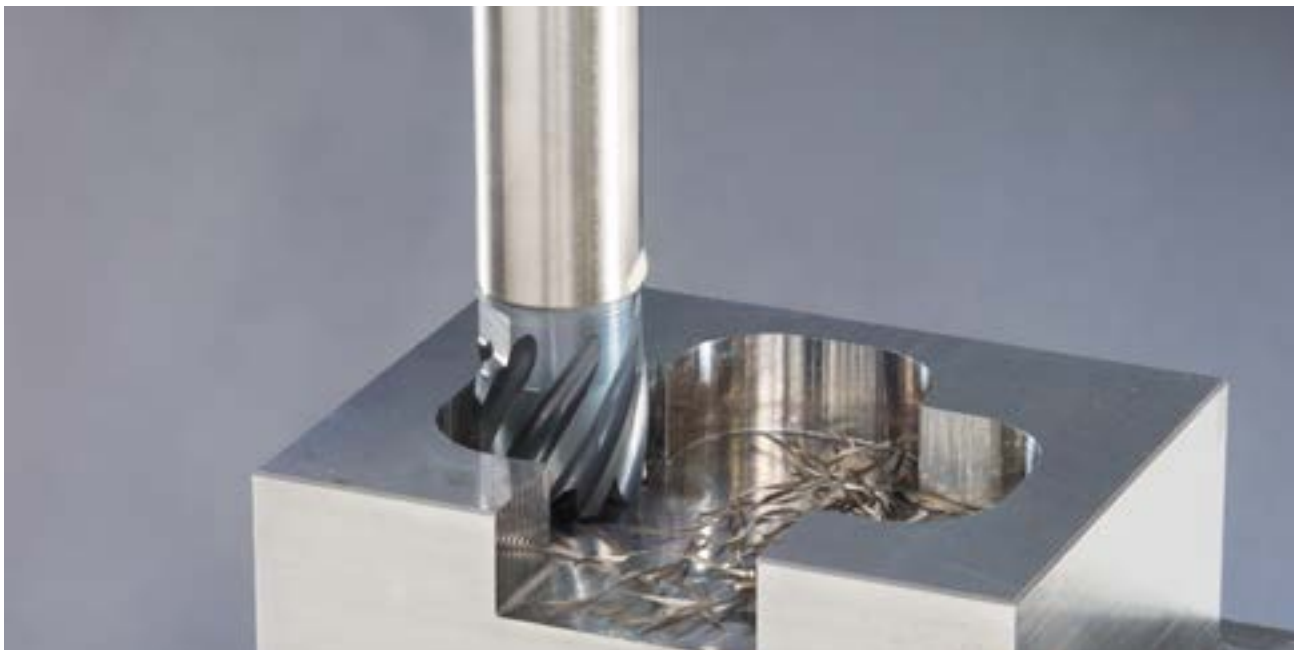
## MM EC-6

6 Flute Interchangeable Solid Carbide Endmill Heads,  
30° and 45° Helix, Various Corner Radii



| Designation           | Dimensions |       |                |      |                |                |       |                  |                  |                       | IC908     | Recommended Machining Data |
|-----------------------|------------|-------|----------------|------|----------------|----------------|-------|------------------|------------------|-----------------------|-----------|----------------------------|
|                       | D          | Flute | a <sub>p</sub> | r    | T <sub>s</sub> | D <sub>2</sub> | l     | H <sub>a</sub> ° | R <sub>d</sub> ° | f <sub>z</sub> (mm/t) |           |                            |
| MM EC080A05R0.5-6T05  | 8.00       | 6     | 5.00           | 0.50 | T05            | 7.70           | 10.00 | 30.0             | 6.0              | ●                     | 0.03-0.09 |                            |
| MM EC080A05R1.0-6T05  | 8.00       | 6     | 5.00           | 1.00 | T05            | 7.70           | 10.00 | 30.0             | 6.0              | ●                     | 0.03-0.09 |                            |
| MM EC080A05R1.5-6T05  | 8.00       | 6     | 5.00           | 1.50 | T05            | 7.70           | 10.00 | 30.0             | 6.0              | ●                     | 0.03-0.09 |                            |
| MM EC080B05R0.5-6T05  | 8.00       | 6     | 5.00           | 0.50 | T05            | 7.70           | 10.00 | 45.0             | 3.0              | ●                     | 0.03-0.10 |                            |
| MM EC080B05R1.0-6T05  | 8.00       | 6     | 5.00           | 1.00 | T05            | 7.70           | 10.00 | 45.0             | 3.0              | ●                     | 0.03-0.09 |                            |
| MM EC080B05R1.5-6T05  | 8.00       | 6     | 5.00           | 1.50 | T05            | 7.70           | 10.00 | 45.0             | 3.0              | ●                     | 0.03-0.09 |                            |
| MM EC100A07R0.5-6T06  | 10.00      | 6     | 7.00           | 0.50 | T06            | 9.60           | 13.00 | 30.0             | 6.0              | ●                     | 0.03-0.10 |                            |
| MM EC100A07R1.0-6T06  | 10.00      | 6     | 7.00           | 1.00 | T06            | 9.60           | 13.00 | 30.0             | 6.0              | ●                     | 0.03-0.10 |                            |
| MM EC100A07R1.5-6T06  | 10.00      | 6     | 7.00           | 1.50 | T06            | 9.60           | 13.00 | 30.0             | 6.0              | ●                     | 0.03-0.10 |                            |
| MM EC100B07R0.5-6T06  | 10.00      | 6     | 7.00           | 0.50 | T06            | 9.60           | 13.00 | 45.0             | 3.0              | ●                     | 0.04-0.10 |                            |
| MM EC100B07R000-6T06  | 10.00      | 6     | 7.00           | 0.00 | T06            | 9.60           | 13.00 | 45.0             | 3.0              | ●                     | 0.03-0.10 |                            |
| MM EC100B07R1.0-6T06  | 10.00      | 6     | 7.00           | 1.00 | T06            | 9.60           | 13.00 | 45.0             | 3.0              | ●                     | 0.04-0.10 |                            |
| MM EC100B07R1.5-6T06  | 10.00      | 6     | 7.00           | 1.50 | T06            | 9.60           | 13.00 | 45.0             | 3.0              | ●                     | 0.03-0.10 |                            |
| MM EC100B12R1.5-6T06  | 10.00      | 6     | 12.00          | 1.50 | T06            | 9.60           | 19.00 | 45.0             | 3.0              | ●                     | 0.04-0.10 |                            |
| MM EC120A09R0.5-6T08  | 12.00      | 6     | 9.00           | 0.50 | T08            | 11.70          | 16.50 | 30.0             | 6.0              | ●                     | 0.04-0.11 |                            |
| MM EC120A09R1.0-6T08  | 12.00      | 6     | 9.00           | 1.00 | T08            | 11.70          | 16.50 | 30.0             | 6.0              | ●                     | 0.04-0.11 |                            |
| MM EC120B09R0.5-6T08  | 12.00      | 6     | 9.00           | 0.50 | T08            | 11.70          | 16.50 | 45.0             | 3.0              | ●                     | 0.04-0.10 |                            |
| MM EC120B09R000-6T08  | 12.00      | 6     | 9.00           | 0.00 | T08            | 11.70          | 16.50 | 45.0             | 3.0              | ●                     | 0.04-0.11 |                            |
| MM EC120B09R1.0-6T08  | 12.00      | 6     | 9.00           | 1.00 | T08            | 11.70          | 16.50 | 45.0             | 3.0              | ●                     | 0.04-0.10 |                            |
| MM EC120B09R1.5-6T08  | 12.00      | 6     | 9.00           | 1.50 | T08            | 11.70          | 16.50 | 45.0             | 3.0              | ●                     | 0.04-0.11 |                            |
| MM EC.500A37R015-6T08 | 12.70      | 6     | 9.50           | 0.40 | T08            | 12.40          | 16.50 | 30.0             | 6.0              | ●                     | 0.04-0.11 |                            |
| MM EC.500A37R030-6T08 | 12.70      | 6     | 9.50           | 0.76 | T08            | 12.40          | 16.50 | 30.0             | 6.0              | ●                     | 0.04-0.11 |                            |
| MM EC.500B37R000-6T08 | 12.70      | 6     | 9.50           | 0.00 | T08            | 12.40          | 16.50 | 45.0             | 5.0              | ●                     | 0.04-0.11 |                            |
| MM EC.500B37R015-6T08 | 12.70      | 6     | 9.50           | 0.40 | T08            | 12.40          | 16.50 | 45.0             | 5.0              | ●                     | 0.04-0.11 |                            |
| MM EC.500B37R031-6T08 | 12.70      | 6     | 9.50           | 0.80 | T08            | 12.40          | 16.50 | 45.0             | 5.0              | ●                     | 0.04-0.11 |                            |
| MM EC.500B37R060-6T08 | 12.70      | 6     | 9.50           | 1.50 | T08            | 12.40          | 16.50 | 45.0             | 5.0              | ●                     | 0.04-0.11 |                            |

• For shanks, see pages 63-71 • For Clamping keys (should be ordered separately), tightening torques and clamping instructions, see page 8. • Do not apply lubricant to the threaded connection. • For user guide, see pages 72-84.



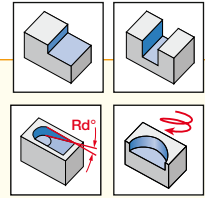
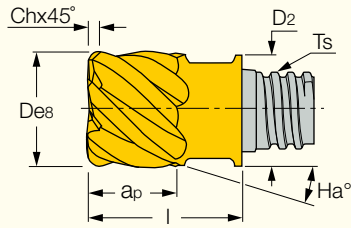


# MULTI-MASTER

INDEXABLE SOLID CARBIDE LINE  
MM EC-D

6, 8, 10 Flute Interchangeable Solid Carbide Endmill Heads  
with 50° Helix, for Machining Hardened Steel

Engineered for  
**MAXIMUM**  
**MULTI-MASTER**  
Performance

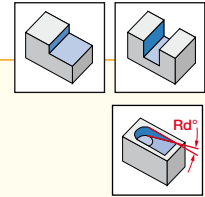
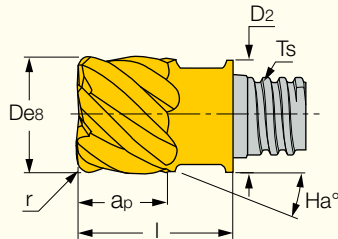


| Designation          | Dimensions |       |       |      |     |       |       |      |     |           | IC903     | Recommended Machining Data |
|----------------------|------------|-------|-------|------|-----|-------|-------|------|-----|-----------|-----------|----------------------------|
|                      | D          | Flute | ap    | Ch   | Ts  | D2    | l     | Ha°  | Rd° | fz (mm/t) |           |                            |
| MM EC080D05C01-6T05  | 8.00       | 6     | 5.00  | 0.10 | T05 | 7.70  | 10.00 | 50.0 | 2.0 | ●         | 0.03-0.10 |                            |
| MM EC100D07C01-6T06  | 10.00      | 6     | 7.00  | 0.10 | T06 | 9.60  | 13.00 | 50.0 | 2.0 | ●         | 0.03-0.10 |                            |
| MM EC120D09C01-6T08  | 12.00      | 6     | 9.00  | 0.10 | T08 | 11.70 | 16.50 | 50.0 | 3.0 | ●         | 0.04-0.11 |                            |
| MM EC160D12C02-8T10  | 16.00      | 8     | 12.00 | 0.20 | T10 | 15.30 | 20.50 | 50.0 | 3.0 | ●         | 0.05-0.13 |                            |
| MM EC200D15C02-10T12 | 20.00      | 10    | 15.00 | 0.20 | T12 | 18.30 | 25.50 | 50.0 | 3.0 | ●         | 0.05-0.13 |                            |

• For shanks, see pages 63-71 • For Clamping keys (should be ordered separately), tightening torques and clamping instructions, see page 8. • Do not apply lubricant to the threaded connection. • For user guide, see pages 72-84.

## MM EC-8/MM EC-10

8, 10 Flute Interchangeable Solid Carbide Endmill Heads,  
30° and 45° Helix, Various Corner Radii



| Designation                          | Dimensions |       |       |      |     |       |       |      |     |           | IC908     | Recommended Machining Data |
|--------------------------------------|------------|-------|-------|------|-----|-------|-------|------|-----|-----------|-----------|----------------------------|
|                                      | D          | Flute | ap    | r    | Ts  | D2    | l     | Ha°  | Rd° | fz (mm/t) |           |                            |
| MM EC160A12R0.5-8T10                 | 16.00      | 8     | 12.00 | 0.50 | T10 | 15.30 | 20.50 | 30.0 | 5.0 | ●         | 0.05-0.13 |                            |
| MM EC160A12R0.5-8T10H <sup>(1)</sup> | 16.00      | 8     | 12.00 | 0.50 | T10 | 15.30 | 20.50 | 30.0 | 5.0 | ●         | 0.05-0.13 |                            |
| MM EC160A12R1.0-8T10                 | 16.00      | 8     | 12.00 | 1.00 | T10 | 15.30 | 20.50 | 30.0 | 5.0 | ●         | 0.05-0.13 |                            |
| MM EC160A12R1.6-8T10                 | 16.00      | 8     | 12.00 | 1.60 | T10 | 15.30 | 20.50 | 30.0 | 5.0 | ●         | 0.05-0.13 |                            |
| MM EC160A12R2.0-8T10                 | 16.00      | 8     | 12.00 | 2.00 | T10 | 15.30 | 20.50 | 30.0 | 5.0 | ●         | 0.05-0.13 |                            |
| MM EC160B12R0.5-8T10                 | 16.00      | 8     | 12.00 | 0.50 | T10 | 15.30 | 20.50 | 45.0 | 5.0 | ●         | 0.05-0.13 |                            |
| MM EC160B12R1.0-8T10                 | 16.00      | 8     | 12.00 | 1.00 | T10 | 15.30 | 20.50 | 45.0 | 5.0 | ●         | 0.05-0.13 |                            |
| MM EC160B12R1.6-8T10                 | 16.00      | 8     | 12.00 | 1.60 | T10 | 15.30 | 20.50 | 45.0 | 5.0 | ●         | 0.05-0.13 |                            |
| MM EC160B12R2.0-8T10                 | 16.00      | 8     | 12.00 | 2.00 | T10 | 15.30 | 20.50 | 45.0 | 5.0 | ●         | 0.05-0.13 |                            |
| MM EC200A15R1.0-10T12                | 20.00      | 10    | 15.00 | 1.00 | T12 | 18.30 | 25.50 | 30.0 | 3.0 | ●         | 0.05-0.13 |                            |
| MM EC200A15R2.0-10T12                | 20.00      | 10    | 15.00 | 2.00 | T12 | 18.30 | 25.50 | 30.0 | 3.0 | ●         | 0.05-0.13 |                            |
| MM EC250A22R0.8-10T15                | 25.00      | 10    | 22.00 | 0.80 | T15 | 23.90 | 37.00 | 30.0 | 3.0 | ●         | 0.05-0.13 |                            |

• For shanks, see pages 63-71 • For Clamping keys (should be ordered separately), tightening torques and clamping instructions, see page 8. • Do not apply lubricant to the threaded connection. • For user guide, see pages 72-84.

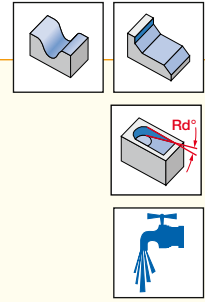
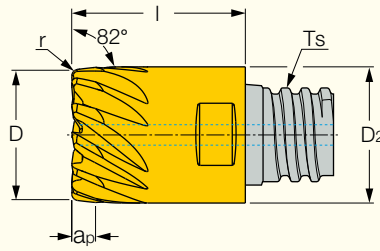
<sup>(1)</sup> With a central coolant hole

# MULTI-MASTER

INDEXABLE SOLID CARBIDE LINE

## MM ET

Solid Carbide Tapered Heads with 20/30° Helix, Variable Pitch and Coolant Holes for Chatter Free Finishing Operations



| Designation                    | Dimensions |      |       |                |                |       |                             | IC908 | Recommended Machining Data |
|--------------------------------|------------|------|-------|----------------|----------------|-------|-----------------------------|-------|----------------------------|
|                                | D          | r    | Flute | a <sub>p</sub> | T <sub>s</sub> | l     | R <sub>d</sub> <sup>o</sup> |       | f <sub>z</sub> (mm/t)      |
| <b>MM ET11/8H4R10CF-8T08H</b>  | 11.00      | 1.00 | 8     | 3.50           | T08            | 16.50 | 3.0                         | ●     | 0.04-0.10                  |
| <b>MM ET15/8H4R10CF-12T10H</b> | 15.00      | 1.00 | 12    | 3.50           | T10            | 20.50 | 3.0                         | ●     | 0.05-0.11                  |

• For shanks, see pages 63-71 • For Clamping keys (should be ordered separately), tightening torques and clamping instructions, see page 8. • Do not apply lubricant to the threaded connection. • For user guide, see pages 72-84.

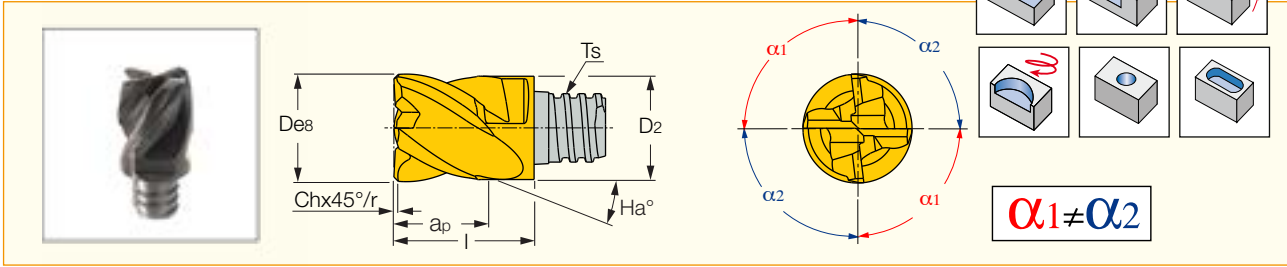
# MULTI-MASTER • CHATTERFREE

INDEXABLE SOLID CARBIDE LINE MULTI-MASTER LINE

## MM EC-CF

Interchangeable Solid Carbide Endmill Heads for Chatter Free  
Roughing and Finishing Operations

Engineered for  
**MAXIMUM**  
MULTI-MASTER  
Performance



| Designation               | Dimensions |     |      |       |       |     |       |       |      |   | IC908     | Recommended Machining Data<br>fz (mm/t) |
|---------------------------|------------|-----|------|-------|-------|-----|-------|-------|------|---|-----------|-----------------------------------------|
|                           | D          | Ch  | r    | Flute | ap    | Ts  | D2    | l     | Ha°  |   |           |                                         |
| MM EC080E05C3CF-4T05      | 8.00       | 0.3 | -    | 4     | 5.00  | T05 | 7.70  | 10.00 | 38.0 | ● | 0.03-0.09 |                                         |
| MM EC080E05R0CF-4T05      | 8.00       | -   | 0.00 | 4     | 5.00  | T05 | 7.70  | 10.00 | 38.0 | ● | 0.03-0.09 |                                         |
| MM EC080E05R05CF-4T05     | 8.00       | -   | 0.50 | 4     | 5.00  | T05 | 7.70  | 10.00 | 38.0 | ● | 0.03-0.09 |                                         |
| MM EC100E07C4CF-4T06      | 10.00      | 0.4 | -    | 4     | 7.00  | T06 | 9.60  | 13.00 | 38.0 | ● | 0.03-0.10 |                                         |
| MM EC100E07R05CF-4T06     | 10.00      | -   | 0.50 | 4     | 7.00  | T06 | 9.60  | 13.00 | 38.0 | ● | 0.03-0.10 |                                         |
| MM EC120E09C5CF-4T08      | 12.00      | 0.5 | -    | 4     | 9.00  | T08 | 11.70 | 16.50 | 38.0 | ● | 0.04-0.11 |                                         |
| MM EC120E09C5CF-4T08i (1) | 12.00      | 0.5 | -    | 4     | 9.00  | T08 | 11.70 | 16.50 | 38.0 | ● | 0.04-0.11 |                                         |
| MM EC120E09R05CF-4T08     | 12.00      | -   | 0.50 | 4     | 9.00  | T08 | 11.70 | 16.50 | 38.0 | ● | 0.04-0.11 |                                         |
| MM EC500E37C20CF-4T08     | 12.70      | 0.5 | -    | 4     | 9.50  | T08 | 12.40 | 16.50 | 38.0 | ● | 0.04-0.11 |                                         |
| MM EC500E37R0-CF-4T08     | 12.70      | -   | -    | 4     | 9.50  | T08 | 12.40 | 16.50 | 38.0 | ● | 0.04-0.11 |                                         |
| MM EC500E37R15CF-4T08     | 12.70      | -   | 0.39 | 4     | 9.50  | T08 | 12.40 | 16.50 | 38.0 | ● | 0.04-0.11 |                                         |
| MM EC500E37R31CF-4T08     | 12.70      | -   | 0.78 | 4     | 9.50  | T08 | 12.40 | 16.50 | 38.0 | ● | 0.04-0.11 |                                         |
| MM EC500E37R62CF-4T08     | 12.70      | -   | 1.56 | 4     | 9.50  | T08 | 12.40 | 16.50 | 38.0 | ● | 0.04-0.11 |                                         |
| MM EC160E12C6CF-4T10      | 16.00      | 0.6 | -    | 4     | 12.00 | T10 | 15.30 | 20.50 | 38.0 | ● | 0.05-0.13 |                                         |
| MM EC160E12R05CF-4T10     | 16.00      | -   | 0.50 | 4     | 12.00 | T10 | 15.30 | 20.50 | 38.0 | ● | 0.05-0.13 |                                         |
| MM EC200E15C6CF-4T12      | 20.00      | 0.6 | -    | 4     | 15.00 | T12 | 18.45 | 25.50 | 38.0 | ● | 0.05-0.17 |                                         |
| MM EC200E15R05CF-4T12     | 20.00      | -   | 0.50 | 4     | 15.00 | T12 | 18.30 | 25.50 | 38.0 | ● | 0.05-0.17 |                                         |
| MM EC250E22C6CF-4T15      | 25.00      | 0.6 | -    | 4     | 22.00 | T15 | 23.90 | 37.00 | 38.0 | ● | 0.06-0.17 |                                         |
| MM EC250E28C6CF-12T15     | 25.00      | 0.6 | -    | 12    | 28.00 | T15 | 23.90 | 43.00 | 38.0 | ● | 0.06-0.13 |                                         |
| MM EC250E28C6CF-4T15      | 25.00      | 0.6 | -    | 4     | 28.00 | T15 | 23.90 | 43.00 | 38.0 | ● | 0.06-0.17 |                                         |
| MM EC250E22R05CF-4T15     | 25.00      | -   | 0.50 | 4     | 22.00 | T15 | 23.90 | 37.00 | 38.0 | ● | 0.06-0.17 |                                         |
| MM EC250E22R10CF-4T15     | 25.00      | -   | 1.00 | 4     | 22.00 | T15 | 23.90 | 37.00 | 38.0 | ● | 0.06-0.17 |                                         |
| MM EC250E22R20CF-4T15     | 25.00      | -   | 2.00 | 4     | 22.00 | T15 | 23.90 | 37.00 | 38.0 | ● | 0.06-0.17 |                                         |
| MM EC250E22R30CF-4T15     | 25.00      | -   | 3.00 | 4     | 22.00 | T15 | 23.90 | 37.00 | 38.0 | ● | 0.06-0.17 |                                         |

• For shanks, see pages 63-71 • For Clamping keys (should be ordered separately), tightening torques and clamping instructions, see page 8. • Do not apply lubricant to the threaded connection. • For user guide, see pages 72-84.

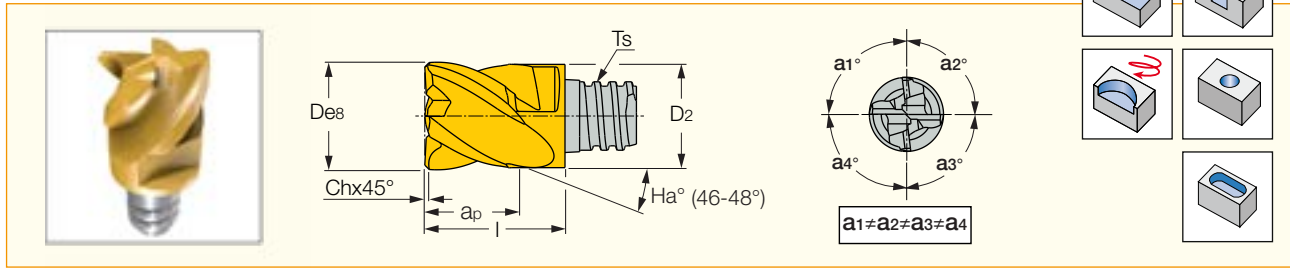
(1) With coolant holes directed to each flute

# MULTI-MASTER

INDEXABLE SOLID CARBIDE LINE

## MM EC-H-4

Interchangeable Carbide Endmill Heads for Chatter Free Milling of Alloyed Steel



| Designation          | Dimensions |    |       |       |       |       |       |             |              | IC908     | Recommended Machining Data |
|----------------------|------------|----|-------|-------|-------|-------|-------|-------------|--------------|-----------|----------------------------|
|                      | D          | Ch | Flute | $a_p$ | $T_s$ | $D_2$ | $l$   | $R_d^\circ$ | $f_z$ (mm/t) |           |                            |
| MM EC080H05C3-4T05CF | 8.00       | .3 | 4     | 5.00  | T05   | 7.70  | 10.00 | -           | ●            | 0.03-0.09 |                            |
| MM EC100H07C4-4T06CF | 10.00      | .4 | 4     | 7.00  | T06   | 9.60  | 13.00 | -           | ●            | 0.03-0.10 |                            |
| MM EC120H09C5-4T08CF | 12.00      | .5 | 4     | 9.00  | T08   | 11.70 | 16.50 | -           | ●            | 0.04-0.11 |                            |
| MM EC160H12C6-4T10CF | 16.00      | .6 | 4     | 12.00 | T10   | 15.30 | 20.50 | -           | ●            | 0.05-0.13 |                            |
| MM EC200H15C6-4T12CF | 20.00      | .6 | 4     | 15.00 | T12   | 18.30 | 25.50 | -           | ●            | 0.05-0.17 |                            |

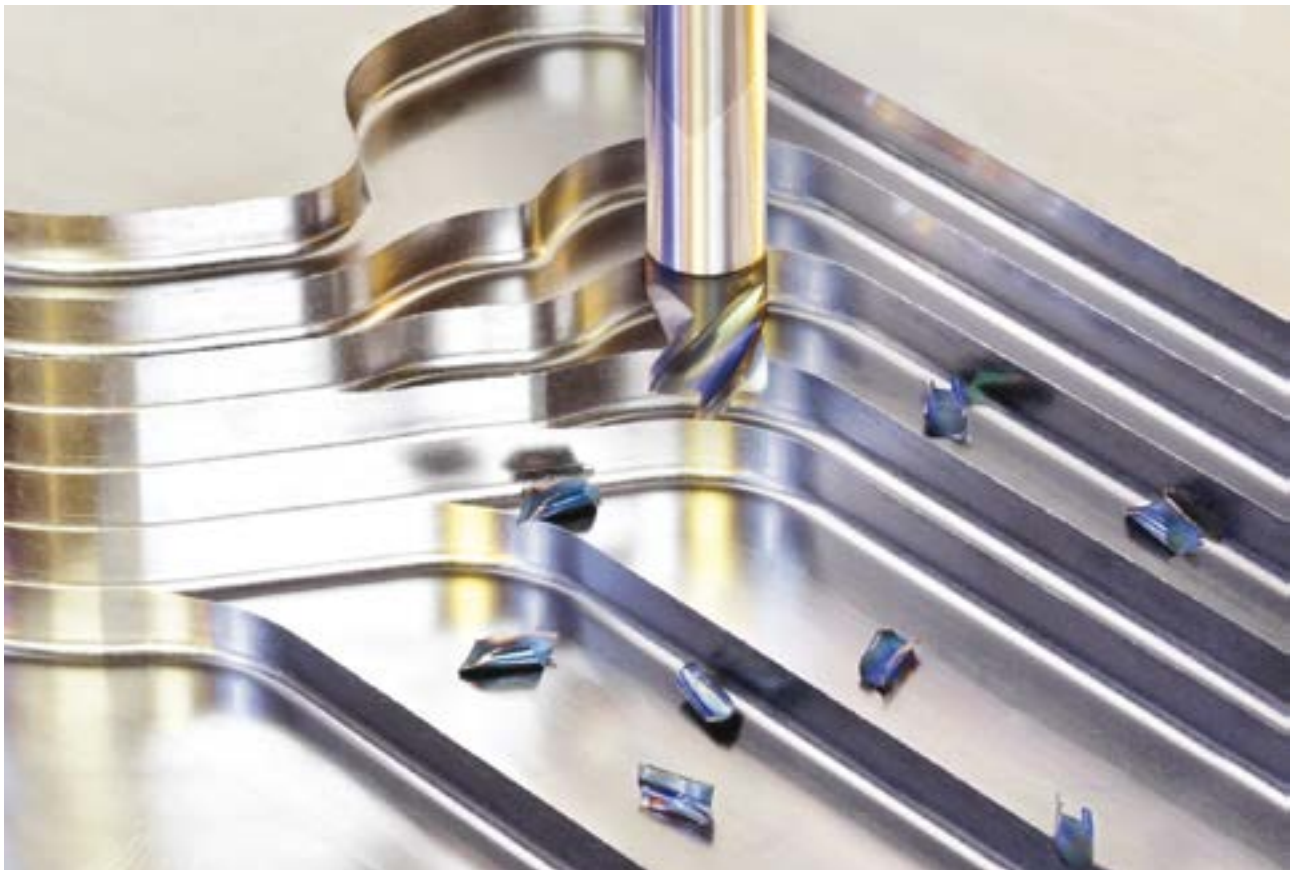
• For shanks, see pages 63-71 • For Clamping keys (should be ordered separately), tightening torques and clamping instructions, see page 8. • Do not apply lubricant to the threaded connection. • For user guide, see pages 72-84.

### Spare Parts



| Designation          | Wrench      |
|----------------------|-------------|
| MM EC080H05C3-4T05CF | MM KEY 6X4* |
| MM EC100H07C4-4T06CF | MM KEY 8X5* |

\* (Optional, should be ordered separately)



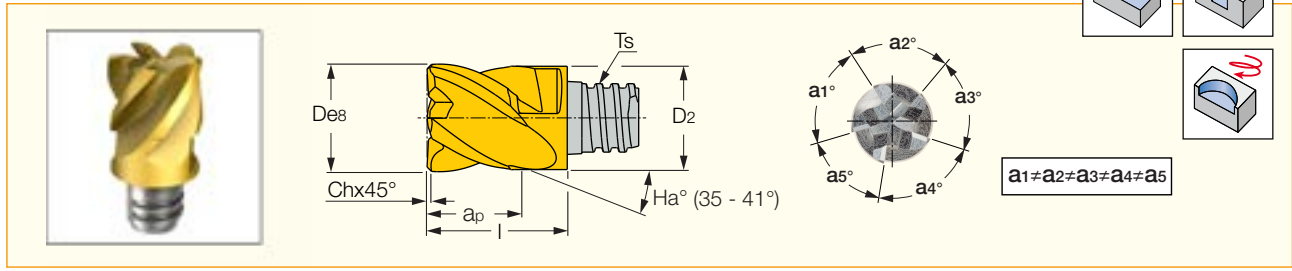
# MULTI-MASTER

INDEXABLE SOLID CARBIDE LINE

## MM EC-H-5

Interchangeable Carbide Endmill Heads for Chatter Free Milling of High Temperature Alloys like Titanium and Inconel

Engineered for  
**MAXIMUM**  
**MULTI-MASTER**  
Performance



| Designation          | Dimensions |     |       |       |       |       |       |             |              | IC308     | Recommended Machining Data |
|----------------------|------------|-----|-------|-------|-------|-------|-------|-------------|--------------|-----------|----------------------------|
|                      | D          | Ch  | Flute | $a_p$ | $T_s$ | $D_2$ | $l$   | $R_d^\circ$ | $f_z$ (mm/t) |           |                            |
| MM EC080H05C3-5T05CF | 8.00       | 0.3 | 5     | 5.00  | T05   | 7.70  | 10.00 | 5.0         | ●            | 0.03-0.09 |                            |
| MM EC100H07C4-5T06CF | 10.00      | 0.4 | 5     | 7.00  | T06   | 9.60  | 13.00 | 5.0         | ●            | 0.03-0.10 |                            |
| MM EC120H09C5-5T08CF | 12.00      | 0.5 | 5     | 9.00  | T08   | 11.70 | 16.50 | 4.0         | ●            | 0.04-0.11 |                            |
| MM EC160H12C6-5T10CF | 16.00      | 0.6 | 5     | 12.00 | T10   | 15.30 | 20.50 | 4.0         | ●            | 0.05-0.13 |                            |
| MM EC200H15C6-5T12CF | 20.00      | 0.6 | 5     | 15.00 | T12   | 18.30 | 25.50 | 3.0         | ●            | 0.05-0.17 |                            |
| MM EC250H22C6-5T15CF | 25.00      | 0.6 | 5     | 22.00 | T15   | 23.90 | 37.00 | 3.0         | ●            | 0.06-0.17 |                            |

• For shanks, see pages 63-71 • For Clamping keys (should be ordered separately), tightening torques and clamping instructions, see page 8. • Do not apply lubricant to the threaded connection. • For user guide, see pages 72-84.

### Spare Parts



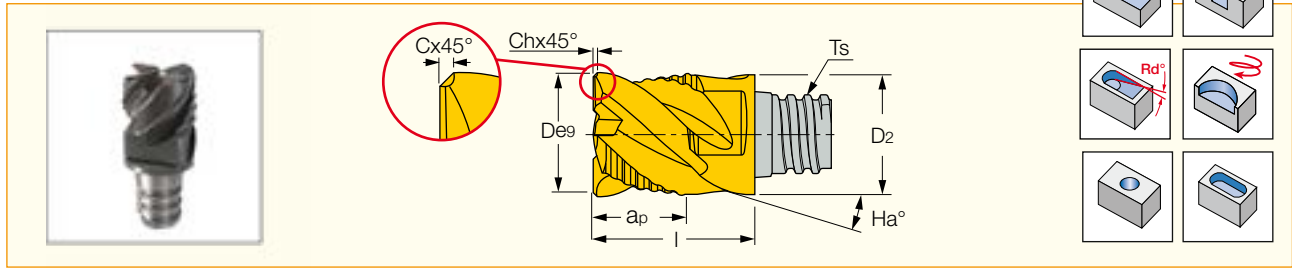
| Designation          | Wrench       |
|----------------------|--------------|
| MM EC080H05C3-5T05CF | MM KEY 6X4*  |
| MM EC100H07C4-5T06CF | MM KEY 8X5*  |
| MM EC120H09C5-5T08CF | MM KEY 10X7* |
| MM EC160H12C6-5T10CF | MM KEY 13X8* |
| MM EC200H15C6-5T12CF | MM KEY 16X9* |
| MM EC250H22C6-5T15CF | MM KEY 20*   |

\* (Optional, should be ordered separately)



**MULTI-MASTER** • **FINISHRED**  
 INDEXABLE SOLID CARBIDE LINE MULTI-MASTER LINE  
**MM EFS**

Combination of Roughing and Finishing Interchangeable Solid Carbide Endmill Heads



| Designation              | Dimensions |       |       |      |       |       |       |             |              | IC908     | Recommended Machining Data |
|--------------------------|------------|-------|-------|------|-------|-------|-------|-------------|--------------|-----------|----------------------------|
|                          | D          | Flute | $a_p$ | Ch   | $T_s$ | $D_2$ | l     | $H_a^\circ$ | $f_z$ (mm/t) |           |                            |
| <b>MM EFS080B05-4T05</b> | 8.00       | 4     | 5.00  | 0.30 | T05   | 7.70  | 10.00 | 45.0        | ●            | 0.03-0.08 |                            |
| <b>MM EFS100B07-4T06</b> | 10.00      | 4     | 7.00  | 0.30 | T06   | 9.60  | 13.00 | 45.0        | ●            | 0.03-0.09 |                            |
| <b>MM EFS120B09-4T08</b> | 12.00      | 4     | 9.00  | 0.40 | T08   | 11.70 | 16.50 | 45.0        | ●            | 0.04-0.10 |                            |
| <b>MM EFS160B12-4T10</b> | 16.00      | 4     | 12.00 | 0.60 | T10   | 15.30 | 20.50 | 45.0        | ●            | 0.05-0.11 |                            |
| <b>MM EFS200B15-4T12</b> | 20.00      | 4     | 15.00 | 0.60 | T12   | 18.30 | 25.50 | 45.0        | ●            | 0.05-0.11 |                            |
| <b>MM EFS250B22-4T15</b> | 25.00      | 4     | 22.00 | 0.60 | T15   | 23.90 | 37.00 | 45.0        | ●            | 0.06-0.11 |                            |

• For shanks, see pages 63-71 • For Clamping keys (should be ordered separately), tightening torques and clamping instructions, see page 8. • Do not apply lubricant to the threaded connection. • For user guide, see pages 72-84.

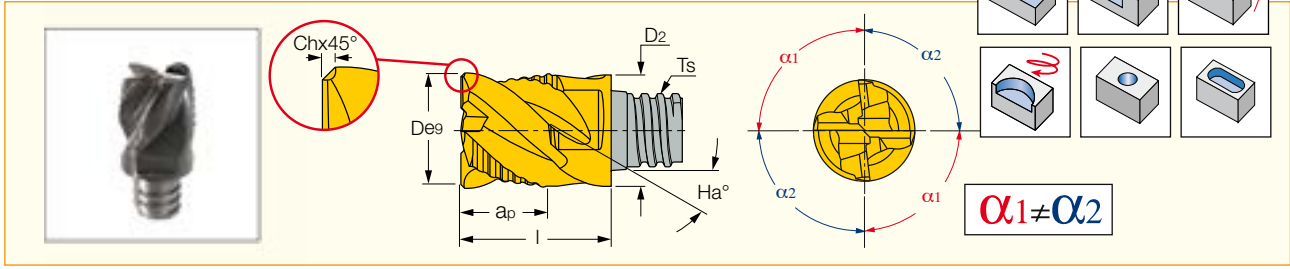
# FINISHEDRED • CHATTERFREE

MULTI-MASTER LINE MULTI-MASTER LINE

## MM EFS-CF

4 Flute 38° Helix with Variable Pitch, Solid Carbide Heads for Chatter Free Roughing and Finishing Applications

Engineered for  
**MAXIMUM**  
**MULTI-MASTER**  
Performance



| Designation           | Dimensions |       |       |      |     |       |       |      | IC908 | Recommended Machining Data |
|-----------------------|------------|-------|-------|------|-----|-------|-------|------|-------|----------------------------|
|                       | D          | Flute | ap    | Ch   | Ts  | D2    | l     | Ha°  |       | fz (mm/t)                  |
| MM EFS060E05-4T05 CF  | 6.00       | 4     | 5.00  | 0.25 | T05 | 7.70  | 10.00 | 38.0 | ●     | 0.03-0.08                  |
| MM EFS080E05-4T05 CF  | 8.00       | 4     | 5.00  | 0.3  | T05 | 7.70  | 10.00 | 38.0 | ●     | 0.03-0.08                  |
| MM EFS100E07-4T06 CF  | 10.00      | 4     | 7.00  | 0.4  | T06 | 9.60  | 13.00 | 38.0 | ●     | 0.03-0.09                  |
| MM EFS120E09-4T08 CF  | 12.00      | 4     | 9.00  | 0.5  | T08 | 11.70 | 16.50 | 38.0 | ●     | 0.04-0.10                  |
| MM EFS.500E37-4T08 CF | 12.70      | 4     | 9.50  | 0.5  | T08 | 12.40 | 16.50 | 38.0 | ●     | 0.04-0.10                  |
| MM EFS160E12-4T10 CF  | 16.00      | 4     | 12.00 | 0.6  | T10 | 15.30 | 20.50 | 38.0 | ●     | 0.05-0.11                  |
| MM EFS200E15-4T12 CF  | 20.00      | 4     | 16.00 | 0.6  | T12 | 18.30 | 25.50 | 38.0 | ●     | 0.05-0.11                  |
| MM EFS250E22-4T15 CF  | 25.00      | 4     | 22.00 | 0.6  | T15 | 23.90 | 37.00 | 38.0 | ●     | 0.06-0.11                  |

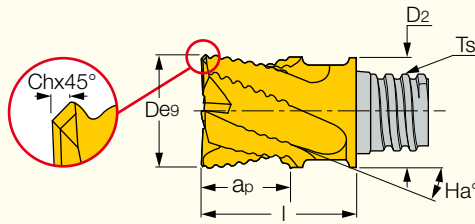
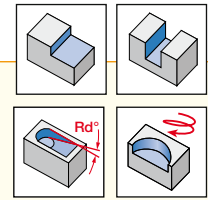
• For shanks, see pages 63-71 • For Clamping keys (should be ordered separately), tightening torques and clamping instructions, see page 8. • Do not apply lubricant to the threaded connection. • For user guide, see pages 72-84.



