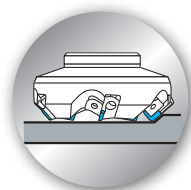


THE NEW VALUE FRONTIER



Heavy Roughing Milling Cutter

MSR Series

Improving machine efficiency

Double the productivity

MonSteR Mill

Square Insert MSR Facemill

MonSteR Square Mill

Insert lineup expanded

ADVANCING PRODUCTIVITY

Heavy Milling Cutter MSR

MSR_{Type}

Heavy Milling Cutter MSR



PR830 (For Steel)



PR905 (For Cast Iron)

BT50 Integral Arbor type



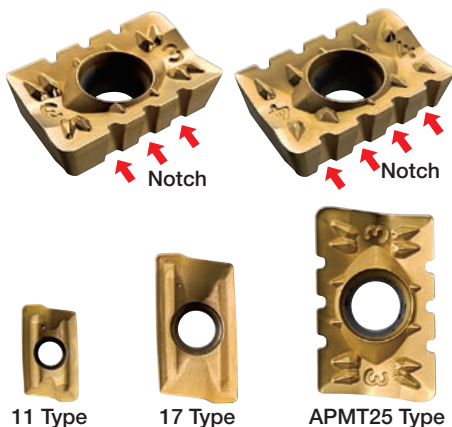
Low cutting force design

Efficient Heavy Milling

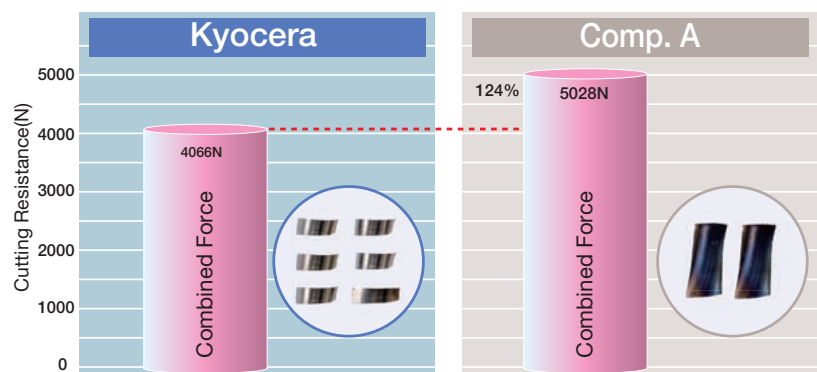
- Double the metal removal rate; double the productivity.
- Notched inserts promote larger depth of cut and excellent chip control.
- Heavy machining with low cutting forces, and also drastically improves machining efficiency. (Reduction of machining time)

● Notched Insert

Size Comparison (Full Size)



● Comparison of cutting resistance



*The exclusive notched chipbreaker provides low resistance and good chip evacuation.

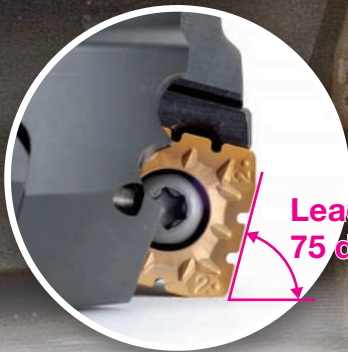
(Internal evaluation)

Face Mill for Heavy Milling

MSRS^{Type}

Face Mill for Heavy Milling

A.R. +9°
R.R. -9°(ø80)
-5°(more than ø100)



Lead angle:
75 degrees

Square Insert MSR Facemill

Significantly
Improved
Metal Removal
Rate



MSRS^{type}

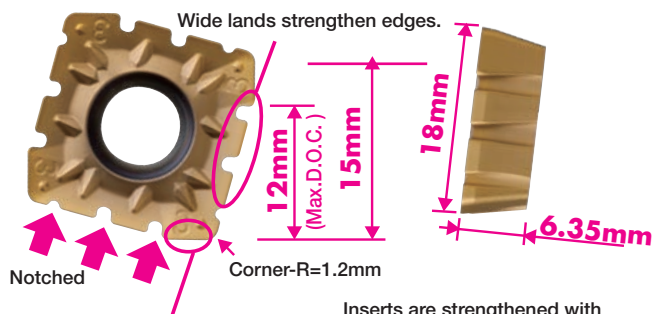


Conventional tools

MSRS Revolutionizes Heavy Milling (maximum depth of cut is 12mm)

- Large depth of cut and high feed rate achieve high efficiency machining.

Recommended depth of cut: 5 to 10mm.



Large wiper edges achieve high feed rate.

Notched insert reduces cutting force, chattering and enables efficient machining.

Inserts are strengthened with 6.35mm width.

- Unique design allows suppressed chattering and low cutting force

Comparison of cutting force (radial force)

The MSRS suppresses chattering since less up force is created reducing potential to lift the work piece into the cutter.



- Economical square inserts with four edges

Three types added to lineup to suit the applications

NEW



NB2P (With 4 notches)

Standard type



NB3 (With 3 notches)

General Purpose



NB3T (With 3 notches)

NB2T (With 2 notches)

Tougher edge type

Possible to machine thin-plate workpieces (low rigidity material such as can manufacturing equipment)

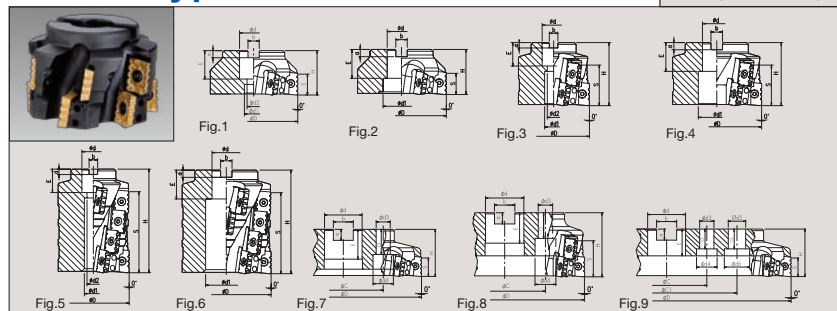


MSRS15160R-8T

Workpiece Material :S50C
Vc=200m/min(n=398min⁻¹)
fz=0.15mm/t(Vf=477mm/min), ap x ae=6x100mm
(Machining of overhang from 15mm to 9mm)

MSR Type

MSR Type



Spare Part (Bore ød: common inch/mm)

Description	Spare Part					
	Clamp Screw	Wrench	Shim	Clamp Screw	Wrench	Anti-seize Compound
MSR 063R-○						
MSR 080R-○	SB-60120TR	TT-25L	MAP-2506	SB-40140TR	DT-15	MP-1
315R-○	for Insert Clamp			for Shim Clamp		

Coat seizing inhibitor (MP-1) thinly on clamp screw when insert is fixed.

