

Indexable Insert with Wiper Edge Geometry

Expanded
Inserts

MW/SWbreaker

**Indexable insert with wiper geometry
for simultaneous roughing
and finishing.**



Indexable Insert with Wiper Edge Geometry

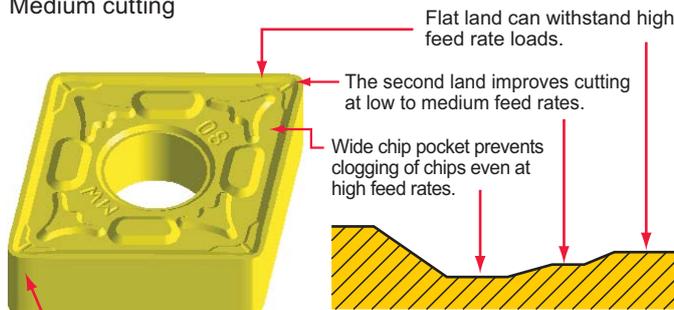
MW/SWbreaker

Features

High efficiency insert, surface finish doesn't deteriorate even when the feed rate is increased!

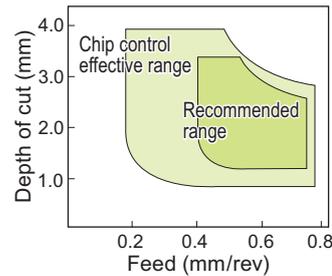
MWbreaker (Negative Insert)

Medium cutting



Wiper improves surface finishes.

Application range

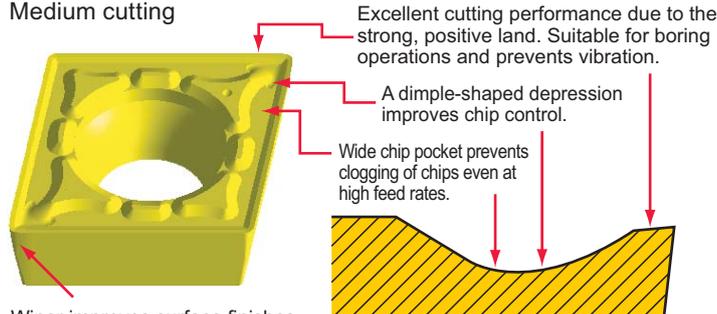


<Cutting conditions>

Insert : CNMG120408-MW
Workpiece : Carbon steel (JIS S45C)
Cutting speed : 200m/min
Coolant : Wet cutting

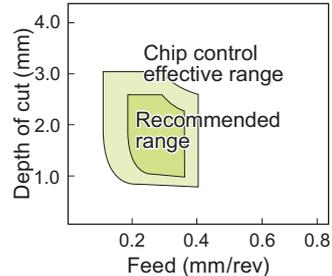
MWbreaker (Positive Insert)

Medium cutting



Wiper improves surface finishes.

Application range

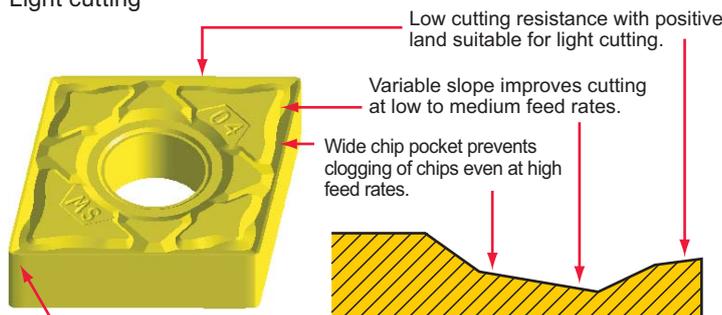


<Cutting conditions>

Insert : CCMT09T308-MW
Workpiece : Alloy steel (JIS SCr420H)
Cutting speed : 150m/min
Coolant : Wet cutting

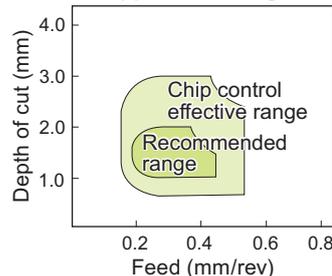
SWbreaker (Negative Insert)

Light cutting



Wiper improves surface finishes.

