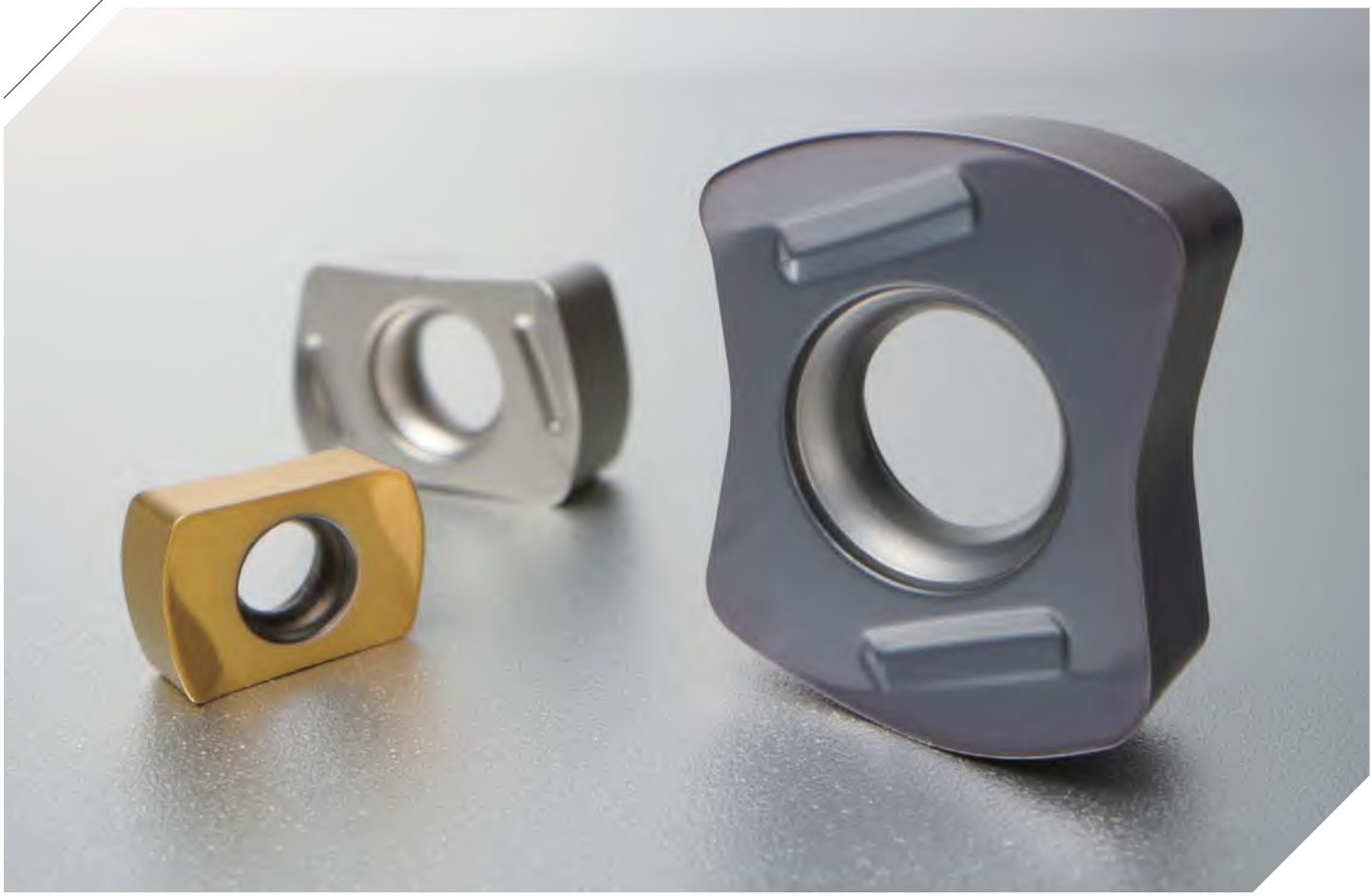
KORLOY TECH-NEWS

HFMD

High Feed Mill Double

- Available for economical and highly efficient machining with implementation of double sided 4 corner inserts and increase in the number of teeth per cutter diameter
- Available for high speed/high feed machining with high helix edge design and excellent clamping stability



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TECH-NEWS

High feed milling tool with 4 corners for small diameter

HFMD

With the development of the end-user market, the current cutting tool industry has challenges including:

First, discovering highly effective machining technologies that can improve productivity and reduce production costs within limited time and budget. Second, to find a tool/solution that can easily machine hard-to-cut materials which are becoming more widely used in numerous industries (mold, aerospace, and etc) in pursuit of durability and lighter weight.

KORLOY recommends a new high feed tool, HFMD, which can easily resolve above two challenges.

HFMD insert is a double sided 4 corner insert which is economical and enhances machining productivity by implementing more flutes per diameter. In addition, HFMD has achieved high speed/high feed machining by applying high rake angle and helix design on its edge. These two features have significantly reduced cutting resistance compared to competitors' tools or even against positive-type inserts.

Furthermore, HFMD provides excellent clamping stability by applying concave clamping system on the side, wider bottom face at the clamping area, and bigger sized screws. These will help minimize noise and vibration, prevent damage of insert with stable machining in high feed machining, and improve the surface finish of the workpiece.

As we can see in these advantages, KORLOY's HFMD is the next-generation high speed/high feed machining solution, one step ahead in the high-efficiency machining trend.

» Highly efficient and economical insert
- Double-sided 4 corners

» Superior clamping stability
- Prevents insert chipping and damage by minimizing vibrations
- Improved surface finish of workpieces

» Realization of high speed/high feed
- High speed machining by applying high rake angle, and helix cutting edge
- Available for high feed machining with the increase in the number of teeth per cutter diameter

» Optimized holder design
- Excellent chip evacuation in slotting or deep shouldering with minimized interference with side walls

Code system

Shank type

HFMD	S	A	100	R	-	4	C	100	-	400	-	LN06
HFMD	Type S: Shank	Arbor type A: inch None: Metric	Machining diameter 100: Ø1.0 inch	Oil hole & Hand R: With oil hole, Right-handed NR: Without oil hole, Right-handed		No. of tooth 4: 4 teeth	Shank type W: Weldon C: Cylinder	Shank diameter 100: Ø1.0 inch		Overall length 400: 4 inch		Available inserts LN04: LNMX04 LN06: LNMX06 LN10: LNMX10

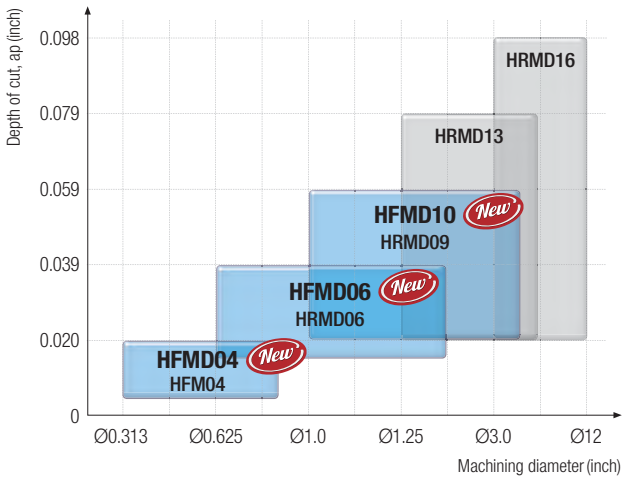
Cutter type

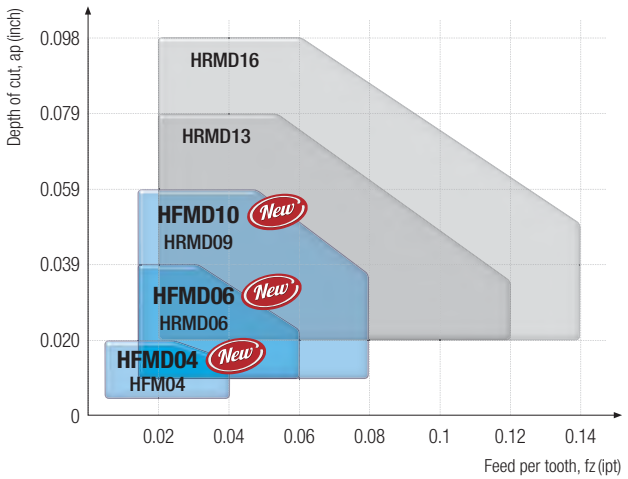
HFMD	C	A	200	R	-	075	-	7	-	LN10
HFMD	Type C: Cutter	Arbor type M: Metric A: inch None: Asia	Machining diameter 200: Ø2.0 inch	Oil hole & Hand R: With oil hole, Right-handed NR: Without oil hole, Right-handed		Internal diameter 075: Ø0.75 inch		No. of tooth 7: 7 teeth		Available inserts LN06: LNMX06 LN10: LNMX10

Modular type

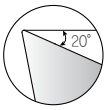
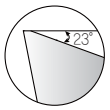
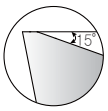
HFMD	M	A	062	R	-	4	-	M08	-	LN04
HFMD	Type M: Modular	Arbor type A: inch None: Metric	Machining diameter 062: Ø0.62 inch	Oil hole & Hand R: With oil hole, Right-handed NR: Without oil hole, Right-handed		No. of tooth 4: 4 teeth		M Dimensions		Available inserts LN04: LNMX04 LN06: LNMX06 LN10: LNMX10

Application range

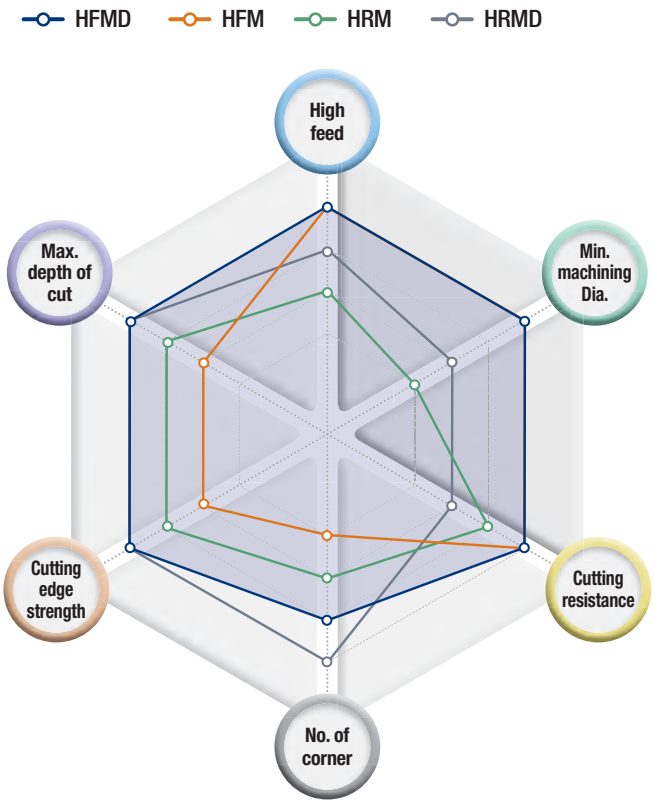




Application and features of chip breakers

Chip breakers		Cutting-edge	Application	Features
ML			For heat resistant alloy and titanium	Ensures superior machining quality by applying a low cutting resistance chip breaker and high-strength cutting edge design suitable for machining heat resistant alloy
MF			For light cutting	Suitable for light cutting with a low cutting resistance chip breaker design
MM			For multi-purpose	Available for most cutting area with its exclusive design suitable for general high feed machining

High feed tool selection guide



HFMD New

- To increase productivity
- To machine workpiece with more edges
- Min. ∅0.375 inch machining

HFM

- To machine smaller diameter
- Min. ∅0.375 inch machining

HRM

- For general machining
- Single-sided 3 corners machining

HRMD

- To focus on economical feasibility
- Double-sided 6 corners machining

Tools	High feed	Min. machining Dia.	Cutting resistance	No. of corner	Cutting edge strength	Max. depth of cut
HFMD New	★★★★	★★★★	★★★★	★★★	★★★★	★★★★
HFM	★★★★	★★★★	★★★★	★	★★	★★
HRM	★★	★	★★★	★★	★★★	★★★
HRMD	★★★	★★	★★	★★★★	★★★★	★★★★

Recommended cutting conditions _ HFMD04

N/mm²: Specific cutting force Kc1

Workpiece						PC5300			PC3700			PC2510		PC2505		ML, MM
ISO	Workpiece materials	AISI	ISO	N/mm²	HB (HRC)	vc (sfm)	ML fz (ipt)	MM fz (ipt)	vc (sfm)	ML fz (ipt)	MM fz (ipt)	vc (sfm)	MM fz (ipt)	vc (sfm)	MM fz (ipt)	ap (inch)
P	Mild steel	1020	C22	1500	125	525	0.047	0.047	525	0.039	0.039	-	-	-	-	0.008 ~0.020
						591	**0.039**	**0.039**	**656**	**0.031**	**0.031**	-	-	-	-	
						656	0.031	0.031	787	0.024	0.024	-	-	-	-	
	Carbon steel	1045	C45	1700	190	525	0.047	0.047	525	0.039	0.039	-	-	-	-	0.008 ~0.020
						591	**0.039**	**0.039**	**656**	**0.031**	**0.031**	-	-	-	-	
						656	0.031	0.031	787	0.024	0.024	-	-	-	-	
	Alloy steel	4140	41CrMo4	1700	175	525	-	0.047	591	-	0.039	-	-	-	-	0.008 ~0.020
						591	**-**	**0.039**	**656**	**-**	**0.031**	-	-	-	-	
						656	-	0.031	722	-	0.024	-	-	-	-	
	Pre-hardened steel	4340 (Improved)	36CrNiMo6 (Improved)	2020	330	459	-	0.039	525	-	0.031	-	-	-	-	0.008 ~0.016
						525	**-**	**0.035**	**591**	**-**	**0.028**	-	-	-	-	
						591	-	0.031	656	-	0.024	-	-	-	-	
		4340 (Improved)	36CrNiMo6 (Improved)	2020	360	459	-	0.039	525	-	0.031	-	-	-	-	0.008 ~0.016
						525	**-**	**0.035**	**591**	**-**	**0.028**	-	-	-	-	
						591	-	0.031	656	-	0.024	-	-	-	-	
		4340 (Improved)	36CrNiMo6 (Improved)	2020	400	394	-	0.039	-	-	-	-	-	-	-	0.008 ~0.016
						459	**-**	**0.035**	**-**	**-**	**-**	-	-	-	-	
						525	-	0.031	-	-	-	-	-	-	-	
		420	X20Cr13	2300	330	328	-	0.028	459	-	0.028	-	-	-	-	0.008 ~0.016
						394	**-**	**0.024**	**492**	**-**	**0.024**	-	-	-	-	
						459	-	0.020	525	-	0.020	-	-	-	-	
	Alloy tool steel	H13	X40CrMoV5-1	2300	(38)	-	-	-	-	-	-	361	0.028	361	0.028	0.008 ~0.012
						-	-	-	-	-	-	**394**	**0.024**	**394**	**0.024**	
						-	-	-	-	-	-	427	0.020	427	0.020	

Workpiece						PC5300		PC9540		UPC845		UNC840		ML
ISO	Workpiece materials	AISI	ISO	N/mm²	HB (HRC)	vc (sfm)	ML fz (ipt)	vc (sfm)	ML fz (ipt)	vc (sfm)	ML fz (ipt)	vc (sfm)	ML fz (ipt)	ap (inch)
M	Ferritic/ martensitic	405 430	X10CrAl13 X10CrAl18	1800	200	394	0.039	394	0.039	394	0.039	394	0.039	0.008 ~0.020
						525	**0.031**	**525**	**0.031**	**525**	**0.031**	**525**	**0.031**	
						656	0.024	656	0.024	656	0.024	656	0.024	
		416 434	X12CrS13 X6CrMo17-1	2800	330	328	0.039	328	0.039	328	0.039	328	0.039	0.008 ~0.020
						459	**0.031**	**459**	**0.031**	**459**	**0.031**	**459**	**0.031**	
						591	0.024	591	0.024	591	0.024	591	0.024	
		403 410	X6Cr13 X10Cr13	2300	330	328	0.039	328	0.039	328	0.039	328	0.039	0.008 ~0.020
						459	**0.031**	**459**	**0.031**	**459**	**0.031**	**459**	**0.031**	
						591	0.024	591	0.024	591	0.024	591	0.024	
	Austenitic	304 316	5CrNi18-10 X5CrNiMo17-12-2	2000	200	328	0.031	328	0.031	328	0.031	328	0.031	0.008 ~0.016
						427	**0.028**	**394**	**0.028**	**394**	**0.028**	**427**	**0.028**	
						525	0.024	459	0.024	459	0.024	525	0.024	
	Austenitic/ ferritic (Duplex)	S31803 S32750	X2CrNiMoN22-53	2400	260	197	0.028	197	0.028	197	0.028	197	0.028	0.008 ~0.012
						295	**0.024**	**295**	**0.024**	**295**	**0.024**	**295**	**0.024**	
						394	0.020	394	0.020	394	0.020	394	0.020	

