MITSUBISHI MITSUBISHI MATERIALS TOOL NEWS
2016.2 Update B020A YOUR GLOBAL CRAFTSMAN STUDIO

Ball-nose End Mill for Rough to Semi-finish Cutting

SRM2 series

Insert Expansion

SRM2 applications offer you the strength of a large radius insert, and the ability to penetrate hard to reach cavities.

MIRACLE SIGMA

Ball-Nose End Mill for Rough to Semi-Finish Cutting

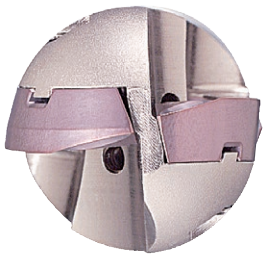
SRM2

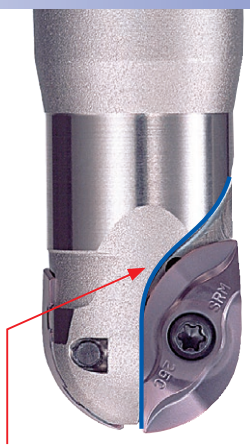
Features

Cutting Edge Diameter	**Ø.625", Ø.750", Ø1.000", Ø1.250"**
Application	**SRM2 applications offer you the strength of a large radius insert, and the ability to penetrate hard to reach cavities.**

High Rigidity

Large insert thickness guards against fracture. Thick body core resists body web fracture.

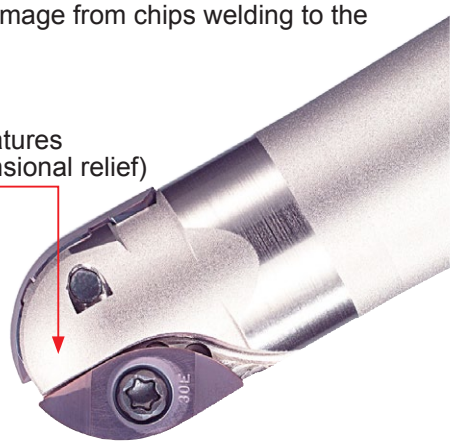




"Streamlined pocket" optimizes a balance of chip flow and body rigidity.

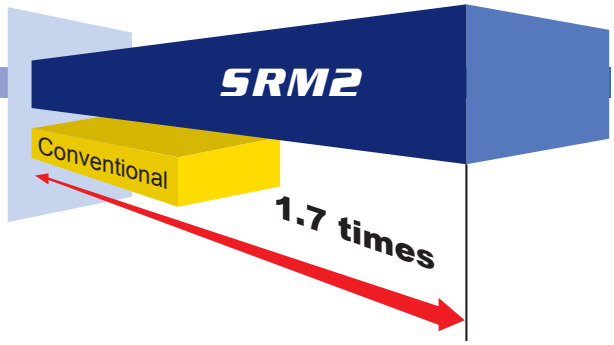
High body rigidity and good chip control, avoid damage from chips welding to the body.

Body features
(3-dimensional relief)



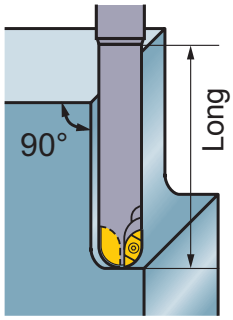
Highly Heat-resistant Body

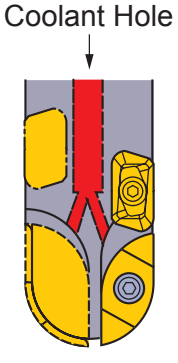
The body of the SRM2 is made of a special alloy steel with excellent high-tempurature strength, enhanced by a corrosion-resistant surface treatment.



Series Expansion

In addition to the standard and long cutting edge types, this series has been expanded with a long type which can machine vertical faces. The series is now equipped with a coolant hole as standard, enabling it to tackle a wider range of die mold cutting applications.





High Precision, Low Resistance Inserts

Strong Cutting Edge Type Inserts

Inserts with strong geometry and tough edge condition for reliable rough machining. Peripheral grinding improves the precision of the insert for longer tool life.

Sharp, Low-resistance Type Inserts

Top rake chip breaker type inserts for reduced cutting forces.
Lower resistance results in higher quality surface finishes.
Insert tolerance similar to G-class type at economical M-class prices.

Low Resistance Type Inserts for Ø40 and Ø50

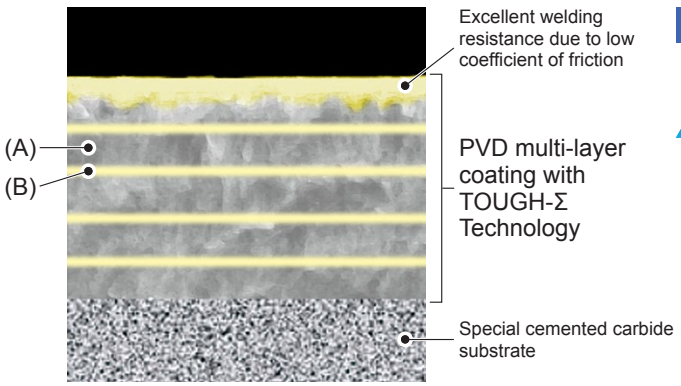
Unique design, 3-dimensional cutting edge:- Variable Radial Undulation (V.R.U. Pat. pending) for efficient chip breaking to significantly lower cutting resistance and vibration.
Screw, slot and key type insert location and clamping for extra security.

NEW

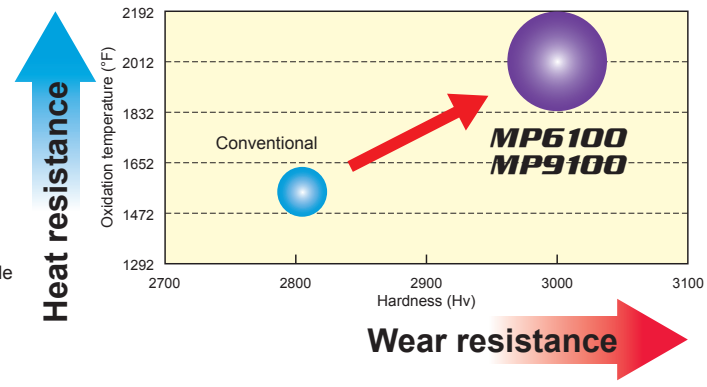
MP6100, MP9100 - With accumulated Al-Ti-Cr-N based PVD coating

TOUGH-Σ Technology

A fusion of the separate coating technologies; PVD and multi-layering provides extra toughness.



Dramatically improving the heat and wear resistance!



	Work material	Grade	Coating		Coefficient of friction		
			Base layer (A)	Optimized layer for work material (B)	Measured at 1112° F		
					1055	304	Ti-6Al-4V
P	Carbon Steel, Alloy Steel	MP6100	High Al-(Al, Ti)N The new technology Al-(Al, Ti)N provides stability of the high hardness phase and succeeds in dramatically improving wear, crater and welding resistance.	(Al, Cr) N based Tough! Resists Chipping	0.4		
S	Titanium Alloy, Heat Resistant Alloy	MP9100		CrN based Tough! Resists Thermal Cracking			0.3
				Conventional	0.7	0.7	0.7

Ball-Nose End Mill for Rough Cutting

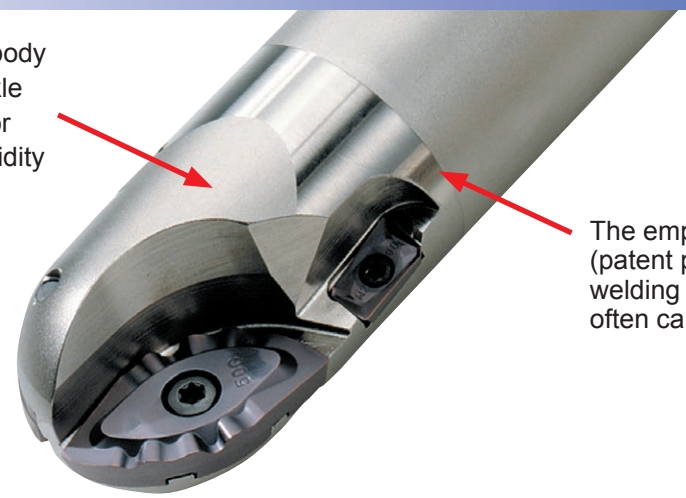
SRM2 Ø40 Ø50

Features

Cutting Edge Diameter	1.575" (ø40mm), 1.969" (ø50mm)

High Rigidity

The specially designed silver body employs special alloy with nickle based coating on its surface for significantly improved body rigidity and durability.