# MULTI-MASTER

INDEXABLE SOLID CARBIDE LINE  
MM ERS

Interchangeable Solid Carbide Rough Milling Heads, for High Metal Removal Rates



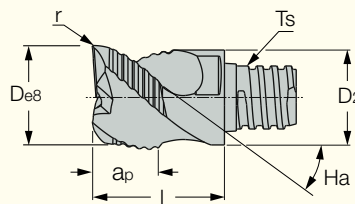
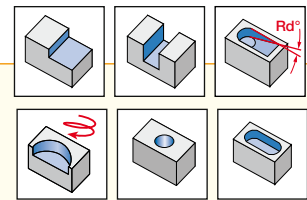
| Designation                       | Dimensions |       |       |       |       |       |      |             |             | IC908 | Recommended Machining Data |
|-----------------------------------|------------|-------|-------|-------|-------|-------|------|-------------|-------------|-------|----------------------------|
|                                   | D          | Flute | $a_p$ | $T_s$ | $D_2$ | $l$   | Ch   | $H_a^\circ$ | $R_d^\circ$ |       | $f_z$ (mm/t)               |
| MM ERS080B05-4T05                 | 8.00       | 4     | 5.00  | T05   | 7.70  | 10.00 | 0.25 | 45.0        | 90.0        | ●     | 0.03-0.08                  |
| MM ERS080B09-4T05                 | 8.00       | 4     | 9.00  | T05   | 7.70  | 15.00 | 0.25 | 45.0        | 90.0        | ●     | 0.03-0.08                  |
| MM ERS100B07-4T06                 | 10.00      | 4     | 7.00  | T06   | 9.60  | 13.00 | 0.30 | 45.0        | 90.0        | ●     | 0.03-0.09                  |
| MM ERS120B09-4T08                 | 12.00      | 4     | 9.00  | T08   | 11.70 | 16.50 | 0.35 | 45.0        | 90.0        | ●     | 0.04-0.10                  |
| MM ERS120B09-4T08H <sup>(1)</sup> | 12.00      | 4     | 9.00  | T08   | 11.70 | 16.50 | 0.35 | 45.0        | 90.0        | ●     | 0.04-0.10                  |
| MM ERS120B09-4T08I <sup>(2)</sup> | 12.00      | 4     | 9.00  | T08   | 11.70 | 16.50 | 0.35 | 45.0        | 90.0        | ●     | 0.04-0.11                  |
| MM ERS120B14-4T08                 | 12.00      | 4     | 14.00 | T08   | 11.70 | 23.00 | 0.35 | 45.0        | 90.0        | ●     | 0.04-0.10                  |
| MM ERS.500B37-4T08                | 12.70      | 4     | 9.50  | T08   | 12.40 | 16.50 | 0.35 | 45.0        | 90.0        | ●     | 0.04-0.10                  |
| MM ERS160B12-5T10                 | 16.00      | 5     | 12.00 | T10   | 15.30 | 20.50 | 0.40 | 45.0        | 7.0         | ●     | 0.04-0.10                  |
| MM ERS160B12-5T10H <sup>(1)</sup> | 16.00      | 5     | 12.00 | T10   | 15.30 | 20.50 | 0.40 | 45.0        | 7.0         | ●     | 0.04-0.10                  |
| MM ERS200B15-6T12                 | 20.00      | 6     | 15.00 | T12   | 18.30 | 25.50 | 0.40 | 45.0        | 3.0         | ●     | 0.05-0.11                  |
| MM ERS250B22-6T15                 | 25.00      | 6     | 22.00 | T15   | 23.90 | 37.00 | 0.50 | 45.0        | 3.0         | ●     | 0.05-0.11                  |
| MM ERS1.00B36-6T15                | 25.40      | 6     | 22.00 | T15   | 23.90 | 37.00 | 0.50 | 45.0        | 3.0         | ●     | 0.04-0.10                  |

• For shanks, see pages 63-71 • For Clamping keys (should be ordered separately), tightening torques and clamping instructions, see page 8. • Do not apply lubricant to the threaded connection. • For user guide, see pages 72-84.

<sup>(1)</sup> With a central coolant hole <sup>(2)</sup> With coolant holes directed to each flute

## MM ERA

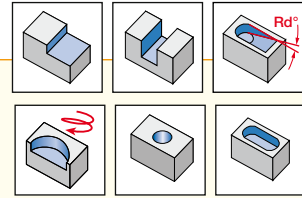
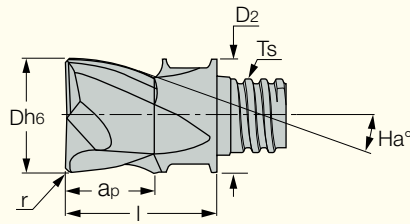
Interchangeable Solid Carbide Rough Milling Heads, for Machining Aluminum



**ALUMINUM**

| Designation           | Dimensions |       |       |      |       |       |       |             | IC08 | Recommended Machining Data |
|-----------------------|------------|-------|-------|------|-------|-------|-------|-------------|------|----------------------------|
|                       | D          | Flute | $a_p$ | $r$  | $T_s$ | $D_2$ | $l$   | $H_a^\circ$ |      | $f_z$ (mm/t)               |
| MM ERA080B05R0.2-3T05 | 8.00       | 3     | 5.00  | 0.20 | T05   | 7.70  | 10.00 | 45.0        | ●    | 0.03-0.15                  |
| MM ERA100B06R0.2-3T06 | 10.00      | 3     | 6.00  | 0.20 | T06   | 9.60  | 13.00 | 45.0        | ●    | 0.05-0.20                  |
| MM ERA120B08R0.2-3T08 | 12.00      | 3     | 8.00  | 0.20 | T08   | 11.70 | 16.50 | 45.0        | ●    | 0.07-0.22                  |
| MM ERA160B10R0.2-3T10 | 16.00      | 3     | 10.00 | 0.20 | T10   | 15.30 | 20.50 | 45.0        | ●    | 0.07-0.25                  |
| MM ERA200B12R0.2-3T12 | 20.00      | 3     | 12.00 | 0.20 | T12   | 18.30 | 25.50 | 45.0        | ●    | 0.07-0.25                  |
| MM ERA250B19R0.2-3T15 | 25.00      | 3     | 19.00 | 0.20 | T15   | 23.90 | 37.00 | 45.0        | ●    | 0.07-0.25                  |

• For shanks, see pages 63-71 • For Clamping keys (should be ordered separately), tightening torques and clamping instructions, see page 8. • Do not apply lubricant to the threaded connection. • For user guide, see pages 72-84.



**ALUMINUM**

| Designation           | Dimensions |       |                |      |                |                |       |                  |   | IC08      | Recommended Machining Data<br>f <sub>z</sub> (mm/t) |
|-----------------------|------------|-------|----------------|------|----------------|----------------|-------|------------------|---|-----------|-----------------------------------------------------|
|                       | D          | Flute | a <sub>p</sub> | r    | T <sub>s</sub> | D <sub>2</sub> | l     | H <sub>a</sub> ° |   |           |                                                     |
| MM EA080B05R0.5-2T05  | 8.00       | 2     | 5.00           | 0.50 | T05            | 7.70           | 10.00 | 45.0             | ● | 0.03-0.09 |                                                     |
| MM EA080B05R0.5-3T05  | 8.00       | 3     | 5.00           | 0.50 | T05            | 7.70           | 10.00 | 45.0             | ● | 0.03-0.09 |                                                     |
| MM EA100B06R0.5-3T06  | 10.00      | 3     | 6.00           | 0.50 | T06            | 9.60           | 13.00 | 45.0             | ● | 0.03-0.10 |                                                     |
| MM EA100B06R1.0-3T06  | 10.00      | 3     | 6.00           | 1.00 | T06            | 9.60           | 13.00 | 45.0             | ● | 0.03-0.10 |                                                     |
| MM EA100B07R0.5-2T06  | 10.00      | 2     | 7.00           | 0.50 | T06            | 9.60           | 13.00 | 45.0             | ● | 0.03-0.10 |                                                     |
| MM EA100B07R1.0-2T06  | 10.00      | 2     | 7.00           | 1.00 | T06            | 9.60           | 13.00 | 45.0             | ● | 0.03-0.10 |                                                     |
| MM EA120B08R0.5-3T08  | 12.00      | 3     | 8.00           | 0.50 | T08            | 11.70          | 16.50 | 45.0             | ● | 0.04-0.11 |                                                     |
| MM EA120B08R1.0-3T08  | 12.00      | 3     | 8.00           | 1.00 | T08            | 11.70          | 16.50 | 45.0             | ● | 0.04-0.11 |                                                     |
| MM EA120B08R3.0-3T08  | 12.00      | 3     | 8.00           | 3.00 | T08            | 11.70          | 16.50 | 45.0             | ● | 0.04-0.11 |                                                     |
| MM EA120B09R0.5-2T08  | 12.00      | 2     | 9.00           | 0.50 | T08            | 11.70          | 16.50 | 45.0             | ● | 0.04-0.11 |                                                     |
| MM EA120B09R1.0-2T08  | 12.00      | 2     | 9.00           | 1.00 | T08            | 11.70          | 16.50 | 45.0             | ● | 0.04-0.11 |                                                     |
| MM EA.500B31R031-3T08 | 12.70      | 3     | 8.00           | 0.80 | T08            | 12.40          | 16.50 | 45.0             | ● | 0.04-0.11 |                                                     |
| MM EA.500B31R062-3T08 | 12.70      | 3     | 8.00           | 1.60 | T08            | 12.40          | 16.50 | 45.0             | ● | 0.04-0.11 |                                                     |
| MM EA.500B31R094-3T08 | 12.70      | 3     | 8.00           | 2.40 | T08            | 12.40          | 16.50 | 45.0             | ● | 0.04-0.11 |                                                     |
| MM EA.500B31R125-3T08 | 12.70      | 3     | 8.00           | 3.20 | T08            | 12.40          | 16.50 | 45.0             | ● | 0.04-0.11 |                                                     |
| MM EA.500B37R000-2T08 | 12.70      | 2     | 9.50           | 0.00 | T08            | 12.40          | 16.50 | 45.0             | ● | 0.04-0.11 |                                                     |
| MM EA.500B37R020-2T08 | 12.70      | 2     | 9.50           | 0.50 | T08            | 12.40          | 16.50 | 45.0             | ● | 0.04-0.11 |                                                     |
| MM EA160B10R000-3T10  | 16.00      | 3     | 10.00          | 0.00 | T10            | 15.30          | 20.50 | 45.0             | ● | 0.05-0.13 |                                                     |
| MM EA160B10R1.0-3T10  | 16.00      | 3     | 10.00          | 1.00 | T10            | 15.30          | 20.50 | 45.0             | ● | 0.05-0.13 |                                                     |
| MM EA160B10R2.0-3T10  | 16.00      | 3     | 10.00          | 2.00 | T10            | 15.30          | 20.50 | 45.0             | ● | 0.05-0.13 |                                                     |
| MM EA160B10R3.0-3T10  | 16.00      | 3     | 10.00          | 3.00 | T10            | 15.30          | 20.50 | 45.0             | ● | 0.05-0.13 |                                                     |
| MM EA160B10R4.0-3T10  | 16.00      | 3     | 10.00          | 4.00 | T10            | 15.30          | 20.50 | 45.0             | ● | 0.05-0.13 |                                                     |
| MM EA200B12R0.5-3T12  | 20.00      | 3     | 12.00          | 0.50 | T12            | 18.30          | 25.50 | 45.0             | ● | 0.05-0.13 |                                                     |
| MM EA200B12R1.0-3T12  | 20.00      | 3     | 12.00          | 1.00 | T12            | 18.30          | 25.50 | 45.0             | ● | 0.05-0.13 |                                                     |
| MM EA200B12R2.0-3T12  | 20.00      | 3     | 12.00          | 2.00 | T12            | 18.30          | 25.50 | 45.0             | ● | 0.05-0.13 |                                                     |
| MM EA200B12R3.0-3T12  | 20.00      | 3     | 12.00          | 3.00 | T12            | 18.30          | 25.50 | 45.0             | ● | 0.05-0.13 |                                                     |
| MM EA200B12R4.0-3T12  | 20.00      | 3     | 12.00          | 4.00 | T12            | 18.30          | 25.50 | 45.0             | ● | 0.05-0.13 |                                                     |

- For shanks, see pages 63-71
- For Clamping keys (should be ordered separately), tightening torques and clamping instructions, see page 8
- Do not apply lubricant to the threaded connection.

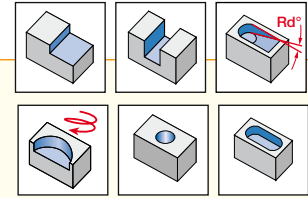
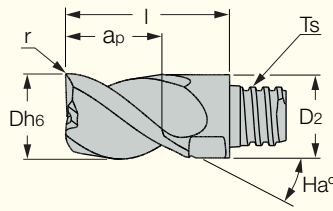


# CHATTERFREE

MULTI-MASTER LINE

## MM EA-CF

Interchangeable Solid Carbide Endmill Heads with Different Helix for Machining Aluminum



**ALUMINUM**

| Designation               | Dimensions |       |       |      |     |       |       |      |   | IC08      | Recommended Machining Data<br>fz (mm/t) |
|---------------------------|------------|-------|-------|------|-----|-------|-------|------|---|-----------|-----------------------------------------|
|                           | D          | Flute | ap    | r    | Ts  | D2    | l     | Ha°  |   |           |                                         |
| MM EA080H08R0CF-4T05 08   | 8.00       | 4     | 8.00  | 0.00 | T05 | 7.70  | 15.00 | 40.0 | ● | 0.03-0.09 |                                         |
| MM EA100H10R0CF-4T06      | 10.00      | 4     | 10.00 | 0.00 | T06 | 9.60  | 19.00 | 40.0 | ● | 0.03-0.10 |                                         |
| MM EA120H12R0.2CF-3T08 08 | 12.00      | 3     | 12.00 | 0.20 | T08 | 11.70 | 23.00 | 40.0 | ● | 0.04-0.11 |                                         |
| MM EA120H12R0CF-4T08 08   | 12.00      | 4     | 12.00 | 0.00 | T08 | 11.70 | 23.00 | 40.0 | ● | 0.04-0.11 |                                         |
| MM EA160H16R0.0CF-3T10    | 16.00      | 3     | 16.00 | 0.00 | T10 | 15.30 | 28.00 | 40.0 | ● | 0.05-0.13 |                                         |
| MM EA160H16R0.2CF-3T10    | 16.00      | 3     | 16.00 | 0.20 | T10 | 15.30 | 28.00 | 40.0 | ● | 0.05-0.13 |                                         |
| MM EA160H16R0.5CF-3T10    | 16.00      | 3     | 16.00 | 0.50 | T10 | 15.30 | 28.00 | 40.0 | ● | 0.05-0.13 |                                         |
| MM EA160H16R2.5CF-3T10    | 16.00      | 3     | 16.00 | 2.50 | T10 | 15.30 | 28.00 | 40.0 | ● | 0.05-0.13 |                                         |
| MM EA160H16R0CF-4T10      | 16.00      | 4     | 16.00 | 0.00 | T10 | 15.30 | 26.00 | 40.0 | ● | 0.05-0.12 |                                         |
| MM EA200H20R0.0CF-3T12    | 20.00      | 3     | 20.00 | 0.00 | T12 | 18.30 | 34.00 | 40.0 | ● | 0.05-0.13 |                                         |
| MM EA200H20R0.2CF-3T12    | 20.00      | 3     | 20.00 | 0.20 | T12 | 18.30 | 34.00 | 40.0 | ● | 0.05-0.13 |                                         |
| MM EA200H20R0.5CF-3T12    | 20.00      | 3     | 20.00 | 0.50 | T12 | 18.30 | 34.00 | 40.0 | ● | 0.05-0.13 |                                         |
| MM EA200H20R2.5CF-3T12    | 20.00      | 3     | 20.00 | 2.50 | T12 | 18.30 | 34.00 | 40.0 | ● | 0.05-0.13 |                                         |
| MM EA250H19R0.5-3T15      | 25.00      | 3     | 19.00 | 0.50 | T15 | 23.90 | 37.00 | 40.0 | ● | 0.06-0.16 |                                         |
| MM EA250H19R1.0-3T15      | 25.00      | 3     | 19.00 | 1.00 | T15 | 23.90 | 37.00 | 40.0 | ● | 0.06-0.16 |                                         |
| MM EA250H19R3.0-3T15      | 25.00      | 3     | 19.00 | 3.00 | T15 | 23.90 | 37.00 | 40.0 | ● | 0.06-0.16 |                                         |

• For shanks, see pages 63-71 • For Clamping keys (should be ordered separately), tightening torques and clamping instructions, see page 8. • Do not apply lubricant to the threaded connection. • For user guide, see pages 72-84.

### Spare Parts

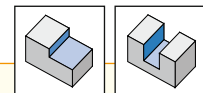
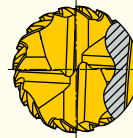
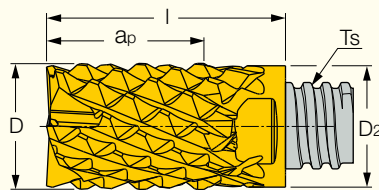


| Designation | Wrench      |
|-------------|-------------|
| MM EA-CF    | MM KEY 6X4* |

\* (Optional, should be ordered separately)

## MM EPNC

Interchangeable Solid Endmills with Changing Directions Helix Flutes, for Rough Machining of CFRP Parts



| Designation         | Dimensions |       |       |      |     |       |       |   |           | IC02 | Recommended Machining Data<br>fz (mm/t) |
|---------------------|------------|-------|-------|------|-----|-------|-------|---|-----------|------|-----------------------------------------|
|                     | D          | Flute | ap    | r    | Ts  | D2    | l     |   |           |      |                                         |
| MM EPNC100S12-12T06 | 10.00      | 12    | 12.00 | 0.00 | T06 | 9.60  | 19.00 | ● | 0.02-0.04 |      |                                         |
| MM EPNC120S14-12T08 | 12.00      | 12    | 14.00 | 0.00 | T08 | 11.70 | 23.00 | ● | 0.02-0.04 |      |                                         |

• For shanks, see pages 63-71 • For Clamping keys (should be ordered separately), tightening torques and clamping instructions, see page 8. • Do not apply lubricant to the threaded connection. • For user guide, see pages 72-84.

### Spare Parts



| Designation | Wrench      |
|-------------|-------------|
| MM EPNC     | MM KEY 8X5* |

\* (Optional, should be ordered separately)

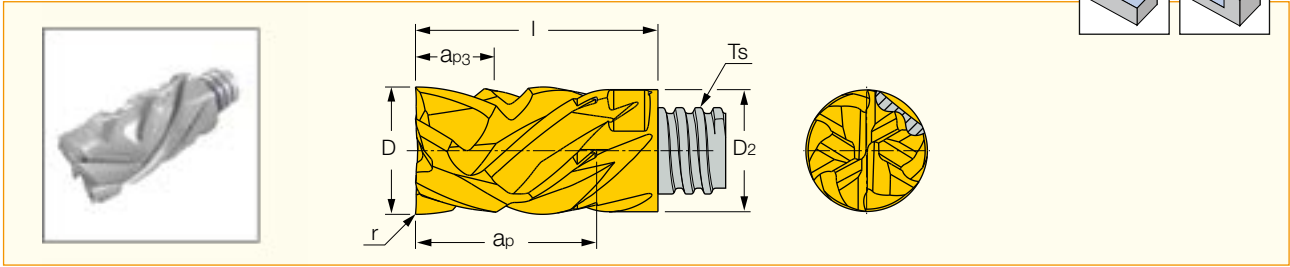
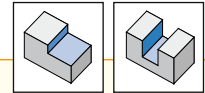


# MULTI-MASTER

INDEXABLE SOLID CARBIDE LINE  
MM EPX

Interchangeable Solid Endmills with Right and Left-Hand Changing Directions Helix Flutes, for Machining CFRP Parts

Engineered for  
**MAXIMUM**  
**MULTI-MASTER**  
Performance



| Designation          | Dimensions |       |       |      |      |     |       |       | IC08 | Recommended Machining Data |
|----------------------|------------|-------|-------|------|------|-----|-------|-------|------|----------------------------|
|                      | D          | Flute | ap    | ap3  | r    | Ts  | D2    | l     |      | fz (mm/t)                  |
| MM EPX100S12-6T06 08 | 10.00      | 6     | 12.00 | 6.30 | 0.00 | T06 | 9.60  | 19.00 | ●    | 0.02-0.06                  |
| MM EPX120S14-8T08 08 | 12.00      | 8     | 14.00 | 6.70 | 0.00 | T08 | 11.70 | 23.00 | ●    | 0.02-0.06                  |

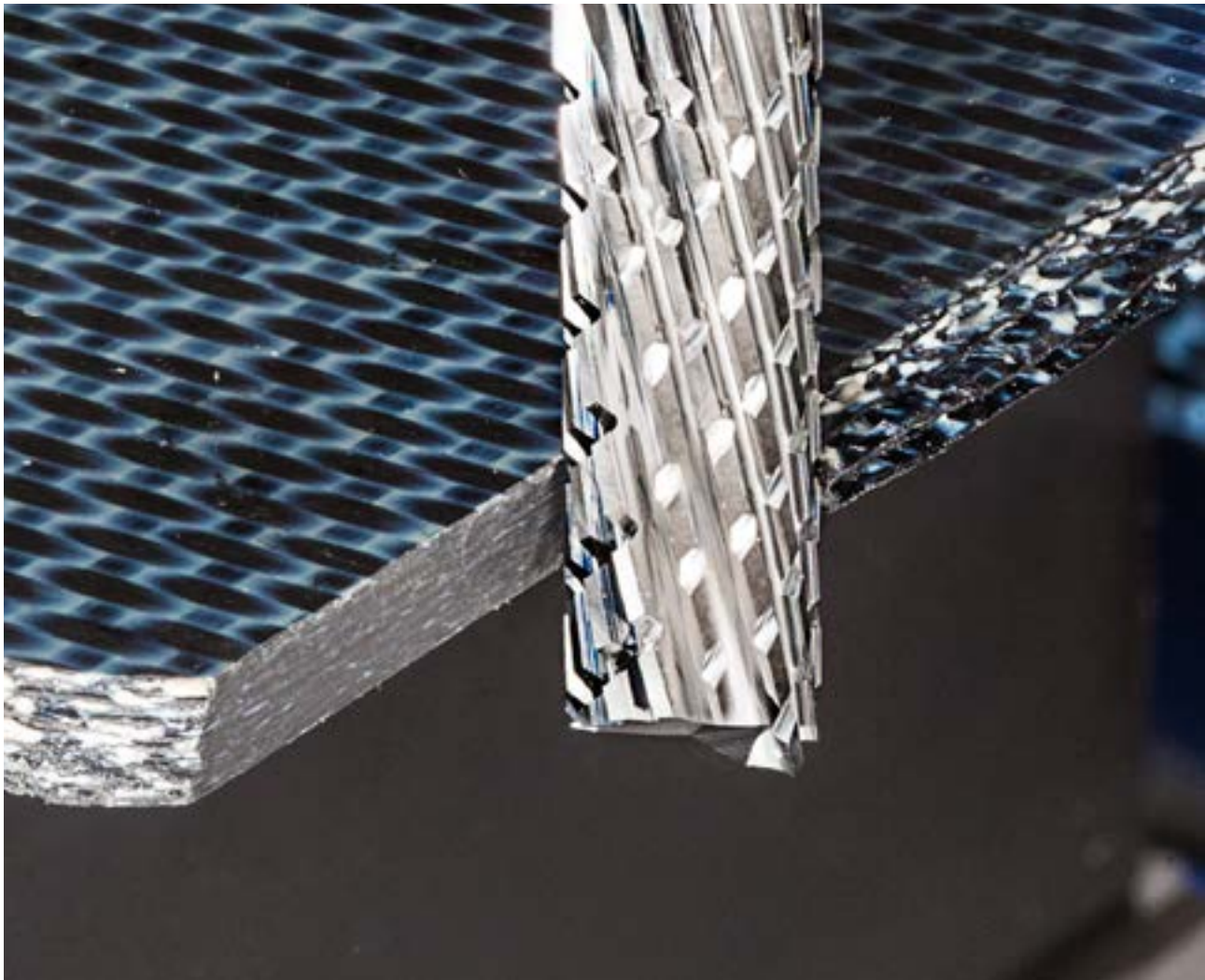
• Important: for best results, the intersection of the alternating flute directions (ap3) should be positioned in the middle of the workpiece height • For shanks, see pages 63-71. • For Clamping keys (should be ordered separately), tightening torques and clamping instructions, see page 8. • Do not apply lubricant to the threaded connection. • For user guide, see pages 72-84.

## Spare Parts



| Designation          | Wrench       |
|----------------------|--------------|
| MM EPX120S14-8T08 08 | MM KEY 10X7* |

\* (Optional, should be ordered separately)



Engineered for  
**MAXIMUM**  
**MULTI-MASTER**  
Performance

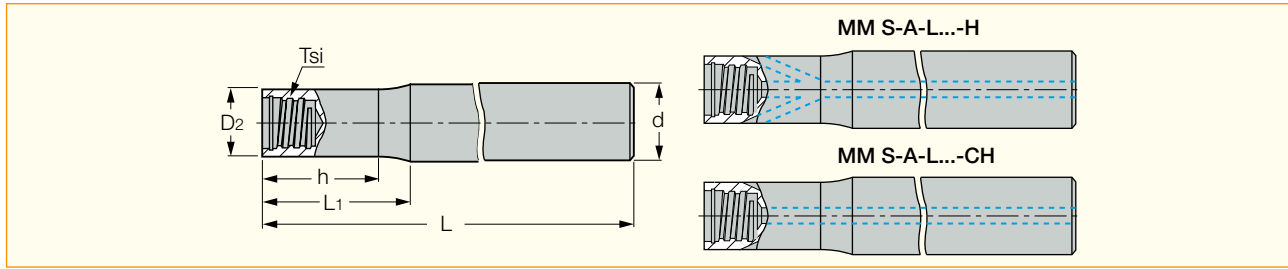


## **MULTI-MASTER**

### **Shanks**

The MULTI-MASTER shanks are produced from various materials: Steel (for general applications), Tungsten carbide (has high stiffness) and heavy metal (an alloy with great tungsten percentage). This alloy features excellent vibration damping properties but is not recommended for heavy-duty applications due to its limited impact fatigue strength.

The shanks differ in configuration; a) without a neck, b) with a straight or tapered neck. The tapered angle for standard shanks varies from 5° or 1°. Naturally, overall lengths and neck lengths also vary.



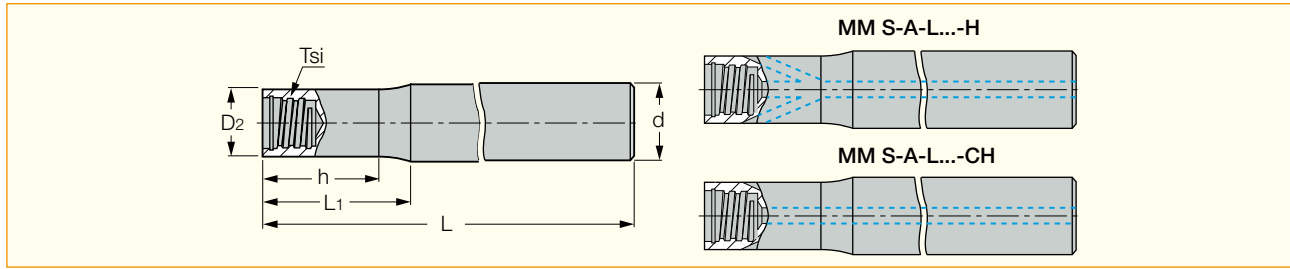
| Designation               | Tsi | d     | D <sub>2</sub> | h     | L <sub>1</sub> | L      | Shank m. <sup>(1)</sup> | Coolant | RPM <sub>max</sub> <sup>(2)</sup> | Kg   |
|---------------------------|-----|-------|----------------|-------|----------------|--------|-------------------------|---------|-----------------------------------|------|
| MM S-A-L050-C08-T04       | T04 | 8.00  | 5.80           | 9.90  | 14.0           | 50.00  | S                       | N       | 60000                             | 0.02 |
| MM S-A-L060-C08-T05       | T05 | 8.00  | 7.60           | 12.50 | 15.0           | 60.00  | S                       | N       | 60000                             | 0.02 |
| MM S-A-L070-C08-T05-C     | T05 | 8.00  | 7.60           | 18.60 | 20.0           | 70.00  | C                       | N       | 60000                             | 0.04 |
| MM S-A-L070-C08-T05-W     | T05 | 8.00  | 7.60           | 18.90 | 20.0           | 70.00  | W                       | N       | 60000                             | 0.06 |
| MM S-A-L090-C08-T05-C     | T05 | 8.00  | 7.60           | 38.60 | 40.0           | 90.00  | C                       | N       | 50160                             | 0.06 |
| MM S-A-L090-C08-T05-W     | T05 | 8.00  | 7.60           | 38.90 | 40.0           | 90.00  | W                       | N       | 36090                             | 0.07 |
| MM S-A-L110-C08-T05-C     | T05 | 8.00  | 7.60           | 57.90 | 60.0           | 110.00 | C                       | N       | 30600                             | 0.07 |
| MM S-A-L110-C08-T05-W     | T05 | 8.00  | 7.60           | 58.90 | 60.0           | 110.00 | W                       | N       | 21060                             | 0.09 |
| MM S-A-L070-C10-T06-C     | T06 | 10.00 | 9.60           | 18.50 | 20.0           | 70.00  | C                       | N       | 54900                             | 0.07 |
| MM S-A-L070-C10-T06-W-H   | T06 | 10.00 | 9.60           | 18.90 | 20.0           | 70.00  | W                       | Y       | 60000                             | 0.08 |
| MM S-A-L075-C10-T06       | T06 | 10.00 | 9.55           | 17.40 | 20.0           | 75.00  | S                       | N       | 60000                             | 0.05 |
| MM S-A-L075-C10-T06-H     | T06 | 10.00 | 9.55           | 18.80 | 20.0           | 75.00  | S                       | Y       | 53940                             | 0.04 |
| MM S-A-L090-C10-T06-C     | T06 | 10.00 | 9.60           | 38.50 | 40.0           | 90.00  | C                       | N       | 55170                             | 0.06 |
| MM S-A-L090-C10-T06-W     | T06 | 10.00 | 9.55           | 17.20 | 20.0           | 90.00  | W                       | N       | 41670                             | 0.12 |
| MM S-A-L090-C10-T06-W-H   | T06 | 10.00 | 9.60           | 39.00 | 40.0           | 90.00  | W                       | Y       | 40860                             | 0.10 |
| MM S-A-L110-C10-T06-C     | T06 | 10.00 | 9.60           | 57.90 | 60.0           | 110.00 | C                       | N       | 34530                             | 0.11 |
| MM S-A-L110-C10-T06-W-H   | T06 | 10.00 | 9.60           | 59.00 | 60.0           | 110.00 | W                       | Y       | 24840                             | 0.12 |
| MM S-A-L150-C10-T06-C     | T06 | 10.00 | 9.60           | 98.50 | 100.0          | 150.00 | C                       | N       | 16620                             | 0.15 |
| MM S-A-L070-C12-T08-C     | T08 | 12.00 | 11.50          | 17.90 | 20.0           | 70.00  | C                       | N       | 60000                             | 0.10 |
| MM S-A-L070-C12-T08-W-H   | T08 | 12.00 | 11.50          | 18.70 | 20.0           | 70.00  | W                       | Y       | 60000                             | 0.11 |
| MM S-A-L090/14-C12-T08-CH | T08 | 12.00 | 11.50          | 13.00 | 14.0           | 90.00  | S                       | Y       | -                                 | 0.12 |
| MM S-A-L090-C12-T08       | T08 | 12.00 | 11.50          | 13.30 | 16.0           | 90.00  | S                       | N       | 43000                             | 0.10 |
| MM S-A-L070/020C12T08C-CH | T08 | 12.00 | 11.50          | 18.00 | 20.0           | 90.00  | C                       | Y       | -                                 | 0.08 |
| MM S-A-L090-C12-T08-C     | T08 | 12.00 | 11.50          | 39.00 | 40.0           | 90.00  | C                       | N       | 43050                             | 0.12 |
| MM S-A-L090-C12-T08-H     | T08 | 12.00 | 11.50          | 38.70 | 40.0           | 90.00  | S                       | Y       | 41040                             | 0.08 |
| MM S-A-L090-C12-T08-W-H   | T08 | 12.00 | 11.50          | 38.70 | 40.0           | 90.00  | W                       | Y       | 49800                             | 0.15 |
| MM S-A-L090/040C12T08C-CH | T08 | 12.00 | 11.50          | 38.00 | 40.0           | 90.00  | C                       | Y       | -                                 | 0.11 |
| MM S-A-L090/42-C12-T08-CH | T08 | 12.00 | 11.50          | 41.00 | 42.0           | 90.00  | S                       | Y       | 41010                             | 0.07 |
| MM S-A-L110-C12-T08-W     | T08 | 12.00 | 11.50          | 17.00 | 20.0           | 110.00 | W                       | N       | 31350                             | 0.09 |
| MM S-A-L110-C12-T08-C     | T08 | 12.00 | 11.50          | 57.00 | 60.0           | 110.00 | C                       | N       | 41040                             | 0.16 |
| MM S-A-L110-C12-T08-W-H   | T08 | 12.00 | 11.50          | 58.70 | 60.0           | 110.00 | W                       | Y       | 30210                             | 0.18 |
| MM S-A-L110/060C12T08C-CH | T08 | 12.00 | 11.50          | 58.00 | 60.0           | 110.00 | C                       | Y       | -                                 | 0.12 |
| MM S-A-L130-C12-T08-C     | T08 | 12.00 | 11.50          | 77.80 | 80.0           | 130.00 | C                       | N       | 27960                             | 0.19 |
| MM S-A-L130-C12-T08-W-H   | T08 | 12.00 | 11.50          | 78.70 | 80.0           | 130.00 | W                       | Y       | 20100                             | 0.21 |
| MM S-A-L130/080C12T08C-CH | T08 | 12.00 | 11.50          | 78.00 | 80.0           | 130.00 | C                       | Y       | -                                 | 0.17 |

• Do not apply lubricant to the threaded connection.

<sup>(1)</sup> S-steel, C-carbide, W-tungsten <sup>(2)</sup> The maximum RPM must be calculated. Divide the listed max. RPM by the number of flutes (on the milling head) being used.

## MM S-A (stepped shanks) (continued)

Stepped Cylindrical Shanks for Interchangeable Milling Heads



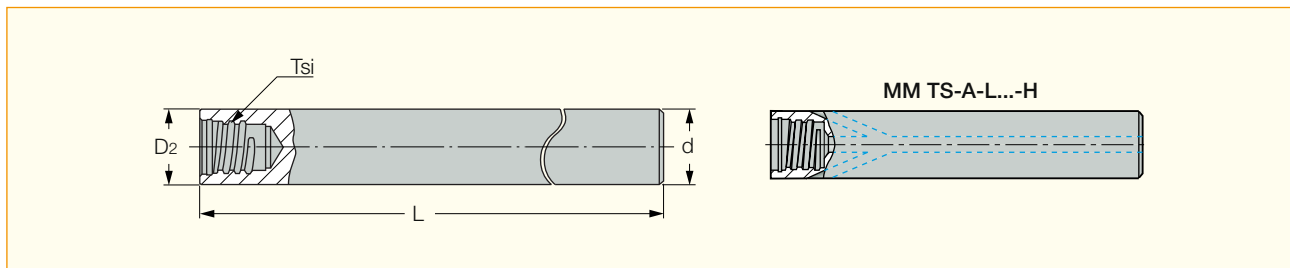
| Designation               | Tsi | d     | D <sub>2</sub> | h      | L <sub>1</sub> | L      | Shank m. <sup>(1)</sup> | Coolant | RPM <sub>max</sub> <sup>(2)</sup> | Kg   |
|---------------------------|-----|-------|----------------|--------|----------------|--------|-------------------------|---------|-----------------------------------|------|
| MM S-A-L070-C16-T10-W-H   | T10 | 16.00 | 15.20          | 18.20  | 20.0           | 70.00  | W                       | Y       | 60000                             | 0.21 |
| MM S-A-L090-C16-T10-C     | T10 | 16.00 | 15.20          | 38.00  | 40.0           | 90.00  | C                       | N       | 60000                             | 0.21 |
| MM S-A-L090-C16-T10-W-H   | T10 | 16.00 | 15.20          | 38.20  | 40.0           | 90.00  | W                       | Y       | 57510                             | 0.27 |
| MM S-A-L100-C16-T10       | T10 | 16.00 | 15.20          | 16.30  | 20.0           | 100.00 | S                       | N       | 39000                             | 0.16 |
| MM S-A-L100-C16-T10-H     | T10 | 16.00 | 15.20          | 48.00  | 50.0           | 100.00 | S                       | Y       | 37140                             | 0.13 |
| MM S-A-L100/42-C16-T10-CH | T10 | 16.00 | 15.20          | 40.20  | 42.0           | 100.00 | S                       | Y       | 38040                             | 0.14 |
| MM S-A-L110-C16-T10-C     | T10 | 16.00 | 15.20          | 58.00  | 60.0           | 110.00 | C                       | N       | 47010                             | 0.27 |
| MM S-A-L110-C16-T10-W-H   | T10 | 16.00 | 15.20          | 58.20  | 60.0           | 110.00 | W                       | Y       | 36030                             | 0.33 |
| MM S-A-L130-C16-T10-C     | T10 | 16.00 | 15.20          | 77.40  | 80.0           | 130.00 | C                       | N       | 33510                             | 0.32 |
| MM S-A-L130-C16-T10-W-H   | T10 | 16.00 | 15.20          | 78.20  | 80.0           | 130.00 | W                       | Y       | 24450                             | 0.39 |
| MM S-A-L150-C16-T10-C     | T10 | 16.00 | 15.20          | 97.40  | 100.0          | 150.00 | C                       | N       | 24660                             | 0.37 |
| MM S-A-L150-C16-T10-W-H   | T10 | 16.00 | 15.20          | 98.20  | 100.0          | 150.00 | W                       | Y       | 17610                             | 0.45 |
| MM S-A-L090-C20-T12-C     | T12 | 20.00 | 18.30          | 37.00  | 40.0           | 90.00  | C                       | N       | 60000                             | 0.32 |
| MM S-A-L090-C20-T12-W-H   | T12 | 20.00 | 18.30          | 36.90  | 40.0           | 90.00  | W                       | Y       | 60000                             | 0.41 |
| MM S-A-L120-C20-T12       | T12 | 20.00 | 18.30          | 20.30  | 25.0           | 120.00 | S                       | N       | 36000                             | 0.27 |
| MM S-A-L120-C20-T12-H     | T12 | 20.00 | 18.30          | 66.70  | 70.0           | 120.00 | S                       | Y       | 32160                             | 0.25 |
| MM S-A-L130-C20-T12-C     | T12 | 20.00 | 18.30          | 77.20  | 80.0           | 130.00 | C                       | N       | 42360                             | 0.47 |
| MM S-A-L130-C20-T12-W-H   | T12 | 20.00 | 18.30          | 76.90  | 80.0           | 130.00 | W                       | Y       | 31650                             | 0.59 |
| MM S-A-L170-C20-T12-C     | T12 | 20.00 | 18.30          | 97.20  | 100.0          | 170.00 | C                       | N       | 25170                             | 0.63 |
| MM S-A-L170-C20-T12-C     | T12 | 20.00 | 18.30          | 116.50 | 120.0          | 200.00 | C                       | N       | 17790                             | 0.76 |
| MM S-A-L200-C20-T12-W-H   | T12 | 20.00 | 18.30          | 116.90 | 120.0          | 200.00 | W                       | Y       | 12540                             | 0.92 |
| MM S-A-L120-C25-T15-C     | T15 | 25.00 | 23.90          | 57.50  | 60.0           | 120.00 | C                       | N       | 49400                             | 0.64 |
| MM S-A-L120-C25-T15-W-H   | T15 | 25.00 | 23.90          | 58.00  | 60.0           | 120.00 | W                       | Y       | 41700                             | 0.89 |
| MM S-A-L135-C25-T15       | T15 | 25.00 | 23.90          | 33.00  | 35.0           | 135.00 | S                       | N       | 28290                             | 0.47 |
| MM S-A-L135/35-C25-T15-CH | T15 | 25.00 | 23.90          | 33.00  | 35.0           | 135.00 | S                       | Y       | 28230                             | 0.42 |
| MM S-A-L170-C25-T15-C     | T15 | 25.00 | 23.90          | 98.00  | 100.0          | 170.00 | C                       | N       | 27360                             | 0.96 |
| MM S-A-L175-C25-T15       | T15 | 25.00 | 23.90          | 62.70  | 65.0           | 175.00 | S                       | N       | 16890                             | 1.00 |
| MM S-A-L250-C25-T15-C     | T15 | 25.00 | 23.90          | 148.00 | 150.0          | 250.00 | C                       | N       | 12690                             | 1.45 |

• Do not apply lubricant to the threaded connection.

<sup>(1)</sup> S-steel, C-carbide, W-tungsten <sup>(2)</sup> The maximum RPM must be calculated. Divide the listed max. RPM by the number of flutes (on the milling head) being used.

## MM TS-A

Cylindrical Shanks for Interchangeable Milling Heads



| Designation            | Tsi | d     | D <sub>2</sub> | L      | Coolant | RPM <sub>max</sub> <sup>(1)</sup> | Kg   |
|------------------------|-----|-------|----------------|--------|---------|-----------------------------------|------|
| MM TS-A-L070-C08-T05   | T05 | 8.00  | 8.00           | 70.00  | N       | 60000                             | 0.03 |
| MM TS-A-L080-C10-T06   | T06 | 10.00 | 10.00          | 80.00  | N       | 47400                             | 0.07 |
| MM TS-A-L080-C10-T06-H | T06 | 10.00 | 10.00          | 80.00  | Y       | 46920                             | 0.04 |
| MM TS-A-L090-C12-T08   | T08 | 12.00 | 12.00          | 90.00  | N       | 43110                             | 0.12 |
| MM TS-A-L090-C12-T08-H | T08 | 12.00 | 12.00          | 90.00  | Y       | 42780                             | 0.08 |
| MM TS-A-L100-C16-T10   | T10 | 16.00 | 16.00          | 100.00 | N       | 39420                             | 0.17 |
| MM TS-A-L100-C16-T10-H | T10 | 16.00 | 16.00          | 100.00 | Y       | 39210                             | 0.14 |

• Do not apply lubricant to the threaded connection

<sup>(1)</sup> The actual maximum RPM should be calculated by dividing the listed RPM max by the number of the heads flutes being used.

