KORLOY
TECH-NEWS

HRMDouble

High Feed Milling cutter with Double Sided 6 Corner Insert

- **Great Value for the Money**
  The multi-corner insert is simply cost-effective
- **Excellent Productivity**
  The high rake angle chip breaker and corner are designed to maximize high feed milling
- **High Rigidity**
  Strong negative inserts

KORLOY

Double Sided 6 Corner Insert

for High Feed Milling Machining

Insert

Cutter

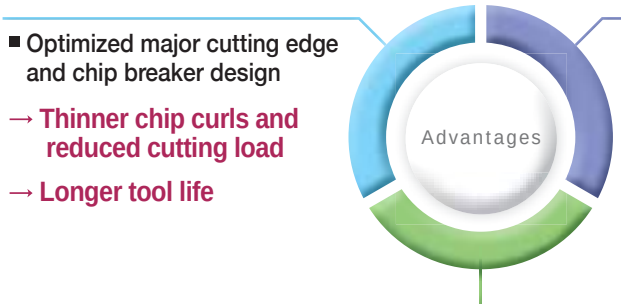
Shank

High feed milling tools provide an answer to the call of machinists for cutting edge durability, efficiency, and value for money, that delivers excellent output.

KORLOY's latest **HRMDouble**, a double sided 6 corner insert milling tool designed for high feed machining brings you one step closer to the goal of eliminating all the troubles caused by unexpected breakdowns and overhead repair costs, while offering extended tool life.

Its proprietary major cutting edges were designed to form thin chips that help reduce cutting load during machining, even at high feeds. The HRMDouble with 6 cutting edges provides more corners per insert than many conventional designs with 2/3/4 corners.

The **HRMDouble** comes equipped with a high rake angle chip breaker for smooth cutting and reduced cutting loads. It is available in 4 size variations-06/09/13/16 covering small tolarge diameters (Ø0.688~Ø12 inch). The HRMDouble provides cost effective high feed productivity.



■ Optimized major cutting edge and chip breaker design

→ Thinner chip curls and reduced cutting load

→ Longer tool life

■ Wide size variations (06/09/13/16)

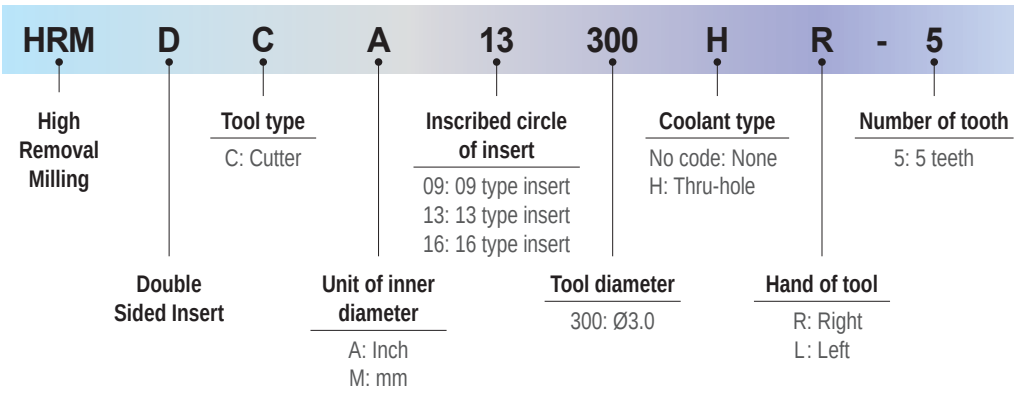
→ Covers small to large diameters (Ø0.688~Ø12 inch)

■ Double sided 6 corner insert

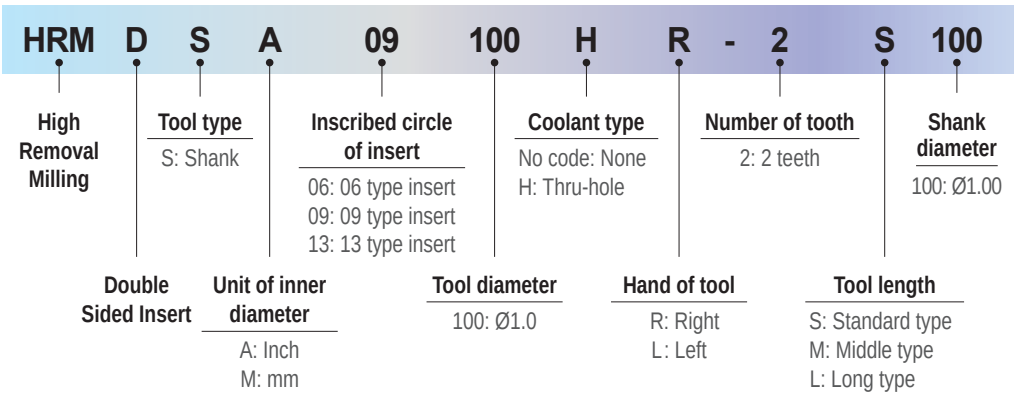
→ Multi-corner use for cost efficiency

Code System

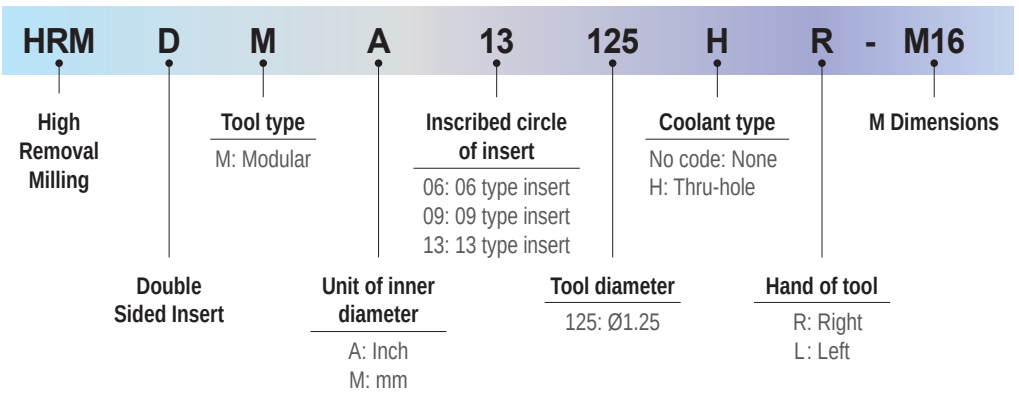
[Cutter Type]



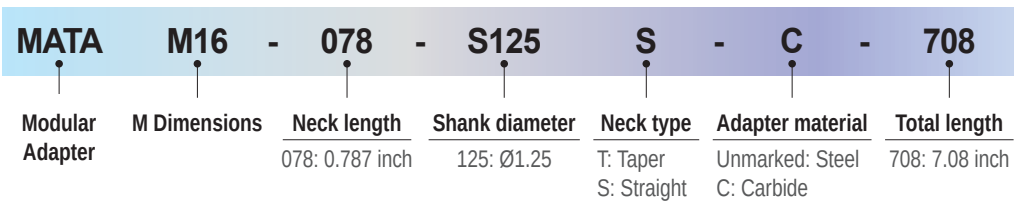
[Shank Type]



[Modular Head]



[Modular Adopter]



HRMDouble

- The HRMDouble is more economical with 6 cutting edges compared to the HRM tool with positive inserts with 3 edges.
- High rake angle cutting edge and chip breaker reduces cutting loads.
- Negative geometry design increases rigidity of cutting edge and doubles the number of cutting edges.
- Simple screw on system provides stable support and stronger clamping force
- Unique insert design specifically for high feed and multifunctional machining
- The HRMDouble insert with symmetrical cutting edge is applicable for both R and L hand machining.

