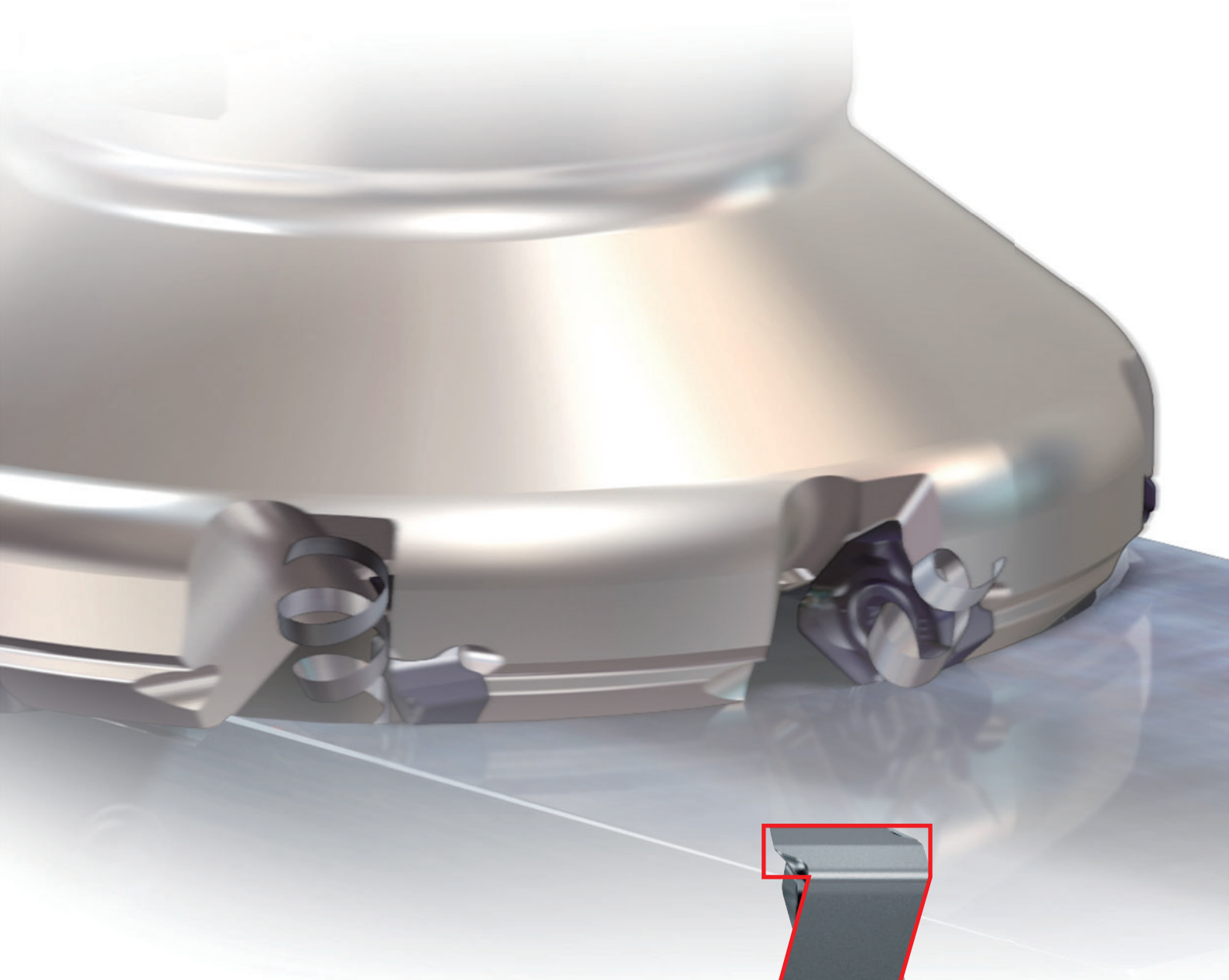
MITSUBISHI MITSUBISHI MATERIALS TOOLS NEWS
2017.1 Update B220G YOUR GLOBAL CRAFTSMAN STUDIO

Low Cutting Resistance, Double Sided Insert Face Mill for General Machining

WSX445

Series Expansion

Unique geometry minimizes chatter and vibration!



MIRACLE SIGMA

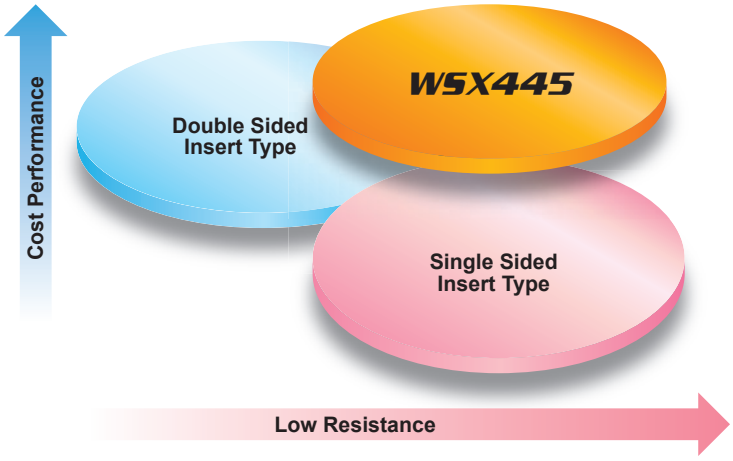
Double Geometry

Patent : Registration No. 5482190

Low Cutting Resistance, Double Sided Insert Face Mill for General Machining

WSX445

New face milling cutter with innovative double sided insert. Perfect balance between high efficiency and ease of use.

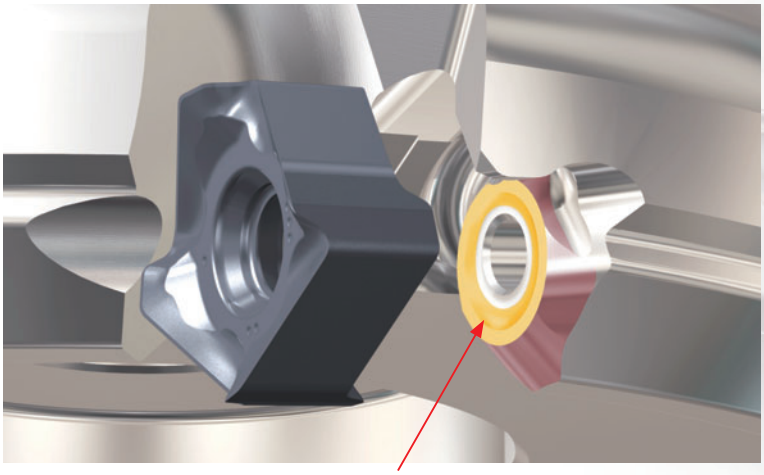


Designed to control abnormal insert breakage and body damage

The unique conical insert seat and Anti Fly mechanism (A.F.I) hold the insert securely. The outer edge of the insert is not in contact with the body, thereby preventing damage if sudden fracturing occurs. The thick insert negates the need for a shim.

Through Coolant Holes

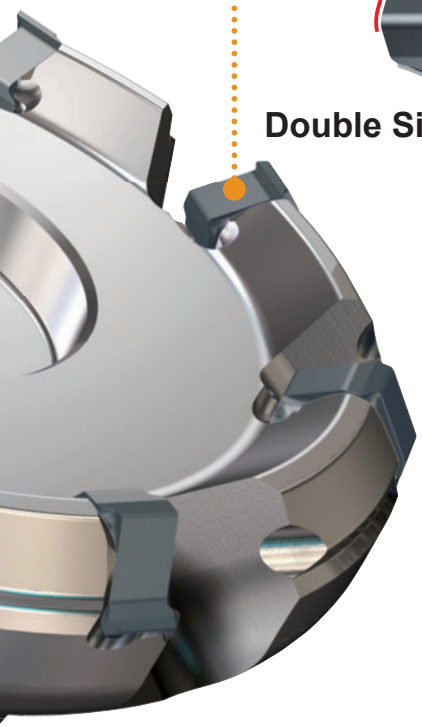
Improves chip discharge and prevents chip welding.



Anti Fly Insert Mechanism (A.F.I)

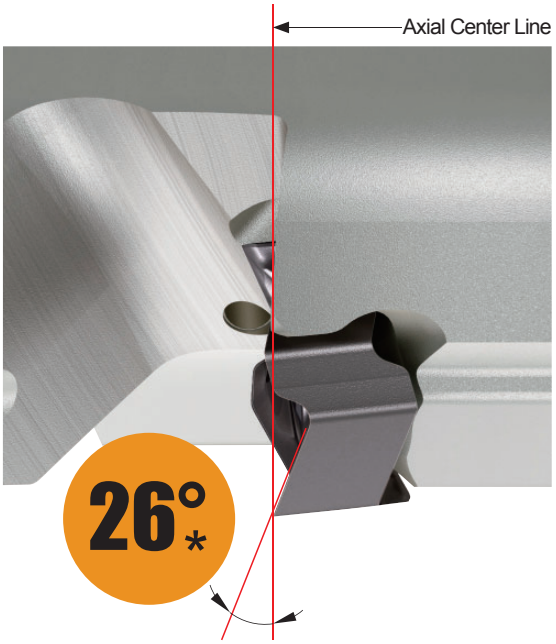
Unique insert minimizes chatter and vibration
Z Insert Geometry provides low cutting resistance

Mitsubishi Materials' proprietary "Double sided, Z Geometry" insert features a sharp cutting edge with low cutting resistance by utilizing features of both conventional positive and negative rake inserts.