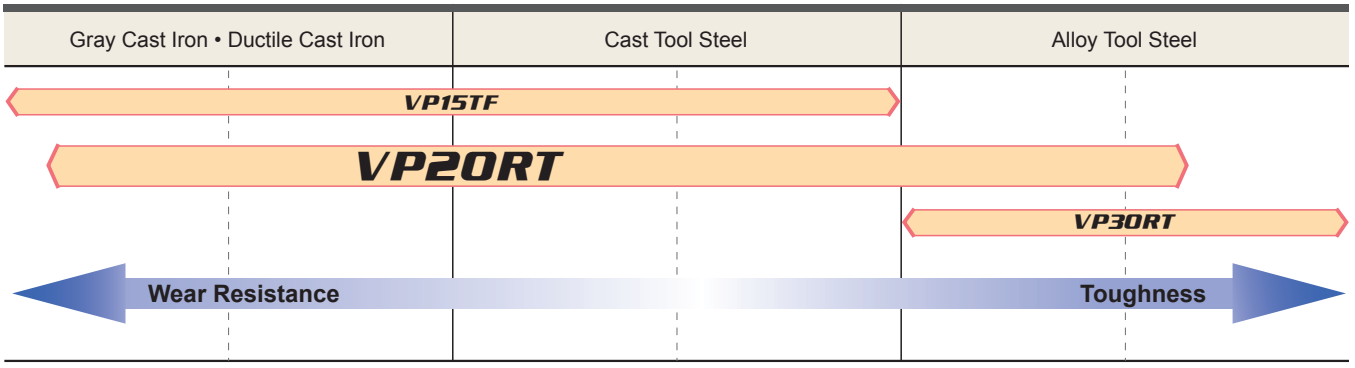
The employment of heel cut (patent pending) prevents welding and damage to the body often caused by generated chips.

Low Resistance

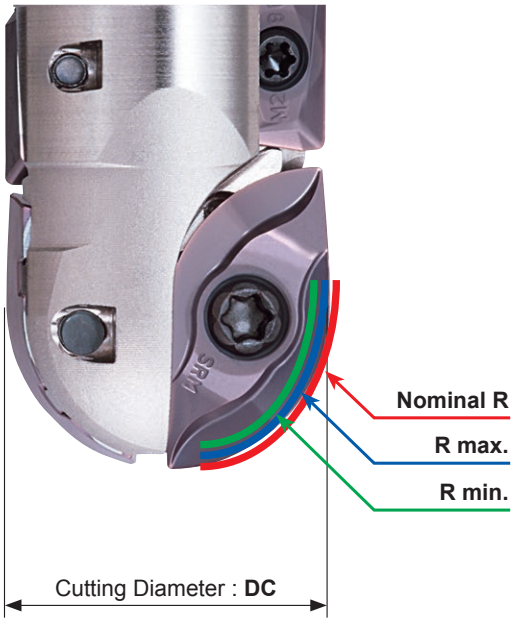
Low-resistance Cutting Edge Type Inserts (With Breakers)

Unique design, 3-dimentional cutting edge:- Variable Radial Undulation (V.R.U. Pat. pending) for efficient chip breaking to significantly lower cutting resistance and vibration. Screw, slot and key type insert location and clamping for extra security.

Insert Grade Application Guide



Radius tolerance and other dimensions when an insert is set in a body



<Radius tolerance>

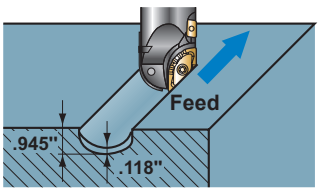
Cutting Dia.	Nominal R	R min.	R max.
.625	.3125	.309	.312
.750	.375	.371	.374
1.000	.500	.496	.499
1.250	.625	.621	.624

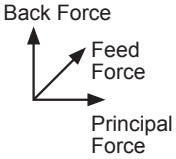
<Dimensions when an insert is set in a body>

Cutting Dia.	DC min.	DC max.
.625	.616	.6250
.750	.741	.7496
1.000	.991	.9996
1.250	1.241	1.2496

Cutting Performance

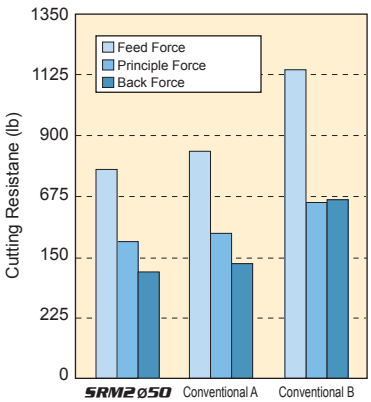
Comparison of Cutting Resistance



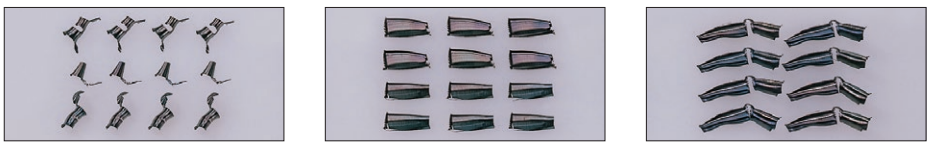


Cutting Conditions

Work piece	Ductile cast iron
Tool	Ball nose end mill with 50mm cutting edge diameter
Cutting Speed	615 SFM
Table Feed	42.5 IPM
Depth of Cut	.118 inch
Cutting mode	Dry cutting



Chip Geometry



SRM2Ø50 | Conventional A | Conventional B

BALL NOSE END MILL

Roughing

Including curved faces

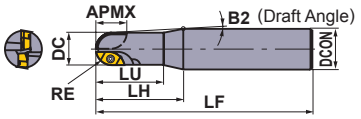
SRM2

P M K N S H

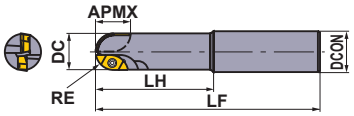
- Air / coolant through.
- Suitable for roughing to semi-finishing of small and medium molds.
- High rigidity body design.
- Low resistance chipbreaker.
- Key type clamp.
- Shrink fit ready.

Short Type

SRM210SAS2
SRM212SAS2

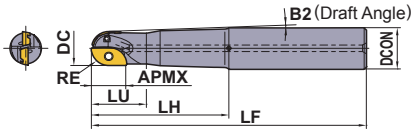


SRM216SAS2
SRM220SAS2

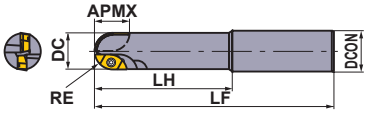


Medium Type

SRM210SAM2
SRM212SAM2

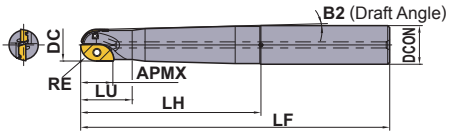


SRM216SAM2
SRM220SAM2

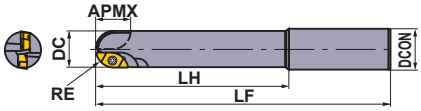


Long Type

SRM210SAL2
SRM212SAL2
SRM216SAL2

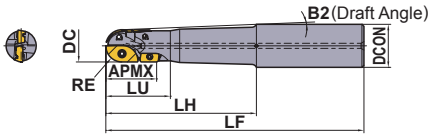


SRM220SAL2

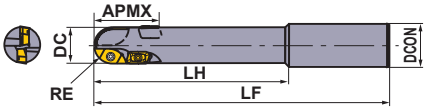


Long Edge Type

SRM212SAL4
SRM216SAL4



SRM220SAL4



Right hand tool holder only.