Insert Features

Nose-R

- Security of rigid edge in ramping pocket machining
- Round geometric insert edge suited for high feed rate machining
- Can use R/L type machining

Clamping surface

- Designed for stable clamping
- Designed to prevention chip friction

Chip breaker

- Reduction of cutting load due to high rake angle
- Improvement of chip flow and evacuation in various applications and materials
- Prevents damage to occur on the clamping face part

Major cutting edge

- Symmetrical design insert for R/L type tool
- Superior cutting performance due to high rake angle cutting edge
- Low cutting resistance in high feeds
- Special design for decreasing thrust force

Minor cutting edge

- Improves surface finish during high feed machining
- Special design for decreasing thrust force
- Symmetrical insert design for R/L type tool

Cutter Features

Inner coolant system

- Improvement of chip control and evacuation
- Longer tool life due to reduced cutting temperature

Simple screw on system

- Strong clamping of screw on system
- Convenient clamping system
- Wide chip pocket for better chip evacuation

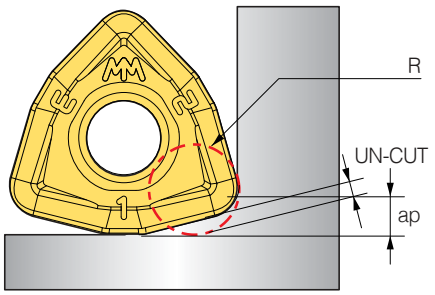
3-Surface constrained System

- Strong clamping of screw on system
- Stable clamping system against different cutting resistances in various machining applications

Corner R Programming

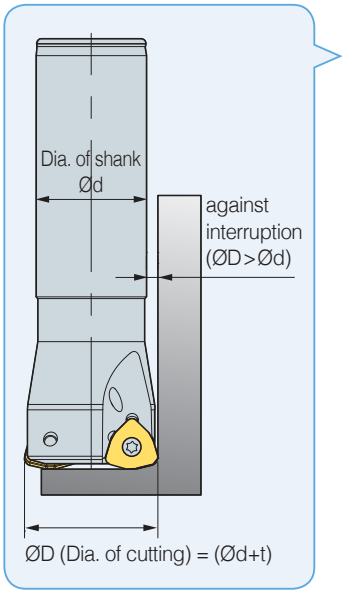
Designation		Cutting condition		Approx. R (inch)	
		Max.ap (inch)	Max.fz (ipt)	Input. R	Uncut
WNMX	060312ZNN-□□	0.04	0.05	0.07	0.015
	09T316ZNN-□□	0.06	0.08	0.10	0.024
	130520ZNN-□□	0.08	0.12	0.12	0.032
	160720ZNN-□□	0.10	0.14	0.14	0.047

- Information for uncut part by using "Input.R" for CAM program



■ Uncut corner part can be changed depending on the cutting conditions and with unstable clamping system or workpiece.

Interference Prevent System



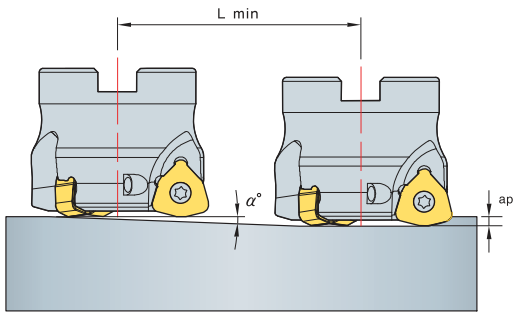
(inch)

Designation	ØD	Ød	t
HRMDSA06068HR-2□062	0.6880	0.625	0.063
HRMDSA06087HR-2□075	0.8750	0.750	0.125
HRMDSA06112HR-3□100	1.1250	1.000	0.125
HRMDSA06137HR-4□125	1.3750	1.250	0.125
HRMDSA09106HR-2□100	1.0625	1.000	0.060
HRMDSA09131HR-3□125	1.3125	1.250	0.060
HRMDSA09137HR-4□125	1.3750	1.250	0.130
HRMDSA09150HR-4□125	1.5000	1.250	0.250
HRMDSA09200HR-4□150	2.0000	1.500	0.500
HRMDSA13131HR-2□125	1.3130	1.250	0.060
HRMDSA13137HR-2□125	1.3750	1.250	0.130
HRMDSA13150HR-3□125	1.5000	1.250	0.250
HRMDSA13162HR-3□125	1.6250	1.250	0.380
HRMDSA13162HR-3□150	1.6250	1.500	0.130
HRMDSA13200HR-3□150	2.0000	1.500	0.500
HRMDSA13250HR-4□150	2.5000	1.500	1.000

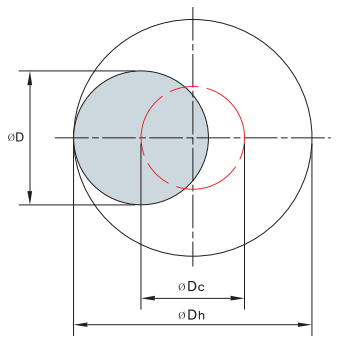
• The side clearance prevents to interference between tool and workpiece even in deep hole machining

Ramping & Helical Cutting Technical Data

Ramping



Helical cutting



• $L\ min = \frac{ap}{\tan \alpha^{\circ}}$ (inch)

• ØDc = ØDh-ØD

ØDc = Tool pass of tool center
ØDh = Desirable hole diameter on workpiece
ØD = Tool diameter

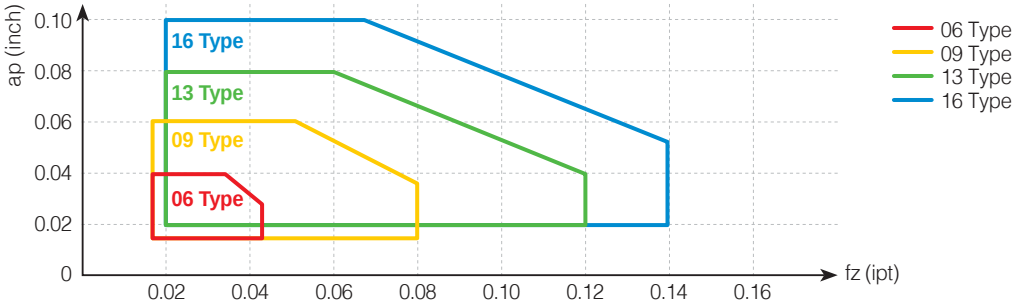
• Adjust feed to under 70% of recommended cutting condition when ramping & helical cutting
• In helical ramping, max. cutting depth per 1 helical revolution of cutter should not exceed max. cutting depth as per insert size
• In ramping, max. cutting depth for 1 ramping process should not exceed max. depth of cut as per used insert size

Ramping & Helical Cutting Technical Data

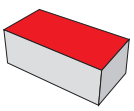
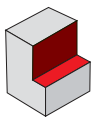
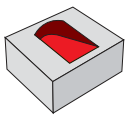
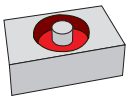
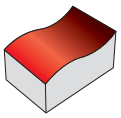
(inch)

Designation		Tool diameter ØD	Efficient cutting diameter ØDe	Ramping			Helical ramping	
				Max. ap	Max. angle α°	Cutting Length Lmin	Dh Min. Cutting dia.	Dh Max. Cutting dia.
HRMDSA	06068HR	0.688	0.433	0.039	3.7	0.603	1.052	1.281
	06075HR	0.750	0.495	0.039	3.3	0.676	1.177	1.406
	06087HR	0.875	0.619	0.039	2.1	1.063	1.427	1.656
	06100HR	1.000	0.741	0.039	2.6	0.858	1.677	1.906
	06112HR	1.125	0.866	0.039	1.9	1.175	1.927	2.156
	06125HR	1.250	0.992	0.039	0.6	3.724	2.177	2.406
	06137HR	1.375	1.115	0.039	0.4	5.586	2.427	2.656
HRMDSA	09100HR-2□□□	1.000	0.606	0.059	5.4	0.622	1.480	1.843
	09106HR-2□□□	1.063	0.646	0.059	5.0	0.669	1.559	1.921
	09118HR-3□□□	1.188	0.803	0.059	3.9	0.866	1.874	2.236
	09125HR-3□□□	1.250	0.878	0.059	3.5	0.965	2.031	2.394
	09131HR-3□□□	1.313	0.917	0.059	3.3	1.016	2.110	2.472
	09137HR-4□□□	1.375	1.000	0.059	3.0	1.114	2.268	2.630
	09150HR-4□□□	1.500	1.125	0.059	2.5	1.351	2.512	2.874
	09162HR-4□□□	1.625	1.189	0.059	2.5	1.358	2.661	3.024
	09200HR-□□□	2.000	1.583	0.059	1.8	1.850	3.449	3.811
	13125HR-2□□□	1.250	0.760	0.079	5.7	0.787	1.850	2.362
	13131HR-2□□□	1.313	0.799	0.079	5.4	0.839	1.929	2.441
	13137HR-2□□□	1.375	0.878	0.079	4.8	0.945	2.087	2.598
	13150HR-3□□□	1.500	0.996	0.079	3.7	1.222	2.331	2.843
	13162HR-3□□□	1.625	1.071	0.079	3.7	1.209	2.480	2.992
	13200HR-□□□	2.000	1.457	0.079	2.6	1.732	3.268	3.780
	13250HR-□□□	2.500	1.969	0.079	1.9	2.413	4.291	4.803
HRMDCA	09200HR-□	2.000	1.583	0.059	1.8	1.850	3.449	3.811
	09250HR-□	2.500	2.091	0.059	1.4	2.492	4.472	4.835
	09300HR-□	3.000	2.760	0.059	1.0	3.327	5.811	6.173
	09400HR-□	4.000	3.543	0.059	0.8	4.311	7.386	7.748
	13200HR-□	2.000	1.457	0.079	2.6	1.732	3.268	3.780
	13250HR-□	2.500	1.969	0.079	1.9	2.413	4.291	4.803
	13300HR-□	3.000	2.634	0.079	1.4	3.307	5.630	6.142
	13400HR-□	4.000	3.421	0.079	1.0	4.358	7.205	7.717
	13500HR-□	5.000	4.406	0.079	0.8	4.488	9.173	9.685
HRMDCA	16300HR-□	3.000	2.343	0.098	1.5	3.742	5.134	5.843
	16400HR-□	4.000	3.344	0.098	1.0	5.614	7.134	7.843
	16500HR-□	5.000	4.345	0.098	0.8	7.018	9.134	9.843
	16600R-□	6.000	5.345	0.098	0.6	9.357	11.134	11.843
	16800R-□	8.000	7.346	0.098	0.3	18.716	15.134	15.843
	61000R-□	10.000	9.346	0.098	0.2	28.074	19.134	19.843
	161200R-□	12.000	11.346	0.098	0.1	56.149	23.134	23.843

