

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 resharpener 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 E
MM ECF	-	4, 6	10-25		11
MM HR	-	2	8-20		12 E
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

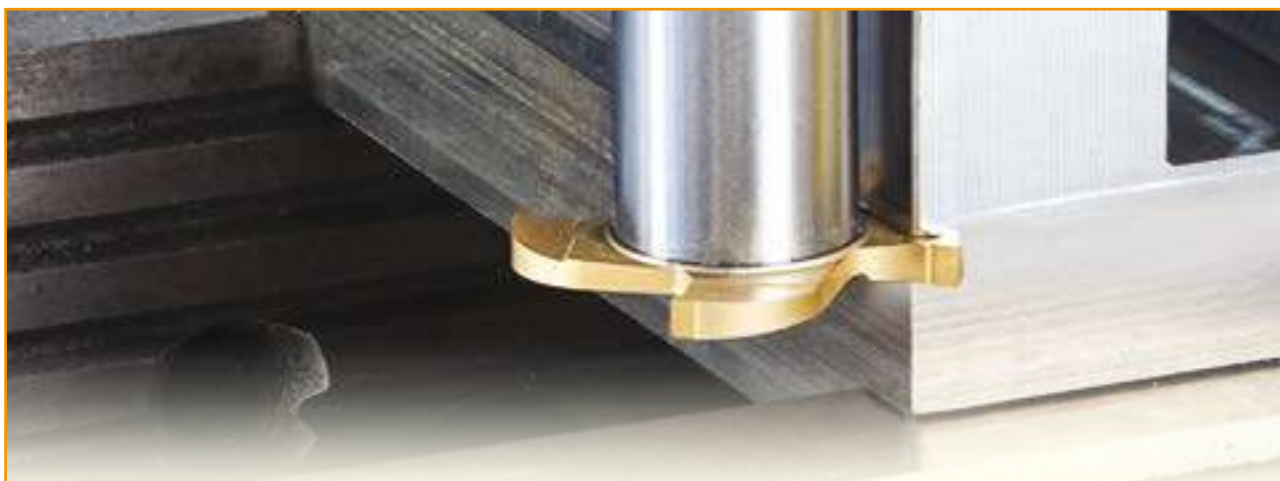
Type	Helix Angle	No. of Flutes	Diameter Range	Remarks	Page
MM TRD-M			15.7, 21.7		31
MM TRD-W			21.7		31
MT-ISO-MM		3-6	10-16		32
MT-UN-MM		3-5	10-16		33
MT-W-MM		4	10, 16		34
MM FF	-	2	10-20		37
MM EFF	-	4, 6	8-25.4		38
MM HT	-	2	10-20		39
MM HT-NCSR	-	2	12		40
MM HT-NWFR	-	2	12		40
MM ETR	30°	6	8-16		41
MM HCR	-	2	8-16	General Finishing	43
MM HRF	-	2	8-16	General Finishing	43
MM HBR	-	2	10-25.4		44
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 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.

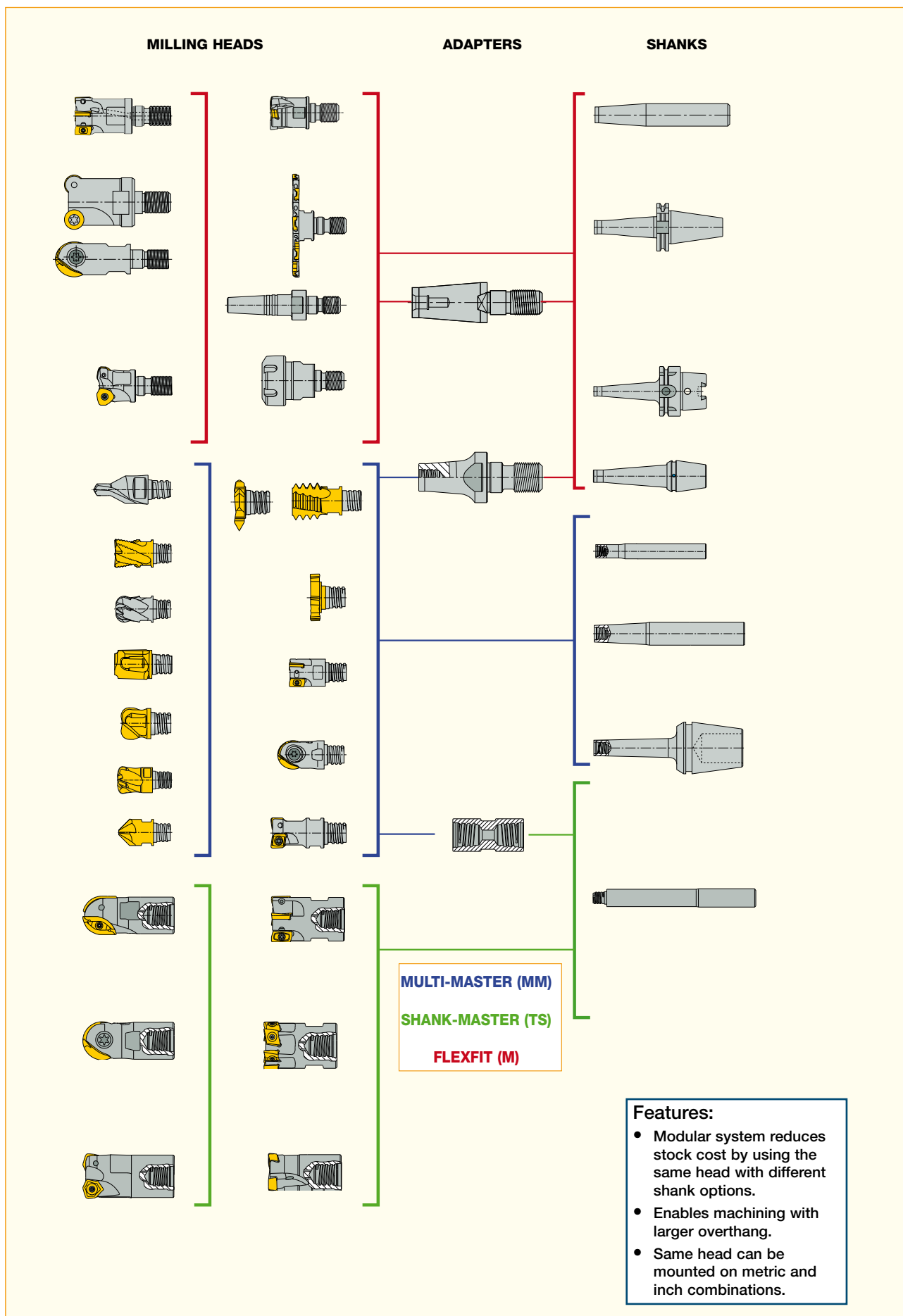


Designation	Thread Size	Key ⁽¹⁾	Tightening Torque (Nxcm)
MM	T04	MM KEY 6x4	400
MM	T05	MM KEY 6x4	700
MM	T06	MM KEY 8x5	1000
MM	T08	MM KEY 10x7	1500
MM	T10	MM KEY 13x8	2800
MM	T12	MM KEY 16x9	2800
MM	T15	MM KEY 20	4000

⁽¹⁾ Order separately



MULTI-MASTER, SHANK-MASTER and FLEXFIT Connection Options

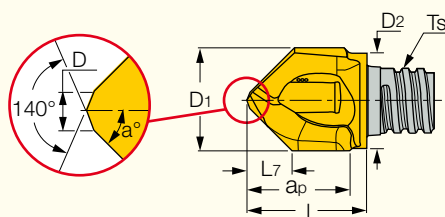
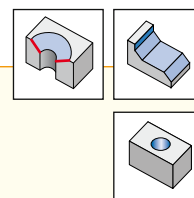


MULTI-MASTER

INDEXABLE SOLID CARBIDE LINE

MM HCD

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

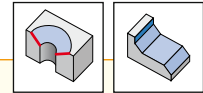
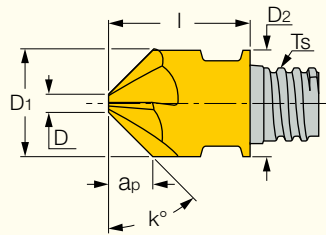


ECONOMICAL SOLUTION

Designation	Dimensions										IC908
	D ₁	Dtol ⁽³⁾	Z	a _p	T _s	D ₂	I	a°	L ₇	D	
MM HCD080-090-2T05 ⁽¹⁾	8.0	z9	2	7.00	T05	7.60	9.75	45	3.15	1.00	●
MM HCD083-090-2T05 ⁽¹⁾	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 ⁽¹⁾	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 ⁽¹⁾	10.4	z9	2	9.00	T06	9.60	11.75	45	4.60	1.50	●
MM HCD120-090-2T08 ⁽¹⁾	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 ⁽¹⁾	12.4	z9	2	11.80	T08	11.50	15.50	45	5.50	1.50	●
MM HCD.500-080-2T08 ⁽²⁾	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 ⁽¹⁾	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 ⁽¹⁾	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 ⁽¹⁾	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.

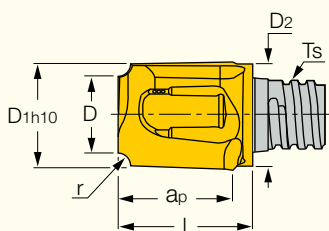
⁽¹⁾ May be used for F-type (fine) countersink according to DIN 74. ⁽²⁾ Countersink according to American National and British standard flat screws. ⁽³⁾ D diameter tolerance



Designation	Dimensions								IC908
	K°	D ₁	Flute	D	a _p	T _s	D ₂	I	
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 ECF45-150-4T08	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





ECONOMICAL SOLUTION

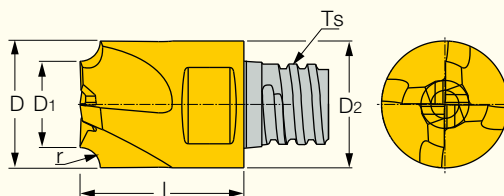
Designation	Dimensions									IC908
	D ₁	r	Z	D	a _p	T _s	D ₂	l	T _m ⁽¹⁾	
MM HR1.0/047-5.8-2T05	8.0	1.00	2	5.80	7.50	T05	7.60	10.60	r0.5-3.0	●
MM HR1.6/063-6.8-2T06	10.0	1.60	2	6.80	9.50	T06	9.60	12.50	r0.5-3.0	●
MM HR2.0/078-6.0-2T06	10.0	2.00	2	6.00	9.50	T06	9.60	12.50	r0.5-3.0	●
MM HR2.5/094-5.1-2T06	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.

⁽¹⁾ Specially tailored radius range upon request.

MM ER

Interchangeable 4 Flute Solid Carbide, Corner Rounding Milling Heads



Designation	Dimensions								IC908
	r	D ₁	D	T _m ⁽¹⁾	Z	l	D ₂	T _s	
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.

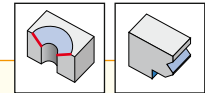
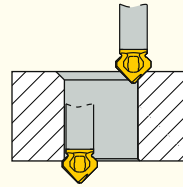
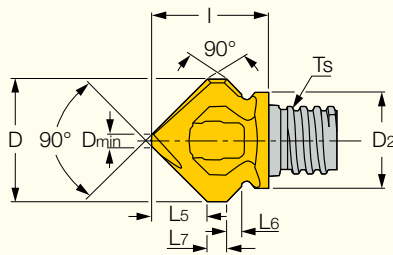
⁽¹⁾ Specially tailored radius range upon request.

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)



ECONOMICAL SOLUTION

Designation	Dimensions										IC908
	D	Z	L ₅	L ₆	L ₇	D _{min}	T _s	D ₂	I		
MM HDF100-090-2T05	9.80	2	4.30	0.90	2.50	1.20	T05	7.60	10.80		●
MM HDF120-090-2T06	11.80	2	5.30	1.20	2.00	1.20	T06	9.30	11.20		●
MM HDF160-090-2T08	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



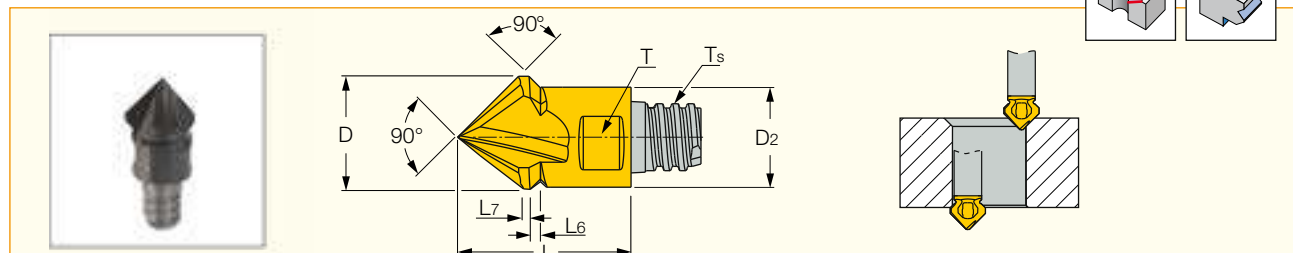
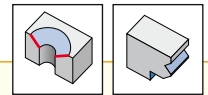
Designation	Wrench
MM HDF100-090-2T05	MM KEY 8X5*
MM HDF120-090-2T06	MM KEY 10X7*
MM HDF160-090-2T08	MM KEY 13X8*

* (Optional, should be ordered separately)



MM EDF

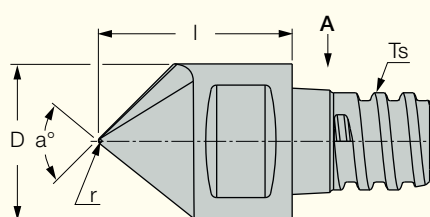
3 Flute Interchangeable Solid Carbide Heads, for Upper and Bottom Chamfering



Designation	Dimensions							IC908
	D	D2	Flute	L6	L7	I	Ts	
MM EDF074-090-58-3T04	7.40	5.80	3	0.90	1.00	10.00	T04	●
MM EDF094-090-76-3T05	9.40	7.60	3	0.90	1.00	12.50	T05	●
MM EDF116-090-95-3T06	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.





View A



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

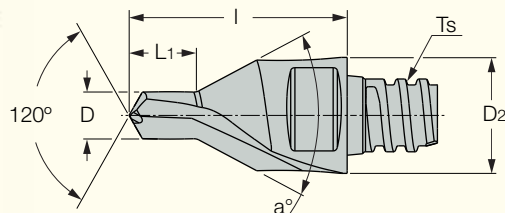


Fig. 1 Type A

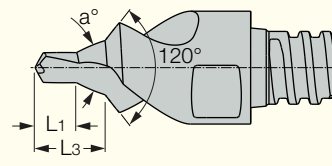


Fig. 2 Type B

Designation	Dimensions								IC908
	D	D ₂	I	L ₁	L ₂	T _s	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	●

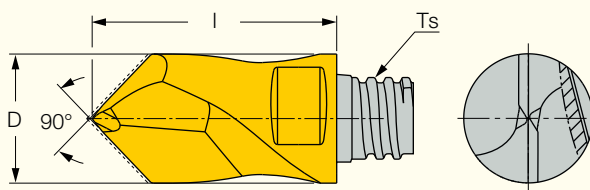
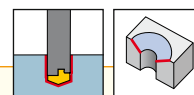
• For shanks, see pages 63-71 • For Clamping keys (should be ordered separately), tightening torques and clamping instructions, see page 8. • Do not apply lubricant to the threaded connection. • For user guide, see pages 72-84.



SOLIDDRILL • MULTI-MASTER

MM ECD

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



Designation	Dimensions			IC908
	D	L	T _s	
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

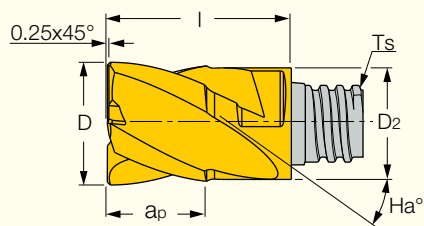
Spare Parts



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)





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

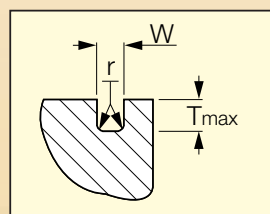
There are two kinds of MULTI-MASTER heads intended for milling slot and grooves: MM GRIT and MM TS. The MM GRIT heads were originally designed for machining internal and external grooves for various O-rings and retaining rings in accordance with international standards - DIN 471 or ANSI B27.7M. The heads 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.

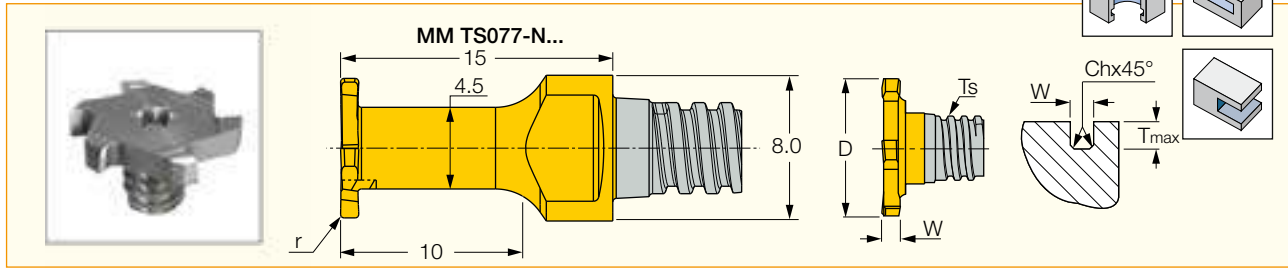


MM GRIT



MM TS





Designation	Dimensions							Tough $\longleftrightarrow$ Hard		
	D ± 0.05	W ± 0.02	T _{max}	Z	r	Ch	T _s	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...