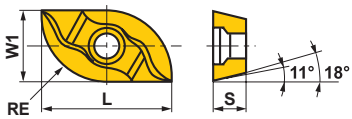
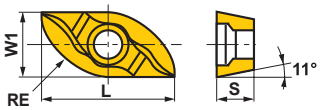
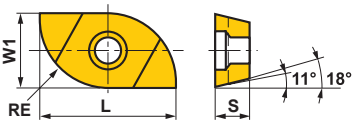
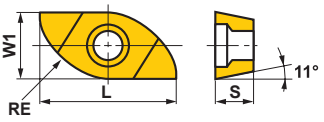
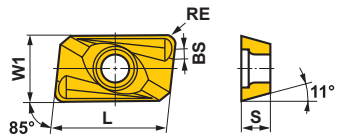
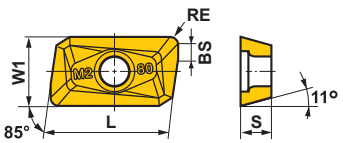
SHANK TYPE

Type	Order Number	Stock R	Number of Teeth	RE	DC	LF	DCON	LH	LU	APMX	B2	Inner, Outer Insert Screw *	Peripheral Insert Screw *	Inner, Outer Wrench	Peripheral Wrench	Inner Insert	Outer Insert	Peripheral Insert
Short	SRM210SAS2	●	2	.313	.625	4.0	.75	1.5	1.00	.625	3°	TS25H	—	① TKY08D	—	SRM210C-M	SRM210E-M	—
	SRM212SAS2	●	2	.375	.750	4.0	1.00	1.5	1.25	.750	6° 30'	TS32	—	① TKY08D	—	SRM212C SRM212C-M	SRM212E SRM212E-M	—
	SRM216SAS2	●	2	.500	1.000	4.5	1.00	2.0	—	.945	—	TS43	—	② TKY15T	—	SRM216C SRM216C-M	SRM216E SRM216E-M	—
	SRM220SAS2	●	2	.625	1.250	5.0	1.25	2.0	—	1.102	—	TS55	—	② TKY25T	—	SRM220C SRM220C-M	SRM220E SRM220E-M	—
Medium	SRM210SAM2	●	2	.313	.625	5.0	.75	2.5	1.00	.625	1° 30'	TS25H	—	① TKY08D	—	SRM210C-M	SRM210E-M	—
	SRM212SAM2	●	2	.375	.750	5.0	1.00	2.5	1.25	.750	1° 30'	TS32	—	① TKY08D	—	SRM212C SRM212C-M	SRM212E SRM212E-M	—
	SRM216SAM2	●	2	.500	1.000	5.5	1.00	3.0	—	.945	—	TS43	—	② TKY15T	—	SRM216C SRM216C-M	SRM216E SRM216E-M	—
	SRM220SAM2	●	2	.625	1.250	6.5	1.25	3.5	—	1.102	—	TS55	—	② TKY25T	—	SRM220C SRM220C-M	SRM220E SRM220E-M	—
Long	SRM210SAL2	●	2	.313	.625	6.0	.75	3.5	1.00	.625	1° 30'	TS25H	—	① TKY08D	—	SRM210C-M	SRM210E-M	—
	SRM212SAL2	●	2	.375	.750	6.0	1.00	3.5	1.50	.750	1° 30'	TS32	—	① TKY08D	—	SRM212C SRM212C-M	SRM212E SRM212E-M	—
	SRM216SAL2	●	2	.500	1.000	6.5	1.25	4.0	1.75	.945	1° 30'	TS43	—	② TKY15T	—	SRM216C SRM216C-M	SRM216E SRM216E-M	—
	SRM220SAL2	●	2	.625	1.250	8.0	1.25	5.0	—	1.102	—	TS55	—	② TKY25T	—	SRM220C SRM220C-M	SRM220E SRM220E-M	—
Long Edge	SRM212SAL4	●	4	.375	.750	6.0	1.00	3.5	1.50	1.180	1° 30'	TS32	TS25	① TKY08D	① TKY08D	SRM212C SRM212C-M	SRM212E SRM212E-M	APMT1135 PDER-□2
	SRM216SAL4	●	4	.500	1.000	6.5	1.25	4.0	1.75	1.457	1° 30'	TS43	TS25	② TKY15T	③ TKY08F	SRM216C SRM216C-M	SRM216E SRM216E-M	APMT1135 PDER-□2
	SRM220SAL4	●	4	.625	1.250	8.0	1.25	5.0	—	1.732	—	TS55	TS43	② TKY25T	③ TKY15F	SRM220C SRM220C-M	SRM220E SRM220E-M	APMT1604 PDER-□2

* Clamp Torque (lbf-in) : TS25H=8.9, TS25=8.9, TS32=8.9, TS43=31, TS55=66

● : Inventory maintained.
<10 inserts in one case>

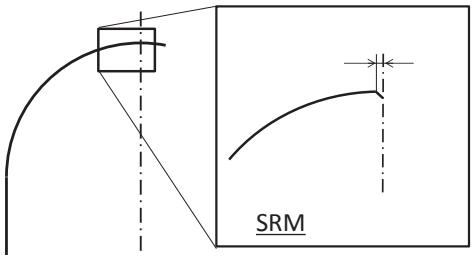
INSERTS

Type		Shape	Order Number	Class	Coated			Dimensions (inch)					Geometry
					MP6120 (NEW)	MP9120 (NEW)	VP15TF	RE	L	W1	S	BS	
Inner	With Breaker		**SRM210C-M**	M	●	●	●	.313	.630	.323	.138	—	
			SRM212C-M	M	●	●	●	.375	.748	.385	.169	—	
			SRM216C-M	M	●	●	●	.500	.945	.512	.216	—	
			SRM220C-M	M	●	●	●	.625	1.102	.638	.275	—	
Outer	With Breaker		**SRM210E-M**	M	●	●	●	.313	.531	.258	.138	—	
			SRM212E-M	M	●	●	●	.375	.610	.315	.169	—	
			SRM216E-M	M	●	●	●	.500	.807	.409	.216	—	
			SRM220E-M	M	●	●	●	.625	.964	.520	.275	—	
Inner	No Breaker	Strong Cutting Edge Type 	**SRM212C**	M	●	●	●	.375	.748	.385	.169	—	
			SRM216C	M	●	●	●	.500	.945	.512	.216	—	
			SRM220C	M	●	●	●	.625	1.102	.638	.275	—	
Outer	No Breaker	Strong Cutting Edge Type 	**SRM212E**	M	●	●	●	.375	.610	.315	.169	—	
			SRM216E	M	●	●	●	.500	.807	.409	.216	—	
			SRM220E	M	●	●	●	.625	.964	.520	.275	—	
Peripheral	With Breaker	Strong Cutting Edge Type 	**APMT1135PDER-H2**	M			●	.031	.433	.250	.138	.047	
			APMT1604PDER-H2	M			●	.031	.650	.375	.187	.055	
	With Breaker	Low Resistance Type 	**APMT1135PDER-M2**	M			●	.031	.433	.250	.138	.047	
			APMT1604PDER-M2	M			●	.031	.650	.375	.187	.055	

(Note) The **M** type breaker (APMT....PDER-M2) is the first recommendation for its excellent cutting performance.
Please use **H** type breakers (APMT....PDER-H2) due to cutting edge strength.