Application Area



Uses

Facing	Shouldering	Ramping	Helical cutting	Copying	Through coolant system
					

Recommended Cutting Conditions

ISO	Workpiece		Material	Grade	Cutting speed, vc (sfm)
P	Carbon steel	Low carbon steel	1213, C = 0.1~25	PC5300	919
				PC5400	804
		General carbon steel	C = 0.30~55	PC5300	837
				PC5400	722
		High carbon steel	C = 0.55~80	PC5300	787
				PC5400	673
	Low alloy steel (Alloy constituent < 5%)	-	4115, 4120, 4140	PC5300	640
				PC5400	558
		Hardened	-	PC5300	377
				PC5400	328
	High alloy steel (Alloy constituent > 5%)	annealed	H13	PC5300	492
				PC5400	427
		Hardened	M2, M35	PC5300	394
				PC5400	344
M	Stainless steel	Ferritic/martensitic	S41000, S42000, S43000	PC5300	525
				PC5400	443
		Austenitic	S30300, S30400, S31600	PC5300	427
				PC5400	361
		Duplex (Austenitic/Ferrictic)	31803	PC5300	328
				PC5400	279
K	Gray cast iron	Low tensile	No30B, No35B	PC5300	558
				PC5400	492
		Hight tensile	No45B, No50B	PC5300	492
				PC5400	427
	Ductile cast iron	Ferric	60-40-18, 80-55-06	PC5300	558
				PC5400	492
		Pearlitic	80-55-06, 100-70-03	PC5300	492
				PC5400	427
S	Fe Base	-	Incoloy	PC5300	197
				PC5400	164
	Ni Base	-	Inconel, Nimonic, Hastelloy	PC5300	180
				PC5400	148
	Co base	-	stelite	PC5300	82
				PC5400	66
	Titanium alloys	-	pure Ti	PC5300	427
				PC5400	344
			alloy (TiAl6V4)	PC5300	213
				PC5400	180

Application Examples

AISI 1045 (SM45C, HRC22)

- Cutting conditions: vc (sfm) = 930, fz (ipt) = 0.055, vf (ipm) = 398, ap (inch) = 0.032, ae (inch) = 1.378
  Coolant: Dry, Machining: Copying
  Overhang of tool: 10 inch
- Tools: Cutter: HRMDCA13200HR-4
  Insert: WNMX130520ZNN-MM (PC3500)
- Machine: MCT (Horizontal)

- Productivity: 40% increase
- Tool cost: 80% decrease

In comparing HRMD with our competitor using the same cutting conditions, the cutting speed of HRMD was higher with the same depth of cut (ap×ae), the cycle time was reduced by 40% and the tool life was increased to over 60%. HRMD is economically more efficient due to the use of 6 cutting edges compared to EDNW type with positive insert.

AISI 304 (STS304)

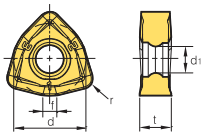
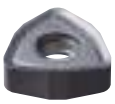
- Cutting conditions: vc (sfm) = 430, fz (ipt) = 0.047, vf (ipm) = 117, ap (inch) = 0.04, ae (inch) = 3.15
  Coolant: Wet, Machining: Facing and Slotting
  Overhang of tool: 10 inch
- Tools: Cutter: HRMDCA13400HR-6
  Insert: WNMX130520ZNN-MM (PC3545)
- Machine: MCT (Vertical)

- Productivity: 80% increase
- Tool cost: 25% decrease

When comparing the HRMD with our competitor with the same cutting conditions, the cutting speed of the HRMD was higher with the same depth of cut (apxae). Even though the cycle time was reduced by 80% the tool life was the same, but the HRMD is more economically efficient due to the use of 6 cutting edges compared to SDKN positive insert type.

Inserts

(inch)

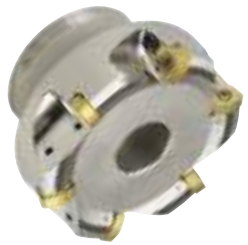
Insert shape	Designation		Coated											Uncoated			Dimensions					Geometries
			NC5330	NC5340	NC5350	PC2505	PC2510	PC3500	PC3600	PC9530	PC6510	PC5300	PC5400	PD2000	ST30A	G10	H01	d	t	r	d1	f	
	WNMX	060312ZNN-MF							●			●	●					0.250	0.125	0.047	0.113	0.047	
		09T316ZNN-MF							●			●	●					0.375	0.156	0.063	0.142	0.067	
		130520ZNN-MF							●			●	●					0.500	0.219	0.079	0.185	0.098	
		160720ZNN-MF							●			●	●					0.630	0.276	0.079	0.228	0.118	
	WNMX	060312ZNN-ML										●	●					0.250	0.125	0.047	0.113	0.047	
		09T316ZNN-ML										●	●					0.375	0.156	0.063	0.142	0.067	
		130520ZNN-ML										●	●					0.500	0.219	0.079	0.185	0.098	
		160720ZNN-ML										●						0.630	0.276	0.079	0.228	0.118	
	WNMX	060312ZNN-MM				●	●		●			●	●					0.250	0.125	0.047	0.113	0.047	
		09T316ZNN-MM				●	●	●	●	●		●	●					0.375	0.156	0.063	0.142	0.067	
		130520ZNN-MM				●	●	●	●	●		●	●					0.500	0.219	0.079	0.185	0.098	
		160720ZNN-MM							●			●	●					0.630	0.276	0.079	0.228	0.118	

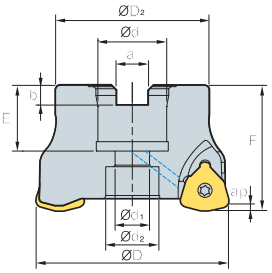
● : Korea Stock ● : US Stock

HRMDCA09

Facing | Shouldering | Ramping | Helical cutting | Copying | Through coolant system | AA 76°

- AR: -7°
- RR: -12°~ -18°

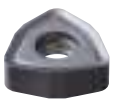




(inch)

Designation		⦶	ØD	ØD2	Ød	Ød1	Ød2	a	b	E	F	ap	lbs	Bolt
HRMDCA	09200HR-4	4	2.000	1.772	0.750	0.413	0.630	0.315	0.220	0.787	1.75	0.06	0.662	3/8-24UNF
	09200HR-5	5	2.000	1.772	0.750	0.413	0.630	0.315	0.220	0.787	1.75	0.06	0.662	
	09250HR-5	5	2.500	1.772	0.750	0.413	0.630	0.315	0.220	0.787	1.75	0.06	1.103	
	09250HR-6	6	2.500	1.772	0.750	0.413	0.630	0.315	0.220	0.787	1.75	0.06	1.103	
	09300HR-6	6	3.000	2.205	1.000	0.551	0.827	0.374	0.248	0.866	2.00	0.06	3.308	1/2-20UNF
	09300HR-7	7	3.000	2.205	1.000	0.551	0.827	0.374	0.248	0.866	2.00	0.06	3.308	
	09400HR-7	7	4.000	2.874	1.250	0.709	1.024	0.500	0.319	0.866	2.00	0.06	4.631	5/8-18UNF
	09400HR-8	8	4.000	2.874	1.250	0.709	1.024	0.500	0.319	0.866	2.00	0.06	4.631	