Toolholder Dimension (Bore ød: inch)

Description	Stock	No. of Insert	No. of Line	No. of Stage	Dimension (mm)															Shape	Weight (kg)					
					øD	ød	ød1	ød2	H	E	a	b	S	ød3	ød4	ød5	ød6	øC	øC1			G				
MSR 063R-1	●	4	4	1	63	25.4	20	14	65	26	6	9.5	23.5	-	-	-	-	-	-	-	Fig.1	0.8				
063R-2	●	8		2					85				45								Fig.3	1.0				
080R-1	●	4	4	1	80	25.4	20	14	50	26	6	9.5	23.5	-	-	-	-	-	-	-	Fig.1	1.1				
080R-2	●	8		2					70				45								Fig.3	1.6				
080R-2-31.75	●								31.75				27								18	32	8	12.7	Fig.3	1.7
080R-4	●			4					25.4				20								14	26	6	9.5	Fig.5	2.6
080R-4-31.75	●								31.75				27								18	32	8	12.7	Fig.5	2.7
100R-1	●	6		6					1				100								31.75	42	-	50	32	8
100R-2	●	12	2		70	45	Fig.4	2.2																		
100R-4	●	24	4		115	90	Fig.6	3.6																		
125R-1	●	6	6	1	125	38.1	54	-	60	38	10	15.9	23.5	-	-	-	-	-	-	-	Fig.2	3.5				
125R-2	●	12		2					70				45								Fig.4	3.8				
125R-4	○	24		4					115				90								Fig.6	6.1				
160R-1	●	8	8	1	160	50.8	68	-	60	38	11	19.0	23.5	-	-	-	-	-	-	-	Fig.2	5.8				
160R-2	●	16		2					70				45								Fig.4	6.4				
160R-4	○	32		4					115				90								Fig.6	10.7				
200R-1	●	10	10	1	200	47.625	-	-	60	38	14	25.4	23.5	18	26	-	-	101.6	-	32	Fig.7	7.5				
200R-2	○	20		2					80				45								Fig.8	10.4				
250R-1	●	12	12	1	250	47.625	-	-	60	38	14	25.4	23.5	18	26	-	-	101.6	-	32	Fig.7	10.9				
250R-2	○	24		2					80				45								Fig.8	14.7				
315R-1	△	14	14	1	315	47.625	-	-	60	35	14	25.4	23.5	17	27	22	32	101.6	177.8	25	Fig.9	16.0				

*Shim is not available for MSR063R (Dia. D=63).

*Arbor attachment bolt (HH12x40) is included for MSR063R/MSR080R-○. Arbor attachment bolt (HH16x45) is included for MSR080R-○-31.75.

*It is not recommended using only top edge part (D.O.C 30mm) for 4 stages type. If D.O.C is small, use 1 stage or 2 stages type.

*Deep grooving is not recommended for this cutter.

●:Standard Stock ○:Check Availability

△:Made to order

Toolholder Dimension (Bore ød: mm)

Description	Stock	No. of Insert	No. of Line	No. of Stage	Dimension (mm)																	Shape	Weight (kg)
					øD	ød	ød1	ød2	H	E	a	b	S	ød3	ød4	ød5	ød6	øC	øC1	G			
MSR 063R-1M	●	4	4	1	63	27	20	14	65	22	7.2	12.4	23.5	-	-	-	-	-	-	-	Fig.1	0.7	
063R-2M	●	8		2					85				45								Fig.3	0.9	
080R-1M	●	4		1					50				23.5								Fig.1	1.0	
080R-2M	●	8	4	2	80	27	20	14	70	22	7.2	12.4	45	-	-	-	-	-	-	-	Fig.3	1.5	
080R-4M	●	16		4					115				90								Fig.5	2.5	
100R-1M	●	6		1					50				23.5								Fig.2	1.5	
100R-2M	●	12	6	2	100	32	42	-	70	28	8	14.4	45	-	-	-	-	-	-	-	Fig.4	2.0	
100R-4M	●	24		4					115				90								Fig.6	3.2	
125R-1M	●	6		1					60				23.5								Fig.2	3.4	
125R-2M	●	12	6	2	125	40	58	-	70	30	9	16.4	45	-	-	-	-	-	-	-	Fig.4	3.7	
125R-4M	○	24		4					115				90								Fig.6	6.0	
160R-1M	●	8	8	1	160	40	68	-	60	30	9	16.4	23.5	14	20	-	-	66.7	-	28	Fig.7	6.1	
160R-2M	●	16		2					70				45								Fig.8	6.8	
200R-1M	●	10	10	1					60				23.5								Fig.7	7.0	
200R-2M	○	20		2	200	60	-	-	80	38	15	25.7	45	18	26	-	-	101.6	-	32	Fig.8	9.9	
250R-1M	●	12		1					60				23.5								Fig.7	10.3	
250R-2M	○	24	12	2	250	60	-	-	80	38	15	25.7	45	18	26	-	-	101.6	-	32	Fig.8	14.2	

*Shim is not available for MSR063R (Dia. D=63).

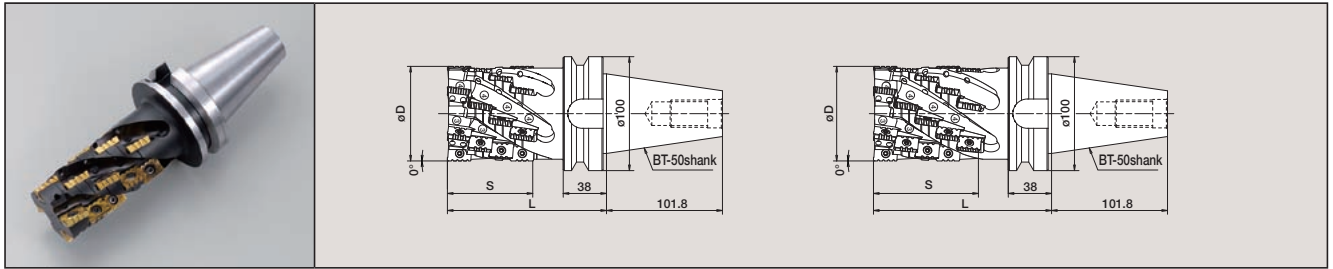
*Arbor attachment bolt (HH12x40) is included for MSR063R/MSR080R.

*It is not recommended using only top edge part (D.O.C 30mm) for 4 stages type. If D.O.C is small, use 1 stage or 2 stages type.

*Deep grooving is not recommended for this cutter.