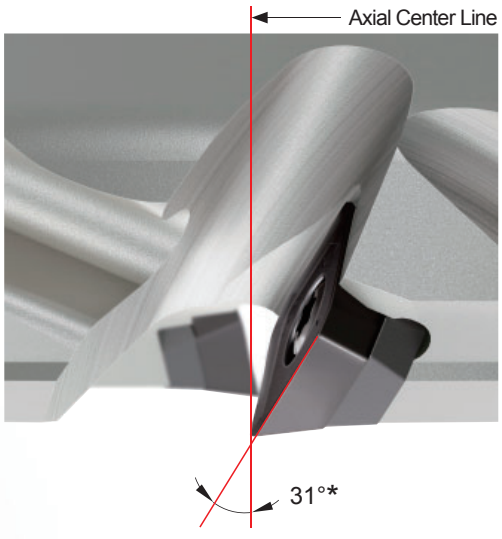
Double Sided, Z Geometry

WSX445



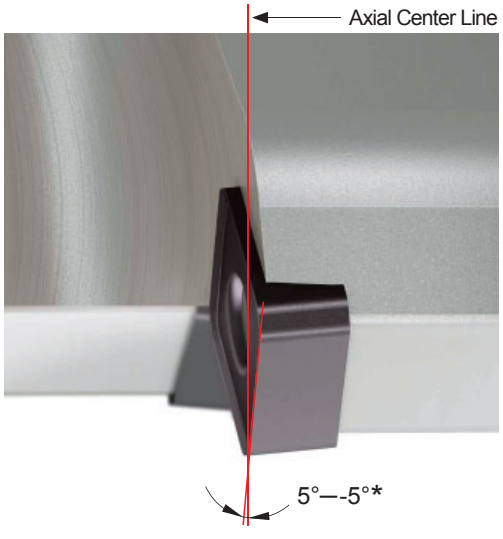
For a Sharper Cutting Edge **Double Sided Insert**

Conventional Positive Insert



For a Sharper Cutting Edge **Single Sided Insert**

Conventional Negative Insert



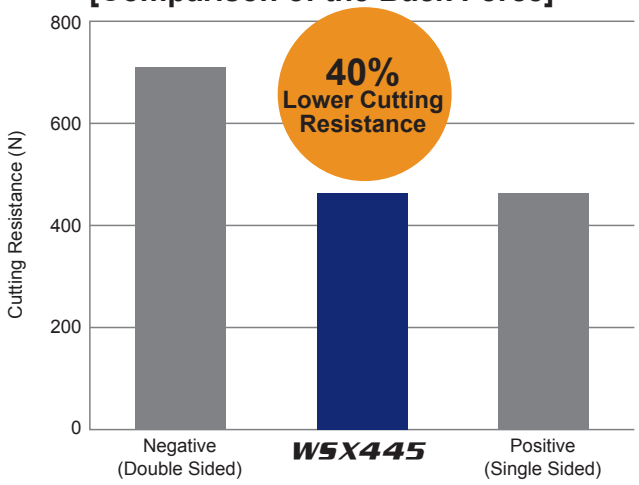
For Higher Edge Strength **Double Sided Insert**

*Rake angle mounted an insert.

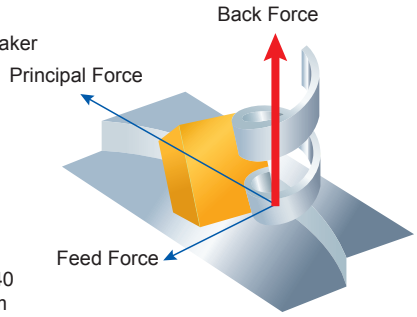
Cutting Resistance

WSX445's low cutting resistance equals that of single sided insert cutters.
The low axial and radial forces reduce vibrations to a minimum.

[Comparison of the Back Force]



WSX445 M Breaker
Conventional Insert



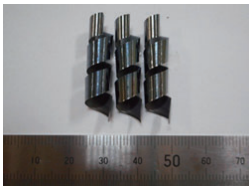
<Cutting Conditions>
Work Material : AISI 4140
Cutter Dia. : ø125mm
Cutting Speed : 200m/min
Feed per Tooth : 0.2mm/t.
Depth of Cut : ap=4.0mm
ae=100mm
Cutting Mode : Dry Cutting
Single Insert

<Back Force>
Cutting force in the axial direction. Back force can cause inaccuracy and vibration, resulting in deflection of the workpiece as well as cutting tools.

Chip Discharge Effect

Chips are discharged outwardly because of the negative/positive edge design.
This helps prevent jamming of continuous chips also damage to the coolant holes.

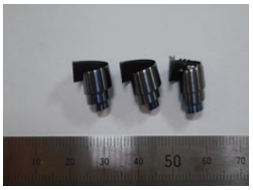
Conventional Positive Insert



WSX445

The chips generated are helical and are discharged outwardly.

Conventional Negative Insert A



Conventional Negative Insert B

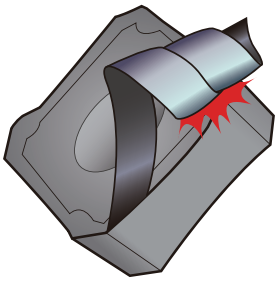
Chips can be discharged inwardly and can cause problems.

<Cutting Conditions>
Work Material : AISI 4140
Cutting Speed : 150m/min
Feed per Tooth : 0.2mm/t.
Depth of Cut : ap=4mm
ae=100mm
Cutting Mode : Dry Cutting

Abrasive Damage from Chips

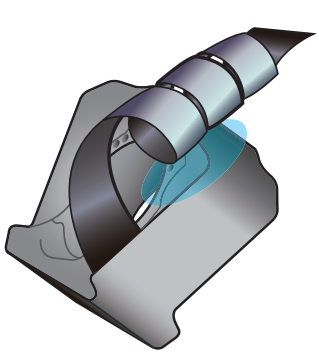
Depth of cut can be set without regard to the unused corner.

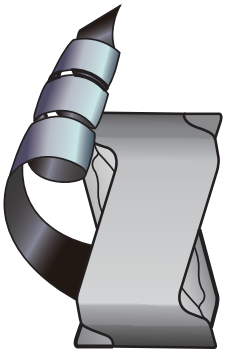
Conventional Double Sided Insert



Chips can contact the unused corner.

WSX445

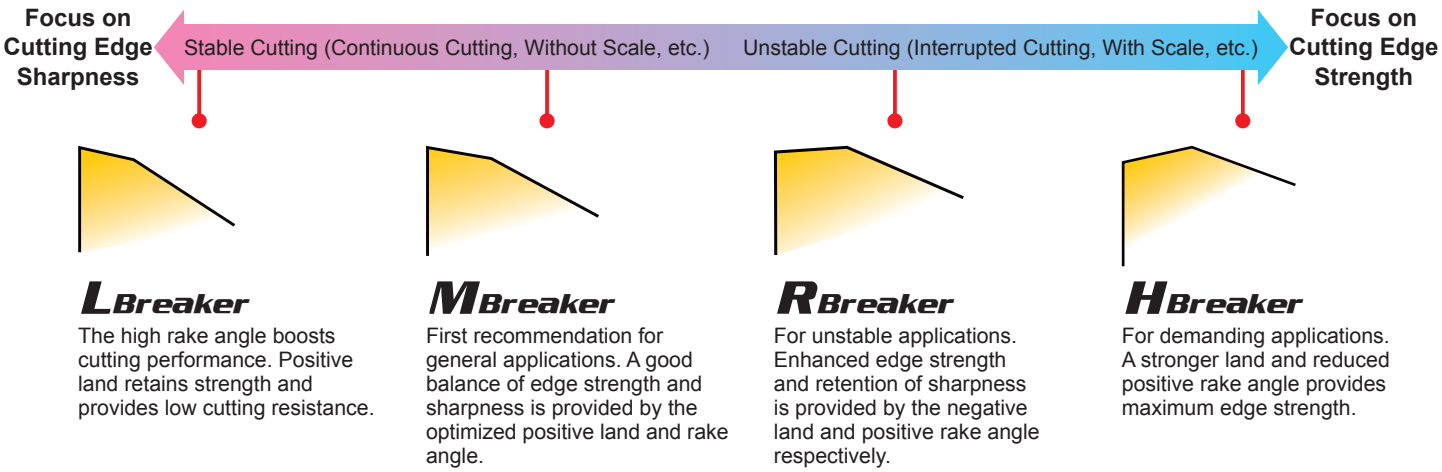




The chips generated do not contact the unused corner.

Breaker System

Breaker series for varied cutting condition



LBreaker

The high rake angle boosts cutting performance. Positive land retains strength and provides low cutting resistance.

MBreaker

First recommendation for general applications. A good balance of edge strength and sharpness is provided by the optimized positive land and rake angle.

RBreaker

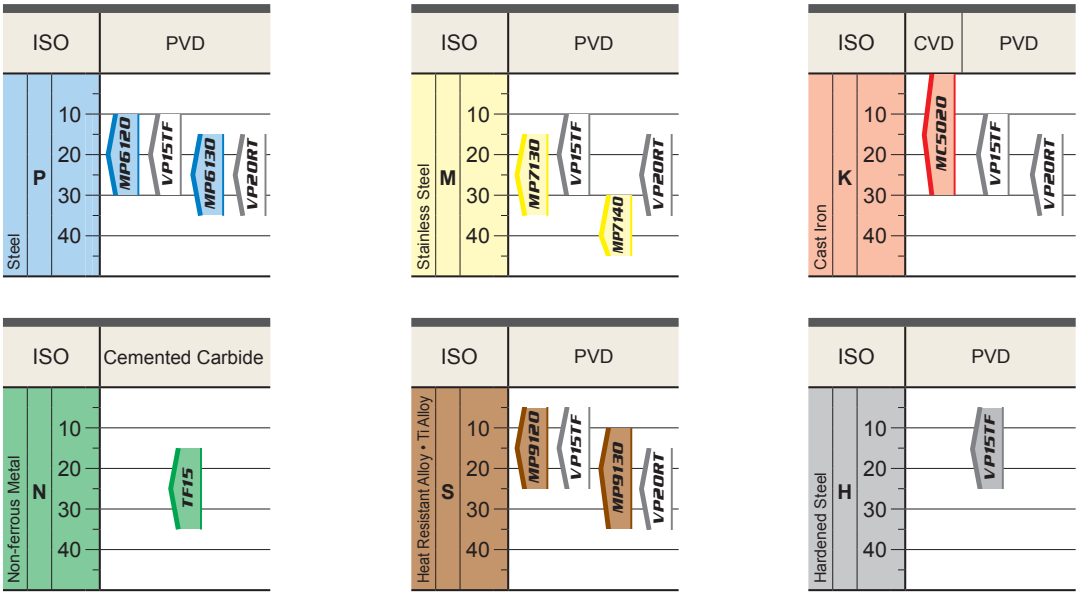
For unstable applications. Enhanced edge strength and retention of sharpness is provided by the negative land and positive rake angle respectively.