Available Inserts


WNMX-MF


WNMX-ML


WNMX-MM

Designation		Cermet		Coated										Uncoated		
		CN2000	CN30	NC5330	NC5340	NC5350	PC2505	PC2510	PC3500	PC3600	PC9530	PC6510	PC5300	PC5400	ST30A	G10	H01
WNMX	09T316ZNN-MF									●			●	●			
	09T316ZNN-ML												●	●			
	09T316ZNN-MM						●	●	●	●	●		●	●			

●: Korea Stock ●: US Stock

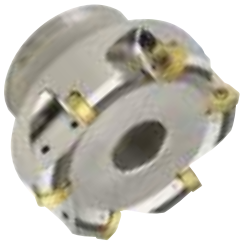
Parts

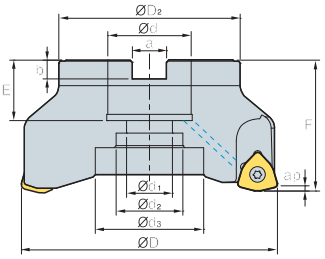
Specification	Screw	Wrench
Ø2.000 ~ Ø4.000	FTKA0307	TW09S

HRMDCA13

Facing | Shouldering | Ramping | Helical cutting | Copying | Through coolant system | AA 76°

- AR: -7°
- RR: -12°~ -4°





(inch)

Designation			ØD	ØD2	Ød	Ød1	Ød2	Ød3	a	b	E	F	ap	lbs	Bolt
HRMDCA	13200HR-3	3	2.0	1.772	0.75	0.413	0.630	-	0.315	0.220	0.787	1.75	0.08	0.662	3/8-24UNF
	13200HR-4	4	2.0	1.772	0.75	0.413	0.630	-	0.315	0.220	0.787	1.75	0.08	0.662	
	13250HR-4	4	2.5	1.772	0.75	0.413	0.630	-	0.315	0.220	0.787	1.75	0.08	1.103	
	13250HR-5	5	2.5	1.772	0.75	0.413	0.630	-	0.315	0.220	0.787	1.75	0.08	1.103	
	13300HR-5	5	3.0	2.205	1.00	0.551	0.827	-	0.374	0.248	0.866	2.00	0.08	2.205	1/2-20UNF
	13300HR-6	6	3.0	2.205	1.00	0.551	0.827	-	0.374	0.248	0.866	2.00	0.08	2.205	
	13400HR-6	6	4.0	2.874	1.25	0.709	1.024	-	0.500	0.319	0.866	2.00	0.08	3.528	5/8-18UNF
	13400HR-7	7	4.0	2.874	1.25	0.709	1.024	-	0.500	0.319	0.866	2.00	0.08	3.528	
	13500HR-7	7	5.0	3.433	1.50	0.827	1.220	2.125	0.626	0.394	1.181	2.50	0.08	4.410	3/4-16UNF
	13500HR-8	8	5.0	3.433	1.50	0.827	1.220	2.125	0.626	0.394	1.181	2.50	0.08	4.410	

Available Inserts


WNMX-MF


WNMX-ML


WNMX-MM

Designation		Cermet		Coated											Uncoated		
		CN2000	CN30	NC5330	NC5340	NC5350	PC2505	PC2510	PC3500	PC3600	PC9530	PC6510	PC5300	PC5400	ST30A	G10	H01
WNMX	130520ZNN-MF									●			●	●			
	130520ZNN-ML												●	●			
	130520ZNN-MM						●	●	●	●	●		●	●			

●: Korea Stock ●: US Stock

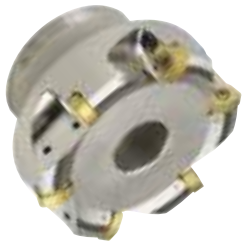
Parts

Specification	Screw	Wrench
Ø2.0 ~ Ø5.0	FTKA0412B	TW15S

HRMDCA16

Facing | Shouldering | Ramping | Helical cutting | Copying | Through coolant system | AA 76°

• AR: -7°
• RR: -12°~ -4°



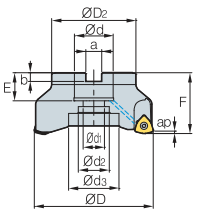


Fig. 1

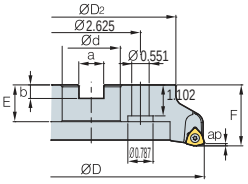


Fig. 2

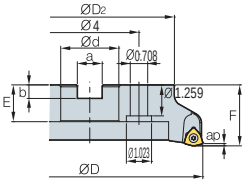


Fig. 3

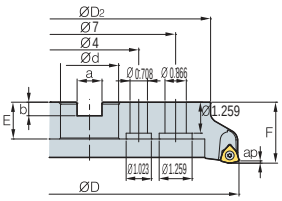


Fig. 4

(inch)

Designation			ØD	ØD2	Ød	Ød1	Ød2	Ød3	a	b	E	F	ap	lbs	Bolt	Fig.
HRMDCA	16300HR-4	4	3.0	2.362	1.00	0.551	0.827	-	0.374	0.248	0.866	2.00	0.098	1.94	1/2-20UNF	1
	16300HR-5	5	3.0	2.362	1.00	0.551	0.827	-	0.374	0.248	0.866	2.00	0.098	1.81		
	16400HR-5	5	4.0	3.346	1.25	0.709	1.024	-	0.500	0.319	0.866	2.00	0.098	3.77	5/8-18UNF	1
	16400HR-6	6	4.0	3.346	1.25	0.709	1.024	-	0.500	0.319	0.866	2.00	0.098	3.86		
	16500HR-6	6	5.0	3.937	1.50	0.827	1.220	2.205	0.626	0.394	1.181	2.50	0.098	7.23	3/4-16UNF	1
	16500HR-7	7	5.0	3.937	1.50	0.827	1.220	2.205	0.626	0.394	1.181	2.50	0.098	7.25		
	16600R-7	7	6.0	5.039	2.00	-	3.543	-	0.752	0.433	1.181	2.50	0.098	8.99	1-14UNF	2
	16600R-8	8	6.0	5.039	2.00	-	3.543	-	0.752	0.433	1.181	2.50	0.098	9.13		
	16800R-8	8	8.0	5.701	2.50	-	5.197	-	1.000	0.551	1.496	2.50	0.098	14.7	-	3
	16800R-10	10	8.0	5.701	2.50	-	5.197	-	1.000	0.551	1.496	2.50	0.098	14.79		
	161000R-10	10	10.0	7.480	2.50	-	7.087	-	1.000	0.551	1.496	2.50	0.098	24.98	-	3
	161000R-12	12	10.0	7.480	2.50	-	7.087	-	1.000	0.551	1.496	2.50	0.098	24.89		
	161200R-12	12	12.0	9.646	2.50	-	9.370	-	1.000	0.551	1.496	2.50	0.098	37.15	-	4
	161200R-14	14	12.0	9.646	2.50	-	9.370	-	1.000	0.551	1.496	2.50	0.098	37.39		

Available Inserts

WNMX-MF

WNMX-ML

WNMX-MM

Designation		Cermet		Coated											Uncoated		
		CN2000	CN30	NC5330	NC5340	NC5350	PC2505	PC2510	PC3500	PC3600	PC9530	PC6510	PC5300	PC5400	ST30A	G10	H01
WNMX	160720ZNN-MF									●			●	●			
	160720ZNN-ML												●				
	160720ZNN-MM									●			●	●			

●: Korea Stock ●: US Stock

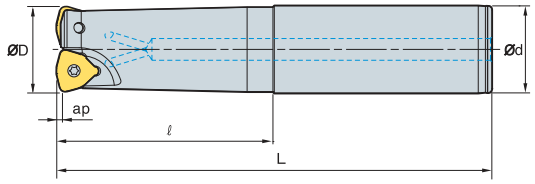
Parts

Specification	Screw	Wrench
Ø3.0 ~ Ø12.0	FTGA0513-P	TW20-100

HRMDSA06

Facing | Shouldering | Ramping | Helical cutting | Copying | Through coolant system | AA 76°

- AR: -7°
- RR: -17°~ -25°



(inch)