Workpiece				N/mm²	HB (HRC)	PC5300		MM
ISO	Workpiece materials	AISI	ISO			vc (sfm)	MM fz (ipt)	ap (inch)
K	Gray cast iron	No 30 B	200 EN-GJL-200	900	180	394	0.039	0.008 ~0.020
						525	**0.031**	
						656	0.024	
	Nodular graphite cast iron	80-55-06	500-7 EN-GJS-800-7	870	155	361	0.039	0.008 ~0.020
						476	**0.031**	
						591	0.024	

Workpiece				N/mm²	HB (HRC)	UPC845			UNC840			ML, MM
ISO	Workpiece materials	AISI	ISO			vc (sfm)	ML fz (ipt)	MM fz (ipt)	vc (sfm)	ML fz (ipt)	MM fz (ipt)	ap (inch)
S	Nickel based	15156-3	15156-3	2650	250	82	-	0.028	98	-	0.028	0.008 ~0.012
						131	**-**	**0.020**	**148**	**-**	**0.020**	
						180	-	0.012	197	-	0.012	
		9723	9723	2900	350	66	-	0.028	82	-	0.028	0.008 ~0.012
						115	**-**	**0.020**	**131**	**-**	**0.020**	
						164	-	0.012	180	-	0.012	
	Cobalt based alloy	Stellite	Stellite	3000	300	66	0.028	-	98	0.028	-	0.008 ~0.012
						115	**0.020**	**-**	**148**	**0.020**	**-**	
						164	0.012	-	197	0.012	-	
	Titanium alloy steel	-	TiAl6V4	1400	320	66	0.031	-	98	0.031	-	0.008 ~0.012
						131	**0.024**	**-**	**164**	**0.024**	**-**	
						197	0.016	-	230	0.016	-	

Recommended cutting conditions _ HFMD06

N/mm²: Specific cutting force Kc1

Workpiece						PC5400		PC5300			PC3700			PC2510		PC2505		ML, MF, MM
ISO	Workpiece materials	AISI	ISO	N/mm²	HB (HRC)	vc (sfm)	ML fz (ipt)	vc (sfm)	MF fz (ipt)	MM fz (ipt)	vc (sfm)	MF fz (ipt)	MM fz (ipt)	vc (sfm)	MM fz (ipt)	vc (sfm)	MM fz (ipt)	ap (inch)
P	Mild steel	1020	C22	1500	125	525	0.039	525	0.047	0.047	-	-	-	-	-	-	-	0.008 ~0.039
						656	**0.031**	**591**	**0.039**	**0.039**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	
						787	0.024	656	0.031	0.031	-	-	-	-	-	-	-	
	Carbon steel	1045	C45	1700	190	525	0.039	525	0.047	0.047	591	0.047	-	-	-	-	-	0.008 ~0.039
						656	**0.031**	**591**	**0.039**	**0.039**	**656**	**0.039**	**-**	**-**	**-**	**-**	**-**	
						787	0.024	656	0.031	0.031	722	0.031	-	-	-	-	-	
	Alloy steel	4140	41CrMo4	1700	175	-	-	525	0.039	0.047	591	0.039	0.047	-	-	-	-	0.008 ~0.039
						-	**-**	**591**	**0.031**	**0.039**	**656**	**0.031**	**0.039**	**-**	**-**	**-**	**-**	
						-	-	656	0.024	0.031	722	0.024	0.031	-	-	-	-	
	Pre-hardened steel	4340 (Improved)	36CrNiMo6 (Improved)	2020	330	-	-	459	0.031	0.039	525	0.031	0.039	-	-	-	-	0.008 ~0.031
						-	**-**	**525**	**0.028**	**0.035**	**591**	**0.028**	**0.035**	**-**	**-**	**-**	**-**	
						-	-	591	0.024	0.031	656	0.024	0.031	-	-	-	-	
		4340 (Improved)	36CrNiMo6 (Improved)	2020	360	-	-	459	0.031	0.039	525	0.031	0.039	-	-	-	-	0.008 ~0.031
						-	**-**	**525**	**0.028**	**0.035**	**591**	**0.028**	**0.035**	**-**	**-**	**-**	**-**	
						-	-	591	0.024	0.031	656	0.024	0.031	-	-	-	-	
		4340 (Improved)	36CrNiMo6 (Improved)	2020	400	-	-	394	0.031	0.039	-	-	-	-	-	-	-	0.008 ~0.031
						-	**-**	**459**	**0.028**	**0.035**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	
						-	-	525	0.024	0.031	-	-	-	-	-	-	-	
		420	X20Cr13	2300	330	-	-	328	-	0.031	459	0.031	0.031	-	-	-	-	0.008 ~0.031
						-	**-**	**394**	**-**	**0.028**	**492**	**0.028**	**0.028**	**-**	**-**	**-**	**-**	
						-	-	459	-	0.024	525	0.024	0.024	-	-	-	-	
	Alloy tool steel	H13	X40CrMoV5-1	2300	(38)	-	-	-	-	-	-	-	-	361	0.031	361	0.031	0.008 ~0.024
						-	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**394**	**0.028**	**394**	**0.028**	
						-	-	-	-	-	-	-	-	427	0.024	427	0.024	

Workpiece						PC5400		PC9540		UPC845		UNC840		ML
ISO	Workpiece materials	AISI	ISO	N/mm²	HB (HRC)	vc (sfm)	ML fz (ipt)	vc (sfm)	ML fz (ipt)	vc (sfm)	ML fz (ipt)	vc (sfm)	ML fz (ipt)	ap (inch)
M	Ferritic/ martensitic	405 430	X10CrAl13 X10CrAl18	1800	200	394	0.039	394	0.039	394	0.039	394	0.039	0.008 ~0.039
						525	**0.031**	**525**	**0.031**	**525**	**0.031**	**525**	**0.031**	
						656	0.024	656	0.024	656	0.024	656	0.024	
		416 434	X12CrS13 X6CrMo17-1	2800	330	328	0.039	328	0.039	328	0.039	328	0.039	0.008 ~0.039
						459	**0.031**	**459**	**0.031**	**459**	**0.031**	**459**	**0.031**	
						591	0.024	591	0.024	591	0.024	591	0.024	
		403 410	X6Cr13 X10Cr13	2300	330	328	0.039	328	0.039	328	0.039	328	0.039	0.008 ~0.039
						459	**0.031**	**459**	**0.031**	**459**	**0.031**	**459**	**0.031**	
						591	0.024	591	0.024	591	0.024	591	0.024	
	Austenitic	304 316	X5CrNi18-10 X5CrNiMo17-12-2	2000	200	328	0.031	328	0.031	328	0.031	328	0.031	0.008 ~0.031
						427	**0.028**	**394**	**0.028**	**394**	**0.028**	**427**	**0.028**	
						525	0.024	459	0.024	459	0.024	525	0.024	
	Austenitic/ ferritic (Duplex)	S31803 S32750	X2CrNiMoN22-53	2400	260	197	0.028	197	0.028	197	0.028	197	0.028	0.008 ~0.024
						295	**0.024**	**295**	**0.024**	**295**	**0.024**	**295**	**0.024**	
						394	0.020	394	0.020	394	0.020	394	0.020	

Workpiece						PC5300			MF, MM
ISO	Workpiece materials	AISI	ISO	N/mm²	HB (HRC)	vc (sfm)	MF fz (ipt)	MM fz (ipt)	ap (inch)
K	Gray cast iron	No 30 B	200 EN-GJL-200	900	180	394	0.039	0.039	0.008 ~0.039
						525	**0.031**	**0.031**	
						656	0.024	0.024	
	Nodular graphite cast iron	80-55-06	500-7 EN-GJS-800-7	870	155	361	0.039	0.039	0.008 ~0.039
						476	**0.031**	**0.031**	
						591	0.024	0.024	

Workpiece						UPC845			UNC840			ML, MF
ISO	Workpiece materials	AISI	ISO	N/mm²	HB (HRC)	vc (sfm)	ML fz (ipt)	MF fz (ipt)	vc (sfm)	ML fz (ipt)	MF fz (ipt)	ap (inch)
S	Nickel based	15156-3	15156-3	2650	250	82	-	0.028	98	-	0.028	0.008 ~0.024
						131	**-**	**0.020**	**148**	**-**	**0.020**	
						180	-	0.012	197	-	0.012	
		9723	9723	2900	350	66	-	0.028	82	-	0.028	0.008 ~0.024
						115	**-**	**0.020**	**131**	**-**	**0.020**	
						164	-	0.012	180	-	0.012	
	Cobalt based alloy	Stellite	Stellite	3000	300	66	0.028	-	98	0.028	-	0.008 ~0.024
						115	**0.020**	**-**	**148**	**0.020**	**-**	
						164	0.012	-	197	0.012	-	
	Titanium alloy steel	-	TiAl6V4	1400	320	66	0.039	-	98	0.039	-	0.008 ~0.024
						131	**0.031**	**-**	**164**	**0.031**	**-**	
						197	0.024	-	230	0.024	-	

Recommended cutting conditions _ HFMD10

N/mm²: Specific cutting force Kc1

Workpiece						PC5400		PC5300			PC3700			PC2510		PC2505		ML, MF, MM
ISO	Workpiece materials	AISI	ISO	N/mm²	HB (HRC)	vc (sfm)	ML fz (ipt)	vc (sfm)	MF fz (ipt)	MM fz (ipt)	vc (sfm)	MF fz (ipt)	MM fz (ipt)	vc (sfm)	MM fz (ipt)	vc (sfm)	MM fz (ipt)	ap (inch)
P	Mild steel	1020	C22	1500	125	525	0.047	525	0.047	0.055	-	-	-	-	-	-	-	0.012 ~0.059
						656	**0.039**	**656**	**0.039**	**0.047**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	
						787	0.031	787	0.031	0.039	-	-	-	-	-	-	-	
	Carbon steel	1045	C45	1700	190	525	0.047	525	0.047	0.055	160	0.055	-	-	-	-	-	0.012 ~0.059
						656	**0.039**	**656**	**0.039**	**0.047**	**200**	**0.047**	**-**	**-**	**-**	**-**	**-**	
						787	0.031	787	0.031	0.039	240	0.039	-	-	-	-	-	
	Alloy steel	4140	41CrMo4	1700	175	-	-	525	0.047	0.055	180	0.047	0.055	-	-	-	-	0.012 ~0.059
						-	**-**	**591**	**0.039**	**0.047**	**200**	**0.039**	**0.047**	**-**	**-**	**-**	**-**	
						-	-	656	0.031	0.039	220	0.031	0.039	-	-	-	-	
	Pre-hardened steel	4340 (Improved)	36CrNiMo6 (Improved)	2020	330	-	-	459	0.039	0.047	160	0.039	0.047	-	-	-	-	0.012 ~0.047
						-	**-**	**525**	**0.035**	**0.039**	**180**	**0.035**	**0.039**	**-**	**-**	**-**	**-**	
						-	-	591	0.031	0.031	200	0.031	0.031	-	-	-	-	
		4340 (Improved)	36CrNiMo6 (Improved)	2020	360	-	-	459	0.039	0.047	160	0.039	0.047	-	-	-	-	0.012 ~0.047
						-	**-**	**525**	**0.035**	**0.039**	**180**	**0.035**	**0.039**	**-**	**-**	**-**	**-**	
						-	-	591	0.031	0.031	200	0.031	0.031	-	-	-	-	
		4340 (Improved)	36CrNiMo6 (Improved)	2020	400	-	-	459	0.039	0.047	-	-	-	-	-	-	-	0.012 ~0.047
						-	**-**	**525**	**0.035**	**0.039**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	
						-	-	591	0.031	0.031	-	-	-	-	-	-	-	
		420	X20Cr13	2300	330	-	-	328	-	0.031	459	0.035	0.035	-	-	-	-	0.012 ~0.047
						-	**-**	**394**	**-**	**0.028**	**492**	**0.031**	**0.031**	**-**	**-**	**-**	**-**	
						-	-	459	-	0.024	525	0.028	0.028	-	-	-	-	
	Alloy tool steel	H13	X40CrMoV5-1	2300	(38)	-	-	-	-	-	-	-	-	427	0.035	427	0.035	0.012 ~0.035
						-	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**459**	**0.031**	**459**	**0.031**	
						-	-	-	-	-	-	-	-	492	0.028	492	0.028	

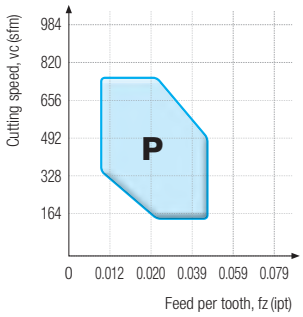
Workpiece						PC5400		PC9540		UPC845		UNC840		ML
ISO	Workpiece materials	AISI	ISO	N/mm²	HB (HRC)	vc (sfm)	ML fz (ipt)	vc (sfm)	ML fz (ipt)	vc (sfm)	ML fz (ipt)	vc (sfm)	ML fz (ipt)	ap (inch)
M	Ferritic/ martensitic	405 430	X10CrAl13 X10CrAl18	1800	200	394	0.047	394	0.047	394	0.047	394	0.047	0.012 ~0.059
						525	**0.039**	**525**	**0.039**	**525**	**0.039**	**525**	**0.039**	
						656	0.031	656	0.031	656	0.031	656	0.031	
		416 434	X12CrS13 X6CrMo17-1	2800	330	328	0.047	328	0.047	328	0.047	328	0.047	0.012 ~0.059
						459	**0.039**	**459**	**0.039**	**459**	**0.039**	**459**	**0.039**	
						591	0.031	591	0.031	591	0.031	591	0.031	
		403 410	X6Cr13 X10Cr13	2300	330	328	0.047	328	0.047	328	0.047	328	0.047	0.012 ~0.059
						459	**0.039**	**459**	**0.039**	**459**	**0.039**	**459**	**0.039**	
						591	0.031	591	0.031	591	0.031	591	0.031	
	Austenitic	304 316	X5CrNi18-10 X5CrNiMo17-12-2	2000	200	328	0.039	328	0.039	328	0.039	328	0.039	0.012 ~0.047
						427	**0.035**	**394**	**0.035**	**394**	**0.035**	**427**	**0.035**	
						525	0.031	459	0.031	459	0.031	525	0.031	
	Austenitic/ ferritic (Duplex)	S31803 S32750	X2CrNiMoN22-53	2400	260	197	0.035	197	0.035	197	0.035	197	0.035	0.012 ~0.039
						295	**0.031**	**295**	**0.031**	**295**	**0.031**	**295**	**0.031**	
						394	0.028	394	0.028	394	0.028	394	0.028	

Workpiece						PC5300			MF, MM
ISO	Workpiece materials	AISI	ISO	N/mm²	HB (HRC)	vc (sfm)	MF fz (ipt)	MM fz (ipt)	ap (inch)
K	Gray cast iron	No 30 B	200 EN-GJL-200	900	180	394	0.047	4	0.012 ~0.059
						525	**0.039**	**3**	
						656	0.031	3	
	Nodular graphite cast iron	80-55-06	500-7 EN-GJS-800-7	870	155	361	0.047	4	0.012 ~0.059
						476	**0.039**	**3**	
						591	0.031	3	

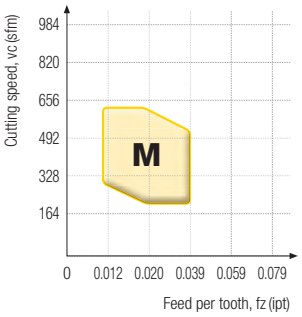
Workpiece						UPC845			UNC840			ML, MF
ISO	Workpiece materials	AISI	ISO	N/mm²	HB (HRC)	vc (sfm)	ML fz (ipt)	MF fz (ipt)	vc (sfm)	ML fz (ipt)	MF fz (ipt)	ap (inch)
S	Nickel based	15156-3	15156-3	2650	250	82	-	0.031	98	-	0.031	0.012 ~0.035
						131	**-**	**0.024**	**148**	**-**	**0.024**	
						180	-	0.016	197	-	0.016	
		9723	9723	2900	350	66	-	0.031	82	-	0.031	0.012 ~0.035
						115	**-**	**0.024**	**131**	**-**	**0.024**	
						164	-	0.016	180	-	0.016	
	Cobalt based alloy	Stellite	Stellite	3000	300	66	0.031	-	98	0.031	-	0.012 ~0.035
						115	**0.024**	**-**	**148**	**0.024**	**-**	
						164	0.016	-	197	0.016	-	
	Titanium alloy steel	-	TiAl6V4	1400	320	66	0.039	-	98	0.039	-	0.012 ~0.035
						131	**0.031**	**-**	**164**	**0.031**	**-**	
						197	0.024	-	230	0.024	-	