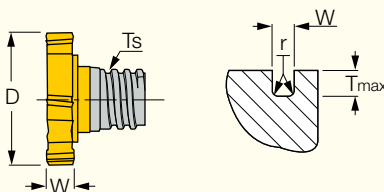
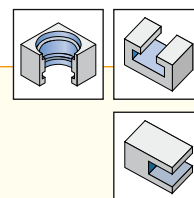


Spare Parts



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*

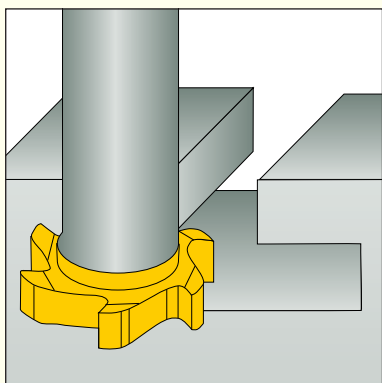
* (Optional, should be ordered separately)



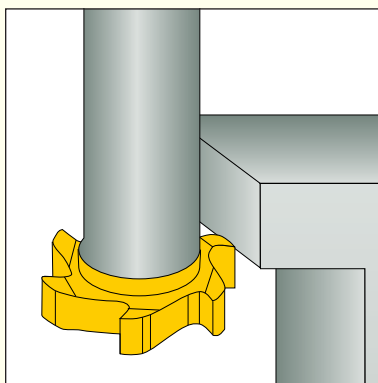
Designation	Dimensions						IC328	Key
	D _{-0.05}	W _{±0.02}	T _{max}	Z	r	T _s		
MM TS135-H30D-06T05	13.50	3.00	2.65	6	0.40	T05	●	T-20/3*
MM TS135-H40D-06T05	13.50	4.00	2.65	6	0.40	T05	●	T-20/3*
MM TS165-H40A-06T05	16.50	4.00	4.25	6	0.20	T05	●	T-20/3*
MM TS160-H20D-06T06	16.00	2.00	3.00	6	0.40	T06	●	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)

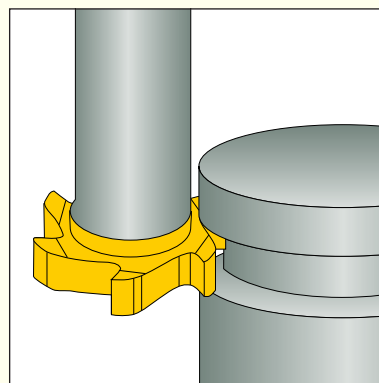




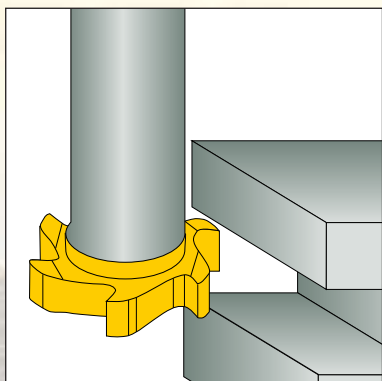
T Slot



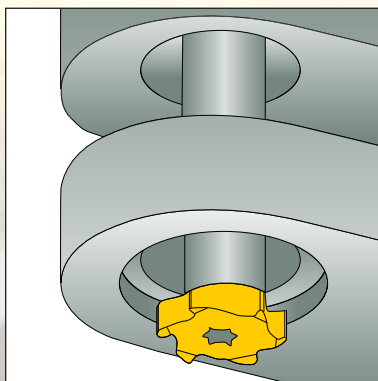
Bottom Deburring



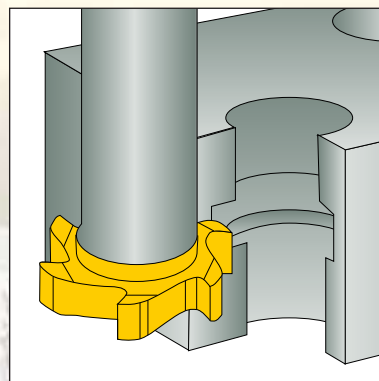
Circular Groove



Straight Groove



Bottom Circular Groove



Internal Circular Groove

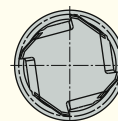
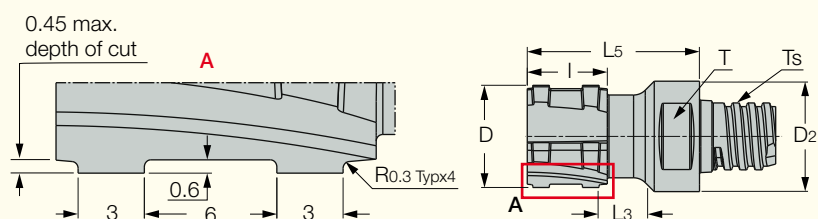


MULTI-MASTER

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 ₄ ⁽¹⁾	D	T _s	Z	L ₅	L ₃	I	D ₂	T ⁽²⁾		
	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.

⁽¹⁾ For minimum tube outer diameter. ⁽²⁾ Clamping wrench size

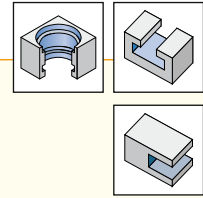
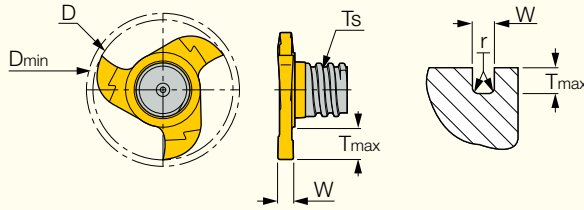
Spare Parts



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)





Designation	Dimensions							IC528
	D	W±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 (1)	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 (1)	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 (1)	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.

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

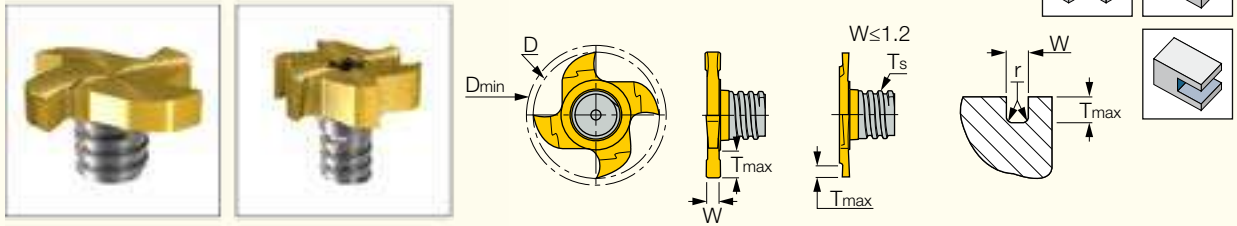
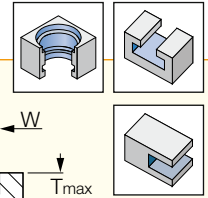
Spare Parts



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

* (Optional, should be ordered separately)

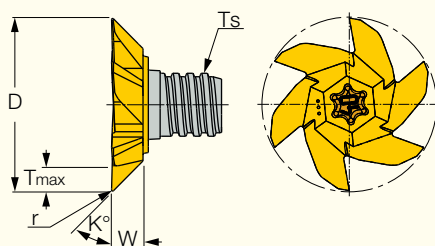




Designation	Dimensions								IC528
	D	W±0.02	T _{max}	Z	r	D _{min} ⁽²⁾	T _s	Clamping Key	
MM GRIT 22K-0.76-0.00 ⁽¹⁾	21.70	0.76	1.50	4	0.00	22.00	T08	MM EGR 20-22*	●
MM GRIT 22K-0.86-0.00 ⁽¹⁾	21.70	0.86	1.70	4	0.00	22.00	T08	MM EGR 20-22*	●
MM GRIT 22K-0.96-0.00 ⁽¹⁾	21.70	0.96	1.90	4	0.00	22.00	T08	MM EGR 20-22*	●
MM GRIT 22K-1.00-0.05	21.70	1.00	2.00	4	0.05	22.00	T08	MM EGR 20-22*	●
MM GRIT 22P-1.00-0.05	21.70	1.00	2.00	4	0.05	22.00	T08	MM EGR 20-22*	●
MM GRIT 22K-1.20-0.05 ⁽¹⁾	21.70	1.20	4.50	4	0.05	22.00	T08	MM EGR 20-22*	●
MM GRIT 22K-1.40-0.05 ⁽¹⁾	21.70	1.40	4.50	4	0.05	22.00	T08	MM EGR 20-22*	●
MM GRIT 22K-1.57-0.00	21.70	1.57	4.50	4	0.00	22.00	T08	MM EGR 20-22*	●
MM GRIT 22K-1.70-0.10 ⁽¹⁾	21.70	1.70	4.50	4	0.10	22.00	T08	MM EGR 20-22*	●
MM GRIT 22P-1.70-0.10 ⁽¹⁾	21.70	1.70	4.50	4	0.10	22.00	T08	MM EGR 20-22*	●
MM GRIT 22K-1.95-0.20 ⁽¹⁾	21.70	1.95	4.50	4	0.20	22.00	T08	MM EGR 20-22*	●
MM GRIT 22K-2.00-0.20	21.70	2.00	4.50	4	0.20	22.00	T08	MM EGR 20-22*	●
MM GRIT 22P-2.00-0.20	21.70	2.00	4.50	4	0.20	22.00	T08	MM EGR 20-22*	●
MM GRIT 22K-2.25-0.20 ⁽¹⁾	21.70	2.25	4.50	4	0.20	22.00	T08	MM EGR 20-22*	●
MM GRIT 22K-2.39-0.20	21.70	2.39	4.50	4	0.20	22.00	T08	MM EGR 20-22*	●
MM GRIT 22K-2.50-0.20	21.70	2.50	4.50	4	0.20	22.00	T08	MM EGR 20-22*	●
MM GRIT 22P-2.50-0.20	21.70	2.50	4.50	4	0.20	22.00	T08	MM EGR 20-22*	●
MM GRIT 22K-2.75-0.20 ⁽¹⁾	21.70	2.75	4.50	4	0.20	22.00	T08	MM EGR 20-22*	●
MM GRIT 22K-3.00-0.20	21.70	3.00	4.50	4	0.20	22.00	T08	MM EGR 20-22*	●
MM GRIT 22P-3.00-0.20	21.70	3.00	4.50	4	0.20	22.00	T08	MM EGR 20-22*	●
MM GRIT 22K-3.17-0.20	21.70	3.17	4.50	4	0.20	22.00	T08	MM EGR 20-22*	●
MM GRIT 22K-3.25-0.20 ⁽¹⁾	21.70	3.25	4.50	4	0.20	22.00	T08	MM EGR 20-22*	●
MM GRIT 22P-3.81-0.20	21.70	3.81	4.50	4	0.20	22.00	T08	MM EGR 20-22*	●
MM GRIT 22K-4.00-0.20	21.70	4.00	4.50	4	0.20	22.00	T08	MM EGR 20-22*	●
MM GRIT 22P-3.98-0.20	21.70	3.98	4.50	4	0.20	22.00	T08	MM EGR 20-22*	●
MM GRIT 22P-4.00-0.20	21.70	4.00	4.50	4	0.20	22.00	T08	MM EGR 20-22*	●
MM GRIT 22P-4.00-2.00	21.70	4.00	4.50	4	2.00	22.00	T08	MM EGR 20-22*	●
MM GRIT 22K-4.25-0.20 ⁽¹⁾	21.70	4.25	4.50	4	0.20	22.00	T08	MM EGR 20-22*	●
MM GRIT 22K-4.25-1.20 ⁽¹⁾	21.70	4.25	4.50	4	1.20	22.00	T08	MM EGR 20-22*	●
MM GRIT 22K-4.75-0.20	21.70	4.75	4.50	4	0.20	22.00	T08	MM EGR 20-22*	●
MM GRIT 22K-5.25-0.20 ⁽¹⁾	21.70	5.25	4.50	4	0.20	22.00	T08	MM EGR 20-22*	●
MM GRIT 22K-6.00-3.00	21.70	6.00	4.50	4	3.00	22.00	T08	MM EGR 20-22*	●
MM GRIT 28K-2.50-0.2	27.70	2.50	6.00	6	0.20	28.00	T10	T-40/3 L*	●
MM GRIT 28K-5.25-0.2	27.70	5.25	6.00	6	0.20	28.00	T10	T-40/3 L*	●
MM GRIT 28P-7.0-3.5	27.70	7.00	5.70	6	3.50	28.00	T10	T-40/3 L*	●
MM GRIT 28K-10.0-0.2	27.70	10.00	6.00	6	0.20	28.00	T10	T-40/3 L*	●

- Recommended for O-rings and retaining rings • MM EGR 20-22 clamping keys are supplied with each MM GRT... shank • Tightening torque for MM GRIT 22: 1500 Nxcmm, for MM GRIT 28: 2800 Nxcmm • K - for general steel & cast iron machining P - for soft and gummy materials • Modification options on request.
- Do not apply lubricant to the threaded connection. • For clamping instructions, see page 8. • For user guide, see pages 72-84.
- For shanks, see pages 63-71.

⁽¹⁾ For circle clips according to DIN471/472 and ANSI B27.7M ⁽²⁾ Minimum bore diameter.



Designation	Dimensions							IC528
	D	K°	T _{max}	W	r	T _s	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)

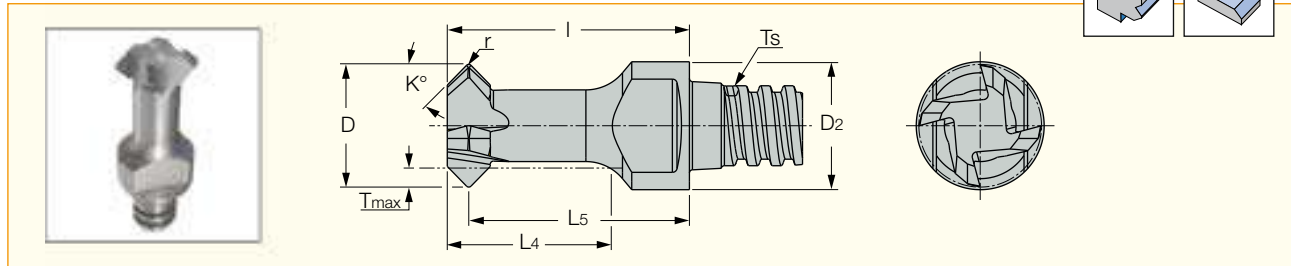
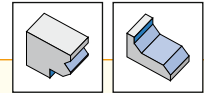


MULTI-MASTER

INDEXABLE SOLID CARBIDE LINE

MM TS-45

Interchangeable Solid Carbide Small Diameter 45° Chamfering Heads



Dimensions											IC908
Designation	D	K°	T _{max}	r	Z	L	T _s	D ₂	L ₄	L ₅	
MM TS077-45-20A-4T05	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

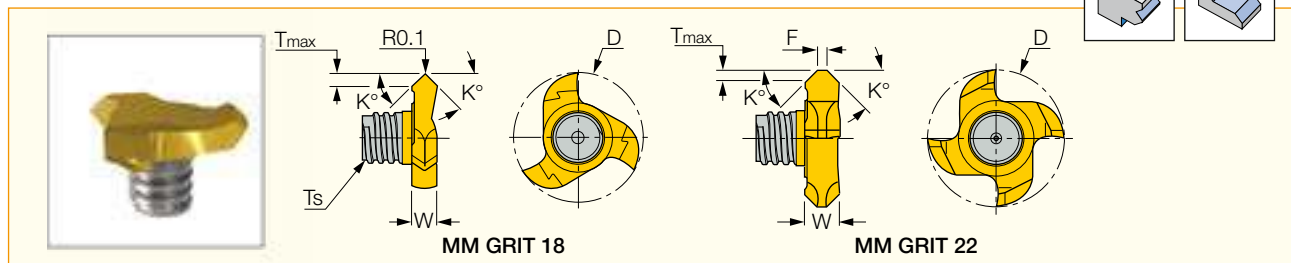
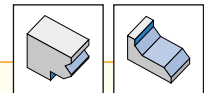


Designation	Wrench
MM TS-45	MM KEY 6X4*

* (Optional, should be ordered separately)

MM GRIT-K/P-45A

Interchangeable Solid Carbide Small Diameter 45° Chamfering Heads



Dimensions									IC528
Designation	D	K°	T _{max}	F	W	T _s	Z	Clamping Key	
MM GRIT 18K-45A	17.70	45.0	1.40	-	3.40	T06	3	MM EGR 16-18*	
MM GRIT 18P-45A	17.70	45.0	1.40	-	3.40	T06	3	MM EGR 16-18*	•
MM GRIT 22K-45A	21.70	45.0	1.70	1.50	5.50	T08	4	MM EGR 20-22*	•
MM GRIT 22P-45A	21.70	45.0	1.70	1.50	5.50	T08	4	MM EGR 20-22*	•
MM GRIT 28K-45A	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.

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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.

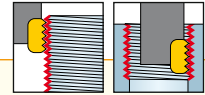
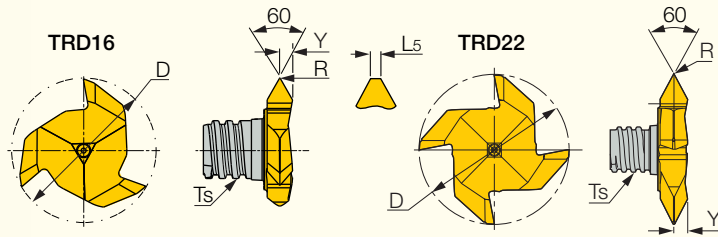
Available are 60 and 55° partial profile thread milling heads and ISO, UN and Whitworth standard profiles for external and internal thread milling applications.



MM TRD-M

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

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Designation	Dimensions											IC528	
	D	Z	P _{min}	P _{max}	R	L ₅	Y	T _s	T _h ⁽¹⁾	D _{min}	Standard		
	MM TRD16-M60-05P-3T06	15.70	3	0.50	2.00	- ⁽²⁾	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.

⁽¹⁾ Smallest possible thread ⁽²⁾ Flat

Spare Parts

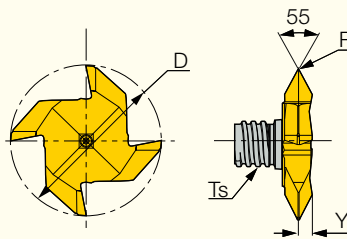
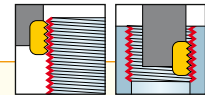


Designation	Clamping Key
MM TRD16-M60-05P-3T06	MM EGR 16-18*
MM TRD16-M60-15P-3T06	MM EGR 16-18*
MM TRD22-M60-30P-4T08	MM EGR 20-22*

* (Optional, should be ordered separately)

MM TRD-W

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



Designation	Dimensions										IC528
	D	Z	R	Y	TPI _{max}	TPI _{min}	T _s	T _h	D _{min}	Standard	
	MM TRD22-W55-14P-4T08	21.70	4	0.20	2.4	14	11	T08	G3/4	24.20	

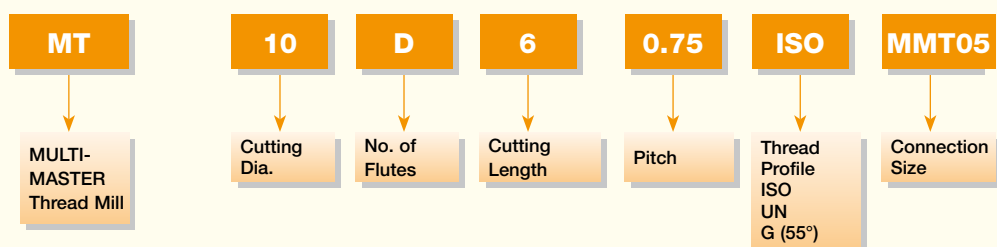
• For shanks, see pages 63-71 • For clamping instructions, see page 8. • Do not apply lubricant to the threaded connection.