Designation		⦾	ØD	Ød	ℓ	L	ap	lbs
HRMDSA	06068HR-2S062	2	0.688	0.625	0.787	4.331	0.039	0.32
	06068HR-2M062	2	0.688	0.625	0.787	5.906	0.039	0.44
	06068HR-2L062	2	0.688	0.625	0.787	7.874	0.039	0.60
	06075HR-2S075	2	0.750	0.750	1.969	5.118	0.039	0.55
	06075HR-2M075	2	0.750	0.750	3.937	7.087	0.039	0.75
	06075HR-2L075	2	0.750	0.750	5.118	9.843	0.039	1.06
	06087HR-2S075	2	0.875	0.750	0.787	5.118	0.039	0.59
	06087HR-2M075	2	0.875	0.750	0.787	7.087	0.039	0.82
	06087HR-2L075	2	0.875	0.750	0.787	9.843	0.039	1.14
	06100HR-3S100	3	1.000	1.000	2.362	5.512	0.039	1.01
	06100HR-3M100	3	1.000	1.000	3.150	7.087	0.039	1.31
	06100HR-3L100	3	1.000	1.000	4.724	9.843	0.039	1.84
	06112HR-3S100	3	1.125	1.000	1.181	5.512	0.039	1.09
	06112HR-3M100	3	1.125	1.000	1.181	7.087	0.039	1.40
	06112HR-3L100	3	1.125	1.000	1.181	9.843	0.039	1.95
	06125HR-4S125	4	1.250	1.250	2.756	5.906	0.039	1.76
	06125HR-4M125	4	1.250	1.250	3.937	7.874	0.039	2.38
	06125HR-4L125	4	1.250	1.250	7.087	11.811	0.039	3.58
	06137HR-4S125	4	1.375	1.250	1.575	7.874	0.039	2.53
	06137HR-4M125	4	1.375	1.250	1.575	9.843	0.039	3.17
	06137HR-4L125	4	1.375	1.250	1.575	11.811	0.039	3.81

Available Inserts


WNMX-MF


WNMX-ML


WNMX-MM

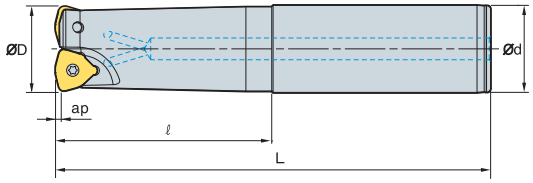
Designation		Cermet		Coated											Uncoated		
		CN2000	CN30	NC5330	NC5340	NC5350	PC2505	PC2510	PC3500	PC3600	PC9530	PC6510	PC5300	PC5400	ST30A	G10	H01
WNMX	060312ZNN-MF									●			●	●			
	060312ZNN-ML												●	●			
	060312ZNN-MM						●	●		●			●	●			

●: Korea Stock ●: US Stock

Parts

Specification	Screw	Wrench
Ø0.688 ~ Ø1.375	ETNA02506	TW07S

HRMDSA09



Facing | Shouldering | Ramping | Helical cutting | Copying | Through coolant system | AA 76°

- AR: -7°
- RR: -17°~ -25°

(inch)

Designation		⦶	ØD	Ød	ℓ	L	ap	lbs
HRMDSA	09100HR-2S100	2	1.0000	1.00	2.362	5.512	0.06	1.103
	09100HR-2M100	2	1.0000	1.00	4.724	7.874	0.06	1.323
	09100HR-2L100	2	1.0000	1.00	7.087	11.811	0.06	2.205
	09106HR-2S100	2	1.0625	1.00	2.362	5.512	0.06	1.103
	09106HR-2M100	2	1.0625	1.00	2.362	7.874	0.06	1.544
	09106HR-2L100	2	1.0625	1.00	2.362	11.811	0.06	2.205
	09118HR-3S125	3	1.1875	1.25	2.756	5.906	0.06	1.764
	09118HR-3M125	3	1.1875	1.25	4.724	7.874	0.06	2.205
	09118HR-3L125	3	1.1875	1.25	7.087	11.811	0.06	3.308
	09125HR-3S125	3	1.2500	1.25	2.756	5.906	0.06	1.764
	09125HR-3M125	3	1.2500	1.25	4.724	7.874	0.06	2.426
	09125HR-3L125	3	1.2500	1.25	7.087	11.811	0.06	3.749
	09131HR-3S125	3	1.3125	1.25	2.756	5.906	0.06	1.764
	09131HR-3M125	3	1.3125	1.25	2.756	7.874	0.06	2.426
	09131HR-3L125	3	1.3125	1.25	2.756	11.811	0.06	3.749

Available Inserts


WNMX-MF


WNMX-ML


WNMX-MM

Designation		Cermet		Coated										Uncoated		
		CN2000	CN30	NC5330	NC5340	NC5350	PC2505	PC2510	PC3500	PC3600	PC3530	PC6510	PC5300	PC5400	ST30A	G10	H01
WNMX	09T316ZNN-MF									●			●	●			
	09T316ZNN-ML												●	●			
	09T316ZNN-MM						●	●	●	●	●		●	●			

●: Korea Stock ●: US Stock

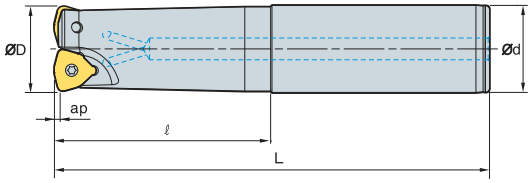
Parts

Specification	Screw	Wrench
Ø1.000 ~ Ø1.3125	FTKA0307	TW09S

HRMDSA09

Facing | Shouldering | Ramping | Helical cutting | Copying | Through coolant system | AA 76°

• AR: -7°
• RR: -17°~ -25°



(inch)

Designation		◎	ØD	Ød	ℓ	L	ap	lbs
HRMDSA	09137HR-4S125	4	1.3750	1.25	1.969	5.906	0.06	1.985
	09137HR-4M125	4	1.3750	1.25	1.969	7.874	0.06	2.426
	09137HR-4L125	4	1.3750	1.25	1.969	11.811	0.06	3.749
	09150HR-4S125	4	1.5000	1.25	1.969	5.906	0.06	1.985
	09150HR-4M125	4	1.5000	1.25	1.969	9.843	0.06	3.308
	09150HR-4L125	4	1.5000	1.25	1.969	11.811	0.06	3.969
	09200HR-4S150	4	2.0000	1.50	1.575	5.906	0.06	3.087
	09200HR-4M150	4	2.0000	1.50	1.575	9.843	0.06	5.292
	09200HR-4L150	4	2.0000	1.50	1.575	11.811	0.06	6.395
	09200HR-5S150	5	2.0000	1.50	1.575	5.906	0.06	3.087
	09200HR-5M150	5	2.0000	1.50	1.575	9.843	0.06	5.292
	09200HR-5L150	5	2.0000	1.50	1.575	11.811	0.06	6.395

Available Inserts


WNMX-MF


WNMX-ML


WNMX-MM

Designation		Cermet		Coated											Uncoated		
		CN2000	CN30	NC5330	NC5340	NC5350	PC2505	PC2510	PC3500	PC3600	PC9530	PC6510	PC5300	PC5400	ST30A	G10	H01
WNMX	09T316ZNN-MF									●			●	●			
	09T316ZNN-ML												●	●			
	09T316ZNN-MM						●	●	●	●	●		●	●			

●: Korea Stock ●: US Stock

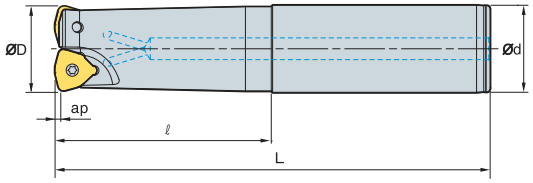
Parts

Specification	Screw	Wrench
Ø1.3750 ~ Ø2.0000	FTKA0307	TW09S

HRMDSA13

Facing | Shouldering | Ramping | Helical cutting | Copying | Through coolant system | AA 76°

- AR: -7°
- RR: -14°~ -16°



(inch)