[HFMD04]

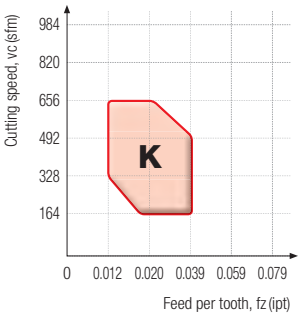
P Steel



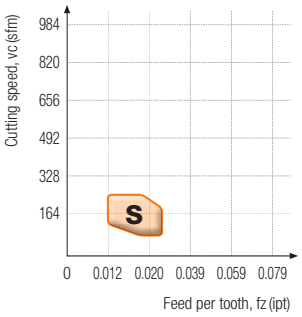
M Stainless steel



K Cast iron

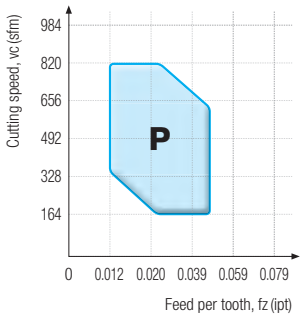


S HRSA

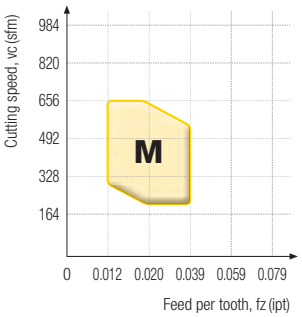


[HFMD06]

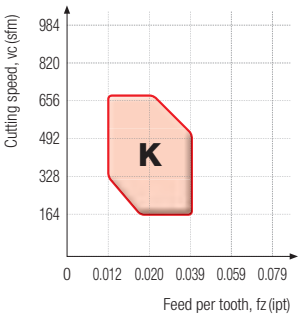
P Steel



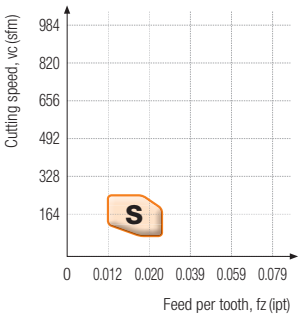
M Stainless steel



K Cast iron

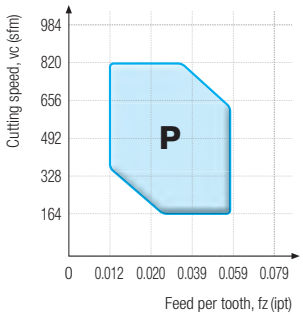


S HRSA

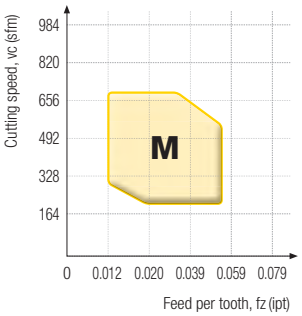


[HFMD10]

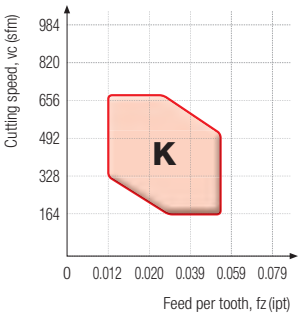
P Steel



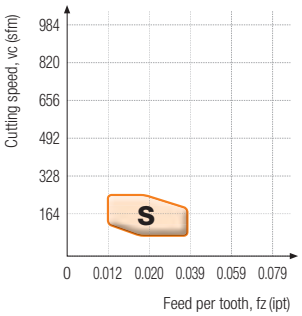
M Stainless steel



K Cast iron



S HRSA



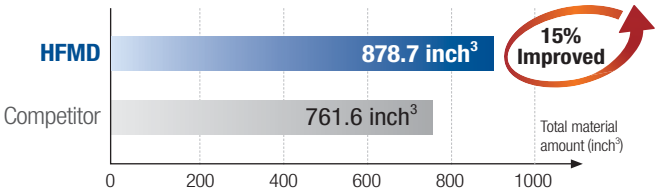
Cutting performance

Carbon steel (1042, HB200)

Workpiece	Steel rectangular tube (11.8 × 7.8 × 3.9)
Cutting conditions	vc (sfm) = 656, fz (ipt) = 0.047, ap (inch) = 0.031, ae (inch) = 0.787, dry
Tools	Insert LNMX060310R-MF (PC5300) Holder HFMDSA125R-5C125-600-LN06

[HFMD]

[Competitor]



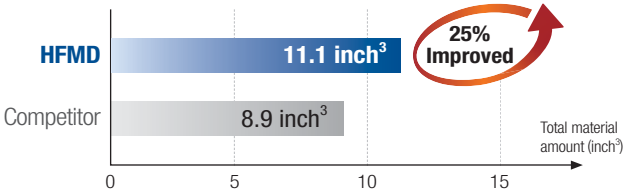
- Material removal rate Q (inch³/min): 11.6
- Cutting time (min): 75.4

Alloy tool steel (H13, HRC40 ~ 45)

Workpiece	Steel rectangular tube (11.8 × 7.8 × 3.9)
Cutting conditions	vc (sfm) = 525, fz (ipt) = 0.047, ap (inch) = 0.035, ae (inch) = 0.787, dry
Tools	Insert LNMX100412R-MF (PC2510) Holder HFMDSA125R-4C125-600-LN10

[HFMD]

[Competitor]



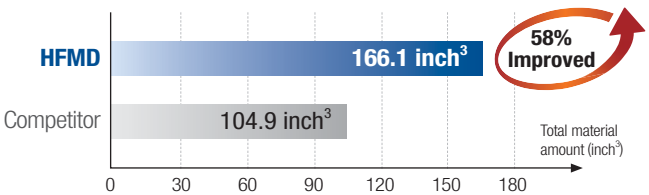
- Material removal rate Q (inch³/min): 5.6
- Cutting time (min): 2.0

Stainless steel (304, HB200)

Workpiece	Steel rectangular tube (11.8 × 7.8 × 3.9)
Cutting conditions	vc (sfm) = 492, fz (ipt) = 0.024, ap (inch) = 0.016, ae (inch) = 0.394, dry
Tools	Insert LNMX040205R-ML (PC5300) Holder HFMDSA062R-4C062-600-LN04

[HFMD]

[Competitor]

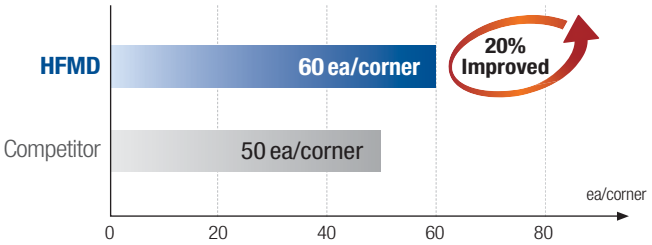


- Material removal rate Q (inch³/min): 0.1
- Cutting time (min): 93

Application examples

Carbon steel (1045, HB200)

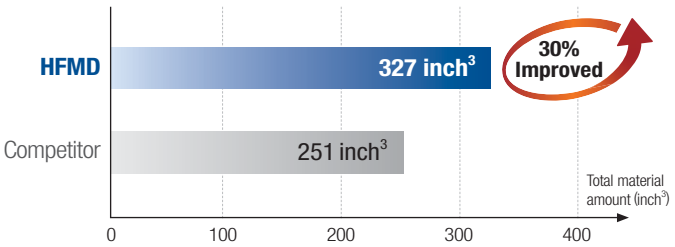
Workpiece	Machine parts
Cutting conditions	vc (sfm) = 417, fz (ipt) = 0.017, ap (inch) = 0.020, ae (inch) = 2.0, dry
Tools	**Insert** LNMX100412R-MF (PC2510) **Holder** HFMDCA200R-075-7-LN10



» 20% longer tool life than existing items

Alloy tool steel (1.2714*, HRC37~38) (*: DIN)

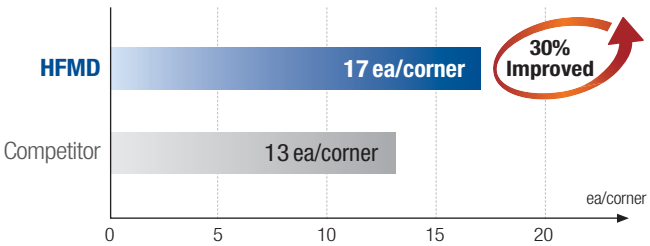
Workpiece	Pipe
Cutting conditions	vc (sfm) = 427, fz (ipt) = 0.047, ap (inch) = 0.012, ae (inch) = 1.25, dry
Tools	**Insert** LNMX060310R-MF (PC3700) **Holder** HFMDCA150R-050-6-LN06



» 30% longer tool life and 10% higher productivity than existing items

HRSA (15156-3, HRC40)

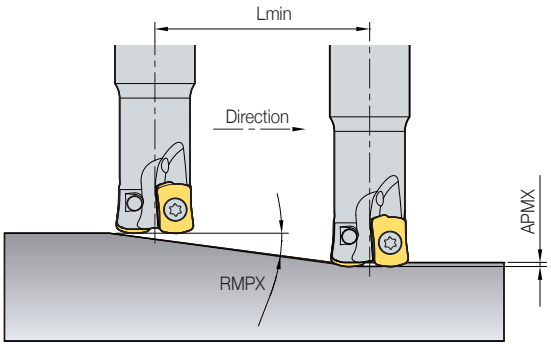
Workpiece	Aircrafts parts
Cutting conditions	vc (sfm) = 262, fz (ipt) = 0.008, ap (inch) = 0.020, ae (inch) = 0.433, wet
Tools	**Insert** LNMX060310R-ML (UPC845) **Holder** HFMDSA062R-2C062-400-LN06



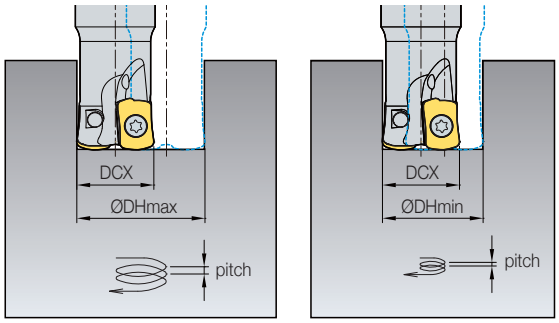
» 30% longer tool life than existing items

Ramping and helical cutting

Ramping



Helical cutting



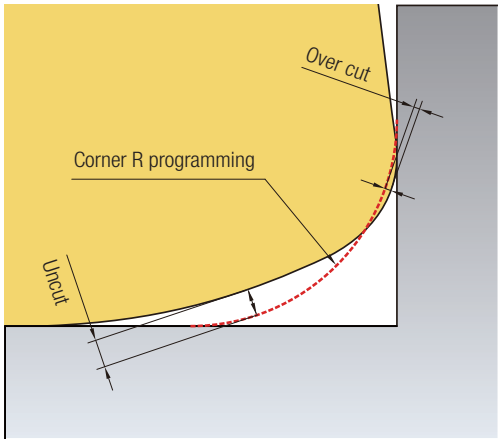
(inch)

Designation	Tool dia. DCX	Depth of cut APMX	Ramping		Blind hole helical cutting				Through hole helical cutting	
			Max. rake angle RMPX	Lmin	Max. machining dia. ØDHmax	Max. pitch	Min. machining dia. ØDHmin	Max. pitch	Min. machining dia. ØDHmin	Max. pitch
LNMX04	0.375	0.016	0.6	1.464	0.593	0.012	0.474	0.012	0.474	0.012
	0.438	0.020	0.8	1.439	0.718	0.012	0.599	0.012	0.599	0.012
	0.500	0.020	1.0	1.091	0.843	0.016	0.724	0.016	0.724	0.016
	0.625	0.020	1.0	1.078	1.093	0.016	0.974	0.016	0.974	0.016
	0.688	0.020	1.0	1.101	1.218	0.020	1.099	0.020	1.099	0.020
	0.750	0.020	1.0	1.139	1.343	0.020	1.224	0.020	1.224	0.020
	1.000	0.020	0.9	1.284	1.843	0.020	1.724	0.020	1.724	0.020
	1.250	0.020	0.7	1.730	2.343	0.020	2.224	0.020	2.224	0.020
LNMX06	0.625	0.028	3.0	0.523	1.181	0.028	0.877	0.028	0.818	0.028
	0.750	0.039	1.5	1.463	1.496	0.039	1.165	0.039	1.106	0.039
	1.000	0.039	1.4	1.583	1.890	0.039	1.559	0.039	1.500	0.039
	1.250	0.039	1.0	2.158	2.441	0.039	2.110	0.039	2.051	0.039
	1.500	0.039	0.8	2.814	3.071	0.039	2.740	0.039	2.681	0.039
	2.000	0.039	0.6	3.634	3.858	0.039	3.527	0.039	3.468	0.039
	2.500	0.039	0.5	4.700	4.882	0.039	4.551	0.039	4.492	0.039
LNMX10	1.000	1.500	2.8	1.212	1.685	0.059	1.409	0.059	1.311	0.059
	1.250	1.500	2.0	1.681	2.185	0.059	1.909	0.059	1.811	0.059
	1.500	1.500	1.6	2.150	2.685	0.059	2.409	0.059	2.311	0.059
	2.000	1.500	1.1	3.087	3.685	0.059	3.409	0.059	3.311	0.059
	2.500	1.500	0.8	4.025	4.685	0.059	4.409	0.059	4.311	0.059
	3.000	1.500	0.7	4.962	5.685	0.059	5.409	0.059	5.311	0.059
	4.000	1.500	0.5	6.837	7.685	0.059	7.409	0.059	7.311	0.059

- When ramping and helical milling, table feed, vf (ipm) should be lower than 70% of the recommended cutting conditions.
- When helical milling, Max. pitch, DHmax should be lower than max. depth of cut, APMX.
- When ramping, the depth of cut should be lower than max. depth of cut, APMX.

- Lmin = APMX/tan (RMPX) (inch)
- Lmin : Min. length of ramping
- APMX : Depth of cut
- RMPX : Max. rake angle in ramping

Caution for corner R programming



------ Corner R programming

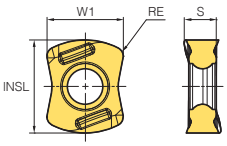
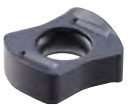
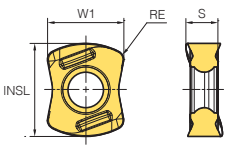
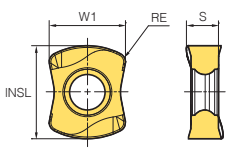
(inch)

Insert	Corner R programming	Cutting conditions		Over cut	Uncut
		Nose R RE	Max. APMX		
LNMX040205R-ML LNMX040205R-MM	R0.031	0.020	0.020	0.000	0.011
	R0.035 (Standard)			0.000	0.009
	R0.039			0.000	0.009
LNMX060310R-ML LNMX060310R-MF LNMX060310R-MM	R0.059	0.039	0.039	0.000	0.016
	R0.063 (Standard)			0.000	0.015
	R0.079			0.002	0.011
LNMX100412R-ML LNMX100412R-MF LNMX100412R-MM	R0.079	0.047	0.059	0.000	0.033
	R0.098 (Standard)			0.000	0.025
	R0.118			0.002	0.020

- During usage of CNC program, over cut & uncut would be occurred on the corner processing site if entering the correct program corner R value for each insert.
- To prevent overcut, you will need to complete a CNC program considering the above overcut.