HBreaker

For demanding applications. A stronger land and reduced positive rake angle provides maximum edge strength.

Work Material	Cutting Conditions		
	Light	General	Heavy
P	L	M	R, H
M	L	M	
K	L	M	R, H
N	L		
S	L	M	
H	M	R	H

Insert Grade for a Wide Range of Materials



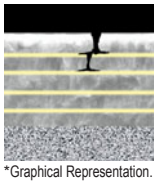
MP6100, MP7100, MP9100

TOUGH-Σ Technology

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

Base Layer
High Al-(Al, Ti)N

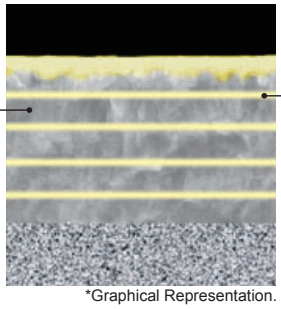
The new technology Al-(Al, Ti)N coating provides stabilisation of the high hardness phase and succeeds in dramatically improving wear, crater and welding resistance.



Multi-layering of the coating prevents any cracks penetrating through to the substrate.

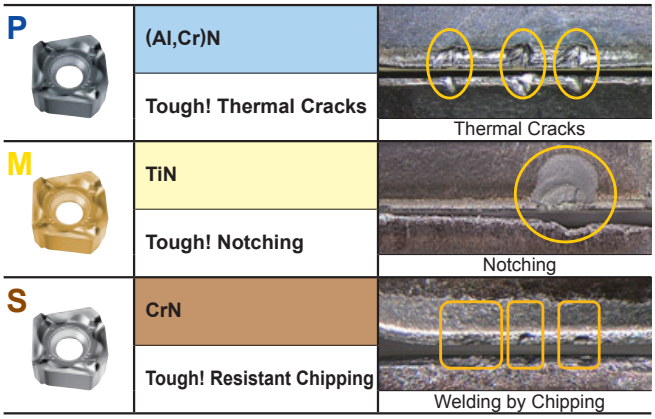
*Graphical Representation.

Al-Ti-Cr-N Based PVD Coating



*Graphical Representation.

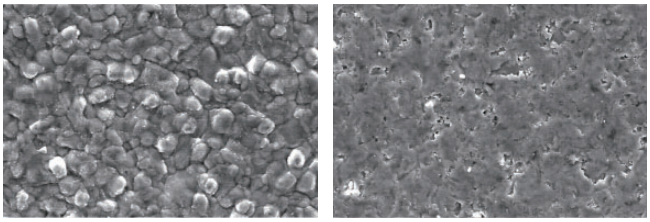
Best Layer of Each Work Material



CVD Coating *MC5020*

First recommendation for cast iron milling.
MC5020 has excellent wear resistance and also controls thermal cracking and chipping that are common when machining ductile cast iron.

Comparison of Coating Surface



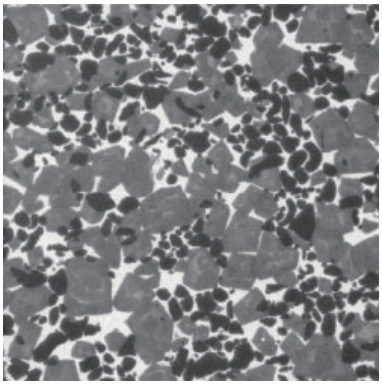
Conventional Coating | Black Super-smooth Coating

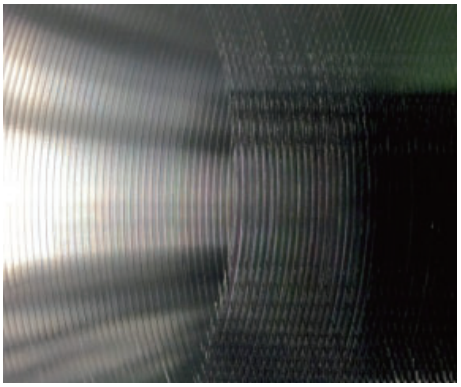
Extermely Smooth Coating Black Super-smooth Coating

An extremely smooth black super-smooth coating prevents abnormal damage such as weld chipping.

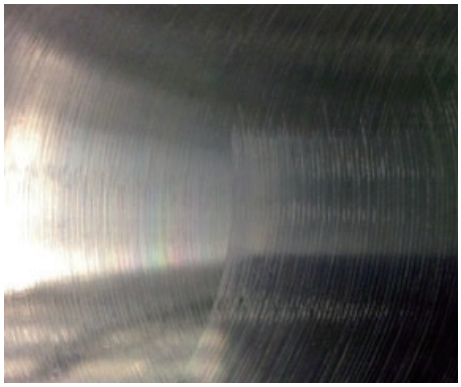
NEW Cermet Grade *MX3030*

Suitable for finishing and light cutting, etc.
Excellent welding and fracture resistance provides a coated finish.





Conventional



MX3030

<Cutting Conditions>
Work Material : ASTM A36M
Cutter Dia. : ø125mm
Cutting Speed : 200m/min
Feed per Tooth : 0.1mm/t.
Depth of Cut : ap=2.0mm ae=100mm
Cutting Mode : Dry Cutting
Center Cut
After 8m Cutting Work
8 Inserts

Low Cutting Resistance, Double Sided Insert Face Mill for General Machining

FACE MILLING <GENERAL CUTTING>

45° Finishing Roughing

WSX445

P M K N S H

- Unique design both sides insert
- Sudden fracture & welding prevention function
- Highly efficient chip discharge

Fig.1

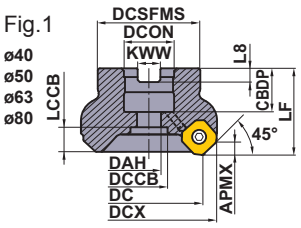


Fig.2

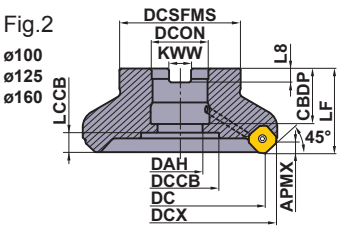
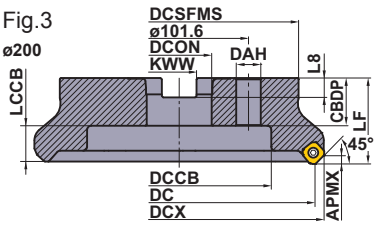


Fig.3



Right hand tool holder shown.

Arbor Type Right Hand Tool Holder

KAPR : 45°
GAMP : +17° T : -7°—-2°
GAMF : -6°—+1° I : +16°—+19°

DC = mm size, DCON = Inch size (mm)

DC	Order Number	Stock	Coolant Hole	* No.T	Type	DCX	LF	DCON	WT(kg)	APMX	Fig.
40	**WSX445-040A03AR**	●	○	3	Coarse Pitch	52.8	40	16	0.3	5	1
40	**WSX445-040A04AR**	●	○	4	Fine Pitch	52.8	40	16	0.3	5	1
50	**WSX445-050A03AR**	●	○	3	Coarse Pitch	62.9	40	22	0.5	5	1
50	**WSX445-050A04AR**	●	○	4	Fine Pitch	62.9	40	22	0.4	5	1
50	**WSX445-050A05AR**	●	○	5	Extra Fine Pitch	62.9	40	22	0.4	5	1
63	**WSX445-063A04AR**	●	○	4	Coarse Pitch	75.9	40	22	0.6	5	1
63	**WSX445-063A05AR**	●	○	5	Fine Pitch	75.9	40	22	0.6	5	1
63	**WSX445-063A06AR**	●	○	6	Extra Fine Pitch	75.9	40	22	0.6	5	1
80	**WSX445R08004CA**	●	○	4	Coarse Pitch	92.9	50	25.4	1.3	5	1
80	**WSX445R08006CA**	●	○	6	Fine Pitch	92.9	50	25.4	1.2	5	1
80	**WSX445R08008CA**	●	○	8	Extra Fine Pitch	92.9	50	25.4	1.1	5	1
100	**WSX445R10005DA**	●	○	5	Coarse Pitch	112.9	50	31.75	1.8	5	2
100	**WSX445R10007DA**	●	○	7	Fine Pitch	112.9	50	31.75	1.7	5	2
100	**WSX445R10010DA**	●	○	10	Extra Fine Pitch	112.9	50	31.75	1.6	5	2
125	**WSX445R12506EA**	●	○	6	Coarse Pitch	137.9	63	38.1	3.2	5	2
125	**WSX445R12508EA**	●	○	8	Fine Pitch	137.9	63	38.1	3.1	5	2
125	**WSX445R12512EA**	●	○	12	Extra Fine Pitch	137.9	63	38.1	3.0	5	2
160	**WSX445R16007FA**	●	○	7	Coarse Pitch	172.9	63	50.8	4.9	5	2
160	**WSX445R16010FA**	●	○	10	Fine Pitch	172.9	63	50.8	4.8	5	2
160	**WSX445R16016FA**	●	○	16	Extra Fine Pitch	172.8	63	50.8	4.6	5	2
200	**WSX445R20008KN**	●	–	8	Coarse Pitch	212.9	63	47.625	8.7	5	3
200	**WSX445R20012KN**	●	–	12	Fine Pitch	212.9	63	47.625	8.6	5	3
200	**WSX445R20020KN**	●	–	20	Extra Fine Pitch	212.8	63	47.625	8.4	5	3