Designation		⦾	ØD	Ød	ℓ	L	ap	lbs
HRMDSA	13125HR-2S125	2	1.250	1.250	2.756	5.906	0.08	1.764
	13125HR-2M125	2	1.250	1.250	4.724	7.874	0.08	2.205
	13125HR-2L125	2	1.250	1.250	7.087	11.811	0.08	3.528
	13131HR-2S125	2	1.313	1.250	2.756	5.906	0.08	1.754
	13131HR-2M125	2	1.313	1.250	2.756	7.874	0.08	2.426
	13131HR-2L125	2	1.313	1.250	2.756	11.811	0.08	3.749
	13137HR-2S125	2	1.375	1.250	1.969	5.906	0.08	1.764
	13137HR-2M125	2	1.375	1.250	1.969	7.874	0.08	2.426
	13137HR-2L125	2	1.375	1.250	1.969	11.811	0.08	3.749
	13150HR-3S125	3	1.500	1.250	1.969	5.906	0.08	1.764
	13150HR-3M125	3	1.500	1.250	1.969	9.843	0.08	3.087
	13150HR-3L125	3	1.500	1.250	1.969	11.811	0.08	3.749
	13150HR-3S150	3	1.500	1.500	2.362	5.906	0.08	2.646
	13150HR-3M150	3	1.500	1.500	5.118	9.843	0.08	4.631
	13150HR-3L150	3	1.500	1.500	7.087	11.811	0.08	5.733
	13162HR-3S125	3	1.625	1.250	1.969	5.906	0.08	1.985
	13162HR-3M125	3	1.625	1.250	1.969	9.843	0.08	2.646
	13162HR-3L125	3	1.625	1.250	1.969	11.811	0.08	3.969
	13162HR-3S150	3	1.625	1.500	1.969	5.906	0.08	2.867
	13162HR-3M150	3	1.625	1.500	1.969	9.843	0.08	4.851
	13162HR-3L150	3	1.625	1.500	1.969	11.811	0.08	5.954

Available Inserts

WNMX-MF

WNMX-ML

WNMX-MM

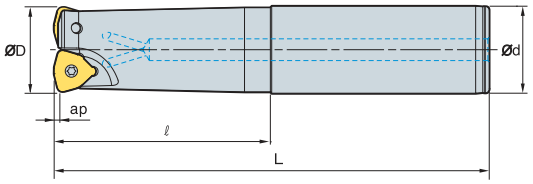
Designation		Cermet		Coated										Uncoated		
		CN2000	CN30	NC5330	NC5340	NC5350	PC2505	PC2510	PC3500	PC3600	PC9530	PC6510	PC5300	PC5400	ST30A	G10	H01
WNMX	130520ZNN-MF									●			●	●			
	130520ZNN-ML												●	●			
	130520ZNN-MM						●	●	●	●	●		●	●			

●: Korea Stock ●: US Stock

Parts

Specification	Screw	Wrench
Ø1.250 ~ Ø1.625	FTKA0412B	TW15S

HRMDSA13



Facing | Shouldering | Ramping | Helical cutting | Copying | Through coolant system | AA 76°

- AR: -7°
- RR: -14°~ -16°

(inch)

Designation		◌	ØD	Ød	ℓ	L	ap	lbs
HRMDSA	13200HR-3S150	3	2.000	1.500	1.969	5.906	0.08	2.426
	13200HR-3M150	3	2.000	1.500	1.969	9.843	0.08	3.749
	13200HR-3L150	3	2.000	1.500	1.969	11.811	0.08	4.410
	13200HR-4S150	4	2.000	1.500	1.969	5.906	0.08	3.308
	13200HR-4M150	4	2.000	1.500	1.969	9.843	0.08	5.292
	13200HR-4L150	4	2.000	1.500	1.969	11.811	0.08	6.395
	13250HR-4S150	4	2.500	1.500	1.969	5.906	0.08	3.087
	13250HR-4M150	4	2.500	1.500	1.969	9.843	0.08	4.631
	13250HR-4L150	4	2.500	1.500	1.969	11.811	0.08	5.292
	13250HR-5S150	5	2.500	1.500	1.969	5.906	0.08	3.969
	13250HR-5M150	5	2.500	1.500	1.969	9.843	0.08	6.174
	13250HR-5L150	5	2.500	1.500	1.969	11.811	0.08	7.056

Available Inserts


WNMX-MF


WNMX-ML


WNMX-MM

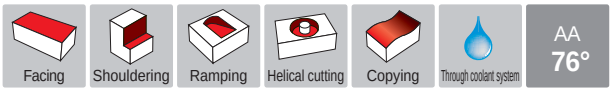
Designation		Cermet		Coated										Uncoated		
		CN2000	CN30	NC5330	NC5340	NC5350	PC2505	PC2510	PC3500	PC3600	PC9530	PC6510	PC5300	PC5400	ST30A	G10	H01
WNMX	130520ZNN-MF									●			●	●			
	130520ZNN-ML												●	●			
	130520ZNN-MM						●	●	●	●	●		●	●			

●: Korea Stock ●: US Stock

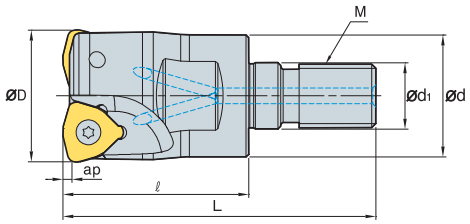
Parts

Specification	Screw	Wrench
Ø2.000 ~ Ø2.500	FTKA0412B	TW15S

HRMDMA06



• AR: -7°
• RR: -18°~ -25°



(inch)

Designation		⦶	ØD	Ød	Ød1	ℓ	L	M	ap	lbs
HRMDMA	06068HR-M08	2	0.688	0.571	0.335	0.984	1.654	M08	0.039	0.07
	06075HR-M10	2	0.750	0.689	0.413	1.181	2.008	M10	0.039	0.13
	06087HR-M10	2	0.875	0.709	0.413	1.181	2.008	M10	0.039	0.15
	06100HR-M12	3	1.000	0.906	0.492	1.378	2.323	M12	0.039	0.23
	06112HR-M12	3	1.125	0.906	0.492	1.378	2.323	M12	0.039	0.28
	06125HR-M16	4	1.250	1.142	0.669	1.575	2.638	M16	0.039	0.45
	06137HR-M16	4	1.375	1.142	0.669	1.575	2.638	M16	0.039	0.51

Available Inserts


WNMX-MF


WNMX-ML


WNMX-MM

Designation		Cermet		Coated										Uncoated		
		CN2000	CN30	NC5330	NC5340	NC5350	PC2505	PC2510	PC3500	PC3600	PC9530	PC6510	PC5300	PC5400	ST30A	G10	H01
WNMX	060312ZNN-MF									●			●	●			
	060312ZNN-ML												●	●			
	060312ZNN-MM						●	●		●			●	●			

●: Korea Stock ●: US Stock

Available Adaptor

Designation		Available Adaptor	Designation		Available Adaptor
HRMDMA	06068HR-M08	MAT- M08	HRMDMA	06112HR-M12	MAT- M12
	06075HR-M10	MAT- M10		06125HR-M16	MAT- M16
	06087HR-M10	MAT- M10		06137HR-M16	MAT- M16
	06100HR-M12	MAT- M12			

Designation: HRMDMA06125HR-M16
Modular Head Threading Measure size (M16)

II

Adaptor Spec.: MATA-M16-137-S125S
Adaptor Threading Measure (M16)

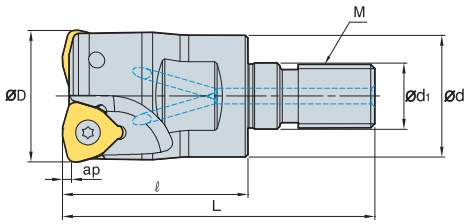
Parts

Specification	Screw	Wrench
		
Ø0.688 ~ Ø1.375	ETNA02506	TW07S

HRMDMA09/13

Facing | Shouldering | Ramping | Helical cutting | Copying | Through coolant system | AA 76°

• AR: -7°
• RR: -18°~ -25°



(inch)

Designation		⦾	ØD	Ød	Ød1	ℓ	L	M	ap	lbs
HRMDMA	09100HR-M12	2	1.000	0.906	0.492	1.378	2.323	M12	0.06	0.22
	09106HR-M12	2	1.063	0.906	0.492	1.378	2.323	M12	0.06	0.24
	09118HR-M16	3	1.188	1.142	0.669	1.575	2.638	M16	0.06	0.42
	09125HR-M16	3	1.250	1.142	0.669	1.575	2.638	M16	0.06	0.44
	09131HR-M16	3	1.313	1.142	0.669	1.575	2.638	M16	0.06	0.46
	09137HR-M16	4	1.375	1.142	0.669	1.575	2.638	M16	0.06	0.49
	09150HR-M16	4	1.500	1.142	0.669	1.575	2.638	M16	0.06	0.55
	13125HR-M16	2	1.250	1.142	0.669	1.575	2.638	M16	0.08	0.44
	13131HR-M16	2	1.313	1.142	0.669	1.575	2.638	M16	0.08	0.44
	13137HR-M16	2	1.375	1.142	0.669	1.575	2.638	M16	0.08	0.49
	13150HR-M16	3	1.500	1.142	0.669	1.772	2.835	M16	0.08	0.57