Insert

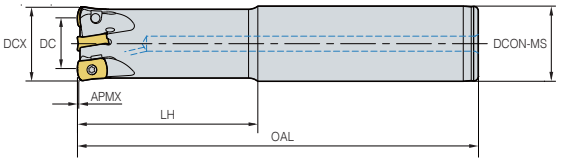
(inch)

Picture	Designation		Coated								Dimensions (inch)				Geometries
			PC2505	PC2510	PC3700	PC9540	PC5300	PC5400	UNC840	UPC845	INSL	W1	S	RE	
	LNMX	040205R-ML					●	●	●	●	0.244	0.165	0.093	0.020	
		060310R-ML					●	●	●	●	0.394	0.268	0.142	0.039	
		100412R-ML				●	●	●	●	●	0.480	0.394	0.165	0.047	
	LNMX	060310R-MF		●	●		●	●	●	●	0.394	0.268	0.142	0.039	
		100412R-MF		●	●	●	●	●	●	●	0.480	0.394	0.165	0.047	
	LNMX	040205R-MM		●	●		●	●		●	0.244	0.165	0.093	0.020	
		060310R-MM		●	●		●	●			0.394	0.268	0.142	0.039	
		100412R-MM		●	●		●	●			0.480	0.394	0.165	0.047	

●: Stock item

HFMDSA-LN04

• AR : -8°
• RR : -14°~ -13°



(inch)

Designation			DCX	DC	DCON-MS	LH	OAL	APMX	lbs
HFMDSA	037R-1C031-300-LN04	1	0.375	0.205	0.313	0.787	3.0	0.02	0.07
	037R-1C037-300-LN04	1	0.375	0.205	0.375	1.181	3.0	0.02	0.11
	037R-1C037-400-LN04	1	0.375	0.205	0.375	0.787	4.0	0.02	0.11
	037R-1C037-600-LN04	1	0.375	0.205	0.375	1.575	6.0	0.02	0.15
	043R-2C037-400-LN04	2	0.438	0.267	0.375	0.787	4.0	0.02	0.11
	043R-2C037-600-LN04	2	0.438	0.267	0.375	0.787	6.0	0.02	0.18
	050R-3C050-400-LN04	3	0.500	0.330	0.500	1.969	4.0	0.02	0.15
	050R-3C050-600-LN04	3	0.500	0.330	0.500	1.575	6.0	0.02	0.24

●: Stock item

Available inserts

LNMX-ML

LNMX-MM

Designation		Coated							
		PC2505	PC2510	PC3700	PC9540	PC5300	PC5400	UNC840	UPC845
LNMX	040205R-ML					●	●	●	●
	040205R-MM		●	●		●	●		●

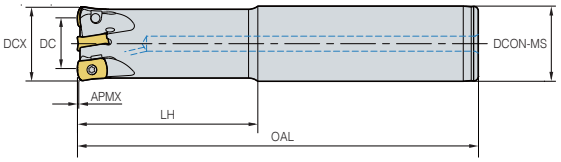
●: Stock item

Parts

Parts / Specification	Screw	Wrench
Ø0.375 ~ Ø0.500	FTKA01844-A	TW06S-A

HFMDSA-LN04

• AR : -8°
• RR : -15°



(inch)

	Designation		DCX	DC	DCON-MS	LH	OAL	APMX	lbs
HFMDSA	062R-4C062-400-LN04	4	0.625	0.455	0.625	1.969	4.0	0.02	0.29
	062R-4C062-476-LN04	4	0.625	0.455	0.625	2.756	5.0	0.02	0.44
	062R-4C062-600-LN04	4	0.625	0.455	0.625	3.150	6.0	0.02	0.44
	062R-4C062-800-LN04	4	0.625	0.455	0.625	4.724	8.0	0.02	0.57
	068R-4C062-400-LN04	4	0.688	0.517	0.625	0.787	4.0	0.02	0.31
	068R-4C062-600-LN04	4	0.688	0.517	0.625	0.787	6.0	0.02	0.44
	068R-4C062-800-LN04	4	0.688	0.517	0.625	0.787	8.0	0.02	0.64
	075R-5C075-400-LN04	5	0.750	0.580	0.750	0.787	4.0	0.02	0.49
	075R-5C075-600-LN04	5	0.750	0.580	0.750	1.575	6.0	0.02	0.66
	075R-5C075-800-LN04	5	0.750	0.580	0.750	3.150	8.0	0.02	0.88

●: Stock item

Available inserts

LNMX-ML

LNMX-MM

	Designation	Coated							
		PC2505	PC2510	PC3700	PC9540	PC5300	PC5400	UNC840	UPC845
LNMX	040205R-ML					●	●	●	●
	040205R-MM		●	●		●	●		●

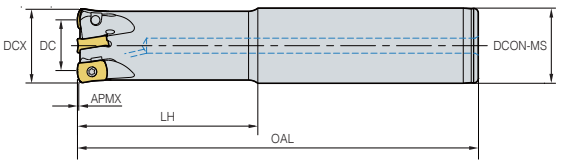
●: Stock item

Parts

Specification \ Parts	Screw	Wrench
Ø0.625 ~ Ø0.750	FTKA01844-A	TW06S-A

HFMDSA-LN06

• AR : -9°
• RR : -14°~ -12°



(inch)

Designation			DCX	DC	DCON-MS	LH	OAL	APMX	lbs
HFMDSA	062R-2C062-400-LN06	2	0.625	0.334	0.625	1.181	4.0	0.028	0.29
	062R-2C062-600-LN06	2	0.625	0.334	0.625	1.969	6.0	0.028	0.42
	075R-3C075-400-LN06	3	0.750	0.459	0.750	1.575	4.0	0.039	0.44
	075R-3C075-500-LN06	3	0.750	0.459	0.750	1.969	5.0	0.039	0.57
	075R-3C075-600-LN06	3	0.750	0.459	0.750	3.150	6.0	0.039	0.68
	075R-3C075-800-LN06	3	0.750	0.459	0.750	4.724	8.0	0.039	0.88
	100R-4C100-400-LN06	4	1.000	0.709	1.000	1.575	4.0	0.039	0.73
	100R-4C100-600-LN06	4	1.000	0.709	1.000	2.362	6.0	0.039	1.01
	100R-4C100-800-LN06	4	1.000	0.709	1.000	3.937	8.0	0.039	1.28
	100R-4C100-1000-LN06	4	1.000	0.709	1.000	5.906	10.0	0.039	1.48

●: Stock item

Available inserts


LNMX-ML


LNMX-MF


LNMX-MM

Designation		Coated							
		PC2505	PC2510	PC3700	PC9540	PC5300	PC5400	UNC840	UPC845
LNMX	060310R-ML					●	●	●	●
	060310R-MF		●	●		●	●	●	●
	060310R-MM		●	●		●	●		

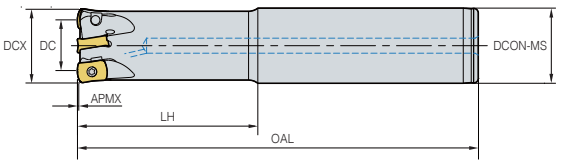
●: Stock item

Parts

Parts / Specification	Screw	Wrench
Ø0.625 ~ Ø1.000	FTNA0306	TW09S

HFMDSA-LN06

• AR : -9°
• RR : -12°~ -11°



(inch)

Designation		⊙	DCX	DC	DCON-MS	LH	OAL	APMX	lbs
HFMDSA	125R-5C125-600-LN06	5	1.250	0.959	1.250	2.756	6.0	0.039	1.81
	125R-5C125-800-LN06	5	1.250	0.959	1.250	4.724	8.0	0.039	2.38
	125R-5C125-1000-LN06	5	1.250	0.959	1.250	5.906	10.0	0.039	2.65
	150R-6C125-600-LN06	6	1.500	1.209	1.250	1.575	6.0	0.039	2.14
	150R-6C125-800-LN06	6	1.500	1.209	1.250	1.575	8.0	0.039	2.82
	150R-6C125-1000-LN06	6	1.500	1.209	1.250	1.575	10.0	0.039	3.04

●: Stock item

Available inserts


LNMX-ML


LNMX-MF


LNMX-MM

Designation		Coated							
		PC2505	PC2510	PC3700	PC9540	PC5300	PC5400	UNC840	UPC845
LNMX	060310R-ML					●	●	●	●
	060310R-MF		●	●		●	●	●	●
	060310R-MM		●	●		●	●		

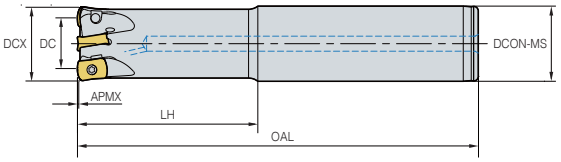
●: Stock item

Parts

Parts / Specification	Screw	Wrench
Ø1.250 ~ Ø1.500	FTNA0306	TW09S

HFMDSA-LN10

• AR : -9°
• RR : -16°~ -13°



(inch)

Designation			DCX	DC	DCON-MS	LH	OAL	APMX	lbs
HFMDSA	100R-2C100-600-LN10	2	1.000	0.567	1.000	3.0	6.0	0.059	1.01
	100R-2C100-800-LN10	2	1.000	0.567	1.000	4.0	8.0	0.059	1.32
	100R-3C100-600-LN10	3	1.000	0.567	1.000	3.0	6.0	0.059	0.99
	100R-3C100-800-LN10	3	1.000	0.567	1.000	4.0	8.0	0.059	1.32
	125R-4C125-600-LN10	4	1.250	0.817	1.250	3.0	6.0	0.059	1.65
	125R-4C125-800-LN10	4	1.250	0.817	1.250	4.0	8.0	0.059	2.21
	125R-4C125-1000-LN10	4	1.250	0.817	1.250	6.0	10.0	0.059	2.65
	150R-4C125-600-LN10	4	1.500	1.067	1.250	1.5	6.0	0.059	1.96
	150R-4C125-800-LN10	4	1.500	1.067	1.250	1.5	8.0	0.059	2.65
	150R-4C125-1000-LN10	4	1.500	1.067	1.250	1.5	10.0	0.059	3.26
	150R-5C125-600-LN10	5	1.500	1.067	1.250	1.5	6.0	0.059	1.96
	150R-5C125-800-LN10	5	1.500	1.067	1.250	1.5	8.0	0.059	2.62
	150R-5C125-1000-LN10	5	1.500	1.067	1.250	1.5	10.0	0.059	3.26

●: Stock item

Available inserts


LNMX-ML


LNMX-MF


LNMX-MM

Designation		Coated							
		PC2505	PC2510	PC3700	PC9540	PC5300	PC5400	UNC840	UPC845
LNMX	100412R-ML				●	●	●	●	●
	100412R-MF		●	●	●	●	●	●	●
	100412R-MM		●	●		●	●		

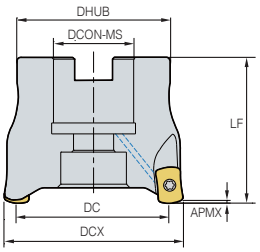
●: Stock item

Parts

Specification \ Parts	Screw	Wrench
Ø1.000 ~ Ø1.500	FTNA0408	TW15S

HFMDCA-LN06

• AR : -9°
• RR : -12°~ -10°



(inch)

Designation		⊙	DCX	DC	DHUB	DCON-MS	LF	APMX	lbs
HFMDCA	125R-050-5-LN06	5	1.250	0.959	1.181	0.50	1.50	0.039	0.27
	150R-050-6-LN06	6	1.500	1.209	1.417	0.50	1.50	0.039	0.46
	200R-075-7-LN06	7	2.000	1.709	1.772	0.75	1.75	0.039	0.71
	200R-075-8-LN06	8	2.000	1.709	1.772	0.75	1.75	0.039	0.71
	250R-075-8-LN06	8	2.500	2.209	1.772	0.75	1.75	0.039	1.13
	250R-075-9-LN06	9	2.500	2.209	1.772	0.75	1.75	0.039	1.13
	250R-100-8-LN06	8	2.500	2.209	2.205	1.00	1.75	0.039	1.17
	250R-100-9-LN06	9	2.500	2.209	2.205	1.00	1.75	0.039	1.17

●: Stock item

Available inserts


LNMX-ML


LNMX-MF


LNMX-MM

Designation		Coated							
		PC2505	PC2510	PC3700	PC9540	PC5300	PC5400	UNC840	UPC845
LNMX	060310R-ML					●	●	●	●
	060310R-MF		●	●		●	●	●	●
	060310R-MM		●	●		●	●		

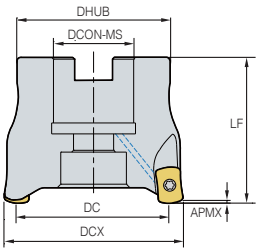
●: Stock item

Parts

Parts / Specification	Screw	Wrench
Ø1.250 ~ Ø2.500	FTNA0306	TW09S

HFMDCA-LN10

• AR : -9°
• RR : -16°~ -13°



(inch)

Designation		⊚	DCX	DC	DHUB	DCON-MS	LF	APMX	lbs
HFMDCA	**150R-050-4-LN10**	4	1.500	1.067	1.417	0.500	1.500	0.059	0.37
	150R-050-5-LN10	5	1.500	1.067	1.417	0.500	1.500	0.059	0.37
	200R-075-6-LN10	6	2.000	1.567	1.772	0.750	1.750	0.059	0.57
	200R-075-7-LN10	7	2.000	1.567	1.772	0.750	1.750	0.059	0.57
	250R-075-7-LN10	7	2.500	2.067	2.205	0.750	1.750	0.059	1.04
	250R-075-8-LN10	8	2.500	2.067	2.205	0.750	1.750	0.059	1.04
	250R-100-7-LN10	7	2.500	2.067	2.205	1.000	1.750	0.059	1.04
	250R-100-8-LN10	8	2.500	2.067	2.205	1.000	1.750	0.059	1.04
	300R-100-9-LN10	9	3.000	2.567	2.205	1.000	2.000	0.059	1.85
	300R-100-10-LN10	10	3.000	2.567	2.205	1.000	2.000	0.059	1.85
	400R-125-10-LN10	10	4.000	3.567	2.874	1.250	2.000	0.059	3.26
	400R-125-11-LN10	11	4.000	3.567	2.874	1.250	2.000	0.059	3.26
	400R-125-12-LN10	12	4.000	3.567	2.874	1.250	2.000	0.059	3.26

●: Stock item

Available inserts


LNMX-ML


LNMX-MF


LNMX-MM

Designation		Coated							
		PC2505	**PC2510**	**PC3700**	**PC9540**	**PC5300**	**PC5400**	**UNC840**	**UPC845**
LNMX	100412R-ML				●	●	●	●	●
	100412R-MF		●	●	●	●	●	●	●
	100412R-MM		●	●		●	●		

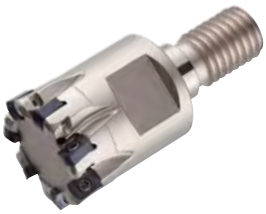
●: Stock item

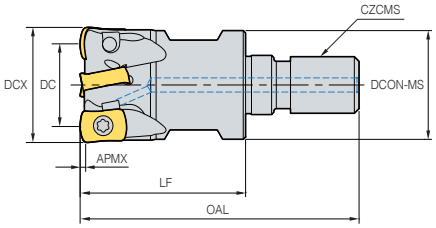
Parts

Parts / Specification	Screw	Wrench
Ø1.500 ~ Ø4.000	FTNA0408	TW15S

HFMDMA-LN04

• AR : -8°
• RR : -15°~ -13°





(inch)

Designation		⌀	DCX	DC	DCON-MS	LF	OAL	CZCMS	APMX	lbs
HFMDMA	037R-1-M06-LN04	1	0.375	5.68	0.374	0.866	1.457	M06	0.02	0.02
	043R-2-M06-LN04	2	0.438	6.68	0.433	0.866	1.457	M06	0.02	0.02
	050R-3-M06-LN04	3	0.500	7.68	0.433	0.866	1.457	M06	0.02	0.02
	062R-4-M08-LN04	4	0.625	8.68	0.571	0.866	1.535	M08	0.02	0.07
	068R-4-M08-LN04	4	0.688	11.68	0.571	0.866	1.535	M08	0.02	0.07
	075R-5-M10-LN04	5	0.750	12.68	0.709	1.181	2.008	M10	0.02	0.13
	100R-7-M12-LN04	7	1.000	15.68	0.906	1.181	2.323	M12	0.02	0.22
	125R-8-M16-LN04	8	1.250	20.68	1.142	1.378	2.441	M16	0.02	0.44

●: Stock item

Available inserts

LNMX-ML

LNMX-MM

Designation		Coated							
		PC2505	PC2510	PC3700	PC9540	PC5300	PC5400	UNC840	UPC845
LNMX	040205R-ML					●	●	●	●
	040205R-MM		●	●		●	●		●

●: Stock item

Available adapter

Designation		Available adapter
HFMDMA	037R-1-M06-LN04	MATA-M06
	043R-2-M06-LN04	
	050R-3-M06-LN04	
	062R-4-M08-LN04	MATA-M08

Designation		Available adapter
HFMDMA	068R-4-M08-LN04	MATA-M08
	075R-5-M10-LN04	MATA-M10
	100R-7-M12-LN04	MATA-M12
	125R-8-M16-LN04	MATA-M16

Designation:
HFMDMA062R-□-M08-LN04
Modular head threading measure size (M08)

=

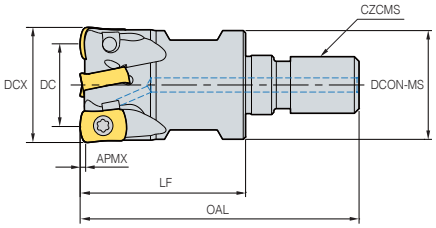
Adapter spec: MATA-M08-040-S16T
Adapter threading measure (M08)