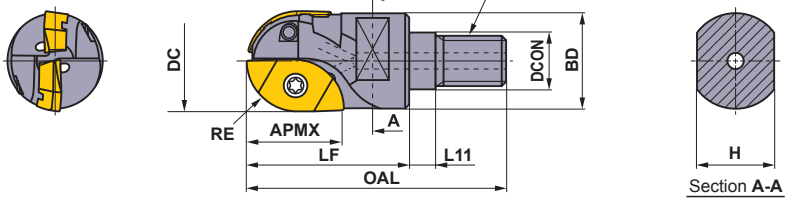
■ = MIRACLE SIGMA

(Note) SRM tooling is designed for rough machining applications.
*Programming Note: If you choose to use SRM tooling for semi-finishing applications, care must be taken when setting the tool height. The SRM insert includes a chamfer flat at the tip as illustrated. To assist with SRM programming needs, please download our CAD data from our web site; http://www.mitsubishicarbide.com/

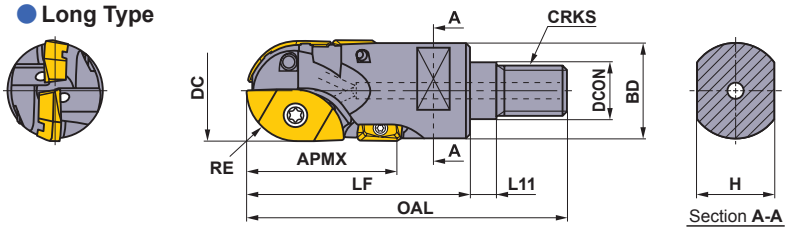


BALL-NOSE END MILL FOR ROUGH TO SEMI-FINISH CUTTING

● Standard Type



● Long Type



METRIC Standard

SCREW-IN TYPE

Right hand tool holder only.

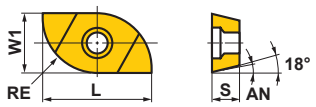
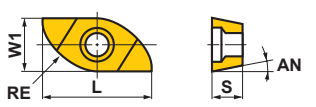
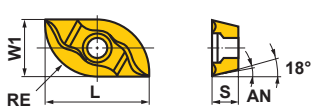
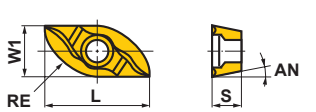
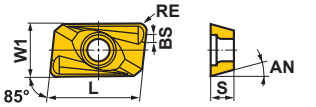
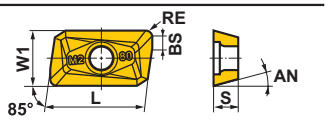
Type	Order Number	Stock R	Coolant Thru *3	Dimensions (mm) RE	DC	DCON	BD	OAL	LF	L11	H	CRKS *2	APMX	WT *4	Inner, Outer Insert Screw *1	Peripheral Insert Screw *1	Wrench	Inner Insert	Outer Insert	Peripheral Insert
Standard	**SRM2160AM08S30**	★	Y	8	16	8.5	14.6	48	30	6	10	M8	12	0.1	TS25H	—	①TKY08D	SRG16C SRM16C-M	SRG16E SRM16E-M	—
	SRM2200AM10S35	★	Y	10	20	10.5	18.6	54	35	6	14	M10	14	0.1	TS32	—	①TKY08D	SRG20C SRM20C-M	SRG20E SRM20E-M	—
	SRM2250AM12S40	★	Y	12.5	25	12.5	23.5	62	40	6	19	M12	19	0.2	TS43	TS25	②TKY15T	SRG25C SRM25C-M	SRG25E SRM25E-M	—
	SRM2300AM16S45	★	Y	15	30	17	28.3	68	45	6	24	M16	24	0.2	TS55	—	②TKY15T ③TKY08F	SRG30C SRM30C-M	SRG30E SRM30E-M	—
	SRM2320AM16S45	★	Y	16	32	17	30.0	68	45	6	24	M16	28	0.2	TS55	TS43	②TKY25T ③TKY15F	SRG32C SRM32C-M	SRG32E SRM32E-M	—
Long	**SRM2200AM10L45**	★	Y	10	20	10.5	18.6	64	45	6	14	M10	30	0.2	TS32	TS25	①TKY08D	SRG20C SRM20C-M	SRG20E SRM20E-M	APMT1135 PDER-□2
	SRM2250AM12L55	★	Y	12.5	25	12.5	23.5	77	55	6	19	M12	37	0.3	TS43	TS25	②TKY15T ③TKY08F	SRG25C SRM25C-M	SRG25E SRM25E-M	APMT1135 PDER-□2
	SRM2300AM16L60	★	Y	15	30	17	28.3	83	60	6	24	M16	44	0.3	TS55	TS43	②TKY25T ③TKY15F	SRG30C SRM30C-M	SRG30E SRM30E-M	APMT1604 PDER-□2
	SRM2320AM16L60	★	Y	16	32	17	29.0	83	60	6	24	M16	44	0.3	TS55	TS43	②TKY25T ③TKY15F	SRG32C SRM32C-M	SRG32E SRM32E-M	APMT1604 PDER-□2

*1 Clamp Torque (lbf-in) : TS25H=8.9, TS25=8.9, TS32=8.9, TS43=31, TS55=66
*2 Clamp Torque of the Head (lbf-ft) : M8=17.1, M10=33.8, M12=59.2, M16=66.7
*3 Y=Yes
*4 WT : Mass

● : Inventory maintained. ★ : Inventory maintained in Japan.
<10 inserts in one case>

INSERTS

For Metric Standard

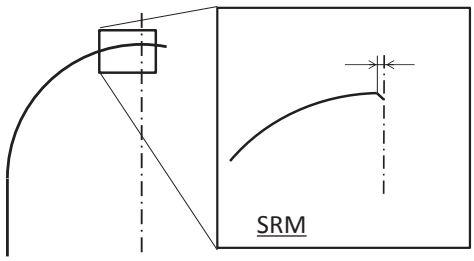
Type	Shape	Order Number	Class	Coated				Dimensions (mm)						Geometry
				F7030	MP6120 NEW	MP9120 NEW	VP15TF	RE	L	W1	S	BS	AN	
Inner	Strong Cutting Edge Type 	**SRG16C**	G		★	★	★	8	16	8.2	3.5	–	11°	
		SRG20C	G		★	★	★	10	19	10.2	4.6	–	10°	
		SRG25C	G		★	★	★	12.5	24	12.8	5.5	–	10°	
		SRG30C	G		★	★	★	15	28	15.3	7	–	10°	
		SRG32C	G		★	★	★	16	28	16.3	7	–	10°	
Outer	Strong Cutting Edge Type 	**SRG16E**	G		★	★	★	8	13.5	6.7	3.5	–	11°	
		SRG20E	G		★	★	★	10	15.5	8.5	4.6	–	9°	
		SRG25E	G		★	★	★	12.5	20.5	10.2	5.5	–	9°	
		SRG30E	G		★	★	★	15	25.2	12.2	7	–	9°	
		SRG32E	G		★	★	★	16	26.1	13.1	7	–	9°	
Inner	Low Resistance Type 	**SRM16C-M**	M		★	★	★	8	16	8.2	3.5	–	11°	
		SRM20C-M	M		★	★	★	10	19	10.2	4.6	–	10°	
		SRM25C-M	M		★	★	★	12.5	24	12.8	5.5	–	10°	
		SRM30C-M	M		★	★	★	15	28	15.3	7	–	10°	
		SRM32C-M	M		★	★	★	16	28	16.3	7	–	10°	
Outer	Low Resistance Type 	**SRM16E-M**	M		★	★	★	8	13.5	6.7	3.5	–	11°	
		SRM20E-M	M		★	★	★	10	15.5	8.5	4.6	–	9°	
		SRM25E-M	M		★	★	★	12.5	20.5	10.2	5.5	–	9°	
		SRM30E-M	M		★	★	★	15	25.2	12.2	7	–	9°	
		SRM32E-M	M		★	★	★	16	26.1	13.1	7	–	9°	
* Peripheral	Strong Cutting Edge Type 	**APMT1135PDER-H2**	M	●			●	0.8	11	6.35	3.5	1.2	11°	
		APMT1604PDER-H2	M	●			●	0.8	16.5	9.525	4.76	1.4	11°	
	Low Resistance Type 	**APMT1135PDER-M2**	M	●			●	0.8	11	6.35	3.5	1.2	11°	
		APMT1604PDER-M2	M	●			●	0.8	16.5	9.525	4.76	1.4	11°	

(Low-resistance inner or outer inserts are precision M class type.)