Arbor Type Left Hand Tool Holder

DC = mm size, DCON = Inch size (mm)

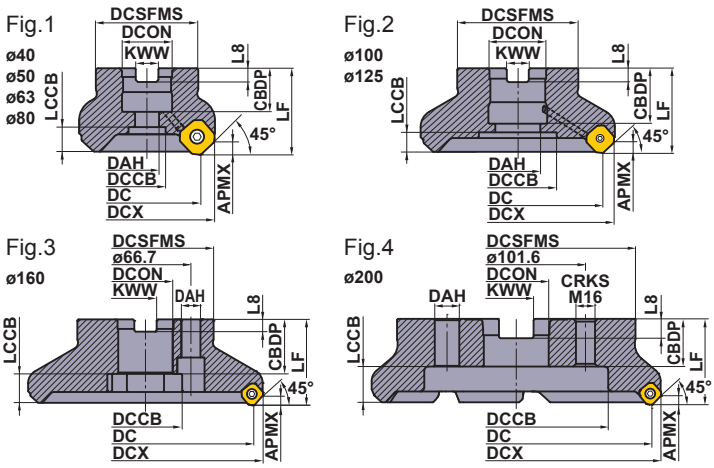
DC	Order Number	Stock	Coolant Hole	* No.T	Type	DCX	LF	DCON	WT(kg)	APMX	Fig.
NEW 80	**WSX445L08004CA**	●	○	4	Coarse Pitch	92.9	50	25.4	1.3	5	1
NEW 100	**WSX445L10005DA**	●	○	5	Coarse Pitch	112.9	50	31.75	1.8	5	2
NEW 125	**WSX445L12506EA**	●	○	6	Coarse Pitch	137.9	63	38.1	3.2	5	2
NEW 160	**WSX445L16007FA**	●	○	7	Coarse Pitch	172.9	63	50.8	4.9	5	2
NEW 200	**WSX445L20008KN**	●	–	8	Coarse Pitch	212.9	63	47.625	8.7	5	3

(Note1) A set bolt to the arbor is not supplied with the body. Please refer to page 9, when ordering.
(Note2) Please use a set bolt of the FMC(metric) type on the cutter body from 40 to 63 in diameter(DC).
(Note3) Please use a set bolt of the FMA type on the cutter body from 80 to 200 in diameter(DC).
* Number of Teeth

● : **Inventory maintained in Japan.**

Metric Standard

The cutter bore diameter DCON is indicated in millimetres.



Right hand tool holder shown.

Arbor Type Right Hand Tool Holder

KAPR : 45°
GAMP : +17° T : -7°—-2°
GAMF : -6°—+1° I : +16°—+19°

DC = mm size, DCON = mm size (mm)

DC	Order Number	Stock	Coolant Hole	* No.T	形式	DCX	LF	DCON	WT(kg)	APMX	Fig.
40	**WSX445-040A03AR**	●	○	3	Coarse Pitch	52.8	40	16	0.3	5	1
40	**WSX445-040A04AR**	●	○	4	Fine Pitch	52.8	40	16	0.3	5	1
50	**WSX445-050A03AR**	●	○	3	Coarse Pitch	62.9	40	22	0.5	5	1
50	**WSX445-050A04AR**	●	○	4	Fine Pitch	62.9	40	22	0.4	5	1
50	**WSX445-050A05AR**	●	○	5	Extra Fine Pitch	62.9	40	22	0.4	5	1
63	**WSX445-063A04AR**	●	○	4	Coarse Pitch	75.9	40	22	0.6	5	1
63	**WSX445-063A05AR**	●	○	5	Fine Pitch	75.9	40	22	0.6	5	1
63	**WSX445-063A06AR**	●	○	6	Extra Fine Pitch	75.9	40	22	0.6	5	1
80	**WSX445-080A04AR**	●	○	4	Coarse Pitch	92.9	50	27	1.3	5	1
80	**WSX445-080A06AR**	●	○	6	Fine Pitch	92.9	50	27	1.2	5	1
80	**WSX445-080A08AR**	●	○	8	Extra Fine Pitch	92.9	50	27	1.1	5	1
100	**WSX445-100B05AR**	●	○	5	Coarse Pitch	112.9	50	32	1.9	5	2
100	**WSX445-100B07AR**	●	○	7	Fine Pitch	112.9	50	32	1.9	5	2
100	**WSX445-100B10AR**	●	○	10	Extra Fine Pitch	112.9	50	32	1.8	5	2
125	**WSX445-125B06AR**	●	○	6	Coarse Pitch	137.9	63	40	3.4	5	2
125	**WSX445-125B08AR**	●	○	8	Fine Pitch	137.9	63	40	3.4	5	2
125	**WSX445-125B12AR**	●	○	12	Extra Fine Pitch	137.9	63	40	3.2	5	2
160	**WSX445-160C07NR**	●	–	7	Coarse Pitch	172.9	63	40	4.9	5	3
160	**WSX445-160C10NR**	●	–	10	Fine Pitch	172.9	63	40	4.8	5	3
160	**WSX445-160C16NR**	●	–	16	Extra Fine Pitch	172.8	63	40	4.6	5	3
200	**WSX445-200C08NR**	●	–	8	Coarse Pitch	212.9	63	60	7.5	5	4
200	**WSX445-200C12NR**	●	–	12	Fine Pitch	212.9	63	60	7.4	5	4
200	**WSX445-200C20NR**	●	–	20	Extra Fine Pitch	212.8	63	60	7.2	5	4

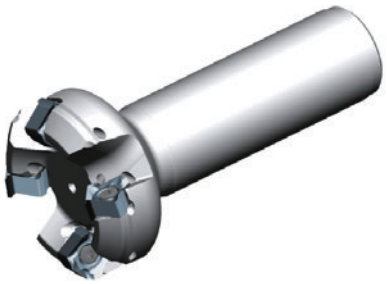
Arbor Type Left Hand Tool Holder

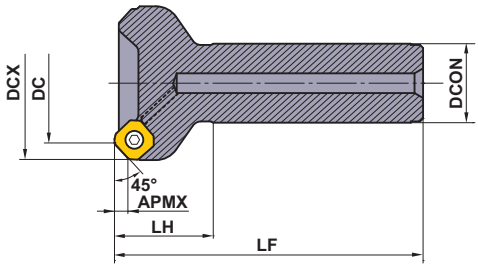
DC = mm size, DCON = mm size (mm)

DC	Order Number	Stock	Coolant Hole	* No.T	Type	DCX	LF	DCON	WT(kg)	APMX	Fig.
NEW 80	**WSX445-080A04AL**	●	○	4	Coarse Pitch	92.9	50	27	1.3	5	1
NEW 100	**WSX445-100B05AL**	●	○	5	Coarse Pitch	112.9	50	32	1.9	5	2
NEW 125	**WSX445-125B06AL**	●	○	6	Coarse Pitch	137.9	63	40	3.4	5	2
NEW 160	**WSX445-160C07NL**	●	–	7	Coarse Pitch	172.9	63	40	4.9	5	3

(Note1) A set bolt to the arbor is not supplied with the body. Please refer to page 9, when ordering.
(Note2) Please use a set bolt of the FMC(metric) type on the cutter body from 40 to 63 in diameter(DC).
(Note3) Please use a set bolt of the FMA type on the cutter body from 80 to 200 in diameter(DC).
* Number of Teeth

Low Cutting Resistance, Double Sided Insert Face Mill for General Machining





Right hand tool holder only.

Shank Type

(mm)

DC	Order Number	Stock	Coolant Hole	* No.T	Type	DCX	LF	DCON	LH	WT(kg)	APMX
40	**WSX445R4003SA32M**	●	○	3	Coarse Pitch	52.8	125	32	40	0.8	5
40	**WSX445R4004SA32M**	●	○	4	Fine Pitch	52.8	125	32	40	0.8	5
50	**WSX445R5003SA32M**	●	○	3	Coarse Pitch	62.9	125	32	40	1.0	5
50	**WSX445R5004SA32M**	●	○	4	Fine Pitch	62.9	125	32	40	1.0	5
63	**WSX445R6304SA32M**	●	○	4	Coarse Pitch	75.9	125	32	40	1.2	5
63	**WSX445R6305SA32M**	●	○	5	Fine Pitch	75.9	125	32	40	1.2	5
80	**WSX445R8004SA32M**	●	○	4	Coarse Pitch	92.9	125	32	40	1.6	5
80	**WSX445R8006SA32M**	●	○	6	Fine Pitch	92.9	125	32	40	1.5	5

* Number of Teeth

Spare Parts

Arbor Type	 * Clamp Screw	 Wrench (Insert)
WSX445	TPS4R	TIP15W

* Clamp Torque (N • m) : TPS4R=3.5

Set Bolt (Sold Separately)

(mm)

Arbor Type	Set Bolt: With Coolant Hole Order Number	Set Bolt: Without Coolant Hole Order Number	Fig.	Reference Dimensions a	b	c	d	e	f	g	Geometry
WSX445-040A○○AR	HSC08025H	HSC08040	1	13	M8×1.25	33	8	5	–	–	
WSX445-050A○○AR	HSC10030H	HSC10035	1	16	M10×1.5	40	10	6	–	–	Fig.1
WSX445-063A○○AR	HSC10030H	HSC10035	1	16	M10×1.5	40	10	6	–	–	
WSX445-080A○○A○	HSC12035H	HSC12035 HSC12045	1	18	M12×1.75	47 57	12	10	–	–	
WSX445-100B○○A○	MBA16033H	—	2	40	M16×2	43	10	14	6	23	
WSX445-125B○○A○	MBA20040H	—	2	50	M20×2.5	54	14	17	6	27	
WSX445-160C○○N○	No coolant hole	—	2	50	M20×2.5	54	14	17	6	27	Fig.2
WSX445-200C○○NR	No coolant hole	—	1	24	M16×2	43	16	14	–	–	
WSX445○080○○CA	HSC12035H	HSC12035 HSC12045	1	18	M12×1.75	47 57	12	10	–	–	
WSX445○100○○DA	MBA16033H	—	2	40	M16×2	43	10	14	6	23	
WSX445○125○○EA	MBA20040H	—	2	50	M20×2.5	54	14	17	6	27	
WSX445○160○○FA	MBA24045H	—	2	65	M24×3	59	14	17	10	37	
WSX445○200○○KN	No coolant hole	—	1	24	M16×2	43	16	14	–	–	

(Note 1) Internal coolant is necessary with the set bolt.