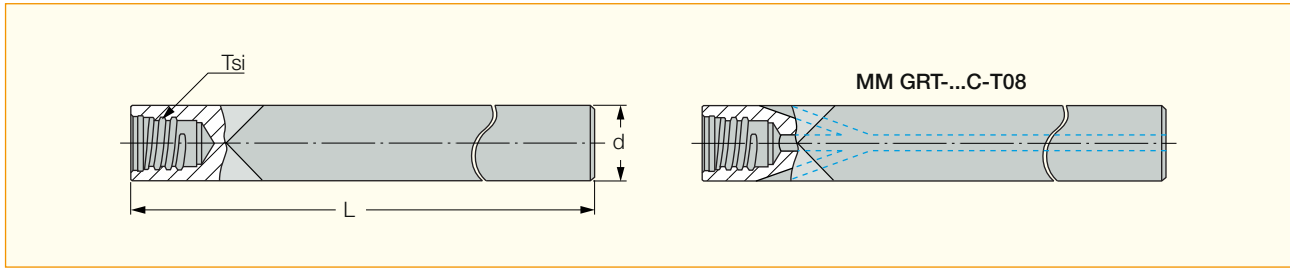
# MULTI-MASTER

INDEXABLE SOLID CARBIDE LINE

## MM GRT (shanks)

Solid Carbide Cylindrical Shanks for Slitting and Grooving Interchangeable Milling Heads

Engineered for  
**MAXIMUM**  
**MULTI-MASTER**  
Performance



| Designation     | Tsi | d     | L      | Shank <sup>(1)</sup> | Coolant | Kg   |
|-----------------|-----|-------|--------|----------------------|---------|------|
| MM GRT-095-T06  | T06 | 9.52  | 80.00  | C                    | N       | 0.07 |
| MM GRT-100-T06  | T06 | 10.00 | 100.00 | C                    | N       | 0.10 |
| MM GRT-120C-T08 | T08 | 12.00 | 100.00 | C                    | Y       | 0.12 |
| MM GRT-127C-T08 | T08 | 12.70 | 120.00 | C                    | Y       | 0.17 |

<sup>(1)</sup> C-Cylindrical

MM GRT... shanks serve mainly for MM GRIT... slitting heads. When mounting other types of milling heads, do not exceed maximum specified depth of cut for the particular milling head. Since the shank diameter is not relieved, it may touch a wall on the workpiece being machined.

Use carbide shanks for groove milling heads and for applications requiring high rigidity and precision. Each slitting shank is supplied with MM EGR clamping key. (page 8) Keys for other milling heads must be ordered separately.

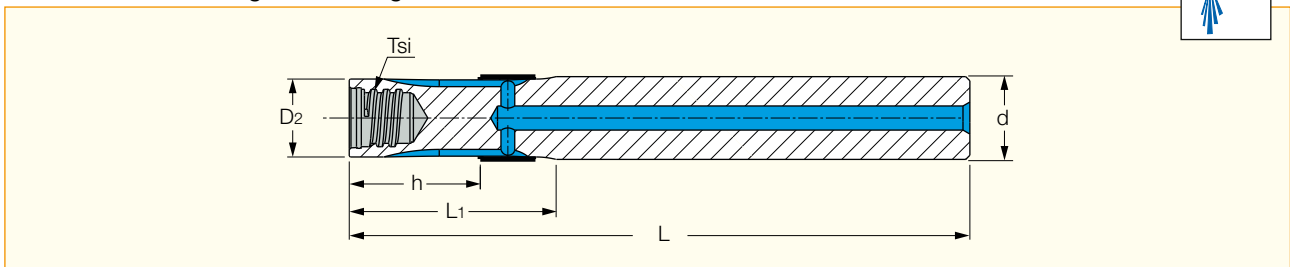
### Spare Parts



| Designation     | Clamping Key |
|-----------------|--------------|
| MM GRT-095-T06  | MM EGR 16-18 |
| MM GRT-100-T06  | MM EGR 16-18 |
| MM GRT-120C-T08 | MM EGR 20-22 |
| MM GRT-127C-T08 | MM EGR 20-22 |

## MM S-A-N

Stepped Cylindrical Shanks with Parallel Directed Coolant for Interchangeable Milling Heads



| Designation           | Tsi | d     | D2    | h     | L1   | L      | Kg   |
|-----------------------|-----|-------|-------|-------|------|--------|------|
| MM S-A-L075-C10-T06-N | T06 | 10.00 | 9.60  | 18.00 | 28.0 | 75.00  | 0.04 |
| MM S-A-L090-C12-T08-N | T08 | 12.00 | 11.60 | 18.00 | 30.0 | 90.00  | 0.07 |
| MM S-A-L100-C16-T10-N | T10 | 16.00 | 15.30 | 23.00 | 35.0 | 100.00 | 0.04 |

• Do not apply lubricant to the threaded connection



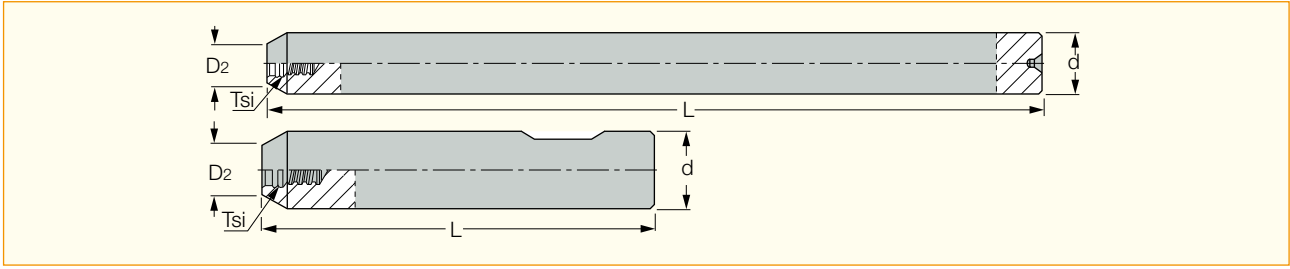


# MULTI-MASTER

INDEXABLE SOLID CARBIDE LINE

## MM S-A (straight shanks)

Shanks for Interchangeable Milling Heads



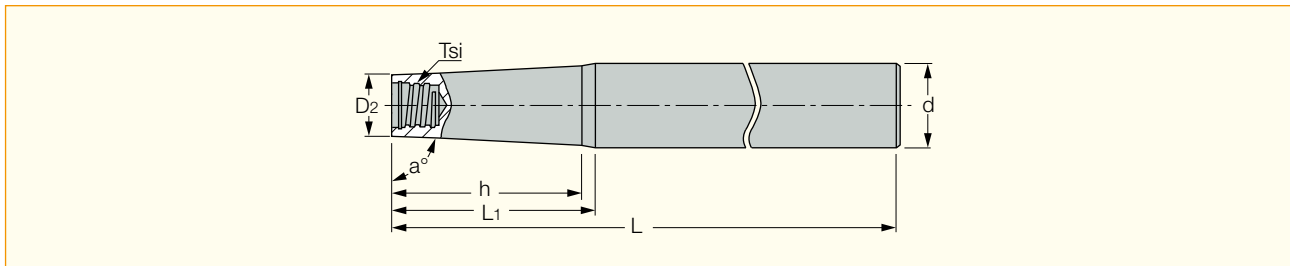
| Designation                          | Tsi | d     | D <sub>2</sub> | Shank <sup>(2)</sup> | L      | RPM <sub>max</sub> <sup>(3)</sup> | Kg   |
|--------------------------------------|-----|-------|----------------|----------------------|--------|-----------------------------------|------|
| MM S-A-L055-W12-T05                  | T05 | 12.00 | 7.60           | W                    | 55.00  | 60000                             | 0.05 |
| MM S-A-L065-W16-T06                  | T06 | 16.00 | 9.50           | W                    | 65.00  | 60000                             | 0.11 |
| MM S-A-L065-W16-T08                  | T08 | 16.00 | 11.50          | W                    | 65.00  | 60000                             | 0.10 |
| MM S-A-L070-W20-T10                  | T10 | 20.00 | 15.20          | W                    | 70.00  | 60000                             | 0.18 |
| MM S-A-L075-W25-T12                  | T12 | 25.00 | 18.30          | W                    | 75.00  | 60000                             | 0.31 |
| MM S-A-L100-W32-T15                  | T15 | 32.00 | 23.90          | W                    | 100.00 | 60000                             | 0.30 |
| MM S-A-L150-C12-T05-B <sup>(1)</sup> | T05 | 12.00 | 7.60           | C                    | 150.00 | 18270                             | 0.13 |
| MM S-A-L200-C16-T06-B <sup>(1)</sup> | T06 | 16.00 | 9.60           | C                    | 200.00 | 11970                             | 0.45 |
| MM S-A-L250-C20-T08-B <sup>(1)</sup> | T08 | 20.00 | 11.50          | C                    | 250.00 | 9330                              | 0.60 |
| MM S-A-L250-C25-T10-B <sup>(1)</sup> | T10 | 25.00 | 15.20          | C                    | 250.00 | 11130                             | 0.94 |

• Do not apply lubricant to the threaded connection.

<sup>(1)</sup> "B" suffix - cylindrical shank which may be shortened. <sup>(2)</sup> C-Cylindrical, W-Weldon <sup>(3)</sup> The maximum RPM must be calculated. Divide the listed max. RPM by the number of flutes (on the milling head) being used.

## MM S-B (85° conical shanks)

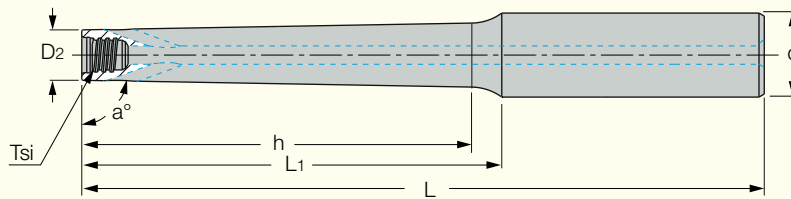
85° Conical Shanks for Interchangeable Milling Heads



| Designation           | Tsi | a° | d     | D <sub>2</sub> | Shank <sup>(1)</sup> | L <sub>1</sub> | L      | Shank m. | h     | RPM <sub>max</sub> <sup>(2)</sup> | Kg   |
|-----------------------|-----|----|-------|----------------|----------------------|----------------|--------|----------|-------|-----------------------------------|------|
| MM S-B-L080-C12-T05   | T05 | 85 | 12.00 | 7.60           | C                    | 25.0           | 80.00  | S        | -     | 60000                             | 0.06 |
| MM S-B-L125-C16-T06   | T06 | 85 | 16.00 | 9.60           | C                    | 34.0           | 125.00 | S        | 31.50 | 41280                             | 0.26 |
| MM S-B-L140-C20-T06-W | T06 | 85 | 20.00 | 9.60           | C                    | 60.0           | 140.00 | W        | -     | 51180                             | 0.62 |
| MM S-B-L140-C16-T08   | T08 | 85 | 16.00 | 11.50          | C                    | 22.0           | 140.00 | S        | 19.20 | 25590                             | 0.22 |
| MM S-B-L140-C20-T10   | T10 | 85 | 20.00 | 15.20          | C                    | 27.5           | 140.00 | S        | -     | 31020                             | 0.34 |
| MM S-B-L170-C25-T10   | T10 | 85 | 25.00 | 15.20          | C                    | 56.0           | 170.00 | S        | -     | 29490                             | 0.16 |
| MM S-B-L160-C25-T12   | T12 | 85 | 25.00 | 18.30          | C                    | 40.0           | 160.00 | S        | -     | 28680                             | 0.11 |
| MM S-B-L190-C32-T12   | T12 | 85 | 32.00 | 18.30          | C                    | 80.0           | 190.00 | S        | -     | 34890                             | 0.56 |
| MM S-B-L200-C32-T15   | T15 | 85 | 32.00 | 23.90          | C                    | 50.0           | 200.00 | S        | -     | 14160                             | 0.30 |
| MM S-B-L250-W40-T15   | T15 | 85 | 40.00 | 23.90          | W                    | 100.0          | 250.00 | S        | -     | 21840                             | 2.54 |

• Shank material (Shank m.): S-steel, W-tungsten. • Do not apply lubricant to the threaded connection.

<sup>(1)</sup> C-Cylindrical, W-Weldon <sup>(2)</sup> The maximum RPM must be calculated. Divide the listed max. RPM by the number of flutes (on the milling head) being used.



| Designation               | Tsi | a° | d     | D <sub>2</sub> | L <sub>1</sub> | L      | Shank m. | h      | Coolant | RPM <sub>max</sub> <sup>(2)</sup> | Kg   |
|---------------------------|-----|----|-------|----------------|----------------|--------|----------|--------|---------|-----------------------------------|------|
| MM S-D-L100-C12-T05       | T05 | 89 | 12.00 | 7.60           | 35.0           | 100.00 | S        | 29.60  | N       | 52000                             | 0.15 |
| MM S-D-L110-C12-T05-C     | T05 | 89 | 12.00 | 7.60           | 60.0           | 110.00 | C        | 55.90  | N       | 53430                             | 0.13 |
| MM S-D-L110-C12-T05-W-H   | T05 | 89 | 12.00 | 7.60           | 60.0           | 110.00 | W        | 55.70  | Y       | 38460                             | 0.14 |
| MM S-D-L130-C12-T05-C     | T05 | 89 | 12.00 | 7.60           | 80.0           | 130.00 | C        | 77.30  | N       | 36420                             | 0.15 |
| MM S-D-L130-C12-T05-W-H   | T05 | 89 | 12.00 | 7.60           | 80.0           | 130.00 | W        | 76.40  | Y       | 26160                             | 0.16 |
| MM S-D-L150-C16-T05-C     | T05 | 89 | 16.00 | 7.60           | 100.0          | 150.00 | C        | 91.50  | N       | 29700                             | 0.17 |
| MM S-D-L110-C12-T06-W-H   | T06 | 89 | 12.00 | 9.60           | 60.0           | 110.00 | W        | 58.80  | Y       | 36990                             | 0.17 |
| MM S-D-L130-C16-T06-W-H   | T06 | 89 | 16.00 | 9.60           | 80.0           | 130.00 | W        | 73.40  | Y       | 29490                             | 0.29 |
| MM S-D-L150-C16-T06-C     | T06 | 89 | 16.00 | 9.60           | 100.0          | 150.00 | C        | 95.40  | N       | 30150                             | 0.11 |
| MM S-D-L150-C16-T06-W-H   | T06 | 89 | 16.00 | 9.60           | 100.0          | 150.00 | W        | 93.80  | Y       | 21660                             | 0.33 |
| MM S-D-L160-C16-T06       | T06 | 89 | 16.00 | 9.60           | 55.0           | 160.00 | S        | 46.80  | N       | 23370                             | 0.12 |
| MM S-D-L170-C16-T06-C     | T06 | 89 | 16.00 | 9.60           | 120.0          | 170.00 | C        | 116.90 | N       | 23400                             | 0.11 |
| MM S-D-L170-C16-T06-W     | T06 | 89 | 16.00 | 9.60           | 55.0           | 170.00 | W        | 46.30  | N       | 21210                             | 0.48 |
| MM S-D-L130-C16-T08-C     | T08 | 89 | 16.00 | 11.50          | 80.0           | 130.00 | C        | 77.20  | N       | 39870                             | 0.28 |
| MM S-D-L130-C16-T08-W-H   | T08 | 89 | 16.00 | 11.50          | 80.0           | 130.00 | W        | 76.40  | Y       | 29040                             | 0.32 |
| MM S-D-L150-C16-T08-C     | T08 | 89 | 16.00 | 11.50          | 100.0          | 150.00 | C        | 97.80  | N       | 29970                             | 0.33 |
| MM S-D-L150-C16-T08-W-H   | T08 | 89 | 16.00 | 11.50          | 100.0          | 150.00 | W        | 98.30  | Y       | 21540                             | 0.38 |
| MM S-D-L170-C20-T08       | T08 | 89 | 20.00 | 11.50          | 80.0           | 170.00 | S        | 69.70  | N       | 22680                             | 0.30 |
| MM S-D-L170-C20-T08-C     | T08 | 89 | 20.00 | 11.50          | 120.0          | 170.00 | C        | 112.00 | N       | 26250                             | 0.49 |
| MM S-D-L170-C20-T08-W     | T08 | 89 | 20.00 | 11.50          | 80.0           | 170.00 | W        | 69.70  | N       | 24900                             | 0.50 |
| MM S-D-L170-C20-T08-W-H   | T08 | 89 | 20.00 | 11.50          | 120.0          | 170.00 | W        | 113.10 | Y       | 18750                             | 0.53 |
| MM S-D-L150-C20-T10-C     | T10 | 89 | 20.00 | 15.20          | 120.0          | 150.00 | C        | 97.50  | N       | 35610                             | 0.55 |
| MM S-D-L150-C20-T10-W-H   | T10 | 89 | 20.00 | 15.20          | 100.0          | 150.00 | W        | 96.80  | Y       | 25800                             | 0.60 |
| MM S-D-L170-C20-T10-C     | T10 | 89 | 20.00 | 15.20          | 120.0          | 170.00 | C        | 118.30 | N       | 28140                             | 0.61 |
| MM S-D-L170-C20-T10-W-H   | T10 | 89 | 20.00 | 15.20          | 120.0          | 170.00 | W        | 118.00 | Y       | 20100                             | 0.73 |
| MM S-D-L190-C20-T10       | T10 | 89 | 20.00 | 15.20          | 80.0           | 190.00 | S        | 73.70  | N       | 15780                             | 0.70 |
| MM S-D-L190-C20-T10-C     | T10 | 89 | 20.00 | 15.20          | 140.0          | 190.00 | C        | 140.00 | N       | 22830                             | 0.68 |
| MM S-D-L190-C20-T10-W-H   | T10 | 89 | 20.00 | 15.20          | 140.0          | 190.00 | W        | -      | Y       | 16170                             | 0.83 |
| MM S-D-L210-C20-T10-C     | T10 | 89 | 20.00 | 15.20          | 160.0          | 210.00 | C        | 160.00 | N       | 18270                             | 0.75 |
| MM S-D-L210-C20-T10-W-H   | T10 | 89 | 20.00 | 15.20          | 160.0          | 210.00 | W        | -      | Y       | 12870                             | 0.93 |
| MM S-D-L180-C25-T12-C     | T12 | 89 | 25.00 | 18.30          | 120.0          | 180.00 | C        | 115.70 | N       | 29460                             | 0.91 |
| MM S-D-L180-C25-T12-W-H   | T12 | 89 | 25.00 | 18.30          | 120.0          | 180.00 | W        | 114.60 | Y       | 20940                             | 1.15 |
| MM S-D-L200-C25-T12-W-H   | T12 | 89 | 25.00 | 18.30          | 150.0          | 200.00 | W        | 146.60 | Y       | 16560                             | 1.21 |
| MM S-D-L210-C25-T12       | T12 | 89 | 25.00 | 18.30          | 100.0          | 210.00 | S        | 94.60  | N       | 15540                             | 1.20 |
| MM S-D-L250-C25-T12-C     | T12 | 89 | 25.00 | 18.30          | 140.0          | 250.00 | C        | 135.60 | N       | 16170                             | 1.40 |
| MM S-D-L250-C25-160T12W-H | T12 | 89 | 25.00 | 18.30          | 160.0          | 250.00 | W        | 157.20 | Y       | 11310                             | 1.77 |
| MM S-D-L250-C25-T12-W-H   | T12 | 89 | 25.00 | 18.30          | 140.0          | 250.00 | W        | 135.60 | Y       | 11300                             | 1.80 |
| MM S-D-L250-C32-T15       | T15 | 89 | 32.00 | 23.90          | 100.0          | 250.00 | S        | 90.10  | N       | 14160                             | 1.90 |
| MM S-D-L250-C32-T15-C     | T15 | 89 | 32.00 | 23.90          | 150.0          | 250.00 | C        | 143.30 | N       | 20370                             | 2.05 |
| MM S-D-L300-C32-T15-C     | T15 | 89 | 32.00 | 23.90          | 200.0          | 300.00 | C        | 195.70 | N       | 16000                             | 2.62 |

• Shank material (Shank m.): S-steel, C-carbide, W-tungsten. • Do not apply lubricant to the threaded connection.

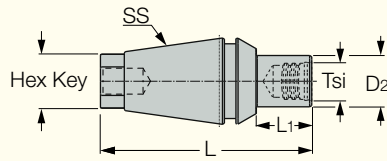
<sup>(2)</sup> The maximum RPM must be calculated. Divide the listed max. RPM by the number of flutes (on the milling head) being used.

# MULTI-MASTER

INDEXABLE SOLID CARBIDE LINE

## MM S-ER

Shanks for MULTI-MASTER Solid Carbide Heads with ER Collet Adaptation



| Designation           | SS   | Tsi | a° | D <sub>2</sub> | D <sub>1</sub> | h     | L <sub>1</sub> | L      | Key <sup>(1)</sup> | Fig. |
|-----------------------|------|-----|----|----------------|----------------|-------|----------------|--------|--------------------|------|
| MM S-A-H004-ER11-T05  | ER11 | T05 | -  | 7.60           | -              | -     | 4.0            | 26.50  | 6.35               | 1    |
| MM S-A-H10.5-ER11-T05 | ER11 | T05 | -  | 7.60           | -              | -     | 10.5           | 33.00  | 6.35               | 1    |
| MM S-A-H004-ER16-T05  | ER16 | T05 | -  | 7.60           | -              | -     | 4.0            | 33.50  | 7.94               | 1    |
| MM S-A-H004-ER16-T06  | ER16 | T06 | -  | 9.00           | -              | -     | 4.0            | 33.50  | 7.94               | 1    |
| MM S-A-H004-ER16-T08  | ER16 | T08 | -  | 11.50          | -              | -     | 4.0            | 33.50  | 7.94               | 1    |
| MM S-A-H10.5-ER16-T05 | ER16 | T05 | -  | 7.60           | -              | -     | 10.5           | 43.10  | 7.94               | 1    |
| MM S-A-H10.5-ER16-T06 | ER16 | T06 | -  | 9.00           | -              | -     | 10.5           | 43.10  | 7.94               | 1    |
| MM S-A-H013-ER16-T08  | ER16 | T08 | -  | 11.50          | -              | -     | 13.0           | 45.60  | 7.94               | 1    |
| MM S-A-H004-ER20-T05  | ER20 | T05 | -  | 7.60           | -              | -     | 4.0            | 40.60  | 11.11              | 1    |
| MM S-A-H004-ER20-T06  | ER20 | T06 | -  | 9.00           | -              | -     | 4.0            | 40.60  | 11.11              | 1    |
| MM S-A-H004-ER20-T08  | ER20 | T08 | -  | 11.50          | -              | -     | 4.0            | 40.60  | 11.11              | 1    |
| MM S-A-H004-ER20-T10  | ER20 | T10 | -  | 15.20          | -              | -     | 4.0            | 40.60  | 11.11              | 1    |
| MM S-A-H10.5-ER20-T05 | ER20 | T05 | -  | 7.60           | -              | -     | 10.5           | 47.10  | 11.11              | 1    |
| MM S-A-H10.5-ER20-T06 | ER20 | T06 | -  | 9.00           | -              | -     | 10.5           | 47.10  | 11.11              | 1    |
| MM S-A-H013-ER20-T08  | ER20 | T08 | -  | 11.50          | -              | -     | 13.0           | 49.60  | 11.11              | 1    |
| MM S-A-H016-ER20-T10  | ER20 | T10 | -  | 15.20          | -              | -     | 16.0           | 52.60  | 11.11              | 1    |
| MM S-A-H004-ER25-T05  | ER25 | T05 | -  | 7.60           | -              | -     | 4.0            | 44.60  | 14.29              | 1    |
| MM S-A-H004-ER25-T06  | ER25 | T06 | -  | 9.00           | -              | -     | 4.0            | 44.60  | 14.29              | 1    |
| MM S-A-H10.5-ER25-T06 | ER25 | T06 | -  | 9.00           | -              | -     | 10.5           | 51.10  | 14.29              | 1    |
| MM S-A-H004-ER25-T08  | ER25 | T08 | -  | 11.50          | -              | -     | 4.0            | 44.60  | 14.29              | 1    |
| MM S-A-H10.5-ER25-T08 | ER25 | T08 | -  | 11.50          | -              | -     | 10.5           | 51.10  | 14.29              | 1    |
| MM S-A-H004-ER25-T10  | ER25 | T10 | -  | 15.20          | -              | -     | 4.0            | 44.60  | 14.29              | 1    |
| MM S-A-H10.5-ER25-T10 | ER25 | T10 | -  | 15.20          | -              | -     | 10.5           | 51.10  | 14.29              | 1    |
| MM S-A-H004-ER25-T12  | ER25 | T12 | -  | 18.30          | -              | -     | 4.0            | 44.60  | 14.29              | 1    |
| MM S-A-H10.5-ER25-T12 | ER25 | T12 | -  | 18.30          | -              | -     | 10.5           | 51.10  | 14.29              | 1    |
| MM S-A-H025-ER32-T06  | ER32 | T06 | -  | 9.60           | 10.0           | 18.00 | 25.0           | 65.00  | -                  | 2    |
| MM S-B-H025-ER32-T06  | ER32 | T06 | 5  | 9.60           | 13.5           | 22.30 | 25.0           | 65.00  | -                  | 2    |
| MM S-B-H050-ER32-T06  | ER32 | T06 | 5  | 9.60           | 17.9           | 47.30 | 50.0           | 90.00  | -                  | 2    |
| MM S-B-H075-ER32-T06  | ER32 | T06 | 5  | 9.60           | 22.6           | 74.10 | 75.0           | 115.00 | -                  | 2    |
| MM S-D-H050-ER32-T06  | ER32 | T06 | 1  | 9.60           | 11.2           | 45.00 | 50.0           | 90.00  | -                  | 2    |

• Do not apply lubricant to the threaded connection. • For adaptation see page 9.

<sup>(1)</sup> Inch size spanners (displayed in mm)



# MULTI-MASTER

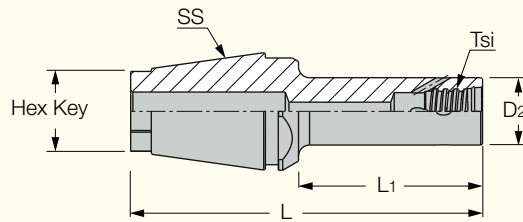
INDEXABLE SOLID CARBIDE LINE

## MM S-ER-H

Shanks for MULTI-MASTER Solid Carbide Heads with ER Collet Adaptation and Coolant Holes



Engineered for  
**MAXIMUM**  
**MULTI-MASTER**  
Performance



| Designation            | SS   | Tsi | D <sub>2</sub> | L <sub>1</sub> | L     | Key   | Kg   |
|------------------------|------|-----|----------------|----------------|-------|-------|------|
| MM S-A-H025-ER32-T05-H | ER32 | T05 | 7.62           | 25.0           | 69.60 | 19.05 | 0.20 |
| MM S-A-H040-ER32-T05-H | ER32 | T05 | 7.62           | 40.0           | 85.60 | 19.05 | 0.30 |
| MM S-A-H025-ER32-T06-H | ER32 | T06 | 9.00           | 25.0           | 69.60 | 19.05 | 0.59 |
| MM S-A-H040-ER32-T06-H | ER32 | T06 | 9.00           | 40.0           | 85.60 | 19.05 | 0.22 |
| MM S-A-H025-ER32-T08-H | ER32 | T08 | 11.50          | 25.0           | 69.60 | 19.05 | 0.20 |
| MM S-A-H050-ER32-T08-H | ER32 | T08 | 11.50          | 50.0           | 94.60 | 19.05 | 0.23 |
| MM S-A-H025-ER32-T10-H | ER32 | T10 | 15.20          | 25.0           | 69.60 | 19.05 | 0.20 |
| MM S-A-H050-ER32-T10-H | ER32 | T10 | 15.20          | 50.0           | 94.60 | 19.05 | 0.25 |
| MM S-A-H025-ER32-T12-H | ER32 | T12 | 18.30          | 25.0           | 69.60 | 19.05 | 0.22 |
| MM S-A-H050-ER32-T12-H | ER32 | T12 | 18.30          | 50.0           | 94.60 | 19.05 | 0.22 |
| MM S-A-H025-ER32-T15-H | ER32 | T15 | 23.90          | 25.0           | 69.60 | 19.05 | 0.21 |
| MM S-A-H050-ER32-T15-H | ER32 | T15 | 23.90          | 50.0           | 94.60 | 19.05 | 0.25 |

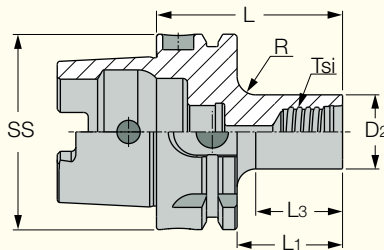
• Do not apply lubricant to the threaded connection. • For adaptation see page 9.

# MULTI-MASTER • HSK

## MM S-A-HSK

HSK DIN69893 Form A Integral Tapered Shanks, for MULTI-MASTER Milling Heads

G2.5  
20,000 RPM  
U<1.0 gmm



| Designation             | SS | Tsi | D <sub>2</sub> | L     | L <sub>1</sub> | L <sub>3</sub> | R   |
|-------------------------|----|-----|----------------|-------|----------------|----------------|-----|
| MM S-A-H050-HSK A63-T06 | 63 | T06 | 9.50           | 50.00 | 24.0           | 18.00          | 6.0 |
| MM S-A-H050-HSK A63-T08 | 63 | T08 | 11.50          | 50.00 | 24.0           | 18.00          | 6.0 |
| MM S-A-H055-HSK A63-T10 | 63 | T10 | 15.20          | 55.00 | 29.0           | 23.00          | 6.0 |
| MM S-A-H055-HSK A63-T12 | 63 | T12 | 18.30          | 55.00 | 29.0           | 23.00          | 6.0 |
| MM S-A-H060-HSK A63-T15 | 63 | T15 | 23.90          | 60.00 | 34.0           | 28.00          | 6.0 |

• Do not apply lubricant to the threaded connection • For adaptation see page 9.

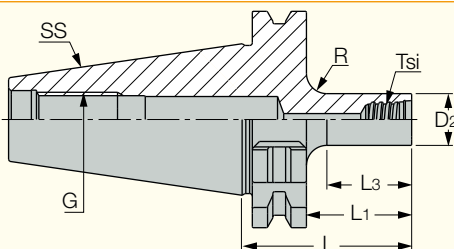


# MULTI-MASTER • DIN69871

## MM S-A-SK

DIN 69871 Integral Tapered Shanks, for MULTI-MASTER Milling Heads

G2.5  
20,000 RPM  
U<1.0 gmm



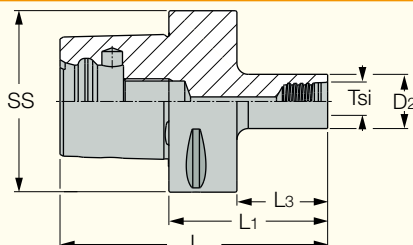
| Designation           | SS | Tsi | D <sub>2</sub> | L     | L <sub>1</sub> | L <sub>3</sub> | R   |
|-----------------------|----|-----|----------------|-------|----------------|----------------|-----|
| MM S-A-H040-SK 40-T06 | 40 | T06 | 9.50           | 40.00 | 21.0           | 15.00          | 6.0 |
| MM S-A-H045-SK 40-T08 | 40 | T08 | 11.50          | 45.00 | 26.0           | 20.00          | 6.0 |
| MM S-A-H050-SK 40-T10 | 40 | T10 | 15.20          | 50.00 | 31.0           | 25.00          | 6.0 |
| MM S-A-H050-SK 40-T12 | 40 | T12 | 18.30          | 50.00 | 31.0           | 25.00          | 6.0 |
| MM S-A-H050-SK 40-T15 | 40 | T15 | 23.90          | 50.00 | 31.0           | 25.00          | 6.0 |

• Do not apply lubricant to the threaded connection • For adaptation see page 9.

# MULTI-MASTER • CAMFIX

## MM S-A-C#

MULTI MASTER Threaded Connection Shanks with CAMFIX  
(ISO 26623-1) Exchangeable Adaptation



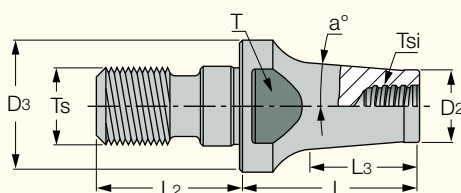
| Designation        | SS | Tsi | D <sub>2</sub> | L     | L <sub>1</sub> | L <sub>3</sub> |
|--------------------|----|-----|----------------|-------|----------------|----------------|
| MM S-A-H035-C3-T05 | 32 | T05 | 7.60           | 35.00 | 20.0           | 15.00          |
| MM S-A-H035-C3-T06 | 32 | T06 | 9.25           | 35.00 | 20.0           | 15.00          |
| MM S-A-H040-C3-T08 | 32 | T08 | 11.50          | 40.00 | 25.0           | 20.00          |
| MM S-A-H040-C3-T10 | 32 | T10 | 15.20          | 40.00 | 25.0           | 20.00          |
| MM S-A-H045-C3-T12 | 32 | T12 | 18.30          | 45.00 | 30.0           | 25.00          |
| MM S-A-H045-C4-T06 | 40 | T06 | 9.25           | 45.00 | 25.0           | 20.00          |
| MM S-A-H045-C4-T08 | 40 | T08 | 11.50          | 45.00 | 25.0           | 20.00          |
| MM S-A-H050-C4-T10 | 40 | T10 | 15.20          | 50.00 | 30.0           | 25.00          |
| MM S-A-H055-C4-T12 | 40 | T12 | 18.30          | 55.00 | 35.0           | 30.00          |
| MM S-A-H055-C4-T15 | 40 | T15 | 23.90          | 55.00 | 35.0           | 30.00          |
| MM S-A-H060-C5-T10 | 50 | T10 | 15.20          | 60.00 | 40.0           | 35.00          |
| MM S-A-H060-C5-T12 | 50 | T12 | 18.30          | 60.00 | 40.0           | 35.00          |
| MM S-A-H060-C5-T15 | 50 | T15 | 23.90          | 60.00 | 40.0           | 35.00          |
| MM S-A-H065-C6-T12 | 63 | T12 | 23.90          | 65.00 | 43.0           | 38.00          |
| MM S-A-H065-C6-T15 | 63 | T15 | 23.90          | 65.00 | 43.0           | 38.00          |
| MM S-A-H070-C8-T15 | 80 | T15 | 23.90          | 70.00 | 40.0           | 35.00          |

• Do not apply lubricant to the threaded connection • For adaptation see page 9.



## MM CAB

Adapters for Connecting FLEXFIT Shanks and MULTI-MASTER Milling Heads



| Designation          | T <sub>si</sub> | T <sub>s</sub> | L     | L <sub>3</sub> | D <sub>1</sub> | D <sub>3</sub> | L <sub>2</sub> | T <sup>(1)</sup> | a°   | Kg   |
|----------------------|-----------------|----------------|-------|----------------|----------------|----------------|----------------|------------------|------|------|
| MM CAB T06M06-16/.63 | T06             | M06            | 16.00 | 11.60          | 9.3            | 9.70           | 14.50          | 8.0              | 1.5  | 0.01 |
| MM CAB T06M08-16/.63 | T06             | M08            | 16.00 | 13.70          | 9.6            | 13.00          | 17.50          | 11.0             | 6    | 0.02 |
| MM CAB T06M08-25/1.0 | T06             | M08            | 25.00 | 11.30          | 9.3            | 13.00          | 17.50          | 11.0             | 1.5  | 0.02 |
| MM CAB T06M10-25/1.0 | T06             | M10            | 25.00 | 16.60          | 9.6            | 18.00          | 20.00          | 11.0             | 5    | 0.04 |
| MM CAB T08M08-16/.63 | T08             | M08            | 16.00 | 5.40           | 11.7           | 13.00          | 17.50          | 11.0             | 11.4 | 0.08 |
| MM CAB T08M08-25/1.0 | T08             | M08            | 25.00 | 19.50          | 11.7           | 13.00          | 17.50          | 11.0             | 1.5  | 0.03 |
| MM CAB T08M10-20/.75 | T08             | M10            | 20.00 | 11.30          | 11.7           | 18.00          | 20.00          | 13.0             | 7    | 0.04 |
| MM CAB T08M10-25/1.0 | T08             | M10            | 25.00 | 14.20          | 11.7           | 18.00          | 20.00          | 11.0             | 1.5  | 0.03 |
| MM CAB T08M12-20/.75 | T08             | M12            | 20.00 | 9.30           | 11.7           | 21.00          | 22.00          | 13.0             | 7    | 0.05 |
| MM CAB T08M12-25/1.0 | T08             | M12            | 25.00 | 12.50          | 11.7           | 21.00          | 22.00          | 13.0             | 1.5  | 0.04 |

• Do not apply lubricant to the threaded connection. • For adaptation see page 9.

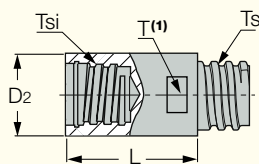
<sup>(1)</sup> Clamping wrench size

## MULTI-MASTER

INDEXABLE SOLID CARBIDE LINE

### MM CAB-T-T

MULTI-MASTER Shank Extensions










| Designation             | D <sub>2</sub> | T <sub>s</sub> | T <sub>si</sub> | L     | T <sup>(1)</sup> | Kg   |
|-------------------------|----------------|----------------|-----------------|-------|------------------|------|
| MM CAB T05T05-25/1.0-C  | 7.60           | T05            | T05             | 25.40 | 6.0              | 0.02 |
| MM CAB T06T06-25/1.0-C  | 9.30           | T06            | T06             | 25.40 | 8.0              | 0.02 |
| MM CAB T08T08-25/1.0-C  | 11.50          | T08            | T08             | 25.40 | 10.0             | 0.02 |
| MM CAB T10T10-38/1.5-C  | 15.20          | T10            | T10             | 38.10 | 13.0             | 0.08 |
| MM CAB T12T12-38/1.5-C  | 18.30          | T12            | T12             | 38.10 | 16.0             | 0.11 |
| MM CAB T15T15-45/1.77-C | 23.90          | T15            | T15             | 45.00 | 20.0             | 0.21 |

• Clamping key should be ordered separately. • For adaptation see page 9.

<sup>(1)</sup> Clamping wrench size



### Grade Priorities

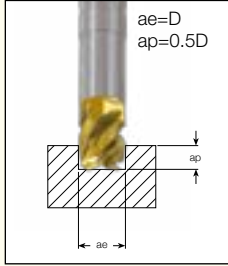
|                                                                                     |  |  |  |  |  |  |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
|                                                                                     | <b>ISO P</b>                                                                        | <b>ISO H</b>                                                                        | <b>ISO M</b>                                                                        | <b>ISO S</b>                                                                        | <b>ISO K</b>                                                                          | <b>ISO N</b>                                                                          |
| <b>Material Groups</b>                                                              | 1 - 13                                                                              | 38 - 41                                                                             | 14                                                                                  | 31 - 37                                                                             | 15 - 20                                                                               | 21 - 28                                                                               |
|                                                                                     | <b>Steel</b>                                                                        | <b>Hard Steel</b>                                                                   | <b>Stainless Steel</b>                                                              | <b>High Temp.</b>                                                                   | <b>Cast Iron</b>                                                                      | <b>Nonferrous</b>                                                                     |
|  | Harder<br>↑ IC903<br>IC908                                                          | Harder<br>↑ IC903<br>IC908                                                          | Harder<br>↑ IC908                                                                   | Harder<br>↑ IC903<br>IC908                                                          | Harder<br>↑ IC903<br>IC908                                                            | Harder<br>↑ IC908<br>IC08                                                             |
|                                                                                     | Tougher<br>↓                                                                        | Tougher<br>↓                                                                        | Tougher<br>↓                                                                        | Tougher<br>↓ IC08                                                                   | Tougher<br>↓                                                                          | Tougher<br>↓                                                                          |

In most cases the best performance can be attained without using coolant for specific grades. However, it should be noted that if for any reason coolant must be used, it could possibly affect tool life and sometimes cause insert failure, due to thermal shock.