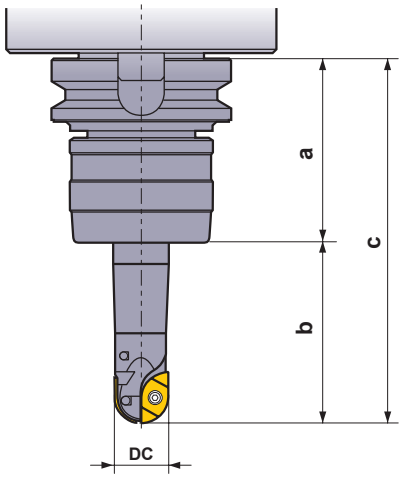
■ = MIRACLE SIGMA

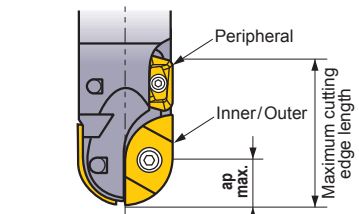
* Selection guide for peripheral cutting edges : The first recommendation is the super sharp M breaker (APMT....PDER-M2).
When cutting edge strength is particularly important, use the H breaker (APMT....PDER-H2).

(Note) SRM tooling is designed for rough machining applications. *Programming Note: If you choose to use SRM tooling for semi-finishing applications, care must be taken when setting the tool height. The SRM insert includes a chamfer flat at the tip as illustrated. To assist with SRM programming needs, please download our CAD data from our web site; http://www.mitsubishicarbide.com/



RECOMMENDED CUTTING CONDITIONS





(Long cutting edge type)

Tool Overhang

Recommended cutting conditions on this literature are chosen based on deflection, vibration and machined surface when using a CAT50 arbor. Conditions-**"a"** is the length from a gage line to the arbor end face, and **"b"** is the neck length (tool overhang from the arbor).

(Inch)

Cutting Diameter : DC	Type	a	b	c
.625"	Short	4	1.5	5.5
	Medium		2.5	6.5
	Long		3.5	7.5
.750"	Short		1.5	5.5
	Medium		2.5	6.5
	Long		3.5	7.5
1.000"	Short		2.0	6.0
	Medium		3.0	7.0
	Long		4.0	8.0
1.250"	Short		2.0	6.0
	Medium		3.5	7.5
	Long		5.0	9.0

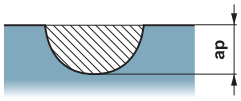
Recommended Depth of Cut for Long Cutting Edge Type

The maximum cutting edge length of the long cutting edge type with a peripheral insert is 1.4-1.5DC. The peripheral insert is for light machining only.

Please refer the recommended cutting condition or page 12.

SLOT MILLING

Cutting Mode



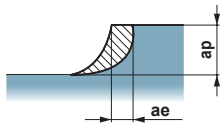
N : Spindle Speed (RPM)
F : Table Feed (IPM)

	Work Material	Hardness	Cutting Speed (SFM)	Grade	Type	ϕ.625"			ϕ.750"			ϕ1.000"			ϕ1.250"		
						RPM	IPM	ap	RPM	IPM	ap	RPM	IPM	ap	RPM	IPM	ap
P	Carbon Steel Alloy Steel	180-280HB	525	MP6120 VP15TF	Short	3183	15	.236	2546	12	.315	2037	19	.492	1698	16	.591
			395		Medium	3183	15	.236	2546	12	.315	2037	19	.492	1698	16	.591
			655		Long	3183	15	.157	2546	12	.157	2037	19	.236	1698	16	.295
		280-350HB	460	MP6120 VP15TF	Short	2785	13	.236	2228	11	.315	1783	17	.492	1485	14	.591
			395		Medium	2785	13	.236	2228	11	.315	1783	17	.492	1485	14	.591
			525		Long	2785	13	.157	2228	11	.157	1783	17	.236	1485	14	.295
	Pre-Hardened Steel	35-45HRC	395	MP6120 VP15TF	Short	2387	11	.236	1910	9	.315	1528	14	.492	1273	12	.472
			330		Medium	2387	11	.236	1910	9	.315	1528	14	.492	1273	12	.472
			525		Long	2387	11	.157	1910	9	.157	1528	14	.236	1273	12	.177
	Alloy Tool Steel	≤350HB	460	MP6120 VP15TF	Short	2785	13	.236	2228	11	.315	1783	21	.394	1485	23	.295
			395		Medium	2785	13	.236	2228	11	.315	1783	21	.394	1485	23	.295
			525		Long	2785	13	.157	2228	11	.157	1783	21	.197	1485	23	.177
M	Stainless Steel	≤270HB	655	VP15TF	Short	3979	19	.157	3183	15	.197	2546	30	.236	2122	33	.591
			330		Medium	3979	19	.157	3183	15	.197	2546	30	.236	2122	33	.591
			820		Long	3979	19	.118	3183	15	.118	2546	24	.157	2122	25	.177
K	Gray Cast Iron	≤350MPa	655	VP15TF	Short	3979	31	.236	3183	25	.315	2546	40	.492	2122	33	.591
			490		Medium	3979	31	.236	3183	25	.315	2546	40	.492	2122	33	.591
			985		Long	3979	31	.157	3183	25	.157	2546	40	.295	2122	33	.177
	Ductile Cast Iron	≤500MPa	590	VP15TF	Short	3581	28	.236	2865	23	.315	2292	36	.492	1910	30	.591
			490		Medium	3581	28	.236	2865	23	.315	2292	36	.492	1910	30	.591
			785		Long	3581	28	.157	2865	23	.157	2292	36	.295	1910	30	.177
		≤800MPa	525	VP15TF	Short	3183	25	.236	2546	20	.315	2037	32	.492	1698	27	.591
			490		Medium	3183	25	.236	2546	20	.315	2037	32	.492	1698	27	.591
			820		Long	3183	25	.157	2546	20	.157	2037	32	.295	1698	27	.177
S	Titanium Alloy	≤350HB	165	MP9120	Short	995	4	.157	796	3	.157	637	3	.236	531	2	.295
			100		Medium	995	4	.157	796	3	.157	637	3	.236	531	2	.295
			195		Long	995	4	.079	796	3	.079	637	3	.157	531	2	.118
	Heat-resistant Alloy	–	165	MP9120	Short	995	4	.157	796	3	.157	637	3	.236	531	2	.295
			100		Medium	995	4	.157	796	3	.157	637	3	.236	531	2	.295
			195		Long	995	4	.079	796	3	.079	637	3	.157	531	2	.118
H	Heat Treated Steel	45-50HRC	330	VP15TF	Short	1989	9	.157	1591	8	.157	1273	10	.236	1061	8	.295
			195		Medium	1989	9	.157	1591	8	.157	1273	10	.236	1061	8	.295
			395		Long	1989	9	.079	1591	8	.079	1273	10	.157	1061	8	.118
		50-60HRC	195	VP15TF	Short	1194	6	.157	955	5	.157	764	6	.236	637	5	.295
			130		Medium	1194	6	.157	955	5	.157	764	6	.236	637	5	.295
			330		Long	1194	6	.079	955	5	.079	764	6	.157	637	5	.118

RECOMMENDED CUTTING CONDITIONS

SHOULDER MILLING (Cutting Depth : Small)