●:Standard Stock ○:Check Availability

MSR Type



Holder Dimension (BT50 Integral Arbor Type)

Description	Stock	No. of Insert	No. of Line	No. of Stage	Dimension(mm)			Rake Angle(°)		Shape	Weight(kg)	Spare Part						
					øD	L	S	A.R.	R.R.			Clamp Screw	Wrench	Shim	Clamp Screw	Wrench	Anti-seize Compound	
																		
MSR	063R-BT50-4	●	16	4	4	63	160	90	+9°	-8°	Fig.1	5.7	SB-60120TR	TT-25L	-	-	-	MP-1
	063R-BT50-5	●	20		5		180	111			Fig.2	6.2			-	-	-	
	080R-BT50-4	●	16	4	4	80	160	90	+9°	-8°	Fig.1	6.9	for Insert Clamp	MAP-2506	SB-40140TR	DT-15		
	080R-BT50-5	●	20		5		180	111			Fig.2	7.4						
	100R-BT50-4	●	24	6	4	100	160	90	+9°	-5°	Fig.1	9.6	for Shim Clamp					
	100R-BT50-5	●	30		5		180	111			Fig.2	10.5						

●:Standard Stock

-Shim is not available for MSR063R (Dia. D=63).

-It is not recommended using only top edge part (D.O.C 30mm) for 4 stages/5 stages type. If D.O.C is small, use previous page's 1 stage type or 2 stages type.

-Deep grooving is not recommended for this cutter.



-Coat seizing inhibitor (MP-1) thinly on clamp screw when insert is fixed.

Applicable Insert

Shape		Description	Dimension (mm)					Angle(°)			PVD Coated			Applicable Tool holder
			A	T	ød	W	rε	α	β	γ	PR660	PR830	PR905	
Right-hand shown														
		APMT 250608ER-NB3	15.875	6.35	6.5	25	0.8	15°	11°	-	●	●	●	MSR... MSR...M
		APMT 250616ER-NB3					1.6			-	●	●	●	
		APMT 250640ER-NB3					4.0			-	●	●	●	
		APMT 250616EL-NB3					1.6			-	●	●	●	For custom-made cutter
		APMT 250608ER-NB4	15.875	6.35	6.5	25	0.8	15°	11°	-	●	●	●	MSR... MSR...M
		APMT 250616ER-NB4					1.6			-	●	●	●	
		APMT 250640ER-NB4					4.0			-	●	●	●	
		APMT 250616EL-NB4					1.6			-	●	●	●	For custom-made cutter
		APMT 250616ER-NB3P	15.875	6.35	6.5	25	1.6	15°	11°	-	●	●	●	MSR... MSR...M
		APMT 250616ER-NB4P	15.875	6.35	6.5	25	1.6	15°	11°	-	●	●	●	MSR... MSR...M

●:Standard Stock

Caution when installing notched Insert

It is important to install the appropriate notched insert into the correct position. Failure to do so may result in damage to the cutter body.

The appropriate insert is marked on the pocket of the cutter body. When it is installed wrong, it may damage the tool holder body. The notched insert location indicator is marked on the Insert itself.

Indication is marked near the Insert pocket for MSR type.

1) If marked with a "3" in the pocket, use APMT 250608ER-NB3

2) If marked with a "4" in the pocket, use APMT 250616ER-NB4

(Example of No of necessary inserts)

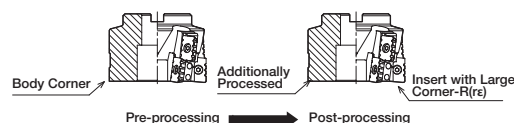
Description	No. of Insert	No. of Line	No. of Inserts	
			Nicked	
			NB3	NB4
MSR 100R-1	6	6	3	3
100R-2	12		6	6
100R-4	24		12	12

Caution when installing the insert with corner-radius 4.0mm

When installing the insert with corner-radius 4.0mm, additional processing to the body is needed. Apply additional processing to the body corner according to the chart.

Insert Corner-R(re)	Additional Processing Dimension (mm) to Body Corner
4.0	R2.0

*Round- shaped additional processing is recommended. When applying chamfer-shaped additional processing, do not cut away too much.

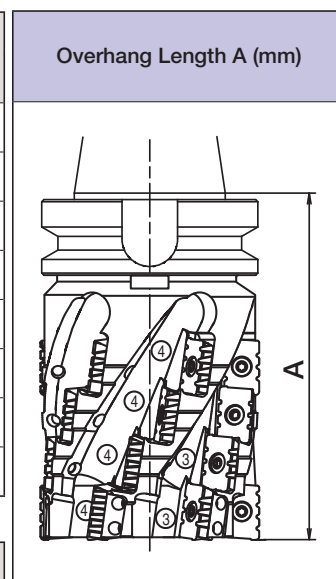


Cutting Conditions

1) Shouldering

● In case of MSR100R-1

Workpiece Material	Overhang Length A (mm)	Cutting Conditions		D.O.C.(mm) (ap×ae)	Chip Removal rate (cc/min)
		Cutting Speed	Feed rate		
Cast Iron	Up to 100mm	Vc=180m/min (n=570min ⁻¹)	fz=0.2mm/t (Vf=690mm/min)	20×80	1100
	100~200mm	Vc=180m/min (n=570min ⁻¹)	fz=0.2mm/t (Vf=690mm/min)	20×40	550
	More than 201mm	Vc=120m/min (n=380min ⁻¹)	fz=0.2mm/t (Vf=460mm/min)	20×30	276
Carbon Steel (S○○C-SS)	Up to 100mm	Vc=150m/min (n=480min ⁻¹)	fz=0.2mm/t (Vf=575mm/min)	20×80	920
	100~200mm	Vc=150m/min (n=480min ⁻¹)	fz=0.2mm/t (Vf=575mm/min)	20×40	460
	More than 201mm	Vc=100m/min (n=320min ⁻¹)	fz=0.2mm/t (Vf=380mm/min)	20×30	228
Stainless Steel	-	Not Recommended			
Non-ferrous Material	-	Not Recommended			



● In case of MSR100R-2

Workpiece Material	Overhang Length A (mm)	Cutting Conditions		D.O.C.(mm) (ap×ae)	Chip Removal rate (cc/min)
		Cutting Speed	Feed rate		
Cast Iron	Up to 130mm	Vc=180m/min (n=570min ⁻¹)	fz=0.2mm/t (Vf=690mm/min)	40×40	1100
	130~230mm	Vc=180m/min (n=570min ⁻¹)	fz=0.2mm/t (Vf=690mm/min)	40×20	550
	More than 231mm	Vc=120m/min (n=380min ⁻¹)	fz=0.2mm/t (Vf=460mm/min)	40×20	368
Carbon Steel (S○○C-SS)	Up to 130mm	Vc=150m/min (n=480min ⁻¹)	fz=0.2mm/t (Vf=575mm/min)	40×40	920
	130~230mm	Vc=150m/min (n=480min ⁻¹)	fz=0.2mm/t (Vf=575mm/min)	40×20	460
	More than 231mm	Vc=100m/min (n=320min ⁻¹)	fz=0.2mm/t (Vf=380mm/min)	40×20	304
Stainless Steel	-	Not Recommended			
Non-ferrous Material	-	Not Recommended			