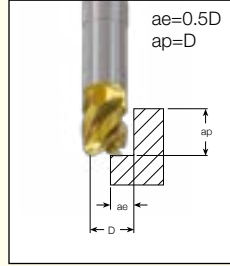
■ First choice

**Recommended Feeds for SOLIDSHRED Rougher Endmills**

**Slotting**



**Shouldering**

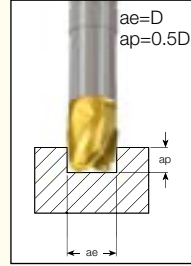


| Slotting        |                      |                      | Shouldering     |                      |                      |
|-----------------|----------------------|----------------------|-----------------|----------------------|----------------------|
| D <sub>mm</sub> | F <sub>z</sub> (min) | F <sub>z</sub> (max) | D <sub>mm</sub> | F <sub>z</sub> (min) | F <sub>z</sub> (max) |
| 5               | 0.04                 | 0.10                 | 5               | 0.04                 | 0.110                |
| 6               | 0.05                 | 0.12                 | 6               | 0.05                 | 0.132                |
| 7               | 0.06                 | 0.14                 | 7               | 0.06                 | 0.154                |
| 8               | 0.06                 | 0.16                 | 8               | 0.06                 | 0.176                |
| 9               | 0.06                 | 0.16                 | 9               | 0.06                 | 0.176                |
| 10              | 0.06                 | 0.18                 | 10              | 0.06                 | 0.196                |
| 12              | 0.07                 | 0.20                 | 12              | 0.07                 | 0.216                |
| 14              | 0.08                 | 0.22                 | 14              | 0.08                 | 0.238                |
| 16              | 0.10                 | 0.24                 | 16              | 0.10                 | 0.260                |
| 18              | 0.10                 | 0.26                 | 18              | 0.10                 | 0.280                |
| 20              | 0.10                 | 0.30                 | 20              | 0.10                 | 0.340                |
| 25              | 0.12                 | 0.30                 | 25              | 0.12                 | 0.360                |

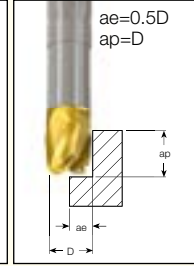
High Speed Cutting on Hard Materials  
(up to 60 HRC)  
Apply small depth of cut  
(0.1-0.3 mm) at 80-160 m/min

**Recommended Feeds for MULTI-MASTER Endmills**

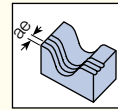
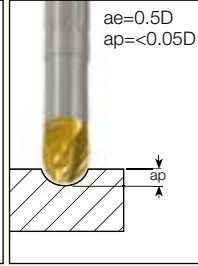
**Slotting**



**Shouldering**



**Profiling**



| Slotting        |                      |                      | Shouldering/Profiling |                      |
|-----------------|----------------------|----------------------|-----------------------|----------------------|
| D <sub>mm</sub> | F <sub>z</sub> (min) | F <sub>z</sub> (max) | F <sub>z</sub> (min)  | F <sub>z</sub> (max) |
| 5               | 0.025                | 0.050                | 0.020                 | 0.055                |
| 6               | 0.030                | 0.060                | 0.025                 | 0.066                |
| 7               | 0.030                | 0.070                | 0.030                 | 0.077                |
| 8               | 0.030                | 0.080                | 0.030                 | 0.088                |
| 9               | 0.030                | 0.080                | 0.030                 | 0.088                |
| 10              | 0.035                | 0.090                | 0.030                 | 0.098                |
| 12              | 0.040                | 0.10                 | 0.035                 | 0.108                |
| 14              | 0.050                | 0.11                 | 0.04                  | 0.119                |
| 16              | 0.050                | 0.12                 | 0.05                  | 0.130                |
| 18              | 0.050                | 0.13                 | 0.05                  | 0.140                |
| 20              | 0.050                | 0.15                 | 0.05                  | 0.170                |
| 25              | 0.060                | 0.15                 | 0.06                  | 0.180                |

**Fz (mm/t) for MM GRIT.../MM TS... heads**

| ISO      | Diagram 1 | Diagram 2 |
|----------|-----------|-----------|
| <b>P</b> | 0.02-0.12 | 0.03-0.15 |
| <b>M</b> | 0.02-0.10 | 0.02-0.12 |
| <b>K</b> | 0.02-0.15 | 0.03-0.17 |



**Machining Data for MULTI-MASTER Endmills**

| ISO | Material                                                   | Condition                    | Tensile Strength [N/mm <sup>2</sup> ] | Hardness HB      | Material <sup>(1)</sup> No. |    |
|-----|------------------------------------------------------------|------------------------------|---------------------------------------|------------------|-----------------------------|----|
| P   | Non-alloy steel and cast steel, free cutting steel         | < 0.25 %C                    | Annealed                              | 420              | 125                         | 1  |
|     |                                                            | >= 0.25 %C                   | Annealed                              | 650              | 190                         | 2  |
|     |                                                            | < 0.55 %C                    | Quenched and tempered                 | 850              | 250                         | 3  |
|     |                                                            | >= 0.55 %C                   | Annealed                              | 750              | 220                         | 4  |
|     |                                                            | >= 0.55 %C                   | Quenched and tempered                 | 1000             | 300                         | 5  |
|     | Low alloy steel and cast steel (less than 5% all elements) | Annealed                     | 600                                   | 200              | 6                           |    |
|     |                                                            |                              | 930                                   | 275              | 7                           |    |
|     |                                                            | Quenched and tempered        | 1000                                  | 300              | 8                           |    |
|     |                                                            |                              | 1200                                  | 350              | 9                           |    |
|     | High alloy steel, cast steel, and tool steel               | Annealed                     | 680                                   | 200              | 10                          |    |
|     |                                                            | Quenched and tempered        | 1100                                  | 325              | 11                          |    |
|     | Stainless steel                                            | Ferritic/martensitic         | 680                                   | 200              | 12                          |    |
|     |                                                            | Martensitic                  | 820                                   | 240              | 13                          |    |
| M   | Stainless steel                                            | Austenitic                   | 600                                   | 180              | 14                          |    |
| K   | Grey cast iron                                             | Pearlitic/ferritic           |                                       | 180              | 15                          |    |
|     |                                                            | Pearlitic/martensitic        |                                       | 260              | 16                          |    |
|     | Ductile cast iron (nodular)                                | Ferritic                     |                                       | 160              | 17                          |    |
|     |                                                            | Pearlitic                    |                                       | 250              | 18                          |    |
|     | Malleable cast iron                                        | Ferritic                     |                                       | 130              | 19                          |    |
|     |                                                            | Pearlitic                    |                                       | 230              | 20                          |    |
| N   | Aluminum-wrought alloy                                     | Not cureable                 |                                       | 60               | 21                          |    |
|     |                                                            | Cured                        |                                       | 100              | 22                          |    |
|     | Aluminum-cast, alloyed                                     | <=12% Si                     | Not cureable                          |                  | 75                          | 23 |
|     |                                                            | Cured                        |                                       | 90               | 24                          |    |
|     |                                                            |                              | >12% Si                               | High temperature | 130                         | 25 |
|     | Copper alloys                                              | >1% Pb                       | Free cutting                          |                  | 110                         | 26 |
|     |                                                            | Brass                        |                                       | 90               | 27                          |    |
|     |                                                            |                              | Electrolitic copper                   |                  | 100                         | 28 |
|     | Non-metallic                                               | Duroplastics, fiber plastics |                                       |                  |                             | 29 |
|     |                                                            |                              | Hard rubber                           |                  |                             | 30 |
| S   | High temp. alloys                                          | Fe based                     | Annealed                              |                  | 200                         | 31 |
|     |                                                            |                              | Cured                                 |                  | 280                         | 32 |
|     |                                                            | Ni or Co based               | Annealed                              |                  | 250                         | 33 |
|     |                                                            |                              | Cured                                 |                  | 350                         | 34 |
|     |                                                            |                              | Cast                                  |                  | 320                         | 35 |
|     | Titanium and Ti alloys                                     |                              | RM 400                                |                  | 36                          |    |
|     |                                                            | Alpha+beta alloys cured      | RM 1050                               |                  | 37                          |    |
| H   | Hardened steel                                             | Hardened                     |                                       | 55 HRc           | 38                          |    |
|     |                                                            | Hardened                     |                                       | 60 HRc           | 39                          |    |
|     | Chilled cast iron                                          | Cast                         |                                       | 400              | 40                          |    |
|     | Cast iron                                                  | Hardened                     |                                       | 55 HRc           | 41                          |    |

**For grade priorities for multi-master endmills, see page 72.**

<sup>(1)</sup> For workpiece materials list, see pages 88-123.

**Cutting Speed (m/min)**

| No. | IC900 / IC908 | IC903     | IC300     | IC08      |
|-----|---------------|-----------|-----------|-----------|
| 1   | 260 - 280     | 260 - 280 | 210 - 220 | 180 - 200 |
| 2   | 200 - 230     | 200 - 230 | 160 - 180 | 140 - 160 |
| 3   | 160 - 220     | 160 - 220 | 130 - 180 | 110 - 150 |
| 4   | 160 - 220     | 160 - 220 | 130 - 180 | 110 - 150 |
| 5   | 140 - 180     | 140 - 180 | 110 - 140 | 100 - 130 |
| 6   | 160 - 220     | 160 - 220 | 130 - 180 | 110 - 150 |
| 7   | 120 - 180     | 120 - 180 | 100 - 140 | 80 - 130  |
| 8   | 130 - 180     | 130 - 180 | 100 - 140 | 90 - 130  |
| 9   | 140 - 180     | 140 - 180 | 110 - 140 | 100 - 130 |
| 10  | 130 - 180     | 130 - 180 | 100 - 140 | 90 - 130  |
| 11  | 70 - 120      | 70 - 120  | 60 - 100  | 50 - 80   |
| 12  | 80 - 160      | 80 - 160  | 60 - 130  | 60 - 110  |
| 13  | 60 - 150      | 60 - 150  | 50 - 120  | 40 - 100  |
| 14  | 60 - 120      | 60 - 120  | 50 - 100  | 40 - 80   |
| 15  | 80 - 260      | 80 - 250  | 60 - 210  | 60 - 180  |
| 16  | 130 - 240     | 130 - 240 | 100 - 190 | 90 - 170  |
| 17  | 150 - 280     | 150 - 270 | 120 - 220 | 100 - 200 |
| 18  | 90 - 280      | 90 - 270  | 70 - 220  | 60 - 200  |
| 19  | 150 - 280     | 150 - 270 | 120 - 220 | 100 - 200 |
| 20  | 140 - 240     | 140 - 240 | 110 - 190 | 100 - 170 |
| 21  |               |           |           | 800 - 900 |
| 22  |               |           |           | 700 - 800 |
| 23  |               |           |           | 800 - 900 |
| 24  |               |           |           | 750 - 850 |
| 25  |               |           |           | 400 - 450 |
| 26  |               |           |           | 500 - 550 |
| 27  |               |           |           | 500 - 550 |
| 28  |               |           |           | 350 - 380 |
| 29  |               |           |           |           |
| 30  |               |           |           |           |
| 31  | 20 - 40       | 20 - 40   | 20 - 30   | 10 - 20   |
| 32  | 20 - 40       | 20 - 30   | 20 - 20   | 10 - 20   |
| 33  | 20 - 50       | 20 - 30   | 20 - 20   | 20 - 50   |
| 34  | 20 - 70       | 20 - 30   | 20 - 20   | 20 - 50   |
| 35  | 30 - 70       | 30 - 80   | 20 - 60   | 20 - 50   |
| 36  | 30 - 70       | 30 - 80   | 20 - 60   | 20 - 30   |
| 37  | 30 - 70       | 30 - 80   | 20 - 60   | 20 - 30   |
| 38  | 30 - 50       | 30 - 60   | 20 - 40   | 40 - 60   |
| 39  | 30 - 40       | 30 - 40   | 20 - 30   | 20 - 30   |
| 40  | 60 - 80       | 70 - 90   | 50 - 60   | 65 - 75   |
| 41  | 30 - 50       | 30 - 60   | 20 - 40   | 40 - 45   |



**Machining Data for MULTI-MASTER Groove Milling Heads**

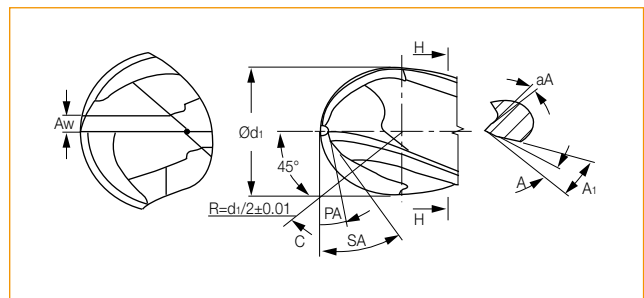
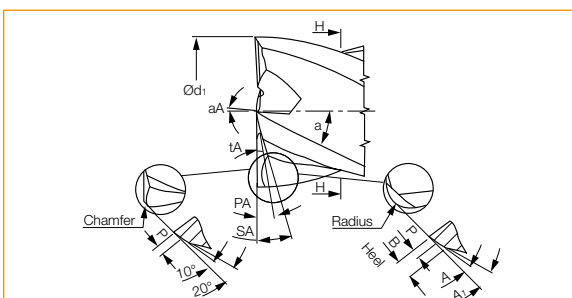
| ISO                     | Material                                                   | Condition                    | Tensile Strength [N/mm <sup>2</sup> ] | Hardness HB | Material <sup>(1)</sup> No. |    |
|-------------------------|------------------------------------------------------------|------------------------------|---------------------------------------|-------------|-----------------------------|----|
| <b>P</b>                | Non-alloy steel and cast steel, free cutting steel         | < 0.25 %C                    | Annealed                              | 420         | 125                         | 1  |
|                         |                                                            | >= 0.25 %C                   | Annealed                              | 650         | 190                         | 2  |
|                         |                                                            | < 0.55 %C                    | Quenched and tempered                 | 850         | 250                         | 3  |
|                         |                                                            | >= 0.55 %C                   | Annealed                              | 750         | 220                         | 4  |
|                         |                                                            | >= 0.55 %C                   | Quenched and tempered                 | 1000        | 300                         | 5  |
|                         | Low alloy steel and cast steel (less than 5% all elements) | Annealed                     | 600                                   | 200         | 6                           |    |
|                         |                                                            |                              | 930                                   | 275         | 7                           |    |
|                         |                                                            | Quenched and tempered        | 1000                                  | 300         | 8                           |    |
|                         |                                                            |                              | 1200                                  | 350         | 9                           |    |
|                         | High alloy steel, cast steel, and tool steel               | Annealed                     | 680                                   | 200         | 10                          |    |
|                         |                                                            | Quenched and tempered        | 1100                                  | 325         | 11                          |    |
|                         | Stainless steel                                            | Ferritic/martensitic         | 680                                   | 200         | 12                          |    |
|                         |                                                            | Martensitic                  | 820                                   | 240         | 13                          |    |
| <b>M</b>                | Stainless steel                                            | Austenitic                   | 600                                   | 180         | 14                          |    |
| <b>K</b>                | Grey cast iron                                             | Ferritic                     |                                       | 160         | 15                          |    |
|                         |                                                            | Pearlitic                    |                                       | 250         | 16                          |    |
|                         | Ductile cast iron (nodular)                                | Pearlitic/ferritic           |                                       | 180         | 17                          |    |
|                         |                                                            | Pearlitic/martensitic        |                                       | 260         | 18                          |    |
|                         | Malleable cast iron                                        | Ferritic                     |                                       | 130         | 19                          |    |
|                         |                                                            | Pearlitic                    |                                       | 230         | 20                          |    |
| <b>N</b>                | Aluminum-wrought alloy                                     | Not cureable                 |                                       | 60          | 21                          |    |
|                         |                                                            | Cured                        |                                       | 100         | 22                          |    |
|                         | Aluminum-cast, alloyed                                     | <=12% Si                     | Not cureable                          |             | 75                          | 23 |
|                         |                                                            |                              | Cured                                 |             | 90                          | 24 |
|                         |                                                            | >12% Si                      | High temperature                      |             | 130                         | 25 |
|                         | Copper alloys                                              | >1% Pb                       | Free cutting                          |             | 110                         | 26 |
|                         |                                                            |                              | Brass                                 |             | 90                          | 27 |
|                         |                                                            |                              | Electrolitic copper                   |             | 100                         | 28 |
|                         | Non-metallic                                               | Duroplastics, fiber plastics |                                       |             |                             | 29 |
|                         |                                                            | Hard rubber                  |                                       |             |                             | 30 |
| <b>S</b>                | High temp. alloys                                          | Fe based                     | Annealed                              |             | 200                         | 31 |
|                         |                                                            |                              | Cured                                 |             | 280                         | 32 |
|                         |                                                            | Ni or Co based               | Annealed                              |             | 250                         | 33 |
|                         |                                                            |                              | Cured                                 |             | 350                         | 34 |
|                         |                                                            |                              | Cast                                  |             | 320                         | 35 |
|                         | Titanium and Ti alloys                                     |                              | RM 400                                |             | 36                          |    |
| Alpha+beta alloys cured |                                                            | RM 1050                      |                                       | 37          |                             |    |
| <b>H</b>                | Hardened steel                                             | Hardened                     |                                       | 55 HRc      | 38                          |    |
|                         |                                                            | Hardened                     |                                       | 60 HRc      | 39                          |    |
|                         | Chilled cast iron                                          | Cast                         |                                       | 400         | 40                          |    |
|                         | Cast iron                                                  | Hardened                     |                                       | 55 HRc      | 41                          |    |

<sup>(1)</sup> For workpiece materials list, see pages 88-123.

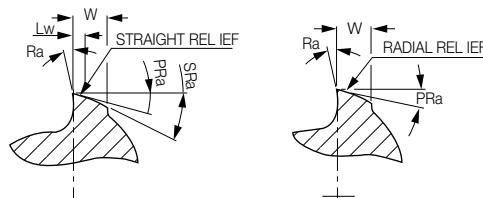
| MM-TS    |          |          | MM-GRIT K-TYPE |           |          | MM-GRIT P-TYPE |           |          |
|----------|----------|----------|----------------|-----------|----------|----------------|-----------|----------|
| Speed    | Feed     |          | Speed          | Feed mm/t |          | Speed          | Feed mm/t |          |
| V m/min  | Fz (min) | Fz (max) | V m/min        | Fz (min)  | Fz (max) | V m/min        | Fz (min)  | Fz (max) |
| 110-140  | 0.08     | 0.20     | 110-160        | 0.05      | 0.15     | -              | -         | -        |
| 100-120  | 0.08     | 0.18     | 100-150        | 0.05      | 0.15     | -              | -         | -        |
| 70-100   | 0.08     | 0.15     | 80-100         | 0.05      | 0.15     | -              | -         | -        |
| 70-100   | 0.08     | 0.15     | 80-100         | 0.05      | 0.15     | -              | -         | -        |
| 60-80    | 0.08     | 0.15     | 60-80          | 0.05      | 0.15     | -              | -         | -        |
| 100-120  | 0.08     | 0.15     | 110-150        | 0.05      | 0.15     | -              | -         | -        |
| 90-120   | 0.08     | 0.15     | 100-120        | 0.05      | 0.15     | -              | -         | -        |
| 80-110   | 0.08     | 0.15     | 70-110         | 0.05      | 0.15     | -              | -         | -        |
| 70-100   | 0.05     | 0.12     | 70-100         | 0.05      | 0.15     | -              | -         | -        |
| 60-80    | 0.05     | 0.18     | 60-80          | 0.05      | 0.15     | -              | -         | -        |
| 55-70    | 0.08     | 0.15     | 55-70          | 0.05      | 0.15     | -              | -         | -        |
| 100-130  | 0.06     | 0.12     | 100-130        | 0.03      | 0.15     | 100-130        | 0.03      | 0.10     |
| 100-120  | 0.08     | 0.15     | 100-130        | 0.03      | 0.15     | 100-130        | 0.03      | 0.10     |
| 80-120   | 0.05     | 0.10     | 90-120         | 0.03      | 0.12     | 90-120         | 0.03      | 0.10     |
| 160-220  | 0.10     | 0.20     | 160-220        | 0.03      | 0.12     | -              | -         | -        |
| 120-200  | 0.10     | 0.15     | 120-200        | 0.03      | 0.12     | -              | -         | -        |
| 100-140  | 0.10     | 0.20     | -              | -         | -        | -              | -         | -        |
| 80-100   | 0.10     | 0.15     | -              | -         | -        | -              | -         | -        |
| 180-250  | 0.10     | 0.20     | 180-250        | 0.03      | 0.15     | -              | -         | -        |
| 160-220  | 0.10     | 0.15     | 160-220        | 0.03      | 0.15     | -              | -         | -        |
| 800-1200 | 0.10     | 0.20     | -              | -         | -        | 800-1200       | 0.05      | 0.15     |
| 800-1200 | 0.10     | 0.20     | -              | -         | -        | 800-1200       | 0.05      | 0.15     |
| -        | -        | -        | -              | -         | -        | 600-1000       | 0.05      | 0.15     |
| -        | -        | -        | -              | -         | -        | 500-1000       | 0.05      | 0.15     |
| -        | -        | -        | -              | -         | -        | 200-400        | 0.05      | 0.15     |
| -        | -        | -        | -              | -         | -        | -              | -         | -        |
| -        | -        | -        | -              | -         | -        | -              | -         | -        |
| -        | -        | -        | -              | -         | -        | -              | -         | -        |
| -        | -        | -        | -              | -         | -        | -              | -         | -        |
| -        | -        | -        | -              | -         | -        | -              | -         | -        |
| -        | -        | -        | -              | -         | -        | -              | -         | -        |
| -        | -        | -        | 30-40          | 0.02      | 0.12     | -              | -         | -        |
| 25-35    | 0.05     | 0.12     | 25-40          | 0.02      | 0.12     | -              | -         | -        |
| 25-35    | 0.05     | 0.12     | 25-40          | -         | -        | -              | 0.01      | 0.12     |
| 25-35    | 0.05     | 0.12     | 25-40          | -         | -        | -              | 0.01      | 0.12     |
| 40-60    | 0.05     | 0.12     | 25-40          | -         | -        | -              | 0.01      | 0.12     |
| 40-60    | 0.05     | 0.12     | 40-60          | -         | -        | -              | 0.05      | 0.12     |
| 40-60    | 0.05     | 0.10     | 40-60          | -         | -        | -              | 0.05      | 0.10     |
|          |          |          |                |           |          |                |           |          |
|          |          |          |                |           |          |                |           |          |
|          |          |          |                |           |          |                |           |          |
|          |          |          |                |           |          |                |           |          |

**Regrinding Instructions**

|                                    | d1 [μ m] | d1 [μ in] | **a   | *Ra | *Pra/Rra | *SRa  | **tA | *aA | *PA |
|------------------------------------|----------|-----------|-------|-----|----------|-------|------|-----|-----|
| <b>Square End *</b>                |          |           |       |     |          |       |      |     |     |
| <b>2 Flute *</b>                   | < 7      | < .3      | 30    | 10  | 10       | -     | 2    | 7   | 8   |
| <b>General Use</b>                 | > 7      | > .3      | 30    | 8   | 10       | -     | 2    | 7   | 8   |
| <b>3 Flute *</b>                   | < 7      | < .3      | 38-45 | 9   | 10       | -     | 2    | 5   | 7   |
| <b>General Use</b>                 | > 7      | > .3      | 38-45 | 7   | 10       | -     | 2    | 5   | 7   |
| <b>4 Flute *</b>                   | < 7      | < .3      | 30-45 | 7   | 10       | -     | 1.5  | 5   | 7   |
| <b>General Use</b>                 | > 7      | > .3      | 30-45 | 7   | 10       | -     | 1.5  | 5   | 7   |
| <b>6 Flute ECH... *</b>            | < 7      | < .3      | 45    | 8   | 10       | -     | 1.5  | 6   | 7   |
| <b>General Use</b>                 | > 7      | > .3      | 45    | 7   | 9        | -     | 1.5  | 5   | 7   |
| <b>6 Flute EC-D6 Hard Mater.*</b>  | -        | -         | 50    | -12 | 10       | -     | 1    | -2  | 7   |
| <b>Ball End</b>                    |          |           |       |     |          |       |      |     |     |
| <b>2 Flute *</b>                   | < 7      | < .3      | 30    | 7   | 11       | 24    | -    | 3   | 13  |
| <b>General Use</b>                 | > 7      | > .3      | 30    | 7   | 11       | 24    | -    | 3   | 13  |
| <b>3 Flute *</b>                   | < 7      | < .3      | 30    | 7   | 11       | 24    | -    | 3   | 11  |
| <b>General Use</b>                 | > 7      | > .3      | 30    | 7   | 11       | 24    | -    | 3   | 11  |
| <b>4 Flute</b>                     | < 7      | < .3      | 30    | 7   | 11       | 24    | -    | 3   | 13  |
| <b>General Use</b>                 | > 7      | > .3      | 30    | 7   | 11       | 24    | -    | 3   | 13  |
| <b>Square End + Radius *</b>       |          |           |       |     |          |       |      |     |     |
| <b>3 Flute *</b>                   | < 7      | < .3      | 38-45 | 9   | 12       | 25    | 3    | 6   | 12  |
| <b>General Use</b>                 | > 7      | > .3      | 38-45 | 7   | 12       | 24    | 3    | 5   | 12  |
| <b>4 Flute *</b>                   | < 7      | < .3      | 30-45 | 8   | 12       | 26    | 3    | 5   | 12  |
| <b>General Use</b>                 | > 7      | > .3      | 30-45 | 7   | 12       | 24    | 4    | 5   | 12  |
| <b>6 Flute *</b>                   | < 7      | < .3      | 45    | 8   | 12       | 22    | 4    | 5   | 12  |
| <b>General Use</b>                 | > 7      | > .3      | 45    | 7   | 11       | 22    | 4    | 5   | 11  |
| <b>10 Flute * (MM) General Use</b> | -        | -         | 30    | 7   | 10       | 16    | 4    | 3   | 10  |
| <b>Roughers *</b>                  |          |           |       |     |          |       |      |     |     |
| <b>ERF-A-3..6 *</b>                | < 7      | < .3      | 30-38 | 9   | 8        | -     | 2.5  | 6   | 7   |
| <b>General Use *</b>               | > 7      | > .3      | 30-38 | 8   | 8        | -     | 2.5  | 6   | 7   |
| <b>EBRF-T3...4 *</b>               | < 7      | < .3      | 20    | 6   | 8        | -     | -    | 3   | 12  |
| <b>General Use</b>                 | > 7      | > .3      | 20    | 6   | 8        | -     | -    | 3   | 12  |
| <b>ECR-B-4/5/7 *</b>               | < 7      | < .3      | 45    | 9   | 7.5      | -     | 3    | 5   | 7   |
| <b>Stainless Steel/General Use</b> | > 7      | > .3      | 45    | 8   | 8        | -     | 3    | 5   | 7   |
| <b>ECR-T4... *</b>                 | < 7      | < .3      | 20    | 9   | 7.5      | -     | 2    | 5   | 7   |
| <b>PH /General Use</b>             | > 7      | > .3      | 20    | 8   | 7.5      | -     | 2    | 5   | 7   |
| <b>ERC-E3 *</b>                    | < 7      | < .3      | 38    | 16  | 10       | -     | 2    | 10  | 10  |
| <b>Aluminum</b>                    | > 7      | > .3      | 38    | 16  | 11       | -     | 2    | 10  | 10  |
| <b>ECR-B3 3 Flute Aluminum*</b>    | -        | -         | 45    | 16  | 11       | -     | 4    | 10  | 10  |
| <b>Aluminum *</b>                  |          |           |       |     |          |       |      |     |     |
| <b>ECA-B-2 *</b>                   | < 7      | < .3      | 45-55 | 16  | 11       | 25    | 5    | 10  | 11  |
| <b>2 Flute Aluminum</b>            | > 7      | > .3      | 45-55 | 16  | 11       | 25    | 5    | 10  | 11  |
| <b>ECA-B-3 *</b>                   | < 7      | < .3      | 45    | 16  | 10       | -     | 4    | 10  | 10  |
| <b>3 Flute Aluminum</b>            | > 7      | > .3      | 45    | 16  | 10       | -     | 4    | 10  | 10  |
| <b>Chip Splitters</b>              |          |           |       |     |          |       |      |     |     |
| <b>ECP-E3/4 *</b>                  | < 7      | < .3      | 38    | 8   | 8        | -     | 3    | 6   | 7   |
| <b>Stainless Steel/Gen Use</b>     | > 7      | > .3      | 38    | 8   | 8        | -     | 3    | 6   | 7   |
| <b>FINISHED</b>                    |          |           |       |     |          |       |      |     |     |
| <b>EFS-B44 *</b>                   | < 7      | < .3      | 45    | 3   | 7.5      | -     | 1.5  | 2   | 7   |
| <b>General Use ***</b>             | > 7      | > .3      | 45    | 3   | 7.5      | -     | 1.5  | 2   | 7   |
| <b>CHATTERFREE</b>                 |          |           |       |     |          |       |      |     |     |
| <b>EC-E4...CF *</b>                | < 7      | < .3      | 38    | 4   | 3        | 9**** | 3    | 2   | 7   |
| <b>General Use</b>                 | > 7      | > .3      | 38    | 4   | 3        | 8**** | 3    | 2   | 7   |
| <b>CHATTERFREE</b>                 |          |           |       |     |          |       |      |     |     |
| <b>EC-E5...CF *</b>                | < 7      | < .3      | 38    | 7   | 8        | -     | 3    | 2   | 7   |
| <b>General Use</b>                 | > 7      | > .3      | 38    | 6   | 8        | -     | 3    | 2   | 7   |



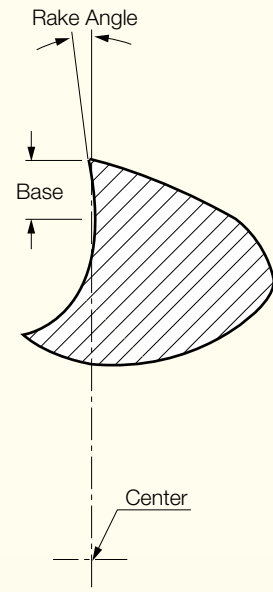
| *S <sub>A</sub> | W                 | *A   | *A <sub>1</sub> | L <sub>w</sub>   | A <sub>w</sub> | P        | B        | Radius |
|-----------------|-------------------|------|-----------------|------------------|----------------|----------|----------|--------|
| 17              | 0.18*d1           | 12.0 | -               | -                | 0.10*d1        | -        | -        | -      |
| 17              | 0.175*d1          | 12.0 | -               | -                | 0.10*d1        | -        | -        | -      |
| 17              | 0.175*d1          | 12.0 | -               | -                | 0.10*d1        | -        | -        | -      |
| 17              | 0.16*d1           | 12.0 | -               | -                | 0.10*d1        | -        | -        | -      |
| 16              | 0.17*d1           | 12.0 | -               | -                | 0.10*d1        | -        | -        | -      |
| 16              | 0.16*d1           | 12.0 | -               | -                | 0.10*d1        | -        | -        | -      |
| 17              | 0.14*d1           | -    | -               | -                | 0.08*d1        | -        | -        | -      |
| 17              | 0.13*d1           | -    | -               | -                | 0.08*d1        | -        | -        | -      |
| -               | 0.19*d1           | -    | -               | -                | -              | -        | -        | -      |
| 24              | 0.175*d1          | 12.0 | 24              | 0.06*d1          | 0.06*d1        | 0.06*d1  | 0.22*d1  | -      |
| 24              | 0.165*d1          | 12.0 | 24              | 0.05*d1          | 0.05*d1        | 0.05*d1  | 0.17*d1  | -      |
| 24              | 0.175*d1          | 11.0 | 24              | 0.06*d1          | 0.06*d1        | 0.08*d1  | 0.165*d1 | -      |
| 24              | 0.165*d1          | 11.0 | 24              | 0.05*d1          | 0.05*d1        | 0.05*d1  | 0.170*d1 | -      |
| 24              | 0.175*d1          | 12.0 | 24              | 0.06*d1          | 0.06*d1        | 0.06*d1  | 0.165*d1 | -      |
| 24              | 0.165*d1          | 12.0 | 24              | 0.05*d1          | 0.05*d1        | 0.05*d1  | 0.170*d1 | -      |
| 22              | 0.175*d1          | 12.0 | 23.5            | 0.06*d1          | 0.10*d1        | 0.08*d1  | 0.157*d1 | -      |
| 22              | 0.165*d1          | 12.0 | 23              | 0.05*d1          | 0.10*d1        | 0.075*d1 | 0.148*d1 | -      |
| 22              | 0.175*d1          | 12.0 | 24              | 0.06*d1          | 0.10*d1        | 0.08*d1  | 0.157*d1 | -      |
| 22              | 0.165*d1          | 12.0 | 23              | 0.05*d1          | 0.10*d1        | 0.075*d1 | 0.148*d1 | -      |
| 22              | 0.14*d1           | 12.0 | 22              | 0.06*d1          | 0.10*d1        | 0.08*d1  | 0.126*d1 | -      |
| 22              | 0.13*d1           | 11.0 | 22              | 0.05*d1          | 0.10*d1        | 0.075*d1 | 0.117*d1 | -      |
| 16              | 0.10*d1           | 10.0 | 16              | 0.04*d1          | 0.045*d1       | 0.04*d1  | -        | R      |
| 17              | 0.21*d1           | -    | -               | -                | 0.10*d1        | -        | -        | -      |
| 17              | 0.21*d1           | -    | -               | -                | 0.08*d1        | -        | -        | -      |
| 26              | 0.19*d1           | 12.0 | 26              | 0.06*d1          | 0.06*d1        | 0.06*d1  | 0.18*d1  | -      |
| 25              | 0.22*d1           | 12.0 | 25              | 0.053*d1         | 0.053*d1       | 0.053*d1 | 0.25*d1  | -      |
| 17              | 0.22*d1           | 13.0 | -               | -                | 0.10*d1        | -        | -        | -      |
| 16              | 0.24/0.20/0.14*d1 | 12.0 | -               | -                | 0.08*d1        | -        | -        | -      |
| 16              | 0.32*d1           | 12.0 | -               | -                | 0.09*d1        | -        | -        | -      |
| 16              | 0.3*d1            | 11.0 | -               | -                | 0.09*d1        | -        | -        | -      |
| 22              | 0.2*d1            | -    | -               | -                | 0.10*d1        | -        | -        | -      |
| 22              | 0.2*d1            | -    | -               | -                | 0.09*d1        | -        | -        | -      |
| 22              | 0.24*d1           | 10.0 | -               | -                | 0.10*d1        | -        | -        | R0.2   |
| 24              | 0.17*d1           | -    | -               | 0.06*d1          | 0.10*d1        | 0.08*d1  | 0.153*d1 | -      |
| 24              | 0.19*d1           | -    | -               | 0.05*d1          | 0.10*d1        | 0.075*d1 | 0.171*d1 | -      |
| 22              | 0.26*d1           | 10.0 | -               | -                | 0.10*d1        | -        | -        | R0.2   |
| 22              | 0.24*d1           | 10.0 | -               | -                | 0.10*d1        | -        | -        | R0.2   |
| 17              | 0.27*d1           | 14.0 | -               | -                | 0.10*d1        | -        | -        | -      |
| 17              | 0.27*d1           | 12.0 | -               | -                | 0.10*d1        | -        | -        | -      |
| 16              | 0.27*d1           | 12.0 | -               | -                | 0.10*d1        | -        | -        | -      |
| 16              | 0.27*d1           | 12.0 | -               | -                | 0.10*d1        | -        | -        | -      |
| 17              | 0.17*d1/0.23*d1   | 13.0 | -               | 0.008*d1/0.04*d1 | 0.075*d1       | -        | -        | -      |
| 17              | 0.15*d1/0.23*d1   | 13.0 | -               | 0.006*d1/0.04*d1 | 0.075*d1       | -        | -        | -      |
| 16              | 0.17*d1/0.21*d1   | 12.0 | -               | -                | 0.085*d1       | -        | -        | -      |
| 16              | 0.17*d1/0.21*d1   | 12.0 | -               | -                | 0.08*d1        | -        | -        | -      |



**Regrinding Instructions (continued)**

**Base Distance for Rake Angle Measurement**

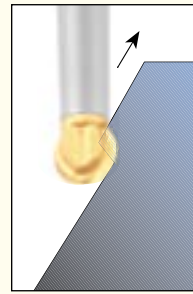
| Tool Diameter |               | Base Distance |        |
|---------------|---------------|---------------|--------|
| mm            | in            | mm            | in     |
| 5<d1≤6.35     | .158<d1≤.25   | 0.3           | .01181 |
| 6.35<d1≤8     | .25<d1≤.315   | 0.4           | .01574 |
| 8<d1≤13       | .315<d1≤.512  | 0.5           | .01968 |
| 13<d1≤21      | .512<d1≤.827  | 0.6           | .02362 |
| 21<d1≤25      | .827<d1≤1.063 | 0.7           | .02755 |



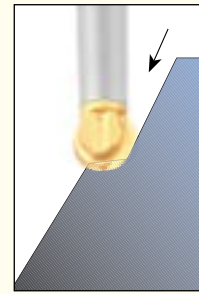


**Ball Nose**

- For die & mold making, turbine manufacturing and aircraft industry, etc.
- Useful for intricate-shaped surfaces.
- Profiling of up to 70 HRC high hardened steels and alloy steels, nickel based alloys, titanium alloys.
- Ultra-fine grain carbide which increases both toughness and hardness.
- Suitable for dry and high speed cutting.
- Special sphere shaped tool geometry provides increased tool life and enables higher speed and feed operations.



**Favorable Back Milling** ✓



**Unfavorable Steep Ramping**

**Milling Features**

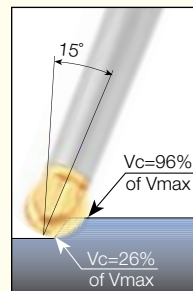
Operating angle 208°-212°

- Excellent surface roughness and high milling process.
- Enables milling with high speed and feed in back milling mode.

**Operating Recommendations**

It is recommended to machine with the tool inclined at a 15° angle. This technique eliminates cutting at nearly zero speed at the tool axis. Cutting is more efficient, and tool life substantially improves.

- Decreased cutting force.
- Excellent surface roughness and brightness.