Cutting Mode

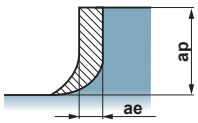


N : Spindle Speed (RPM)
F : Table Feed (IPM)

	Work Material	Hardness	Cutting Speed (SFM)	Grade	Type	ϕ.625"				ϕ.750"				ϕ1.000"				ϕ1.250"			
						RPM	IPM	ap	ae	RPM	IPM	ap	ae	RPM	IPM	ap	ae	RPM	IPM	ap	ae
P	Carbon Steel Alloy Steel	180-280HB	655	MP6120 VP15TF	Short	3979	31	.157	.236	3183	38	.197	.315	2546	50	.236	.394	2122	50	.295	.394
			525		Medium	3979	31	.157	.236	3183	38	.197	.315	2546	50	.236	.394	2122	50	.295	.394
			820		Long	3979	25	.157	.157	3183	25	.197	.236	2546	50	.236	.295	2122	50	.295	.295
		280-350HB	525	MP6120 VP15TF	Short	3183	20	.157	.236	2546	20	.197	.315	2037	32	.236	.394	1698	33	.295	.394
			395		Medium	3183	20	.157	.236	2546	20	.197	.315	2037	32	.236	.394	1698	33	.295	.394
			655		Long	3183	15	.157	.157	2546	16	.197	.236	2037	24	.236	.295	1698	20	.295	.295
	Pre-Hardened Steel	35-45HRC	525	MP6120 VP15TF	Short	3183	20	.157	.236	2546	20	.197	.315	2037	32	.236	.394	1698	33	.295	.394
			395		Medium	3183	20	.157	.236	2546	20	.197	.315	2037	32	.236	.394	1698	33	.295	.394
			655		Long	3183	15	.157	.157	2546	16	.197	.236	2037	24	.236	.295	1698	27	.295	.295
	Alloy Tool Steel	≤350HB	525	MP6120 VP15TF	Short	3183	20	.157	.236	2546	20	.197	.315	2037	32	.236	.394	1698	33	.295	.394
			395		Medium	3183	20	.157	.236	2546	20	.197	.315	2037	32	.236	.394	1698	33	.295	.394
			655		Long	3183	15	.157	.157	2546	16	.197	.236	2037	24	.236	.295	1698	20	.295	.295
M	Stainless Steel	≤270HB	655	VP15TF	Short	3979	19	.157	.236	3183	20	.197	.315	2546	30	.236	.394	2122	33	.295	.394
			330		Medium	3979	19	.157	.236	3183	20	.197	.315	2546	30	.236	.394	2122	33	.295	.394
			820		Long	3979	19	.157	.157	3183	15	.197	.236	2546	24	.236	.295	2122	33	.295	.295
K	Gray Cast Iron	≤350MPa	655	VP15TF	Short	3979	63	.157	.315	3183	63	.197	.394	2546	60	.236	.394	2122	58	.295	.394
			490		Medium	3979	63	.157	.315	3183	63	.197	.394	2546	60	.236	.394	2122	58	.295	.394
			985		Long	3979	47	.157	.236	3183	50	.197	.315	2546	60	.236	.394	2122	58	.295	.236
	Ductile Cast Iron	≤500MPa	655	VP15TF	Short	3979	63	.157	.315	3183	63	.197	.394	2546	60	.236	.394	2122	50	.295	.394
			490		Medium	3979	63	.157	.315	3183	63	.197	.394	2546	60	.236	.394	2122	50	.295	.394
			920		Long	3979	47	.157	.236	3183	50	.197	.315	2546	60	.236	.394	2122	50	.295	.236
		≤800MPa	590	VP15TF	Short	3581	56	.157	.315	2865	56	.197	.394	2292	54	.236	.394	1910	45	.295	.394
			490		Medium	3581	56	.157	.315	2865	56	.197	.394	2292	54	.236	.394	1910	45	.295	.394
			820		Long	3581	42	.157	.236	2865	45	.197	.315	2292	54	.236	.394	1910	45	.295	.236
S	Titanium Alloy	≤350HB	165	MP9120	Short	995	12	.157	.157	796	9	.157	.197	637	8	.236	.236	531	6	.295	.118
			100		Medium	995	12	.157	.157	796	9	.157	.197	637	8	.236	.236	531	6	.295	.118
			195		Long	995	12	.079	.079	796	9	.079	.118	637	8	.157	.157	531	6	.118	.059
	Heat-resistant Alloy	–	165	MP9120	Short	995	12	.157	.157	796	9	.157	.197	637	8	.236	.236	531	6	.295	.118
			100		Medium	995	12	.157	.157	796	9	.157	.197	637	8	.236	.236	531	6	.295	.118
			195		Long	995	12	.079	.079	796	9	.079	.118	637	8	.157	.157	531	6	.118	.059
H	Heat Treated Steel	45-50HRC	330	VP15TF	Short	1989	9	.157	.157	1591	8	.197	.197	1273	10	.236	.295	1061	8	.295	.118
			195		Medium	1989	9	.157	.157	1591	8	.197	.197	1273	10	.236	.295	1061	8	.295	.118
			395		Long	1989	9	.157	.079	1591	8	.197	.118	1273	10	.236	.157	1061	8	.295	.059
		50-60HRC	195	VP15TF	Short	1194	6	.157	.157	955	5	.197	.197	764	6	.236	.295	637	5	.295	.118
			130		Medium	1194	6	.157	.157	955	5	.197	.197	764	6	.236	.295	637	5	.295	.118
			330		Long	1194	6	.157	.079	955	5	.197	.118	764	6	.236	.157	637	5	.295	.059

SHOULDER MILLING (Cutting Depth : Large)

Cutting Mode



N : Spindle Speed (RPM)
F : Table Feed (IPM)

***Machining Stainless Steels**

Down cutting (Climb milling) is preferred.