Application range

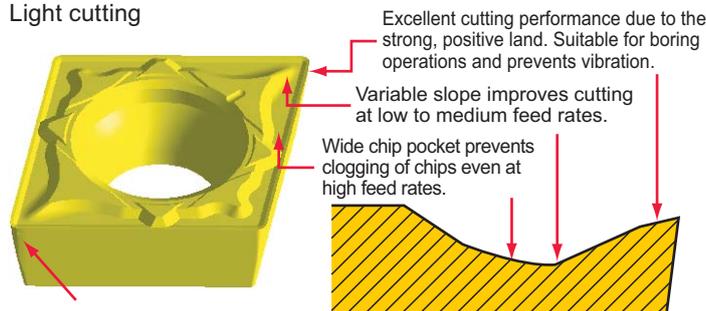


<Cutting conditions>

Insert : CNMG120408-SW
Workpiece : Carbon steel (JIS S45C)
Cutting speed : 200m/min
Coolant : Wet cutting

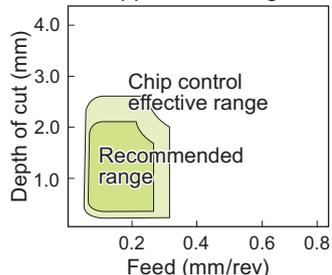
SWbreaker (Positive Insert)

Light cutting



Wiper improves surface finishes.

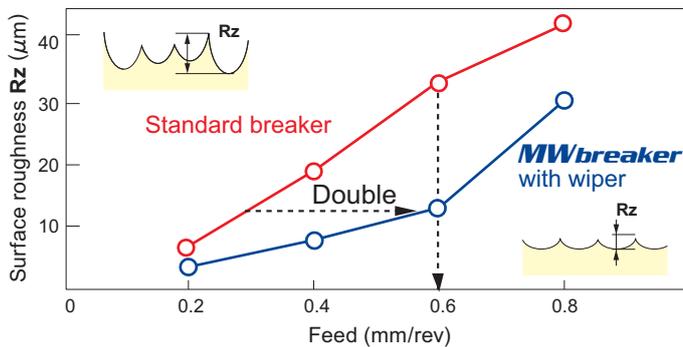
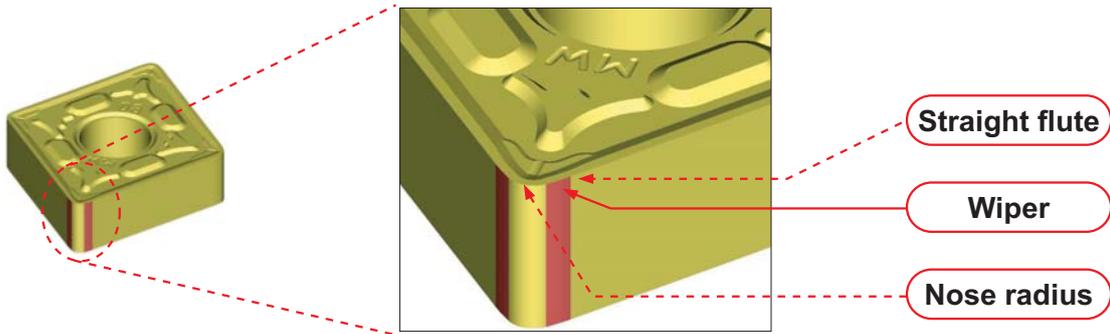
Application range



<Cutting conditions>

Insert : CCMT09T304-SW
Workpiece : Alloy steel (JIS SCr420H)
Cutting speed : 150m/min
Coolant : Wet cutting

Advantages



The wiper geometry is positioned between the nose radius and the straight edge of the insert. Even if the feed rate is doubled, the surface finish doesn't deteriorate.

<Cutting conditions>

Insert : CNMG120408-
 Workpiece : Carbon steel (JIS S45C)
 Cutting speed: 200m/min
 Coolant : Wet cutting

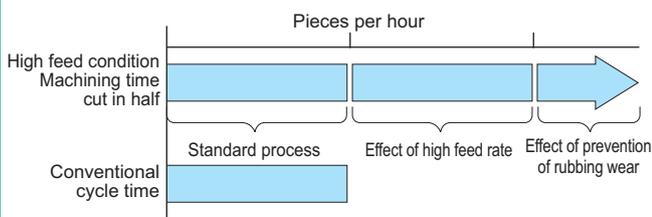
Effective Use

Replacing a conventional indexable insert with an **MW** breaker or **SW** breaker has the following advantages.

High Feed Rate

Improved productivity

When changing to high feed conditions,

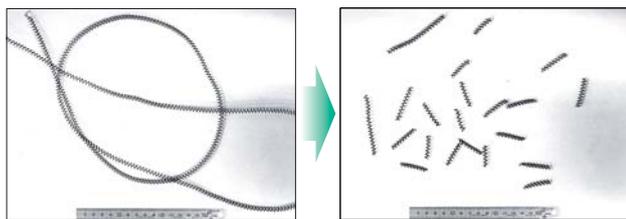


the cycle time is decreased, so more parts can be machined with each insert.