Parts

Parts / Specification	Screw	Wrench
Ø0.375 ~ Ø1.250	FTKA01844-A	TW06S-A

HFMDMA-LN06

• AR : -9°
• RR : -15°~ -10°



(inch)

Designation			DCX	DC	DCON-MS	LF	OAL	CZCMS	APMX	lbs
HFMDMA	062R-2-M08-LN06	2	0.625	0.334	0.571	0.98	1.65	M08	0.028	0.07
	075R-3-M10-LN06	3	0.750	0.459	0.709	1.18	2.01	M10	0.039	0.13
	100R-4-M12-LN06	4	1.000	0.709	0.906	1.38	2.32	M12	0.039	0.22
	125R-5-M16-LN06	5	1.250	0.959	1.142	1.57	2.64	M16	0.039	0.44
	150R-6-M16-LN06	6	1.500	1.209	1.142	1.57	2.64	M16	0.039	0.53

●: Stock item

Available inserts


LNMX-ML


LNMX-MF


LNMX-MM

Designation		Coated							
		PC2505	PC2510	PC3700	PC9540	PC5300	PC5400	UNC840	UPC845
LNMX	060310R-ML					●	●	●	●
	060310R-MF		●	●		●	●	●	●
	060310R-MM		●	●		●	●		

●: Stock item

Available adapter

Designation		Available adapter
HFMDMA	062R-□-M08-LN06	MATA-M08
	075R-□-M10-LN06	MATA-M10
	100R-□-M12-LN06	MATA-M12
	125R-□-M16-LN06	MATA-M16
	150R-□-M16-LN06	

Designation: HFMDMA125R-□-M16-LN06
Modular head threading measure size (M16)

II

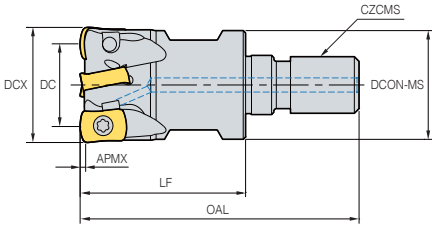
Adapter spec: MATA-M16-354-S125S-C
Adapter threading measure (M16)

Parts

Parts / Specification	Screw	Wrench
Ø0.625 ~ Ø1.500	FTNA0306	TW09S

HFMDMA-LN10

• AR : -9°
• RR : -16°~ -13°



(inch)

Designation			DCX	DC	DCON-MS	LF	OAL	CZCMS	APMX	lbs
HFMDMA	100R-2-M12-LN10	2	1.000	0.567	0.906	1.378	2.323	M12	0.059	0.20
	100R-3-M12-LN10	3	1.000	0.567	0.906	1.378	2.323	M12	0.059	0.20
	125R-3-M16-LN10	3	1.250	0.817	1.142	1.575	2.638	M16	0.059	0.42
	125R-4-M16-LN10	4	1.250	0.817	1.142	1.575	2.638	M16	0.059	0.42
	150R-4-M16-LN10	4	1.500	1.067	1.142	1.575	2.638	M16	0.059	0.49
	150R-5-M16-LN10	5	1.500	1.067	1.142	1.575	2.638	M16	0.059	0.49

●: Stock item

Available inserts


LNMX-ML


LNMX-MF


LNMX-MM

Designation		Coated							
		PC2505	PC2510	PC3700	PC9540	PC5300	PC5400	UNC840	UPC845
LNMX	100412R-ML				●	●	●	●	●
	100412R-MF		●	●	●	●	●	●	●
	100412R-MM		●	●		●	●		

●: Stock item

Available adapter

Designation		Available adapter
HFMDMA	100R-□-M12-LN10	MATA-M12
	125R-□-M16-LN10	MATA-M16
	150R-□-M16-LN10	

Designation: HFMDMA125R-□-M16-LN10
Modular head threading measure size (M16)

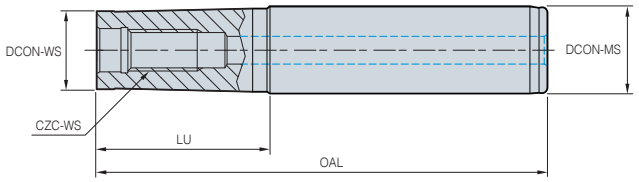
II

Adapter spec: MATA-M16-354-S125S-C
Adapter threading measure (M16)

Parts

Specification \ Parts	Screw	Wrench
Ø1.000 ~ Ø1.500	FTNA0408	TW15S

MATA (Steel Shank type)



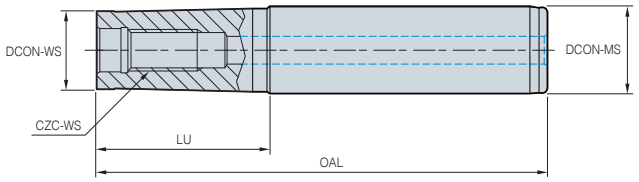
(inch)

	Designation	DCON-WS	DCON-MS	LU	OAL	CZC-WS
MATA-	**M06-078-S037S**	0.354	3/8	0.787	2.756	M06
	M06-157-S050T	0.354	1/2	1.575	3.780	M06
	M06-255-S062T	0.354	5/8	2.559	4.921	M06
	M6B-078-S050S	0.433	1/2	0.787	2.992	M06
	M6B-157-S050S	0.433	1/2	1.575	3.780	M06
	M6B-255-S062T	0.433	5/8	2.559	4.921	M06
	M6B-315-S062T	0.433	5/8	3.150	5.512	M06
	M08-078-S062S	0.571	5/8	0.787	3.150	M08
	M08-157-S062T	0.571	5/8	1.575	3.937	M08
	M08-255-S062T	0.571	5/8	2.559	4.921	M08
	M08-315-S075T	0.571	3/4	3.150	5.906	M08
	M08-433-S100T	0.571	1/1	4.331	7.480	M08
	M10-118-S075S	0.689	3/4	1.181	3.937	M10
	M10-196-S075T	0.689	3/4	1.969	4.724	M10
	M10-275-S075T	0.689	3/4	2.756	5.512	M10
	M10-354-S100T	0.689	1	3.543	6.693	M10
	M10-433-S100T	0.689	1	4.331	7.480	M10
	M10-511-S125T	0.689	1 1/4	5.118	8.661	M10
	M12-118-S100S	0.906	1	1.181	4.331	M12
	M12-196-S100T	0.906	1	1.969	5.118	M12
	M12-275-S100T	0.906	1	2.756	5.906	M12
	M12-354-S100T	0.906	1	3.543	6.693	M12
	M12-433-S125T	0.906	1 1/4	4.331	7.874	M12
	M12-689-S150T	0.906	1 1/2	6.890	11.811	M12
	M16-137-S125S	1.142	1 1/4	1.378	4.921	M16
	M16-216-S125T	1.142	1 1/4	2.165	5.709	M16
	M16-315-S125T	1.142	1 1/4	3.150	6.693	M16
	M16-472-S125T	1.142	1 1/4	4.724	8.268	M16
	M16-689-S150T	1.142	1 1/2	6.890	11.811	M16

* S: Straight neck adapter * T: Taper neck adapter

●: Stock item

MATA-C (Carbide Shank type)



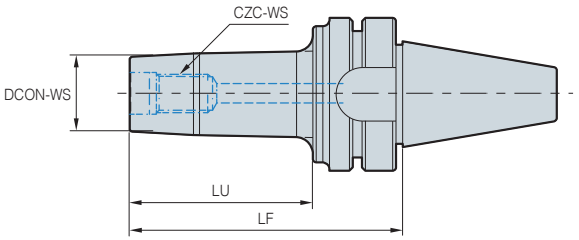
(inch)

	Designation	DCON-WS	DCON-MS	LU	OAL	CZC-WS
MATA-	M06-118-S039S-C-315	0.374	0.394	1.181	3.150	M06
	M06-196-S039S-C-393	0.374	0.394	1.969	3.937	M06
	M06-315-S039S-C-511	0.374	0.394	3.150	5.118	M06
	M06B-118-S039S-C-315	0.433	0.394	1.181	3.150	M06
	M06B-196-S039S-C-393	0.433	0.394	1.969	3.937	M06
	M06B-315-S039S-C-511	0.433	0.394	3.150	5.118	M06
	M08-315-S062S-C	0.571	5/8	3.150	5.906	M08
	M08-433-S062S-C	0.571	5/8	4.331	7.087	M08
	M08-590-S062S-C	0.571	5/8	5.906	9.843	M08
	M08-394-S062S-C-590	0.571	5/8	0.394	5.906	M08
	M08-394-S062S-C-708	0.571	5/8	0.394	7.087	M08
	M08-394-S062S-C-984	0.571	5/8	0.394	9.843	M08
	M10-354-S075S-C	0.689	3/4	3.543	6.693	M10
	M10-433-S075S-C	0.689	3/4	4.331	7.874	M10
	M10-689-S075S-C	0.689	3/4	6.890	11.811	M10
	M10-394-S075S-C-669	0.689	3/4	0.394	6.693	M10
	M10-394-S075S-C-787	0.689	3/4	0.394	7.874	M10
	M10-394-S075S-C-1181	0.689	3/4	0.394	11.811	M10
	M12-354-S100S-C	0.906	1	3.543	6.693	M12
	M12-433-S100S-C	0.906	1	4.331	7.874	M12
	M12-689-S100S-C	0.906	1	6.890	11.811	M12
	M12-059-S100S-C-669	0.906	1	0.591	6.693	M12
	M12-059-S100S-C-787	0.906	1	0.591	7.874	M12
	M12-059-S100S-C-1181	0.906	1	0.591	11.811	M12
	M16-354-S125S-C	1.142	1 1/4	3.543	7.087	M16
	M16-472-S125S-C	1.142	1 1/4	4.824	8.268	M16
	M16-689-S125S-C	1.142	1 1/4	6.890	11.811	M16
	M16-078-S125S-C-708	1.142	1 1/4	0.787	7.087	M16
	M16-078-S125S-C-826	1.142	1 1/4	0.787	8.268	M16
	M16-078-S125S-C-1181	1.142	1 1/4	0.787	11.811	M16

* S: Straight neck adapter * T: Taper neck adapter

●: Stock item

BT30/BT40/BT50

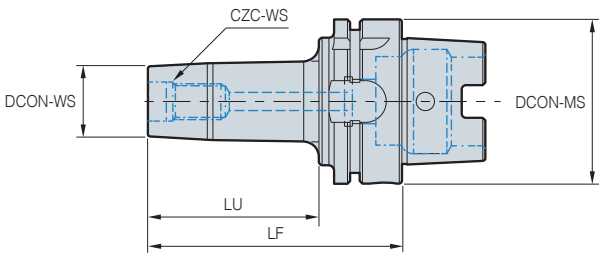


(inch)

	Designation	DCON-WS	LU	LF	CZC-WS
BT30-	MAT-M06-053	0.433	0.827	2.087	6
	MAT-M08-057	0.571	0.984	2.244	8
	MAT-M10-062	0.709	1.181	2.441	10
	MAT-M12-067	0.906	1.378	2.638	12
	MAT-M16-067	1.142	1.378	2.638	16
BT40-	MAT-M06-062	0.433	0.984	2.441	8
	MAT-M06-077	0.433	1.575	3.031	6
	MAT-M06-092	0.433	2.165	3.622	6
	MAT-M08-067	0.571	1.181	2.638	8
	MAT-M08-082	0.571	1.772	3.228	8
	MAT-M08-097	0.571	2.362	3.819	8
	MAT-M10-072	0.709	1.378	2.835	10
	MAT-M10-087	0.709	1.969	3.425	10
	MAT-M10-102	0.709	2.559	4.016	10
	MAT-M12-077	0.906	1.575	3.031	12
	MAT-M12-092	0.906	2.165	3.622	12
	MAT-M12-107	0.906	2.756	4.213	12
	MAT-M16-077	1.142	1.575	3.031	16
	MAT-M16-092	1.142	2.165	3.622	16
	MAT-M16-107	1.142	2.756	4.213	16
BT50-	MAT-M06-083	0.433	1.378	3.268	6
	MAT-M06-098	0.433	1.969	3.858	6
	MAT-M06-113	0.433	2.559	4.449	6
	MAT-M08-088	0.571	1.575	3.465	8
	MAT-M08-103	0.571	2.165	4.055	8
	MAT-M08-118	0.571	2.756	4.646	8
	MAT-M10-093	0.709	1.772	3.661	10
	MAT-M10-113	0.709	2.559	4.449	10
	MAT-M10-128	0.709	3.150	5.039	10
	MAT-M12-103	0.906	2.165	4.055	12
	MAT-M12-118	0.906	2.756	4.646	12
	MAT-M12-133	0.906	3.346	5.236	12
	MAT-M16-103	1.142	2.165	4.055	16
	MAT-M16-118	1.142	2.756	4.646	16
	MAT-M16-133	1.142	3.346	5.236	16

●: Stock item

HSK63A/HSK100A



(inch)

Designation		DCON-WS	DCON-MS	LU	LF	CZC-WS
HSK63A-	MAT-M06-061	0.433	2.480	0.984	2.402	6
	MAT-M06-076	0.433	2.480	1.575	2.992	6
	MAT-M06-091	0.433	2.480	2.165	3.583	6
	MAT-M08-066	0.571	2.480	1.181	2.598	8
	MAT-M08-081	0.571	2.480	1.772	3.189	8
	MAT-M08-096	0.571	2.480	2.362	3.780	8
	MAT-M10-071	0.709	2.480	1.378	2.795	10
	MAT-M10-086	0.709	2.480	1.969	3.386	10
	MAT-M10-101	0.709	2.480	2.559	3.976	10
	MAT-M12-076	0.906	2.480	1.575	2.992	12
	MAT-M12-091	0.906	2.480	2.165	3.583	12
	MAT-M12-106	0.906	2.480	2.756	4.173	12
	MAT-M16-076	1.142	2.480	1.575	2.992	16
	MAT-M16-091	1.142	2.480	2.165	3.583	16
	MAT-M16-106	1.142	2.480	2.756	4.173	16
HSK100A-	MAT-M06-074	0.433	3.937	1.378	2.913	6
	MAT-M06-089	0.433	3.937	1.969	3.504	6
	MAT-M06-104	0.433	3.937	2.559	4.094	6
	MAT-M08-079	0.571	3.937	1.575	3.110	8
	MAT-M08-094	0.571	3.937	2.165	3.701	8
	MAT-M08-109	0.571	3.937	2.756	4.291	8
	MAT-M10-084	0.709	3.937	1.772	3.307	10
	MAT-M10-104	0.709	3.937	2.559	4.094	10
	MAT-M10-119	0.709	3.937	3.150	4.685	10
	MAT-M12-094	0.906	3.937	2.165	3.701	12
	MAT-M12-109	0.906	3.937	2.756	4.291	12
	MAT-M12-124	0.906	3.937	3.346	4.882	12
	MAT-M16-094	1.142	3.937	2.165	3.701	16
	MAT-M16-109	1.142	3.937	2.756	4.291	16
	MAT-M16-124	1.142	3.937	3.346	4.882	16

●: Stock item

⚠ For the safe metalcutting

- Use safety supplies such as protective gloves to prevent possible injury while touching the edge of tools.
- Use safety glasess or safety cover to hedge possible dangers. Inappropriate usage or excessive cutting condition may lead tool's breakage or even the fragment's scattering.
- Clamp the workpiece tightly enough to prevent its movement while its machining.
- Properly manage the tool change phase because the inordinately used tool can be easily broken under the excessive cutting load or severe wear, and it may threat the operator's safety.
- Use safety cover because chips evacuated during cutting are hot and sharp and may cause burns and cuts. To remove chips safely, stop machining, put on protective gloves, and use a hook or other tools.
- Prepare for fire prevention measures as the use of the non-water soluble cutting oil may cause fire.
- Use safety cover and other safety supplies because the spare parts or the inserts can be pulled out due to centrifugal force while high speed machining.