● : Inventory maintained in Japan. (10 inserts in one case)

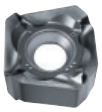
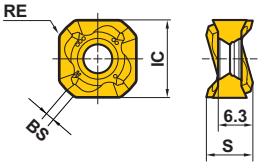
Inserts with Breaker

(mm)

Work Material		
	P	Steel
	M	Stainless Steel
	K	Cast Iron
	N	Non-ferrous Metal
	S	Heat-resistant Alloy, Titanium Alloy
	H	Hardened Steel

Cutting Conditions :
● : Stable Cutting ◐ : General Cutting
✣ : Unstable Cutting

Honing : **E :** Round **F :** Sharp

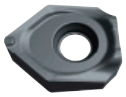
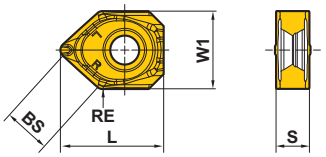
Shape	Order Number	Class	Hand	Honing	Coated									Cermet	Carbide		IC	S	BS	RE	Geometry
					MC5020	MP6120	MP6130	MP7130	MP7140 NEW	MP9120	MP9130 NEW	VP15TF	VP20RT	MX3030 NEW	TF15						
	SNGU140812ANFR-L	G	R	F											●		14	8.4	1.5	1.2	
	SNGU140812ANER-L	G	R	E	●	●	●	●	●	●	●	●	●	●			14	8.4	1.5	1.2	
	SNGU140812ANER-M	G	R	E	●	●	●	●	●	●	●	●	●	●			14	8.4	1.5	1.2	
	SNMU140812ANER-M	M	R	E	●	●	●	●	●	●	●	●	●	●			14	8.4	1.5	1.2	
	SNMU140812ANER-R	M	R	E	●	●	●					●	●				14	8.4	1.5	1.2	
	SNMU140812ANER-H	M	R	E	●	●	●					●	●				14	8.4	1.5	1.2	
NEW	SNGU140812ANEL-M	G	L	E	●	●	●					●		●			14	8.4	1.5	1.2	
NEW	SNMU140812ANEL-M	M	L	E	●	●	●					●		●			14	8.4	1.5	1.2	
NEW	SNMU140812ANEL-R	M	L	E	●	●	●					●					14	8.4	1.5	1.2	

Right hand insert shown.

■ = MIRACLE SIGMA

Wiper Inserts

(mm)

Shape	Order Number	Class	Honing	Coated				L	W1	S	BS	RE	Geometry
				MC5020	MP6120	VP15TF							
	WNGU1406ANEN8C-M	G	E	●	●	●		18.1	14	6	8	1.0	

■ = MIRACLE SIGMA

Instructions for Use of Wiper Iinserts

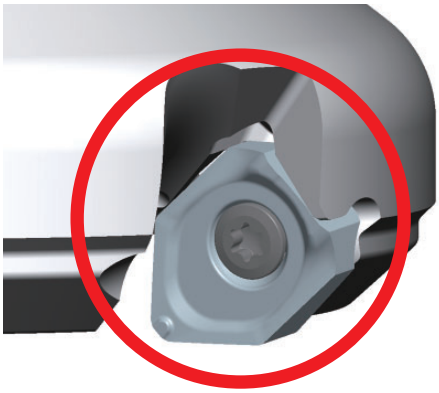


Fig.1

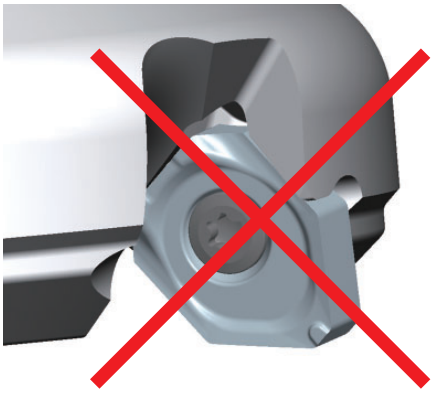


Fig.2

Wiper inserts for WSX445 are two-cornered. Please set as shown in Fig.1.
Excellent finished surfaces can be achieved with one wiper.
Set more than 2 wiper inserts, equally spaced, when the feed per revolution is larger than 8mm/rev.

Recommended Cutting Conditions

Dry Cutting

Work Material		Hardness	1st Recommendation	2nd Recommendation	vc (m/min)	Finish Cutting fz	Finish Cutting ap
P						L Breaker	
	Mild Steel	≤ 180HB	MP6120	VP15TF	250 (200—300)	0.15 (0.1—0.2)	≤ 1.0
			MP6130	VP20RT	240 (190—290)	0.15 (0.1—0.2)	≤ 1.0
			MX3030	—	180 (130—230)	0.15 (0.1—0.2)	≤ 1.0
	Carbon Steel Alloy Steel	180—350HB	MP6120	VP15TF	220 (170—270)	0.15 (0.1—0.2)	≤ 1.0
			MP6130	VP20RT	200 (150—250)	0.15 (0.1—0.2)	≤ 1.0
			MX3030	—	150 (120—180)	0.15 (0.1—0.2)	≤ 1.0
	Alloy Tool Steel	≤ 350HB (annealing)	MP6120	VP15TF	220 (170—270)	0.15 (0.1—0.2)	≤ 1.0
			MP6130	VP20RT	200 (150—250)	0.15 (0.1—0.2)	≤ 1.0
			MX3030	—	150 (120—180)	0.15 (0.1—0.2)	≤ 1.0
	Pre-Hardened Steel	35—45HRC	MP6120	VP15TF	140 (100—180)	0.15 (0.1—0.2)	≤ 1.0
			MP6130	VP20RT	120 (90—150)	0.15 (0.1—0.2)	≤ 1.0
M						L Breaker	
	Austenitic Stainless Steel	≤ 200HB	MP7130	VP15TF	200 (150—250)	0.15 (0.1—0.2)	≤ 1.0
			MP7140	VP20RT	200 (150—250)	0.15 (0.1—0.2)	≤ 1.0
			MX3030	—	130 (100—180)	0.15 (0.1—0.2)	≤ 1.0
	Austenitic Stainless Steel	>200HB	MP7130	VP15TF	170 (120—220)	0.15 (0.1—0.2)	≤ 1.0
			MP7140	VP20RT	170 (120—220)	0.15 (0.1—0.2)	≤ 1.0
	Two-phase Stainless Steel	≤ 280HB	MP7130	VP15TF	160 (110—210)	0.15 (0.1—0.2)	≤ 1.0
			MP7140	VP20RT	160 (110—210)	0.15 (0.1—0.2)	≤ 1.0
	Precipitation Hardening Stainless Steel	≤ 450HB	MP7130	VP15TF	150 (100—200)	0.15 (0.1—0.2)	≤ 1.0
			MP7140	VP20RT	150 (100—200)	0.15 (0.1—0.2)	≤ 1.0
K						L Breaker	
	Gray Cast Iron	≤ 350MPa	MC5020	—	220 (200—270)	0.15 (0.1—0.2)	≤ 1.0
			VP15TF	—	180 (130—250)	0.15 (0.1—0.2)	≤ 1.0
			VP20RT	—	170 (120—240)	0.15 (0.1—0.2)	≤ 1.0
			MX3030	—	150 (120—180)	0.15 (0.1—0.2)	≤ 1.0
	Ductile Cast Iron	≤ 450MPa	MC5020	—	200 (180—250)	0.15 (0.1—0.2)	≤ 1.0
			VP15TF	VP20RT	160 (110—240)	0.15 (0.1—0.2)	≤ 1.0
	Ductile Cast Iron	≤ 800MPa	MC5020	—	200 (180—250)	0.15 (0.1—0.2)	≤ 1.0
			VP15TF	—	160 (110—240)	0.15 (0.1—0.2)	≤ 1.0
			VP20RT	—	150 (100—200)	0.15 (0.1—0.2)	≤ 1.0
H						M Breaker	
	Hardened Steel	40—55HRC	VP15TF	—	50 (30—70)	0.05 (0.05—0.1)	≤ 1.0
	Hardened Steel	55—62HRC	VP15TF	—	40 (20—50)	0.05 (0.05—0.1)	≤ 1.0

* Refer to the table above and set the cutting conditions to match the application.
* Wet cutting is recommended, when focusing on the surface finish. (Life is lower than dry cutting.)