Spare Parts



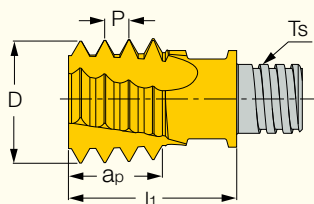
Designation	Clamping Key
MM TRD-W	MM EGR 20-22*

Identification Code



MT-ISO-MM

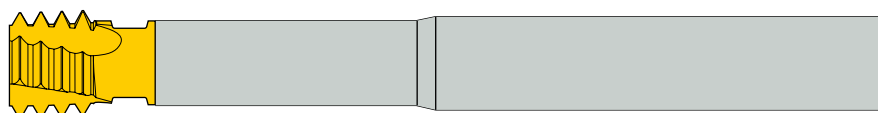
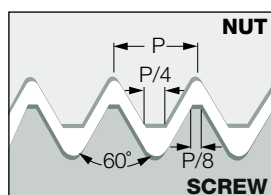
Carbide Milling Heads with a Threaded Connection for Internal ISO Metric Thread



Application: General engineering

Designation	Dimensions								IC908
	Pitch	M Coarse	M Fine	D	Flute	ap	l1	Ts	
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



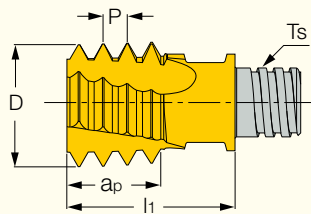
Designation	Thread Size	Key ⁽¹⁾	Tightening Torque (NxcM)
MM... T05	T05	MM KEY 6x4	700
MM... T06	T06	MM KEY 8x5	1000
MM... T08	T08	MM KEY 10x7	1500

⁽¹⁾ Order separately

MT-UN-MM

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

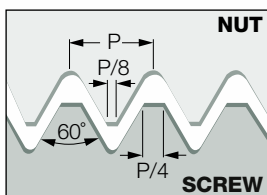
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Application: General engineering

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

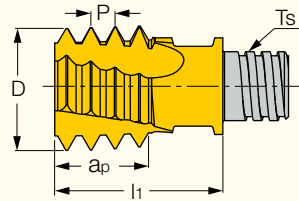
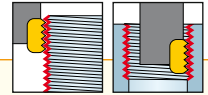


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INDEXABLE SOLID CARBIDE LINE

MT-W-MM

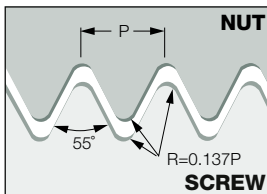
Carbide Milling Heads with a Threaded Connection, for Internal and External 55° BSW Thread Profile



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



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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.

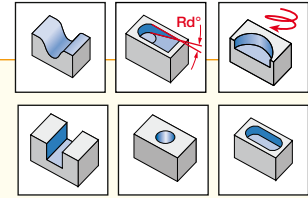
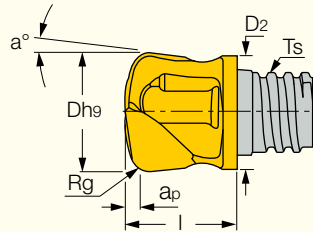
Consequently, it causes substantial vibration reduction and correspondingly stability of milling.

MULTI-MASTER • SOLID^{FEED} 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.

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ECONOMICAL SOLUTION

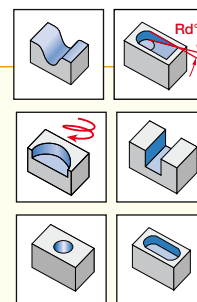
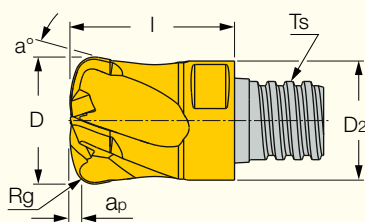
Designation	Dimensions									Tough ↔ Hard		Recommended Machining Data f _z (mm/t)
	D	Flute	a _p	R _g ⁽¹⁾	T _s	D ₂	l	a°	R _d °	IC908	IC903	
MM FF100R1.5-L12-2T06	10.00	2	0.60	2.00	T06	9.60	12.50	7	7.0	●		0.30-0.60
MM FF120R2.0-2T08	12.00	2	0.68	2.50	T08	11.50	11.10	7	7.0	●	●	0.50-1.00
MM FF500R08-L59-2T08	12.70	2	0.68	2.50	T08	11.50	15.00	5	7.0	●		0.50-1.00
MM FF160R2.0-2T10	16.00	2	1.10	3.00	T10	15.20	13.50	7	7.0	●		0.55-1.10
MM FF200R2.0-2T12	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.

⁽¹⁾ Radius for programming



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



Designation	Dimensions								Tough ↔ Hard		Recommended Machining Data f _z (mm/t)
	D	Z	a _p	T _s	D ₂	l	a°	R _g ⁽³⁾	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 ⁽¹⁾	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 ⁽¹⁾	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 ⁽²⁾	25.00	6	1.20	T15	23.90	25.00	7	3.10		●	0.25-1.00
MM EFF254A7R3.63-6T15 ⁽²⁾	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.

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

Machining Recommendations

VDI 3323	Material Group ⁽¹⁾	Vc (m/min)	Fz (mm/t) vs. Tool Diameter (mm)							
			a _p	a _e	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 _p max	0.7xD	0.45	0.52	0.60	0.70	0.80	0.90
	17-18	160	A _p max	0.7xD	0.38	0.45	0.52	0.60	0.70	0.80
H	38.1 ⁽²⁾	100	0.035xD	0.45xD	0.20	0.25	0.33	0.40	0.48	0.55
	38.2 ⁽³⁾	80	0.03xD	0.3xD	0.16	0.22	0.30	0.38	0.45	0.52
	39 ⁽⁴⁾	60	0.02xD	0.25xD	0.12	0.16	0.16	0.20	0.20	0.25

⁽¹⁾ ISCAR material group in accordance with VDI 3323 standard

⁽²⁾ 45-49 HRC

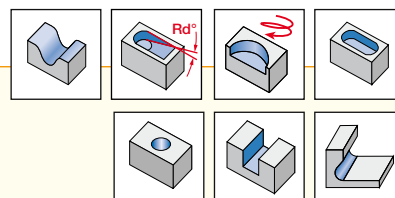
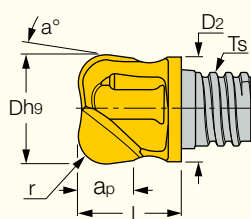
⁽³⁾ 50-55 HRC

⁽⁴⁾ 56-63 HRC

a_p - Depth of cut

a_e - Width of cut





ECONOMICAL SOLUTION

Designation	Dimensions									Tough ↔ Hard	
	D	Flute	ap	r	Tm ⁽¹⁾	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	●	

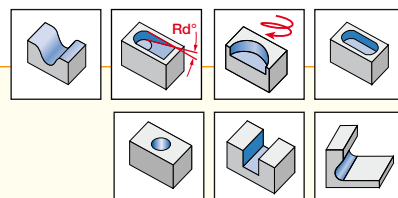
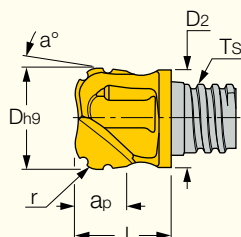
• For shanks, see pages 63-71 • For Clamping keys (should be ordered separately), tightening torques and clamping instructions, see page 8. • Do not apply lubricant to the threaded connection. • For user guide, see pages 72-84.

⁽¹⁾ Specially tailored radius range upon request



MM HT-NCSR

2 Flute Chip Splitting Toroidal, Solid Carbide Milling Heads



ECONOMICAL SOLUTION

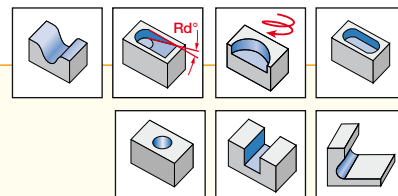
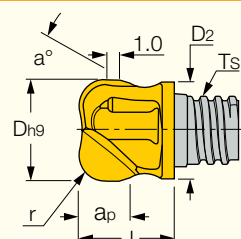
Designation	Dimensions									IC908
	D	Flute	ap	r	Tm ⁽¹⁾	Ts	D2	l	a°	
MM HT120NCSR3.0-2T08	12.00	2	5.50	3.00	r2.7-4.4	T08	11.50	11.10	7	●

• 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.

⁽¹⁾ Specially tailored radius range, available upon request.

MM HT-NWFR

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

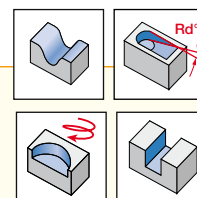
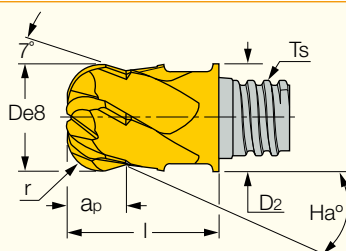


ECONOMICAL SOLUTION

Designation	Dimensions									IC908
	D	Flute	ap	r	Tm ⁽¹⁾	Ts	D2	l	a°	
MM HT120NWFR3.0-2T08	12.00	2	5.30	3.00	r2.7-4.4	T08	11.50	11.10	7	●

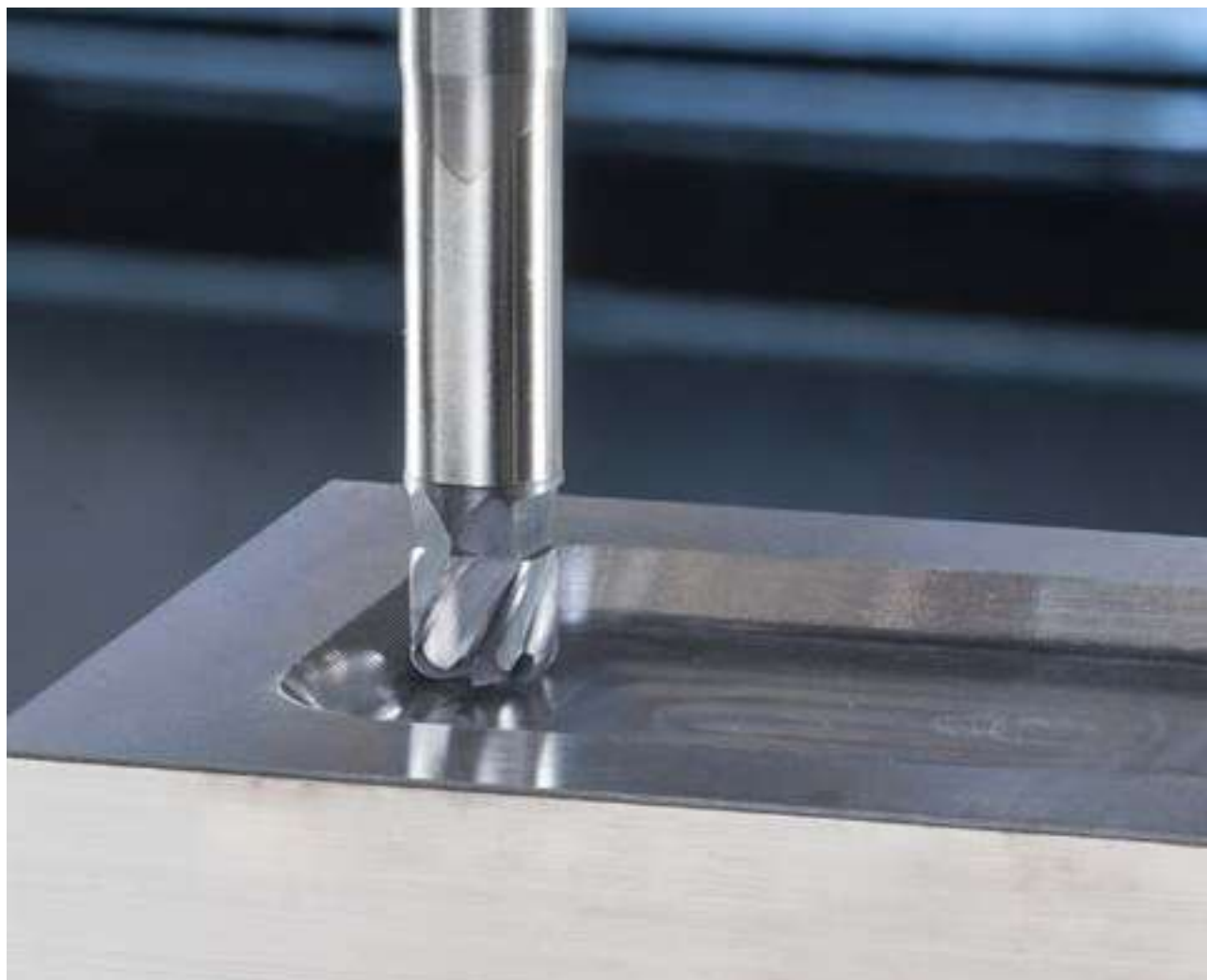
• For shanks, see pages 63-71 • For Clamping keys (should be ordered separately), tightening torques and clamping instructions, see page 8. • Do not apply lubricant to the threaded connection. • For user guide, see pages 72-84.

⁽¹⁾ Specially tailored radius range, available upon request.



Designation	Dimensions									Tough ↔ Hard	
	D	Flute	a _p	r	T _s	D ₂	l	H _a °	R _d °	IC908	IC903
MM ETR080A04R2.0-6T05	8.00	6	5.00	2.00	T05	7.70	10.00	30.0	9.0	●	
MM ETR080A4R05CF-6T05	8.00	6	4.00	0.50	T05	7.70	0.00	10.0	9.0		●
MM ETR080A4R10CF-6T05	8.00	6	4.00	1.00	T05	7.70	0.00	10.0	9.0		●
MM ETR100A05R3.0-6T06	10.00	6	7.00	3.00	T06	9.60	13.00	30.0	9.0	●	
MM ETR100A5R05CF-6T06	10.00	6	5.00	0.50	T06	9.60	0.00	13.0	9.0		●
MM ETR100A5R10CF-6T06	10.00	6	5.00	1.00	T06	9.60	0.00	13.0	9.0		●
MM ETR120A07R4.0-6T08	12.00	6	9.00	4.00	T08	11.70	16.50	30.0	9.0	●	
MM ETR120A7R05CF-6T08	12.00	6	7.00	0.50	T08	12.00	0.00	17.0	9.0		●
MM ETR120A7R10CF-6T08	12.00	6	7.00	1.00	T08	12.00	0.00	17.0	9.0		●
MM ETR160A09R5.0-6T10	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.



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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).

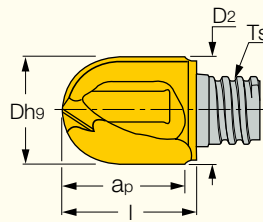
The cutting geometry of MM EB... heads is not different from the solid carbide ball nose cutters; however the heads usually have smaller cutting lengths. The approach to finding cutting data for MM EB... heads is the same as the method for the solid cutters.

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			ground		h7							finish + milling hard steel
MM HBR	~240°	no			h7							
MM EB	180°	yes		2; 4	e8							rough to finish



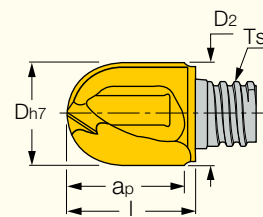
ECONOMICAL SOLUTION

Designation	Dimensions						IC908
	D	Flute	a _p	T _s	D ₂	l	
MM HCR080-2T05	8.00	2	7.80	T05	7.60	9.95	●
MM HCR100-2T06	10.00	2	10.00	T06	9.60	12.35	●
MM HCR120-2T08	12.00	2	11.45	T08	11.50	15.30	●
MM HCR.500-2T08	12.70	2	12.90	T08	12.20	16.40	●
MM HCR160-2T10	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.

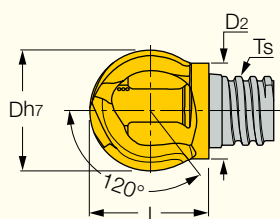
MM HRF

Interchangeable 2 Flute Solid Carbide Ball Nose Finish Milling Heads



Designation	Dimensions						Tough ↔ Hard	
	D	Flute	a _p	T _s	D ₂	l	IC908	IC903
MM HRF080-2T05	8.00	2	7.60	T05	7.60	9.95	●	●
MM HRF100-2T06	10.00	2	10.20	T06	9.60	12.35	●	●
MM HRF120-2T08	12.00	2	11.50	T08	11.50	15.30	●	●
MM HRF160-2T10	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.



ECONOMICAL SOLUTION

Designation	Dimensions					IC908
	D	Flute	T _s	D ₂	I	
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.

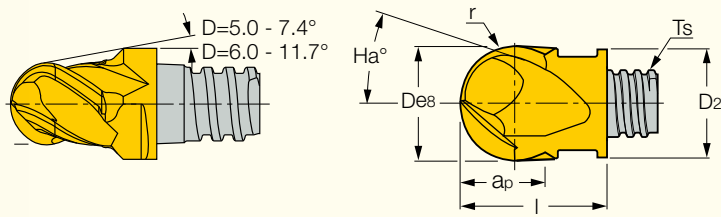
Spare Parts



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)





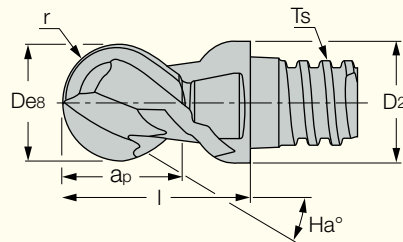
Designation	Dimensions								IC908
	D	Flute	ap	r	Ts	D2	I	Ha°	
MM EB050E07-4T05	5.00	4	7.00	2.49	T05	8.00	15.00	38.0	●
MM EB060E05-4T05	6.00	4	5.00	2.99	T05	8.00	10.00	38.0	●
MM EB080A05-2T05	8.00	2	5.00	3.98	T05	7.70	10.00	30.0	●
MM EB080A05-4T05	8.00	4	5.00	3.98	T05	7.70	10.00	30.0	●
MM EB100A07-2T06	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 ⁽¹⁾	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.

⁽¹⁾ 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	ap	r	r _{toler}	Ts	D2	I	Ha°	
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.