	Work Material	Hardness	Cutting Speed (SFM)	Grade	Type	ϕ.625"				ϕ.750"				ϕ1.000"				ϕ1.250"			
						RPM	IPM	ap	ae	RPM	IPM	ap	ae	RPM	IPM	ap	ae	RPM	IPM	ap	ae
P	Carbon Steel Alloy Steel	180-280HB	655	MP6120 VP15TF	Short	3979	25	.315	.157	3183	30	.394	.157	2546	50	.492	.197	2122	50	.591	.177
			525		Medium	3979	25	.315	.157	3183	30	.394	.157	2546	50	.492	.197	2122	50	.591	.177
			820		Long	3979	19	.315	.118	3183	20	.394	.118	2546	40	.492	.157	2122	33	.591	.118
		280-350HB	525	MP6120 VP15TF	Short	3183	15	.315	.157	2546	20	.394	.157	2037	32	.492	.197	1698	33	.591	.177
			395		Medium	3183	15	.315	.157	2546	20	.394	.157	2037	32	.492	.197	1698	33	.591	.177
			655		Long	3183	15	.315	.118	2546	12	.394	.118	2037	24	.492	.157	1698	20	.591	.118
	Pre-Hardened Steel	35-45HRC	525	MP6120 VP15TF	Short	3183	15	.315	.157	2546	20	.394	.157	2037	32	.492	.197	1698	33	.591	.177
			395		Medium	3183	15	.315	.157	2546	20	.394	.157	2037	32	.492	.197	1698	33	.591	.177
			655		Long	3183	15	.315	.118	2546	12	.394	.118	2037	24	.492	.157	1698	20	.591	.118
	Alloy Tool Steel	≤350HB	525	MP6120 VP15TF	Short	3183	15	.315	.157	2546	20	.394	.157	2037	32	.492	.197	1698	33	.591	.177
			395		Medium	3183	15	.315	.157	2546	20	.394	.157	2037	32	.492	.197	1698	33	.591	.177
			655		Long	3183	15	.315	.118	2546	12	.394	.118	2037	24	.492	.098	1698	20	.591	.118
M	Stainless Steel	≤270HB	655	VP15TF	Short	3979	19	.315	.157	3183	20	.394	.157	2546	30	.492	.394	2122	33	.591	.394
			330		Medium	3979	19	.315	.157	3183	20	.394	.157	2546	30	.492	.394	2122	33	.591	.394
			820		Long	3979	19	.315	.118	3183	15	.394	.118	2546	24	.492	.157	2122	20	.591	.177
K	Gray Cast Iron	≤350MPa	655	VP15TF	Short	3979	47	.315	.315	3183	50	.394	.315	2546	50	.492	.394	2122	58	.591	.394
			490		Medium	3979	47	.315	.315	3183	50	.394	.315	2546	50	.492	.394	2122	58	.591	.394
			985		Long	3979	38	.315	.197	3183	38	.394	.157	2546	50	.492	.295	2122	42	.591	.177
	Ductile Cast Iron	≤500MPa	655	VP15TF	Short	3979	47	.315	.315	3183	50	.394	.315	2546	50	.492	.394	2122	50	.591	.394
			490		Medium	3979	47	.315	.315	3183	50	.394	.315	2546	50	.492	.394	2122	50	.591	.394
			920		Long	3979	38	.315	.197	3183	38	.394	.157	2546	50	.492	.295	2122	33	.591	.177
		≤800MPa	590	VP15TF	Short	3581	42	.315	.315	2865	45	.394	.315	2292	45	.492	.394	1910	45	.591	.394
			490		Medium	3581	42	.315	.315	2865	45	.394	.315	2292	45	.492	.394	1910	45	.591	.394
			820		Long	3581	34	.315	.197	2865	34	.394	.157	2292	45	.492	.295	1910	30	.591	.177
S	Titanium Alloy	≤350HB	165	MP9120	Short	995	8	.157	.079	796	6	.157	.118	637	5	.236	.157	531	4	.295	.118
			100		Medium	995	8	.157	.079	796	6	.157	.118	637	5	.236	.157	531	4	.295	.118
			195		Long	995	8	.079	.039	796	6	.079	.079	637	5	.157	.059	531	4	.118	.059
	Heat-resistant Alloy	–	165	MP9120	Short	995	8	.157	.079	796	6	.157	.118	637	5	.236	.157	531	4	.295	.118
			100		Medium	995	8	.157	.079	796	6	.157	.118	637	5	.236	.157	531	4	.295	.118
			195		Long	995	8	.079	.039	796	6	.079	.079	637	5	.157	.059	531	4	.118	.059
H	Heat Treated Steel	45-50HRC	330	VP15TF	Short	1989	9	.315	.079	1591	8	.394	.118	1273	10	.492	.157	1061	8	.591	.118
			195		Medium	1989	9	.315	.079	1591	8	.394	.118	1273	10	.492	.157	1061	8	.591	.118
			395		Long	1989	9	.315	.039	1591	8	.394	.079	1273	8	.492	.059	1061	4	.591	.059
		50-60HRC	195	VP15TF	Short	1194	6	.315	.079	955	5	.394	.118	764	6	.492	.157	637	5	.591	.118
			130		Medium	1194	6	.315	.079	955	5	.394	.118	764	6	.492	.157	637	5	.591	.118
			330		Long	1194	6	.315	.039	955	5	.394	.079	764	5	.492	.059	637	3	.591	.059

BALL NOSE END MILL

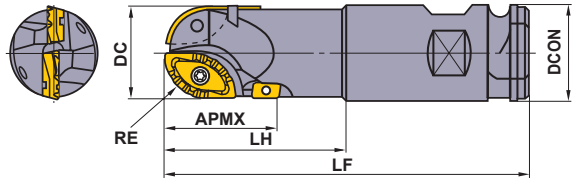
Roughing

Including curved faces

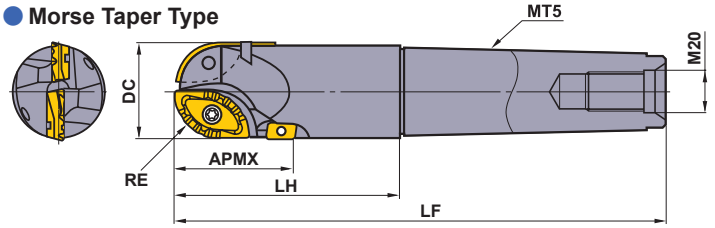
SRM2 Ø40(1.575") Ø50(1.969")

P M K N S H

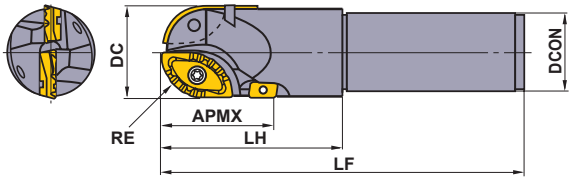
Combination Type



Morse Taper Type



Straight Type



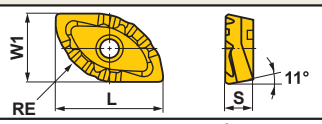
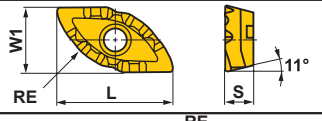
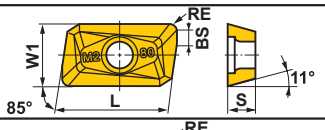
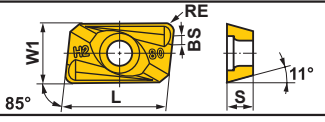
METRIC Standard

Right hand tool holder only.

Type		Order Number	Stock R	Number of Flutes	Dimensions (inch) RE	DC	DCON	LF	LH	APMX	* Inner, Outer Insert	* Peripheral Insert	Inner, Outer Wrench	Peripheral Wrench	Inner Insert	Outer Insert	Peripheral Insert
Combination	Standard	SRM2400WNLS	★	2	.787	1.575	2.000	7.874	4.724	2.126	TS6S	TS43	TKY30T	TKY15F	SRG40C	SRG40E	APMT1604 PDER-□2
		SRM2500WNLS	★	2	.984	1.969	2.000	7.874	4.724	2.480	TS6	TS43	TKY30T	TKY15F	SRG50C	SRG50E	APMT1604 PDER-□2
	Long	SRM2400WNLM	★	2	.787	1.575	2.000	9.843	6.693	2.126	TS6S	TS43	TKY30T	TKY15F	SRG40C	SRG40E	APMT1604 PDER-□2
		SRM2500WNLM	★	2	.984	1.969	2.000	9.843	6.693	2.480	TS6	TS43	TKY30T	TKY15F	SRG50C	SRG50E	APMT1604 PDER-□2
	Extra Long	SRM2500WNLL	★	2	.984	1.969	2.000	11.811	8.661	2.480	TS6	TS43	TKY30T	TKY15F	SRG50C	SRG50E	APMT1604 PDER-□2
		SRM2500WNLX	★	2	.984	1.969	2.000	13.780	10.630	2.480	TS6	TS43	TKY30T	TKY15F	SRG50C	SRG50E	APMT1604 PDER-□2
Straight	Standard	SRM2400SNLS	★	2	.787	1.575	1.654	7.874	3.937	2.126	TS6S	TS43	TKY30T	TKY15F	SRG40C	SRG40E	APMT1604 PDER-□2
		SRM2500SNLS	★	2	.984	1.969	1.654	7.874	3.937	2.480	TS6	TS43	TKY30T	TKY15F	SRG50C	SRG50E	APMT1604 PDER-□2
	Long	SRM2400SNLM	★	2	.787	1.575	1.654	9.843	5.906	2.126	TS6S	TS43	TKY30T	TKY15F	SRG40C	SRG40E	APMT1604 PDER-□2
		SRM2500SNLM	★	2	.984	1.969	1.654	9.843	3.937	2.480	TS6	TS43	TKY30T	TKY15F	SRG50C	SRG50E	APMT1604 PDER-□2
Morse Taper	Standard	SRM2500MNLS	★	2	.984	1.969	—	10.079	4.724	2.480	TS6	TS43	TKY30T	TKY15F	SRG50C	SRG50E	APMT1604 PDER-□2
	Long	SRM2500MNLM	★	2	.984	1.969	—	11.260	5.906	2.480	TS6	TS43	TKY30T	TKY15F	SRG50C	SRG50E	APMT1604 PDER-□2