● In case of MSR100R-4

Workpiece Material	Overhang Length A (mm)	Cutting Conditions		D.O.C.(mm) (ap×ae)	Chip Removal rate (cc/min)
		Cutting Speed	Feed rate		
Cast Iron	Up to 180mm	Vc=180m/min (n=570min ⁻¹)	fz=0.2mm/t (Vf=690mm/min)	75×20	1035
	180~280mm	Vc=180m/min (n=570min ⁻¹)	fz=0.2mm/t (Vf=690mm/min)	75×10	518
	More than 281mm	Vc=120m/min (n=380min ⁻¹)	fz=0.2mm/t (Vf=460mm/min)	75×10	345
Carbon Steel (S○○C-SS)	Up to 180mm	Vc=150m/min (n=480min ⁻¹)	fz=0.2mm/t (Vf=575mm/min)	75×20	863
	180~280mm	Vc=150m/min (n=480min ⁻¹)	fz=0.2mm/t (Vf=575mm/min)	75×10	431
	More than 281mm	Vc=100m/min (n=320min ⁻¹)	fz=0.2mm/t (Vf=380mm/min)	75×10	285
Stainless Steel	-	Not Recommended			
Non-ferrous Material	-	Not Recommended			

2)Slotting

●In case of MSR100R-1

Workpiece Material	Overhang Length A (mm)	Cutting Conditions		D.O.C. (mm) (ap×ae)	Chip Removal rate (cc/min)
		Cutting Speed	Feed rate		
Cast Iron	Up to 100mm	Vc=180m/min (n=570min ⁻¹)	fz=0.2mm/t (Vf=680mm/min)	14×100	966
	100~200mm	Vc=180m/min (n=570min ⁻¹)	fz=0.2mm/t (Vf=680mm/min)	7×100	483
	More than 201mm	Vc=120m/min (n=380min ⁻¹)	fz=0.2mm/t (Vf=460mm/min)	4×100	184
Carbon Steel (S○○C·SS)	Up to 100mm	Vc=150m/min (n=480min ⁻¹)	fz=0.2mm/t (Vf=580mm/min)	7×100	403
	100~200mm	Vc=150m/min (n=480min ⁻¹)	fz=0.2mm/t (Vf=580mm/min)	4×100	230
	More than 201mm	Vc=100m/min (n=320min ⁻¹)	fz=0.2mm/t (Vf=380mm/min)	3×100	114
Stainless Steel	-	Not Recommended			
Non-ferrous Material	-	Not Recommended			

●In case of MSR100R-2

Workpiece Material	Overhang Length A (mm)	Cutting Conditions		D.O.C. (mm) (ap×ae)	Chip Removal rate (cc/min)
		Cutting Speed	Feed rate		
Cast Iron	Up to 130mm	Vc=180m/min (n=570min ⁻¹)	fz=0.2mm/t (Vf=680mm/min)	14×100	966
	130~230mm	Vc=150m/min (n=480min ⁻¹)	fz=0.2mm/t (Vf=580mm/min)	7×100	403
	More than 231mm	Vc=120m/min (n=380min ⁻¹)	fz=0.2mm/t (Vf=460mm/min)	4×100	184
Carbon Steel (S○○C·SS)	Up to 130mm	Vc=150m/min (n=480min ⁻¹)	fz=0.2mm/t (Vf=580mm/min)	7×100	403
	130~230mm	Vc=120m/min (n=380min ⁻¹)	fz=0.2mm/t (Vf=460mm/min)	4×100	184
	More than 231mm	Vc=100m/min (n=320min ⁻¹)	fz=0.2mm/t (Vf=380mm/min)	3×100	114
Stainless Steel	-	Not Recommended			
Non-ferrous Material	-	Not Recommended			

●MSR100R-4

Slotting is not recommended

MSR Type

2)Slotting

●In case of MSR160R-1

Workpiece Material	Overhang Length A (mm)	Cutting Conditions		D.O.C. (mm) (ap×ae)	Chip Removal rate (cc/min)
		Cutting Speed	Feed rate		
Cast Iron	Up to 100mm	Vc=180m/min (n=360min ⁻¹)	fz=0.2mm/t (Vf=580mm/min)	10×160	928
	100~200mm	Vc=180m/min (n=360min ⁻¹)	fz=0.2mm/t (Vf=580mm/min)	5×160	464
	More than 201mm	Vc=120m/min (n=240min ⁻¹)	fz=0.2mm/t (Vf=380mm/min)	4×160	243
Carbon Steel (S○○C-SS)	Up to 100mm	Vc=150m/min (n=300min ⁻¹)	fz=0.2mm/t (Vf=480mm/min)	5×160	384
	100~200mm	Vc=150m/min (n=300min ⁻¹)	fz=0.2mm/t (Vf=480mm/min)	3×160	230
	More than 201mm	Vc=100m/min (n=200min ⁻¹)	fz=0.2mm/t (Vf=380mm/min)	2×160	102
Stainless Steel	-	Not Recommended			
Non-ferrous Material	-	Not Recommended			

●In case of MSR160R-2

Workpiece Material	Overhang Length A (mm)	Cutting Conditions		D.O.C. (mm) (ap×ae)	Chip Removal rate (cc/min)
		Cutting Speed	Feed rate		
Cast Iron	Up to 130mm	Vc=180m/min (n=360min ⁻¹)	fz=0.2mm/t (Vf=580mm/min)	10×160	928
	130~230mm	Vc=150m/min (n=300min ⁻¹)	fz=0.2mm/t (Vf=480mm/min)	5×160	384
	More than 231mm	Vc=120m/min (n=240min ⁻¹)	fz=0.2mm/t (Vf=380mm/min)	4×160	243
Carbon Steel (S○○C-SS)	Up to 130mm	Vc=150m/min (n=300min ⁻¹)	fz=0.2mm/t (Vf=480mm/min)	5×160	384
	130~230mm	Vc=120m/min (n=240min ⁻¹)	fz=0.2mm/t (Vf=380mm/min)	3×160	182
	More than 231mm	Vc=100m/min (n=200min ⁻¹)	fz=0.2mm/t (Vf=320mm/min)	2×160	102
Stainless Steel	-	Not Recommended			
Non-ferrous Material	-	Not Recommended			