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90° Endmill Cutting Heads

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

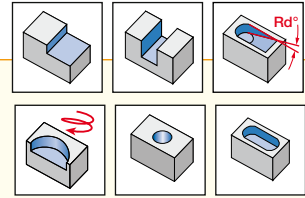
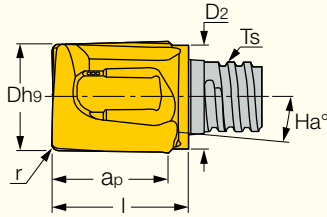
The first, which is designated MM EC..., has exactly the same cutting geometry (number of flutes, helix angle, etc.) as the solid carbide endmills. The only difference is a smaller cutting length: normally, it does not exceed a head diameter. Naturally, the cutting data for MM EC... heads is the same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



ECONOMICAL SOLUTION

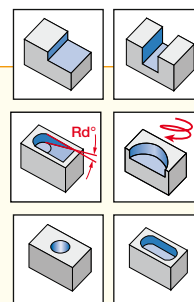
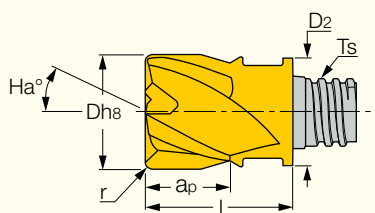
Designation	Dimensions									Tough ↔ Hard		Recommended Machining Data f _z (mm/t)
	D	Flute	a _p	r	T _s	D ₂	l	H _a °	T _m (¹)	IC908	IC903	
MM HC078C08R0.2-2T05	7.80	2	7.70	0.20	T05	7.60	10.00	10.0	r0-2.0	●		0.03-0.09
MM HC080C08R0.4-2T05	8.00	2	7.70	0.40	T05	7.60	10.00	10.0	r0-2.0	●	●	0.03-0.09
MM HC080C08R1.0-2T05	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.

(¹) Specially tailored radius range, available upon request.



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

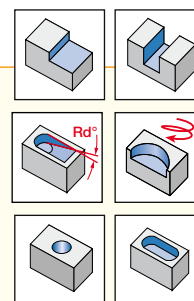
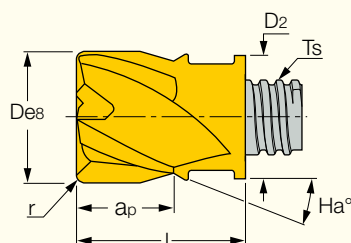


Designation	Dimensions								IC908	Recommended Machining Data
	D	Flute	a _p	r	T _s	D ₂	l	H _a °		f _z (mm/t)
MM ECU077E04R020-3T05	7.70	3	4.00	0.20	T05	7.70	10.00	38.0	●	0.03-0.08
MM ECU097E05R030-3T06	9.70	3	5.00	0.30	T06	9.60	13.00	38.0	●	0.03-0.09
MM ECU117E07R030-3T08	11.70	3	7.00	0.30	T08	11.50	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 °		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⁽¹⁾	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.

⁽¹⁾ With coolant holes directed to each flute

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INDEXABLE SOLID CARBIDE LINE

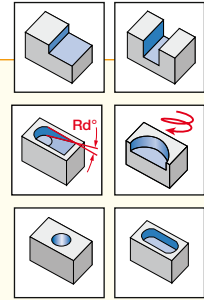
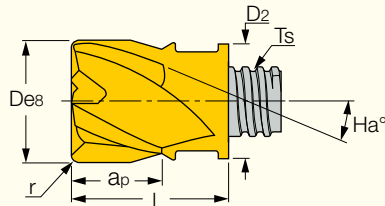
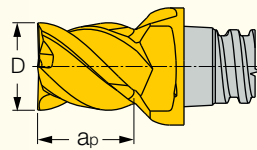
MM EC-4

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

Engineered for
MAXIMUM
MULTI-MASTER
Performance



D= 5.0 and 6.0



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.

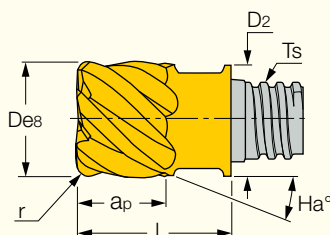
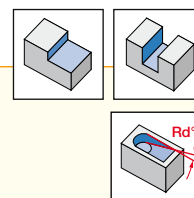


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INDEXABLE SOLID CARBIDE LINE

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 _p	r	T _s	D ₂	l	H _a °	R _d °		f _z (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.

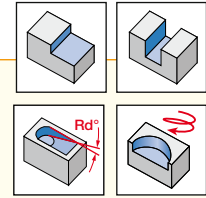
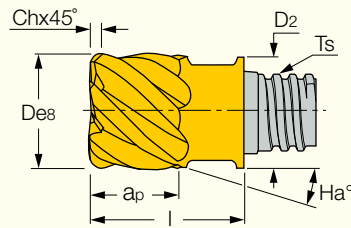


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INDEXABLE SOLID CARBIDE LINE
MM EC-D

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

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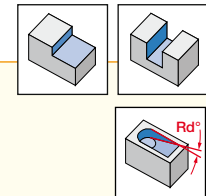
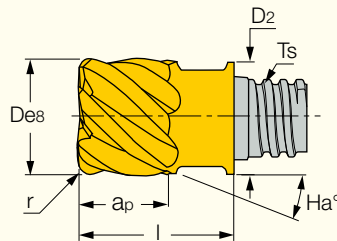


Designation	Dimensions									IC903	Recommended Machining Data
	D	Flute	a _p	Ch	T _s	D ₂	I	H _a °	R _d °		f _z (mm/t)
MM EC080D05C01-6T05	8.00	6	5.00	0.10	T05	7.70	10.00	50.0	2.0	●	0.03-0.10
MM EC100D07C01-6T06	10.00	6	7.00	0.10	T06	9.60	13.00	50.0	2.0	●	0.03-0.10
MM EC120D09C01-6T08	12.00	6	9.00	0.10	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	a _p	r	T _s	D ₂	l	H _a °	R _d °		f _z (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 ⁽¹⁾	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.

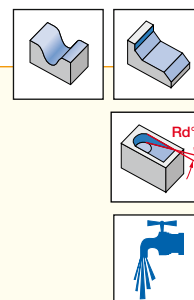
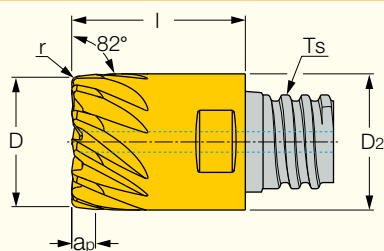
⁽¹⁾ With a central coolant hole

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 f _z (mm/t)
	D	r	Flute	a _p	T _s	l	R _d °		
MM ET11/8H4R10CF-8T08H	11.00	1.00	8	3.50	T08	16.50	3.0	●	0.04-0.10
MM ET15/8H4R10CF-12T10H	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.

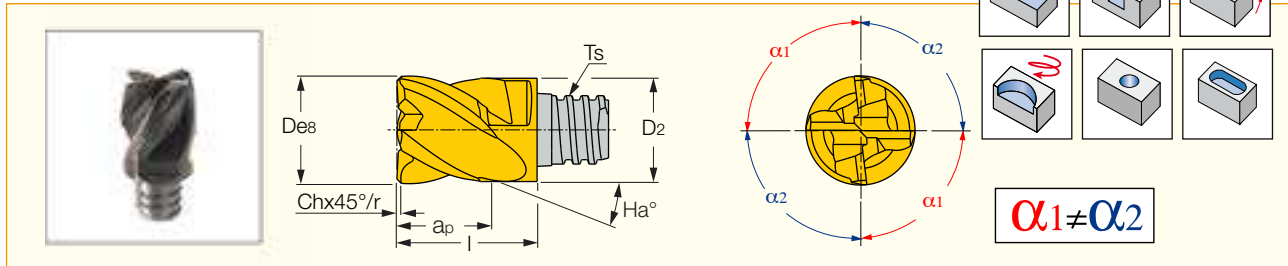
MULTI-MASTER • CHATTERFREE

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
	D	Ch	r	Flute	a _p	T _s	D ₂	l	H _a °		f _z (mm/t)
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.

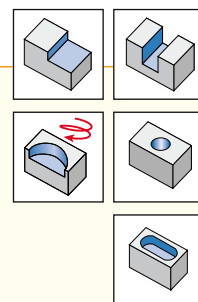
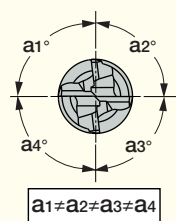
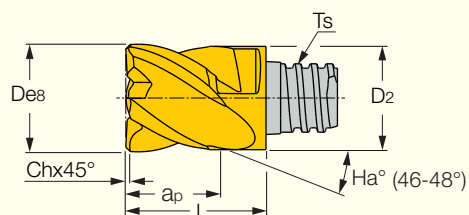
⁽¹⁾ With coolant holes directed to each flute

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	ap	Ts	D2	l	Rd°			fz (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

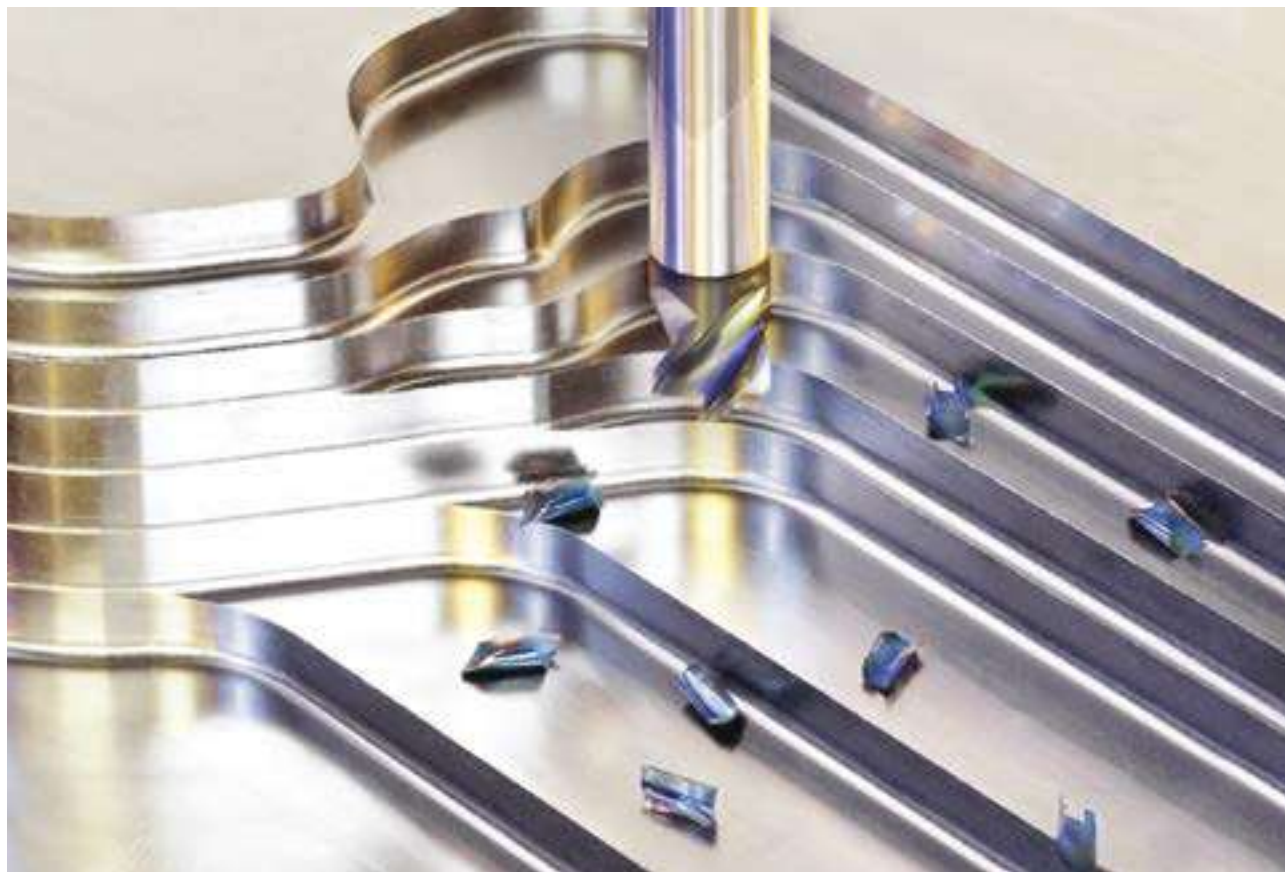
• For shanks, see pages 63-71 • For Clamping keys (should be ordered separately), tightening torques and clamping instructions, see page 8. • Do not apply lubricant to the threaded connection. • For user guide, see pages 72-84.

Spare Parts



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

* (Optional, should be ordered separately)



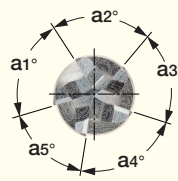
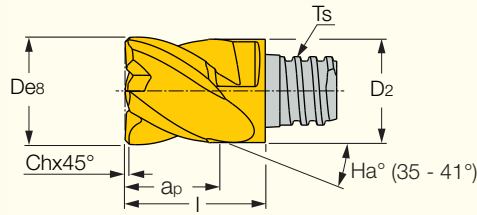
MULTI-MASTER

INDEXABLE SOLID CARBIDE LINE

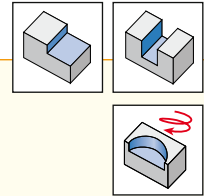
MM EC-H-5

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

Engineered for
MAXIMUM
MULTI-MASTER
Performance



$a1 \neq a2 \neq a3 \neq a4 \neq a5$



Designation	Dimensions									Recommended Machining Data
	D	Ch	Flute	a_p	T_s	D_2	I	R_d°	IC308	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.

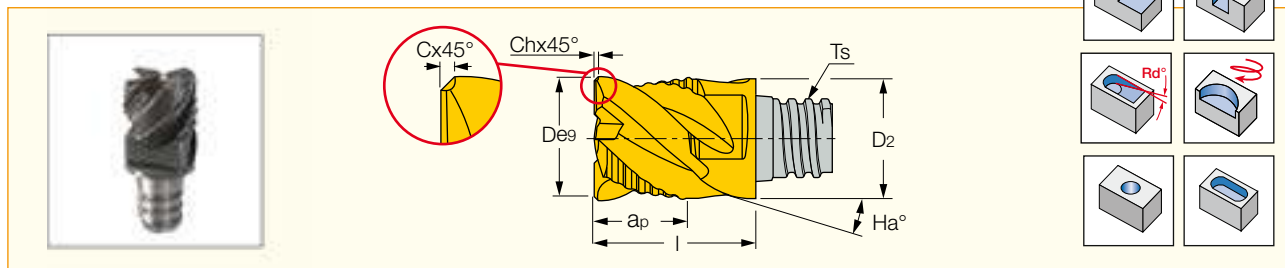
Spare Parts



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)

Combination of Roughing and Finishing Interchangeable Solid Carbide Endmill Heads



Designation	Dimensions								IC908	Recommended Machining Data
	D	Flute	ap	Ch	Ts	D2	l	Ha°		fz (mm/t)
MM EFS080B05-4T05	8.00	4	5.00	0.30	T05	7.70	10.00	45.0	●	0.03-0.08
MM EFS100B07-4T06	10.00	4	7.00	0.30	T06	9.60	13.00	45.0	●	0.03-0.09
MM EFS120B09-4T08	12.00	4	9.00	0.40	T08	11.70	16.50	45.0	●	0.04-0.10
MM EFS160B12-4T10	16.00	4	12.00	0.60	T10	15.30	20.50	45.0	●	0.05-0.11
MM EFS200B15-4T12	20.00	4	15.00	0.60	T12	18.30	25.50	45.0	●	0.05-0.11
MM EFS250B22-4T15	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.

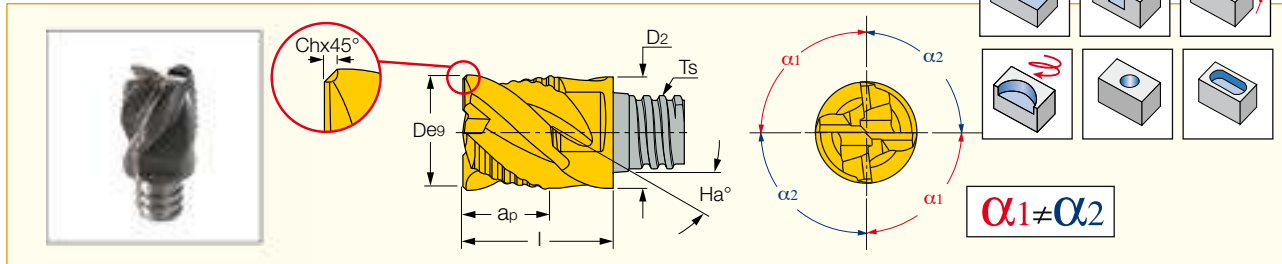
FINISHRED • CHATTERFREE

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

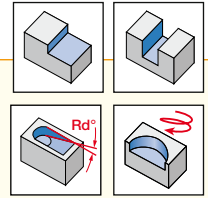
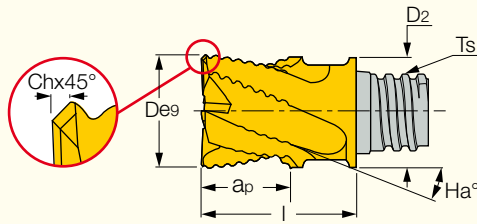


Designation	Dimensions								IC908	Recommended Machining Data	
	D	Flute	a _p	Ch	T _s	D ₂	l	H _a °		f _z (mm/t)	
MM EFS060E05-4T05 CF	6.00	4	5.00	0.25	T05	7.70	10.00	38.0	●	0.03-0.08	
MM EFS080E05-4T05 CF	8.00	4	5.00	0.3	T05	7.70	10.00	38.0	●	0.03-0.08	
MM EFS100E07-4T06 CF	10.00	4	7.00	0.4	T06	9.60	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.



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



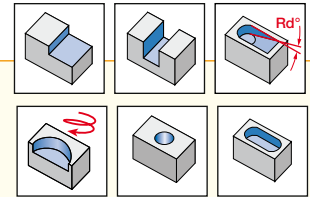
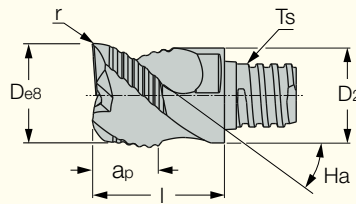
Designation	Dimensions									IC908	Recommended Machining Data
	D	Flute	ap	Ts	D2	l	Ch	Ha°	Rd°		fz (mm/t)
MM ERS080B05-4T05	8.00	4	5.00	T05	7.70	10.00	0.25	45.0	90.0	●	0.03-0.08
MM ERS080B09-4T05	8.00	4	9.00	T05	7.70	15.00	0.25	45.0	90.0	●	0.03-0.08
MM ERS100B07-4T06	10.00	4	7.00	T06	9.60	13.00	0.30	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 ⁽¹⁾	12.00	4	9.00	T08	11.70	16.50	0.35	45.0	90.0	●	0.04-0.10
MM ERS120B09-4T08I ⁽²⁾	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 ⁽¹⁾	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 ERS1.00B86-6T15	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.