* Clamp Torque (lbf-in) : TS43=31, TS6=89, TS6S=89

INSERTS

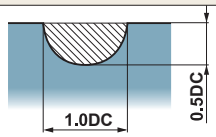
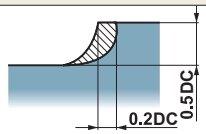
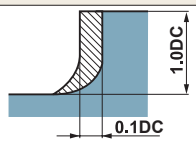
Application	Shape	Order Number	Class	Coated VP15TF	VP20RT	VP30RT	Dimensions (inch) RE	L	W1	S	BS	Geometry
Inner		* SRG40C	G	★	★	★	.787	1.417	.807	.315	—	
		* SRG50C	G	★	★	★	.984	1.575	1.024	.335	—	
Outer		* SRG40E	G	★	★	★	.787	1.260	.654	.315	—	
		* SRG50E	G	★	★	★	.984	1.409	.787	.335	—	
Peripheral		APMT1604PDER-M2	M	●			.031	.650	.375	.187	.055	
	Strong Cutting Edge Type 	APMT1604PDER-H2	M	●			.031	.650	.375	.187	.055	

* 2 inserts in one case.

● : Inventory maintained. ★ : Inventory maintained in Japan.

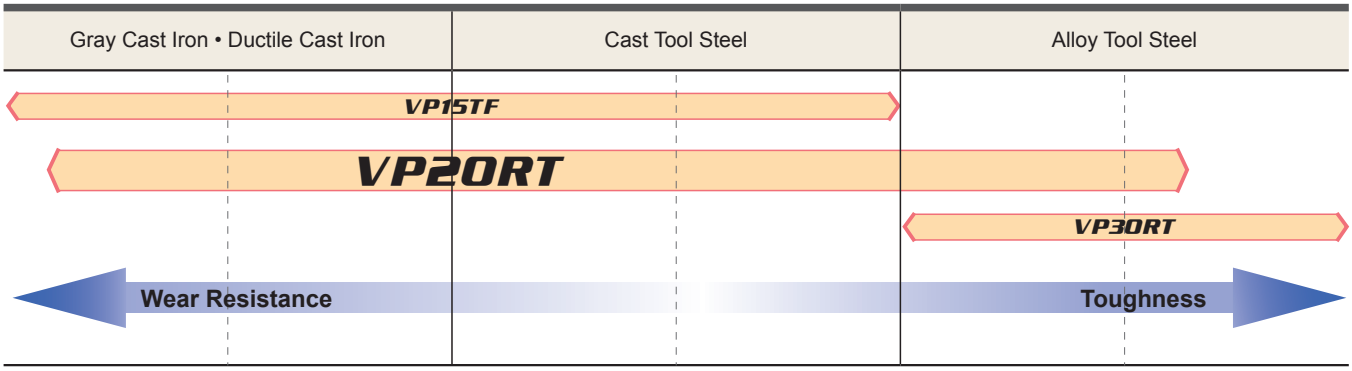
<10 inserts in one case>

RECOMMENDED CUTTING CONDITIONS

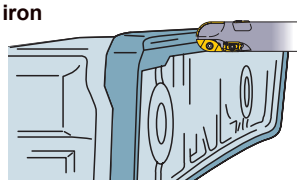
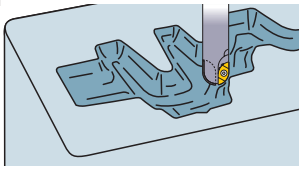
Cutting Mode	A : Slot Milling	B : Shoulder Milling (Standard Type)	C : Shoulder Milling (Long Cutting Edge Type)
			

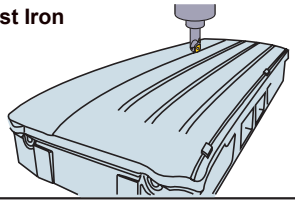
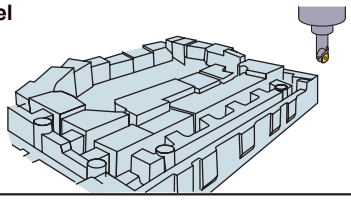
	Work Material	Hardness	Grade	Cutting Speed (SFM)	Feed per Tooth (IPR)	Cutting Mode
P	Alloy Tool Steel	≤250HB	**VP20RT VP30RT**	655 (525—820)	.008 (.004—.012)	A
					.008 (.004—.016)	B
					.012 (.004—.016)	C
	Cast Tool Steel	≤230HB	**VP15TF VP20RT**	655 (525—985)	.008 (.004—.012)	A
					.012 (.004—.018)	B
					.008 (.004—.016)	C
K	Ductile Cast Iron	Tensile Strength ≤540MPa	**VP15TF VP20RT**	655 (525—985)	.010 (.004—.016)	A
					.010 (.004—.018)	B
					.014 (.004—.018)	C
	Gray Cast Iron	Tensile Strength ≤350MPa	**VP15TF VP20RT**	655 (525—985)	.010 (.004—.016)	A
					.014 (.004—.018)	B
					.010 (.004—.016)	C

GRADE APPLICATION GUIDE



Application Examples

	Tool	SRM220SAL2	SRM220SAM2
	Insert	SRM220C-M, SRM220E-M	SRM220C-M, SRM220E-M
	Machine	Horizontal machining center	Double housing planing machining center
	Work Piece	**Gray cast iron** 	**Alloy steel** 
	Component	Press mold	Forging mold
Cutting Conditions	Cutting Speed (SFM)	540	370
	Table Feed (IPM)	27.5	11.8
	Feed per Tooth (IPT)	.009	.005
	Depth of Cut (inch)	.197-.315	.197
	Width of Cut (inch)	.197	.591
	Cutting mode	Air blow	Air blow
	Results	Compared to a conventional ball nose end mill, the SRM2 has offered better cutting performance, made smaller cutting noise and lengthen tool life 1.5 fold.	Compared to a conventional ball nose end mill, the SRM2 has offered betting cutting performance, made smaller cutting noise and lengthen tool life 1.3 fold.

	Tool	SRM2500WNML	SRM2500WNLS
	Insert	VP15TF	VP20RT
	Machine	2 way machining	Zigzag machining
	Work Piece	**Ductile Cast Iron** 	**Die Steel** 
	Component	Press mold	Press mold
Cutting Conditions	Revolution (min)	1200	1200
	Table Feed (IPM)	23.6-47.5	23.6
	Depth of Cut (inch)	.394-.591	.197-.787
	Pick Feed (inch)	.276	.394
	Cutting mode	Dry	Dry
	Results	Compared to a conventional product, tool life has become about 1.3 - 2 times longer. Small cutting noise and excellent chip disposal enabled unmanned machining at night.	Compared to a conventional product, tool life has become about 2 time longer. Unmanned machining has been achieved without unexpected insert fracture. Small cutting noise and stable cutting performance.

Avoiding screws/bolts seizing
●In order to avoid screws/bolts seizing, the application of a special lubricant MK1K (separately sold) is recommended when setting inserts on end mills.

For Your Safety
●Don't handle inserts and chips without gloves. ●Please machine within the recommended application range and exchange expired tools with new ones in advance of breakage. ●Please use safety covers and wear safety glasses. ●When using compounded cutting oils, please take fire precautions. ●When attaching inserts or spare parts, please use only the correct wrench or driver. ●When using rotating tools, please make a trial run to check run-out, vibration and abnormal sounds etc.

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