(mm)

	Light Cutting		Medium Cutting		Rough Cutting		Heavy Cutting	
	fz	ap	fz	ap	fz	ap	fz	ap
	L,M Breaker		M Breaker		M,R Breaker		R,H Breaker	
	0.15 (0.1–0.2)	≤ 2.0	0.2 (0.15–0.25)	≤ 3.0	0.2 (0.15–0.25)	≤ 4.0	0.25 (0.2–0.3)	≤ 5.0
	0.15 (0.1–0.2)	≤ 2.0	0.2 (0.15–0.25)	≤ 3.0	0.2 (0.15–0.25)	≤ 4.0	0.25 (0.2–0.3)	≤ 5.0
	0.15 (0.1–0.2)	≤ 2.0	0.2 (0.15–0.25)	≤ 3.0	–	–	–	–
	0.15 (0.1–0.2)	≤ 2.0	0.2 (0.15–0.25)	≤ 3.0	0.2 (0.15–0.25)	≤ 4.0	0.25 (0.2–0.3)	≤ 5.0
	0.15 (0.1–0.2)	≤ 2.0	0.2 (0.15–0.25)	≤ 3.0	0.2 (0.15–0.25)	≤ 4.0	0.25 (0.2–0.3)	≤ 5.0
	0.15 (0.1–0.2)	≤ 2.0	0.2 (0.15–0.25)	≤ 3.0	–	–	–	–
	0.15 (0.1–0.2)	≤ 2.0	0.2 (0.15–0.25)	≤ 3.0	0.2 (0.15–0.25)	≤ 4.0	0.25 (0.2–0.3)	≤ 5.0
	0.15 (0.1–0.2)	≤ 2.0	0.2 (0.15–0.25)	≤ 3.0	0.2 (0.15–0.25)	≤ 4.0	0.25 (0.2–0.3)	≤ 5.0
	0.15 (0.1–0.2)	≤ 2.0	0.2 (0.15–0.25)	≤ 3.0	–	–	–	–
	0.15 (0.1–0.2)	≤ 2.0	0.2 (0.15–0.25)	≤ 3.0	0.2 (0.15–0.25)	≤ 4.0	0.25 (0.2–0.3)	≤ 5.0
	0.15 (0.1–0.2)	≤ 2.0	0.2 (0.15–0.25)	≤ 3.0	0.2 (0.15–0.25)	≤ 4.0	0.25 (0.2–0.3)	≤ 5.0
	L,M Breaker		M Breaker					
	0.15 (0.1–0.2)	≤ 2.0	0.2 (0.15–0.25)	≤ 3.0	–	–	–	–
	0.15 (0.1–0.2)	≤ 2.0	0.2 (0.15–0.25)	≤ 3.0	–	–	–	–
	0.15 (0.1–0.2)	≤ 2.0	–	–	–	–	–	–
	0.15 (0.1–0.2)	≤ 2.0	0.2 (0.15–0.25)	≤ 3.0	–	–	–	–
	0.15 (0.1–0.2)	≤ 2.0	0.2 (0.15–0.25)	≤ 3.0	–	–	–	–
	0.15 (0.1–0.2)	≤ 2.0	0.2 (0.15–0.25)	≤ 3.0	–	–	–	–
	0.15 (0.1–0.2)	≤ 2.0	0.2 (0.15–0.25)	≤ 3.0	–	–	–	–
	0.15 (0.1–0.2)	≤ 2.0	0.2 (0.15–0.25)	≤ 3.0	–	–	–	–
	0.15 (0.1–0.2)	≤ 2.0	0.2 (0.15–0.25)	≤ 3.0	–	–	–	–
	L,M Breaker		M Breaker		M,R Breaker		R,H Breaker	
	0.15 (0.1–0.2)	≤ 2.0	0.2 (0.15–0.25)	≤ 3.0	0.2 (0.15–0.25)	≤ 4.0	0.25 (0.2–0.3)	≤ 5.0
	0.15 (0.1–0.2)	≤ 2.0	0.2 (0.15–0.25)	≤ 3.0	0.2 (0.15–0.25)	≤ 4.0	0.25 (0.2–0.3)	≤ 5.0
	0.15 (0.1–0.2)	≤ 2.0	0.2 (0.15–0.25)	≤ 3.0	0.2 (0.15–0.25)	≤ 4.0	0.25 (0.2–0.3)	≤ 5.0
	0.15 (0.1–0.2)	≤ 2.0	0.2 (0.15–0.25)	≤ 3.0	–	–	–	–
	0.15 (0.1–0.2)	≤ 2.0	0.2 (0.15–0.25)	≤ 3.0	0.2 (0.15–0.25)	≤ 4.0	0.25 (0.2–0.3)	≤ 5.0
	0.15 (0.1–0.2)	≤ 2.0	0.2 (0.15–0.25)	≤ 3.0	0.2 (0.15–0.25)	≤ 4.0	0.25 (0.2–0.3)	≤ 5.0
	0.15 (0.1–0.2)	≤ 2.0	0.2 (0.15–0.25)	≤ 3.0	0.2 (0.15–0.25)	≤ 4.0	0.25 (0.2–0.3)	≤ 5.0
	0.15 (0.1–0.2)	≤ 2.0	0.2 (0.15–0.25)	≤ 3.0	0.2 (0.15–0.25)	≤ 4.0	0.25 (0.2–0.3)	≤ 5.0
	0.15 (0.1–0.2)	≤ 2.0	0.2 (0.15–0.25)	≤ 3.0	0.2 (0.15–0.25)	≤ 4.0	0.25 (0.2–0.3)	≤ 5.0
	M,R Breaker		R,H Breaker					
	0.05 (0.05–0.1)	≤ 1.5	0.1 (0.05–0.15)	≤ 2.0	–	–	–	–
	0.05 (0.05–0.1)	≤ 1.5	0.1 (0.05–0.15)	≤ 2.0	–	–	–	–

Recommended Cutting Conditions

Wet Cutting

Work Material		Hardness	1st Recommendation	2nd Recommendation	vc (m/min)	Finish Cutting fz	Finish Cutting ap
P						L Breaker	
	Mild Steel	≤ 180HB	MP6120	VP15TF	150 (100—200)	0.15 (0.1—0.2)	≤ 1.0
			MP6130	VP20RT	150 (100—200)	0.15 (0.1—0.2)	≤ 1.0
	Carbon Steel Alloy Steel	180—350HB	MP6120	VP15TF	120 (80—160)	0.15 (0.1—0.2)	≤ 1.0
			MP6130	VP20RT	120 (80—160)	0.15 (0.1—0.2)	≤ 1.0
	Alloy Tool Steel	≤ 350HB (annealing)	MP6120	VP15TF	120 (80—160)	0.15 (0.1—0.2)	≤ 1.0
			MP6130	VP20RT	120 (80—160)	0.15 (0.1—0.2)	≤ 1.0
	Pre-Hardened Steel	35—45HRC	MP6120	VP15TF	100 (80—120)	0.15 (0.1—0.2)	≤ 1.0
			MP6130	VP20RT	100 (80—120)	0.15 (0.1—0.2)	≤ 1.0
M						L Breaker	
	Austenitic Stainless Steel	≤ 200HB	MP7130	VP15TF	130 (80—180)	0.15 (0.1—0.2)	≤ 1.0
			MP7140	VP20RT	130 (80—180)	0.15 (0.1—0.2)	≤ 1.0
	Austenitic Stainless Steel	> 200HB	MP7130	VP15TF	100 (80—150)	0.15 (0.1—0.2)	≤ 1.0
			MP7140	VP20RT	100 (80—150)	0.15 (0.1—0.2)	≤ 1.0
	Two-phase Stainless Steel	≤ 280HB	MP7130	VP15TF	100 (80—150)	0.15 (0.1—0.2)	≤ 1.0
			MP7140	VP20RT	100 (80—150)	0.15 (0.1—0.2)	≤ 1.0
	Precipitation Hardening Stainless Steel	≤ 450HB	MP7130	VP15TF	90 (50—140)	0.15 (0.1—0.2)	≤ 1.0
			MP7140	VP20RT	90 (50—140)	0.15 (0.1—0.2)	≤ 1.0
K						L Breaker	
	Gray Cast Iron	≤ 350MPa	MC5020	—	180 (160—200)	0.15 (0.1—0.2)	≤ 1.0
			VP15TF	VP20RT	130 (100—160)	0.15 (0.1—0.2)	≤ 1.0
	Ductile Cast Iron	≤ 450MPa	MC5020	—	180 (160—200)	0.15 (0.1—0.2)	≤ 1.0
			VP15TF	VP20RT	130 (100—160)	0.15 (0.1—0.2)	≤ 1.0
	Ductile Cast Iron	≤ 800MPa	MC5020	—	180 (160—200)	0.15 (0.1—0.2)	≤ 1.0
			VP15TF	VP20RT	110 (80—140)	0.15 (0.1—0.2)	≤ 1.0
N						L Breaker	
	Aluminum Alloy	—	TF15	—	≥ 300	0.15 (0.1—0.2)	≤ 1.0
S						L Breaker	
	Titanium Alloy	—	MP9120	VP15TF	50 (40—60)	0.05 (0.05—0.1)	≤ 1.0
			MP9130	VP20RT	50 (40—60)	0.05 (0.05—0.1)	≤ 1.0
	Heat Resistant Alloy	—	MP9120	VP15TF	40 (20—50)	0.05 (0.05—0.1)	≤ 1.0
			MP9130	VP20RT	40 (20—50)	0.05 (0.05—0.1)	≤ 1.0

* Refer to the table above and set the cutting conditions to match the application.
* Wet cutting is recommended, when focusing on the surface finish. (Life is lower than dry cutting.)