**Favorable Profiling** ✓

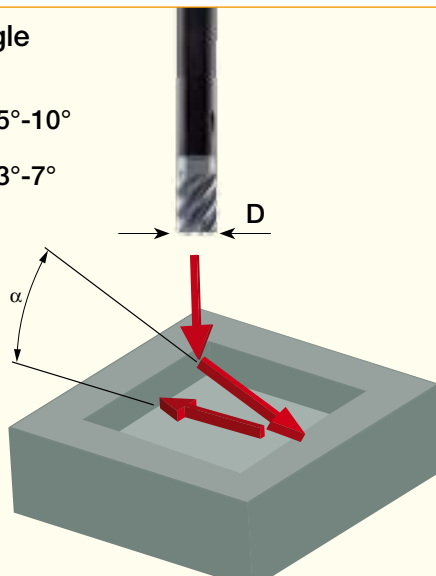


**Unfavorable Profiling**

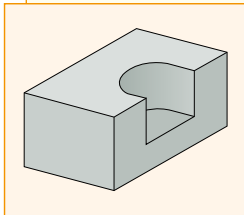
**Recommendations for Popular Applications**

**Recommended Rampdown Angle**

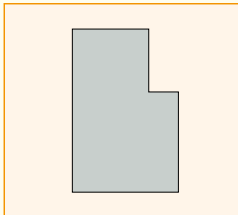
- A**  $D \leq 10 \text{ mm}$        $\alpha = 5^\circ - 10^\circ$
- B**  $D > 10 \text{ mm}$        $\alpha = 3^\circ - 7^\circ$



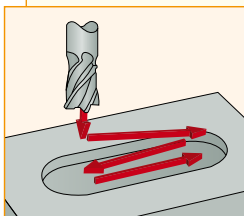
**Popular Endmill Applications**



**Slotting**



**Shouldering**



**Ramping Down**



Engineered for  
**MAXIMUM**  
**MULTI-MATERIAL**  
Performance



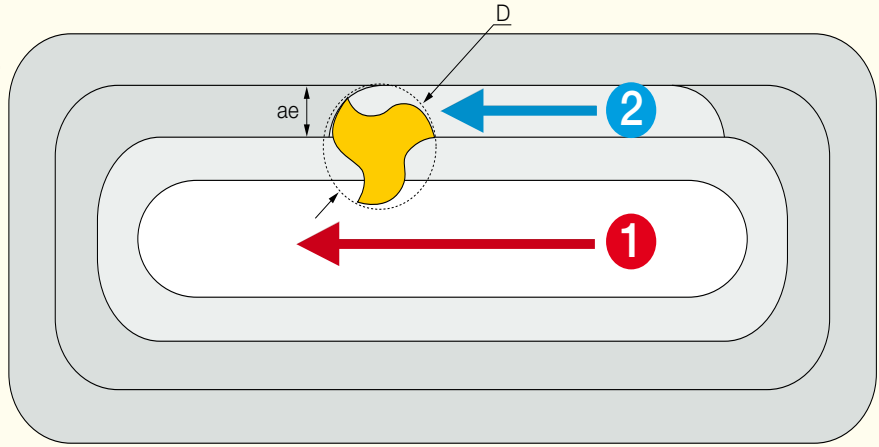
**Pocket Milling**

**1 Recommended Method**  
Open the pocket in the middle

**2** Proceed with shoulder milling  
Width of cut  $a_e = 40-60\% \times D$

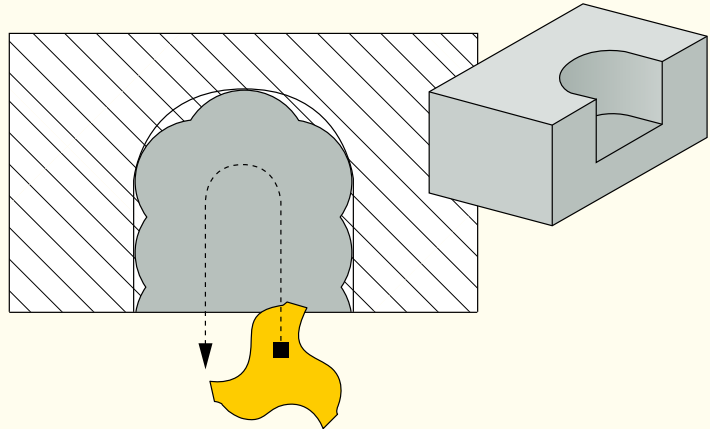
**Features**

- Better chip evacuation
- No mismatch in the corners
- Constant operation
- Less vibration
- Longer tool life



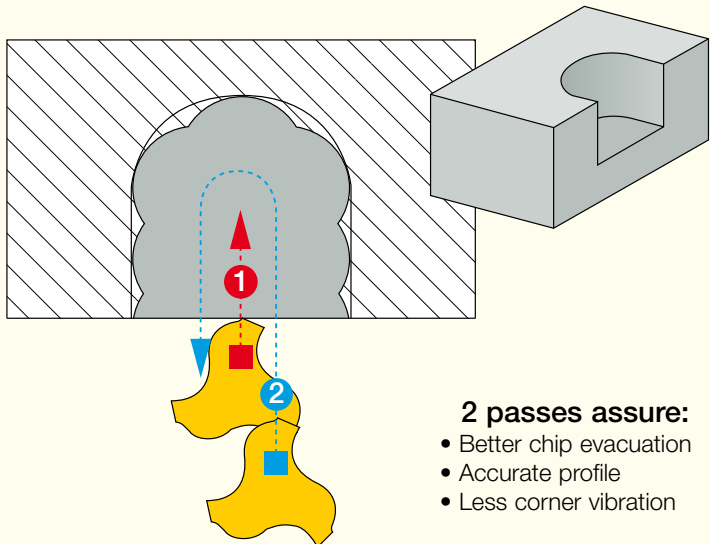
**Roughing Side Pockets**

**Conventional Method**



- Poor chip evacuation
- May cause chipping

**Alternative Recommended Method**



- 2 passes assure:**
- Better chip evacuation
  - Accurate profile
  - Less corner vibration



# ***MATERIALS AND GRADES***





# MATERIAL GROUPS

According to DIN / ISO 513 and VDI 3323

| ISO       | Material                                                           | Condition      | Tensile Strength [N/mm <sup>2</sup> ] | K <sub>C1</sub> <sup>(1)</sup> [N/mm <sup>2</sup> ] | m <sub>c</sub> <sup>(2)</sup> | Hardness HB | Material No. |     |    |
|-----------|--------------------------------------------------------------------|----------------|---------------------------------------|-----------------------------------------------------|-------------------------------|-------------|--------------|-----|----|
| P         | Non-alloy steel and cast steel, free cutting steel                 | < 0.25 %C      | Annealed                              | 420                                                 | 1350                          | 0.21        | 125          | 1   |    |
|           |                                                                    | >= 0.25 %C     | Annealed                              | 650                                                 | 1500                          | 0.22        | 190          | 2   |    |
|           |                                                                    | < 0.55 %C      | Quenched and tempered                 | 850                                                 | 1675                          | 0.24        | 250          | 3   |    |
|           |                                                                    | >= 0.55 %C     | Annealed                              | 750                                                 | 1700                          | 0.24        | 220          | 4   |    |
|           |                                                                    |                | Quenched and tempered                 | 1000                                                | 1900                          | 0.24        | 300          | 5   |    |
|           | Low alloy steel and cast steel (less than 5% of alloying elements) |                | Annealed                              | 600                                                 | 1775                          | 0.24        | 200          | 6   |    |
|           |                                                                    |                |                                       | 930                                                 | 1675                          | 0.24        | 275          | 7   |    |
|           |                                                                    |                | Quenched and tempered                 | 1000                                                | 1725                          | 0.24        | 300          | 8   |    |
|           |                                                                    |                |                                       | 1200                                                | 1800                          | 0.24        | 350          | 9   |    |
|           | High alloy steel, cast steel, and tool steel                       |                | Annealed                              | 680                                                 | 2450                          | 0.23        | 200          | 10  |    |
|           |                                                                    |                | Quenched and tempered                 | 1100                                                | 2500                          | 0.23        | 325          | 11  |    |
|           | Stainless steel                                                    |                | Ferritic/martensitic                  | 680                                                 | 1875                          | 0.21        | 200          | 12  |    |
|           |                                                                    |                | Martensitic                           | 820                                                 | 1875                          | 0.21        | 240          | 13  |    |
| M         | Stainless steel                                                    | Austenitic     | 600                                   | 2150                                                | 0.20                          | 180         | 14           |     |    |
| K         | Grey cast iron                                                     |                | Pearlitic/ferritic                    |                                                     | 1150                          | 0.20        | 180          | 15  |    |
|           |                                                                    |                | Pearlitic/martensitic                 |                                                     | 1350                          | 0.28        | 260          | 16  |    |
|           | Ductile cast iron (nodular)                                        |                | Ferritic                              |                                                     | 1225                          | 0.25        | 160          | 17  |    |
|           |                                                                    |                | Pearlitic                             |                                                     | 1350                          | 0.28        | 250          | 18  |    |
|           | Malleable cast iron                                                |                | Ferritic                              |                                                     | 1225                          | 0.25        | 130          | 19  |    |
|           |                                                                    |                | Pearlitic                             |                                                     | 1420                          | 0.3         | 230          | 20  |    |
| N         | Aluminum-wrought alloy                                             |                | Not cureable                          |                                                     | 700                           | 0.25        | 60           | 21  |    |
|           |                                                                    |                | Cured                                 |                                                     | 800                           | 0.25        | 100          | 22  |    |
|           | Aluminum-cast, alloyed                                             | <=12% Si       |                                       | Not cureable                                        |                               | 700         | 0.25         | 75  | 23 |
|           |                                                                    |                |                                       | Cured                                               |                               | 700         | 0.25         | 90  | 24 |
|           |                                                                    | >12% Si        |                                       | High temperature                                    |                               | 750         | 0.25         | 130 | 25 |
|           | Copper alloys                                                      | >1% Pb         |                                       | Free cutting                                        |                               | 700         | 0.27         | 110 | 26 |
|           |                                                                    |                |                                       | Brass                                               |                               | 700         | 0.27         | 90  | 27 |
|           |                                                                    |                |                                       | Electrolitic copper                                 |                               | 700         | 0.27         | 100 | 28 |
|           | Non-metallic                                                       |                |                                       | Duroplastics, fiber plastics                        |                               |             |              |     | 29 |
|           |                                                                    |                |                                       |                                                     | Hard rubber                   |             |              |     | 30 |
| S         | High temp. alloys                                                  | Fe based       |                                       | Annealed                                            |                               | 2600        | 0.24         | 200 | 31 |
|           |                                                                    |                |                                       | Cured                                               |                               | 3100        | 0.24         | 280 | 32 |
|           |                                                                    | Ni or Co based |                                       | Annealed                                            |                               | 3300        | 0.24         | 250 | 33 |
|           |                                                                    |                |                                       | Cured                                               |                               | 3300        | 0.24         | 350 | 34 |
|           | Titanium and Ti alloys                                             |                |                                       |                                                     | RM 400                        | 1700        | 0.23         |     | 36 |
|           |                                                                    |                |                                       | Alpha+beta alloys cured                             | RM 1050                       | 2110        | 0.22         |     | 37 |
| H         | Hardened steel                                                     |                |                                       |                                                     | 4600                          |             | 55 HRc       | 38  |    |
|           |                                                                    |                |                                       |                                                     | 4700                          |             | 60 HRc       | 39  |    |
|           | Chilled cast iron                                                  |                | Cast                                  |                                                     | 4600                          |             | 400          | 40  |    |
| Cast iron |                                                                    | Hardened       |                                       | 4500                                                |                               | 55 HRc      | 41           |     |    |

■ Steel   
 ■ Stainless Steel   
 ■ Cast Iron  
■ Nonferrous   
 ■ High Temp. Alloys   
 ■ Hardened Steel

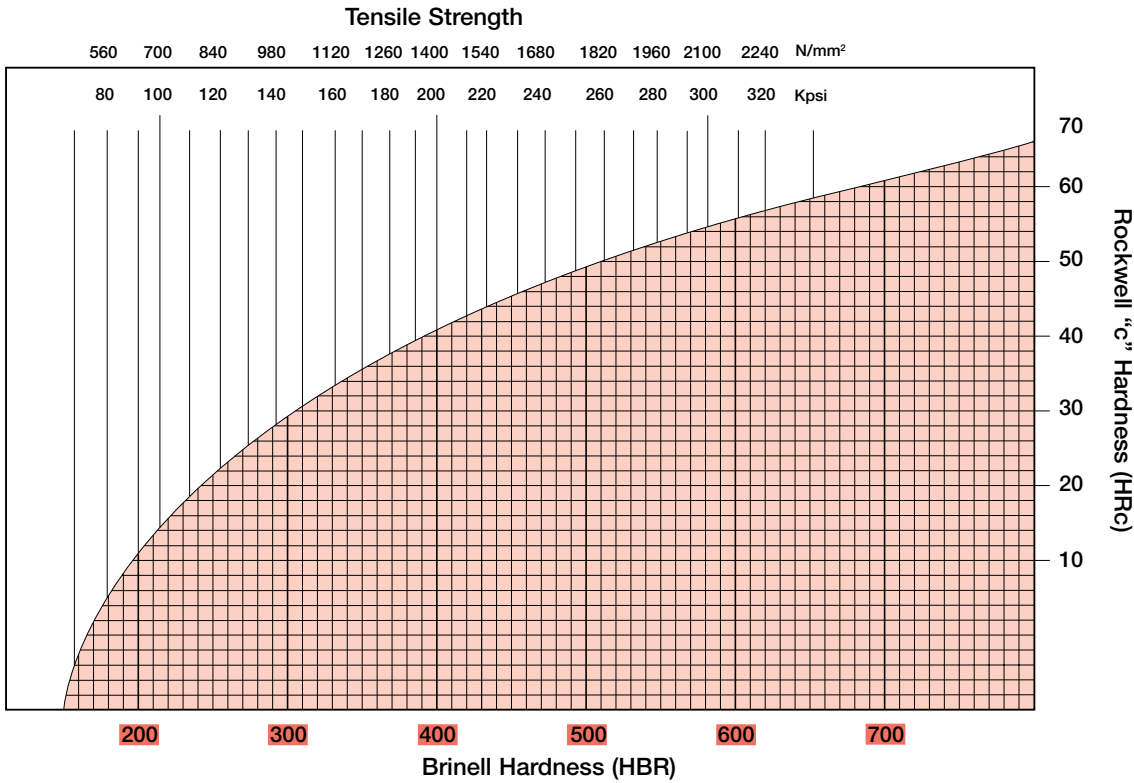
<sup>(1)</sup> Specific cutting force for 1 mm<sup>2</sup> chip section.

<sup>(2)</sup> Chip thickness factor.

# MATERIAL GROUPS

Engineered for  
**MAXIMUM**  
**MULTI-MASTER**  
Performance

## Hardness Conversion Table



## ISCAR MULTI-MASTER Grades Chart







| Grades             | ISO                                                                                                                                                                                                                                 | Coating Layers |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| <b>IC908</b>       | P15-P40 M20-M30<br>K05-K25 S15-S25 AL-TEC<br>H10-H25                                                                                                                                                                                |                |
|                    | A tough, submicron PVD TiAlN coated grade. Suitable for milling heat resistant alloys, austenitic stainless steel, hard alloys and carbon steel at medium to high cutting speeds.                                                   |                |
| <b>IC903</b>       | H01-H10 P05-P15<br>M10-M20 S10-S20 AL-TEC                                                                                                                                                                                           |                |
|                    | Ultra-fine grain carbide with 12% cobalt, TiAlN PVD coated grade. Used for up to 62 HRC hardened steel, titanium, nickel-based alloys and stainless steel at high speeds and medium feeds. A tough and highly wear resistant grade. |                |
| <b>IC08</b>        | N10-N25<br>M10-M30<br>S10-S30                                                                                                                                                                                                       |                |
|                    | An uncoated, fine grain carbide grade. Used for stainless steel and high temperature alloys at low to medium cutting speeds.                                                                                                        |                |
| <b>IC328/IC528</b> | P25-P50<br>M30-M40<br>S25-S30                                                                                                                                                                                                       |                |
|                    |                                                                                                                                                                                                                                     |                |

■ PVD COATED ■ UNCOATED

# ISCAR MATERIAL GROUPS

According to VDI 3323 Standard

| Mtl. No. |  |  |  |
|----------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|          | USA<br>AISI/SAE                                                                   | GERMANY<br>Werkstoff      DIN                                                     | Great Britain<br>BS      EN                                                         |
| <b>1</b> |                                                                                   | 1.0028      Ust 34-2<br>(S250G1T)                                                 |                                                                                     |
| <b>1</b> |                                                                                   | 1.0034      RSt 34-2<br>(S250G2T)                                                 | 1449 34/20HR;<br>1449 34/20HS; 1449<br>34/20CR; 1449<br>34/20CS                     |
| <b>1</b> |                                                                                   | 1.0035      St185<br>(Fe 310-0); St 33                                            | Fe 310-0; 1449<br>15HR; 1449 15HS                                                   |
| <b>1</b> | A 570 Gr. 33; A 570<br>Gr. 36                                                     | 1.0036      S235JRG1;<br>(Fe 360 B); Ust 37-2                                     | Fe 360 B; 4360-40 B                                                                 |
| <b>1</b> |                                                                                   | 1.0037      S235JR<br>(Fe 360 B); St 37-2                                         | Fe 360 B; 4360-40 B                                                                 |
| <b>1</b> | A 570 Gr. 40                                                                      | 1.0044      S275JR<br>(Fe 430 B); St44-2                                          | Fe 430 B FN; 1449<br>43/25 HR; 1449<br>43/25HS; 4360-43 B                           |
| <b>1</b> |                                                                                   | 1.0045      S355JR                                                                | 4360-50 B                                                                           |
| <b>1</b> | A 570 Gr.50; A 572<br>Gr.50                                                       | 1.0050      E295<br>(Fe 490-2); St 50-2                                           | Fe 490-2 FN; 4360-<br>50 B                                                          |
| <b>1</b> | A 572 Gr. 65                                                                      | 1.0060      E335<br>(Fe 590-2); St 60-2                                           | Fe 60-2; 4360-55 E;<br>4360-55 C                                                    |
| <b>1</b> |                                                                                   | 1.0112      P235S                                                                 | 1501-164-360B LT20                                                                  |
| <b>1</b> |                                                                                   | 1.0114      S235JU; St 37-3 U                                                     | 4360-40C                                                                            |
| <b>1</b> |                                                                                   | 1.0130      P265S                                                                 | 1501-164-400B LT<br>20                                                              |
| <b>1</b> |                                                                                   | 1.0143      S275J0; St 44-3 U                                                     | 4360-43C                                                                            |
| <b>1</b> | A 573 Gr. 70; A 611<br>Gr.D                                                       | 1.0144      S275J2G3<br>(Fe 430 D 1); St 44-3                                     | Fe 430 D1 FF; 4360-<br>43 C; 4360-43 D                                              |
| <b>1</b> |                                                                                   | 1.0149      S275JOH; RoSt 44-2                                                    | 4360-43C                                                                            |
| <b>1</b> |                                                                                   | 1.0226      DX51D; St 02 Z                                                        | Z2                                                                                  |
| <b>1</b> | M 1010                                                                            | 1.0301      C10                                                                   | 040 A 10; 045 M 10;<br>1449 10 CS                                                   |
| <b>1</b> | A 621<br>(1008)                                                                   | 1.0330      DC 01; St 2; St 12                                                    | 1449 4 CR; 1449<br>3 CS                                                             |
| <b>1</b> | A 619<br>(1008)                                                                   | 1.0333      Ust 3<br>(DC03G1); Ust 13                                             | 1449 2 CR; 1449 3<br>CR                                                             |







| <br>France<br>AFNOR | <br>Sweden<br>SS | <br>Italy<br>UNI | <br>Spain<br>UNE | <br>Japan<br>JIS | <br>Russia<br>GOST |
|------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
| A 34-2                                                                                               |                                                                                                   | Fe 330; Fe 330 B FU                                                                               |                                                                                                   | SS 330                                                                                              |                                                                                                       |
| A 34-2 NE                                                                                            |                                                                                                   | Fe 330 B FN                                                                                       |                                                                                                   |                                                                                                     | St2sp; St2ps                                                                                          |
| A 33                                                                                                 | 1300                                                                                              | Fe 320                                                                                            | Fe 310-0                                                                                          |                                                                                                     | St0                                                                                                   |
|                                                                                                      | 1311; 1312                                                                                        | FE37BFU                                                                                           | AE 235 B; Fe 360 B                                                                                |                                                                                                     | 16D; 18Kp; St3Kp                                                                                      |
| E 24-2                                                                                               | 1311                                                                                              | Fe 360 B; 1449<br>37/23 HR                                                                        | AE 235 B; Fe 360 B                                                                                | STKM 12 A; STKM<br>12 AC                                                                            |                                                                                                       |
| E 28-2                                                                                               | 1412                                                                                              | Fe 430 B; Fe 430<br>B FN                                                                          | AE 275 B; Fe 430<br>B FN                                                                          | SM 400 A; SM 400<br>B; SM 400 C                                                                     | St4ps; St4sp                                                                                          |
| E 36-2                                                                                               | 2172                                                                                              | Fe 510 B                                                                                          | AE 355 B                                                                                          |                                                                                                     |                                                                                                       |
| A 50-2                                                                                               | 1550; 2172                                                                                        | Fe 490                                                                                            | a 490-2; Fe 490-2<br>FN                                                                           | SS 490                                                                                              | ST5ps; ST5sp                                                                                          |
| A 60-2                                                                                               | 1650                                                                                              | Fe 60-2; Fe 590                                                                                   | A 590-2; Fe 590-2<br>FN                                                                           | SM 570                                                                                              | St6ps; St6sp                                                                                          |
| A37AP                                                                                                |                                                                                                   | Fe 360 C                                                                                          | AE 235 C                                                                                          |                                                                                                     |                                                                                                       |
| E 24-3                                                                                               |                                                                                                   | Fe 360 C                                                                                          | AE 235 C                                                                                          |                                                                                                     |                                                                                                       |
| A 42 AP                                                                                              |                                                                                                   |                                                                                                   | SPH 265                                                                                           |                                                                                                     |                                                                                                       |
| E 28-3                                                                                               | 1414-01                                                                                           | Fe 430 D                                                                                          | AE 275 D                                                                                          |                                                                                                     |                                                                                                       |
| E 28-3; E 28-4                                                                                       | 1411; 1412; 1414                                                                                  | Fe 430 B; Fe 430 C<br>(FN); Fe 430 D<br>(FF)                                                      | AE 275 D; Fe 430<br>D1 FF                                                                         | SM 400 A; SM 400<br>B; SM 400 C                                                                     | St4kp; St4ps; St4sp                                                                                   |
|                                                                                                      | 1412-04                                                                                           | Fe 430 C                                                                                          | Fe 430 C                                                                                          |                                                                                                     |                                                                                                       |
| GC                                                                                                   | 1151 10                                                                                           | FeP 02 G                                                                                          | FeP 02 G                                                                                          |                                                                                                     |                                                                                                       |
| AF 34 C 10; XC 10                                                                                    |                                                                                                   | C 10; 1 C 10                                                                                      | F.1511; F.151.A                                                                                   | S 10C                                                                                               | 10                                                                                                    |
| TC                                                                                                   | 1142                                                                                              | FeP 00; FeP 01                                                                                    | AP 11                                                                                             | SPHD                                                                                                | 15 kp                                                                                                 |
| E                                                                                                    |                                                                                                   | FeP 02                                                                                            | AP 02                                                                                             | SPCD                                                                                                |                                                                                                       |

# ISCAR MATERIAL GROUPS

According to VDI 3323 Standard




| Mtl. No. |  |  |  |
|----------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|          | USA<br>AISI/SAE                                                                   | GERMANY<br>Werkstoff      DIN                                                     | Great Britain<br>BS      EN                                                         |
| <b>1</b> | A 621<br>(1008)                                                                   | 1.0334                                                                            | UStW 23<br>(DD12G1)                                                                 |
| <b>1</b> | A 622<br>(1008)                                                                   | 1.0335                                                                            | DD13; StW 24                                                                        |
| <b>1</b> | A 620<br>(1008)                                                                   | 1.0338                                                                            | DC04; St 4; St 14                                                                   |
| <b>1</b> | A 516 Gr. 65; 55 A<br>515 Gr. 65; 55 A 414<br>Gr. C; A 442 Gr.55                  | 1.0345                                                                            | P235GH/H I                                                                          |
| <b>1</b> | (M) 1020; M 1023                                                                  | 1.0402                                                                            | C22                                                                                 |
| <b>1</b> | 1020                                                                              | 1.0402                                                                            | C22                                                                                 |
| <b>1</b> | 1020; 1023                                                                        | 1.0402                                                                            | C22                                                                                 |
| <b>1</b> |                                                                                   | 1.0425                                                                            | P265GH/H II                                                                         |
| <b>1</b> | A27 65-35                                                                         | 1.0443                                                                            | GS-45                                                                               |
| <b>1</b> |                                                                                   | 1.0539                                                                            | S355NH;StE 335                                                                      |
| <b>1</b> |                                                                                   | 1.0545                                                                            | S355N; StE 355                                                                      |
| <b>1</b> |                                                                                   | 1.0546                                                                            | S355NL;TStE 355                                                                     |
| <b>1</b> |                                                                                   | 1.0547                                                                            | S355JOH                                                                             |
| <b>1</b> |                                                                                   | 1.0549                                                                            | S355 NLH;TStE 355                                                                   |
| <b>1</b> |                                                                                   | 1.0553                                                                            | S355JO;St 52-3U                                                                     |
| <b>1</b> | A 633 Gr.C; A 588                                                                 | 1.0562                                                                            | P355N; StE 355                                                                      |
| <b>1</b> |                                                                                   | 1.0565                                                                            | P355NH; WStE 355                                                                    |
| <b>1</b> |                                                                                   | 1.0566                                                                            | P355NL1; TStE 355                                                                   |
| <b>1</b> | 1                                                                                 | 1.0570                                                                            | S355J2G3; St 52-3                                                                   |
| <b>1</b> | 1213                                                                              | 1.0715                                                                            | 9 SMn 28<br>(1SMn30)                                                                |









| <br>France<br>AFNOR | <br>Sweden<br>SS | <br>Italy<br>UNI | <br>Spain<br>UNE | <br>Japan<br>JIS | <br>Russia<br>GOST |
|------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
| S C                                                                                                  |                                                                                                   | FeP 12                                                                                            | AP 12                                                                                             | SPHE                                                                                                | 10kp                                                                                                  |
| 3 C                                                                                                  |                                                                                                   | FeP 13                                                                                            | AP 13                                                                                             | SPHE                                                                                                | 08kp                                                                                                  |
| ES                                                                                                   | 1147                                                                                              | FeP 04                                                                                            | AP 04                                                                                             | SPCE                                                                                                | 08jU; JUA                                                                                             |
| A 37 CP; A 37 AP                                                                                     | 1331; 1330                                                                                        | FeE235; Fe 360 1 KW; Fe 360 1KG; Fe 360 2 KW; Fe 360 2 KG                                         | A 37 RC I; RA II                                                                                  | SGV 410; SGV 450; SGV 480; SPV 450; SPV 480                                                         |                                                                                                       |
| AF 42 C 20; XC 25; 1 C 22                                                                            | 1450                                                                                              | C 20; C 21; C 25                                                                                  | 1 C 22; F.112                                                                                     | S20C                                                                                                | 20                                                                                                    |
| CC20                                                                                                 | 1450                                                                                              | C20; C21                                                                                          | F.112                                                                                             | S22 C                                                                                               | 20                                                                                                    |
| AF 42 C 20; XC 25; 1 C 22                                                                            | 1450                                                                                              | C 20;C 21;C 25                                                                                    | 1 C 22F.112                                                                                       | S 20 C; S 22 C                                                                                      |                                                                                                       |
| A 42 CP; A 42 AP                                                                                     | 1431; 1430; 1432                                                                                  | Fe 410 1KW; Fe 410 1KG; Fe 410 1KT; Fe 410 2KW; Fe 410 2KG                                        | A 42 RC I; A 42 RC II                                                                             | SPV 315; SPV 355; SG 295; SGV 410; SGV 450; SGV 480                                                 | 16K; 20K                                                                                              |
| E 23-45 M                                                                                            | 1305                                                                                              |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
| TSE 355-4                                                                                            | 2134-04                                                                                           | Fe 510 B                                                                                          | Fe 355 KGN                                                                                        |                                                                                                     |                                                                                                       |
| E 355 R                                                                                              | 2334-01                                                                                           | FeE 355 KG                                                                                        | AE 355 KG                                                                                         |                                                                                                     |                                                                                                       |
| E 355 FP                                                                                             | 2135-01                                                                                           | FeE 355 KT                                                                                        | AE 355 KT                                                                                         |                                                                                                     |                                                                                                       |
| TSE 355-3                                                                                            | 2172-04                                                                                           | Fe 510 C                                                                                          | Fe 510 C                                                                                          |                                                                                                     |                                                                                                       |
|                                                                                                      | 2135                                                                                              | Fe 510 D                                                                                          | FeE 355 KTM                                                                                       |                                                                                                     |                                                                                                       |
| E 36-3                                                                                               |                                                                                                   | Fe 510 C                                                                                          |                                                                                                   |                                                                                                     |                                                                                                       |
| FeE 355 KG N; E 355 R/FP; A 510 AP                                                                   | 2106                                                                                              | FeE 355 KG; FeE 355 KW                                                                            | AEE 355 KG; AEE 355 DD                                                                            | SM 490 A; SM 490 B; SM 490 C; SM 490 YA; SM 490YB                                                   | 15GF                                                                                                  |
| A 510 AP                                                                                             | 2106                                                                                              | FeE 355-2                                                                                         |                                                                                                   |                                                                                                     |                                                                                                       |
| A 510 FP                                                                                             | 2107-01                                                                                           | FeE 355-3                                                                                         |                                                                                                   |                                                                                                     |                                                                                                       |
| E 36-3; E 36-4                                                                                       | 2132; 2133; 2134; 2174                                                                            | 17GS; 17G1S                                                                                       | AE 355 D; Fe 510 D1 FF                                                                            | SM 490 A; SM 490 B; SM 490 C; SM 490 YA; SM 490YB                                                   | 17GS; 17G1S                                                                                           |
| S 250                                                                                                | 1912                                                                                              | CF SMn 28                                                                                         | F.2111 - 11 SMn 28                                                                                | SUM 22                                                                                              |                                                                                                       |

# ISCAR MATERIAL GROUPS




According to VDI 3323 Standard







| Mtl. No. |  |  |  |                                                |
|----------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|------------------------------------------------|
|          | USA<br>AISI/SAE                                                                   | Werkstoff                                                                         | DIN                                                                                 | Great Britain<br>BS EN                         |
| <b>1</b> | 1213                                                                              | 1.0715                                                                            | 9 SMn 28                                                                            | 230 M 07                                       |
| <b>1</b> | 12 L 13                                                                           | 1.0718                                                                            | 9 SMnPb 28<br>(11SMnPb30)                                                           |                                                |
| <b>1</b> | 1108; 1109                                                                        | 1.0721                                                                            | 10 S 20                                                                             | 10S20                                          |
| <b>1</b> | 11 L 08                                                                           | 1.0722                                                                            | 10 SPb 20                                                                           |                                                |
| <b>1</b> | 11 L 08                                                                           | 1.0722                                                                            | 10 SPb 20                                                                           |                                                |
| <b>1</b> | 1215                                                                              | 1.0736                                                                            | 9 SMn 36 11SMn37)                                                                   |                                                |
| <b>1</b> | 12 L 14                                                                           | 1.0737                                                                            | 9 SMnPb 36<br>(11SMnPb37)                                                           |                                                |
| <b>1</b> |                                                                                   | 1.0972                                                                            | S315MC; QStE 300 TM                                                                 | 1501-40F30                                     |
| <b>1</b> |                                                                                   | 1.0976                                                                            | S355MC; QStE 360 TM                                                                 | 1501-43F35                                     |
| <b>1</b> |                                                                                   | 1.0982                                                                            | S460MC; QStE 460 TM                                                                 | 1501-50F45                                     |
| <b>1</b> |                                                                                   | 1.0984                                                                            | S500MC; QStE 500 TM                                                                 |                                                |
| <b>1</b> |                                                                                   | 1.0986                                                                            | S500MC; QStE 500 TM                                                                 | 1501 - 60F55                                   |
| <b>1</b> | 1010                                                                              | 1.1121                                                                            | CK 10;<br>(C10E)                                                                    | 040 A 10                                       |
| <b>1</b> |                                                                                   | 1.1121                                                                            | St 37-1                                                                             | 4360 40 A                                      |
| <b>1</b> | 1015                                                                              | 1.1141                                                                            | CK 15;<br>(C15E)                                                                    | 040 A 15; 080 M 15 32C                         |
| <b>1</b> | 1020; 1023                                                                        | 1.1151                                                                            | C22E; CK 22                                                                         | 055 M 15;<br>(070 M 20)                        |
| <b>1</b> |                                                                                   | 1.2083                                                                            |                                                                                     |                                                |
| <b>1</b> | A572-60                                                                           | 1.8900                                                                            | StE 380                                                                             | 4360 55 E                                      |
| <b>1</b> | A36                                                                               |                                                                                   | St 44-2                                                                             | 4360 43 A                                      |
| <b>1</b> |                                                                                   |                                                                                   | StE 320-3Z                                                                          | 1 501 160                                      |
| <b>2</b> | (M) 1025                                                                          | 1.0406                                                                            | C 25                                                                                | 070 M 26                                       |
| <b>2</b> |                                                                                   | 1.0416                                                                            | GS-38                                                                               |                                                |
| <b>2</b> | A 537 Cl.1; A 414 Gr.<br>G; A 612                                                 | 1.0473                                                                            | P355GH; 19 Mn 6                                                                     |                                                |
| <b>2</b> | 1035                                                                              | 1.0501                                                                            | C35                                                                                 | 080 A 32; 080 A 35;<br>080 M 36; 1449 40<br>CS |
| <b>2</b> | 1045                                                                              | 1.0503                                                                            | CF 45;<br>(C45G)                                                                    | 060 A 47; 080 M 46                             |

| <br><b>France</b><br><b>AFNOR</b> | <br><b>Sweden</b><br><b>SS</b> | <br><b>Italy</b><br><b>UNI</b> | <br><b>Spain</b><br><b>UNE</b> | <br><b>Japan</b><br><b>JIS</b> | <br><b>Russia</b><br><b>GOST</b> |
|--------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|
| S 250                                                                                                              | 1912                                                                                                            | CF 9 SMn 28                                                                                                     | 11 SMn 28                                                                                                       | SUM 22                                                                                                            |                                                                                                                     |
| S 250 Pb                                                                                                           | 1914                                                                                                            | CF 9 SMnPb 28                                                                                                   | F.2112-11 SMnPb 28                                                                                              | SUM 22 L; SUM 23 L; SUM 24 L                                                                                      |                                                                                                                     |
| 10S20; 10 F 2                                                                                                      |                                                                                                                 | CF 10 S 20                                                                                                      | F. 2121 - 10 S 20                                                                                               |                                                                                                                   |                                                                                                                     |
| 10PbF 2                                                                                                            |                                                                                                                 | CF 10 SPb 20                                                                                                    | F.2122-10 SPb 20                                                                                                |                                                                                                                   |                                                                                                                     |
| 10 PbF 2                                                                                                           |                                                                                                                 | CF 10 SPb 20                                                                                                    | 10 SPb 20                                                                                                       |                                                                                                                   |                                                                                                                     |
| S 300                                                                                                              |                                                                                                                 | CF 9 Mn 36                                                                                                      | F.2113 - 12 SMn 35                                                                                              | SUM 25                                                                                                            |                                                                                                                     |
| S 300 Pb                                                                                                           | 1926                                                                                                            | CF 9 SMnPb 36                                                                                                   | F.2114- 12 SMnPb 35                                                                                             |                                                                                                                   |                                                                                                                     |
| E 315 D                                                                                                            |                                                                                                                 |                                                                                                                 |                                                                                                                 |                                                                                                                   |                                                                                                                     |
| E 355 D                                                                                                            | 2642                                                                                                            | FeE 355TM                                                                                                       |                                                                                                                 |                                                                                                                   |                                                                                                                     |
| E 490 D                                                                                                            | 2662                                                                                                            | FeE 490 TM                                                                                                      |                                                                                                                 |                                                                                                                   |                                                                                                                     |
| E 560 D                                                                                                            |                                                                                                                 | FeE 560 TM                                                                                                      |                                                                                                                 |                                                                                                                   |                                                                                                                     |
| XC 10                                                                                                              | 1265                                                                                                            | C 10; 2 C 10; 2 C 15                                                                                            | F-1510-C 10 K                                                                                                   | S 9 CK; S 10 C                                                                                                    | 08;10                                                                                                               |
|                                                                                                                    | 1300                                                                                                            |                                                                                                                 |                                                                                                                 |                                                                                                                   |                                                                                                                     |
| XC 12; XC 15; XC 18                                                                                                | 1370                                                                                                            | C 15; C 16                                                                                                      | F.1110-C 15 K;<br>F.1511-C 16 K                                                                                 | S 15; S 15 CK                                                                                                     | 15                                                                                                                  |
| 2 C 22; XC 18; XC 25                                                                                               | 1450                                                                                                            | C 20; C 25                                                                                                      | F.1120-C 25 K                                                                                                   | S 20 C; S 20 CK; S 22 C                                                                                           | 20                                                                                                                  |
|                                                                                                                    | 2314                                                                                                            |                                                                                                                 |                                                                                                                 |                                                                                                                   |                                                                                                                     |
|                                                                                                                    | 2145                                                                                                            | FeE390KG                                                                                                        |                                                                                                                 | S25C                                                                                                              |                                                                                                                     |
| NFA 35-501 E 28                                                                                                    | 1411                                                                                                            |                                                                                                                 |                                                                                                                 |                                                                                                                   |                                                                                                                     |
|                                                                                                                    | 1421                                                                                                            |                                                                                                                 |                                                                                                                 |                                                                                                                   |                                                                                                                     |
| 1 C 25                                                                                                             |                                                                                                                 | C 25; 1 C 25                                                                                                    |                                                                                                                 |                                                                                                                   |                                                                                                                     |
| 20-400 M                                                                                                           | 1306                                                                                                            |                                                                                                                 |                                                                                                                 |                                                                                                                   |                                                                                                                     |
| A 52 CP                                                                                                            | 2101; 2102                                                                                                      | Fe E 355-2                                                                                                      | A 52 RC I, RA II                                                                                                | SGV 410; SGV 450;<br>SGV 480                                                                                      |                                                                                                                     |
| 1 C 35; AF 55 C 35;<br>XC 38                                                                                       | 1572; 1550                                                                                                      | C 35; 1 C 35                                                                                                    | F.113                                                                                                           | S 35 C                                                                                                            | 35                                                                                                                  |
| XC 42 H 1 TS                                                                                                       | 1672                                                                                                            | C 43; C 46                                                                                                      |                                                                                                                 | S 45 C                                                                                                            | 45                                                                                                                  |

# ISCAR MATERIAL GROUPS

According to VDI 3323 Standard

| Mtl. No. |  |  |  |                                                       |
|----------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------|
|          | USA<br>AISI/SAE                                                                   | Werkstoff                                                                         | DIN                                                                                 | Great Britain<br>BS EN                                |
| <b>2</b> | 1040                                                                              | 1.0511                                                                            | C40                                                                                 | 080 M 40                                              |
| <b>2</b> |                                                                                   | 1.0540                                                                            | C 50                                                                                |                                                       |
| <b>2</b> | A27 70-36                                                                         | 1.0551                                                                            | GS-52                                                                               | A2                                                    |
| <b>2</b> | A148 80-40                                                                        | 1.0553                                                                            | GS-60                                                                               | A3                                                    |
| <b>2</b> | A738                                                                              | 1.0577                                                                            | S355J2G4<br>(Fe 510 D 2)                                                            | Fe 510 D2 FF; 1501<br>Gr.224-460; 1501 Gr.<br>224-490 |
| <b>2</b> | 1140                                                                              | 1.0726                                                                            | 35 S 20                                                                             | 212 M 36 8M                                           |
| <b>2</b> | 1146                                                                              | 1.0727                                                                            | 45 S 20<br>(46S20)                                                                  |                                                       |
| <b>2</b> | 1035; 1041                                                                        | 1.1157                                                                            | 40Mn4                                                                               | 150 M 36 15                                           |
| <b>2</b> | 1025                                                                              | 1.1158                                                                            | C25E; CK 25                                                                         | (070 M 25)                                            |
| <b>2</b> | 1536                                                                              | 1.1166                                                                            | 34Mn5                                                                               |                                                       |
| <b>2</b> | 1330                                                                              | 1.1170                                                                            | 28Mn6                                                                               | (150 M 28);<br>(150 M 18) 14A                         |
| <b>2</b> |                                                                                   | 1.1178                                                                            | C30E; CK 30                                                                         | 080M30                                                |
| <b>2</b> | 1035                                                                              | 1.1180                                                                            | C35R; Cm 35                                                                         | 080 A 35                                              |
| <b>2</b> | 1035; 1038                                                                        | 1.1181                                                                            | C35E; CK 35                                                                         | 080 A 35;<br>(080 M 36)                               |
| <b>2</b> | 1035                                                                              | 1.1181                                                                            | C35E; CK 35                                                                         | 080 A 35;<br>(080 M 36)                               |
| <b>2</b> | 1035                                                                              | 1.1183                                                                            | Cf 35<br>(C35G)                                                                     | 080 A 35                                              |
| <b>2</b> | 1042                                                                              | 1.1191                                                                            | GS- Ck 45                                                                           | 080 A 46                                              |
| <b>2</b> | 1049; 1050                                                                        | 1.1206                                                                            | C50E; CK 50                                                                         | 080 M 50                                              |
| <b>2</b> | 1050; 1055                                                                        | 1.1213                                                                            | Cf 53;<br>(C53G)                                                                    | 070 M 55                                              |
| <b>2</b> | 4520                                                                              | 1.5423                                                                            | 22Mo4                                                                               | 1503-245-420                                          |
| <b>3</b> | A 516 Gr.70; A 515<br>Gr. 70; A 414 Gr.F; A<br>414 Gr.G                           | 1.0481                                                                            | P295GH; 17 Mn 4                                                                     | 1501 Gr. 224                                          |







| <br><b>France</b><br><b>AFNOR</b> | <br><b>Sweden</b><br><b>SS</b> | <br><b>Italy</b><br><b>UNI</b> | <br><b>Spain</b><br><b>UNE</b> | <br><b>Japan</b><br><b>JIS</b> | <br><b>Russia</b><br><b>GOST</b> |
|--------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|
| 1 C 40; AF 60 C 40                                                                                                 |                                                                                                                 | C40; 1 C 40                                                                                                     | F.114.A                                                                                                         |                                                                                                                   |                                                                                                                     |
|                                                                                                                    | 1674                                                                                                            | C 50                                                                                                            | 1 C 50                                                                                                          |                                                                                                                   |                                                                                                                     |
| 280-480 M                                                                                                          | 1505                                                                                                            |                                                                                                                 |                                                                                                                 |                                                                                                                   |                                                                                                                     |
| 320-560 M                                                                                                          | 1606                                                                                                            |                                                                                                                 |                                                                                                                 |                                                                                                                   |                                                                                                                     |
| A 52 FP                                                                                                            | 2107                                                                                                            |                                                                                                                 | A 52 RB II; AE 355 D                                                                                            |                                                                                                                   |                                                                                                                     |
| 35MF 6                                                                                                             | 1957                                                                                                            |                                                                                                                 | F.210.G                                                                                                         |                                                                                                                   |                                                                                                                     |
| 45 MF 4                                                                                                            | 1973                                                                                                            |                                                                                                                 |                                                                                                                 |                                                                                                                   |                                                                                                                     |
| 35 M 5; 40 M 5                                                                                                     |                                                                                                                 |                                                                                                                 |                                                                                                                 |                                                                                                                   | 40G                                                                                                                 |
| 2 C 25; XC 25                                                                                                      |                                                                                                                 | C25                                                                                                             | F.1120 - C 25 K                                                                                                 | S 25 C; S 28 C                                                                                                    | 25                                                                                                                  |
|                                                                                                                    |                                                                                                                 |                                                                                                                 | TO.B                                                                                                            | SMn 433 H                                                                                                         |                                                                                                                     |
| 20 M 5; 28 Mn 6                                                                                                    |                                                                                                                 | C 28 Mn                                                                                                         | 28 Mn 6                                                                                                         | SCMn 1                                                                                                            | 30G                                                                                                                 |
| XC 32                                                                                                              |                                                                                                                 | C 30                                                                                                            | 2 C 30                                                                                                          |                                                                                                                   |                                                                                                                     |
| 3 C 35; XC 32                                                                                                      | 1572                                                                                                            |                                                                                                                 | F.1135-C 35 K-1                                                                                                 |                                                                                                                   |                                                                                                                     |
| 2 C 35; XC 32; XC 38 H 1                                                                                           | 1550; 1572                                                                                                      | C 35                                                                                                            | F.1130-C 35 K                                                                                                   | S 35 C                                                                                                            | 35                                                                                                                  |
| XC 38                                                                                                              | 1572                                                                                                            | C36                                                                                                             |                                                                                                                 | S35C                                                                                                              |                                                                                                                     |
| XC 38 H 1 TS                                                                                                       | 1572                                                                                                            | C 36; C 38                                                                                                      |                                                                                                                 | S 35 C                                                                                                            | 35                                                                                                                  |
| XC 45                                                                                                              | 1660                                                                                                            | C45                                                                                                             | F-1140                                                                                                          |                                                                                                                   |                                                                                                                     |
| 2 C 50; XC 48 H 1; XC 50 H1                                                                                        | 1674                                                                                                            | C 50                                                                                                            |                                                                                                                 |                                                                                                                   | 50                                                                                                                  |
| XC 48 H TS                                                                                                         | 1674                                                                                                            | C 53                                                                                                            |                                                                                                                 | S 50 C                                                                                                            | 50                                                                                                                  |
|                                                                                                                    |                                                                                                                 | 16 Mo 5 KG; 16 Mo 5 KW                                                                                          | F.2602- 16 Mo 5                                                                                                 | SB 450 M; SB 480 M                                                                                                |                                                                                                                     |
| A 48 CP; A 48 AP                                                                                                   |                                                                                                                 | Fe 510 KG; Fe 510 KT; Fe 510 KW; Fe 510-2 KG; Fe 510-2KT; Fe 510-2KW; FeE 295                                   | A 47 RC I; RA II                                                                                                | SG 365; SGV 410; SGV 450; SGV 480                                                                                 | 14G2                                                                                                                |