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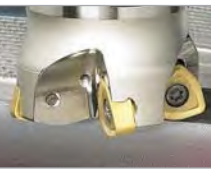
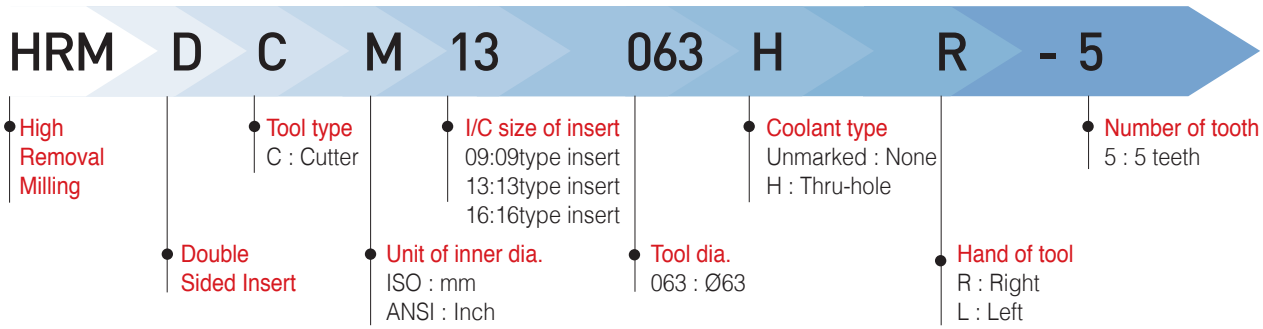
HRMDouble

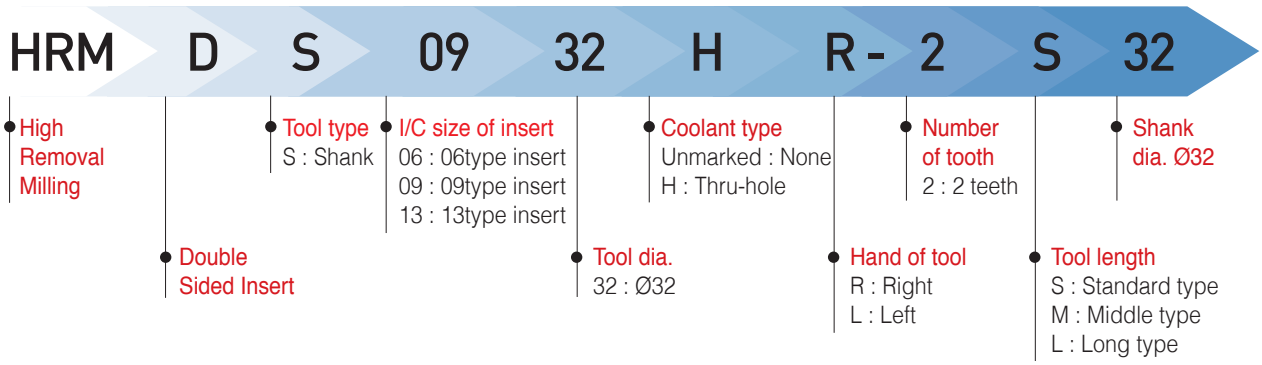


Code system

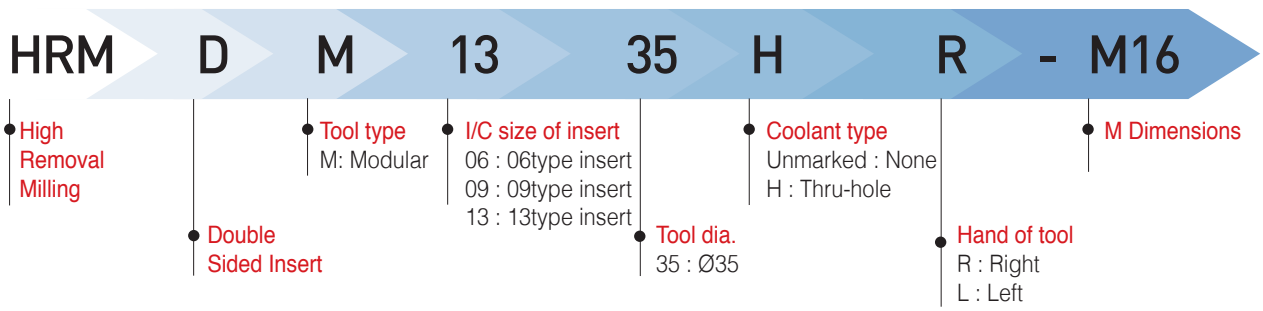
• Cutter type



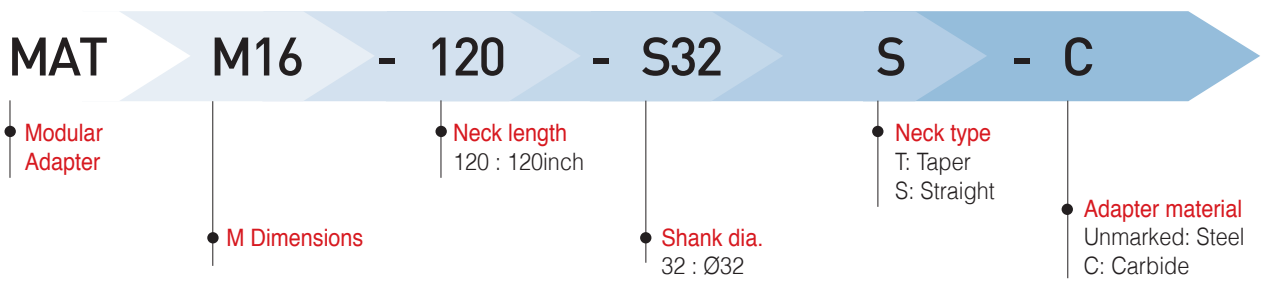
• Shank type



• Modular Head



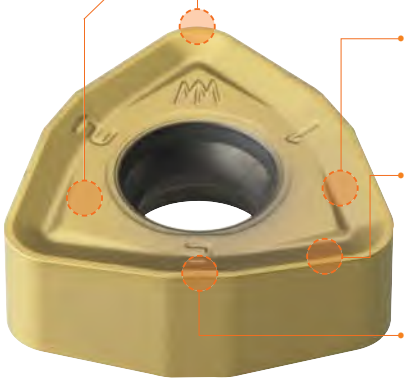
• Modular Adapter



Features

- HRMD is more economical due to the use of 6 cutting edges compared to HRM tool with positive inserts.
- High rake angle cutting edge and chip breaker reduce cutting load.
- Negative geometry has been designed for rigidity of cutting edge and double sided function.
- Simple screw on system and stable support achieves strong clamping force.
- Unique insert design for high feed and multifunctional machining
- HRMD insert with symmetrical cutting edge is applicable for both RH and LH type machining

Features of Insert



Nose-R
- Security of rigid edge in ramping pocket machining
- Round edge insert geometry suitable for high feed rates
- Possible to use RH/LH type machining

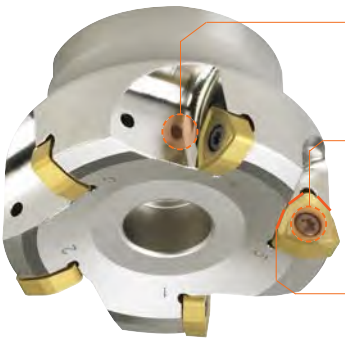
Clamping surface
- Designed for stable clamping
- Designed to prevention chip friction

Chip breaker
- Reduction of cutting loads due to high rake angle
- Improvement of chip flow and evacuation in various applications and materials
- Reduces damage on the clamping face of the insert

Major cutting edge
- Symmetrical design insert for RH/LH 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
- Improvement of surface roughness in high feed machining
- Special design for decreasing thrust force
- Symmetrical insert design for RH/LH type tool

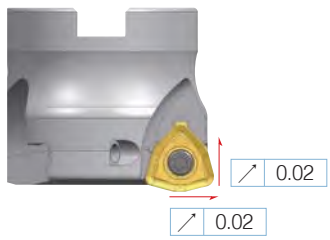
Features of Cutter



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

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

3-Surface constrained System
- Strong clamping
- Stable clamping against different cutting resistances in various machining applications

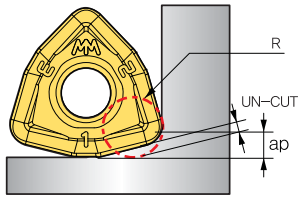


- NOTE :
  Some insert feature information is repeated.
  This occurs because multiple insert features provide the same benefit.
  Example: Symmetrical design.

Corner R programming

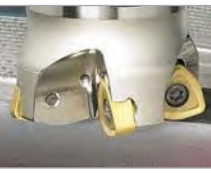
Designation	Cutting condition		Approx. R (mm)	
	Max.ap(mm)	Max.fz(mm/t)	Input. R	Uncut
WNMX060312ZNN-MM	1.0	1.2	1.8	0.4
WNMX09T316ZNN-MM	1.5	2.0	2.5	0.6
WNMX130520ZNN-MM	2.0	3.0	3.0	0.8
WNMX160720ZNN-MM	2.5	3.5	3.5	1.2

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



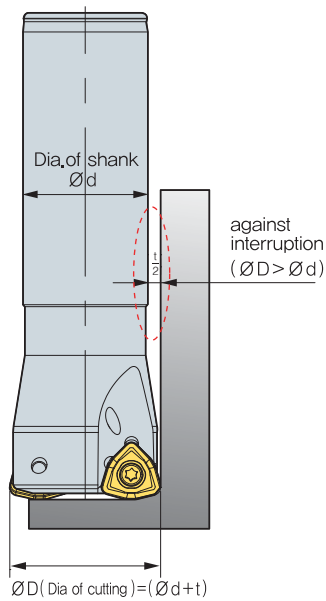
- Uncut part can be changed by poor machine condition or weak clamp of workpiece, etc

HRMDOUBLE

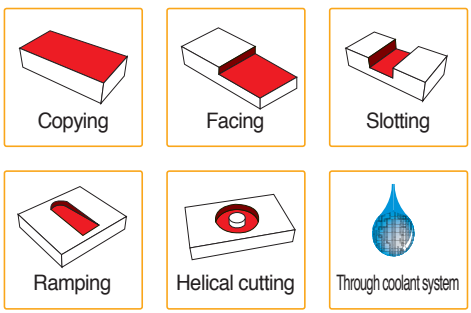


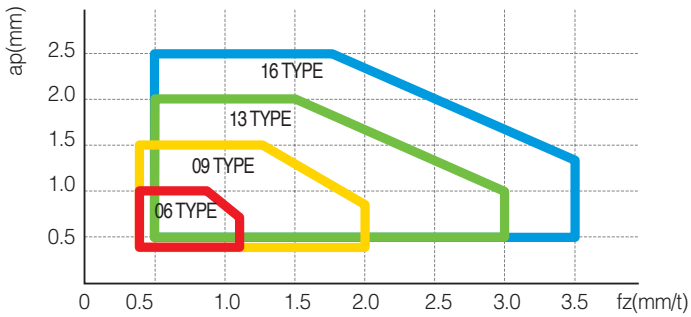
Interference prevent system

Designation	ØD(mm)	Ød(mm)	t(mm)
HRMDS0617HR-2□16	17	16	1
HRMDS0618HR-2□16	18	16	2
HRMDS0621HR-2□20	21	20	1
HRMDS0626HR-3□25	26	25	1
HRMDS0633HR-4□32	33	32	1
HRMDS0926HR-2□25	26	25	1
HRMDS0933HR-3□32	33	32	1
HRMDS0935HR-4□32	35	32	3
HRMDS0940HR-4□32	40	32	8
HRMDS0950HR-5□32	50	32	18
HRMDS0950HR-5□40	50	40	10
HRMDS0950HR-5□42	50	42	8
HRMDS1333HR-3□32	33	32	1
HRMDS1335HR-4□32	35	32	3
HRMDS1340HR-4□30	40	32	8
HRMDS1350HR-4□32	50	32	18
HRMDS1350HR-4□40	50	40	10
HRMDS1350HR-4□42	50	42	8
HRMDS1363HR-5□32	63	32	31
HRMDS1363HR-5□40	63	40	23
HRMDS1363HR-5□42	63	42	21



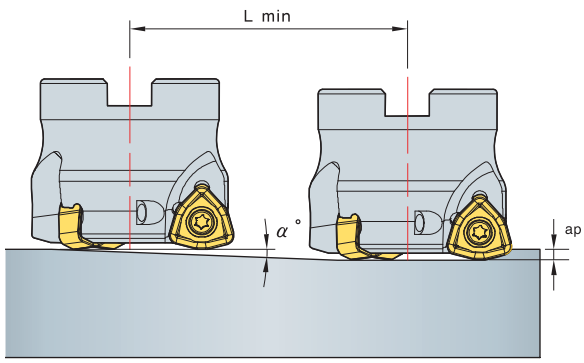
Application area



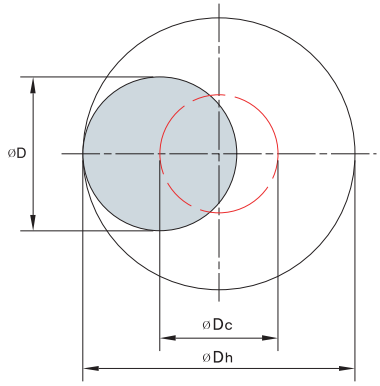


Ramping & Helical cutting technical data

- **Ramping**



- **Helical cutting**



• Tool pass dia.

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

ØDc = ØDh-ØD

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

- 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.

Designation	Tool dia. ØD(mm)	Efficient cutting dia. ØDe(mm)	Ramping			Helical ramping	
			Max. ap (mm)	Max. angle α°	Cutting Length Lmin (mm)	Dh Min. Cutting dia.(mm)	Dh Max. Cutting dia.(mm)
HRMDS0616HR	16	9.5	1	4.8	11	23.8	29.6
HRMDS0617HR	17	10.5	1	4.1	13	25.8	31.6
HRMDS0618HR	18	11.5	1	3.5	16	27.8	33.6
HRMDS0620HR	20	13.5	1	2.5	22	31.8	37.6
HRMDS0621HR	21	14.5	1	2.2	26	33.8	39.6
HRMDS0625HR	25	18.5	1	1.3	44	41.8	47.6
HRMDS0626HR	26	19.5	1	1.2	47	43.8	49.6
HRMDS0632HR	32	25.5	1	0.6	95	55.8	61.6
HRMDS0633HR	33	26.5	1	0.5	114	57.8	63.6
HRMDS0925HR	25	15.4	1.5	5.4	15.8	37.6	46.8
HRMDS0926HR	26	16.4	1.5	5.0	17.0	39.6	48.8
HRMDS0930HR	30	20.4	1.5	3.9	22.0	47.6	56.8
HRMDS0932HR	32	22.3	1.5	3.5	24.5	51.6	60.8
HRMDS0933HR	33	23.3	1.5	3.3	25.8	53.6	62.8
HRMDS0935HR	35	25.4	1.5	3.0	28.3	57.6	66.8
HRMDS0940HR	40	30.2	1.5	2.5	34.5	67.6	76.8
HRMDS0950HR	50	40.2	1.5	1.8	47.0	87.6	96.8
HRMDS1332HR	32	19.3	2	5.7	20.0	47	60
HRMDS1333HR	33	20.3	2	5.4	21.3	49	62
HRMDS1335HR	35	22.3	2	4.8	24.0	53	66
HRMDS1340HR	40	27.2	2	3.7	30.7	63	76
HRMDS1350HR	50	37	2	2.6	44.0	83	96
HRMDS1363HR	63	50	2	1.9	61.3	109	122
HRMDCM09040HR	40	30.2	1.5	2.5	34.5	67.6	76.8
HRMDCM09050HR	50	40.2	1.5	1.8	47.0	87.6	96.8
HRMDCM09063HR	63	53.1	1.5	1.4	63.3	113.6	122.8
HRMDC(M)09080HR	80	70.1	1.5	1.0	84.5	147.6	156.8
HRMDC(M)09100HR	100	90	1.5	0.8	109.5	187.6	196.8
HRMDCM13050HR	50	37	2	2.6	44.0	83	96
HRMDCM13063HR	63	50	2	1.9	61.3	109	122
HRMDC(M)13080HR	80	66.9	2	1.4	84.0	143	156
HRMDC(M)13100HR	100	86.9	2	1.0	110.7	183	196
HRMDC(M)13125HR	125	111.9	2	0.8	144.0	233	246
HRMDC(M)16080HR	80	63.3	2.5	1.4	102	138	156
HRMDC(M)16100HR	100	83.3	2.5	1	143	178	196
HRMDC(M)16125HR	125	108.3	2.5	0.7	204	228	246
HRMDC(M)16160R	160	143.3	2.5	0.5	286	298	316
HRMDC(M)16200R	200	183.3	2.5	0.3	477	378	396
HRMDC(M)16250R	250	233.3	2.5	0.2	716	478	496
HRMDC(M)16315R	315	298.3	2.5	0.1	1432	608	626

HRMDouble

Recommended cutting condition

Workpiece		Hardness	Grades	vc (m/min)	fz (mm/t)
P	General structural steel, Mild steel	Under 200HB	PC3500 PC3545	200(100~230)	1.0 ~ 2.0
	Cardon steel, Alloy steel	Under 30HRC	PC3500 PC3545	180(100~220)	1.0 ~ 1.5
	High Carbon steel, Alloy steel	30~40HRC	PC3500 PC3545	160(100~200)	0.8 ~ 1.3
	Pre-hardened steel	40~50HRC	PC3500 PC5300	120(80~180)	0.6 ~ 1.2
M	Stainless steel	Under 270HB	PC5300 PC3545	120(80~150)	0.8 ~ 1.3
K	Cast iron	Under 350N/㎟	PC5300	180(100~220)	1.2 ~ 1.8

Machining Example - I

- **Workpiece** : SM45C(HRC22)
- **Cutting condition** : vc(m/min)=283(1,803^{-1}), fz(mm/t)=1.4,
  vf(mm/min)=10,097, ap(mm)=0.8, ae(mm)=35
  Coolant : Dry, Machining : Copying
  Machine : Horizontal MCT
  Overhang of tool : 250mm
- **Tools** : HRMDCM13050HR-4
  WNMX130520ZNN-MM(PC3500)

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

• Test result
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.