⁽¹⁾ With a central coolant hole ⁽²⁾ With coolant holes directed to each flute

MM ERA

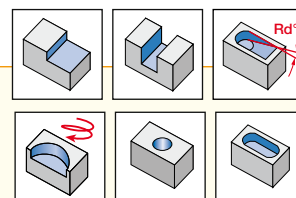
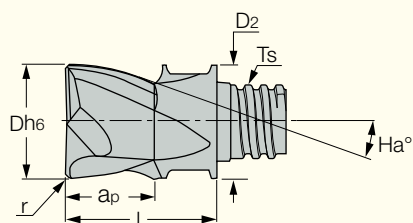
Interchangeable Solid Carbide Rough Milling Heads, for Machining Aluminum



ALUMINUM

Designation	Dimensions									IC08	Recommended Machining Data
	D	Flute	ap	r	Ts	D2	l	Ha°			fz (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									Recommended Machining Data
	D	Flute	ap	r	Ts	D2	l	Ha°	IC08	fz (mm/t)
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.

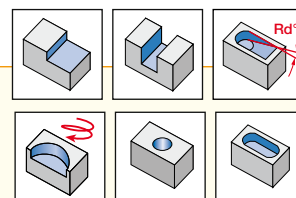
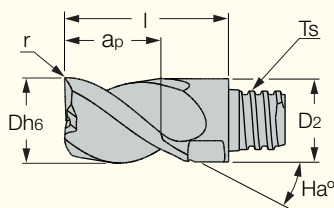


CHATTERFREE

MULTI-MASTER LINE

MM EA-CF

Interchangeable Solid Carbide Endmill Heads with
Different Helix for Machining Aluminum



ALUMINUM

Designation	Dimensions								IC08	Recommended Machining Data 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

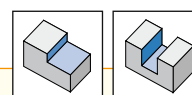
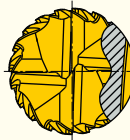
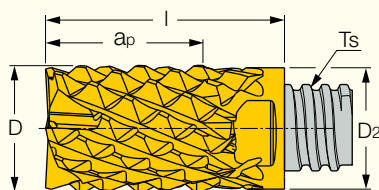


Designation	Wrench
MM EA-CF	MM KEY 6X4*

* (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 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*

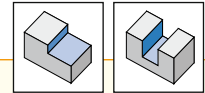
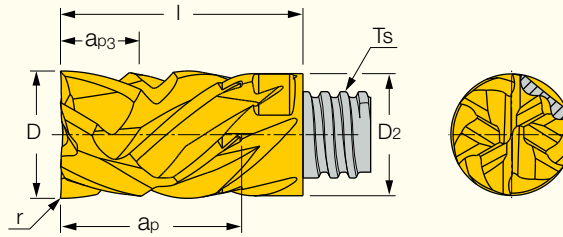
* (Optional, should be ordered separately)

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

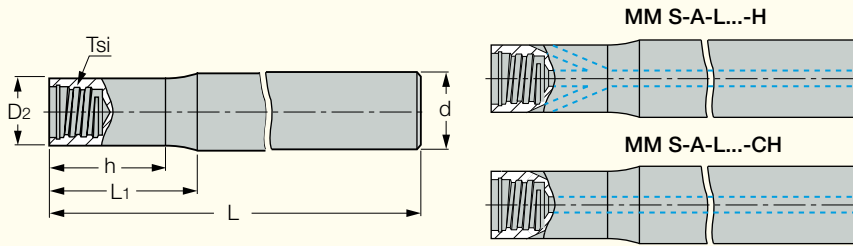


MULTI-MASTER

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.



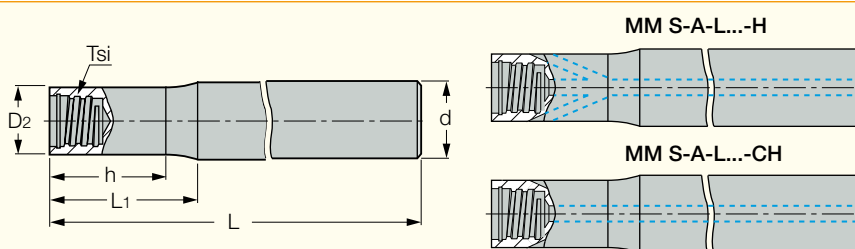
Designation	Tsi	d	D2	h	L1	L	Shank m. ⁽¹⁾	Coolant	RPM _{max} ⁽²⁾	Kg
MM S-A-L050-C08-T04	T04	8.00	5.80	9.90	14.0	50.00	S	N	60000	0.02
MM S-A-L060-C08-T05	T05	8.00	7.60	12.50	15.0	60.00	S	N	60000	0.02
MM S-A-L070-C08-T05-C	T05	8.00	7.60	18.60	20.0	70.00	C	N	60000	0.04
MM S-A-L070-C08-T05-W	T05	8.00	7.60	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.

⁽¹⁾ S-steel, C-carbide, W-tungsten ⁽²⁾ 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



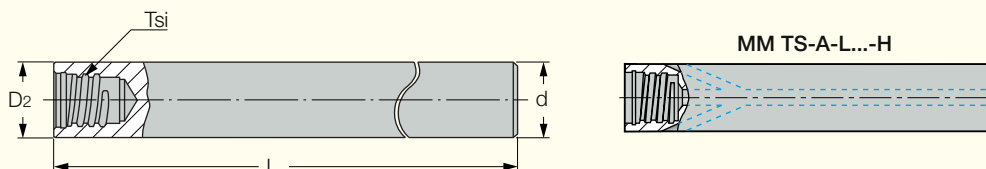
Designation	Tsi	d	D2	h	L1	L	Shank m. ⁽¹⁾	Coolant	RPM _{max} ⁽²⁾	Kg
MM S-A-L070-C16-T10-W-H	T10	16.00	15.20	18.20	20.0	70.00	W	Y	60000	0.21
MM S-A-L090-C16-T10-C	T10	16.00	15.20	38.00	40.0	90.00	C	N	60000	0.21
MM S-A-L090-C16-T10-W-H	T10	16.00	15.20	38.20	40.0	90.00	W	Y	57510	0.27
MM S-A-L100-C16-T10	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-L200-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.

⁽¹⁾ S-steel, C-carbide, W-tungsten ⁽²⁾ 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



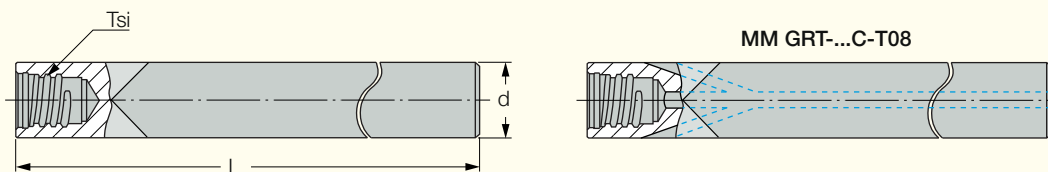
Designation	Tsi	d	D2	L	Coolant	RPM _{max} ⁽¹⁾	Kg
MM TS-A-L070-C08-T05	T05	8.00	8.00	70.00	N	60000	0.03
MM TS-A-L080-C10-T06	T06	10.00	10.00	80.00	N	47400	0.07
MM TS-A-L080-C10-T06-H	T06	10.00	10.00	80.00	Y	46920	0.04
MM TS-A-L090-C12-T08	T08	12.00	12.00	90.00	N	43110	0.12
MM TS-A-L090-C12-T08-H	T08	12.00	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

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

MM GRT (shanks)

Solid Carbide Cylindrical Shanks for Slitting and Grooving Interchangeable Milling Heads



Designation	Tsi	d	L	Shank ⁽¹⁾	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

⁽¹⁾ 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.

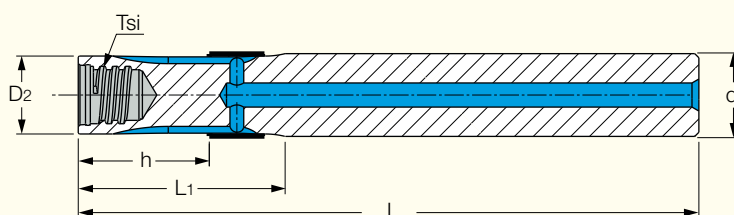
Spare Parts



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



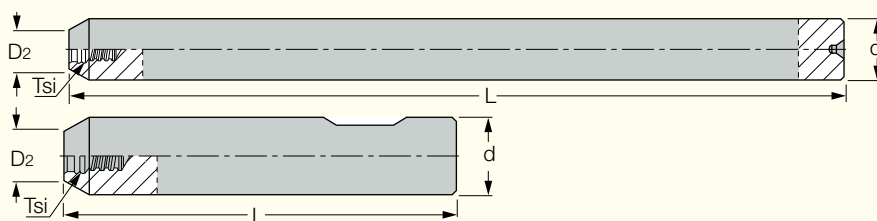
Designation	Tsi	d	D2	h	L1	L	Kg
MM S-A-L075-C10-T06-N	T06	10.00	9.60	18.00	28.0	75.00	0.04
MM S-A-L090-C12-T08-N	T08	12.00	11.60	18.00	30.0	90.00	0.07
MM S-A-L100-C16-T10-N	T10	16.00	15.30	23.00	35.0	100.00	0.04

• Do not apply lubricant to the threaded connection



MM S-A (straight shanks)

Shanks for Interchangeable Milling Heads



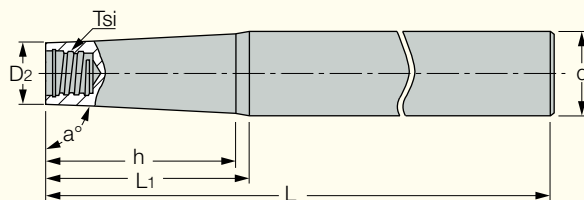
Designation	Tsi	d	D ₂	Shank ⁽²⁾	L	RPM _{max} ⁽³⁾	Kg
MM S-A-L055-W12-T05	T05	12.00	7.60	W	55.00	60000	0.05
MM S-A-L065-W16-T06	T06	16.00	9.50	W	65.00	60000	0.11
MM S-A-L065-W16-T08	T08	16.00	11.50	W	65.00	60000	0.10
MM S-A-L070-W20-T10	T10	20.00	15.20	W	70.00	60000	0.18
MM S-A-L075-W25-T12	T12	25.00	18.30	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 ⁽¹⁾	T05	12.00	7.60	C	150.00	18270	0.13
MM S-A-L200-C16-T06-B ⁽¹⁾	T06	16.00	9.60	C	200.00	11970	0.45
MM S-A-L250-C20-T08-B ⁽¹⁾	T08	20.00	11.50	C	250.00	9330	0.60
MM S-A-L250-C25-T10-B ⁽¹⁾	T10	25.00	15.20	C	250.00	11130	0.94

• Do not apply lubricant to the threaded connection.

⁽¹⁾ "B" suffix - cylindrical shank which may be shortened. ⁽²⁾ C-Cylindrical, W-Weldon ⁽³⁾ 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)

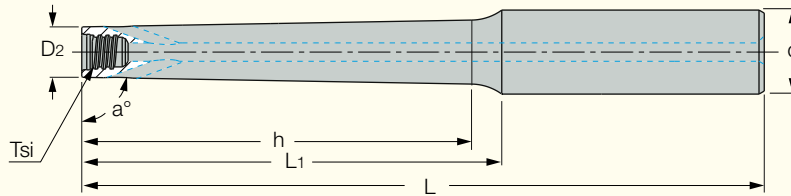
85° Conical Shanks for Interchangeable Milling Heads



Designation	Tsi	a°	d	D ₂	Shank ⁽¹⁾	L ₁	L	Shank m.	h	RPM _{max} ⁽²⁾	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.

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

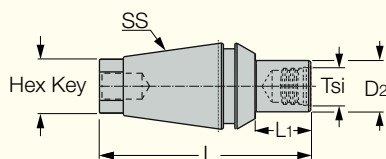


Designation	Tsi	a°	d	D ₂	L ₁	L	Shank m.	h	Coolant	RPM _{max} ⁽²⁾	Kg
MM S-D-L100-C12-T05	T05	89	12.00	7.60	35.0	100.00	S	29.60	N	52000	0.15
MM S-D-L110-C12-T05-C	T05	89	12.00	7.60	60.0	110.00	C	55.90	N	53430	0.13
MM S-D-L110-C12-T05-W-H	T05	89	12.00	7.60	60.0	110.00	W	55.70	Y	38460	0.14
MM S-D-L130-C12-T05-C	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.

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

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



Designation	SS	Tsi	a°	D ₂	D ₁	h	L ₁	L	Key ⁽¹⁾	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.

⁽¹⁾ Inch size spanners (displayed in mm)

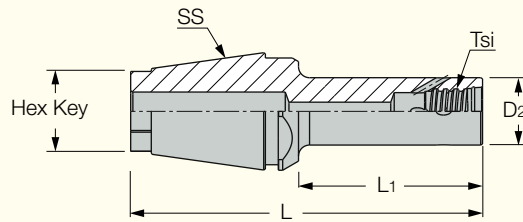


MULTI-MASTER

INDEXABLE SOLID CARBIDE LINE

MM S-ER-H

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



Designation	SS	Tsi	D ₂	L ₁	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

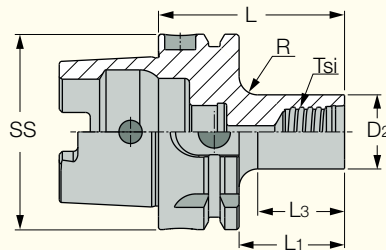
• Do not apply lubricant to the threaded connection. • For adaptation see page 9.

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 ₂	L	L ₁	L ₃	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.

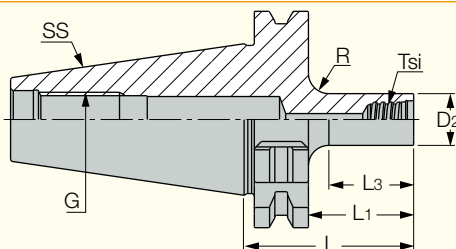


MULTI-MASTER • DIN69871

MM S-A-SK

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

G2.5	
20,000 RPM U<1.0 gmm	



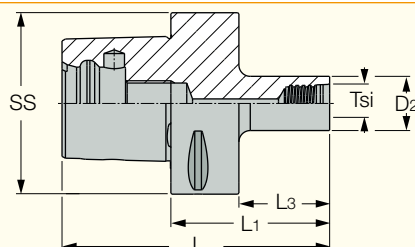
Designation	SS	Tsi	D ₂	L	L ₁	L ₃	R
MM S-A-H040-SK 40-T06	40	T06	9.50	40.00	21.0	15.00	6.0
MM S-A-H045-SK 40-T08	40	T08	11.50	45.00	26.0	20.00	6.0
MM S-A-H050-SK 40-T10	40	T10	15.20	50.00	31.0	25.00	6.0
MM S-A-H050-SK 40-T12	40	T12	18.30	50.00	31.0	25.00	6.0
MM S-A-H050-SK 40-T15	40	T15	23.90	50.00	31.0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

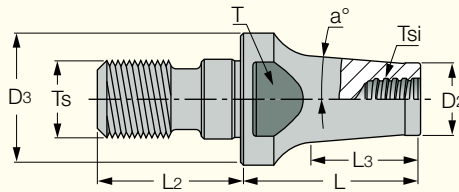


Designation	SS	Tsi	D ₂	L	L ₁	L ₃
MM S-A-H035-C3-T05	32	T05	7.60	35.00	20.0	15.00
MM S-A-H035-C3-T06	32	T06	9.25	35.00	20.0	15.00
MM S-A-H040-C3-T08	32	T08	11.50	40.00	25.0	20.00
MM S-A-H040-C3-T10	32	T10	15.20	40.00	25.0	20.00
MM S-A-H045-C3-T12	32	T12	18.30	45.00	30.0	25.00
MM S-A-H045-C4-T06	40	T06	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	Tsi	Ts	L	L3	D1	D3	L2	T ⁽¹⁾	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.

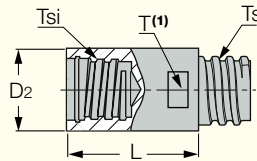
⁽¹⁾ Clamping wrench size

MULTI-MASTER

INDEXABLE SOLID CARBIDE LINE

MM CAB-T-T

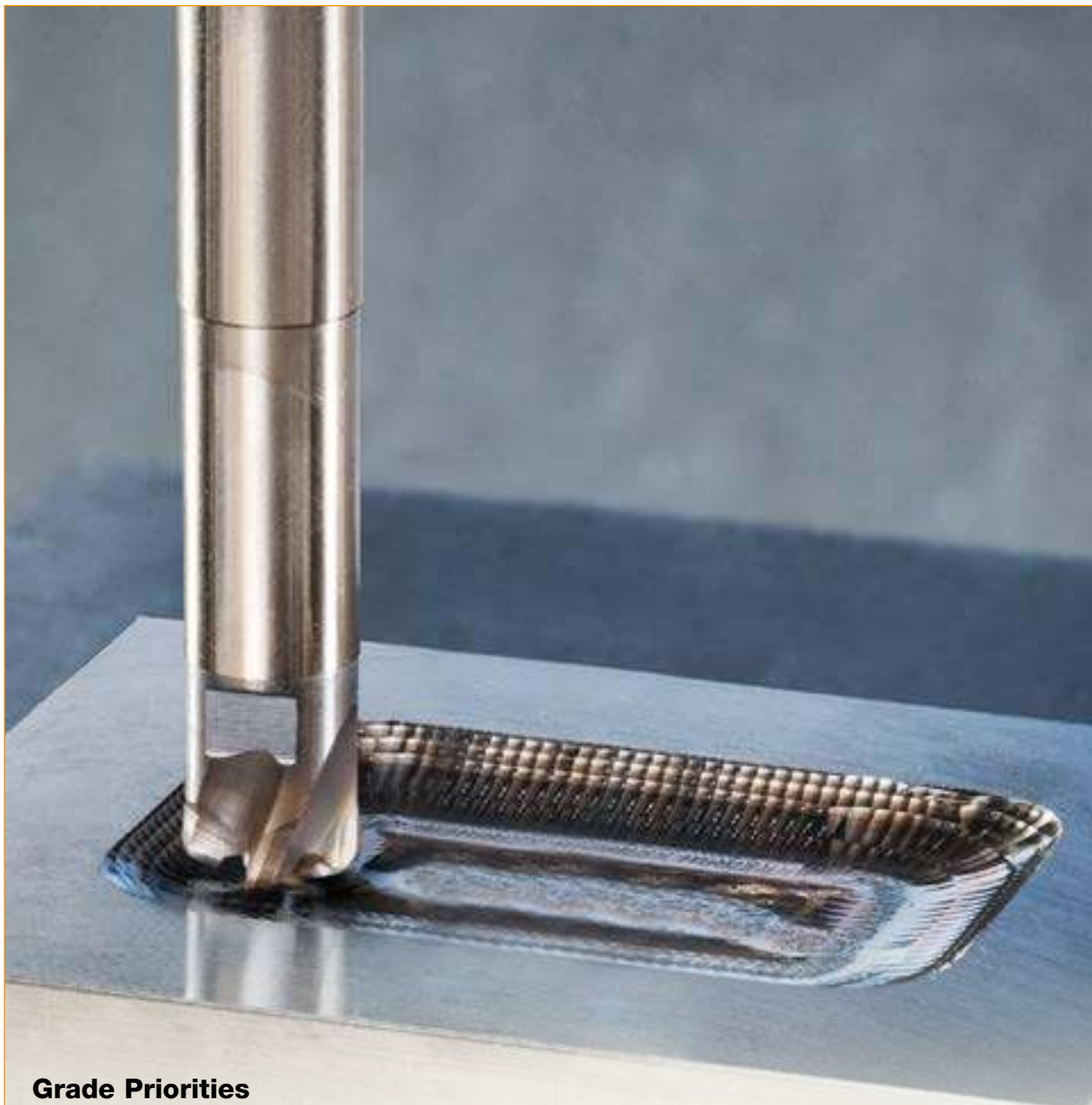
MULTI-MASTER Shank Extensions



Designation	D2	Ts	Tsi	L	T ⁽¹⁾	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.