# ISCAR MATERIAL GROUPS


According to VDI 3323 Standard







| Mtl. No. |  |  |  |                                                  |     |
|----------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------|-----|
|          | USA<br>AISI/SAE                                                                   | GERMANY<br>Werkstoff                                                              | DIN                                                                                 | Great Britain<br>BS EN                           |     |
| <b>3</b> | 1043                                                                              | 1.0503                                                                            | C35                                                                                 | 060 A 47; 080 M 46;<br>1449 50 HS, 1449<br>50 CS |     |
| <b>3</b> | 1074                                                                              | 1.0614                                                                            | C 76 D; D 75-2                                                                      |                                                  |     |
| <b>3</b> | 1086                                                                              | 1.0616                                                                            | C 86 D; D 85-2                                                                      |                                                  |     |
| <b>3</b> | 1095                                                                              | 1.0618                                                                            | C 92 D; D 95-2                                                                      |                                                  |     |
| <b>3</b> | 1036; 1330                                                                        | 1.1165                                                                            | 30Mn5                                                                               | 120 M 36;<br>(150 M 28)                          |     |
| <b>3</b> | 1335                                                                              | 1.1167                                                                            | 36Mn5                                                                               | 150 M 36                                         |     |
| <b>3</b> | 1040                                                                              | 1.1186                                                                            | C40E; CK 40                                                                         | 060 A 40; 080 A 40;<br>080 M 40                  |     |
| <b>3</b> | 1045                                                                              | 1.1191                                                                            | C45E; CK 45                                                                         | 080 M 46; 060 A 47                               |     |
| <b>3</b> | 1049                                                                              | 1.1201                                                                            | C45R; Cm 45                                                                         | 080 M 46                                         |     |
| <b>3</b> |                                                                                   | 1.7242                                                                            | 18 CrMo 4                                                                           |                                                  |     |
| <b>3</b> | A 387 Gr. 12 Cl                                                                   | 1.7337                                                                            | 16 CrMo 4 4                                                                         |                                                  |     |
| <b>3</b> |                                                                                   | 1.7362                                                                            | 12 CrMo 19 5                                                                        | 3606-625                                         |     |
| <b>3</b> | A572-60                                                                           |                                                                                   | 17 MnV 6                                                                            | 436055 E                                         |     |
| <b>4</b> | 1055                                                                              | 1.0535                                                                            | C55                                                                                 | 070 M 55                                         |     |
| <b>4</b> | 1060                                                                              | 1.0601                                                                            | C60                                                                                 | 060 A 62; 1449 HS;<br>1449 CS                    | 43D |
| <b>4</b> | 107                                                                               | 1.0603                                                                            | C67                                                                                 | 080 A 67; 1449 70<br>HS                          |     |
| <b>4</b> | 1074; 1075                                                                        | 1.0605                                                                            | C75                                                                                 | 1449 80 HS                                       |     |
| <b>4</b> | 1055                                                                              | 1.1203                                                                            | C55E; CK 55                                                                         | 060 A 57; 070 M 55                               |     |
| <b>4</b> | 1055                                                                              | 1.1209                                                                            | C55R; Cm 55                                                                         | 070 M 55                                         |     |
| <b>4</b> | 1060; 1064                                                                        | 1.1221                                                                            | C60E; CK 60                                                                         | 060 A 62                                         | 43D |
| <b>4</b> | 1070                                                                              | 1.1231                                                                            | Ck 67;<br>(C67E)                                                                    | 060 A 67                                         |     |
| <b>4</b> | 1074; 1075; 1078                                                                  | 1.1248                                                                            | CK 75;<br>(C75E)                                                                    | 060 A 78                                         |     |
| <b>4</b> | 1086                                                                              | 1.1269                                                                            | CK 85<br>(C85E)                                                                     |                                                  |     |

| <br><b>France</b><br><b>AFNOR</b> | <br><b>Sweden</b><br><b>SS</b> | <br><b>Italy</b><br><b>UNI</b> | <br><b>Spain</b><br><b>UNE</b> | <br><b>Japan</b><br><b>JIS</b> | <br><b>Russia</b><br><b>GOST</b> |
|--------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|
| 1 C 45; AF 65 C 45                                                                                                 | 1672; 1650                                                                                                      | C 45; 1 C 45                                                                                                    | F.114                                                                                                           | S 45 C                                                                                                            | 45                                                                                                                  |
| XC 75                                                                                                              |                                                                                                                 |                                                                                                                 |                                                                                                                 |                                                                                                                   |                                                                                                                     |
| XC 80                                                                                                              |                                                                                                                 | C 85                                                                                                            |                                                                                                                 |                                                                                                                   |                                                                                                                     |
| XC 90                                                                                                              |                                                                                                                 |                                                                                                                 |                                                                                                                 |                                                                                                                   |                                                                                                                     |
| 35 M 5                                                                                                             |                                                                                                                 |                                                                                                                 | F.8211-30 Mn 5;<br>f.8311-AM 30 Mn 5                                                                            | SMn 433 H; SCMn 2                                                                                                 | 27ChGSNMDTL<br>30GSL                                                                                                |
| 40 M 5                                                                                                             | 2120                                                                                                            |                                                                                                                 | F. 1203-36 Mn 6; F.<br>8212-36 Mn 5                                                                             | ssmN 438<br>(H); SCMn 3                                                                                           | 35G2; 35GL                                                                                                          |
| 2 C 40; XC 42 H 1                                                                                                  |                                                                                                                 | C 40                                                                                                            |                                                                                                                 | S 40 C                                                                                                            |                                                                                                                     |
| 2 C 45; XC 42 H 1;<br>XC 45; XC 48 H 1                                                                             | 1672                                                                                                            | C 45; C 46                                                                                                      | F.1140-C 45 K;<br>F.1142-C48 K                                                                                  | S 45 C; S 48 C                                                                                                    | 45                                                                                                                  |
| 3 C 45; XC 42 H 1;<br>XC 48 H 1                                                                                    | 1660                                                                                                            | C 45                                                                                                            | F.1145-C 45K-1;<br>F.1147C 48 K-1                                                                               | S 50 C                                                                                                            |                                                                                                                     |
|                                                                                                                    |                                                                                                                 | A 18 CrMo 4 5 KW                                                                                                |                                                                                                                 |                                                                                                                   | 15ChM                                                                                                               |
| Z 10 CD 5.05                                                                                                       |                                                                                                                 | 16 CrMo 20 5                                                                                                    |                                                                                                                 |                                                                                                                   |                                                                                                                     |
| NFA 35-501 E 36                                                                                                    | 2142                                                                                                            |                                                                                                                 |                                                                                                                 |                                                                                                                   |                                                                                                                     |
| 1 C 55; AF 70 C 55                                                                                                 | 1655                                                                                                            | C 55; 1 C 55                                                                                                    |                                                                                                                 | S 55 C                                                                                                            | 55                                                                                                                  |
| 1 C 60; AF 70 C 55                                                                                                 |                                                                                                                 | C 60; 1 C 60                                                                                                    |                                                                                                                 | S 58 C                                                                                                            | 60(G)                                                                                                               |
| XC 65                                                                                                              |                                                                                                                 | C 67                                                                                                            |                                                                                                                 |                                                                                                                   |                                                                                                                     |
|                                                                                                                    |                                                                                                                 | C 75                                                                                                            |                                                                                                                 |                                                                                                                   | 75                                                                                                                  |
| 2 C 55; XC 55 H 1                                                                                                  | 1655                                                                                                            | C 55                                                                                                            | F.1150-C 55 K                                                                                                   | S 55 C                                                                                                            | 55                                                                                                                  |
| 3 C 55; XC 55 H 1                                                                                                  |                                                                                                                 | C 55                                                                                                            | F.1155-C 55K-1                                                                                                  |                                                                                                                   |                                                                                                                     |
| 2 C 60; XC 60 H 1                                                                                                  | 1665; 1678                                                                                                      | C 60                                                                                                            |                                                                                                                 | S 58 C                                                                                                            | 60; 60G; 60GA                                                                                                       |
| XC 68                                                                                                              | 1770                                                                                                            | C70                                                                                                             |                                                                                                                 |                                                                                                                   | 65GA; 68GA; 70                                                                                                      |
| XC 75                                                                                                              | 1774                                                                                                            | C 75                                                                                                            |                                                                                                                 |                                                                                                                   | 75(A)                                                                                                               |
| XC 90                                                                                                              |                                                                                                                 | C 90                                                                                                            |                                                                                                                 |                                                                                                                   | 85(A)                                                                                                               |

# ISCAR MATERIAL GROUPS

According to VDI 3323 Standard

| Mtl. No. |  |  |  |                                               |
|----------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-----------------------------------------------|
|          | USA<br>AISI/SAE                                                                   | Werkstoff                                                                         | DIN                                                                                 | Great Britain<br>BS EN                        |
| <b>4</b> | 1095                                                                              | 1.1274                                                                            | Ck 101<br>(C101E)                                                                   |                                               |
| <b>4</b> | W 112                                                                             | 1.1663                                                                            | C 125 W                                                                             |                                               |
| <b>4</b> |                                                                                   |                                                                                   |                                                                                     |                                               |
| <b>5</b> |                                                                                   | 1.0070                                                                            | E360<br>(Fe 690-2); St 70-2                                                         | Fe 690-2 FN                                   |
| <b>5</b> |                                                                                   | 1.7238                                                                            | 49 CrMo 4                                                                           |                                               |
| <b>5</b> |                                                                                   | 1.7701                                                                            | 51 CrMoV 4                                                                          |                                               |
| <b>6</b> | A 284 Gr.D; A 573<br>Gr.58; A 570 Gr 36;<br>A 570 Gr C; A 611<br>Gr. C            | 1.0116                                                                            | S235J2G3<br>(Fe 360 D 1); St 37-3                                                   | Fe 360 D1 FF; 1449<br>37/23 CR; 4360-<br>40 D |
| <b>6</b> | 5120                                                                              | 1.0841                                                                            | St 52-3                                                                             | 150 M 19                                      |
| <b>6</b> | 9255                                                                              | 1.0904                                                                            | 55 Si 7                                                                             | 250A53 45                                     |
| <b>6</b> | 9254                                                                              | 1.0904                                                                            | 55 Si 7                                                                             | 250 A 53                                      |
| <b>6</b> | 9262                                                                              | 1.0961                                                                            | 60SiCr7                                                                             |                                               |
| <b>6</b> | L3                                                                                | 1.2067                                                                            | 100Cr6                                                                              | BL3                                           |
| <b>6</b> | L1                                                                                | 1.2108                                                                            | 90 CrSi 5                                                                           |                                               |
| <b>6</b> | L2                                                                                | 1.2210                                                                            | 115CrV3                                                                             |                                               |
| <b>6</b> |                                                                                   | 1.2241                                                                            | 51CrV4                                                                              |                                               |
| <b>6</b> |                                                                                   | 1.2311                                                                            | 40 CrMnMo 7                                                                         |                                               |
| <b>6</b> | 4135                                                                              | 1.2330                                                                            | 35 CrMo 4                                                                           | 708 A 37                                      |
| <b>6</b> |                                                                                   | 1.2419                                                                            | 105WCr6                                                                             | 105WC 13                                      |
| <b>6</b> | 0 1                                                                               | 1.2510                                                                            | 100 MnCrW 4                                                                         | BO1                                           |
| <b>6</b> | S1                                                                                | 1.2542                                                                            | 45 WCrV7                                                                            | BS1                                           |
| <b>6</b> | S1                                                                                | 1.2550                                                                            | 60WCrV7                                                                             |                                               |
| <b>6</b> | L6                                                                                | 1.2713                                                                            | 55NiCrMoV6                                                                          |                                               |
| <b>6</b> | L 6                                                                               | 1.2721                                                                            | 50NiCr13                                                                            |                                               |
| <b>6</b> | O2                                                                                | 1.2842                                                                            | 90MnCrV8                                                                            | BO2                                           |
| <b>6</b> | E 50100                                                                           | 1.3501                                                                            | 100 Cr 2                                                                            |                                               |
| <b>6</b> | 52100                                                                             | 1.3505                                                                            | 100Cr6                                                                              | 2 S 135; 535 A 99 31                          |
| <b>6</b> |                                                                                   | 1.5024                                                                            | 46Si7                                                                               |                                               |
| <b>6</b> | 9255                                                                              | 1.5025                                                                            | 51Si7                                                                               |                                               |
| <b>6</b> | 9255                                                                              | 1.5026                                                                            | 55Si7                                                                               | 251 a 58                                      |







| <br><b>France</b><br>AFNOR | <br><b>Sweden</b><br>SS | <br><b>Italy</b><br>UNI | <br><b>Spain</b><br>UNE | <br><b>Japan</b><br>JIS | <br><b>Russia</b><br>GOST |
|-------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|
| XC 100                                                                                                      | 1870                                                                                                     | C 100                                                                                                    | F-5117                                                                                                   | SUP 4                                                                                                      |                                                                                                              |
| Y2 120                                                                                                      |                                                                                                          |                                                                                                          |                                                                                                          |                                                                                                            |                                                                                                              |
|                                                                                                             | 2223                                                                                                     |                                                                                                          |                                                                                                          |                                                                                                            |                                                                                                              |
| A 70-2                                                                                                      | 1655                                                                                                     | Fe 70-2; Fe 690                                                                                          | A 690-2; Fe 690-2<br>FN                                                                                  |                                                                                                            |                                                                                                              |
|                                                                                                             |                                                                                                          | 51 CrMoV 4                                                                                               |                                                                                                          |                                                                                                            |                                                                                                              |
| E 24-3; E 24-4                                                                                              | 1312; 1313                                                                                               | Fe 360 D1 FF; Fe<br>360 C FN; Fe 360 D<br>FF; Fe 37-2                                                    | AE 235 D; Fe 360<br>D1 FF                                                                                |                                                                                                            | St3kp; St3ps; St3sp;<br>16D                                                                                  |
| 20 MC 5                                                                                                     | 2172                                                                                                     | Fe 52                                                                                                    | F-431                                                                                                    |                                                                                                            |                                                                                                              |
| 55S7                                                                                                        | 2085                                                                                                     | 55Si8                                                                                                    | 56Si7                                                                                                    |                                                                                                            |                                                                                                              |
| 55 S 7                                                                                                      | 2090                                                                                                     |                                                                                                          |                                                                                                          |                                                                                                            |                                                                                                              |
| 60SC6                                                                                                       |                                                                                                          | 60SiCr8                                                                                                  | 60SiCr8                                                                                                  |                                                                                                            |                                                                                                              |
| Y100C6                                                                                                      |                                                                                                          |                                                                                                          | 100Cr6                                                                                                   |                                                                                                            |                                                                                                              |
|                                                                                                             | 2092                                                                                                     | 105WCR 5                                                                                                 |                                                                                                          |                                                                                                            |                                                                                                              |
| 100C3                                                                                                       |                                                                                                          | 107CrV3KU                                                                                                |                                                                                                          |                                                                                                            |                                                                                                              |
|                                                                                                             |                                                                                                          | 35 cRmO 8 KU                                                                                             |                                                                                                          |                                                                                                            |                                                                                                              |
| 34 CD 4                                                                                                     | 2234                                                                                                     | 35CrMo4                                                                                                  | 34CrMo4                                                                                                  | SCM435TK                                                                                                   |                                                                                                              |
| 105WC13                                                                                                     | 2140                                                                                                     | 10WCr6                                                                                                   | 105WCr5                                                                                                  |                                                                                                            | ChWG                                                                                                         |
| 8 MO 8                                                                                                      | 2140                                                                                                     | 10WCr6                                                                                                   | 105WCr5                                                                                                  | SKS31                                                                                                      |                                                                                                              |
|                                                                                                             | 2710                                                                                                     | 45 WCrV8 KU                                                                                              | 45WCrSi8                                                                                                 |                                                                                                            | 5ChW25F                                                                                                      |
| 55WC20                                                                                                      | 2710                                                                                                     | 58WCr9KU                                                                                                 |                                                                                                          |                                                                                                            |                                                                                                              |
| 55NCDV7                                                                                                     |                                                                                                          |                                                                                                          | F.520.S                                                                                                  | SKT4                                                                                                       | 5ChNM                                                                                                        |
| 55 NCV 6                                                                                                    | 2550                                                                                                     |                                                                                                          | f-528                                                                                                    |                                                                                                            |                                                                                                              |
| 90 MV8                                                                                                      |                                                                                                          |                                                                                                          |                                                                                                          |                                                                                                            |                                                                                                              |
| 100 C 6                                                                                                     | 2258                                                                                                     | 100Cr6                                                                                                   | F.1310 - 100 Cr 6                                                                                        | SUJ2                                                                                                       | SchCh 15                                                                                                     |
| 45 S 7; Y 46 7; 46<br>SI 7                                                                                  |                                                                                                          |                                                                                                          | F. 1451 - 46 SI 7                                                                                        |                                                                                                            |                                                                                                              |
| 51 S 7; 51 Si 7                                                                                             | 2090                                                                                                     | 48 Si 7; 50 Si 7                                                                                         | F.1450-50 Si 7                                                                                           |                                                                                                            |                                                                                                              |
| 55 S 7                                                                                                      | 2085; 2090                                                                                               | 55 Si 7                                                                                                  | F.1440 - 56 Si 7                                                                                         |                                                                                                            | 55S2                                                                                                         |

# ISCAR MATERIAL GROUPS

According to VDI 3323 Standard



| Mtl. No. |  |  |  |                               |
|----------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------|
|          | USA<br>AISI/SAE                                                                   | GERMANY<br>Werkstoff                                                              | DIN                                                                                 | Great Britain<br>BS EN        |
| <b>6</b> | 9260                                                                              | 1.5027                                                                            | 60Si7                                                                               | 251 A 60; 251 H 60            |
| <b>6</b> | 9260 H                                                                            | 1.5028                                                                            | 65Si7                                                                               |                               |
| <b>6</b> |                                                                                   | 1.5120                                                                            | 38 MnSi 4                                                                           |                               |
| <b>6</b> | A 204 Gr.A; 4017                                                                  | 1.5415                                                                            | 16Mo3; 15 Mo 3                                                                      | 1503-243 B                    |
| <b>6</b> | 4419                                                                              | 1.5419                                                                            | 20Mo4                                                                               | 1503-243-430                  |
| <b>6</b> | A 350-LF 5                                                                        | 1.5622                                                                            | 14Ni6                                                                               |                               |
| <b>6</b> | 3415                                                                              | 1.5732                                                                            | 1 NiCr10                                                                            |                               |
| <b>6</b> | 3310; 3314                                                                        | 1.5752                                                                            | 14NiCr14                                                                            | 655M13 36A                    |
| <b>6</b> |                                                                                   | 1.6587                                                                            | 17CrNiMo6                                                                           | 820A16                        |
| <b>6</b> |                                                                                   | 1.6657                                                                            | 14NiCrMo134                                                                         |                               |
| <b>6</b> | 5015                                                                              | 1.7015                                                                            | 15 Cr 3                                                                             | 523 M 15                      |
| <b>6</b> | 5132                                                                              | 1.7033                                                                            | 34Cr4                                                                               | 530A32 18B                    |
| <b>6</b> | 5140                                                                              | 1.7035                                                                            | 41C r4                                                                              | 530M40 18                     |
| <b>6</b> | 5140                                                                              | 1.7045                                                                            | 42Cr41                                                                              | 530 A 40                      |
| <b>6</b> | 5115                                                                              | 1.7131                                                                            | 16MnCr5                                                                             | 527 M 17                      |
| <b>6</b> |                                                                                   | 1.7139                                                                            | 16MnCr5                                                                             |                               |
| <b>6</b> | 5155                                                                              | 1.7176                                                                            | 55Cr3                                                                               | 527 A 60 48                   |
| <b>6</b> | 4135; 4137                                                                        | 1.7220                                                                            | 34CrMo4                                                                             | 708 Aa 37                     |
| <b>6</b> | 4142                                                                              | 1.7223                                                                            | 41CrMo4                                                                             |                               |
| <b>6</b> | 4140                                                                              | 1.7225                                                                            | 42CrMo4                                                                             | 708 M 0                       |
| <b>6</b> |                                                                                   | 1.7228                                                                            | 55NiCrMoV6G                                                                         | 823M30 33                     |
| <b>6</b> |                                                                                   | 1.7262                                                                            | 15CrMo5                                                                             |                               |
| <b>6</b> |                                                                                   | 1.7321                                                                            | 20 mOcr 4                                                                           |                               |
| <b>6</b> | ASTM A182 F12                                                                     | 1.7335                                                                            | 13CrMo4 4                                                                           | 1501-620Gr27                  |
| <b>6</b> | A 182-F11; A 182-F12                                                              | 1.7335                                                                            | 13 CrMo 4 4                                                                         | 1 501 620 Gr. 27              |
| <b>6</b> | ASTM A 182 F22                                                                    | 1.7380                                                                            | 10CrMo9 10                                                                          | 1501-622gR31;<br>1501-622gR45 |
| <b>6</b> | A182 F22                                                                          | 1.7380                                                                            | 10 CrMo 9 10                                                                        | 1501-622                      |
| <b>6</b> |                                                                                   | 1.7715                                                                            | 14MoV6 3                                                                            | 1503-660-440                  |









| <br>France<br>AFNOR | <br>Sweden<br>SS | <br>Italy<br>UNI | <br>Spain<br>UNE | <br>Japan<br>JIS | <br>Russia<br>GOST |
|------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
| 60 S 7                                                                                               |                                                                                                   | 60 Si 7                                                                                           | F. 1441 - 60 Si 7                                                                                 |                                                                                                     | 60S2                                                                                                  |
| 60 S 7                                                                                               |                                                                                                   |                                                                                                   |                                                                                                   | 50 P 7; SUP 6                                                                                       |                                                                                                       |
| 15 D 3                                                                                               | 2912                                                                                              | 16Mo3 KG;<br>16Mo3KW                                                                              | F. 2601 - 16 Mo 3                                                                                 |                                                                                                     |                                                                                                       |
|                                                                                                      | 2512                                                                                              | G 20 Mo 5; G 22<br>Mo5                                                                            |                                                                                                   | SCPH 11                                                                                             |                                                                                                       |
| 16N6                                                                                                 |                                                                                                   | 14 Ni 6 KG; 14 Ni<br>6 KT                                                                         | F.2641 - 15 Ni 6                                                                                  |                                                                                                     |                                                                                                       |
| 14 NC 11                                                                                             |                                                                                                   | 16NiCr11                                                                                          | 15NiCr11                                                                                          | SNC415(H)                                                                                           |                                                                                                       |
| 12NC15                                                                                               |                                                                                                   |                                                                                                   |                                                                                                   | SNC815(H)                                                                                           |                                                                                                       |
| 18NCD6                                                                                               |                                                                                                   |                                                                                                   | 14NiCrMo13                                                                                        |                                                                                                     |                                                                                                       |
|                                                                                                      |                                                                                                   |                                                                                                   | 14NiCrMo131                                                                                       |                                                                                                     |                                                                                                       |
| 12 C 3                                                                                               |                                                                                                   |                                                                                                   |                                                                                                   | SCr415(H)                                                                                           | 15Ch                                                                                                  |
| 32C4                                                                                                 |                                                                                                   | 34Cr4(KB)                                                                                         | 35Cr4                                                                                             | SCr430(H)                                                                                           | 35Ch                                                                                                  |
| 42C4                                                                                                 |                                                                                                   | 41Cr4                                                                                             | 42Cr4                                                                                             | SCr440(H)                                                                                           |                                                                                                       |
| 42 C 4 TS                                                                                            | 2245                                                                                              | 41Cr4                                                                                             | 42Cr4                                                                                             | SCr440                                                                                              |                                                                                                       |
| 16 MC 5                                                                                              | 2511                                                                                              | 16MnCr5                                                                                           | 16MnCr5                                                                                           |                                                                                                     |                                                                                                       |
|                                                                                                      | 2127                                                                                              |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
| 55 C 3                                                                                               | 2253                                                                                              |                                                                                                   |                                                                                                   | SUP9(A)                                                                                             | 50ChGA                                                                                                |
| 35 CD 4                                                                                              | 2234                                                                                              |                                                                                                   |                                                                                                   |                                                                                                     | 35ChM                                                                                                 |
|                                                                                                      |                                                                                                   | 41CrMo4                                                                                           | 42CrMo4                                                                                           | SNB 22-1                                                                                            | 40ChFA                                                                                                |
| 42 CD 4                                                                                              | 2244                                                                                              |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
|                                                                                                      | 2512                                                                                              | 653M31                                                                                            |                                                                                                   |                                                                                                     |                                                                                                       |
| 12 CD 4                                                                                              | 2216                                                                                              |                                                                                                   | 12CrMo4                                                                                           |                                                                                                     |                                                                                                       |
|                                                                                                      | 2625                                                                                              |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
|                                                                                                      |                                                                                                   | 14CrMo4 5                                                                                         | 14CrMo45                                                                                          |                                                                                                     |                                                                                                       |
| 15 CD 4.5                                                                                            | 2216                                                                                              |                                                                                                   | 12CrMo4                                                                                           | SCM415(H)                                                                                           | 12ChM; 15ChM                                                                                          |
|                                                                                                      |                                                                                                   |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
| 12 CD 9.10                                                                                           | 2218                                                                                              | 12CrMo9,<br>12CrMo10                                                                              | TU.H                                                                                              |                                                                                                     |                                                                                                       |
|                                                                                                      |                                                                                                   |                                                                                                   | 13MoCrV6                                                                                          |                                                                                                     |                                                                                                       |

# ISCAR MATERIAL GROUPS




According to VDI 3323 Standard







| Mtl. No.  |  |  |  |                                              |
|-----------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|----------------------------------------------|
|           | USA<br>AISI/SAE                                                                   | GERMANY<br>Werkstoff                                                              | DIN                                                                                 | Great Britain<br>BS EN                       |
| <b>6</b>  | A355A                                                                             | 1.8509                                                                            | 41CrAlMo 7                                                                          | 905 M 39 41B                                 |
| <b>7</b>  | A570.36                                                                           | 1.0038                                                                            | S235JRG2<br>(Fe 360 B); RSt 37-2                                                    | Fe 360 B FU; 1449<br>27/23 CR; 4360-<br>40 B |
| <b>7</b>  | 3135                                                                              | 1.5710                                                                            | 36NiCr6                                                                             | 640A35 111A                                  |
| <b>7</b>  |                                                                                   | 1.5755                                                                            | 31 NiCr 14                                                                          | 653 M 31                                     |
| <b>7</b>  | 8620                                                                              | 1.6523                                                                            | 2 NiCrMo2                                                                           | 805M20 362                                   |
| <b>7</b>  | 8740                                                                              | 1.6546                                                                            | 40 NiCrMo 22                                                                        | 311-Tyre 7                                   |
| <b>7</b>  | 4340                                                                              | 1.6565                                                                            | 40NiCrMo6                                                                           | 817 M 40 24                                  |
| <b>7</b>  | 4130                                                                              | 1.7218                                                                            | 25CrMo4                                                                             | CDS 110                                      |
| <b>7</b>  |                                                                                   | 1.7733                                                                            | 24 CrMoV 5 5                                                                        |                                              |
| <b>7</b>  |                                                                                   | 1.7755                                                                            | GS-45 CrMOV 10 4                                                                    |                                              |
| <b>7</b>  |                                                                                   | 1.8070                                                                            | 21 CrMoV 5 11                                                                       |                                              |
| <b>8</b>  | C 45 W                                                                            | 1.173                                                                             | C 45 W3                                                                             |                                              |
| <b>8</b>  | 4142                                                                              | 1.2332                                                                            | 47 CrMo 4                                                                           | 708 M 40 19A                                 |
| <b>8</b>  | A128<br>(A)                                                                       | 1.3401                                                                            | G-X120 Mn 12                                                                        |                                              |
| <b>8</b>  | 3435                                                                              | 1.5736                                                                            | 36 NiCr 10                                                                          |                                              |
| <b>8</b>  | 9840                                                                              | 1.6511                                                                            | 36CrNiMo4                                                                           | 816M40 110                                   |
| <b>8</b>  |                                                                                   | 1.7361                                                                            | 32 CeMo12                                                                           | 722 M 24 40B                                 |
| <b>8</b>  | 6150                                                                              | 1.8159                                                                            | 50 CrV 4                                                                            | 735 A 50 47                                  |
| <b>8</b>  |                                                                                   | 1.8161                                                                            | 58 CrV 4                                                                            |                                              |
| <b>8</b>  |                                                                                   | 1.8515                                                                            | 32 CrMo 12                                                                          | 722 M 24 40B                                 |
| <b>8</b>  |                                                                                   | 1.8523                                                                            | 39CrMoV13 9                                                                         | 897M39 40C                                   |
| <b>9</b>  |                                                                                   | 1.4882                                                                            | X 50 CrMnNiNbN 21 9                                                                 |                                              |
| <b>9</b>  |                                                                                   | 1.5864                                                                            | 35 niCr 18                                                                          |                                              |
| <b>9</b>  |                                                                                   |                                                                                   | 31 NiCrMo 13 4                                                                      | 830 m 31                                     |
| <b>10</b> | A 619                                                                             | 1.0347                                                                            | DC03; RRRSt; RRRSt 13                                                               | 1449 3 CR; 1449<br>2 CR                      |
| <b>10</b> | M 1015; M 1016; M<br>1017                                                         | 1.0401                                                                            | C15                                                                                 | 080 M 15; 080 M 15;<br>1449 17 CS            |
| <b>10</b> |                                                                                   | 1.0723                                                                            | 15 S22; 15 S 20                                                                     | 210 A 15; 210 M 15                           |

| <br><b>France</b><br><b>AFNOR</b> | <br><b>Sweden</b><br><b>SS</b> | <br><b>Italy</b><br><b>UNI</b> | <br><b>Spain</b><br><b>UNE</b> | <br><b>Japan</b><br><b>JIS</b> | <br><b>Russia</b><br><b>GOST</b> |
|--------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|
| 40 CAD 6.12                                                                                                        | 2940                                                                                                            | 41CrAlMo7                                                                                                       | 41CrAlMo7                                                                                                       |                                                                                                                   |                                                                                                                     |
| E 24-2NE                                                                                                           | 1312                                                                                                            | Fe 360 B FN                                                                                                     | AE 235 B FN; AE 235 B FU; Fe 360 B FN; Fe 360 B FU                                                              |                                                                                                                   | St3ps; St3sp                                                                                                        |
| 35NC6                                                                                                              |                                                                                                                 |                                                                                                                 |                                                                                                                 | SNC236                                                                                                            |                                                                                                                     |
| 18 NC 13                                                                                                           |                                                                                                                 |                                                                                                                 |                                                                                                                 |                                                                                                                   |                                                                                                                     |
| 20 NCD 2                                                                                                           | 2506                                                                                                            | 20NiCrMo2                                                                                                       | 20NiCrMo2                                                                                                       | SNCM220(H)                                                                                                        | 20ChGNM                                                                                                             |
|                                                                                                                    |                                                                                                                 | 40NiCrMo2(KB)                                                                                                   | 40NiCrMo2                                                                                                       | SNCM240                                                                                                           | 38ChGNM                                                                                                             |
| 35 NCD 6                                                                                                           | 2541                                                                                                            | 35NiCrMo6(KB)                                                                                                   |                                                                                                                 | SNCM 447                                                                                                          | 38Ch2N2MA                                                                                                           |
| 25 CD 4                                                                                                            | 2225                                                                                                            | 25CrMo4(KB)                                                                                                     | 55Cr3                                                                                                           | SCM420; SCM430                                                                                                    | 20ChM; 30ChM                                                                                                        |
| 20 CDV 6                                                                                                           |                                                                                                                 | 21 CrMoV 5 11                                                                                                   |                                                                                                                 |                                                                                                                   |                                                                                                                     |
|                                                                                                                    |                                                                                                                 | 35 NiCr 9                                                                                                       |                                                                                                                 |                                                                                                                   |                                                                                                                     |
| XC 48                                                                                                              |                                                                                                                 |                                                                                                                 |                                                                                                                 |                                                                                                                   |                                                                                                                     |
| 42 CD 4                                                                                                            | 2244                                                                                                            | 42CrMo4                                                                                                         | 42CrMo4                                                                                                         | SCM (440)                                                                                                         |                                                                                                                     |
| Z 120 M 12                                                                                                         | 2183                                                                                                            | GX120Mn12                                                                                                       | F. 8251-AM-X120Mn12                                                                                             | SCMnH 1; SCMn H 11                                                                                                | 110G13L                                                                                                             |
| 30 NC 11                                                                                                           |                                                                                                                 |                                                                                                                 |                                                                                                                 |                                                                                                                   |                                                                                                                     |
| 40NCD3                                                                                                             |                                                                                                                 | 36NiCrMo4(KB)                                                                                                   | 35NiCrMo4                                                                                                       | SUP10                                                                                                             | 40ChN2MA                                                                                                            |
| 30 CD 12                                                                                                           | 2240                                                                                                            | 30CrMo12                                                                                                        | F.124.A                                                                                                         |                                                                                                                   |                                                                                                                     |
| 50CrV4                                                                                                             | 2230                                                                                                            | 50CrV4                                                                                                          | 51CrV4                                                                                                          |                                                                                                                   | 50ChGFA                                                                                                             |
|                                                                                                                    |                                                                                                                 |                                                                                                                 |                                                                                                                 |                                                                                                                   |                                                                                                                     |
| 30 CD 12                                                                                                           | 2240                                                                                                            | 32CrMo12                                                                                                        | F.124.A                                                                                                         |                                                                                                                   |                                                                                                                     |
|                                                                                                                    |                                                                                                                 | 36CrMoV12                                                                                                       |                                                                                                                 |                                                                                                                   |                                                                                                                     |
| Z 50 CMNNb 21.09                                                                                                   |                                                                                                                 |                                                                                                                 |                                                                                                                 |                                                                                                                   |                                                                                                                     |
|                                                                                                                    | 2534                                                                                                            |                                                                                                                 | f-1270                                                                                                          |                                                                                                                   |                                                                                                                     |
| E                                                                                                                  |                                                                                                                 | Fep 02                                                                                                          | AP 02                                                                                                           |                                                                                                                   | 08JU                                                                                                                |
| AF 37 C12; XC 18                                                                                                   | 1350                                                                                                            | C15; C16; 1 C 15                                                                                                | F.111                                                                                                           | S 15 C                                                                                                            |                                                                                                                     |
|                                                                                                                    | 1922                                                                                                            |                                                                                                                 | F.210.F                                                                                                         | SUM 32                                                                                                            |                                                                                                                     |

# ISCAR MATERIAL GROUPS




According to VDI 3323 Standard

| Mtl. No.  |  |  |  |                    |
|-----------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------|
|           | USA<br>AISI/SAE                                                                   | GERMANY<br>Werkstoff      DIN                                                     | Great Britain<br>BS      EN                                                         |                    |
| <b>10</b> | D 3                                                                               | 1.2080                                                                            | X 210 Cr 12                                                                         | BD 3               |
| <b>10</b> | 420                                                                               | 1.2083                                                                            | X 42 Cr 13                                                                          |                    |
| <b>10</b> |                                                                                   | 1.2085                                                                            | X 33 CrS 16                                                                         |                    |
| <b>10</b> |                                                                                   | 1.2162                                                                            | 21 MnCr 5                                                                           |                    |
| <b>10</b> | L2                                                                                | 1.2210                                                                            | 115 Cr V3                                                                           |                    |
| <b>10</b> |                                                                                   | 1.2311                                                                            | 40 CrMnMo7                                                                          |                    |
| <b>10</b> | P20+S                                                                             | 1.2312                                                                            | 40CrMnMoS 8.6                                                                       |                    |
| <b>10</b> |                                                                                   | 1.2316                                                                            | X36CrMo17                                                                           | X38CrMo16          |
| <b>10</b> | H 11                                                                              | 1.2343                                                                            | x 38 CrMoV 5 1                                                                      | BH 11              |
| <b>10</b> |                                                                                   | 1.234                                                                             | X 38 CrMoV 5 1                                                                      |                    |
| <b>10</b> | H 13                                                                              | 1.2344                                                                            | X 40 CrMoV 5 1                                                                      | BH 13              |
| <b>10</b> | A 2                                                                               | 1.2363                                                                            | X100 CrMoV 5 1                                                                      | BA 2               |
| <b>10</b> |                                                                                   | 1.236                                                                             | X 100 CrMo V5-1                                                                     |                    |
| <b>10</b> | D 2                                                                               | 1.2379                                                                            | X 155 CrVMo 12 1                                                                    | BD2                |
| <b>10</b> |                                                                                   | 1.238                                                                             | X 155 CrVMo 12 1                                                                    |                    |
| <b>10</b> | HNV3                                                                              | 1.2379                                                                            | X210Cr12G                                                                           | BD2                |
| <b>10</b> | D 4<br>(D 6)                                                                      | 1.2436                                                                            | X 210 CrW 12                                                                        | BD6                |
| <b>10</b> |                                                                                   | 1.244                                                                             | X 210 CrW 12                                                                        |                    |
| <b>10</b> | O1                                                                                | 1.251                                                                             | 100 MnCrW 4                                                                         | B0 1               |
| <b>10</b> | H 21                                                                              | 1.2581                                                                            | X 30 WCrV 9 3                                                                       | BH 21              |
| <b>10</b> |                                                                                   | 1.2601                                                                            | X 165 CrMoV 12                                                                      |                    |
| <b>10</b> | H 12                                                                              | 1.2606                                                                            | X 37 CrMoW 5 1                                                                      | BH 12              |
| <b>10</b> |                                                                                   | 1.277                                                                             | X 45 NiCrMo 4                                                                       |                    |
| <b>10</b> | O2                                                                                | 1.284                                                                             | 90 MnCrV 8                                                                          | B0 2               |
| <b>10</b> | D3                                                                                | 1.3343                                                                            | S 6-5-2                                                                             | BM2                |
| <b>10</b> | ASTM A353                                                                         | 1.5662                                                                            | X8Ni9                                                                               | 1501-509; 1501-510 |
| <b>10</b> | ASM A353                                                                          | 1.5662                                                                            | X8Ni9                                                                               | 502-650            |
| <b>10</b> | 2517                                                                              | 1.568                                                                             | 12Ni19                                                                              | 12Ni19             |
| <b>10</b> | 2515                                                                              | 1.5680                                                                            | 12 Ni 19                                                                            |                    |
| <b>10</b> |                                                                                   | 1.713                                                                             | 16 MnCr 5                                                                           |                    |
| <b>10</b> |                                                                                   | 1.276                                                                             | X 19 NiCrMo 4                                                                       |                    |
| <b>11</b> |                                                                                   | 1.3202                                                                            | S 12-1-4-5                                                                          | BT 15              |







| <br><b>France</b><br><b>AFNOR</b> | <br><b>Sweden</b><br><b>SS</b> | <br><b>Italy</b><br><b>UNI</b> | <br><b>Spain</b><br><b>UNE</b> | <br><b>Japan</b><br><b>JIS</b> | <br><b>Russia</b><br><b>GOST</b> |
|--------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|
| Z 200 C 12                                                                                                         |                                                                                                                 |                                                                                                                 |                                                                                                                 |                                                                                                                   |                                                                                                                     |
| Z40 C14                                                                                                            | 2314                                                                                                            |                                                                                                                 |                                                                                                                 | SUS 420 J 2                                                                                                       |                                                                                                                     |
| Z35V CD 17.S                                                                                                       |                                                                                                                 |                                                                                                                 |                                                                                                                 |                                                                                                                   |                                                                                                                     |
| 20 MC 5                                                                                                            |                                                                                                                 |                                                                                                                 |                                                                                                                 |                                                                                                                   |                                                                                                                     |
| 100 C3                                                                                                             |                                                                                                                 | 107 CrV3 KU                                                                                                     | F.520 L                                                                                                         |                                                                                                                   |                                                                                                                     |
| 40 CMD 8                                                                                                           |                                                                                                                 | 35 cRmO 8 KU                                                                                                    |                                                                                                                 |                                                                                                                   |                                                                                                                     |
| 40CMD8S                                                                                                            |                                                                                                                 |                                                                                                                 |                                                                                                                 |                                                                                                                   |                                                                                                                     |
| Z 38 CDV 5                                                                                                         |                                                                                                                 | X 37 CrMoV 5 1 KU                                                                                               |                                                                                                                 |                                                                                                                   | 4Ch5MFS                                                                                                             |
| Z 38 CDV 5                                                                                                         |                                                                                                                 | X 37 CrMoV 51 KU                                                                                                |                                                                                                                 |                                                                                                                   |                                                                                                                     |
| Z 40 CDV 5                                                                                                         | 2242                                                                                                            | X40CrMoV511KU                                                                                                   | F-5318                                                                                                          | SKD61                                                                                                             | 4Ch5MF1S                                                                                                            |
| Z 100 CDV 5                                                                                                        | 2260                                                                                                            | X100CrMoV51KU                                                                                                   | F-5227                                                                                                          | SKD12                                                                                                             |                                                                                                                     |
|                                                                                                                    |                                                                                                                 |                                                                                                                 |                                                                                                                 |                                                                                                                   |                                                                                                                     |
| Z 160 CDV 12                                                                                                       | 2310                                                                                                            | X165CrMoW12KU                                                                                                   | X160CrMoW12KU                                                                                                   | SKD11                                                                                                             |                                                                                                                     |
| Z 160 CDV 12                                                                                                       |                                                                                                                 | X 155 CrVMo 12<br>1 KU                                                                                          |                                                                                                                 |                                                                                                                   |                                                                                                                     |
| Z160CDV12                                                                                                          | 2736                                                                                                            |                                                                                                                 |                                                                                                                 |                                                                                                                   |                                                                                                                     |
| Z 200 CD 12                                                                                                        | 2312                                                                                                            | X215CrW 12 1 KU                                                                                                 | F-5213                                                                                                          |                                                                                                                   |                                                                                                                     |
|                                                                                                                    |                                                                                                                 |                                                                                                                 |                                                                                                                 |                                                                                                                   |                                                                                                                     |
| 90 MnWRv5                                                                                                          |                                                                                                                 | 95MnWCr 5 KU                                                                                                    | 95 MnCrW 5                                                                                                      |                                                                                                                   |                                                                                                                     |
| Z 30 WCV 9                                                                                                         |                                                                                                                 | X30WCrV 9 3 KU                                                                                                  | F-526                                                                                                           | SKD5                                                                                                              | 3Ch2W8F                                                                                                             |
|                                                                                                                    | 2310                                                                                                            |                                                                                                                 |                                                                                                                 |                                                                                                                   |                                                                                                                     |
| Z 35 CWDV 5                                                                                                        |                                                                                                                 | X 35 CrMoW 05 KU                                                                                                | F.537                                                                                                           |                                                                                                                   | 5ChNM                                                                                                               |
| 45 NCD 16                                                                                                          |                                                                                                                 | 40 NiCrMoV 8 KU                                                                                                 |                                                                                                                 |                                                                                                                   |                                                                                                                     |
| 90 MV 8                                                                                                            |                                                                                                                 | 90 MnVCr 8 KU                                                                                                   |                                                                                                                 |                                                                                                                   |                                                                                                                     |
| Z200C12                                                                                                            | 2715                                                                                                            | X210Cr13KU                                                                                                      | X210Cr12                                                                                                        | SUH3                                                                                                              | R6M5                                                                                                                |
|                                                                                                                    |                                                                                                                 | 14 Ni 6 KG; 14 Ni<br>6 KT                                                                                       | XBNiO9                                                                                                          |                                                                                                                   |                                                                                                                     |
| 9 Ni                                                                                                               |                                                                                                                 | X10Ni9                                                                                                          | F-2645                                                                                                          | SL9N60(53)                                                                                                        |                                                                                                                     |
| Z18N5                                                                                                              |                                                                                                                 |                                                                                                                 |                                                                                                                 |                                                                                                                   |                                                                                                                     |
| Z 18 N 5                                                                                                           |                                                                                                                 |                                                                                                                 |                                                                                                                 |                                                                                                                   |                                                                                                                     |
| 16 MC 5                                                                                                            |                                                                                                                 |                                                                                                                 |                                                                                                                 |                                                                                                                   |                                                                                                                     |
|                                                                                                                    |                                                                                                                 |                                                                                                                 |                                                                                                                 |                                                                                                                   |                                                                                                                     |
|                                                                                                                    |                                                                                                                 | HS 12-1-5-5                                                                                                     | 12-1-5-5                                                                                                        |                                                                                                                   |                                                                                                                     |