Available Inserts


WNMX-MF


WNMX-ML


WNMX-MM

Type	Designation		Cermet		Coated										Uncoated		
			CN2000	CN30	NC5330	NC5340	NC5350	PC2505	PC2510	PC3500	PC3600	PC9530	PC6510	PC5300	PC5400	ST30A	G10	H01
09 type	WNMX	09T316ZNN-MF									●			●	●			
		09T316ZNN-ML												●	●			
		09T316ZNN-MM						●	●	●	●	●		●	●			
13 type	WNMX	130520ZNN-MF									●			●	●			
		130520ZNN-ML												●	●			
		130520ZNN-MM						●	●	●	●	●		●	●			

●: Korea Stock ●: US Stock

Available Adaptor

Designation		Available Adaptor	Designation		Available Adaptor
HRMDMA	09100HR-M12	MATA- M12	HRMDMA	13125HR-M16	MATA- M16
	09106HR-M12			13131HR-M16	
	09118HR-M16	MATA- M16		13137HR-M16	
	09125HR-M16			13150HR-M16	
	09131HR-M16				
	09137HR-M16				
	09150HR-M16				

Designation: HRMDMA09125HR-M16
Modular Head Threading Measure size (M16)

II

Adaptor Spec.: MATA-M16-035-S32S
Adaptor Threading Measure (M16)

Parts

Specification	Screw	Wrench
Ø1.000 ~ Ø1.500	FTKA0307	TW09S
Ø1.250 ~ Ø1.500	FTKA0412B	TW15S

MATA (Steel Shank type)

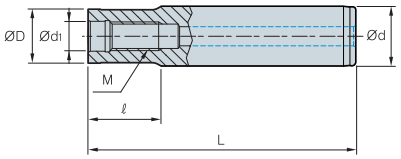


Fig. 1

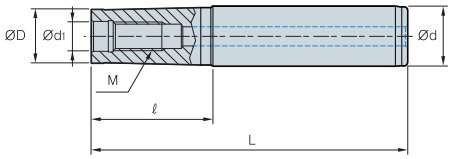


Fig. 2

(inch)

Designation		ØD	Ød	Ød1	ℓ	L	M	Fig.
MATA-	M06-078-S038S	0.354	3/8	0.256	0.787	2.756	M06	1
	M06-157-S050T	0.354	1/2	0.256	1.575	3.780	M06	1
	M06-255-S062T	0.354	5/8	0.256	2.559	4.921	M06	1
	M6B-078-S050S	0.433	1/2	0.256	0.787	2.992	M06	1
	M6B-157-S050S	0.433	1/2	0.256	1.575	3.780	M06	1
	M6B-255-S062T	0.433	5/8	0.256	2.559	4.921	M06	1
	M6B-315-S062T	0.433	5/8	0.256	3.150	5.512	M06	1
	M08-078-S062S	0.571	5/8	0.335	0.787	3.150	M08	2
	M08-157-S062T	0.571	5/8	0.335	1.575	3.937	M08	2
	M08-255-S062T	0.571	5/8	0.335	2.559	4.921	M08	2
	M08-315-S075T	0.571	3/4	0.335	3.150	5.906	M08	2
	M08-433-S100T	0.571	1	0.335	4.331	7.480	M08	2
	M10-118-S075S	0.689	3/4	0.413	1.181	3.937	M10	2
	M10-196-S075T	0.689	3/4	0.413	1.969	4.724	M10	2
	M10-275-S075T	0.689	3/4	0.413	2.756	5.512	M10	2
	M10-354-S100T	0.689	1	0.413	3.543	6.693	M10	2
	M10-433-S100T	0.689	1	0.413	4.331	7.480	M10	2
	M10-511-S125T	0.689	1 1/4	0.413	5.118	8.661	M10	2
	M12-118-S100S	0.906	1	0.492	1.181	4.331	M12	2
	M12-196-S100T	0.906	1	0.492	1.969	5.118	M12	2
	M12-275-S100T	0.906	1	0.492	2.756	5.906	M12	2
	M12-354-S100T	0.906	1	0.492	3.543	6.693	M12	2
	M12-433-S125T	0.906	1 1/4	0.492	4.331	7.874	M12	2
	M12-689-S150T	0.906	1 1/2	0.492	6.890	11.811	M12	2
	M16-137-S125S	1.142	1 1/4	0.669	1.378	4.921	M16	2
	M16-216-S125T	1.142	1 1/4	0.669	2.165	5.709	M16	2
	M16-315-S125T	1.142	1 1/4	0.669	3.150	6.693	M16	2
	M16-472-S125T	1.142	1 1/4	0.669	4.724	8.268	M16	2
	M16-689-S150T	1.142	1 1/2	0.669	6.890	11.811	M16	2

- S: Straight Neck Adapter
- T: Taper Neck Adapter

MATA-C (Carbide Shank type)

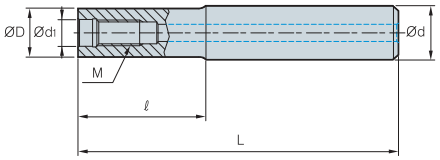


Fig. 1

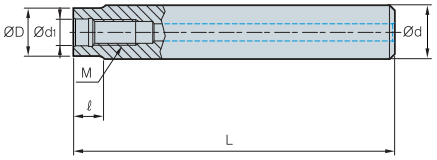
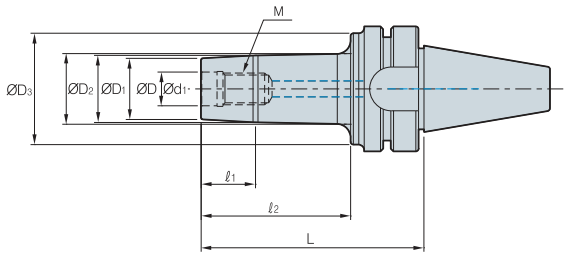


Fig. 2

(inch)

	Designation	ØD	Ød	Ød1	ℓ	L	M	Fig
MATA-	M06-118-S039S-C-315	0.374	0.394	0.256	1.181	3.150	M06	1
	M06-196-S039S-C-393	0.374	0.394	0.256	1.969	3.937	M06	1
	M06-315-S039S-C-511	0.374	0.394	0.256	3.150	5.118	M06	1
	M06B-118-S039S-C-315	0.433	0.394	0.256	1.181	3.150	M06	1
	M06B-196-S039S-C-393	0.433	0.394	0.256	1.969	3.937	M06	1
	M06B-315-S039S-C-511	0.433	0.394	0.256	3.150	5.118	M06	1
	M08-315-S062S-C	0.571	5/8	0.335	3.150	5.906	M08	1
	M08-433-S062S-C	0.571	5/8	0.335	4.331	7.087	M08	1
	M08-590-S062S-C	0.571	5/8	0.335	5.906	9.843	M08	1
	M08-394-S062S-C-590	0.571	5/8	0.335	0.394	5.906	M08	2
	M08-394-S062S-C-708	0.571	5/8	0.335	0.394	7.087	M08	2
	M08-394-S062S-C-984	0.571	5/8	0.335	0.394	9.843	M08	2
	M10-354-S075S-C	0.689	3/4	0.413	3.543	6.693	M10	1
	M10-433-S075S-C	0.689	3/4	0.413	4.331	7.874	M10	1
	M10-689-S075S-C	0.689	3/4	0.413	6.890	11.811	M10	1
	M10-394-S075S-C-669	0.689	3/4	0.413	0.394	6.693	M10	2
	M10-394-S075S-C-787	0.689	3/4	0.413	0.394	7.874	M10	2
	M10-394-S075S-C-1181	0.689	3/4	0.413	0.394	11.811	M10	2
	M12-354-S100S-C	0.906	1	0.492	3.543	6.693	M12	1
	M12-433-S100S-C	0.906	1	0.492	4.331	7.874	M12	1
	M12-689-S100S-C	0.906	1	0.492	6.890	11.811	M12	1
	M12-059-S100S-C-669	0.906	1	0.492	0.591	6.693	M12	2
	M12-059-S100S-C-787	0.906	1	0.492	0.591	7.874	M12	2
	M12-059-S100S-C-1181	0.906	1	0.492	0.591	11.811	M12	2
	M16-354-S125S-C	1.142	1 1/4	0.669	3.543	7.087	M16	1
	M16-472-S125S-C	1.142	1 1/4	0.669	4.824	8.268	M16	1
	M16-689-S125S-C	1.142	1 1/4	0.669	6.890	11.811	M16	1
	M16-078-S125S-C-708	1.142	1 1/4	0.669	0.787	70.87	M16	2
	M16-078-S125S-C-826	1.142	1 1/4	0.669	0.787	8.268	M16	2
	M16-078-S125S-C-1181	1.142	1 1/4	0.669	0.787	11.811	M16	2