●MSR100R-4

Slotting is not recommended

Case Studies



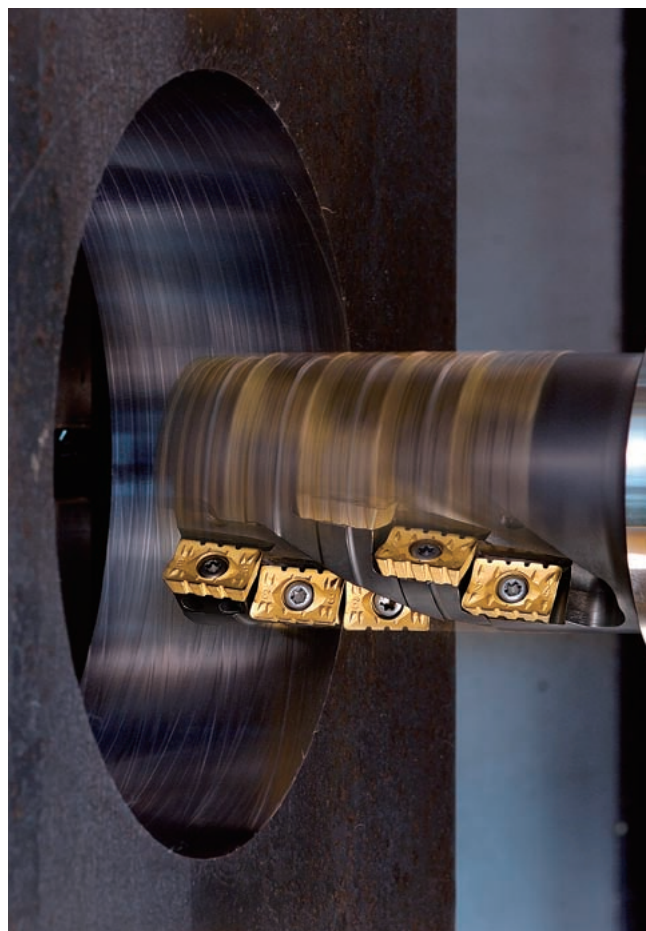
SS400	
•Base •Vc=150m/min (n=478min⁻¹) •apxae=40x15mm •fz=0.15mm/t (Vf=430mm/min) •Dry(Air blow) •MSR100R-2 •6 flutes •APMT250616ER-NB3 •APMT250616ER-NB4 (PR660)	
MSR	Chip Removal rate=258cc/min
Competitor Cutter A	Chip Removal rate=43cc/min
•Since MSR is able to machine a greater D.O.C than competitor Cutter A [dia 100mm (6 edges) Vc=150m/min fz=0.12mm/t (Vf=344mm/min) apxae=5x25mm] Chip Removal rate=43cc/min, the cutting time is drastically improved.	
(Evaluation from the user)	

S45C	
•Plate •Vc=140m/min (n=446min⁻¹) •apxae=43x15mm •fz=0.2mm/t (Vf=535mm/min) •Dry •MSR100R-2 •6 flutes •APMT250616ER-NB3 •APMT250616ER-NB4 (PR660)	
MSR	Chip Removal rate=345cc/min
Competitor Cutter B	Chip Removal rate=33cc/min
•Since MSR is able to evacuate more than 10 times as many chips as competitor Cutter B [dia 125mm (6 Edges) Vc=120m/min fz=0.1mm/t (Vf=184mm/min) apxae=6x30mm] Chip Removal rate= 33cc/min, the cutting time is improved.	
(Evaluation from the user)	

S35C	
•Bracket •Vc=150m/min (n=478min⁻¹) •apxae=20x70mm •fz=0.25mm/t (Vf=718mm/min) •Dry(Mist) •MSR100R-2 •6 flutes •APMT250616ER-NB3 •APMT250616ER-NB4 (PR660)	
MSR	Chip Removal rate=1005cc/min
Competitor Cutter C	Chip Removal rate=417cc/min
•Since MSR is able to cut stably even by increasing feed rate 2.4 times compared competitor Cutter C [dia 100mm (6 edge lines) Vc=130m/min fz=0.12mm/t (Vf=298mm/min) apxae=20x70mm], cutting efficiency is improved.	
(Evaluation from the user)	

MSR Type

Case Studies



SC450(Cast Steel)	
•Construction machine part •$V_c=125\text{m/min}$ ($n=400\text{min}^{-1}$) •$ap_{xae}=15 \times 45\text{mm}$ •$f_z=0.15\text{mm/t}$ ($V_f=360\text{mm/min}$) •Dry •MSR100R-2 •6 flutes •APMT250616ER-NB3 •APMT250616ER-NB4 (PR660)	
MSR	Chip Removal rate=244cc/min
Competitor Cutter D	Chip Removal rate=122cc/min
•Even with double the feed rate, stable machining was possible. and machining efficiency was improved compared with Competitor Cutter D [Dia. 100(4 edges) $V_c=125\text{m/min}$ $f_z=0.08\text{mm/t}$ ($V_f=180\text{mm/min}$) $ap_{xae}=15 \times 45\text{mm}$]	
(Evaluation from the user)	

SS400	
•Plate •$V_c=200\text{m/min}$ ($n=640\text{min}^{-1}$) •$ap_{xae}=80 \times 10\text{mm}$ •$f_z=0.06\text{mm/t}$ ($V_f=230\text{mm/min}$) •Dry •MSR100R-4(4 stage type) •6 flutes •APMT250616ER-NB3 •APMT250616ER-NB4 (PR660)	
MSR	Chip Removal rate=184cc/min
Competitor Cutter E	Chip Removal rate=78cc/min
•Machining efficiency is improved by 2.3 times due to MSR less cutting force performance.	
(Evaluation from the user)	

FCD450	
•Construction machine part •$V_c=173\text{m/min}$ ($n=550\text{min}^{-1}$) •$ap_{xae}=5 \times 50\text{mm}$ •$f_z=0.2\text{mm/t}$ ($V_f=660\text{mm/min}$) •Dry •MSR100R-2 •6 flutes •APMT250616ER-NB3 •APMT250616ER-NB4 (PR905)	
MSR	Chip Removal rate=65cc/min
Competitor Cutter F	Chip Removal rate=51cc/min
•Machining efficiency is 3.2 times better than competitor due to the greater chip evacuation.	
(Evaluation from the user)	

■ MSR Cutter Q & A

Q.1 What is the most recommended cutting condition for MSR?

A.1 $V_c=150\text{m/min}$, $f_z=0.2\text{mm/t}$, Large larger cutting depth and smaller cutting width
In case of MSR100R-2

e.g) Loadmeter 120% e.g) Loadmeter 90%

1 pass	ap X ae: 15 X 75mm	3 pass	2 pass	1 pass
2 pass				
3 pass				

Q.2 Required equipments for MSR?

A.2 Maximum spindle revolution should be lower than 4000min^{-1} . BT50 or larger

*MSR is not only for Double column machining center
The reason why not recommended for high RPM spindle machine is its less torque.
*Although MSR works with BT40 shank, maximum available f_z is about 0.1mm/tooth .