# ISCAR MATERIAL GROUPS

According to VDI 3323 Standard




| Mtl. No.  |  |  |  |                        |
|-----------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|------------------------|
|           | USA<br>AISI/SAE                                                                   | Werkstoff                                                                         | DIN                                                                                 | Great Britain<br>BS EN |
| <b>11</b> |                                                                                   | 1.3207                                                                            | S 10-4-3-10                                                                         | BT42                   |
| <b>11</b> | T 15                                                                              | 1.3243                                                                            | S 6-5-2-5                                                                           |                        |
| <b>11</b> |                                                                                   | 1.3246                                                                            | S 7-4-2-5                                                                           |                        |
| <b>11</b> |                                                                                   | 1.3247                                                                            | S 2-10-1-8                                                                          | BM 42                  |
| <b>11</b> | M 42                                                                              | 1.3249                                                                            | S 2-9-2-8                                                                           | BM 34                  |
| <b>11</b> | T 4                                                                               | 1.3255                                                                            | S 18-1-2-5                                                                          | BT 4                   |
| <b>11</b> | M 2                                                                               | 1.3343                                                                            | S6-5-2                                                                              | BM2                    |
| <b>11</b> | M 7                                                                               | 1.3348                                                                            | S2-9-2                                                                              |                        |
| <b>11</b> | T 1                                                                               | 1.3355                                                                            | S 18-0-1                                                                            | BT 1                   |
| <b>11</b> | HNV 3                                                                             | 1.4718                                                                            | X45CrSi 9 3                                                                         | 401S45 52              |
| <b>11</b> | 422                                                                               | 1.4935                                                                            | x20 CrMoWV 12 1                                                                     |                        |
| <b>12</b> | 403                                                                               | 1.4000                                                                            | X6Cr13                                                                              | 403 S 17               |
| <b>12</b> |                                                                                   | 1.4001                                                                            | X6Cr14                                                                              |                        |
| <b>12</b> | (410S)                                                                            | 1.4001                                                                            | X7 Cr 13                                                                            | (403 S 7)              |
| <b>12</b> | 405                                                                               | 1.4002                                                                            | X6CrA12                                                                             | 405S17                 |
| <b>12</b> | 405                                                                               | 1.4002                                                                            | X6 CrAl 13                                                                          | 405 S 17               |
| <b>12</b> | 416                                                                               | 1.4005                                                                            | X12CrS 13                                                                           | 416 S 21               |
| <b>12</b> | 410; CA-15                                                                        | 1.4006                                                                            | (G-)X10 Cr 13                                                                       | 410S21 56A             |
| <b>12</b> | 430                                                                               | 1.4016                                                                            | X8Cr17                                                                              | Z8C17                  |
| <b>12</b> | 430                                                                               | 1.4016                                                                            | X6 Cr 17                                                                            | 430 S 15 60            |
| <b>12</b> |                                                                                   | 1.4027                                                                            | G-X20Cr14                                                                           | 420C29                 |
| <b>12</b> | 420                                                                               | 1.4028                                                                            | X30 Cr 13                                                                           | 420 S 45               |
| <b>12</b> |                                                                                   | 1.4086                                                                            | G-X120Cr29                                                                          | 452C11                 |
| <b>12</b> | 430 F                                                                             | 1.4104                                                                            | X12CrMoS17                                                                          | 420 S 37               |
| <b>12</b> | 440B                                                                              | 1.4112                                                                            | X90 CrMoV 18                                                                        |                        |
| <b>12</b> | 434                                                                               | 1.4113                                                                            | X6CrMo 17                                                                           | 434 S 17               |
| <b>12</b> |                                                                                   | 1.4340                                                                            | G-X40CrNi27 4                                                                       |                        |
| <b>12</b> | S31500                                                                            | 1.4417                                                                            | X2CrNiMoSi19 5                                                                      |                        |
| <b>12</b> | S31500                                                                            | 1.4417                                                                            | X2 CrNoMoSi 18 5 3                                                                  |                        |









| <br><b>France</b><br><b>AFNOR</b> | <br><b>Sweden</b><br><b>SS</b> | <br><b>Italy</b><br><b>UNI</b> | <br><b>Spain</b><br><b>UNE</b> | <br><b>Japan</b><br><b>JIS</b> | <br><b>Russia</b><br><b>GOST</b> |
|--------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|
| Z130WKCDV                                                                                                          |                                                                                                                 |                                                                                                                 |                                                                                                                 |                                                                                                                   |                                                                                                                     |
| KCV 06-05-05-04-02                                                                                                 | 2723                                                                                                            | HS 6-5-2-5                                                                                                      | 6-5-2-5                                                                                                         | SKH55                                                                                                             | R6M5K5                                                                                                              |
| Z110 WKCDV 07-05-04                                                                                                | 7-4-2-5                                                                                                         | HS 7-4-2-5                                                                                                      | M 35                                                                                                            |                                                                                                                   |                                                                                                                     |
| Z110 DKCWV 09-08-04                                                                                                | 2-10-1-8                                                                                                        | HS 2-9-1-8                                                                                                      | M 41                                                                                                            |                                                                                                                   |                                                                                                                     |
|                                                                                                                    |                                                                                                                 |                                                                                                                 | 2-9-2-8                                                                                                         |                                                                                                                   | R6M5                                                                                                                |
| Z 80 WKCVC 18-05-04-0                                                                                              |                                                                                                                 |                                                                                                                 |                                                                                                                 |                                                                                                                   |                                                                                                                     |
| Z 85 WDCV                                                                                                          | 2722                                                                                                            | HS 6 5 2                                                                                                        | F-5604                                                                                                          | SKH 51                                                                                                            |                                                                                                                     |
| Z 100 DCWV 09-04-02-                                                                                               | 2782                                                                                                            | HS 2 9 2                                                                                                        | F-5607                                                                                                          |                                                                                                                   |                                                                                                                     |
| Z 80 WCV 18-4-01                                                                                                   |                                                                                                                 |                                                                                                                 |                                                                                                                 |                                                                                                                   | R18                                                                                                                 |
| Z45CS9                                                                                                             |                                                                                                                 | X45CrSi8                                                                                                        | F322                                                                                                            | SUH1                                                                                                              | 40Ch9S2                                                                                                             |
| Z 6 C 13                                                                                                           | 2301                                                                                                            | X6Cr13                                                                                                          | F.3110                                                                                                          | SUS403                                                                                                            | 08Ch13                                                                                                              |
|                                                                                                                    |                                                                                                                 |                                                                                                                 | F8401                                                                                                           |                                                                                                                   | 08Ch13                                                                                                              |
| Z 8 C 13                                                                                                           | 2301                                                                                                            |                                                                                                                 |                                                                                                                 |                                                                                                                   | 08Ch13                                                                                                              |
| Z8CA12                                                                                                             |                                                                                                                 | X6CrAl13                                                                                                        |                                                                                                                 |                                                                                                                   |                                                                                                                     |
| Z6CA13                                                                                                             | 2302                                                                                                            | X6CrAl13                                                                                                        |                                                                                                                 |                                                                                                                   |                                                                                                                     |
| Z11 CF 13                                                                                                          | 2380                                                                                                            | X12 CrSC13                                                                                                      | F-3411                                                                                                          | SUS 416                                                                                                           |                                                                                                                     |
| Z10 C 13                                                                                                           | 2302                                                                                                            | X12Cr13                                                                                                         | F.3401                                                                                                          | SUS410                                                                                                            | 12Ch13                                                                                                              |
| 430S15                                                                                                             | 2320                                                                                                            | X8Cr17                                                                                                          | F.3113                                                                                                          |                                                                                                                   | 12Ch17                                                                                                              |
| Z 8 C 17                                                                                                           | 2320                                                                                                            | X8Cr17                                                                                                          | F3113                                                                                                           | SUS430                                                                                                            | 12Ch17                                                                                                              |
| Z20C13M                                                                                                            |                                                                                                                 |                                                                                                                 |                                                                                                                 |                                                                                                                   | 20Ch13L                                                                                                             |
| Z 30 C 13                                                                                                          | 2304                                                                                                            |                                                                                                                 |                                                                                                                 |                                                                                                                   | 20Ch13                                                                                                              |
| Z 10 CF 17                                                                                                         | 2383                                                                                                            | X10CrS17                                                                                                        | F.3117                                                                                                          | SUS430F                                                                                                           |                                                                                                                     |
| Z 8 CD 17.01                                                                                                       | 2325                                                                                                            | X8CrMo17                                                                                                        |                                                                                                                 | SUS434                                                                                                            |                                                                                                                     |
|                                                                                                                    | 2376                                                                                                            |                                                                                                                 |                                                                                                                 |                                                                                                                   |                                                                                                                     |
|                                                                                                                    | 2376                                                                                                            |                                                                                                                 |                                                                                                                 |                                                                                                                   |                                                                                                                     |

# ISCAR MATERIAL GROUPS




According to VDI 3323 Standard







| Mtl. No.  |  |  |  |                                                                      |
|-----------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|----------------------------------------------------------------------|
|           | USA<br>AISI/SAE                                                                   | Werkstoff                                                                         | DIN                                                                                 | Great Britain<br>BS EN                                               |
| <b>12</b> |                                                                                   | 1.4418                                                                            | X4 CrNiMo16 5                                                                       |                                                                      |
| <b>12</b> | XM 8; 430 Ti; 439                                                                 | 1.4510                                                                            |                                                                                     |                                                                      |
| <b>12</b> | 430Ti                                                                             | 1.4510                                                                            | X6 CrTi 17                                                                          |                                                                      |
| <b>12</b> |                                                                                   | 1.4511                                                                            | X 6 CrNb 17                                                                         |                                                                      |
| <b>12</b> | 409                                                                               | 1.4512                                                                            | X 6 CrTi 12;<br>(X2CrTi12)                                                          | LW 19; 409 S 19                                                      |
| <b>12</b> |                                                                                   | 1.4720                                                                            | X20CrMo13                                                                           |                                                                      |
| <b>12</b> | 405                                                                               | 1.4724                                                                            | X10CrA113                                                                           | 403S17                                                               |
| <b>12</b> | 430                                                                               | 1.4742                                                                            | X10CrA118                                                                           | 439S15 60                                                            |
| <b>12</b> | HNV6                                                                              | 1.4747                                                                            | X80CrNiSi20                                                                         | 443S65 59                                                            |
| <b>12</b> | 446                                                                               | 1.4749                                                                            | x18 cRn 28                                                                          |                                                                      |
| <b>12</b> | 446                                                                               | 1.4762                                                                            | X10CrA124                                                                           |                                                                      |
| <b>12</b> | EV 8                                                                              | 1.4871                                                                            | X 53 CrMnNiN 21 9                                                                   | 349 S 54                                                             |
| <b>12</b> | 302                                                                               |                                                                                   | x12 CrNi 18 9                                                                       | 302 S 31                                                             |
| <b>12</b> | 429                                                                               |                                                                                   | X10 CrNi 15                                                                         |                                                                      |
| <b>13</b> | 420                                                                               | 1.4021                                                                            | X20Cr13                                                                             | 420S37                                                               |
| <b>13</b> | 420                                                                               | 1.4031                                                                            | X40 Cr 13                                                                           |                                                                      |
| <b>13</b> |                                                                                   | 1.4034                                                                            | X46Cr13                                                                             | 420 S 45                                                             |
| <b>13</b> | 431                                                                               | 1.4057                                                                            | X20CrNi172                                                                          | 431 S 29 57                                                          |
| <b>13</b> | CA6-NM                                                                            | 1.4313                                                                            | G-X4 CrNi 13 4                                                                      | 425 C 11                                                             |
| <b>13</b> |                                                                                   | 1.4544                                                                            |                                                                                     | S. 524; S. 526                                                       |
| <b>13</b> | 348                                                                               | 1.4546                                                                            | X5CrNiNb 18-10                                                                      | 347 S 31; 2 S. 130;<br>2 S. 143; 2 S. 144; 2<br>S. 145; S.525; S.527 |
| <b>13</b> |                                                                                   | 1.4922                                                                            | x20cRmV12-1                                                                         |                                                                      |
| <b>13</b> |                                                                                   | 1.4923                                                                            | X22 CrMoV12 1                                                                       |                                                                      |
| <b>14</b> | 304                                                                               | 1.4301                                                                            | X 5 CrNi 18 9                                                                       | 304 S 15                                                             |
| <b>14</b> | 303                                                                               | 1.4305                                                                            | X10 CrNiS 18 9                                                                      | 303 S 21 58M                                                         |
| <b>14</b> | 304L                                                                              | 1.4306                                                                            | X2CrNi18 9                                                                          | 304S12                                                               |
| <b>14</b> | 304L                                                                              | 1.4306                                                                            | X2 CrNi 18 10                                                                       | 304 S 11                                                             |
| <b>14</b> | CF-8                                                                              | 1.4308                                                                            | X6 CrNi 18 9                                                                        | 304 C 15 58E                                                         |
| <b>14</b> | 301                                                                               | 1.4310                                                                            | X12CrN i17 7                                                                        | 301 S 21                                                             |
| <b>14</b> | 304 LN                                                                            | 1.4311                                                                            | X2 CrNiN 18 10                                                                      | 304 S 62                                                             |
| <b>14</b> |                                                                                   | 1.4312                                                                            | G-X10CrNi18 8                                                                       | 302C25                                                               |
| <b>14</b> | 305                                                                               | 1.4312                                                                            | X8 CrNi 18 12                                                                       | 305 s 19                                                             |

| <br><b>France</b><br><b>AFNOR</b> | <br><b>Sweden</b><br><b>SS</b> | <br><b>Italy</b><br><b>UNI</b> | <br><b>Spain</b><br><b>UNE</b> | <br><b>Japan</b><br><b>JIS</b> | <br><b>Russia</b><br><b>GOST</b> |
|--------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|
| Z6CND16-04-01                                                                                                      | 2387                                                                                                            |                                                                                                                 |                                                                                                                 |                                                                                                                   |                                                                                                                     |
| Z 4 CT 17                                                                                                          |                                                                                                                 | X 6 CrTi 17                                                                                                     | F.3115 -X 5 CrTi 17                                                                                             | SUS 430 LX                                                                                                        | 08 Ch17T                                                                                                            |
| Z 4 CT 17                                                                                                          |                                                                                                                 |                                                                                                                 |                                                                                                                 |                                                                                                                   | 08Ch17T                                                                                                             |
| Z 4 CNb 17                                                                                                         |                                                                                                                 | X 6 CrNb 17                                                                                                     | F.3122-X 5 CrNb 17                                                                                              | SUS 430 LK                                                                                                        |                                                                                                                     |
| Z 3 CT 12                                                                                                          |                                                                                                                 | X 6 CrTi 12                                                                                                     |                                                                                                                 | SUH 409                                                                                                           |                                                                                                                     |
| Z10C13                                                                                                             |                                                                                                                 | X10CrA112                                                                                                       | F.311                                                                                                           |                                                                                                                   | 10Ch13SJ                                                                                                            |
| Z10CAS18                                                                                                           |                                                                                                                 | X8Cr17                                                                                                          | F.3113                                                                                                          | SUS430                                                                                                            | 15Ch13SJ                                                                                                            |
| Z80CSN20.02                                                                                                        |                                                                                                                 | X80CrSiNi20                                                                                                     | F.320B                                                                                                          | SUH4                                                                                                              |                                                                                                                     |
| Z10CAS24                                                                                                           | 2322                                                                                                            | X16Cr26                                                                                                         |                                                                                                                 | SUH446                                                                                                            |                                                                                                                     |
| Z 52 CMN 21.09                                                                                                     |                                                                                                                 | X53CrMnNiN21 9                                                                                                  |                                                                                                                 | SUH35, SUH36                                                                                                      | 55Ch20G9AN4                                                                                                         |
| Z 10 CN 18-09                                                                                                      | 2330                                                                                                            |                                                                                                                 |                                                                                                                 |                                                                                                                   |                                                                                                                     |
| Z 20 C 13                                                                                                          | 2303                                                                                                            | 14210                                                                                                           |                                                                                                                 |                                                                                                                   | 20Ch13                                                                                                              |
| Z 40 C 14                                                                                                          | -2304                                                                                                           |                                                                                                                 |                                                                                                                 |                                                                                                                   | 40Ch13                                                                                                              |
| Z40 C 14                                                                                                           |                                                                                                                 | X40Cr14                                                                                                         | F.3405                                                                                                          | SUS420J2                                                                                                          |                                                                                                                     |
| Z 15 CN 16.02                                                                                                      | 2321                                                                                                            | X16CrNi16                                                                                                       | F.3427                                                                                                          | SUS431                                                                                                            | 20Ch17N2                                                                                                            |
| Z 4 CND 13-04 M                                                                                                    | 2385                                                                                                            | (G)X6CrNi304                                                                                                    |                                                                                                                 | SCS5                                                                                                              |                                                                                                                     |
|                                                                                                                    |                                                                                                                 | X 6 CrNiTi 18 11                                                                                                |                                                                                                                 |                                                                                                                   | 08Ch 18N12T                                                                                                         |
|                                                                                                                    |                                                                                                                 | X 6 CrNiNb 18 11                                                                                                |                                                                                                                 |                                                                                                                   |                                                                                                                     |
|                                                                                                                    | 2317                                                                                                            | x20cRmOnI 12 01                                                                                                 |                                                                                                                 |                                                                                                                   |                                                                                                                     |
| Z 5 CN 18.09                                                                                                       | 2332; 2333                                                                                                      |                                                                                                                 |                                                                                                                 |                                                                                                                   | 08Ch18N10                                                                                                           |
| Z 8 CNF 18-09                                                                                                      | 2346                                                                                                            | X10CrNiS18.09                                                                                                   | F.3508                                                                                                          | SUS303                                                                                                            | 30Ch18N11                                                                                                           |
| Z2CrNi18 10                                                                                                        | 2352                                                                                                            | x2cRnI18 11                                                                                                     | F.3503                                                                                                          | SCS19                                                                                                             |                                                                                                                     |
| Z 3 CN 19-11                                                                                                       | 2352                                                                                                            | X2CrNi18 11                                                                                                     |                                                                                                                 |                                                                                                                   |                                                                                                                     |
| Z 6 CN 18-10 M                                                                                                     | 2333                                                                                                            |                                                                                                                 |                                                                                                                 | SUS304L                                                                                                           |                                                                                                                     |
| Z 12 CN 17.07                                                                                                      | 2331                                                                                                            | X2CrNi18 07                                                                                                     | F.3517                                                                                                          |                                                                                                                   |                                                                                                                     |
| Z 2 CN18.10                                                                                                        | 2371                                                                                                            | X2CrNi18 10                                                                                                     |                                                                                                                 | SUS304LN                                                                                                          |                                                                                                                     |
| Z10CN18.9M                                                                                                         |                                                                                                                 |                                                                                                                 |                                                                                                                 |                                                                                                                   | 10Ch18N9L                                                                                                           |
|                                                                                                                    |                                                                                                                 |                                                                                                                 |                                                                                                                 |                                                                                                                   | 10Ch18N9L                                                                                                           |

# ISCAR MATERIAL GROUPS




According to VDI 3323 Standard

| Mtl. No.  |  |  |  |                                                                                          |
|-----------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
|           | USA<br>AISI/SAE                                                                   | Werkstoff                                                                         | DIN                                                                                 | Great Britain<br>BS EN                                                                   |
| <b>14</b> | 304                                                                               | 1.4350                                                                            | X5CrNi18 9                                                                          | 304S15 58E                                                                               |
| <b>14</b> | S32304                                                                            | 1.4362                                                                            | X2 CrNiN 23 4                                                                       |                                                                                          |
| <b>14</b> | 202                                                                               | 1.4371                                                                            | X3 CrMnNiN 188 8 7                                                                  | 284 S 16                                                                                 |
| <b>14</b> | 316                                                                               | 1.4401                                                                            | X 5 CrNiMo 17 12 2;<br>(X4 CrNiMo 17 -12-2)                                         | 316 S 13; 316 S 17;<br>316 S 19; 316 S 31;<br>316 S 33                                   |
| <b>14</b> | 316L                                                                              | 1.4404                                                                            | X2 CrNiMo 17 13 2;<br>(X2 CrNiMo 17-12-2); GX<br>2 CrNiMoN 18-10                    | 316 S 11; 316 S 13;<br>316 S 14; 316 S 31;<br>316 S 42; S.537; 316<br>C 12; T.75; S. 161 |
| <b>14</b> | 316LN                                                                             | 1.4406                                                                            | X2 CrNiMoN 17 12 2;<br>(X2CrNiMoN 18-10)                                            | 316 S 61; 316 S 63                                                                       |
| <b>14</b> | CF-8M                                                                             | 1.4408                                                                            | GX 5 CrNiMoN 7 12 2;<br>G-X 6 CrNiMo 18 10                                          | 316 C 16<br>(LT 196); ANC 4 B                                                            |
| <b>14</b> |                                                                                   | 1.4410                                                                            | G-X10CrNiMo18 9                                                                     |                                                                                          |
| <b>14</b> | 316 Ln                                                                            | 1.4429                                                                            | X2 CrNiMo 17 -13-3                                                                  | 316 S 62                                                                                 |
| <b>14</b> | 316L                                                                              | 1.4435                                                                            | X2 CrNiMo18 14 3                                                                    | 316 S 11; 316 S 13;<br>316 S 14; 316 S 31;<br>LW 22; LWCF 22                             |
| <b>14</b> | 316                                                                               | 1.4436                                                                            | X 5 CrNiMo 17 13 3;<br>(X4CRNIMO 17-13-3)                                           | 316 S 19; 316 S 31;<br>316 S 33; LW 23;<br>LWCF 23                                       |
| <b>14</b> | 317L                                                                              | 1.4438                                                                            | X2 CrNiMo 18 16 4;<br>(X2CrNiMo 18-15-4)                                            | 317 S 12                                                                                 |
| <b>14</b> | (s31726)                                                                          | 1.4439                                                                            | X2 CrNiMoN 17 13 5                                                                  |                                                                                          |
| <b>14</b> |                                                                                   | 1.444                                                                             | X 2 CrNiMo 18 13                                                                    |                                                                                          |
| <b>14</b> | 317                                                                               | 1.4449                                                                            | X5 CrNiMo 17 13 3                                                                   | 317 S 16                                                                                 |
| <b>14</b> | 329                                                                               | 1.4460                                                                            | X 4 CrNiMo 27 5 2;<br>(X3CrNiMo27-5-2)                                              |                                                                                          |
| <b>14</b> | 329                                                                               | 1.4460                                                                            | X8CrNiMo27 5                                                                        |                                                                                          |







| <br><b>France</b><br><b>AFNOR</b>    | <br><b>Sweden</b><br><b>SS</b> | <br><b>Italy</b><br><b>UNI</b> | <br><b>Spain</b><br><b>UNE</b> | <br><b>Japan</b><br><b>JIS</b> | <br><b>Russia</b><br><b>GOST</b> |
|-----------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|
| Z6CN18.09                                                                                                             | 2332                                                                                                            | X5CrNi18 10                                                                                                     | F.3551                                                                                                          | SUS304                                                                                                            |                                                                                                                     |
| Z 2 CN 23-04 AZ                                                                                                       | 2327                                                                                                            |                                                                                                                 |                                                                                                                 |                                                                                                                   |                                                                                                                     |
| Z 8 CMN 18- 08-05                                                                                                     |                                                                                                                 |                                                                                                                 |                                                                                                                 |                                                                                                                   |                                                                                                                     |
| Z 3 CND 17 -11-01;<br>Z 6 CND 17-11; Z 6<br>CND 17-11-02; Z 7<br>CND 17-11-02; Z 7<br>CND 17-12-02                    | 2347                                                                                                            | X 5 CrNiMo 17 12                                                                                                | F.3534-X 5 CrNiMo<br>17 12 2                                                                                    | SUS 316                                                                                                           |                                                                                                                     |
| Z 2 CND 17-12; Z<br>2 CND 18-13; Z 3<br>CND 17-11-02; Z 3<br>CND 17-12-02 FF; Z<br>3 CND 18-12-03; Z<br>3 CND 19.10 M | 2348                                                                                                            | X 2 CrNiMo 17 12;<br>G-X 2 CrNiMo 19 11                                                                         | F.3533 - X 2 CrNiMo<br>17 13 2; F.3537 - X<br>2 CrNiMo 17 13 3                                                  | SUS 316 L                                                                                                         |                                                                                                                     |
| Z2 CND 17-12 AZ                                                                                                       |                                                                                                                 | X 2 CrNiMoN 17 12                                                                                               | F.3542-X 2 CrNiMoN<br>17 12 2                                                                                   | SUS316LN                                                                                                          | 07 Ch 18N                                                                                                           |
|                                                                                                                       | 2343                                                                                                            |                                                                                                                 | F.8414-AM-X 7<br>CrNiMo 20 10                                                                                   | SCS 14                                                                                                            | 10G2S2MSL                                                                                                           |
| Z5CND20.12M                                                                                                           | 2328                                                                                                            |                                                                                                                 |                                                                                                                 |                                                                                                                   |                                                                                                                     |
| Z 2 CND 17-13 Az                                                                                                      | 2375                                                                                                            | X 2 CrNiMoN 17 13                                                                                               | F.3543-X 2 CrNiMoN<br>17 13 3                                                                                   | SUS 316 LN                                                                                                        |                                                                                                                     |
| Z 3 CND 17-12-03;<br>Z 3 CND 18-14-03                                                                                 | 2375                                                                                                            | X2CrNiMoN 17 13                                                                                                 | F.3533-X 2 CrNiMo<br>17 13 2                                                                                    | SUS 316 L                                                                                                         | O3 Ch 17N14M3                                                                                                       |
| Z 6 CND 18-12-03;<br>Z 7 CND 18-12-03                                                                                 | 2343                                                                                                            | X 5 CrNiMo 117 13;<br>X 8 cRnlmO 17 13                                                                          | F.3543-X 5 CrNiMo<br>17 12 2 F.3538-X 5<br>CrNiMo 17 13 3                                                       | SUS 316                                                                                                           |                                                                                                                     |
| Z 2 CND 19-15-04;<br>z 3 cnd 19-15-04                                                                                 | 2367                                                                                                            | X2CrNiMo18 16                                                                                                   | f.3539-x 2 cRnlmO<br>18 16 4                                                                                    | SUS317L                                                                                                           |                                                                                                                     |
| Z 3 CND 18-14-06<br>AZ                                                                                                |                                                                                                                 |                                                                                                                 |                                                                                                                 |                                                                                                                   |                                                                                                                     |
|                                                                                                                       |                                                                                                                 | X 5 CrNiMo 18 15                                                                                                |                                                                                                                 | SUS 317                                                                                                           |                                                                                                                     |
| (Z 3 CND 25-07 Az);<br>Z 5 CND 27-05 Az                                                                               | 2324                                                                                                            |                                                                                                                 | F.3309-X 8 CrNiMo<br>17 12 2; F.3552-X 8<br>CrNiMo 18 16 4                                                      | SUS 329 J 1                                                                                                       |                                                                                                                     |
|                                                                                                                       | 2324                                                                                                            |                                                                                                                 |                                                                                                                 |                                                                                                                   |                                                                                                                     |

# ISCAR MATERIAL GROUPS







According to VDI 3323 Standard

| Mtl. No.  | <br><b>USA</b><br>AISI/SAE |  | <br><b>GERMANY</b><br>Werkstoff                      DIN |                                         | <br><b>Great Britain</b><br>BS                      EN |          |
|-----------|-------------------------------------------------------------------------------------------------------------|--|-------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|----------|
|           | <b>14</b>                                                                                                   |  |                                                                                                                                           | 1.4462                                  | X2CrNiMoN22 5 3                                                                                                                           | 318 S 13 |
| <b>14</b> |                                                                                                             |  | 1.4500                                                                                                                                    | G-X7NiCrMoCuNb25 20                     |                                                                                                                                           |          |
| <b>14</b> | 17-7PH                                                                                                      |  | 1.4504                                                                                                                                    |                                         | 316S111                                                                                                                                   |          |
| <b>14</b> | 443                      444                                                                                |  | 1.4521                                                                                                                                    | X2CrMoTi18-2                            |                                                                                                                                           |          |
| <b>14</b> | UNS N 08904                                                                                                 |  | 1.4539                                                                                                                                    | X1NiCrMoCuN25-20-5                      |                                                                                                                                           |          |
| <b>14</b> | CN-7M                                                                                                       |  | 1.4539                                                                                                                                    | (G-)X1 NiCrMoCu 25 20 5                 |                                                                                                                                           |          |
| <b>14</b> | 321                                                                                                         |  | 1.4541                                                                                                                                    | Z 6 CrNiTi 18-10                        | 321 S 31; 321 S 51<br>(1010; 1105); LW 24;<br>LWCF 24                                                                                     |          |
| <b>14</b> | 630                                                                                                         |  | 1.4542                                                                                                                                    | X5 CrNiCuNb 17 4;<br>(X5 CrNiChNb 16-4) |                                                                                                                                           |          |
| <b>14</b> | 15-5PH                                                                                                      |  | 1.4545                                                                                                                                    | Z7 CNU15.05                             |                                                                                                                                           |          |
| <b>14</b> | S31254                                                                                                      |  | 1.4547                                                                                                                                    | X1 CrNiMoN 20 18 7                      |                                                                                                                                           |          |
| <b>14</b> | 347                                                                                                         |  | 1.4550                                                                                                                                    | X6 CrNiNb 18 10                         | 347 S 17                                                                                                                                  | 58F      |
| <b>14</b> |                                                                                                             |  | 1.4552                                                                                                                                    | G-X7CrNiNb18 9                          |                                                                                                                                           |          |
| <b>14</b> | 17-7PH                                                                                                      |  | 1.4568                                                                                                                                    |                                         | 316S111                                                                                                                                   |          |
| <b>14</b> | 316Ti                                                                                                       |  | 1.4571                                                                                                                                    | X6 CrNiMoTi 17 12 2                     | 320 S 31                                                                                                                                  |          |
| <b>14</b> | 316 Ti                                                                                                      |  | 1.4571                                                                                                                                    | x 6 CrNiMoTi 17 12 2                    | 320 S 31                                                                                                                                  | 58J      |
| <b>14</b> |                                                                                                             |  | 1.4581                                                                                                                                    | G-X 5 CrNiMoNb                          | 318 C 17                                                                                                                                  |          |
| <b>14</b> | 318                                                                                                         |  | 1.4583                                                                                                                                    | X 10CrNiMoNb 18 12                      | 303 S 21                                                                                                                                  |          |
| <b>14</b> |                                                                                                             |  | 1.4585                                                                                                                                    | G-X7CrNiMoCuNb18 18                     |                                                                                                                                           |          |
| <b>14</b> |                                                                                                             |  | 1.4821                                                                                                                                    | X20CrNiSi25 4                           |                                                                                                                                           |          |
| <b>14</b> |                                                                                                             |  | 1.4823                                                                                                                                    | G-X40CrNiSi27 4                         |                                                                                                                                           |          |
| <b>14</b> | 309                                                                                                         |  | 1.4828                                                                                                                                    | X15CrNiSi20 12                          | 309 S 24                                                                                                                                  | 58C      |
| <b>14</b> | 309S                                                                                                        |  | 1.4833                                                                                                                                    | X6 CrNi 22 13                           | 309 S 13                                                                                                                                  |          |
| <b>14</b> | 310 S                                                                                                       |  | 1.4845                                                                                                                                    | X12 CrNi 25 21                          | 310S24                                                                                                                                    |          |
| <b>14</b> | 321                                                                                                         |  | 1.4878                                                                                                                                    | X6 CrNiTi 18 9                          | 32 1 S 20                                                                                                                                 | 58B      |






| <br>France<br>AFNOR | <br>Sweden<br>SS | <br>Italy<br>UNI | <br>Spain<br>UNE | <br>Japan<br>JIS | <br>Russia<br>GOST |
|------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
| Z 3 CND 22-05 Az;<br>(Z 2 CND 24 -08 Az);<br>(Z 3 CND 25-06-03<br>Az)                                | 2377                                                                                              |                                                                                                   |                                                                                                   | SUS 329 J3L                                                                                         |                                                                                                       |
| 23NCDU25.20M                                                                                         |                                                                                                   |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
|                                                                                                      |                                                                                                   | Z8CNA17-07                                                                                        | X2CrNiMo1712                                                                                      |                                                                                                     |                                                                                                       |
|                                                                                                      | 2326                                                                                              |                                                                                                   | F.3123-X 2<br>CrMoTiNb 18 2                                                                       | SUS 444                                                                                             |                                                                                                       |
| Z 2 NCDU 25-20                                                                                       | 2562                                                                                              |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
| Z1 NCDU 25-02 M                                                                                      | 2564                                                                                              |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
| Z 6 CNT 18-10                                                                                        | 2337                                                                                              | X 6 CrNiTi 18 11                                                                                  | F.3523 - X 6 CrNiTi<br>18 10                                                                      | SUS 321                                                                                             | 06Ch18N10T;<br>08Ch18N10T;<br>09Ch18N10T;<br>12Ch18N10T                                               |
| Z 7 CNU 15-05; Z 7<br>CNU 17-04                                                                      |                                                                                                   |                                                                                                   |                                                                                                   | SCS 24; SUS 630                                                                                     |                                                                                                       |
|                                                                                                      | 2378                                                                                              |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
| Z 6 CNNb 18.10                                                                                       | 2338                                                                                              | X6CrNiNb18 11                                                                                     | F.3552                                                                                            | SUS347                                                                                              | 08Ch18N12B                                                                                            |
| Z4CNNb19.10M                                                                                         |                                                                                                   |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
|                                                                                                      |                                                                                                   | Z8CNA17-07                                                                                        | X2CrNiMo1712                                                                                      |                                                                                                     | 09Ch17NJu1                                                                                            |
| Z 6 CNDT 17-12002                                                                                    | 2350                                                                                              |                                                                                                   |                                                                                                   |                                                                                                     | 10Ch17N13M2T                                                                                          |
| Z 6 NDT 17.12                                                                                        | 2350                                                                                              | X6CrNiMoTi17 12                                                                                   | F.3535                                                                                            |                                                                                                     | 10Ch17N13M2T                                                                                          |
| Z 4 CNDNb 18.12 M                                                                                    |                                                                                                   |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
| Z15CNS20.12                                                                                          |                                                                                                   | x15cRnIsI2 12                                                                                     |                                                                                                   |                                                                                                     |                                                                                                       |
|                                                                                                      |                                                                                                   | X6CrNiMoTi17 12                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
| Z20CNS25.04                                                                                          |                                                                                                   |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
| Z15CNS20.12                                                                                          |                                                                                                   |                                                                                                   | F.8414                                                                                            | SCS17                                                                                               | 20Ch20N14S2                                                                                           |
| Z 15 CN 24-13                                                                                        |                                                                                                   |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
| Z 12 CN 25-20                                                                                        | 2361                                                                                              | X6CrNi25 20                                                                                       | F.331                                                                                             | SUH310                                                                                              | 20Ch23N18                                                                                             |
| Z 6 CNT 18-12<br>(B)                                                                                 | 2337                                                                                              | X6CrNiTi18 11                                                                                     | F.3553                                                                                            | SUS321                                                                                              |                                                                                                       |









| <br>France<br>AFNOR | <br>Sweden<br>SS | <br>Italy<br>UNI | <br>Spain<br>UNE | <br>Japan<br>JIS | <br>Russia<br>GOST |
|------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
|                                                                                                      | 2372                                                                                              |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
|                                                                                                      | 2368                                                                                              |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
| Z 5 CN 18-09                                                                                         | 2333                                                                                              |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
| Zz 8 nctv 25-15 b ff                                                                                 | 2570                                                                                              |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
|                                                                                                      |                                                                                                   |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
| Ft10D                                                                                                | 110                                                                                               | G10                                                                                               |                                                                                                   |                                                                                                     | SCh10                                                                                                 |
| FT 10 D                                                                                              | 0110-00                                                                                           |                                                                                                   |                                                                                                   |                                                                                                     | SCh10                                                                                                 |
| FT 15 D                                                                                              | 0115-00                                                                                           | G 15                                                                                              | FG 15                                                                                             | FC150                                                                                               | SCh15                                                                                                 |
| Ft15D                                                                                                | 115                                                                                               | G 15                                                                                              | FG 15                                                                                             |                                                                                                     | SCh15                                                                                                 |
| Ft 15 D                                                                                              | 01 15-00                                                                                          | G14                                                                                               | FG15                                                                                              |                                                                                                     | SCh15                                                                                                 |
| Ft 20 D                                                                                              | 0120-00                                                                                           |                                                                                                   |                                                                                                   |                                                                                                     | SCh20                                                                                                 |
| Ft 20 D                                                                                              | 120                                                                                               | G 20                                                                                              |                                                                                                   | FC200                                                                                               | SCh20                                                                                                 |
| L-NC 202                                                                                             | 0523-00                                                                                           |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
| FCS 400-12                                                                                           | 0717-02                                                                                           | GS 370-17                                                                                         | FGE 38-17                                                                                         | FCD400                                                                                              | VCh42-12                                                                                              |
| Ft 10 D                                                                                              | 110                                                                                               |                                                                                                   |                                                                                                   | FC100                                                                                               |                                                                                                       |
| Ft20D                                                                                                | 120                                                                                               | G 20                                                                                              | FG 20                                                                                             |                                                                                                     |                                                                                                       |
| Ft 25 D                                                                                              | 125                                                                                               | G 25                                                                                              | FG 25                                                                                             | FC250                                                                                               | VCh60-2                                                                                               |
| Ft30D                                                                                                | 130                                                                                               | G 30                                                                                              | FG 30                                                                                             | FC300                                                                                               | SCh20                                                                                                 |
| Ft 30 D                                                                                              | 01 30-00                                                                                          |                                                                                                   |                                                                                                   |                                                                                                     | SCh30                                                                                                 |
| Ft35D                                                                                                | 135                                                                                               | G 35                                                                                              | FG 35                                                                                             | FC350                                                                                               | SCh30                                                                                                 |
| Ft 40 D                                                                                              | 140                                                                                               |                                                                                                   |                                                                                                   |                                                                                                     | SCh40                                                                                                 |
|                                                                                                      |                                                                                                   |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
|                                                                                                      |                                                                                                   |                                                                                                   |                                                                                                   |                                                                                                     | SCh25                                                                                                 |
| FGS 370/17                                                                                           | 0717-15                                                                                           |                                                                                                   |                                                                                                   |                                                                                                     | VCh42-12                                                                                              |
| FGS 370/17                                                                                           | 0717-15                                                                                           |                                                                                                   |                                                                                                   |                                                                                                     | VCh50-2                                                                                               |
| FGS 500/7                                                                                            | 0727-02                                                                                           | GGG 50                                                                                            |                                                                                                   | FCD500                                                                                              | VCh50-2                                                                                               |
| FGS 500-7                                                                                            | 0727-02                                                                                           |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
| S-Mn 137                                                                                             | 0772-00                                                                                           |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
| S-NC 202                                                                                             | 0776-00                                                                                           |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |

# ISCAR MATERIAL GROUPS




According to VDI 3323 Standard

| Mtl. No.  |  |  |  |
|-----------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|           | USA<br>AISI/SAE                                                                   | GERMANY<br>Werkstoff      DIN                                                     | Great Britain<br>BS      EN                                                         |
| <b>17</b> |                                                                                   |                                                                                   | GGG 40.3      SNG 370/17                                                            |
| <b>18</b> |                                                                                   | 0.7060                                                                            | GGG60      SNG600/3                                                                 |
| <b>18</b> | 80/55/06                                                                          | 0.7060                                                                            | GGG-60      600/3                                                                   |
| <b>18</b> | 100/70/03                                                                         | 0.7070                                                                            | GGG-70      SNG700/2                                                                |
| <b>18</b> | A48 40 B                                                                          |                                                                                   |                                                                                     |
| <b>19</b> |                                                                                   | 0.8055                                                                            | GTW55                                                                               |
| <b>19</b> | 32510                                                                             | 0.8135                                                                            | GTS-35-10      B 340/12                                                             |
| <b>19</b> | A47-32510                                                                         | 0.8135                                                                            | GTS-35-10      B 340/2                                                              |
| <b>19</b> | A220-40010                                                                        | 0.8145                                                                            | GTS-45-06      P 440/7                                                              |
| <b>19</b> |                                                                                   |                                                                                   | GTS-35      B 340/12                                                                |
| <b>19</b> |                                                                                   |                                                                                   | 8 290/6                                                                             |
| <b>19</b> | 32510                                                                             |                                                                                   | GTS-35      B340/12                                                                 |
| <b>20</b> |                                                                                   | 0.8035                                                                            | GTM-35      W340/3                                                                  |
| <b>20</b> |                                                                                   | 0.8040                                                                            | GTW-40      W410/4                                                                  |
| <b>20</b> |                                                                                   | 0.8045                                                                            |                                                                                     |
| <b>20</b> |                                                                                   | 0.8065                                                                            | GTMW-65                                                                             |
| <b>20</b> | A220-50005                                                                        | 0.8155                                                                            | GTS-55-04      P 510/4                                                              |
| <b>20</b> | 50005                                                                             | 0.8155                                                                            | GTS-55-04      P510/4                                                               |
| <b>20</b> | 70003                                                                             | 0.8165                                                                            | GTS-65-02      P 570/3                                                              |
| <b>20</b> | 90001                                                                             | 0.8170                                                                            | GTS-70-02      P 690/2                                                              |
| <b>20</b> | A220-90001                                                                        | 0.8170                                                                            | GTS-70-02                                                                           |
| <b>20</b> | 1022; 1518                                                                        | 1.1133                                                                            | 20Mn5      120 M 19                                                                 |
| <b>20</b> | 400 10                                                                            |                                                                                   | GTS-45      P440/7                                                                  |
| <b>20</b> | 70003                                                                             |                                                                                   | GTS-65      P 570/3                                                                 |
| <b>21</b> | Al99                                                                              | 3.0205                                                                            |                                                                                     |
| <b>21</b> | 1000                                                                              | 3.0255                                                                            | Al99.5      L31; L34; L36                                                           |
| <b>21</b> |                                                                                   | 3.3315                                                                            | AlMg1                                                                               |
| <b>22</b> |                                                                                   | 3.1325                                                                            | AlCuMg 1                                                                            |
| <b>22</b> |                                                                                   | 3.1655                                                                            | AlCuSiPb                                                                            |
| <b>22</b> |                                                                                   | 3.2315                                                                            | AlMgSi1                                                                             |
| <b>22</b> | 7050                                                                              | 3.4345                                                                            | AlZnMgCuO,5      L 86                                                               |
| <b>22</b> |                                                                                   | 3.437                                                                             | AlZnMgCu 1,5                                                                        |
| <b>23</b> |                                                                                   | 3.2381                                                                            | G-AlSi 10 Mg                                                                        |
| <b>23</b> |                                                                                   | 3.2382                                                                            | GD-AlSi10Mg                                                                         |







| <br><b>France</b><br><b>AFNOR</b> | <br><b>Sweden</b><br><b>SS</b> | <br><b>Italy</b><br><b>UNI</b> | <br><b>Spain</b><br><b>UNE</b> | <br><b>Japan</b><br><b>JIS</b> | <br><b>Russia</b><br><b>GOST</b> |
|--------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|
| FGS 370-17                                                                                                         | 0717-12                                                                                                         |                                                                                                                 |                                                                                                                 | FC250                                                                                                             |                                                                                                                     |
| FGS600-3                                                                                                           | 07 32-03                                                                                                        | GGG 60                                                                                                          | GGG 60                                                                                                          |                                                                                                                   |                                                                                                                     |
| FGS 600/3                                                                                                          | 0727-03                                                                                                         |                                                                                                                 |                                                                                                                 | FCD600                                                                                                            |                                                                                                                     |
| FGS 700-2                                                                                                          | 07 37-01                                                                                                        | GGG 70                                                                                                          | GGG 70                                                                                                          | FCD700                                                                                                            |                                                                                                                     |
|                                                                                                                    |                                                                                                                 |                                                                                                                 | GTW 55                                                                                                          |                                                                                                                   |                                                                                                                     |
| MN35-10                                                                                                            | 810                                                                                                             |                                                                                                                 | GTS 35                                                                                                          |                                                                                                                   | KCh35-10                                                                                                            |
| Mn 35-10                                                                                                           | 0815-00                                                                                                         |                                                                                                                 |                                                                                                                 |                                                                                                                   | KCh35-10                                                                                                            |
| Mn 450-6                                                                                                           | 0852-00                                                                                                         | GMN 45                                                                                                          |                                                                                                                 | FCMW370                                                                                                           |                                                                                                                     |
|                                                                                                                    | 0810-00                                                                                                         |                                                                                                                 |                                                                                                                 |                                                                                                                   |                                                                                                                     |
| MN 32-8                                                                                                            | 814                                                                                                             |                                                                                                                 |                                                                                                                 | AC4A                                                                                                              |                                                                                                                     |
| MN 35-10                                                                                                           | 08 15                                                                                                           |                                                                                                                 |                                                                                                                 | FCMW330                                                                                                           |                                                                                                                     |
| MB35-7                                                                                                             | 852                                                                                                             |                                                                                                                 | GTM 35                                                                                                          |                                                                                                                   |                                                                                                                     |
| MB40-10                                                                                                            |                                                                                                                 | GMB40                                                                                                           | GTM 40                                                                                                          |                                                                                                                   |                                                                                                                     |
|                                                                                                                    |                                                                                                                 | GMB45                                                                                                           | GTM 45                                                                                                          |                                                                                                                   | KCh55-4                                                                                                             |
|                                                                                                                    |                                                                                                                 |                                                                                                                 | GTW 65                                                                                                          |                                                                                                                   | KCh55-4                                                                                                             |
| Mn 550-4                                                                                                           | 0854-00                                                                                                         |                                                                                                                 |                                                                                                                 |                                                                                                                   | KCh60-3                                                                                                             |
| MP 50-5                                                                                                            | 854                                                                                                             | GMN 55                                                                                                          |                                                                                                                 | FCMP490                                                                                                           | KCh70-2                                                                                                             |
| Mn 650-3                                                                                                           | 0856-00                                                                                                         | GMN 65                                                                                                          |                                                                                                                 | FCMP590                                                                                                           | KCh70-2                                                                                                             |
| Mn 700-2                                                                                                           | 0862-00                                                                                                         | GMN 70                                                                                                          |                                                                                                                 | FCMP690                                                                                                           | KCh70-2                                                                                                             |
| Mn 700-2                                                                                                           | 0864-00                                                                                                         |                                                                                                                 |                                                                                                                 |                                                                                                                   | 20G                                                                                                                 |
| 20 M 5                                                                                                             | 2132                                                                                                            | G 22 Mn 3; 20 Mn 7                                                                                              | F.1515-20 Mn 6                                                                                                  | SMnC 420                                                                                                          |                                                                                                                     |
|                                                                                                                    | 08 52                                                                                                           |                                                                                                                 |                                                                                                                 |                                                                                                                   |                                                                                                                     |
| MP 60-3                                                                                                            | 858                                                                                                             |                                                                                                                 |                                                                                                                 | FCMP540                                                                                                           | AD0                                                                                                                 |
| A59050C                                                                                                            |                                                                                                                 |                                                                                                                 |                                                                                                                 |                                                                                                                   | D1                                                                                                                  |
|                                                                                                                    |                                                                                                                 |                                                                                                                 |                                                                                                                 |                                                                                                                   | AD35                                                                                                                |
|                                                                                                                    |                                                                                                                 |                                                                                                                 |                                                                                                                 |                                                                                                                   | AK9                                                                                                                 |
| AZ 4 GU/9051                                                                                                       |                                                                                                                 | 811-04                                                                                                          |                                                                                                                 |                                                                                                                   |                                                                                                                     |
|                                                                                                                    |                                                                                                                 |                                                                                                                 |                                                                                                                 |                                                                                                                   | AK12                                                                                                                |

# ISCAR MATERIAL GROUPS

According to VDI 3323 Standard




| Mtl. No.  |  |  |  |            |
|-----------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|------------|
|           | USA<br>AISI/SAE                                                                   | GERMANY<br>Werkstoff      DIN                                                     | Great Britain<br>BS      EN                                                         |            |
| <b>23</b> | A360.2                                                                            | 3.2383                                                                            | G-AISi0Mg(Cu)                                                                       | LM9        |
| <b>23</b> |                                                                                   | 3.2581                                                                            | G-AISi12                                                                            |            |
| <b>23</b> |                                                                                   | 3.3561                                                                            | G-AlMg 5                                                                            |            |
| <b>23</b> | ZE 41                                                                             | 3.5101                                                                            | G-MgZn4sE1Zr1                                                                       | MAG 5      |
| <b>23</b> | EZ 33                                                                             | 3.5103                                                                            | MgSE3Zn27r1                                                                         | MAG 6      |
| <b>23</b> | AZ 81                                                                             | 3.5812                                                                            | G-MgAl8Zn1                                                                          | NMAG 1     |
| <b>23</b> | AZ 91                                                                             | 3.5912                                                                            | G-MgAl9Zn1                                                                          | MAG 7      |
| <b>23</b> | A356-72                                                                           |                                                                                   |                                                                                     | 2789; 1973 |
| <b>23</b> | 356,1                                                                             |                                                                                   |                                                                                     | LM25       |
| <b>23</b> | A413.2                                                                            |                                                                                   | G-AISi12                                                                            | LM 6       |
| <b>23</b> | A413.1                                                                            |                                                                                   | G-AISi 12<br>(Cu)                                                                   | LM 20      |
| <b>23</b> | A413.0                                                                            |                                                                                   | GD-AISi12                                                                           |            |
| <b>23</b> | A380.1                                                                            |                                                                                   | GD-AISi8Cu3                                                                         | LM24       |
| <b>24</b> |                                                                                   | 2.1871                                                                            | G-AlCu 4 TiMg                                                                       |            |
| <b>24</b> |                                                                                   | 3.1754                                                                            | G-AlCu5Ni1,5                                                                        |            |
| <b>24</b> |                                                                                   | 3.2163                                                                            | G-AISi9Cu3                                                                          |            |
| <b>24</b> | 4218 B                                                                            | 3.2371                                                                            | G-AISi 7 Mg                                                                         |            |
| <b>24</b> | SC64D                                                                             | 3.2373                                                                            | G-AISi9MGWA                                                                         |            |
| <b>24</b> |                                                                                   | 3.2373                                                                            | G-AISi 9 Mg                                                                         |            |
| <b>24</b> | QE 22                                                                             | 3.5106                                                                            | G-MgAg3SE2Zr1                                                                       | mag 12     |
| <b>24</b> | GD-AISi12                                                                         |                                                                                   | G-ALMG5                                                                             | LM5        |
| <b>26</b> | C93200                                                                            | 2.1090                                                                            | G-CuSn 7 5 pb                                                                       |            |
| <b>26</b> | c 83600                                                                           | 2.1096                                                                            | G-CuSn5ZnPb                                                                         | LG 2       |
| <b>26</b> | C 83600                                                                           | 2.1098                                                                            | G-CuSn 2 Znpb                                                                       |            |
| <b>26</b> | C23000                                                                            | 2.1182                                                                            | G-CuPb15Sn                                                                          | LB1        |
| <b>26</b> | C 93800                                                                           | 2.1182                                                                            | G-CuPb15Sn                                                                          |            |
| <b>27</b> |                                                                                   | 2.0240                                                                            | CuZn 15                                                                             |            |
| <b>27</b> | C27200                                                                            | 2.0321                                                                            | CuZn 37                                                                             | cz 108     |
| <b>27</b> | C27700                                                                            | 2.0321                                                                            | CuZn 37                                                                             | cz 108     |
| <b>27</b> |                                                                                   | 2.0590                                                                            | G-CuZn40Fe                                                                          |            |
| <b>27</b> | C 86500                                                                           | 2.0592                                                                            | G-CuZn 35 Al 1                                                                      | U-Z 36 N 3 |
| <b>27</b> | C 86200                                                                           | 2.0596                                                                            | G-CuZn 34 Al 2                                                                      | HTB 1      |
| <b>27</b> | C 18200                                                                           | 2.1293                                                                            | CuCrZr                                                                              | CC 102     |









| <br>France<br>AFNOR | <br>Sweden<br>SS | <br>Italy<br>UNI | <br>Spain<br>UNE | <br>Japan<br>JIS | <br>Russia<br>GOST |
|------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
|                                                                                                      | 4253                                                                                              |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
|                                                                                                      |                                                                                                   |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
| G-TR3Z2                                                                                              |                                                                                                   |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
|                                                                                                      |                                                                                                   |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
| NF A32-201                                                                                           |                                                                                                   |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
|                                                                                                      | 4244                                                                                              |                                                                                                   |                                                                                                   | A5052                                                                                               | AK7                                                                                                   |
|                                                                                                      | 4261                                                                                              |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
|                                                                                                      | 4260                                                                                              |                                                                                                   |                                                                                                   | ADC12                                                                                               | AK12                                                                                                  |
|                                                                                                      | 4247                                                                                              |                                                                                                   |                                                                                                   | A6061                                                                                               |                                                                                                       |
|                                                                                                      | 4250                                                                                              |                                                                                                   |                                                                                                   | A7075                                                                                               |                                                                                                       |
|                                                                                                      |                                                                                                   |                                                                                                   |                                                                                                   |                                                                                                     | VAL 8                                                                                                 |
|                                                                                                      |                                                                                                   |                                                                                                   |                                                                                                   |                                                                                                     | AK8                                                                                                   |
| A-S7G                                                                                                | 4251                                                                                              |                                                                                                   |                                                                                                   | C4BS                                                                                                | AK9                                                                                                   |
|                                                                                                      |                                                                                                   |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
| A-SU12                                                                                               | 4252                                                                                              |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
| U-E 7 Z 5 pb 4                                                                                       |                                                                                                   |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
|                                                                                                      |                                                                                                   |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
| U-pb 15 E 8                                                                                          |                                                                                                   |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
| Uu-PB 15e 8                                                                                          |                                                                                                   |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
|                                                                                                      |                                                                                                   |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
| CuZn 36, CuZn 37                                                                                     |                                                                                                   | C 2700                                                                                            |                                                                                                   |                                                                                                     | L 63                                                                                                  |
| CuZn 36, CuZn 37                                                                                     |                                                                                                   | C2720                                                                                             |                                                                                                   |                                                                                                     | L 63                                                                                                  |
|                                                                                                      |                                                                                                   |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
| HTB 1                                                                                                |                                                                                                   |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
| U-Z 36 N 3                                                                                           |                                                                                                   |                                                                                                   |                                                                                                   |                                                                                                     | LTs23AD; ZMts                                                                                         |
| U-Cr 0.8 Zr                                                                                          |                                                                                                   |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |

# ISCAR MATERIAL GROUPS




According to VDI 3323 Standard







| Mtl. No.  |  |  |  |            |
|-----------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|------------|
|           | USA<br>AISI/SAE                                                                   | GERMANY<br>Werkstoff      DIN                                                     | Great Britain<br>BS      EN                                                         |            |
| <b>28</b> |                                                                                   | 2.0060                                                                            | E-Cu57                                                                              |            |
| <b>28</b> |                                                                                   | 2.0375                                                                            | CuZn36Pb3                                                                           |            |
| <b>28</b> | C 63000                                                                           | 2.0966                                                                            | CuAl 10 Ni 5 Fe 4                                                                   | Ca 104     |
| <b>28</b> | B-148-52                                                                          | 2.0975                                                                            | G-CuAl 10 Ni                                                                        |            |
| <b>28</b> | c 90700                                                                           | 2.1050                                                                            | G-CuSn 10                                                                           | CT1        |
| <b>28</b> | C 90800                                                                           | 2.1052                                                                            | G-CuSn 12                                                                           | pb 2       |
| <b>28</b> | C 81500                                                                           | 2.1292                                                                            | G-CuCrF 35                                                                          | CC1-FF     |
| <b>28</b> |                                                                                   | 2.4764                                                                            | CoCr20W15Ni                                                                         |            |
| <b>31</b> | N 08800                                                                           | 1.4558                                                                            | X 2 NiCrAlTi 32 20                                                                  | NA 15      |
| <b>31</b> | N 08031                                                                           | 1.4562                                                                            | X 1 NiCrMoCu 32 28 7                                                                |            |
| <b>31</b> | N 08028                                                                           | 1.4563                                                                            | X 1 NiCrMoCuN 31 27 4                                                               |            |
| <b>31</b> | N 08330                                                                           | 1.4864                                                                            | X 12 NiCrSi 36 16                                                                   | NA 17      |
| <b>31</b> | 330                                                                               | 1.4864                                                                            | X12 NiCrSi 36 16                                                                    | NA 17      |
| <b>31</b> |                                                                                   | 1.4865                                                                            | G-X40NiCrSi38 18                                                                    | 330 C 40   |
| <b>31</b> |                                                                                   | 1.4958                                                                            | X 5 NiCrAlTi 31 20                                                                  |            |
| <b>31</b> | AMS 5544                                                                          | LW2.4668                                                                          | NiCr19NbMo                                                                          |            |
| <b>32</b> |                                                                                   | 1.4977                                                                            | X 40 CoCrNi 20 20                                                                   |            |
| <b>33</b> | Monel 400                                                                         | 2.4360                                                                            | NiCu30Fe                                                                            | NA 13      |
| <b>33</b> | 5390A                                                                             | 2.4603                                                                            |                                                                                     |            |
| <b>33</b> | Hastelloy C-4                                                                     | 2.4610                                                                            | NiMo16Cr16Ti                                                                        |            |
| <b>33</b> | Nimonic 75                                                                        | 2.4630                                                                            | NiCr20Ti                                                                            | HR 5,203-4 |
| <b>33</b> |                                                                                   | 2.4630                                                                            | NiCr20Ti                                                                            | HR5,203-4  |
| <b>33</b> | Inconel 690                                                                       | 2.4642                                                                            | NiCr29Fe                                                                            |            |
| <b>33</b> | Inconel 625                                                                       | 2.4856                                                                            | NiCr22Mo9Nb                                                                         | NA 21      |
| <b>33</b> | 5666                                                                              | 2.4856                                                                            | NiCr22Mo9Nb                                                                         |            |
| <b>33</b> | Incoloy 825                                                                       | 2.4858                                                                            | NiCr21Mo                                                                            | NA 16      |
| <b>34</b> | Monel k-500                                                                       | 2.4375                                                                            | NiCu30 Al                                                                           | NA 18      |
| <b>34</b> | 4676                                                                              | 2.4375                                                                            | NiCu30Al                                                                            | 3072-76    |
| <b>34</b> |                                                                                   | 2.4631                                                                            | NiCr20TiAl                                                                          | Hr40; 601  |
| <b>34</b> | Inconel 718                                                                       | 2.4668                                                                            | NiCr19FeNbMo                                                                        |            |
| <b>34</b> | Inconel 751                                                                       | 2.4694                                                                            | NiCr16fE7TiAl                                                                       |            |
| <b>34</b> |                                                                                   | 2.4955                                                                            | NiFe25Cr20NbTi                                                                      |            |
| <b>34</b> | 5383                                                                              | LM2.4668                                                                          | NiCr19Fe19NbMo                                                                      | HR8        |
| <b>34</b> | 5391                                                                              | LW2 4670                                                                          | S-NiCr13A16MoNb                                                                     | 3146-3     |

| <br>France<br>AFNOR | <br>Sweden<br>SS | <br>Italy<br>UNI | <br>Spain<br>UNE | <br>Japan<br>JIS | <br>Russia<br>GOST |
|------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
|                                                                                                      |                                                                                                   |                                                                                                   |                                                                                                   |                                                                                                     | LS60-2                                                                                                |
| U-A 10 N                                                                                             |                                                                                                   |                                                                                                   |                                                                                                   |                                                                                                     | BrAD; N10-4-4                                                                                         |
|                                                                                                      |                                                                                                   |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
| UE 12 P                                                                                              |                                                                                                   |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
|                                                                                                      |                                                                                                   |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
| Z1NCDU31-27-03                                                                                       | 2584                                                                                              |                                                                                                   |                                                                                                   |                                                                                                     | EK 77                                                                                                 |
| Z 12 NCS 35.16                                                                                       |                                                                                                   |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
| Z 12 NCS 37.18                                                                                       |                                                                                                   |                                                                                                   |                                                                                                   | SUH330                                                                                              |                                                                                                       |
|                                                                                                      |                                                                                                   | XG50NiCr39 19                                                                                     |                                                                                                   | SCH15                                                                                               |                                                                                                       |
| NC20K14                                                                                              |                                                                                                   |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
| Z 42 CNKDWNb                                                                                         |                                                                                                   |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
| NU 30                                                                                                |                                                                                                   |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
| NC22FeD                                                                                              |                                                                                                   |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
| NC 20 T                                                                                              |                                                                                                   |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
| NC20T                                                                                                |                                                                                                   |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
| Nnc 30 Fe                                                                                            |                                                                                                   |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
| NC 22 FeDNb                                                                                          |                                                                                                   |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
| Inconel 625                                                                                          |                                                                                                   |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
| NC 21 Fe DU                                                                                          |                                                                                                   |                                                                                                   |                                                                                                   |                                                                                                     | KhN38VT                                                                                               |
| NU 30 AT                                                                                             |                                                                                                   |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
|                                                                                                      |                                                                                                   |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
| NC20TA                                                                                               |                                                                                                   |                                                                                                   |                                                                                                   |                                                                                                     | KhN77TYuR                                                                                             |
| NC 19 Fe Nb                                                                                          |                                                                                                   |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
|                                                                                                      |                                                                                                   |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
| NC19eNB                                                                                              |                                                                                                   |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
| NC12AD                                                                                               |                                                                                                   |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |

# ISCAR MATERIAL GROUPS

According to VDI 3323 Standard

| Mtl. No.  |  |  |  |                 |
|-----------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-----------------|
|           | USA<br>AISI/SAE                                                                   | GERMANY<br>Werkstoff      DIN                                                     | Great Britain<br>BS      EN                                                         |                 |
| <b>34</b> | 5660                                                                              | LW2.4662                                                                          | NiFe35Cr14MoTi                                                                      |                 |
| <b>34</b> | 5537C                                                                             | LW2.4964                                                                          | CoCr20W15Ni                                                                         |                 |
| <b>34</b> | AMS 5772                                                                          |                                                                                   | CoCr22W14Ni                                                                         |                 |
| <b>35</b> | Inconel X-750                                                                     | 2.4669                                                                            | NiCr15Fe7TiAl                                                                       |                 |
| <b>35</b> | Hastelloy B                                                                       | 2.4685                                                                            | G-NiMo28                                                                            |                 |
| <b>35</b> | Hastelloy C                                                                       | 2.4810                                                                            | G-NiMo30                                                                            |                 |
| <b>35</b> | AMS 5399                                                                          | 2.4973                                                                            | NiCr19Co11MoTi                                                                      |                 |
| <b>35</b> |                                                                                   | 3.7115                                                                            | TiAl5Sn2                                                                            |                 |
| <b>36</b> | R 50250                                                                           | 3.7025                                                                            | Ti 1                                                                                | 2 TA 1          |
| <b>36</b> | R 52250                                                                           | 3.7225                                                                            | Ti 1 pd                                                                             | TP 1            |
| <b>36</b> | AMS 5397                                                                          | LW2.4674                                                                          | NiCo15Cr10MoAlTi                                                                    |                 |
| <b>37</b> |                                                                                   | 3.7124                                                                            | TiCu2                                                                               | 2 TA 21-24      |
| <b>37</b> | R 54620                                                                           | 3.7145                                                                            | TiAl6Sn2Zr4Mo2Si                                                                    |                 |
| <b>37</b> |                                                                                   | 3.7165                                                                            | TiAl6V4                                                                             | TA 10-13; TA 28 |
| <b>37</b> |                                                                                   | 3.7185                                                                            | TiAl4Mo4Sn2                                                                         | TA 45-51; TA 57 |
| <b>37</b> |                                                                                   | 3.7195                                                                            | TiAl 3 V 2.5                                                                        |                 |
| <b>37</b> |                                                                                   |                                                                                   | TiAl4Mo4Sn4Si0.5                                                                    |                 |
| <b>37</b> | AMS R54520                                                                        |                                                                                   | TiAl5Sn2.5                                                                          | TA14/17         |
| <b>37</b> | AMS R56400                                                                        |                                                                                   | TiAl6V4                                                                             | TA10-13/TA28    |
| <b>37</b> | AMS R56401                                                                        |                                                                                   | TiAl6V4ELI                                                                          | TA11            |
| <b>38</b> | W 1                                                                               | 1.1545                                                                            | C 105 W1                                                                            | BW 1A           |
| <b>38</b> | W210                                                                              | 1.1545                                                                            | C105W1                                                                              | BW2             |
| <b>38</b> |                                                                                   | 1.2762                                                                            | 75 CrMoNiW 6 7                                                                      |                 |
| <b>38</b> | 440C                                                                              | 1.4125                                                                            | X105 CrMo 17                                                                        |                 |
| <b>38</b> |                                                                                   | 1.6746                                                                            | 32 nlcRmO 14 5                                                                      | 832 M 31        |
| <b>40</b> | Ni- Hard 2                                                                        | 0.9620                                                                            | G-X 260 NiCr 4 2                                                                    | Grade 2 A       |
| <b>40</b> | Ni- Hard 1                                                                        | 0.9625                                                                            | G-X 330 Ni Cr 4 2                                                                   | Grade 2 B       |
| <b>40</b> | Ni-Hard 4                                                                         | 0.9630                                                                            | G-X 300 CrNiSi 9 5 2                                                                |                 |
| <b>40</b> |                                                                                   | 0.9640                                                                            | G-X 300 CrMoNi 15 2 1                                                               |                 |
| <b>40</b> | A 532 III A 25% Cr                                                                | 0.9650                                                                            | G-X 260 Cr 27                                                                       | Grade 3 D       |
| <b>40</b> | A 532 III A 25% Cr                                                                | 0.9655                                                                            | G-X 300 CrNMo 27 1                                                                  | Grade 3 E       |
| <b>40</b> | 310                                                                               | 1.4841                                                                            | X15 CrNiSi 25 20                                                                    | 314 S31         |
| <b>41</b> |                                                                                   | 0.9635                                                                            | G-X 300 CrMo 15 3                                                                   |                 |
| <b>41</b> |                                                                                   | 0.9645                                                                            | G-X 260 CrMoNi 20 2 1                                                               |                 |

| <br>France<br>AFNOR | <br>Sweden<br>SS | <br>Italy<br>UNI | <br>Spain<br>UNE | <br>Japan<br>JIS | <br>Russia<br>GOST |
|------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
| ZSNCDT42                                                                                             |                                                                                                   |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
| KC20WN                                                                                               |                                                                                                   |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
| KC22WN                                                                                               |                                                                                                   |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
| NC 15 TNb A                                                                                          |                                                                                                   |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
|                                                                                                      |                                                                                                   |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
| NC19KDT                                                                                              |                                                                                                   |                                                                                                   |                                                                                                   |                                                                                                     | VT5-1<br>VT1-00                                                                                       |
|                                                                                                      |                                                                                                   |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
|                                                                                                      |                                                                                                   |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
|                                                                                                      |                                                                                                   |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
| T-A 6 V                                                                                              |                                                                                                   |                                                                                                   |                                                                                                   |                                                                                                     | VT6                                                                                                   |
|                                                                                                      |                                                                                                   |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
|                                                                                                      |                                                                                                   |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
| T-A5E                                                                                                |                                                                                                   |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
| T-A6V                                                                                                |                                                                                                   |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
|                                                                                                      |                                                                                                   |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
| Y1 105                                                                                               | 1880                                                                                              | C 100 KU                                                                                          | F-5118                                                                                            | SK 3                                                                                                |                                                                                                       |
| Y120                                                                                                 | 2900                                                                                              | C120KU                                                                                            | CF.515                                                                                            | SUP4                                                                                                | U10A                                                                                                  |
| Z 100 CD 17                                                                                          |                                                                                                   | X 105 CrMo 17                                                                                     |                                                                                                   |                                                                                                     | 95Ch18                                                                                                |
| 35 NCD 14                                                                                            |                                                                                                   |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
|                                                                                                      | 0512-00                                                                                           |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
|                                                                                                      | 0513-00                                                                                           |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
|                                                                                                      |                                                                                                   |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
|                                                                                                      | 0466-00                                                                                           |                                                                                                   |                                                                                                   |                                                                                                     | ChWG<br>20Ch25N20S2                                                                                   |
| Z 15 CNS 25-20                                                                                       |                                                                                                   |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
|                                                                                                      |                                                                                                   |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |
|                                                                                                      |                                                                                                   |                                                                                                   |                                                                                                   |                                                                                                     |                                                                                                       |



## Quality Standard

ISCAR has been certified by the prestigious Standards Institution, as being in full compliance with Quality and Environmental & Occupational Health and Safety Management Standards -  
AS 9100 Rev C  
ISO 9001:2008  
ISO 14001:2004  
OHSAS 18001:2007

In addition, completed products are inspected before shipping, to ensure delivery of the finest quality goods. Quality control facilities include the metallurgical laboratory, raw metal testing, an online testing procedure and a machining center for tool performance testing and final product inspection. Only the finest products are packaged for entry into ISCAR's inventory.



THE STANDARDS INSTITUTION OF ISRAEL



THE STANDARDS INSTITUTION OF ISRAEL



THE STANDARDS INSTITUTION OF ISRAEL



THE STANDARDS INSTITUTION OF ISRAEL



**ISCAR LTD.**

**Israel**  
**Headquarters**  
 Tel +972 (0)4 997 0311  
 Fax+972 (0)4 987 3741  
 www.iscar.com  
 headquarter@iscar.co.il

**Argentina**

ISCAR TOOLS ARGENTINA SA  
 Tel +54 114 912 2200  
 Fax+54 114 912 4411  
 admin@iscararg.com.ar  
 www.iscararg.com.ar

**Australia**

ISCAR AUSTRALIA PTY. LTD  
 Tel +61 (0) 2 8848 3500  
 Fax+61 (0) 2 8848 3511  
 iscaraus@iscar.com.au  
 www.iscar.com.au

**Austria**

ISCAR AUSTRIA GmbH  
 Tel +43 7252 71200-0  
 Fax+43 7252 71200-999  
 office@iscar.at  
 www.iscar.at

**Belarus**

JV ALC "TWING-M"  
 Tel +375 17 506-32-38  
 +375 17 506-33-31/65  
 Tel/Fax +375 17 506-32-37  
 info@twing.by  
 www.twing.by, www.iscar.by

**Belgium**

n.v. ISCAR BENELUX s.a.  
 Tel +32 (0) 2 464 2020  
 Fax+32 (0) 2 522 5121  
 info@iscar.be  
 www.iscar.be

**Bosnia**

(Representative Office)  
 Tel +387 32 201 100  
 Fax+387 32 201 101  
 info@iscar.ba

**Brazil**

ISCAR DO BRASIL COML. LTDA.  
 Tel +55 19 3826-7100  
 Fax+55 19 3826-7171  
 DDG 0800 701 8877  
 iscar@iscarbrasil.com.br  
 www.iscar.com.br

**Bulgaria**

ISCAR BULGARIA  
 Tel/Fax +359 431 62557  
 aa\_iscar@infotel.bg  
 www.iscar.bg

**Canada**

ISCAR TOOLS INC.  
 Tel +1 905 829 9000  
 Fax+1 905 829 9100  
 admin@iscar.ca  
 www.iscar.ca

**Chile**

SANDE SA  
 Tel +56 2 695 1700  
 Fax +56 2 697 0332  
 logistica@sande.cl

**China**

ISCAR CHINA  
 Tel +86 10 6561 0261/2/3  
 Fax+86 10 6561 0264  
 iscar@iscar.com.cn  
 www.iscar.com.cn

**Colombia**

RACSI S.A.  
 Tel +57 (1) 4102800  
 Fax +57 (1) 2638988  
 gerencia@racsi.com

**Croatia**

ISCAR ALATI d.o.o.  
 Tel +385 (0) 1 33 23 301  
 Fax +385 (0) 1 33 76 145  
 iscar@zg.t-com.hr  
 www.iscar.hr

**Cyprus**

WAMET (Demetriades) Ltd.  
 Tel +357 (0) 2 336660/5498  
 Fax +357 (0) 2 333386  
 wamet@cytanet.com.cy

**Czech Republic**

ISCAR CR s.r.o.  
 Tel +420 377 420 625  
 Fax +420 377 420 630  
 iscar@iscar.cz  
 www.iscar.cz

**Denmark**

KJ VAERKTOEJ AS/ISCAR DENMARK  
 Tel +45 70 11 22 44  
 Fax++45 46 98 67 10  
 kj@kj.dk  
 www.iscar.dk

**Estonia**

KATOMSK AS  
 Tel +372 6775 671  
 Fax +372 6720 266  
 aleksei@katomsk.ee

**Finland**

ISCAR FINLAND OY  
 Tel +358-(0)9-439 1420  
 Fax +358-(0)9-466 328  
 info@iscar.fi  
 www.iscar.fi

**France**

ISCAR FRANCE SAS  
 Tel +33 (0)1 30 12 92 92  
 Fax+33 (0)1 30 12 95 82  
 info@iscar.fr  
 www.iscar.fr

**Germany**

ISCAR GERMANY GmbH  
 Tel +49 (0) 72 43 9908-0  
 Fax+49 (0) 72 43 9908-93  
 gmbh@iscar.de  
 www.iscar.de

**Greece**

INTERNATIONAL TOOLS  
 K.-X. GEORGOPOULOS & SIA O.E  
 Tel +30 210 346 0133  
 Fax +30 210 342 5621  
 info@internationaltools.gr

**VIMA**

V. MAZLOUMIAN & SONS  
 Tel +30 2310 517-117 / 544-521  
 Fax +30 2310 529-107  
 vimaco@otenet.gr  
 http://www.vimaco.gr

**Hong Kong**

MTC TOOLING SYSTEMS LTD  
 Tel +85-2-23054838  
 Fax +85-2-27988789  
 yoongkamsing@hotmail.com

**Hungary**

ISCAR HUNGARY KFT.  
 Tel +36 28 887 700  
 Fax +36 28 887 710  
 iscar@iscar.hu  
 www.iscar.hu

**India**

LARSEN & TOUBRO Ltd.  
 Tel +91 22 6705 1039 /3371  
 Tel +91 22 6705 1358  
 ask-inp@powai.tlindia.com

**Indonesia**

CV MULTI TEKNIK  
 Tel. +62-21-29206242/44/45/59  
 Fax. +62-21-29206243  
 contact@multi-teknik.co.id

**Ireland**

HARDMETAL MACHINE TOOLS  
 Tel +353 (0) 1 286 2466  
 Fax +353 (0) 1 286 1514  
 phannigan@hardmetal.ie

**Italy**

ISCAR ITALIA srl  
 Tel +39 02 93 528 1  
 Fax +39 02 93 528 213  
 marketing@iscaritalia.it  
 www.iscaritalia.it

**Japan**

ISCAR JAPAN LTD.  
 Tel +81 6 6835 5471  
 Fax +81 6 6835 5472  
 iscar@iscar.co.jp  
 www.iscar.co.jp

**Latvia**

SIA EKL/LS  
 Tel +371 6 733 11 54  
 Fax +371 6 780 56 48  
 eklpstoos@isr.lv

**Lithuania**

MECHA, UB  
 Tel +370 37 407 230  
 Fax +370 37 407 231  
 sigitas@mecha.lt

**Macedonia**

(Representative Office)  
 Tel +389 2 309 02 52  
 Fax +389 2 309 02 54  
 info@iscar.com.mk

**Mexico**

ISCAR DE MÉXICO,  
 Tel +52 (442) 214 5505  
 Fax+52 (442) 214 5510  
 iscar\_mex@iscar.com.mx  
 www.iscar.com.mx

**The Netherlands**

ISCAR NEDERLAND B.V.  
 Tel +31 (0) 182 535523  
 Fax+31 (0) 182 572777  
 info@iscar.nl  
 www.iscar.nl

**New Zealand**

ISCAR PACIFIC LTD.  
 Tel +64 (0) 9 573 1280  
 Fax+64 (0) 9 573 0781  
 iscar@iscarpac.co.nz

**Norway**

SVEA MASKINER AS  
 Tel +47 32277750  
 Fax +47 32277751  
 per.martin.bakken@svea.no

**Philippines**

MESCO  
 Tel +63 2631 1775  
 Fax +63 2635 0276  
 mesco@mesco.com.ph

**Poland**

ISCAR POLAND Sp. z o.o.  
 Tel +48 32 735 7700  
 Fax+48 32 735 7701  
 iscar@iscar.pl  
 www.iscar.pl

**Portugal**

ISCAR PORTUGAL, SA  
 Tel +351 256 579950  
 Fax+351 256 586764  
 info@iscarportugal.pt  
 www.iscarportugal.pt

**Romania**

ISCAR TOOLS SRL  
 Tel +40 (0)312 286 614  
 Fax+40 (0)312 286 615  
 iscar-romania@iscar.com

**Russia**

**Moscow**  
 ISCAR RUSSIA CIS  
 Tel/fax +7 495 660 91 25/31  
 iscar@iscar.ru  
 www.iscar.ru

**Chelyabinsk**

ISCAR RF EAST LTD  
 Tel/fax +7 351 2450432  
 rfe@iscar.com  
 www.iscar.ru

**Serbia**

ISCAR TOOLS d.o.o.  
 Tel +381 11 314 90 38  
 Fax +381 11 314 91 47  
 info@iscartools.rs

**Singapore**

SINO TOOLING SYSTEM  
 Tel +65 6566 7668  
 Fax +65 6567 7336  
 sinotool@singnet.com.sg

**Slovakia**

ISCAR SR, s.r.o.  
 Tel +421 (0) 41 5074301  
 Fax +421 (0) 41 5074311  
 info@iscar.sk  
 www.iscar.sk

**Slovenia**

ISCAR SLOVENIJA d.o.o.  
 Tel +386 1 580 92 30  
 Fax+386 1 562 21 84  
 info@iscar.si  
 www.iscar.si

**South Africa**

ISCAR SOUTH AFRICA (PTY) LTD.  
 ShareCall 08600-47227  
 Tel +27 11 997 2700  
 Fax +27 11 388 9750  
 iscar@iscarsa.co.za  
 www.iscar.co.za

**South Korea**

ISCAR KOREA  
 Tel +82 53 760 7590  
 Fax+82 53 767 7203  
 koss@taegutech.co.kr  
 www.iscarkorea.co.kr

**Spain**

ISCAR IBERICA SA  
 Tel +34 93 594 6484  
 Fax +34 93 582 4458  
 iscar@iscarib.es  
 www.iscarib.es

**Sweden**

ISCAR SVERIGE AB  
 Tel +46 (0) 18 66 90 60  
 Fax +46 (0) 18 122 920  
 info@iscar.se  
 www.iscar.se

**Switzerland**

ISCAR HARTMETALL AG  
 Tel +41 (0) 52 728 0850  
 Fax +41 (0) 52 728 0855  
 office@iscar.ch  
 www.iscar.ch

**Taiwan**

ISCAR TAIWAN LTD.  
 Tel +886 (0)4-24731573  
 Fax +886 (0)4-24731530  
 iscar.taiwan@msa.hinet.net  
 www.iscar.org.tw

**Thailand**

ISCAR THAILAND LTD.  
 Tel +66 (2) 7136633-8  
 Fax+66 (2) 7136632  
 iscar@iscarthailand.com  
 www.isarthailand.com

**Turkey**

ISCAR KESICI TAKIM  
 TIC. VE. IML. LTD  
 Tel +90 (262) 751 04 84 (Pbx)  
 Fax+90 (262) 751 04 85  
 iscar@iscar.com.tr  
 www.iscar.com.tr

**Ukraine**

ISCAR UKRAINE LLC  
 Tel/fax +38 (044) 503-07-08  
 iscar\_ua@iscar.com  
 www.iscar.com.ua

**United Kingdom**

ISCAR TOOLS LTD.  
 Tel +44 (0) 121 422 8585  
 Fax+44 (0) 121 423 2789  
 sales@iscar.co.uk  
 www.iscar.co.uk

**United States**

ISCAR METALS INC.  
 Tel +1 817 258 3200  
 Tech Tel 1-877-BY-ISCAR  
 Fax+1 817 258 3221  
 info@iscarmetals.com  
 www.iscarmetals.com

**Venezuela**

FERREINDUSTRIAL ISO-DIN C.A.  
 Tel +58 2 632 8211/633 4657  
 Fax +58 2 632 5277  
 iso-din@cantv.net

**Vietnam**

ISCAR VIETNAM  
 (Representative Office)  
 Tel +84 8 38 123 519/20  
 Fax +84 8 38 123 521  
 iscarvn@hcm.fpt.vn  
 www.iscarvn.com

"© 2013 Iscar Ltd. This document, as well as all information and other data contained herein and/or derived therefrom, including but not limited to, all trademarks, logos, trade-names, concepts, pictures, designs and/or devices, as well as any data from which any proprietary and/or intellectual property right may emanate ("Information"), is the sole and exclusive property of Iscar Ltd. and is protected by copyright and other applicable laws. No part of any Information may be used or otherwise disseminated for any purpose whatsoever without the express prior written consent of Iscar Ltd.

Items appearing in this catalog may be improved, amended or withdrawn without prior notice."

# **MULTI-MASTER**

INDEXABLE SOLID CARBIDE LINE

**Indexable Solid Carbide Endmills**  
**for Cost Savings.**

**No Setup Time. No Machine Downtime.**