⁽¹⁾ Clamping wrench size



Grade Priorities

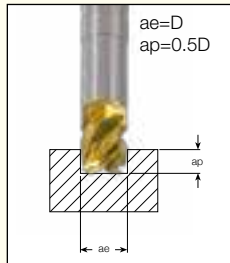
						
	ISO P	ISO H	ISO M	ISO S	ISO K	ISO N
Material Groups	1 - 13	38 - 41	14	31 - 37	15 - 20	21 - 28
	Steel	Hard Steel	Stainless Steel	High Temp.	Cast Iron	Nonferrous
	Harder ↑ IC903 IC908	Harder ↑ IC903 IC908	Harder ↑ IC908	Harder ↑ IC903 IC908	Harder ↑ IC903 IC908	Harder ↑ IC908 IC08
	Tougher ↓	Tougher ↓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

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.

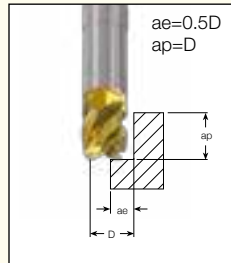
■ First choice

Recommended Feeds for SOLIDSHRED Rougher Endmills

Slotting



Shouldering

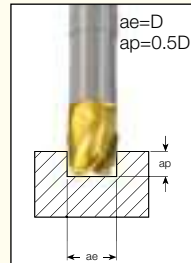


Slotting			Shouldering		
D _{mm}	F _z (min)	F _z (max)	D _{mm}	F _z (min)	F _z (max)
5	0.04	0.10	5	0.04	0.110
6	0.05	0.12	6	0.05	0.132
7	0.06	0.14	7	0.06	0.154
8	0.06	0.16	8	0.06	0.176
9	0.06	0.16	9	0.06	0.176
10	0.06	0.18	10	0.06	0.196
12	0.07	0.20	12	0.07	0.216
14	0.08	0.22	14	0.08	0.238
16	0.10	0.24	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

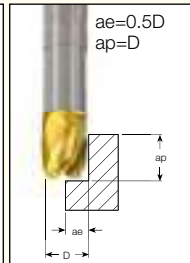
High Speed Cutting on Hard Materials
(up to 60 HRC)
Apply small depth of cut
(0.1-0.3 mm) at 80-160 m/min

Recommended Feeds for MULTI-MASTER Endmills

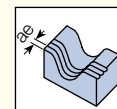
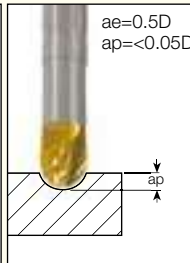
Slotting



Shouldering



Profiling



Slotting			Shouldering/Profiling	
D _{mm}	F _z (min)	F _z (max)	F _z (min)	F _z (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

F_z (mm/t) for MM GRIT.../MM TS... heads

ISO		
P	0.02-0.12	0.03-0.15
M	0.02-0.10	0.02-0.12
K	0.02-0.15	0.03-0.17



Machining Data for MULTI-MASTER Endmills

ISO	Material	Condition	Tensile Strength [N/mm ²]	Hardness HB	Material ⁽¹⁾ 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
		Quenched and tempered	930	275	7
			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.

⁽¹⁾ 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

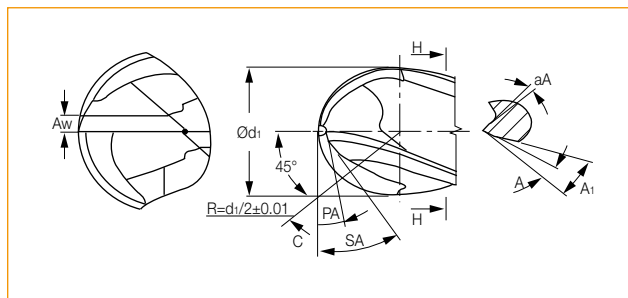
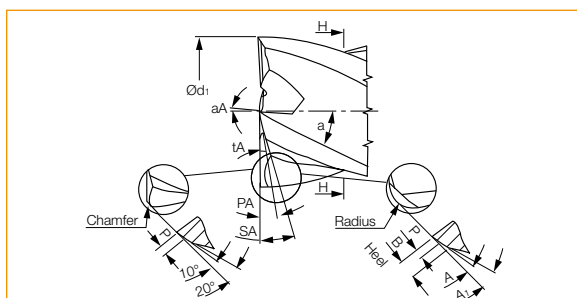
ISO	Material	Condition	Tensile Strength [N/mm ²]	Hardness HB	Material ⁽¹⁾ No.
P	Non-alloy steel and cast steel, free cutting steel	< 0.25 %C Annealed	420	125	1
		>= 0.25 %C Annealed	650	190	2
		< 0.55 %C Quenched and tempered	850	250	3
		>= 0.55 %C Annealed	750	220	4
		>= 0.55 %C Quenched and tempered	1000	300	5
	Low alloy steel and cast steel (less than 5% all elements)	Annealed	600	200	6
		Quenched and tempered	930	275	7
			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	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
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

⁽¹⁾ For workpiece materials list, see pages 88-123.

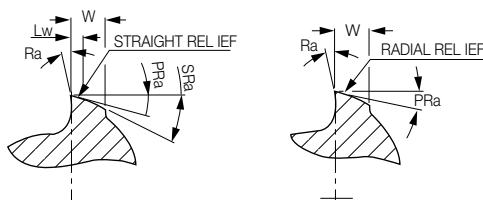
MM-TS			MM-GRIT K-TYPE			MM-GRIT P-TYPE		
Speed	Feed		Speed	Feed mm/t		Speed	Feed mm/t	
V m/min	Fz (min)	Fz (max)	V m/min	Fz (min)	Fz (max)	V m/min	Fz (min)	Fz (max)
110-140	0.08	0.20	110-160	0.05	0.15	-	-	-
100-120	0.08	0.18	100-150	0.05	0.15	-	-	-
70-100	0.08	0.15	80-100	0.05	0.15	-	-	-
70-100	0.08	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

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



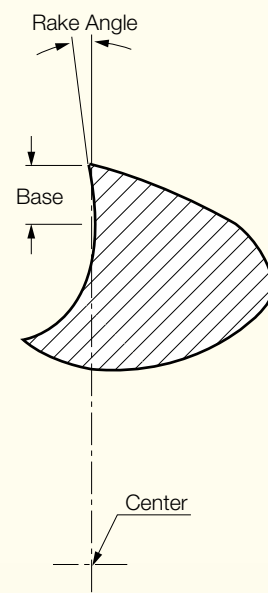
*S _A	W	*A	*A ₁	L _W	A _W	P	B	Radius
17	0.18*d1	12.0	-	-	0.10*d1	-	-	-
17	0.175*d1	12.0	-	-	0.10*d1	-	-	-
17	0.175*d1	12.0	-	-	0.10*d1	-	-	-
17	0.16*d1	12.0	-	-	0.10*d1	-	-	-
16	0.17*d1	12.0	-	-	0.10*d1	-	-	-
16	0.16*d1	12.0	-	-	0.10*d1	-	-	-
17	0.14*d1	-	-	-	0.08*d1	-	-	-
17	0.13*d1	-	-	-	0.08*d1	-	-	-
-	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)

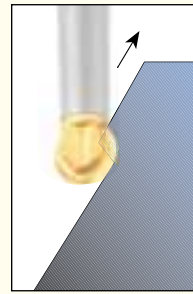
Base Distance for Rake Angle Measurement

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

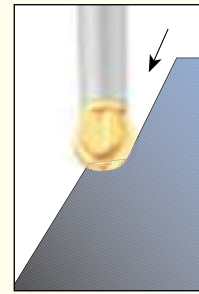


Ball Nose

- 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

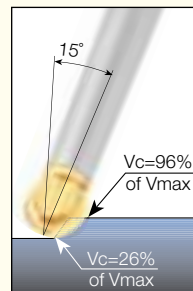
Operating angle 208°-212°

- 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 ✓

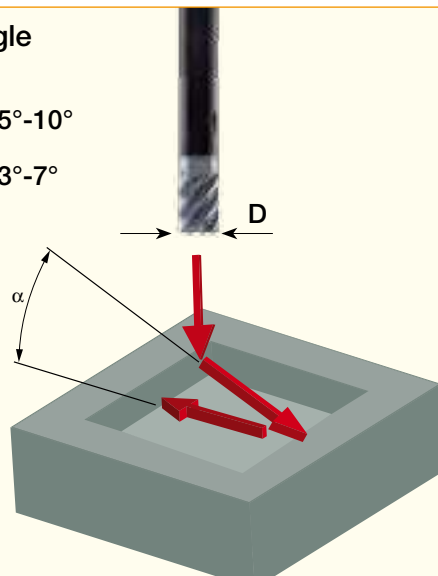


Unfavorable Profiling

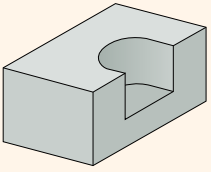
Recommendations for Popular Applications

Recommended Rampdown Angle

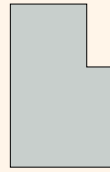
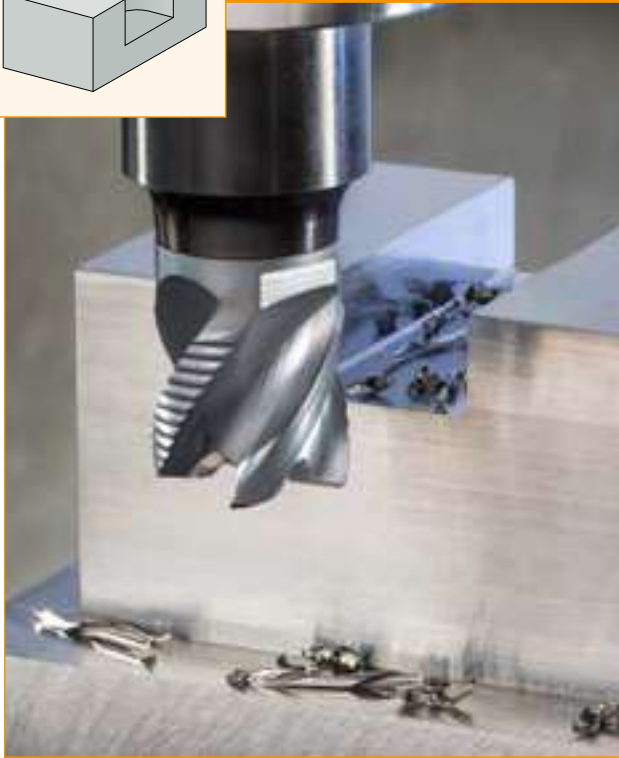
- | | |
|---------------------------------|-------------------------------|
| A $D \leq 10 \text{ mm}$ | $\alpha = 5^\circ - 10^\circ$ |
| B $D > 10 \text{ mm}$ | $\alpha = 3^\circ - 7^\circ$ |



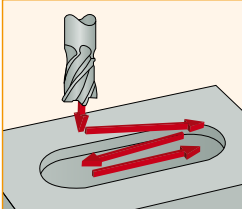
Popular Endmill Applications



Slotting

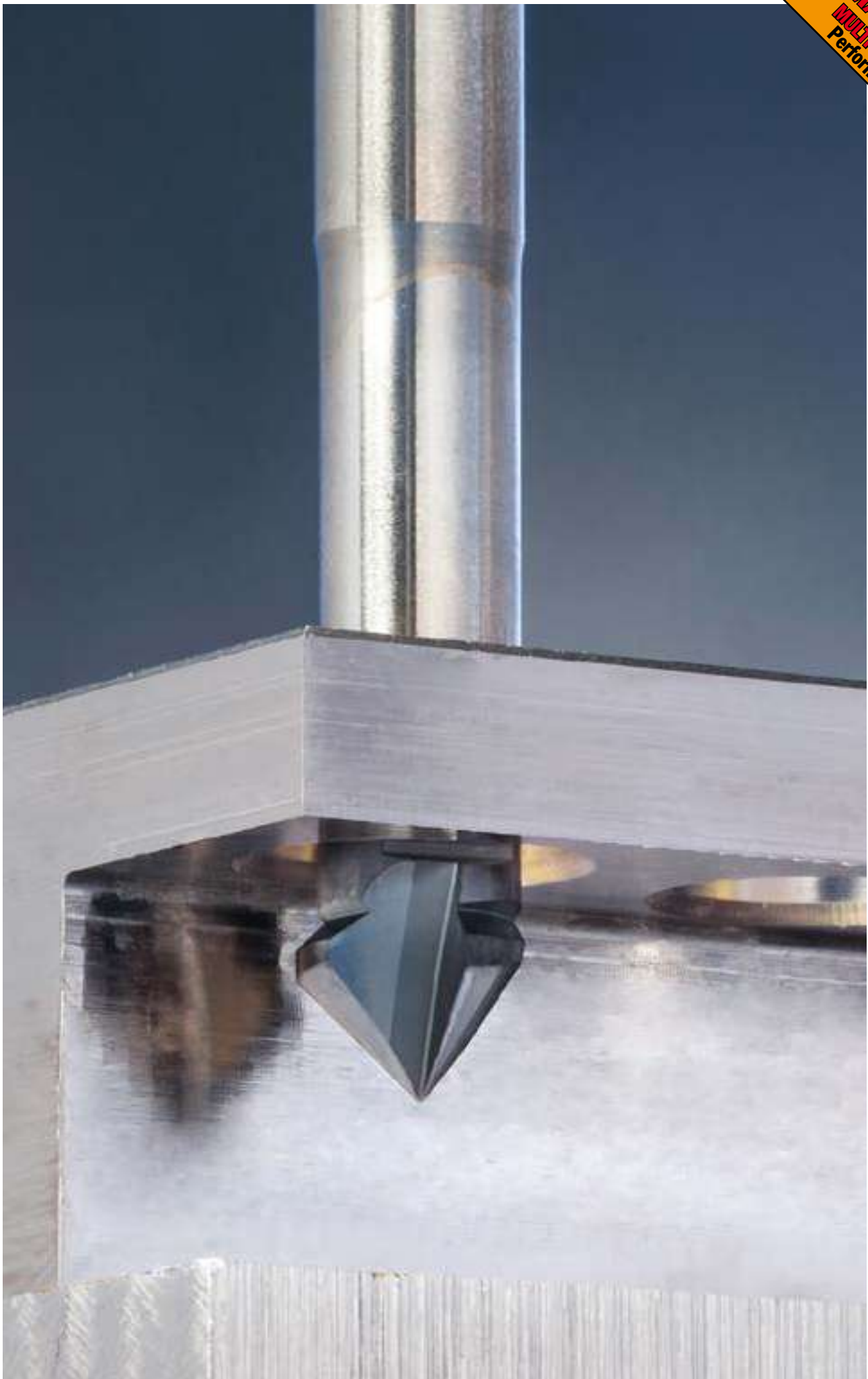


Shouldering



Ramping Down





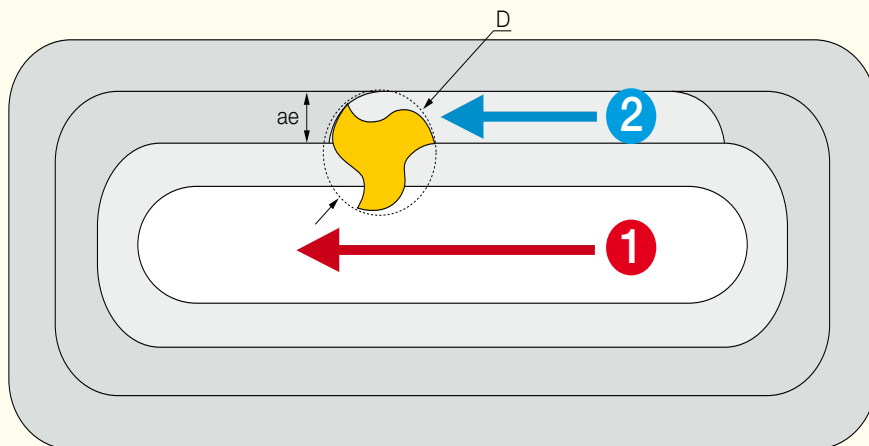
Pocket Milling

1 Recommended Method
Open the pocket in the middle

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

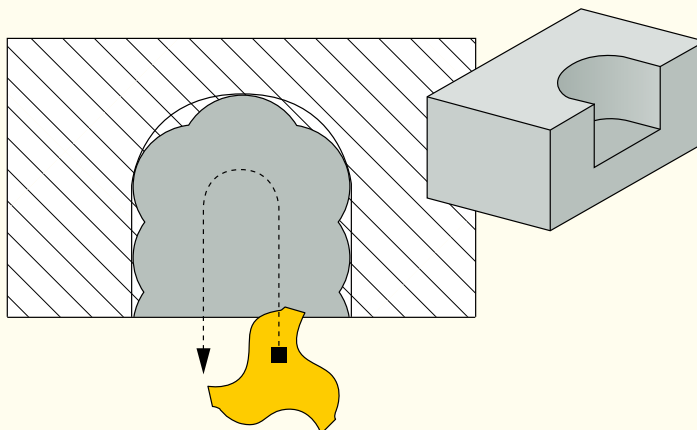
Features

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



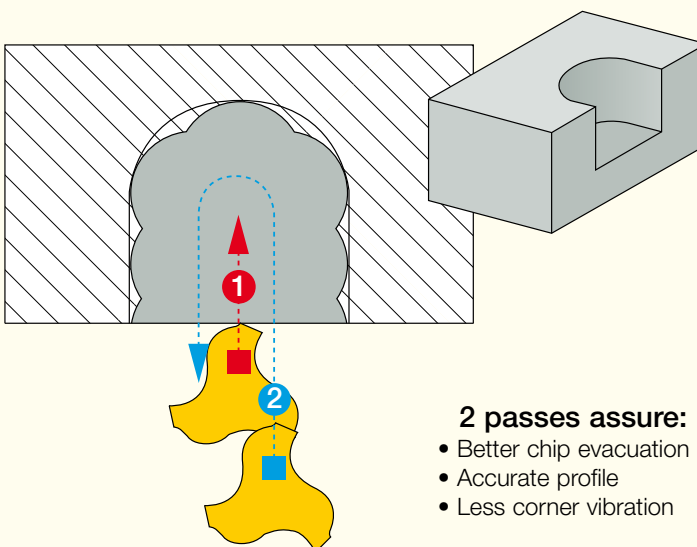
Roughing Side Pockets

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/mm²]	KC1 ⁽¹⁾ [N/mm²]	m _c ⁽²⁾	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
		Cast		3300	0.24	320	35
	Titanium and Ti alloys		RM 400	1700	0.23		36
		Alpha+beta alloys cured	RM 1050	2110	0.22		37
H	Hardened steel	Hardened		4600		55 HRc	38
		Hardened		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