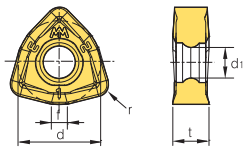
Machining Example - II

- **Workpiece** : STS304
- **Cutting condition** : vc(m/min)=130(414^{-1}), fz(mm/t)=1.2,
  vf(mm/min)=2.981, ap(mm)=1.0, ae(mm)=80
  Machining : Facing and Slotting
  Machine : Vertical MCT
  Overhang of tool : 250mm
- **Tools** : HRMDCM13100HR-6
  WNMX130520ZNN-MM(PC3500)

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

- Test result
  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 80% and the tool life was the same, but HRMD is economically more efficient due to the use of 6 cutting edges compared to SDKN type with positive insert.

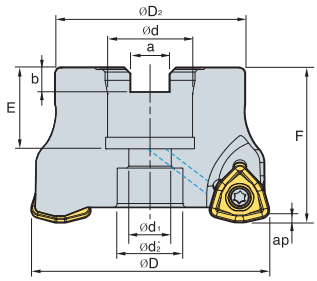
Applicable inserts



Designation		d	t	r	d_1	f
WNMX	060312ZNN-MM	6.35	3.18	1.2	2.86	1.2
	09T316ZNN-MM	9.525	3.97	1.6	3.6	1.7
	130520ZNN-MM	12.7	5.56	2.0	4.7	2.5
	160720ZNN-MM	16.0	7.0	2.0	5.8	3.0

HRMDouble

HRMDC(M)09



- AR : -7°
- RR : -12°~-18°

AA 14°

(mm)

Designation			ØD	ØD2	Ød	Ød1	Ød2	a	b	E	F	ap		Bolt
HRMDCM	09040HR-3	3	40	34	16	9	14	8.4	5.6	19	40	1.5	0.2	SB0825
	09040HR-4	4	40	34	16	9	14	8.4	5.6	19	40	1.5	0.2	
	09050HR-4	4	50	42	22	11	18	10.4	6.3	21	40	1.5	0.3	SB1025
	09050HR-5	5	50	42	22	11	18	10.4	6.3	21	40	1.5	0.3	
	09063HR-5	5	63	49	22	11	18	10.4	6.3	21	40	1.5	0.5	SB1025
	09063HR-6	6	63	49	22	11	18	10.4	6.3	21	40	1.5	0.5	
	09080HR-6	6	80	57	27	14	20	12.4	7	23	50	1.5	1.1	SB1230
	09080HR-7	7	80	57	27	14	20	12.4	7	23	50	1.5	1.1	
	09100HR-7	7	100	67	32	18	26	14.4	8	25	50	1.5	1.7	SB1630
	09100HR-8	8	100	67	32	18	26	14.4	8	25	50	1.5	1.7	
HRMDC	09080HR-6	6	80	57	25.4	14	20	9.5	6	24	50	1.5	1.1	SB1230
	09080HR-7	7	80	57	25.4	14	20	9.5	6	24	50	1.5	1.1	
	09080HR-31.75-6	6	80	67	31.75	18	26	12.7	8	32	63	1.5	1.5	SB1630
	09080HR-31.75-7	7	80	67	31.75	18	26	12.7	8	32	63	1.5	1.5	
	09100HR-7	7	100	67	31.75	18	26	12.7	8	32	63	1.5	2.1	SB1630
	09100HR-8	8	100	67	31.75	18	26	12.7	8	32	63	1.5	2.1	

• Parts

Screw	Wrench
FTKA0307	TW09S

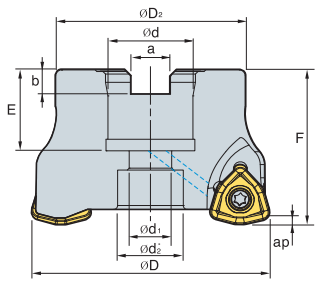
• Available Inserts

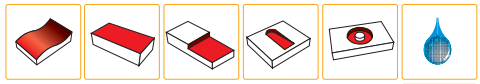
WNMX-MM

Designation	Coated									Cermet			Uncoated			
	NCM325	NCM335	NC5330	PC3500	PC5300	PC3545	PC9530	PC6510	PC215K	PD2000	CN2000	CN20	CN30	H01	G10E	A30	ST20E
WNMX 09T316ZNN-MM				●	●	●	●										

● : Stock item

HRMDC(M)13





• AR : -7°
• RR : -12°~-4°

AA14°

(mm)

Designation			ØD	ØD2	Ød	Ød1	Ød2	a	b	E	F	ap		Bolt
HRMDCM	**13050HR-3**	3	50	42	22	11	17	10.4	6.3	21	40	2	0.3	SB1025
	13050HR-4	4	50	42	22	11	17	10.4	6.3	21	40	2	0.3	
	13063HR-4	4	63	49	22	11	18	10.4	6.3	21	40	2	0.5	SB1025
	13063HR-5	5	63	49	22	11	18	10.4	6.3	21	40	2	0.5	
	13080HR-5	5	80	57	27	14	20	12.4	7	23	50	2	1	SB1230
	13080HR-6	6	80	57	27	14	20	12.4	7	23	50	2	1	
	13100HR-6	6	100	67	32	18	26	14.4	8	25	50	2	1.6	SB1630
	13100HR-7	7	100	67	32	18	26	14.4	8	25	50	2	1.6	
	13125HR-7	7	125	87	40	22	32	16.4	9	29	63	2	3.2	SB2040 MBA-M20
	13125HR-8	8	125	87	40	22	32	16.4	9	29	63	2	3.2	
HRMDC	**13080HR-5**	5	80	57	25.4	14	20	9.5	6	24	50	2	1	SB1230
	13080HR-6	6	80	57	25.4	14	20	9.5	6	24	50	2	1	
	13080HR-31.75-5	5	80	67	31.75	18	26	12.7	8	32	63	2	1.4	SB1630
	13080HR-31.75-6	6	80	67	31.75	18	26	12.7	8	32	63	2	1.4	
	13100HR-6	6	100	67	31.75	18	26	12.7	8	32	63	2	2.1	SB1630
	13100HR-7	7	100	67	31.75	18	26	12.7	8	32	63	2	2.1	
	13125HR-7	7	125	87	38.1	22	32	15.9	10	35	63	2	3.3	SB2040 MBA-M20
	13125HR-8	8	125	87	38.1	22	32	15.9	10	35	63	2	3.3	

• Parts

Screw	Wrench
FTKA0412B	TW15S

• Available Inserts

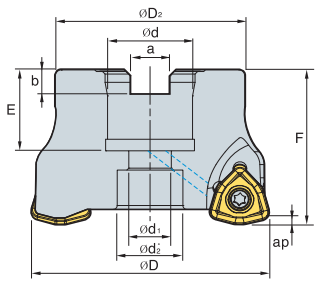
WNMX-MM

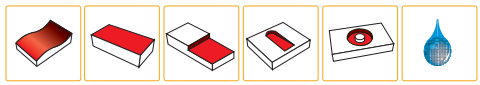
Designation	Coated										Cermet			Uncoated			
	NCM325	NCM335	NC5330	PC3500	PC5300	PC3545	PC9530	PC6510	PC215K	PD2000	CN2000	CN20	CN30	H01	G10E	A30	ST20E
WNMX 130520ZNN-MM				●	●	●	●										

● : Stock item

HRMDouble

HRMDC(M)16





- AR : -7°
- RR : -12°~-4°

AA 14°

(mm)

Designation			ØD	ØD2	Ød	Ød1	Ød2	Ød3	a	b	E	F	ap		Bolt
HRMDC(M)	16080HR-4	4	80	65	25.4(27)	14	20	-	9.5(12.4)	6(7)	25(23)	50	2.5	0.99	SB1230
	16080HR-5	5	80	65	25.4(27)	14	20	-	9.5(12.4)	6(7)	25(23)	50	2.5	0.91	
	16100HR-5	5	100	85	31.75(32)	18	26	-	12.7(14.4)	8	33(25)	63(50)	2.5	1.68	SB1630
	16100HR-6	6	100	85	31.75(32)	18	26	-	12.7(14.4)	8	33(25)	63(50)	2.5	1.64	
	16125HR-6	6	125	100	38.1(40)	22	32	52	15.9(16.4)	10(9)	36(29)	63	2.5	3.23	SB2040 MBA-M20
	16125HR-7	7	125	100	38.1(40)	22	32	52	15.9(16.4)	10(9)	36(29)	63	2.5	3.24	
	16160R-7	7	160	107	50.8(40)	-	90	-	19(16.4)	11(9)	38(32)	63	2.5	3.73	MBA-M24
	16160R-8	8	160	107	50.8(40)	-	90	-	19(16.4)	11(9)	38(32)	63	2.5	3.77	
	16200R-8	8	200	145	47.625(60)	-	132	-	25.4(25.7)	14	38	63	2.5	6.48	-
	16200R-10	10	200	145	47.625(60)	-	132	-	25.4(25.7)	14	38	63	2.5	6.61	
	16250R-10	10	250	190	47.625(60)	-	190	-	25.4(25.7)	14	38	63	2.5	11.01	-
	16250R-12	12	250	190	47.625(60)	-	190	-	25.4(25.7)	14	38	63	2.5	11.04	
	16315R-12	12	315	250	47.625(60)	-	238	-	25.4(25.7)	14	38	63	2.5	18.34	-
	16315R-14	14	315	250	47.625(60)	-	238	-	25.4(25.7)	14	38	63	2.5	18.35	

• Parts

Screw	Wrench
FTGA0513-P	TW20-100

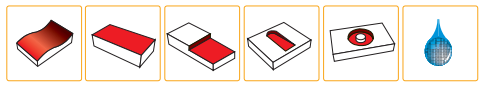
• Available Inserts

WNMX-MM

Designation	Coated										Cermet			Uncoated			
	NCM325	NCM335	NC5330	PC3500	PC5300	PC3545	PC9530	PC6510	PC215K	PD2000	CN2000	CN20	CN30	H01	G10E	A30	ST20E
WNMX 160720ZNN-MM																	

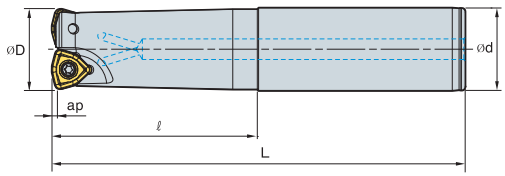
● : Stock item

HRMDS06



• AR : -7°
• RR : -17°~25°

AA 14°



(mm)

Designation			ØD	Ød	ℓ	L	ap	
HRMDS	0616HR-2S16	2	16	16	30	110	1.0	0.15
	0616HR-2M16	2	16	16	70	150	1.0	0.20
	0616HR-2L16	2	16	16	100	200	1.0	0.26
	0617HR-2S16	2	17	16	20	110	1.0	0.15
	0617HR-2M16	2	17	16	20	150	1.0	0.21
	0617HR-2L16	2	17	16	20	200	1.0	0.28
	0618HR-2S16	2	18	16	20	110	1.0	0.15
	0618HR-2M16	2	18	16	20	150	1.0	0.21
	0618HR-2L16	2	18	16	20	200	1.0	0.28
	0620HR-2S20	2	20	20	50	130	1.0	0.28
	0620HR-2M20	2	20	20	100	180	1.0	0.38
	0620HR-2L20	2	20	20	130	250	1.0	0.53
	0621HR-2S20	2	21	20	20	130	1.0	0.29
	0621HR-2M20	2	21	20	20	180	1.0	0.40
	0621HR-2L20	2	21	20	20	250	1.0	0.57
	0625HR-3S25	3	25	25	60	140	1.0	0.44
	0625HR-3M25	3	25	25	80	180	1.0	0.57
	0625HR-3L25	3	25	25	120	250	1.0	0.80
	0626HR-3S25	3	26	25	30	140	1.0	0.46
	0626HR-3M25	3	26	25	30	180	1.0	0.60
	0626HR-3L25	3	26	25	30	250	1.0	0.84
	0632HR-4S32	4	32	32	70	150	1.0	0.82
	0632HR-4M32	4	32	32	100	200	1.0	1.10
	0632HR-4L32	4	32	32	180	300	1.0	1.66
	0633HR-4S32	4	33	32	40	200	1.0	1.14
	0633HR-4M32	4	33	32	40	250	1.0	1.43
	0633HR-4L32	4	33	32	40	300	1.0	1.73

• Parts

Screw	Wrench
ETNA02506	TW07S

• Available Inserts

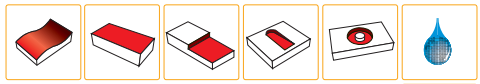
WNMX-MM

Designation	Coated										Cermet			Uncoated			
	NCM325	NCM335	NC5330	PC3500	PC5300	PC3545	PC9530	PC6510	PC215K	PD2000	CN2000	CN20	CN30	H01	G10E	A30	ST20E
WNMX 060312ZNN-MM																	

● : Stock item

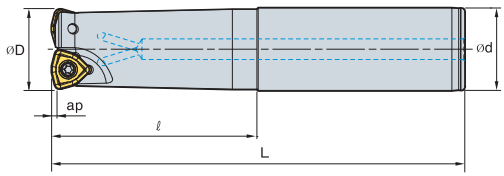
HRMDouble

HRMDS09



• AR : -7°
• RR : -17°~-25°

AA 14°



(mm)

Designation			ØD	Ød	ℓ	L	ap	
HRMDS	0925HR-2S25	2	25	25	60	140	1.5	0.5
	0925HR-2M25	2	25	25	120	200	1.5	0.6
	0925HR-2L25	2	25	25	180	300	1.5	1
	0926HR-2S25	2	26	25	60	140	1.5	0.5
	0926HR-2M25	2	26	25	60	200	1.5	0.7
	0926HR-2L25	2	26	25	60	300	1.5	1
	0930HR-3S32	3	30	32	70	150	1.5	0.8
	0930HR-3M32	3	30	32	120	200	1.5	1
	0930HR-3L32	3	30	32	180	300	1.5	1.5
	0932HR-3S32	3	32	32	70	150	1.5	0.8
	0932HR-3M32	3	32	32	120	200	1.5	1.1
	0932HR-3L32	3	32	32	180	300	1.5	1.7
	0933HR-3S32	3	33	32	70	150	1.5	0.8
	0933HR-3M32	3	33	32	70	200	1.5	1.1
	0933HR-3L32	3	33	32	70	300	1.5	1.7
	0935HR-4S32	4	35	32	50	150	1.5	0.9
	0935HR-4M32	4	35	32	50	200	1.5	1.1
	0935HR-4L32	4	35	32	50	300	1.5	1.7
	0940HR-4S32	4	40	32	50	150	1.5	0.9
	0940HR-4M32	4	40	32	50	250	1.5	1.5
	0940HR-4L32	4	40	32	50	300	1.5	1.8
	0940HR-4S40	4	40	40	60	150	1.5	1.3
	0940HR-4M40	4	40	40	130	250	1.5	2.2
	0940HR-4L40	4	40	40	180	300	1.5	2.7

• Parts

Screw	Wrench
FTKA0307	TW09S

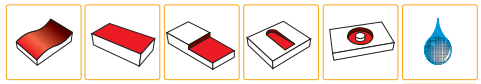
• Available Inserts

WNMX-MM

Designation	Coated										Cermet			Uncoated			
	NCM325	NCM335	NC5330	PC3500	PC5300	PC3545	PC9530	PC6510	PC215K	PD2000	CN2000	CN20	CN30	H01	G10E	A30	ST20E
WNMX 09T316ZNN-MM				●	●	●	●										

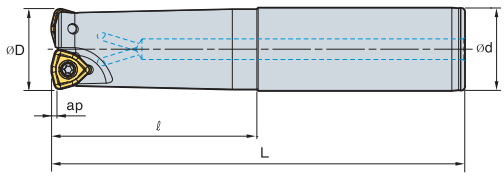
● : Stock item

HRMDS09



• AR : -7°
• RR : -17°~25°

AA 14°



(mm)