Q.3 What is the points to remember in case of less power machine ?

A.3 Do not use large size cutter
⇒ Dia.63 or Dia.80mm is recommended.

Set up conditions to get the largest available torque by checking torque curve of the machine.

Tried under condition of $V_c=150\text{m/min}$, enough torque was not gained because of high gear.

In this case, it has to be prioritized using V_c which can exert enough torque as $V_c=120\text{m/min}$.

Please increase cutting speed and decrease feed ratio.

*Machine torque curve will be prioritized.

Q.4 In case of unstable workpiece

A.4 Decrease feed ratio at start cutting workpiece

* Almost all cases f moving workpiece happens when start machining

◎ Effective for increasing cutting speed and decrease feed ratio

$V_c=150\text{m/min}$, $f_z=0.2\text{mm/t}$



$V_c=200\text{m/min}$, $f_z=0.15\text{mm/t}$

Q.5 Can be applied for cast iron machining ?

A.5 YES

There is a case of cast iron machining at 1800cc/min removal rate.

Basically machinability is better than steel and there is no problem.

Recommended cutting condition
 $V_c=150\text{m/min}$ $f_z=0.3\text{mm/t}$

* In case necessity of wear resistant grade, use PR905(PR830)

Q.6 What is the tool life ?

A.6 Chip weight: 700kg/Corner (Result by PR660)

Machining time: 90min (calculated value)

Machining distance: 65m (calculated value)

•How great 1000cc/min ?

⇒ About 7.8kg chips removed per minute

•Tool life time = 700kg (Chip weight) ÷ 7.8kg (Chip evacuation amount per 1min) = 90min

•Machining distance = 90min (Time by the end of tool life) × 717mm/min (Table feed ratio per 1min) = 65m

* In case of $V_c=150\text{m/min}$, ap x tae: $20 \times 70\text{mm}$, $V_f=717\text{mm/min}$

* Tool: MSR100R-2 (6 flutes)

Q.7 How to reduce chattering.

A.7 If chattering is caused under machining environment, following condition is recommended.

● In case of chattering

⇒ Reduce cutting speed and increase feed rate

In case of general steel

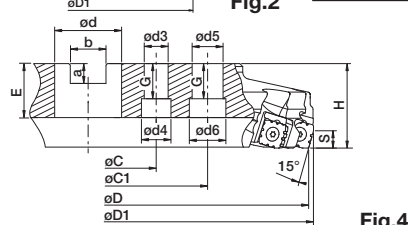
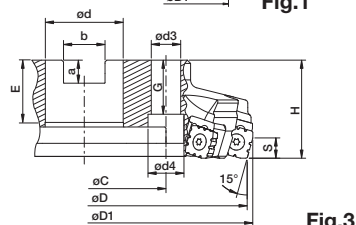
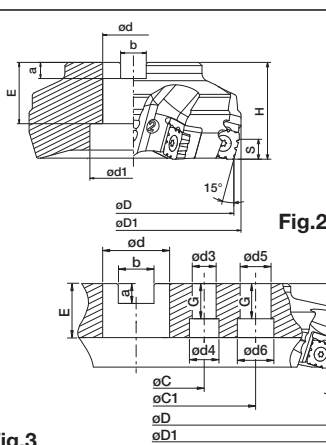
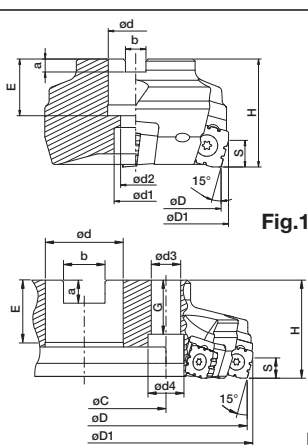
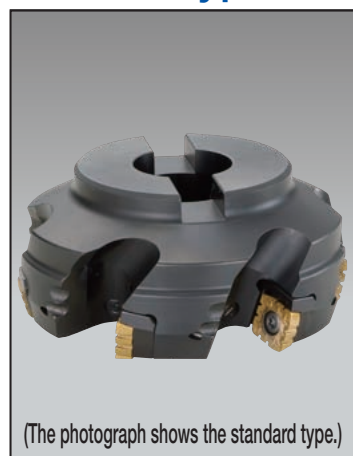
- $V_c=80\text{m/min}$
- $f_z=0.25\text{mm/t}$

In case of cast iron

- $V_c=80\text{m/min}$
- $f_z=0.35\text{mm/t}$

MSRS Type Face Mill

MSRS Type



Rake Angle(°)		
Description	A.R.	R.R.
MSRS15080R...	+9°	-9°
MSRS15100R...	+9°	-5°
MSRS15135R...		

Holder dimension (Bore ød: inch)

Description				Stock	No. of Insert	Dimension (mm)															Fig.	Weight (kg)	
						øD	øD1	ød	ød1	ød2	H	E	a	b	S	ød3	ød4	ød5	ød6	øC			øC1
Coarse pitch type	MSRS	15080R-4T	●	4	80	87	25.4	20	13	50	26	6	9.5	12	-	-	-	-	-	-	-	Fig.1	1.3
		15100R-4T	●	4	100	107	31.75	42			32	8	12.7										2.0
		15125R-6T	●	6	125	132	38.1	54	-		10	15.9										3.6	
		15160R-8T	●	8	160	167	50.8	68		11	19.0		5.0										
		15200R-10T	●	10	200	207	47.625	-	-	60	38	14	25.4		18	26	-	-	101.6	-	32	Fig.3	7.7
		15250R-12T	●	12	250	257																	12.0
		15315R-14T	○	14	315	322																	
Close pitch type	MSRS	15080R-6T	●	6	80	87	25.4	20	13	50	26	6	9.5	12	-	-	-	-	-	-	-	Fig.1	1.3
		15100R-6T	●	6	100	107	31.75	42			32	8	12.7										1.9
		15125R-8T	●	8	125	132	38.1	54	-		10	15.9										3.5	
		15160R-10T	●	10	160	167	50.8	68		11	19.0		4.9										
		15200R-12T	●	12	200	207	47.625	-	-	60	38	14	25.4		18	26	-	-	101.6	-	32	Fig.3	7.6
		15250R-14T	●	14	250	257																	11.9
		15315R-16T	△	16	315	322																	

*Arbor mounting bolts (HH12X35) are included in MSRS15080R-OT Type.

*Cartridge is included in the standard type, but no Cartridge in the multi-edges type.