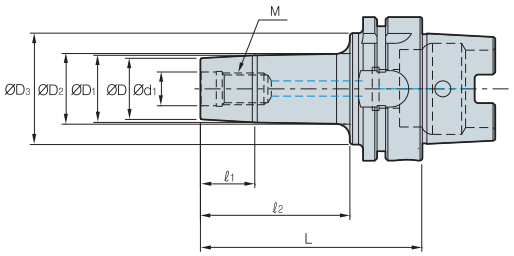
BT30/BT40/BT50



(inch)

Designation		ØD	ØD1	ØD2	ØD3	Ød1	ℓ1	ℓ2	L	M
BT30-	MAT-M06-053	0.433	0.461	0.512	1.181	0.256	0.197	0.827	2.087	06
	MAT-M08-057	0.571	0.618	0.689	1.378	0.335	0.276	0.984	2.244	08
	MAT-M10-062	0.709	0.776	0.945	1.496	0.413	0.276	1.181	2.441	10
	MAT-M12-067	0.906	0.972	1.083	1.614	0.492	0.394	1.378	2.638	12
	MAT-M16-067	1.142	1.248	1.319	1.614	0.669	0.394	1.378	2.638	16
BT40-	MAT-M06-062	0.433	0.461	0.551	1.575	0.256	0.197	0.984	2.441	08
	MAT-M06-077	0.433	0.461	0.551	1.575	0.256	0.197	1.575	3.031	06
	MAT-M06-092	0.433	0.461	0.551	1.575	0.256	0.197	2.165	3.622	06
	MAT-M08-067	0.571	0.618	0.748	1.732	0.335	0.276	1.181	2.638	08
	MAT-M08-082	0.571	0.618	0.748	1.732	0.335	0.276	1.772	3.228	08
	MAT-M08-097	0.571	0.618	0.748	1.732	0.335	0.276	2.362	3.819	08
	MAT-M10-072	0.709	0.776	0.906	1.969	0.413	0.394	1.378	2.835	10
	MAT-M10-087	0.709	0.776	0.906	1.969	0.413	0.394	1.969	3.425	10
	MAT-M10-102	0.709	0.776	0.906	1.969	0.413	0.394	2.559	4.016	10
	MAT-M12-077	0.906	0.972	1.181	2.165	0.492	0.394	1.575	3.031	12
	MAT-M12-092	0.906	0.972	1.181	2.165	0.492	0.512	2.165	3.622	12
	MAT-M12-107	0.906	0.972	1.181	2.165	0.492	0.512	2.756	4.213	12
	MAT-M16-077	1.142	1.248	1.457	2.165	0.669	0.512	1.575	3.031	16
	MAT-M16-092	1.142	1.248	1.457	2.165	0.669	0.512	2.165	3.622	16
	MAT-M16-107	1.142	1.248	1.457	2.165	0.669	0.512	2.756	4.213	16
BT50-	MAT-M06-083	0.433	0.461	0.591	1.575	0.256	0.197	1.378	3.268	06
	MAT-M06-098	0.433	0.461	0.591	1.575	0.256	0.197	1.969	3.858	06
	MAT-M06-113	0.433	0.461	0.591	1.575	0.256	0.197	2.559	4.449	06
	MAT-M08-088	0.571	0.618	0.787	1.772	0.335	0.276	1.575	3.465	08
	MAT-M08-103	0.571	0.618	0.787	1.772	0.335	0.276	2.165	4.055	08
	MAT-M08-118	0.571	0.618	0.787	1.772	0.335	0.276	2.756	4.646	08
	MAT-M10-093	0.709	0.776	0.984	2.165	0.413	0.394	1.772	3.661	10
	MAT-M10-113	0.709	0.776	0.984	2.165	0.413	0.394	2.559	4.449	10
	MAT-M10-128	0.709	0.776	0.984	2.165	0.413	0.394	3.150	5.039	10
	MAT-M12-103	0.906	0.972	1.299	2.559	0.492	0.394	2.165	4.055	12
	MAT-M12-118	0.906	0.972	1.299	2.559	0.492	0.512	2.756	4.646	12
	MAT-M12-133	0.906	0.972	1.299	2.559	0.492	0.512	3.346	5.236	12
	MAT-M16-103	1.142	1.248	1.614	3.346	0.669	0.512	2.165	4.055	16
	MAT-M16-118	1.142	1.248	1.614	3.346	0.669	0.512	2.756	4.646	16
	MAT-M16-133	1.142	1.248	1.614	3.346	0.669	0.512	3.346	5.236	16

HSK63A/HSK100A



(inch)

Designation		ØD	ØD1	ØD2	ØD3	Ød1	ℓ1	ℓ2	L	M
HSK63A-	MAT-M06-061	0.433	0.461	1.063	1.575	0.256	0.197	0.984	2.402	06
	MAT-M06-076	0.433	0.461	1.063	1.575	0.256	0.197	1.575	2.992	06
	MAT-M06-091	0.433	0.461	1.063	1.575	0.256	0.197	2.165	3.583	06
	MAT-M08-066	0.571	0.618	1.201	1.732	0.335	0.276	1.181	2.598	08
	MAT-M08-081	0.571	0.618	1.201	1.732	0.335	0.276	1.772	3.189	08
	MAT-M08-096	0.571	0.618	1.201	1.732	0.335	0.276	2.362	3.780	08
	MAT-M10-071	0.709	0.776	1.339	1.969	0.413	0.394	1.378	2.795	10
	MAT-M10-086	0.709	0.776	1.339	1.969	0.413	0.394	1.969	3.386	10
	MAT-M10-101	0.709	0.776	1.339	1.969	0.413	0.394	2.559	3.976	10
	MAT-M12-076	0.906	0.972	1.437	2.165	0.492	0.394	1.575	2.992	12
	MAT-M12-091	0.906	0.972	1.437	2.165	0.492	0.512	2.165	3.583	12
	MAT-M12-106	0.906	0.972	1.437	2.165	0.492	0.512	2.756	4.173	12
	MAT-M16-076	1.142	1.248	1.516	2.165	0.669	0.512	1.575	2.992	16
	MAT-M16-091	1.142	1.248	1.516	2.165	0.669	0.512	2.165	3.583	16
	MAT-M16-106	1.142	1.248	1.516	2.165	0.669	0.512	2.756	4.173	16
HSK100A-	MAT-M06-074	0.433	0.461	0.591	1.575	0.256	0.197	1.378	2.913	06
	MAT-M06-089	0.433	0.461	0.591	1.575	0.256	0.197	1.969	3.504	06
	MAT-M06-104	0.433	0.461	0.591	1.575	0.256	0.197	2.559	4.094	06
	MAT-M08-079	0.571	0.618	0.787	1.772	0.335	0.276	1.575	3.110	08
	MAT-M08-094	0.571	0.618	0.787	1.772	0.335	0.276	2.165	3.701	08
	MAT-M08-109	0.571	0.618	0.787	1.772	0.335	0.276	2.756	4.291	08
	MAT-M10-084	0.709	0.776	0.984	2.165	0.413	0.394	1.772	3.307	10
	MAT-M10-104	0.709	0.776	0.984	2.165	0.413	0.394	2.559	4.094	10
	MAT-M10-119	0.709	0.776	0.984	2.165	0.413	0.394	3.150	4.685	10
	MAT-M12-094	0.906	0.972	1.299	2.559	0.492	0.394	2.165	3.701	12
	MAT-M12-109	0.906	0.972	1.299	2.559	0.492	0.512	2.756	4.291	12
	MAT-M12-124	0.906	0.972	1.299	2.559	0.492	0.512	3.346	4.882	12
	MAT-M16-094	1.142	1.248	1.614	3.346	0.669	0.512	2.165	3.701	16
	MAT-M16-109	1.142	1.248	1.614	3.346	0.669	0.512	2.756	4.291	16
	MAT-M16-124	1.142	1.248	1.614	3.346	0.669	0.512	3.346	4.882	16

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