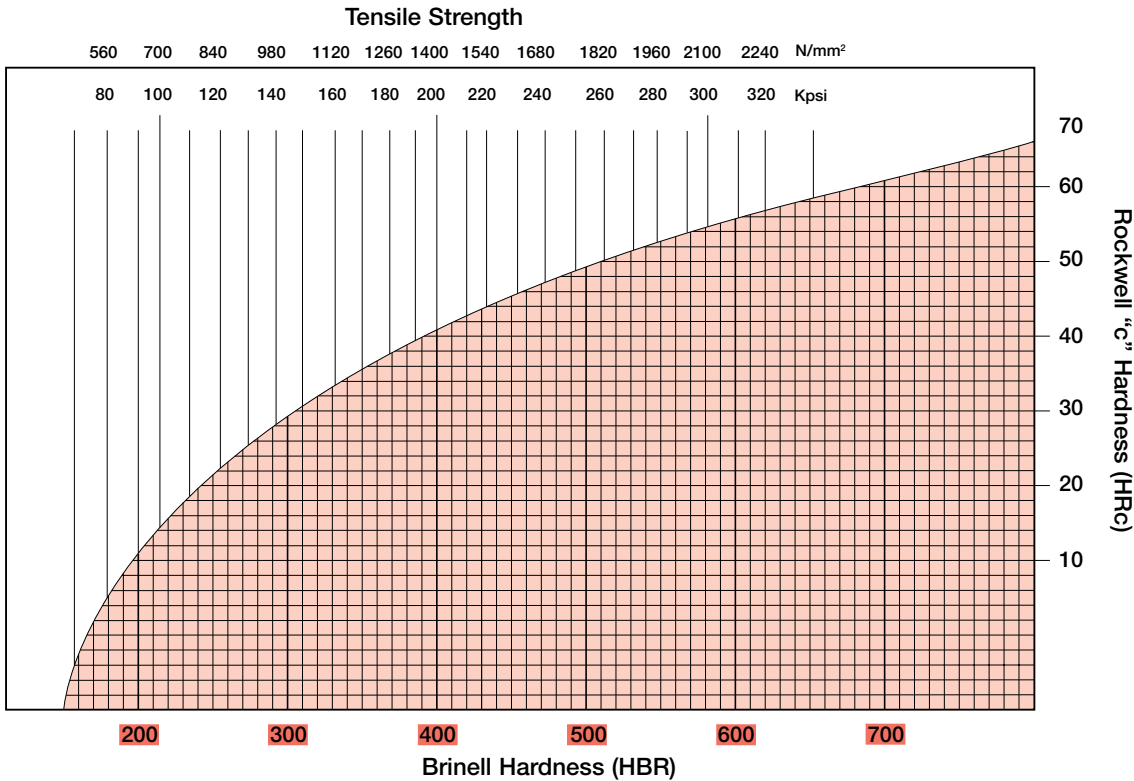
⁽¹⁾ Specific cutting force for 1 mm² chip section.

⁽²⁾ Chip thickness factor.

MATERIAL GROUPS

Engineered for
MAXIMUM
MULTI-MASTER
Performance

Hardness Conversion Table



ISCAR MULTI-MASTER Grades Chart

Grades	ISO	Coating Layers
IC908	P15-P40 M20-M30 K05-K25 S15-S25 AL-TEC 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.	
IC903	H01-H10 P05-P15 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.	
IC08	N10-N25 M10-M30 S10-S30	
	An uncoated, fine grain carbide grade. Used for stainless steel and high temperature alloys at low to medium cutting speeds.	
IC328/IC528	P25-P50 M30-M40 S25-S30	

■ PVD COATED ■ UNCOATED

ISCAR MATERIAL GROUPS

According to VDI 3323 Standard

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

 France AFNOR	 Sweden SS	 Italy UNI	 Spain UNE	 Japan JIS	 Russia 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 37/23 HR	AE 235 B; Fe 360 B	STKM 12 A; STKM 12 AC	
E 28-2	1412	Fe 430 B; Fe 430 B FN	AE 275 B; Fe 430 B FN	SM 400 A; SM 400 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 FN	SS 490	ST5ps; ST5sp
A 60-2	1650	Fe 60-2; Fe 590	A 590-2; Fe 590-2 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 (FN); Fe 430 D (FF)	AE 275 D; Fe 430 D1 FF	SM 400 A; SM 400 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 AISI/SAE	GERMANY Werkstoff DIN	Great Britain BS EN
1	A 621 (1008)	1.0334 UStW 23 (DD12G1)	
1	A 622 (1008)	1.0335 DD13; StW 24	1449 1 HR
1	A 620 (1008)	1.0338 DC04; St 4; St 14	1449 1 CR; 1449 2 CR
1	A 516 Gr. 65; 55 A 515 Gr. 65; 55 A 414 Gr. C; A 442 Gr.55	1.0345 P235GH/H I	1501 Gr. 141-360; 1501 Gr. 161-360; 151-360 1501 Gr. 161-400; 154-360 1501 Gr. 164-360; 161-360
1	(M) 1020; M 1023	1.0402 C22	055 M 15; 070 M 20; 1499 22 HS; 1499 22 CS 2C/2D
1	1020	1.0402 C22	050A20 2C/2D
1	1020; 1023	1.0402 C22	055 M 15; 070 M 20 2C
1		1.0425 P265GH/H II	1501 Gr. 161-400; 151-400 1501 Gr. 164-360; 161-400 1501 Gr. 164-400; 154-400
1	A27 65-35	1.0443 GS-45	A1
1		1.0539 S355NH;StE 335	
1		1.0545 S355N; StE 355	4360-50E
1		1.0546 S355NL;TStE 355	4360-50EE
1		1.0547 S355JOH	4360-50C
1		1.0549 S355 NLH;TStE 355	
1		1.0553 S355JO;St 52-3U	4360-50C
1	A 633 Gr.C; A 588	1.0562 P355N; StE 355	1501 Gr.225-490A LT 20
1		1.0565 P355NH; WStE 355	1501-225-490B LT 20
1		1.0566 P355NL1; TStE 355	1501-225-490A LT 50
1	1	1.0570 S355J2G3; St 52-3	Fe 510 D1 FF; 1449 50/35 HR;HS; 4360- 50 D
1	1213	1.0715 9 SMn 28 (1SMn30)	230 M 07

 France AFNOR	 Sweden SS	 Italy UNI	 Spain UNE	 Japan JIS	 Russia 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 AISI/SAE	GERMANY Werkstoff DIN	Great Britain BS EN
1	1213	1.0715 9 SMn 28	230 M 07
1	12 L 13	1.0718 9 SMnPb 28 (11SMnPb30)	
1	1108; 1109	1.0721 10 S 20	10S20
1	11 L 08	1.0722 10 SPb 20	
1	11 L 08	1.0722 10 SPb 20	
1	1215	1.0736 9 SMn 36 11SMn37)	
1	12 L 14	1.0737 9 SMnPb 36 (11SMnPb37)	
1		1.0972 S315MC; QStE 300 TM	1501-40F30
1		1.0976 S355MC; QStE 360 TM	1501-43F35
1		1.0982 S460MC; QStE 460 TM	1501-50F45
1		1.0984 S500MC; QStE 500 TM	
1		1.0986 S500MC; QStE 500 TM	1501 - 60F55
1	1010	1.1121 CK 10; (C10E)	040 A 10
1		1.1121 St 37-1	4360 40 A
1	1015	1.1141 CK 15; (C15E)	040 A 15; 080 M 15 32C
1	1020; 1023	1.1151 C22E; CK 22	055 M 15; (070 M 20)
1		1.2083	
1	A572-60	1.8900 StE 380	4360 55 E
1	A36	St 44-2	4360 43 A
1		StE 320-3Z	1 501 160
2	(M) 1025	1.0406 C 25	070 M 26
2		1.0416 GS-38	
2	A 537 Cl.1; A 414 Gr. G; A 612	1.0473 P355GH; 19 Mn 6	
2	1035	1.0501 C35	080 A 32; 080 A 35; 080 M 36; 1449 40 CS
2	1045	1.0503 CF 45; (C45G)	060 A 47; 080 M 46

 France AFNOR	 Sweden SS	 Italy UNI	 Spain UNE	 Japan JIS	 Russia GOST
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; 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; SGV 480	
1 C 35; AF 55 C 35; 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 AISI/SAE	GERMANY Werkstoff DIN	Great Britain BS EN
2	1040	1.0511 C40	080 M 40
2		1.0540 C 50	
2	A27 70-36	1.0551 GS-52	A2
2	A148 80-40	1.0553 GS-60	A3
2	A738	1.0577 S355J2G4 (Fe 510 D 2)	Fe 510 D2 FF; 1501 Gr.224-460; 1501 Gr. 224-490
2	1140	1.0726 35 S 20	212 M 36 8M
2	1146	1.0727 45 S 20 (46S20)	
2	1035; 1041	1.1157 40Mn4	150 M 36 15
2	1025	1.1158 C25E; CK 25	(070 M 25)
2	1536	1.1166 34Mn5	
2	1330	1.1170 28Mn6	(150 M 28); (150 M 18) 14A
2		1.1178 C30E; CK 30	080M30
2	1035	1.1180 C35R; Cm 35	080 A 35
2	1035; 1038	1.1181 C35E; CK 35	080 A 35; (080 M 36)
2	1035	1.1181 C35E; CK 35	080 A 35; (080 M 36)
2	1035	1.1183 Cf 35 (C35G)	080 A 35
2	1042	1.1191 GS- Ck 45	080 A 46
2	1049; 1050	1.1206 C50E; CK 50	080 M 50
2	1050; 1055	1.1213 Cf 53; (C53G)	070 M 55
2	4520	1.5423 22Mo4	1503-245-420
3	A 516 Gr.70; A 515 Gr. 70; A 414 Gr.F; A 414 Gr.G	1.0481 P295GH; 17 Mn 4	1501 Gr. 224

 France AFNOR	 Sweden SS	 Italy UNI	 Spain UNE	 Japan JIS	 Russia GOST
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 AISI/SAE	GERMANY Werkstoff DIN	Great Britain BS EN
3	1043	1.0503 C35	060 A 47; 080 M 46; 1449 50 HS, 1449 50 CS
3	1074	1.0614 C 76 D; D 75-2	
3	1086	1.0616 C 86 D; D 85-2	
3	1095	1.0618 C 92 D; D 95-2	
3	1036; 1330	1.1165 30Mn5	120 M 36; (150 M 28)
3	1335	1.1167 36Mn5	150 M 36
3	1040	1.1186 C40E; CK 40	060 A 40; 080 A 40; 080 M 40
3	1045	1.1191 C45E; CK 45	080 M 46; 060 A 47
3	1049	1.1201 C45R; Cm 45	080 M 46
3		1.7242 18 CrMo 4	
3	A 387 Gr. 12 Cl	1.7337 16 CrMo 4 4	
3		1.7362 12 CrMo 19 5	3606-625
3	A572-60	17 MnV 6	436055 E
4	1055	1.0535 C55	070 M 55
4	1060	1.0601 C60	060 A 62; 1449 HS; 1449 CS 43D
4	107	1.0603 C67	080 A 67; 1449 70 HS
4	1074; 1075	1.0605 C75	1449 80 HS
4	1055	1.1203 C55E; CK 55	060 A 57; 070 M 55
4	1055	1.1209 C55R; Cm 55	070 M 55
4	1060; 1064	1.1221 C60E; CK 60	060 A 62 43D
4	1070	1.1231 Ck 67; (C67E)	060 A 67
4	1074; 1075; 1078	1.1248 CK 75; (C75E)	060 A 78
4	1086	1.1269 CK 85 (C85E)	

 France AFNOR	 Sweden SS	 Italy UNI	 Spain UNE	 Japan JIS	 Russia GOST
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; f.8311-AM 30 Mn 5	SMn 433 H; SCMn 2	27ChGSNMDTL 30GSL
40 M 5	2120		F. 1203-36 Mn 6; F. 8212-36 Mn 5	ssmN 438 (H); SCMn 3	35G2; 35GL
2 C 40; XC 42 H 1		C 40		S 40 C	
2 C 45; XC 42 H 1; XC 45; XC 48 H 1	1672	C 45; C 46	F.1140-C 45 K; F.1142-C48 K	S 45 C; S 48 C	45
3 C 45; XC 42 H 1; XC 48 H 1	1660	C 45	F.1145-C 45K-1; 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 AISI/SAE	GERMANY Werkstoff DIN	Great Britain BS EN
4	1095	1.1274 Ck 101 (C101E)	
4	W 112	1.1663 C 125 W	
4			
5		1.0070 E360 (Fe 690-2); St 70-2	Fe 690-2 FN
5		1.7238 49 CrMo 4	
5		1.7701 51 CrMoV 4	
6	A 284 Gr.D; A 573 Gr.58; A 570 Gr 36; A 570 Gr C; A 611 Gr. C	1.0116 S235J2G3 (Fe 360 D 1); St 37-3	Fe 360 D1 FF; 1449 37/23 CR; 4360-40 D
6	5120	1.0841 St 52-3	150 M 19
6	9255	1.0904 55 Si 7	250A53 45
6	9254	1.0904 55 Si 7	250 A 53
6	9262	1.0961 60SiCr7	
6	L3	1.2067 100Cr6	BL3
6	L1	1.2108 90 CrSi 5	
6	L2	1.2210 115CrV3	
6		1.2241 51CrV4	
6		1.2311 40 CrMnMo 7	
6	4135	1.2330 35 CrMo 4	708 A 37
6		1.2419 105WCr6	105WC 13
6	0 1	1.2510 100 MnCrW 4	BO1
6	S1	1.2542 45 WCrV7	BS1
6	S1	1.2550 60WCrV7	
6	L6	1.2713 55NiCrMoV6	
6	L 6	1.2721 50NiCr13	
6	O2	1.2842 90MnCrV8	BO2
6	E 50100	1.3501 100 Cr 2	
6	52100	1.3505 100Cr6	2 S 135; 535 A 99 31
6		1.5024 46Si7	
6	9255	1.5025 51Si7	
6	9255	1.5026 55Si7	251 a 58

 France AFNOR	 Sweden SS	 Italy UNI	 Spain UNE	 Japan JIS	 Russia 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 FN		
		51 CrMoV 4			
E 24-3; E 24-4	1312; 1313	Fe 360 D1 FF; Fe 360 C FN; Fe 360 D FF; Fe 37-2	AE 235 D; Fe 360 D1 FF		St3kp; St3ps; St3sp; 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 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 AISI/SAE	GERMANY Werkstoff DIN	Great Britain BS EN
6	9260	1.5027 60Si7	251 A 60; 251 H 60
6	9260 H	1.5028 65Si7	
6		1.5120 38 MnSi 4	
6	A 204 Gr.A; 4017	1.5415 16Mo3; 15 Mo 3	1503-243 B
6	4419	1.5419 20Mo4	1503-243-430
6	A 350-LF 5	1.5622 14Ni6	
6	3415	1.5732 1 NiCr10	
6	3310; 3314	1.5752 14NiCr14	655M13 36A
6		1.6587 17CrNiMo6	820A16
6		1.6657 14NiCrMo134	
6	5015	1.7015 15 Cr 3	523 M 15
6	5132	1.7033 34Cr4	530A32 18B
6	5140	1.7035 41C r4	530M40 18
6	5140	1.7045 42Cr41	530 A 40
6	5115	1.7131 16MnCr5	527 M 17
6		1.7139 16MnCr5	
6	5155	1.7176 55Cr3	527 A 60 48
6	4135; 4137	1.7220 34CrMo4	708 Aa 37
6	4142	1.7223 41CrMo4	
6	4140	1.7225 42CrMo4	708 M 0
6		1.7228 55NiCrMoV6G	823M30 33
6		1.7262 15CrMo5	
6		1.7321 20 mOcr 4	
6	ASTM A182 F12	1.7335 13CrMo4 4	1501-620Gr27
6	A 182-F11; A 182-F12	1.7335 13 CrMo 4 4	1 501 620 Gr. 27
6	ASTM A 182 F22	1.7380 10CrMo9 10	1501-622gR31; 1501-622gR45
6	A182 F22	1.7380 10 CrMo 9 10	1501-622
6		1.7715 14MoV6 3	1503-660-440

 France AFNOR	 Sweden SS	 Italy UNI	 Spain UNE	 Japan JIS	 Russia 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; 16Mo3KW	F. 2601 - 16 Mo 3		
	2512	G 20 Mo 5; G 22 Mo5		SCPH 11	
16N6		14 Ni 6 KG; 14 Ni 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, 12CrMo10	TU.H		
			13MoCrV6		

ISCAR MATERIAL GROUPS

According to VDI 3323 Standard

Mtl. No.			
	USA AISI/SAE	GERMANY Werkstoff DIN	Great Britain BS EN
6	A355A	1.8509 41CrAlMo 7	905 M 39 41B
7	A570.36	1.0038 S235JRG2 (Fe 360 B); RSt 37-2	Fe 360 B FU; 1449 27/23 CR; 4360- 40 B
7	3135	1.5710 36NiCr6	640A35 111A
7		1.5755 31 NiCr 14	653 M 31
7	8620	1.6523 2 NiCrMo2	805M20 362
7	8740	1.6546 40 NiCrMo 22	311-Tyre 7
7	4340	1.6565 40NiCrMo6	817 M 40 24
7	4130	1.7218 25CrMo4	CDS 110
7		1.7733 24 CrMoV 5 5	
7		1.7755 GS-45 CrMOV 10 4	
7		1.8070 21 CrMoV 5 11	
8	C 45 W	1.173 C 45 W3	
8	4142	1.2332 47 CrMo 4	708 M 40 19A
8	A128 (A)	1.3401 G-X120 Mn 12	
8	3435	1.5736 36 NiCr 10	
8	9840	1.6511 36CrNiMo4	816M40 110
8		1.7361 32 CeMo12	722 M 24 40B
8	6150	1.8159 50 CrV 4	735 A 50 47
8		1.8161 58 CrV 4	
8		1.8515 32 CrMo 12	722 M 24 40B
8		1.8523 39CrMoV13 9	897M39 40C
9		1.4882 X 50 CrMnNiNbN 21 9	
9		1.5864 35 niCr 18	
9		31 NiCrMo 13 4	830 m 31
10	A 619	1.0347 DCO3; RRSt; RRSt 13	1449 3 CR; 1449 2 CR
10	M 1015; M 1016; M 1017	1.0401 C15	080 M 15; 080 M 15; 1449 17 CS
10		1.0723 15 S22; 15 S 20	210 A 15; 210 M 15