●:Standard Stock ○:Check Availability △:Made to order

Holder dimension (Bore ød: mm)

Description		Stock	No. of Insert	Dimension (mm)																	Fig.	Weight (kg)										
				øD	øD1	ød	ød1	ød2	H	E	a	b	S	ød3	ød4	ød5	ød6	øC	øC1	G												
Coarse pitch type	MSRS 15080R-4T-M	●	4	80	87	27	20	13	50	24	7	12.4	12	-	-	-	-	-	-	-	Fig.1	1.3										
	15100R-4T-M	●	4	100	107	32	45	-		29	8	14.4									Fig.2	2.0										
	15125R-6T-M	●	6	125	132	40	55			-	33	9										16.4	14	20	-	-	66.7	-	28	Fig.3	3.6	
	15160R-8T-M	●	8	160	167		60	-	-	38		15		25.7	18	26	-	-	101.6	-	32	Fig.3		5.0								
	15200R-10T-M	●	10	200	207	60					-												-	38	15	25.7	18	26	-	-	101.6	-
	15250R-12T-M	●	12	250	257												60	-				-										
	15315R-14T-M	○	14	315	322	60	-	-	38	15	25.7	18		26	22	32			101.6	177.8	-		32	Fig.4	17.0							
Close pitch type	MSRS 15080R-6T-M	●	6	80	87								27				20	13				50			24	7	12.4	12	-	-	-	-
	15100R-6T-M	●	6	100	107	32	45	-	29	8	14.4	Fig.2	1.9																			
	15125R-8T-M	●	8	125	132	40	55		-	33	9		16.4	14	20	-	-	66.7	-	28	Fig.3		3.5									
	15160R-10T-M	●	10	160	167		60	-	-		38	15	25.7		18	26	-	-	101.6	-		32	Fig.3	4.9								
	15200R-12T-M	●	12	200	207	60				-				-							38			15	25.7	18	26		-	-	101.6	-
	15250R-14T-M	●	14	250	257												60	-					-									
	15315R-16T-M	△	16	315	322	60	-	-	38	15	25.7	18	26	22	32	101.6			177.8	-	32	Fig.4		17.0								

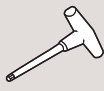
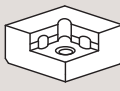
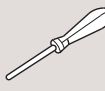
*Arbor mounting bolts (HH12X35) are included in MSRS15080R-OT-M Type.

*Cartridge is included in the standard type, but no Cartridge in the multi-edges type.

●:Standard Stock ○:Check Availability △:Made to order

MSRS Type Face Mill

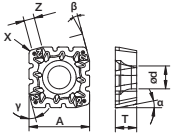
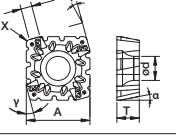
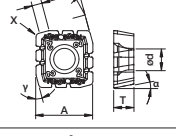
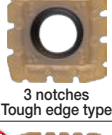
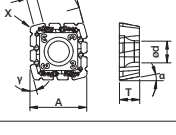
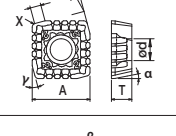
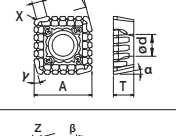
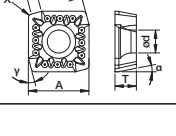
● Spare parts

Description		Spare Part						
		Clamp Screw	Wrench	Cartridge	Clamp Screw	Wrench	Anti-seize Compound	Arbar Clamp Screw
								
Coarse pitch type	MSRS 15080R-○○(M)	SB-60120TR	TT-25L	MAP-1806	SB-40140TR	DT-15	MP-1	HH12×35
	MSRS 15100R-○○(M)							-
	15315R-○○(M)							
Close pitch type	MSRS 15080R-○○(M)	SB-60120TR	TT-25L	-	-	-	MP-1	HH12×35
	MSRS 15100R-○○(M)							-
	15315R-○○(M)							



Coat Anti-seize Compound (MP-1) thinly on clamp screw when insert is fixed.

● Applicable Insert

Shape		Description	Dimension (mm)					Angle(°)			PVD Coated			Applicable Toolholder
			A	T	ød	X	Z	α	β	γ	PR660	PR830	PR905	
Right-hand shown														
		SPMT 1806EDER-NB2	18	6.35	6.8	R1.2	3.1	11°	15°	15°	●	●	●	MSRS... MSRS...M
		SPMT 1806EDER-NB3	18	6.35	6.8	R1.2	3.1	11°	15°	15°	●	●	●	
		SPMT 1806EDS ^R /L-NB2T	18	6.35	6.8	R1.2	3.1	11°	15°	15°		●	R	
		SPMT 1806EDS ^R /L-NB3T	18	6.35	6.8	R1.2	3.1	11°	15°	15°		●	R	
NEW 		SPMT 1806EDER-NB2P	18	6.35	6.8	R1.2	3.1	11°	15°	15°		●	●	
NEW 		SPMT 1806EDER-NB3P	18	6.35	6.8	R1.2	3.1	11°	15°	15°		●	●	
		SPMT 1806EDER-V	18	6.35	6.8	R1.2	3.1	11°	15°	15°	●	●	●	

●:Standard Stock

MSRS Type Face Mill

●Insert Grades

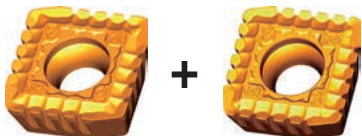
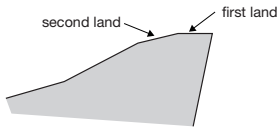
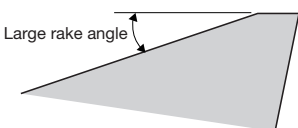
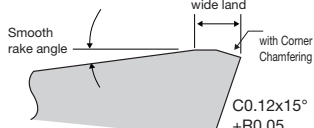
Workpiece Material	Good wear resistance ↔ Good fracture resistance
Steel (Carbon Steel/Alloy Steel)	PR830 PR660
Cast Iron (FC/FCD)	PR905 PR830

●Recommended Cutting Condition

Workpiece Material	Feed Rate (mm/t)			Recommended Insert Grades (Speed Vc:m/min)		
	NB2P+NB3P	NB2+NB3	NB2T+NB3T	PVD Coated		
				PR660	PR830	PR905
Carbon Steel(SxxC)	0.15	0.2	0.3	☆ 150~200	★ 180~220	-
Alloy Steel(SCM)	0.15	0.2	0.3	☆ 150~200	★ 180~220	-
Die Steel(SKD/NAK)	0.1	0.15	0.2	☆ 120~180	★ 150~200	-
Gray Cast Iron(FC)	0.2	0.25	0.35	-	☆ 180~220	★ 150~250
Nodular Cast Iron(FCD)	0.15	0.2	0.3	-	☆ 180~220	★ 180~220
Stainless Steel(SUS304)	-			Not Recommended		
Non-ferrous Material	-			Not Recommended		

☆:1st Recommendation ★:2nd Recommendation

●Selection of chipbreaker

	Emphasis on low cutting force	General Purpose	Emphasis on edge strength
type	 NB2P(4 notches) + NB3P(5 notches)	 NB2(2 notches) + NB3(3 notches)	 NB2T(2 notches) + NB3T(3 notches)
Application	Ideal when using long arbor type or for machining of thin-plate workpieces	General purpose type with balance of strength and resistance	Ideal for interrupted cutting and high load cutting. Ideal when feed rate is increased or workpiece material is FC/FCD
Edge preparation	As many as four (or five) notches help to alleviate the shock when biting into the workpiece 	Strength, edge and chip control are all well balanced 	Strength is increased by the edge shape and moderate rake angle of the chamfer edge 

A supplemental chipbreaker is used when it is necessary to increase strength and bite while focusing on resistance, as when machining welded areas.