(mm)

	Light Cutting		Medium Cutting		Rough Cutting		Heavy Cutting	
	fz	ap	fz	ap	fz	ap	fz	ap
	L,M Breaker		M Breaker		M,R Breaker		R,H Breaker	
	0.15 (0.1—0.2)	≤ 2.0	0.2 (0.15—0.25)	≤ 3.0	0.2 (0.15—0.25)	≤ 4.0	0.25 (0.2—0.3)	≤ 5.0
	0.15 (0.1—0.2)	≤ 2.0	0.2 (0.15—0.25)	≤ 3.0	0.2 (0.15—0.25)	≤ 4.0	0.25 (0.2—0.3)	≤ 5.0
	0.15 (0.1—0.2)	≤ 2.0	0.2 (0.15—0.25)	≤ 3.0	0.2 (0.15—0.25)	≤ 4.0	0.25 (0.2—0.3)	≤ 5.0
	0.15 (0.1—0.2)	≤ 2.0	0.2 (0.15—0.25)	≤ 3.0	0.2 (0.15—0.25)	≤ 4.0	0.25 (0.2—0.3)	≤ 5.0
	0.15 (0.1—0.2)	≤ 2.0	0.2 (0.15—0.25)	≤ 3.0	0.2 (0.15—0.25)	≤ 4.0	0.25 (0.2—0.3)	≤ 5.0
	0.15 (0.1—0.2)	≤ 2.0	0.2 (0.15—0.25)	≤ 3.0	0.2 (0.15—0.25)	≤ 4.0	0.25 (0.2—0.3)	≤ 5.0
	0.15 (0.1—0.2)	≤ 2.0	0.2 (0.15—0.25)	≤ 3.0	0.2 (0.15—0.25)	≤ 4.0	0.25 (0.2—0.3)	≤ 5.0
	0.15 (0.1—0.2)	≤ 2.0	0.2 (0.15—0.25)	≤ 3.0	0.2 (0.15—0.25)	≤ 4.0	0.25 (0.2—0.3)	≤ 5.0
	L,M Breaker		M Breaker					
	0.15 (0.1—0.2)	≤ 2.0	0.2 (0.15—0.25)	≤ 3.0	—	—	—	—
	0.15 (0.1—0.2)	≤ 2.0	0.2 (0.15—0.25)	≤ 3.0	—	—	—	—
	0.15 (0.1—0.2)	≤ 2.0	0.2 (0.15—0.25)	≤ 3.0	—	—	—	—
	0.15 (0.1—0.2)	≤ 2.0	0.2 (0.15—0.25)	≤ 3.0	—	—	—	—
	0.15 (0.1—0.2)	≤ 2.0	0.2 (0.15—0.25)	≤ 3.0	—	—	—	—
	0.15 (0.1—0.2)	≤ 2.0	0.2 (0.15—0.25)	≤ 3.0	—	—	—	—
	0.15 (0.1—0.2)	≤ 2.0	0.2 (0.15—0.25)	≤ 3.0	—	—	—	—
	0.15 (0.1—0.2)	≤ 2.0	0.2 (0.15—0.25)	≤ 3.0	—	—	—	—
	L,M Breaker		M Breaker		M,R Breaker		R,H Breaker	
	0.15 (0.1—0.2)	≤ 2.0	0.15 (0.1—0.2)	≤ 2.0	0.2 (0.15—0.25)	≤ 4.0	0.25 (0.2—0.3)	≤ 5.0
	0.15 (0.1—0.2)	≤ 2.0	0.15 (0.1—0.2)	≤ 2.0	0.2 (0.15—0.25)	≤ 4.0	0.25 (0.2—0.3)	≤ 5.0
	0.15 (0.1—0.2)	≤ 2.0	0.15 (0.1—0.2)	≤ 2.0	0.2 (0.15—0.25)	≤ 4.0	0.25 (0.2—0.3)	≤ 5.0
	0.15 (0.1—0.2)	≤ 2.0	0.15 (0.1—0.2)	≤ 2.0	0.2 (0.15—0.25)	≤ 4.0	0.25 (0.2—0.3)	≤ 5.0
	0.15 (0.1—0.2)	≤ 2.0	0.15 (0.1—0.2)	≤ 2.0	0.2 (0.15—0.25)	≤ 4.0	0.25 (0.2—0.3)	≤ 5.0
	0.15 (0.1—0.2)	≤ 2.0	0.15 (0.1—0.2)	≤ 2.0	0.2 (0.15—0.25)	≤ 4.0	0.25 (0.2—0.3)	≤ 5.0
	L Breaker		L Breaker		L Breaker		L Breaker	
	0.15 (0.1—0.2)	≤ 2.0	0.2 (0.15—0.25)	≤ 3.0	0.2 (0.15—0.25)	≤ 4.0	0.25 (0.2—0.3)	≤ 5.0
	L,M Breaker		M Breaker					
	0.05 (0.05—0.1)	≤ 1.5	0.1 (0.05—0.15)	≤ 2.0	—	—	—	—
	0.05 (0.05—0.1)	≤ 1.5	0.1 (0.05—0.15)	≤ 2.0	—	—	—	—
	0.05 (0.05—0.1)	≤ 1.5	0.1 (0.05—0.15)	≤ 2.0	—	—	—	—
	0.05 (0.05—0.1)	≤ 1.5	0.1 (0.05—0.15)	≤ 2.0	—	—	—	—

Arbor Type Mounting Dimensions

Fig.1
ø40
ø50
ø63
ø80

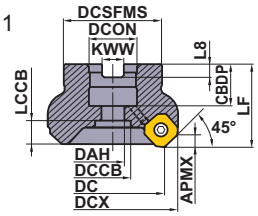


Fig.2
ø100
ø125
ø160

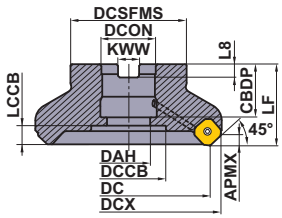
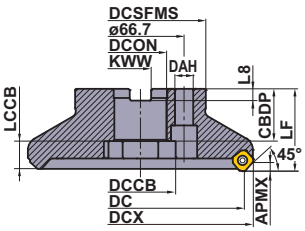


Fig.3
ø160



Right hand tool holder shown.

(mm)

DC	Order Number	DCON	CBDP	DAH	DCCB	LCCB	DCSFMS	KWW	L8	Fig.
40	**WSX445-040A03AR**	16	18	9	14	13.3	37	8.4	5.6	1
40	**WSX445-040A04AR**	16	18	9	14	13.3	37	8.4	5.6	1
50	**WSX445-050A03AR**	22	20	11	17	11.3	47	10.4	6.3	1
50	**WSX445-050A04AR**	22	20	11	17	11.3	47	10.4	6.3	1
50	**WSX445-050A05AR**	22	20	11	17	11.3	47	10.4	6.3	1
63	**WSX445-063A04AR**	22	20	11	17	11.3	50	10.4	6.3	1
63	**WSX445-063A05AR**	22	20	11	17	11.3	50	10.4	6.3	1
63	**WSX445-063A06AR**	22	20	11	17	11.3	50	10.4	6.3	1
80	**WSX445R08004CA**	25.4	26	13	20	14.3	56	9.5	6	1
80	**WSX445R08006CA**	25.4	26	13	20	14.3	56	9.5	6	1
80	**WSX445R08008CA**	25.4	26	13	20	14.3	56	9.5	6	1
80	**WSX445L08004CA**	25.4	26	13	20	14.3	56	9.5	6	1
80	**WSX445-080A04AR**	27	23	13	20	14.3	56	12.4	7	1
80	**WSX445-080A06AR**	27	23	13	20	14.3	56	12.4	7	1
80	**WSX445-080A08AR**	27	23	13	20	14.3	56	12.4	7	1
80	**WSX445-080A04AL**	27	23	13	20	14.3	56	12.4	7	1
100	**WSX445R10005DA**	31.75	32	26	45	11.3	70	12.7	8	2
100	**WSX445R10007DA**	31.75	32	26	45	11.3	70	12.7	8	2
100	**WSX445R10010DA**	31.75	32	26	45	11.3	70	12.7	8	2
100	**WSX445L10005DA**	31.75	32	26	45	11.3	70	12.7	8	2
100	**WSX445-100B05AR**	32	26	26	45	16.3	78	14.4	8	2
100	**WSX445-100B07AR**	32	26	26	45	16.3	78	14.4	8	2
100	**WSX445-100B10AR**	32	26	26	45	16.3	78	14.4	8	2
100	**WSX445-100B05AL**	32	26	26	45	16.3	78	14.4	8	2

Fig.4
ø200

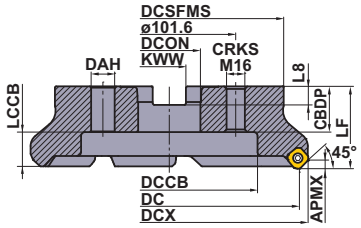
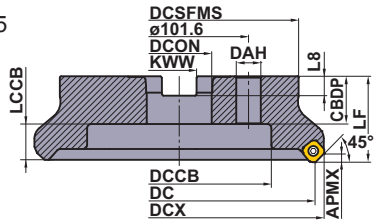


Fig.5
ø200



Right hand tool holder shown.