 France AFNOR	 Sweden SS	 Italy UNI	 Spain UNE	 Japan JIS	 Russia GOST
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	SNM220(H)	20ChGNM
		40NiCrMo2(KB)	40NiCrMo2	SNM240	38ChGNM
35 NCD 6	2541	35NiCrMo6(KB)		SNM 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 AISI/SAE	GERMANY Werkstoff DIN	Great Britain BS EN
10	D 3	1.2080 X 210 Cr 12	BD 3
10	420	1.2083 X 42 Cr 13	
10		1.2085 X 33 CrS 16	
10		1.2162 21 MnCr 5	
10	L2	1.2210 115 Cr V3	
10		1.2311 40 CrMnMo7	
10	P20+S	1.2312 40CrMnMoS 8.6	
10		1.2316 X36CrMo17	X38CrMo16
10	H 11	1.2343 x 38 CrMoV 5 1	BH 11
10		1.234 X 38 CrMoV 5 1	
10	H 13	1.2344 X 40 CrMoV 5 1	BH 13
10	A 2	1.2363 X100 CrMoV 5 1	BA 2
10		1.236 X 100 CrMo V5-1	
10	D 2	1.2379 X 155 CrVMo 12 1	BD2
10		1.238 X 155 CrVMo 12 1	
10	HNV3	1.2379 X210Cr12G	BD2
10	D 4 (D 6)	1.2436 X 210 CrW 12	BD6
10		1.244 X 210 CrW 12	
10	O1	1.251 100 MnCrW 4	B0 1
10	H 21	1.2581 X 30 WCrV 9 3	BH 21
10		1.2601 X 165 CrMoV 12	
10	H 12	1.2606 X 37 CrMoW 5 1	BH 12
10		1.277 X 45 NiCrMo 4	
10	O2	1.284 90 MnCrV 8	B0 2
10	D3	1.3343 S 6-5-2	BM2
10	ASTM A353	1.5662 X8Ni9	1501-509; 1501-510
10	ASM A353	1.5662 X8Ni9	502-650
10	2517	1.568 12Ni19	12Ni19
10	2515	1.5680 12 Ni 19	
10		1.713 16 MnCr 5	
10		1.276 X 19 NiCrMo 4	
11		1.3202 S 12-1-4-5	BT 15

 France AFNOR	 Sweden SS	 Italy UNI	 Spain UNE	 Japan JIS	 Russia GOST
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 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 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 AISI/SAE	GERMANY Werkstoff DIN	Great Britain BS EN
11		1.3207 S 10-4-3-10	BT42
11	T 15	1.3243 S 6-5-2-5	
11		1.3246 S 7-4-2-5	
11		1.3247 S 2-10-1-8	BM 42
11	M 42	1.3249 S 2-9-2-8	BM 34
11	T 4	1.3255 S 18-1-2-5	BT 4
11	M 2	1.3343 S6-5-2	BM2
11	M 7	1.3348 S2-9-2	
11	T 1	1.3355 S 18-0-1	BT 1
11	HNV 3	1.4718 X45CrSi 9 3	401S45 52
11	422	1.4935 x20 CrMoWV 12 1	
12	403	1.4000 X6Cr13	403 S 17
12		1.4001 X6Cr14	
12	(410S)	1.4001 X7 Cr 13	(403 S 7)
12	405	1.4002 X6CrA12	405S17
12	405	1.4002 X6 CrAl 13	405 S 17
12	416	1.4005 X12CrS 13	416 S 21
12	410; CA-15	1.4006 (G)-X10 Cr 13	410S21 56A
12	430	1.4016 X8Cr17	Z8C17
12	430	1.4016 X6 Cr 17	430 S 15 60
12		1.4027 G-X20Cr14	420C29
12	420	1.4028 X30 Cr 13	420 S 45
12		1.4086 G-X120Cr29	452C11
12	430 F	1.4104 X12CrMoS17	420 S 37
12	440B	1.4112 X90 CrMoV 18	
12	434	1.4113 X6CrMo 17	434 S 17
12		1.4340 G-X40CrNi27 4	
12	S31500	1.4417 X2CrNiMoSi19 5	
12	S31500	1.4417 X2 CrNoMoSi 18 5 3	

 France AFNOR	 Sweden SS	 Italy UNI	 Spain UNE	 Japan JIS	 Russia GOST
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 WKCV 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 AISI/SAE	GERMANY Werkstoff DIN	Great Britain BS EN
12		1.4418 X4 CrNiMo16 5	
12	XM 8; 430 Ti; 439	1.4510	
12	430Ti	1.4510 X6 CrTi 17	
12		1.4511 X 6 CrNb 17	
12	409	1.4512 X 6 CrTi 12; (X2CrTi12)	LW 19; 409 S 19
12		1.4720 X20CrMo13	
12	405	1.4724 X10CrA113	403S17
12	430	1.4742 X10CrA118	439S15 60
12	HNV6	1.4747 X80CrNiSi20	443S65 59
12	446	1.4749 x18 cRn 28	
12	446	1.4762 X10CrA124	
12	EV 8	1.4871 X 53 CrMnNiN 21 9	349 S 54
12	302	x12 CrNi 18 9	302 S 31
12	429	X10 CrNi 15	
13	420	1.4021 X20Cr13	420S37
13	420	1.4031 X40 Cr 13	
13		1.4034 X46Cr13	420 S 45
13	431	1.4057 X20CrNi172	431 S 29 57
13	CA6-NM	1.4313 G-X4 CrNi 13 4	425 C 11
13		1.4544	S. 524; S. 526
13	348	1.4546 X5CrNiNb 18-10	347 S 31; 2 S. 130; 2 S. 143; 2 S. 144; 2 S. 145; S.525; S.527
13		1.4922 x20cRmV12-1	
13		1.4923 X22 CrMoV12 1	
14	304	1.4301 X 5 CrNi 18 9	304 S 15
14	303	1.4305 X10 CrNiS 18 9	303 S 21 58M
14	304L	1.4306 X2CrNi18 9	304S12
14	304L	1.4306 X2 CrNi 18 10	304 S 11
14	CF-8	1.4308 X6 CrNi 18 9	304 C 15 58E
14	301	1.4310 X12CrN i17 7	301 S 21
14	304 LN	1.4311 X2 CrNiN 18 10	304 S 62
14		1.4312 G-X10CrNi18 8	302C25
14	305	1.4312 X8 CrNi 18 12	305 s 19

 France AFNOR	 Sweden SS	 Italy UNI	 Spain UNE	 Japan JIS	 Russia GOST
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 AISI/SAE	GERMANY Werkstoff DIN	Great Britain BS EN
14	304	1.4350 X5CrNi18 9	304S15 58E
14	S32304	1.4362 X2 CrNiN 23 4	
14	202	1.4371 X3 CrMnNiN 188 8 7	284 S 16
14	316	1.4401 X 5 CrNiMo 17 12 2; (X4 CrNiMo 17 -12-2)	316 S 13; 316 S 17; 316 S 19; 316 S 31; 316 S 33
14	316L	1.4404 X2 CrNiMo 17 13 2; (X2 CrNiMo 17-12-2); GX 2 CrNiMoN 18-10	316 S 11; 316 S 13; 316 S 14; 316 S 31; 316 S 42; S.537; 316 C 12; T.75; S. 161
14	316LN	1.4406 X2 CrNiMoN 17 12 2; (X2CrNiMoN 18-10)	316 S 61; 316 S 63
14	CF-8M	1.4408 GX 5 CrNiMoN 7 12 2; G-X 6 CrNiMo 18 10	316 C 16 (LT 196); ANC 4 B
14		1.4410 G-X10CrNiMo18 9	
14	316 Ln	1.4429 X2 CrNiMo 17 -13-3	316 S 62
14	316L	1.4435 X2 CrNiMo18 14 3	316 S 11; 316 S 13; 316 S 14; 316 S 31; LW 22; LWCF 22
14	316	1.4436 X 5 CrNiMo 17 13 3; (X4CRNIMO 17-13-3)	316 S 19; 316 S 31; 316 S 33; LW 23; LWCF 23
14	317L	1.4438 X2 CrNiMo 18 16 4; (X2CrNiMo 18-15-4)	317 S 12
14	(s31726)	1.4439 X2 CrNiMoN 17 13 5	
14		1.444 X 2 CrNiMo 18 13	
14	317	1.4449 X5 CrNiMo 17 13 3	317 S 16
14	329	1.4460 X 4 CrNiMo 27 5 2; (X3CrNiMo27-5-2)	
14	329	1.4460 X8CrNiMo27 5	

 France AFNOR	 Sweden SS	 Italy UNI	 Spain UNE	 Japan JIS	 Russia GOST
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; Z 6 CND 17-11; Z 6 CND 17-11-02; Z 7 CND 17-11-02; Z 7 CND 17-12-02	2347	X 5 CrNiMo 17 12	F.3534-X 5 CrNiMo 17 12 2	SUS 316	
Z 2 CND 17-12; Z 2 CND 18-13; Z 3 CND 17-11-02; Z 3 CND 17-12-02 FF; Z 3 CND 18-12-03; Z 3 CND 19.10 M	2348	X 2 CrNiMo 17 12; G-X 2 CrNiMo 19 11	F.3533 - X 2 CrNiMo 17 13 2; F.3537 - X 2 CrNiMo 17 13 3	SUS 316 L	
Z2 CND 17-12 AZ		X 2 CrNiMoN 17 12	F.3542-X 2 CrNiMoN 17 12 2	SUS316LN	07 Ch 18N
	2343		F.8414-AM-X 7 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 17 13 3	SUS 316 LN	
Z 3 CND 17-12-03; Z 3 CND 18-14-03	2375	X2CrNiMoN 17 13	F.3533-X 2 CrNiMo 17 13 2	SUS 316 L	O3 Ch 17N14M3
Z 6 CND 18-12-03; Z 7 CND 18-12-03	2343	X 5 CrNiMo 117 13; X 8 cRnImO 17 13	F.3543-X 5 CrNiMo 17 12 2 F.3538-X 5 CrNiMo 17 13 3	SUS 316	
Z 2 CND 19-15-04; z 3 cnd 19-15-04	2367	X2CrNiMo18 16	f.3539-x 2 cRnImO 18 16 4	SUS317L	
Z 3 CND 18-14-06 AZ					
		X 5 CrNiMo 18 15		SUS 317	
(Z 3 CND 25-07 Az); Z 5 CND 27-05 Az	2324		F.3309-X 8 CrNiMo 17 12 2; F.3552-X 8 CrNiMo 18 16 4	SUS 329 J 1	
	2324				

ISCAR MATERIAL GROUPS

According to VDI 3323 Standard

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

 France AFNOR	 Sweden SS	 Italy UNI	 Spain UNE	 Japan JIS	 Russia GOST
Z 3 CND 22-05 Az; (Z 2 CND 24 -08 Az); (Z 3 CND 25-06-03 Az)	2377			SUS 329 J3L	
23NCDU25.20M					
		Z8CNA17-07	X2CrNiMo1712		
	2326		F.3123-X 2 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 18 10	SUS 321	06Ch18N10T; 08Ch18N10T; 09Ch18N10T; 12Ch18N10T
Z 7 CNU 15-05; Z 7 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 (B)	2337	X6CrNiTi18 11	F.3553	SUS321	

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According to VDI 3323 Standard

Mtl. No.			
	USA AISI/SAE	GERMANY Werkstoff DIN	Great Britain BS EN
14	Ss30415	1.4891 X5 CrNiNb 18 10	
14	S30815	1.4893 X8 CrNiNb 11	
14	304H	1.4948 X6 CrNi 18 11	304 S 51
14	660	1.4980 X5 NiCrTi 25 15	
14		X5 NiCrN 35 25	
14	S31753	X2 CrNiMoN 18 13 4	
14		X2 CrNiMoN 25 22 7	
15	CLASS20	0.6010 GG10	
15	A48-20B	0.6010 GG-10	
15	NO 25 B	0.6015 GG 15	Grade 150
15	CLASS25	0.6015 GG15	GRADE150
15	A48 25 B	0.6015 GG 15	Grade 150
15	A48-30B	0.6020 GG-20	Grade 220
15	NO 30 B	0.6020 GG 20	Grade 220
15	A436 Type 2	0.6660 GGL-NiCr202	L-NiCuCr202
15	60-40-18	0.7040 GGG 40	SNG 420/12
15	No 20 B	GG 10	
16	CLASS30	0.6020 GG20	GRADE220
16	A48-40 B	0.6025 EN- GJL-250 (GG25)	Grade260
16	CLASS45	0.6030 GG30	GRADE300
16	A48-45 B	0.6030	Grade 300
16	A48-50	0.6035 GG-35	GRADE 350
16	A48-60 B	0.6040 GG40	GRADE400
16		1.4829 X 12 CrNi 22 12	
16			
16			
17		0.7033 GGG-35.3	350/22 L 40
17	60/40/18	0.7043 GGG-40.3	370/7
17	80-55-06	0.7050 EN- GJS-800-7 (GGG50)	SNG500/7
17	65-45-12	0.7050 GGG-50	SNG 500/7
17		0.7652 GGG-NiMn 13 7	S-NiMn 137
17	A43D2	0.7660 GGG-NiCr 20 2	Grade S6

 France AFNOR	 Sweden SS	 Italy UNI	 Spain UNE	 Japan JIS	 Russia 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				

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According to VDI 3323 Standard

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

 France AFNOR	 Sweden SS	 Italy UNI	 Spain UNE	 Japan JIS	 Russia GOST
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 AISI/SAE	GERMANY Werkstoff DIN	Great Britain BS EN
23	A360.2	3.2383 G-AlSi0Mg(Cu)	LM9
23		3.2581 G-AlSi12	
23		3.3561 G-AlMg 5	
23	ZE 41	3.5101 G-MgZn4sE1Zr1	MAG 5
23	EZ 33	3.5103 MgSE3Zn27r1	MAG 6
23	AZ 81	3.5812 G-MgAl8Zn1	NMAG 1
23	AZ 91	3.5912 G-MgAl9Zn1	MAG 7
23	A356-72		2789; 1973
23	356,1		LM25
23	A413.2	G-AlSi12	LM 6
23	A413.1	G-AlSi 12 (Cu)	LM 20
23	A413.0	GD-AlSi12	
23	A380.1	GD-AlSi8Cu3	LM24
24		2.1871 G-AlCu 4 TiMg	
24		3.1754 G-AlCu5Ni1,5	
24		3.2163 G-AlSi9Cu3	
24	4218 B	3.2371 G-AlSi 7 Mg	
24	SC64D	3.2373 G-AlSi9MGWA	
24		3.2373 G-AlSi 9 Mg	
24	QE 22	3.5106 G-MgAg3SE2Zr1	mag 12
24	GD-AlSi12	G-ALMG5	LM5
26	C93200	2.1090 G-CuSn 7 5 pb	
26	c 83600	2.1096 G-CuSn5ZnPb	LG 2
26	C 83600	2.1098 G-CuSn 2 Znpb	
26	C23000	2.1182 G-CuPb15Sn	LB1
26	C 93800	2.1182 G-CuPb15Sn	
27		2.0240 CuZn 15	
27	C27200	2.0321 CuZn 37	cz 108
27	C27700	2.0321 CuZn 37	cz 108
27		2.0590 G-CuZn40Fe	
27	C 86500	2.0592 G-CuZn 35 Al 1	U-Z 36 N 3
27	C 86200	2.0596 G-CuZn 34 Al 2	HTB 1
27	C 18200	2.1293 CuCrZr	CC 102

 France AFNOR	 Sweden SS	 Italy UNI	 Spain UNE	 Japan JIS	 Russia 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					

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According to VDI 3323 Standard

Mtl. No.			
	USA AISI/SAE	GERMANY Werkstoff DIN	Great Britain BS EN
28		2.0060 E-Cu57	
28		2.0375 CuZn36Pb3	
28	C 63000	2.0966 CuAl 10 Ni 5 Fe 4	Ca 104
28	B-148-52	2.0975 G-CuAl 10 Ni	
28	c 90700	2.1050 G-CuSn 10	CT1
28	C 90800	2.1052 G-CuSn 12	pb 2
28	C 81500	2.1292 G-CuCrF 35	CC1-FF
28		2.4764 CoCr20W15Ni	
31	N 08800	1.4558 X 2 NiCrAlTi 32 20	NA 15
31	N 08031	1.4562 X 1 NiCrMoCu 32 28 7	
31	N 08028	1.4563 X 1 NiCrMoCuN 31 27 4	
31	N 08330	1.4864 X 12 NiCrSi 36 16	NA 17
31	330	1.4864 X12 NiCrSi 36 16	NA 17
31		1.4865 G-X40NiCrSi38 18	330 C 40
31		1.4958 X 5 NiCrAlTi 31 20	
31	AMS 5544	LW2.4668 NiCr19NbMo	
32		1.4977 X 40 CoCrNi 20 20	
33	Monel 400	2.4360 NiCu30Fe	NA 13
33	5390A	2.4603	
33	Hastelloy C-4	2.4610 NiMo16Cr16Ti	
33	Nimonic 75	2.4630 NiCr20Ti	HR 5,203-4
33		2.4630 NiCr20Ti	HR5,203-4
33	Inconel 690	2.4642 NiC29Fe	
33	Inconel 625	2.4856 NiCr22Mo9Nb	NA 21
33	5666	2.4856 NiCr22Mo9Nb	
33	Incoloy 825	2.4858 NiCr21Mo	NA 16
34	Monel k-500	2.4375 NiCu30 Al	NA 18
34	4676	2.4375 NiCu30Al	3072-76
34		2.4631 NiCr20TiAl	Hr40; 601
34	Inconel 718	2.4668 NiCr19FeNbMo	
34	Inconel 751	2.4694 NiCr16fE7TiAl	
34		2.4955 NiFe25Cr20NbTi	
34	5383	LM2.4668 NiCr19Fe19NbMo	HR8
34	5391	LW2 4670 S-NiCr13A16MoNb	3146-3

 France AFNOR	 Sweden SS	 Italy UNI	 Spain UNE	 Japan JIS	 Russia GOST
					LS60-2
U-A 10 N					BrAD; N10-4-4
UE 12 P					
Z1NCU31-27-03	2584				EK 77
Z 12 NCS 35.16					
Z 12 NCS 37.18				SUH330	
		XG50NiCr39 19		SCH15	
NC20K14					
Z 42 CNKDOWNb					
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					

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According to VDI 3323 Standard

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

 France AFNOR	 Sweden SS	 Italy UNI	 Spain UNE	 Japan JIS	 Russia GOST
ZSNC DT42					
KC20WN					
KC22WN					
NC 15 TNb A					
NC19KDT					VT5-1
					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
					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.



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