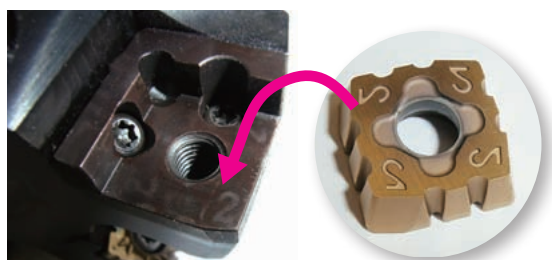
●About marked numbers of NB2P(4notches) and NB3P(5notches) Inserts

In order to adjust applicable inserts on marked numbers on tool holders, "2" is marked for NB2P (4 notches) and "3" is marked on NB3P(5 notches).

●Notch effect

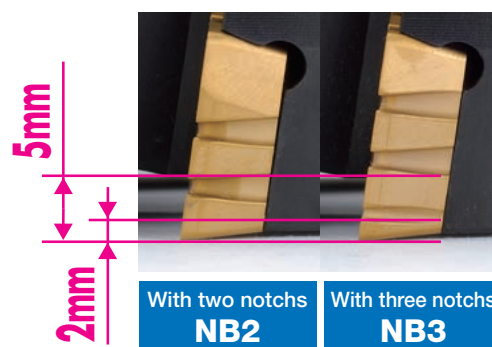
The effects of the notch can be seen at more than 5mm of vertical depth of cut. (effects for NB3 appears from at least 2mm or more)

●Insert Replacement Identification



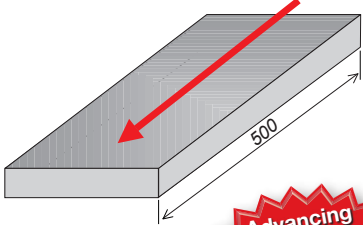
Insert number is transcribed as a result of the cutting tool load.

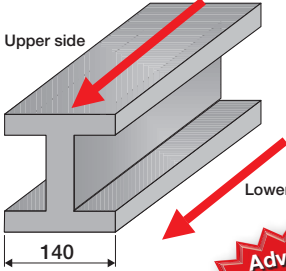
*Depending on the cutting conditions, marks are not transcribed.

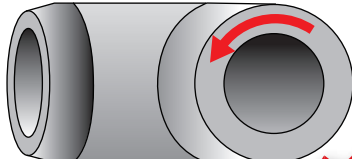


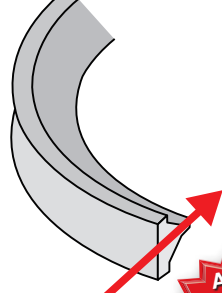
MSRS Type Face Mill

● Case studies - Achievement of productivity improvement and machining time reduction

SS400	
Plate	
·Vc=150m/min (n=382min⁻¹) ·apxae=10×125mm ·fz=0.2mm/t (Vf=458mm/min) ·Dry ·8edges ·MSRS15125R-6T ·SPMT1806EDER-NB2 ·SPMT1806EDER-NB3 (PR830)	
MSRS	Chip removal 572cc/min.
Competitor Cutter G	129cc/min.
(Competitor Cutter G)	(User comment) Improvement of the condition to a large extent results in time reduction. Productivity has improved 4.4 times. (Evaluation by the user)

S50C	
Rail	
·Vc=150m/min (n=300min⁻¹) ·apxae=6×140mm ·fz=0.2mm/t (Vf=480mm/min) ·Dry ·8edges ·MSRS15160R-8T ·SPMT1806EDER-NB2 ·SPMT1806EDER-NB3 (PR830)	
MSRS	Chip removal 403cc/min.
Competitor Cutter H	84cc/min.
(Competitor Cutter H)	(User comment) MSRS enabled one pass cutting, while it formerly took three pass. Still, the MSRS has less cutting noise. Productivity has improved 4.7 times. (Evaluation by the user)

C12A(Cast steel)	
Industrial machinery components	
·Vc=100m/min (n=200min⁻¹) ·apxae=10×114mm ·fz=0.4mm/t (Vf=635mm/min) ·Dry ·8edges ·MSRS15160R-8T ·SPMT1806EDER-NB2 ·SPMT1806EDER-NB3 (PR830)	
MSRS	Chip removal 724cc/min.
Competitor Cutter I	290cc/min.
(Competitor Cutter I)	(User comment) Although conventional type could not increase depth of cut due to high cutting force, MSRS has enabled to increase depth of cut without increasing spindle load. Productivity increased 2.5 times. (Evaluation by the user)

S45C	
Gear	
·Vc=200m/min (n=255min⁻¹) ·apxae=10×200mm ·fz=0.17mm/t (Vf=600mm/min) ·Dry ·14edges ·MSRS15250R-14T ·SPMT1806EDER-NB2 ·SPMT1806EDER-NB3 (PR830)	
MSRS	Chip removal 1200cc/min.
Competitor Cutter J	459cc/min.
(Competitor Cutter J)	(User comment) Cutting noise is quiet even when cutting width is nearly 80% of cutter diameter. Productivity increased 2.6 times. (Evaluation by the user)

MSRS Type Face Mill

Q&A

Q-1 What is the recommended radial width of cut (a_e)?

A-1 Recommendation is 70 to 80% of cutter diameter.

Q-2 Why is the MSRS cutting edge inclination angle 75 degree ?

A-2 Type with 45 degree cutting edge angle suppresses the impact of cutting into workpiece, but has bigger radial force. Meanwhile, type with 90 degree cutting edge angle has smaller radial force, but bigger impact on cutting into workpiece. The MSRS cutter with 75 degree cutting edge angle generates small radial force even on large depth of cut, as well as less impact on approaching, and, due to its well-balanced design, enables smooth machining.

The amount of chip evacuation of MSRS Type is increased much more than conventional tools.

●Features of Holder

Coarse pitch type

Design of large chip pocket

Good chip evacuation

Adoption of cartridge (standard type)

Damage prevention of base body

Display the applicable insert number (Notch number)

Close pitch type

Higher productivity due to close pitch design