In addition, rubbing wear is prevented, delaying the progression of wear and prolonging tool life.

Improved chip control

When changing to high feed conditions,



Chips under a conventional feed condition

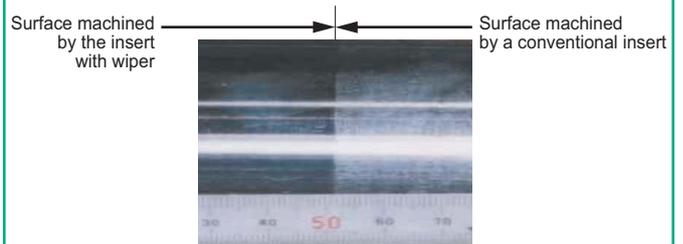
Chips under the high feed condition

the chips become thicker and are easily broken.

The Given Parameters

Improved surface roughness

Using the same cutting speed but with double the feed rate,

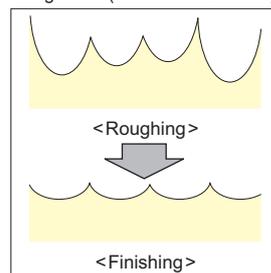


the surface finish can be improved.

Improved Productivity

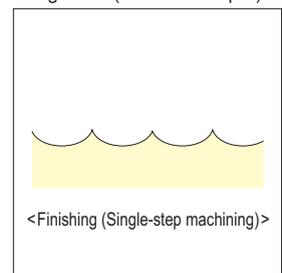
The high feed rate shortens cycle times and can also eliminate finishing operations.

Roughness (Conventional insert)



2 step (Roughing and finishing)

Roughness (Insert with wiper)

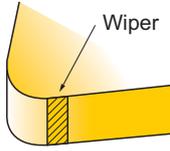


Reducing 1 step

MW/SWbreaker

Wiper Insert

- The wiper insert is designed with a wiper edge that is situated where the straight edge meets the corner radius.
- In comparison to conventional breakers, the surface finish does not deteriorate even if the feed rate is doubled.
- Machining at high feed rates improves cutting efficiency.



Improving Surface Finish

Under the same machining conditions as conventional breakers, but with the feed rate increased, the surface finish of the workpiece can be improved.

Improving Efficiency

High feed rates not only shorten machining times but also make it possible to combine roughing and finishing operations.

Increased Tool Life

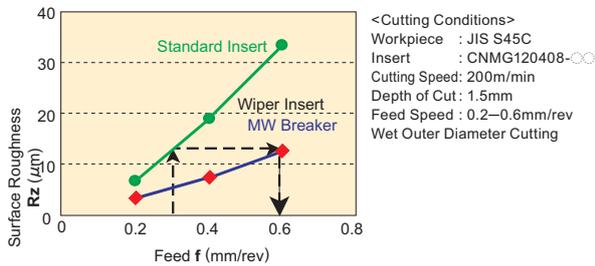
When changing to high feed conditions, the time required to cut one component is decreased, thus more parts can be machined with each insert. In addition, the high feed rate prevents rubbing, therefore, delaying the progression of wear and increasing the tool life of the insert.

Improving Chip Control

Under high feed conditions, the chips generated become thicker and are more easily broken, thus, chip control is improved.

Wiper insert + **High feed (The feed rate is doubled.)** = **Standard insert** + **The conventional feed condition**
 Finished surface Same surface roughness

*Please use a wiper insert at high feed rate.



<Cutting Conditions>
 Workpiece : JIS S45C
 Insert : CNMG120408
 Cutting Speed: 200m/min
 Depth of Cut: 1.5mm
 Feed Speed : 0.2-0.6mm/rev
 Wet Outer Diameter Cutting

<Ex>The surface roughness does not deteriorate even if the feed rate is **doubled** (0.3→0.6)!

A wiper insert + machining at high feed rate

- Reduced machining time (per workpieces)
- Increased number of workpieces (per definitive time period)
- Improving chip control

A wiper insert + machining at conventional feed rate

- Eliminating the finishing step by roughing and finishing together (Separate roughing and finishing steps → Single-step machining)



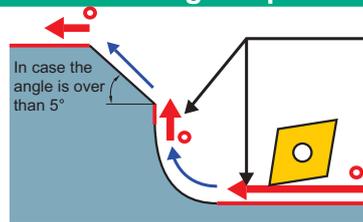
- Reducing cycle times
- Increased productivity
- Avoiding Line-Stoppage

The realisation of Reduced Costs!!