Designation			ØD	Ød	ℓ	L	ap	
HRMDS	0940HR-4S42	4	40	42	60	150	1.5	1.4
	0940HR-4M42	4	40	42	130	250	1.5	2.3
	0940HR-4L42	4	40	42	180	300	1.5	2.8
	0950HR-4S32	4	50	32	40	150	1.5	1.1
	0950HR-4M32	4	50	32	40	250	1.5	1.6
	0950HR-4L32	4	50	32	40	300	1.5	2
	0950HR-4S40	4	50	40	40	150	1.5	1.4
	0950HR-4M40	4	50	40	40	250	1.5	2.4
	0950HR-4L40	4	50	40	40	300	1.5	2.9
	0950HR-4S42	4	50	42	40	150	1.5	1.6
	0950HR-4M42	4	50	42	40	250	1.5	2.6
	0950HR-4L42	4	50	42	40	300	1.5	3.1
	0950HR-5S32	5	50	32	40	150	1.5	1.1
	0950HR-5M32	5	50	32	40	250	1.5	1.6
	0950HR-5L32	5	50	32	40	300	1.5	2
	0950HR-5S40	5	50	40	40	150	1.5	1.4
	0950HR-5M40	5	50	40	40	250	1.5	2.4
	0950HR-5L40	5	50	40	40	300	1.5	2.9
	0950HR-5S42	5	50	42	40	150	1.5	1.6
	0950HR-5M42	5	50	42	40	250	1.5	2.6
	0950HR-5L42	5	50	42	40	300	1.5	3.1

• Parts

Screw	Wrench
FTKA0307	TW09S

• Available Inserts

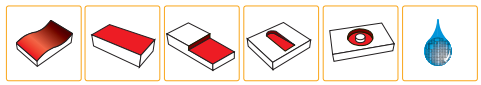
WNMX-MM

Designation	Coated										Cermet			Uncoated			
	NCM325	NCM335	NC5330	PC3500	PC5300	PC3545	PC9530	PC6510	PC215K	PD2000	CN2000	CN20	CN30	H01	G10E	A30	ST20E
WNMX 09T316ZNN-MM				●	●	●	●										

● : Stock item

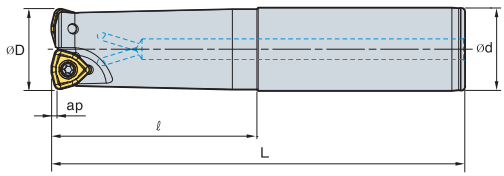
HRMDouble

HRMDS13



• AR : -7°
• RR : -14°~-16°

AA 14°



(mm)

Designation			ØD	Ød	ℓ	L	ap	
HRMDS	**1332HR-2S32**	2	32	32	70	150	2	0.8
	1332HR-2M32	2	32	32	120	200	2	1
	1332HR-2L32	2	32	32	180	300	2	1.6
	1333HR-2S32	2	33	32	70	150	2	0.8
	1333HR-2M32	2	33	32	70	200	2	1.1
	1333HR-2L32	2	33	32	70	300	2	1.7
	1335HR-2S32	2	35	32	50	150	2	0.8
	1335HR-2M32	2	35	32	50	200	2	1.1
	1335HR-2L32	2	35	32	50	300	2	1.7
	1340HR-3S32	3	40	32	50	150	2	0.8
	1340HR-3M32	3	40	32	50	250	2	1.4
	1340HR-3L32	3	40	32	50	300	2	1.7
	1340HR-3S40	3	40	40	60	150	2	1.2
	1340HR-3M40	3	40	40	130	250	2	2.1
	1340HR-3L40	3	40	40	180	300	2	2.6
	1340HR-3S42	3	40	42	60	150	2	1.4
	1340HR-3M42	3	40	42	130	250	2	2.3
	1340HR-3L42	3	40	42	180	300	2	2.7
	1350HR-3S32	3	50	32	50	150	2	1.1
	1350HR-3M32	3	50	32	50	250	2	1.7
	1350HR-3L32	3	50	32	50	300	2	2
	1350HR-3S40	3	50	40	50	150	2	1.5
	1350HR-3M40	3	50	40	50	250	2	2.4
	1350HR-3L40	3	50	40	50	300	2	2.9
	1350HR-3S42	3	50	42	50	150	2	1.6
	1350HR-3M42	3	50	42	50	250	2	2.6
	1350HR-3L42	3	50	42	50	300	2	3.1

• Parts

Screw	Wrench
FTKA0412B	TW15S

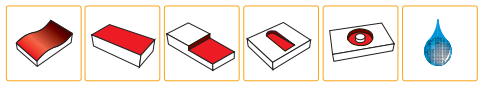
• Available Inserts

WNMX-MM

Designation	Coated										Cermet			Uncoated			
	NCM325	NCM335	NC5330	PC3500	PC5300	PC3545	PC9530	PC6510	PC215K	PD2000	CN2000	CN20	CN30	H01	G10E	A30	ST20E
WNMX130520ZNN-MM				●	●	●	●										

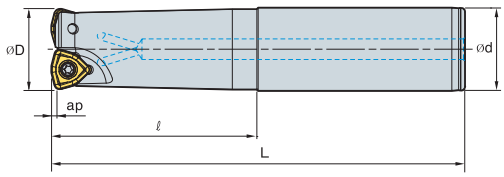
● : Stock item

HRMDS13



• AR : -7°
• RR : -14°~-16°

AA 14°



(mm)

Designation			ØD	Ød	ℓ	L	ap	
HRMDS	1350HR-4S32	4	50	32	50	150	2	1.1
	1350HR-4M32	4	50	32	50	250	2	1.7
	1350HR-4L32	4	50	32	50	300	2	2
	1350HR-4S40	4	50	40	50	150	2	1.5
	1350HR-4M40	4	50	40	50	250	2	2.4
	1350HR-4L40	4	50	40	50	300	2	2.9
	1350HR-4S42	4	50	42	50	150	2	1.6
	1350HR-4M42	4	50	42	50	250	2	2.6
	1350HR-4L42	4	50	42	50	300	2	3.1
	1363HR-4S32	4	63	32	50	150	2	1.4
	1363HR-4M32	4	63	32	50	250	2	2.1
	1363HR-4L32	4	63	32	50	300	2	2.4
	1363HR-4S40	4	63	40	50	150	2	1.8
	1363HR-4M40	4	63	40	50	250	2	2.8
	1363HR-4L40	4	63	40	50	300	2	3.2
	1363HR-4S42	4	63	42	50	150	2	1.9
	1363HR-4M42	4	63	42	50	250	2	3
	1363HR-4L42	4	63	42	50	300	2	3.5
	1363HR-5S32	5	63	32	50	150	2	1.5
	1363HR-5M32	5	63	32	50	250	2	2
	1363HR-5L32	5	63	32	50	300	2	2.3
	1363HR-5S40	5	63	40	50	150	2	1.8
	1363HR-5M40	5	63	40	50	250	2	2.8
	1363HR-5L40	5	63	40	50	300	2	3.2
	1363HR-5S42	5	63	42	50	150	2	1.9
	1363HR-5M42	5	63	42	50	250	2	3
	1363HR-5L42	5	63	42	50	300	2	3.5

• Parts

Screw	Wrench
FTKA0412B	TW15S

• Available Inserts

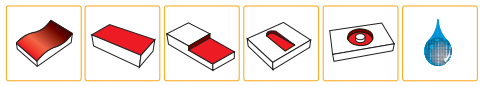
WNMX-MM

Designation	Coated									Cermet			Uncoated			
	NCM325	NCM335	NC5330	PC3500	PC5300	PC3545	PC9530	PC6510	PC215K	PD2000	CN2000	CN20	CN30	H01	G10E	A30	ST20E
WNMX130520ZNN-MM				●	●	●	●										

● : Stock item

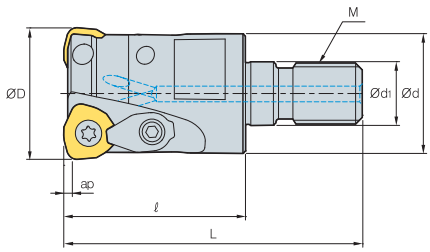
HRMDouble

HRMDM06



• AR : -7°
• RR : -18°~-25°

AA 14°



(mm)

Designation			ØD	Ød	Ød1	ℓ	L	M	ap	
HRMDM	0616HR-M08	2	16	14.5	8.5	25	42	M08	1.0	0.03
	0617HR-M08	2	17	14.5	8.5	25	42	M08	1.0	0.03
	0618HR-M08	2	18	14.5	8.5	25	42	M08	1.0	0.03
	0620HR-M10	2	20	18	10.5	30	51	M10	1.0	0.06
	0621HR-M10	2	21	18	10.5	30	51	M10	1.0	0.07
	0625HR-M12	3	25	23	12.5	35	59	M12	1.0	0.10
	0626HR-M12	3	26	23	12.5	35	59	M12	1.0	0.11
	0632HR-M16	4	32	29	17	40	67	M16	1.0	0.21
	0633HR-M16	4	33	29	17	40	67	M16	1.0	0.22

• Parts

Screw	Wrench
ETNA02506	TW07S

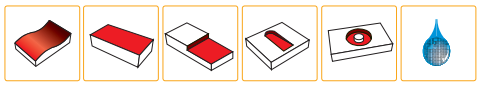
• Available Inserts

WNMX-MM

Designation	Coated									Cermet			Uncoated			
	NCM325	NCM335	NC5330	PC3500	PC5300	PC3545	PC9530	PC6510	PC215K	PD2000	CN2000	CN20	CN30	H01	G10E	A30	ST20E
WNMX 060312ZNN-MM																	

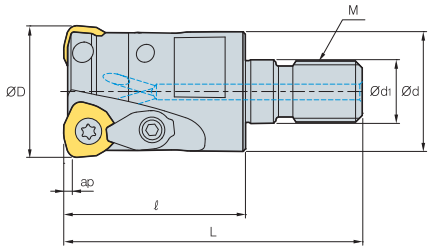
● : Stock item

HRMDM09/13



• AR : -7°
• RR : -18°~25°

AA 14°



(mm)

Designation			ØD	Ød	Ød1	ℓ	L	M	ap	
HRMDM	**0925HR-M12**	2	25	23	12.5	35	59	M12	1.5	0.10
	0926HR-M12	2	26	23	12.5	35	59	M12	1.5	0.11
	0930HR-M16	3	30	29	17	40	67	M16	1.5	0.19
	0932HR-M16	3	32	29	17	40	67	M16	1.5	0.20
	0933HR-M16	3	33	29	17	40	67	M16	1.5	0.21
	0935HR-M16	4	35	29	17	40	67	M16	1.5	0.22
	0940HR-M16	4	40	29	17	40	67	M16	1.5	0.25
HRMDM	**1332HR-M16**	2	32	29	17	40	67	M16	2	0.20
	1333HR-M16	2	33	29	17	40	67	M16	2	0.20
	1335HR-M16	2	35	29	17	40	67	M16	2	0.22
	1340HR-M16	3	40	29	17	45	72	M16	2	0.26

• Parts

	Screw	Wrench
09 Type	FTKA0307	TW09S
13 Type	FTKA0412B	TW15S

• Available Inserts

WNMX-MM

Type	Designation	Coated										Cermet			Uncoated			
		NCM325	NCM335	NC5330	PC3500	PC5300	PC3545	PC9530	PC6510	PC215K	PD2000	CN2000	CN20	CN90	H01	G10E	A30	ST20E
09 Type	**WNMX 09T316ZNN-MM**				●	●	●	●										
13 Type	**130520ZNN-MM**				●	●	●	●										

● : Stock item

MAT (Steel Shank type)

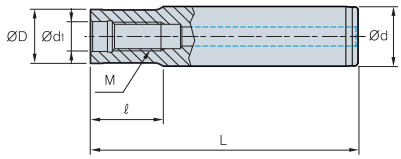


Fig. 1

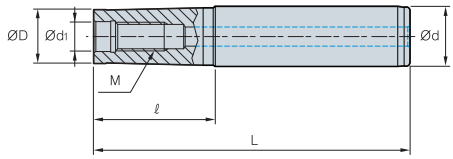


Fig. 2

(mm)

	Designation	ØD	Ød	Ød1	ℓ	L	M	Fig.
MAT	M06-020-S10S	9.5	10	6.5	20	70	M06	1
	M6B-020-S12S	11.0	12	6.5	20	76	M06	1
	M6B-040-S12S	11.0	12	6.5	40	96	M06	1
	M08-020-S16S	14.5	16	8.5	20	80	M08	1
	M10-030-S20S	18.0	20	10.5	30	100	M10	1
	M12-030-S25S	22.5	25	12.5	29	110	M12	1
	M16-035-S32S	28.5	32	17.0	35	125	M16	1
	M06-040-S12T	9.5	12	6.5	40	96	M06	2
	M06-065-S16T	9.5	16	6.5	65	125	M06	2
	M6B-065-S16T	11.0	16	6.5	65	125	M06	2
	M6B-080-S16T	11.0	16	6.5	80	140	M06	2
	M08-040-S16T	14.5	16	8.5	40	100	M08	2
	M08-065-S16T	14.5	16	8.5	65	125	M08	2
	M08-080-S20T	14.5	20	8.5	80	150	M08	2
	M08-110-S25T	14.5	25	8.5	110	190	M08	2
	M10-050-S20T	18.0	20	10.5	50	120	M10	2
	M10-070-S20T	18.0	20	10.5	70	140	M10	2
	M10-090-S25T	18.0	25	10.5	90	170	M10	2
	M10-110-S25T	18.0	25	10.5	110	190	M10	2
	M10-130-S32T	18.0	32	10.5	130	220	M10	2
	M12-050-S25T	22.5	25	12.5	50	130	M12	2
	M12-070-S25T	22.5	25	12.5	70	150	M12	2
	M12-090-S25T	22.5	25	12.5	90	170	M12	2
	M12-110-S32T	22.5	32	12.5	110	200	M12	2
	M12-175-S40T	22.5	40	12.5	175	300	M12	2
	M16-055-S32T	28.5	32	17.0	55	145	M16	2
	M16-080-S32T	28.5	32	17.0	80	170	M16	2
	M16-120-S32T	28.5	32	17.0	120	210	M16	2
	M16-175-S40T	28.5	40	17.0	175	300	M16	2

• S : Straight Neck Adapter
• T : Taper Neck Adapter

MAT-C (Carbide Shank type)

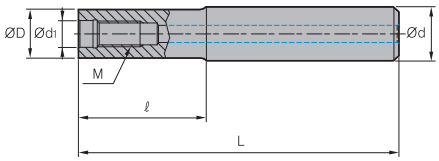


Fig. 1

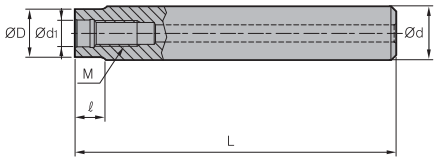


Fig. 2

(mm)

Designation		ØD	Ød	Ød1	ℓ	L	M	Fig.
MAT	M08-080-S16S-C	14.5	16	8.5	80	150	M08	1
	M08-110-S16S-C	14.5	16	8.5	110	180	M08	1
	M08-150-S16S-C	14.5	16	8.5	150	250	M08	1
	M08-010-S16S-C-150	14.5	16	8.5	10	150	M08	2
	M08-010-S16S-C-180	14.5	16	8.5	10	180	M08	2
	M08-010-S16S-C-250	14.5	16	8.5	10	250	M08	2
	M10-090-S20S-C	18.0	20	10.5	90	170	M10	1
	M10-110-S20S-C	18.0	20	10.5	110	200	M10	1
	M10-175-S20S-C	18.0	20	10.5	175	300	M10	1
	M10-010-S20S-C-170	18.0	20	10.5	10	170	M10	2
	M10-010-S20S-C-200	18.0	20	10.5	10	200	M10	2
	M10-010-S20S-C-300	18.0	20	10.5	10	300	M10	2
	M12-090-S25S-C	22.5	25	12.5	90	170	M12	1
	M12-110-S25S-C	22.5	25	12.5	110	200	M12	1
	M12-175-S25S-C	22.5	25	12.5	175	300	M12	1
	M12-015-S25S-C-170	22.5	25	12.5	15	170	M12	2
	M12-015-S25S-C-200	22.5	25	12.5	15	200	M12	2
	M12-015-S25S-C-300	22.5	25	12.5	15	300	M12	2
	M16-090-S32S-C	28.5	32	17.0	90	180	M16	1
	M16-120-S32S-C	28.5	32	17.0	120	210	M16	1
	M16-175-S32S-C	28.5	32	17.0	175	300	M16	1
	M16-020-S32S-C-180	28.5	32	17.0	20	180	M16	2
	M16-020-S32S-C-210	28.5	32	17.0	20	210	M16	2
	M16-020-S32S-C-300	28.5	32	17.0	20	300	M16	2