(mm)

DC	Order Number	DCON	CBDP	DAH	DCCB	LCCB	DCSFMS	KWW	L8	Fig.
125	**WSX445R12506EA**	38.1	36	30	56	19.3	80	15.9	10	2
125	**WSX445R12508EA**	38.1	36	30	56	19.3	80	15.9	10	2
125	**WSX445R12512EA**	38.1	36	30	56	19.3	80	15.9	10	2
125	**WSX445L12506EA**	38.1	36	30	56	19.3	80	15.9	10	2
125	**WSX445-125B06AR**	40	28	30	56	21.3	89	16.4	9	2
125	**WSX445-125B08AR**	40	28	30	56	21.3	89	16.4	9	2
125	**WSX445-125B12AR**	40	28	30	56	21.3	89	16.4	9	2
125	**WSX445-125B06AL**	40	28	30	56	21.3	89	16.4	9	2
160	**WSX445-160C07NR**	40	40	14	56	21.3	100	16.4	9	3
160	**WSX445-160C10NR**	40	40	14	56	21.3	100	16.4	9	3
160	**WSX445-160C16NR**	40	40	14	56	21.3	100	16.4	9	3
160	**WSX445-160C07NL**	40	40	14	56	21.3	100	16.4	9	3
160	**WSX445R16007FA**	50.8	38	40	72	16.3	100	19.1	11	2
160	**WSX445R16010FA**	50.8	38	40	72	16.3	100	19.1	11	2
160	**WSX445R16016FA**	50.8	38	40	72	16.3	100	19.1	11	2
160	**WSX445L16007FA**	50.8	38	40	72	16.3	100	19.1	11	2
200	**WSX445R20008KN**	47.625	35	18	135	26.3	175	25.4	14.22	5
200	**WSX445R20012KN**	47.625	35	18	135	26.3	175	25.4	14.22	5
200	**WSX445R20020KN**	47.625	35	18	135	26.3	175	25.4	14.22	5
200	**WSX445L20008KN**	47.625	35	18	135	26.3	175	25.4	14.22	5
200	**WSX445-200C08NR**	60	32	18	135	29.3	160	25.7	14.22	4
200	**WSX445-200C12NR**	60	32	18	135	29.3	160	25.7	14.22	4
200	**WSX445-200C20NR**	60	32	18	135	29.3	160	25.7	14.22	4

Cutting Performance

Comparison in Finished Surface of Aluminum (AISI 6061)

Feature of Breaker for Aluminum

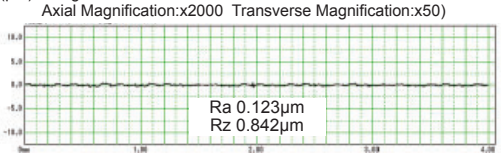
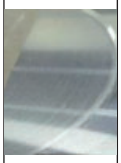
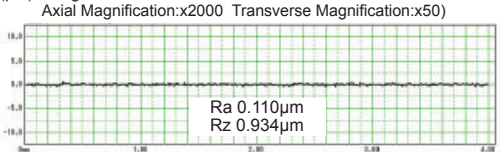
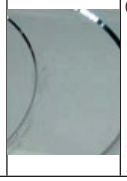
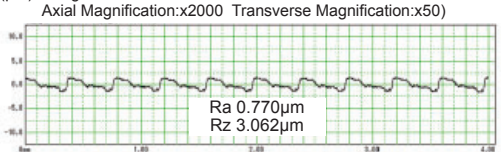
Rake Face Polished

→Improved Welding Resistance

Sharp Edge

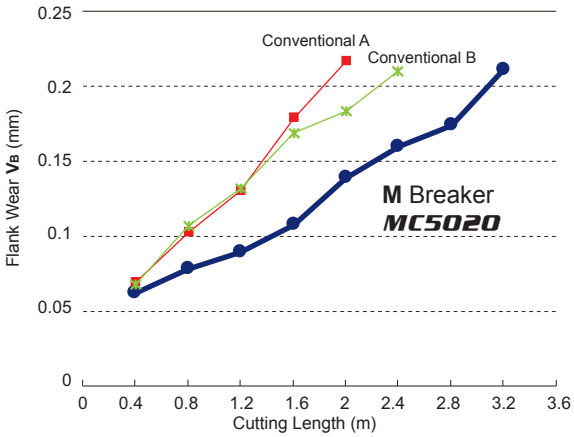
→Focus the Sharpness

- Breaker for aluminum have sharp cutting edges. Handling them with bare hands may cause injuries.

Insert	Surface	Measured Value	Surface Roughness	Surface Quality
L Breaker ***TF15***		(μm) Roughness Profile Axial Magnification:x2000 Transverse Magnification:x50)  Ra 0.123μm Rz 0.842μm	○	○
Conventional A		(μm) Roughness Profile Axial Magnification:x2000 Transverse Magnification:x50)  Ra 0.110μm Rz 0.934μm	○	× Cloudiness
Conventional B		(μm) Roughness Profile Axial Magnification:x2000 Transverse Magnification:x50)  Ra 0.770μm Rz 3.062μm	× Rough	○

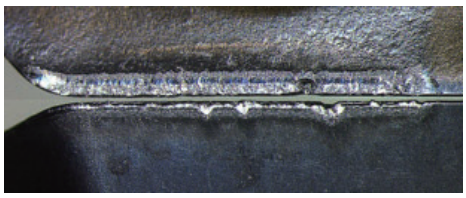
<Cutting Conditions>
Cutter Dia. : ø125mm
Cutting Speed : 500m/min
Feed per Tooth : 0.1mm/t.
Depth of Cut : ap=2.0mm ae=100mm
Cutting Mode : Dry Cutting
Center cut
4 Inserts

Tool Life Comparison in Ductile Cast Iron



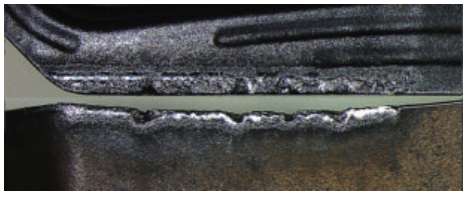
<Cutting Conditions>
Cutter Dia. : ø125mm
Cutting Speed : 200m/min
Feed per Tooth : 0.2mm/t.
Depth of Cut : ap=3.0mm
ae=100mm
Cutting Mode : Dry Cutting
Center Cut
1 Insert

M Breaker
MC5020

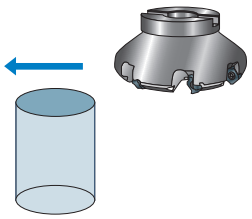
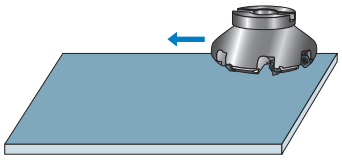


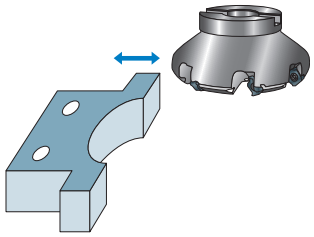
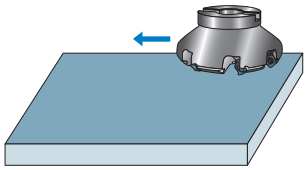
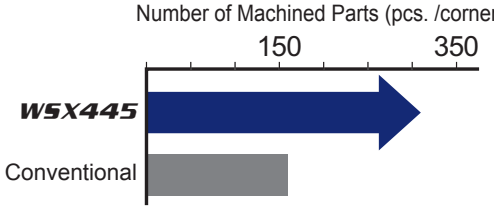
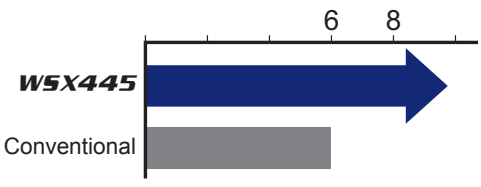
Conventional A

Conventional B



Application Examples

Cutter Body		WSX445-050A04AR	WSX445R12508EA
Insert (Grade)		SNMU140812ANER-R (MP6120)	SNGU140812ANER-M (MP6120)
Workpiece		AISI 1045 	AISI A570.36 
Component		Round Bar	Thin Plate
Cutting Conditions	Cutting Speed (m/min)	190	216
	Feed per Tooth (mm/t.)	0.2	0.3
	Depth of Cut (mm)	ap=2 ae=25	ap=1.5–2.5 ae=120
Cutting Mode		Dry Cutting	Dry Cutting
Results		Double sided insert became possible in BT30 arbor that was not able to support conventional. WSX445 achieved the equivalent of tool life to, the number of corner from that has doubled, were able to reduce the cost down.	Spindle load could be suppressed to 80% of conventional products, thus WSX445 has offered better chip discharge performance and made smooth and silent machining.

Cutter Body		WSX445-080A08AR	WSX445R10007DA
Insert (Grade)		SNGU140812ANER-M (MP6120)	SNGU140812ANER-L (MP9120)
Workpiece		AISI 100-70-03 	15-5PH Hardened Stainless Steel 
Component		Automotive Component	Aerospace Component
Cutting Conditions	Cutting Speed (m/min)	200	45
	Feed per Tooth (mm/t.)	0.4	0.3
	Depth of Cut (mm)	ap=2.0 ae=60	ap=2.0–3.0 ae=80
Cutting Mode		Dry Cutting	Wet Cutting
Results		Number of Machined Parts (pcs. /corner)  WSX445 achieved double tool life compared to conventional products without insert fracturing in interrupted machining.	Number of Machined Parts(pass)  Number of workpieces increased by 1.5 times or more since WSX445 prevents thermal crack.

Low Cutting Resistance, Double Sided Insert Face Mill for General Machining

WSX445

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.

MITSUBISHI MATERIALS CORPORATION

MITSUBISHI MATERIALS CORPORATION

Overseas Sales Dept, Asian Region
KFC bldg., 8F, 1-6-1 Yokoami, Sumida-ku, Tokyo 130-0015, Japan
TEL +81-3-5819-8771 FAX +81-3-5819-8774

Overseas Sales Dept, European & American Region
KFC bldg., 8F, 1-6-1 Yokoami, Sumida-ku, Tokyo 130-0015, Japan
TEL +81-3-5819-8772 FAX +81-3-5819-8774

http://www.mitsubishicarbide.com/en/
(Tools specifications subject to change without notice.)

EXP-14-E005
2016.11.E(-)