The estimate of finished surface roughness when using a wiper insert

The effects of wiper inserts on external machining, boring and facing.

*The surface roughness when machining at corner R or taper angle over 5°, is the same as machining with standard inserts.



$$Rz(W) = Rz \times 0.5$$

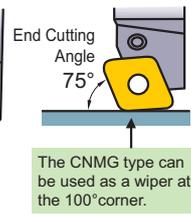
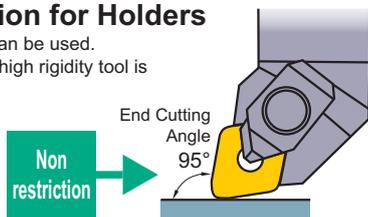
$Rz(W)$ = Finished surface roughness when using a wiper insert.
 Rz : Finished surface roughness from conventional conditions. (When using a standard insert)

- Effective usage of a wiper insert
- Non effective usage of a wiper insert

Special attention is not necessary when using CNMG / WNMG / CCMT types

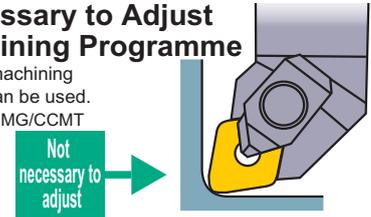
No Restriction for Holders

Standard holders can be used. (*A double clamp, high rigidity tool is recommended.)



Not Necessary to Adjust the Machining Programme

Conventional machining programmes can be used. (The CNMG/WNMG/CCMT types are based on the ISO/ANSI.)

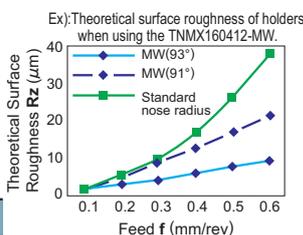
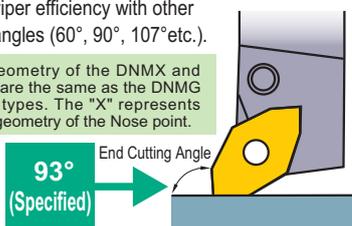


Special attention is necessary when using the DNMX / TNMX types due to the special top face geometry

Restriction for Holders

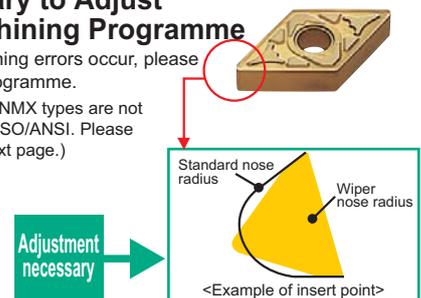
Use a holder with an end cutting angle of 93° for improving wiper efficiency. A holder with an end cutting angle of 91° can improve wiper efficiency (see the following figure), however, there is no wiper efficiency with other end cutting angles (60°, 90°, 107° etc.).

The hole geometry of the DNMX and TNMX type are the same as the DNMG and TNMG types. The "X" represents the special geometry of the Nose point.



Necessary to Adjust the Machining Programme

When machining errors occur, please adjust the programme. (The DNMX/TNMX types are not based on the ISO/ANSI. Please refer to the next page.)

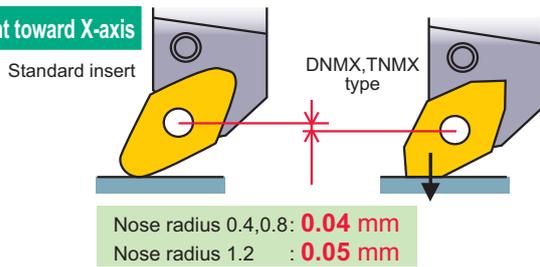


Adjustment of machining programmes for DNMX / TNMX types

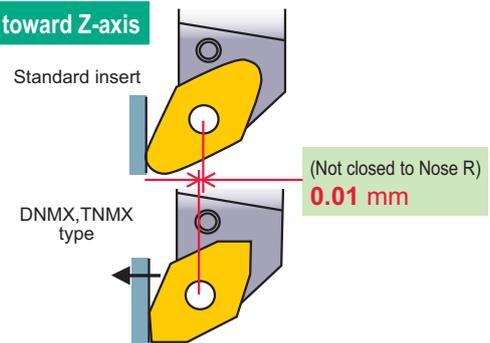
Basic Process) Adjusting Toward X-axis and Z-axis

Adjusting the differential between a standard insert and Z-axis / X-axis.

Adjustment toward X-axis



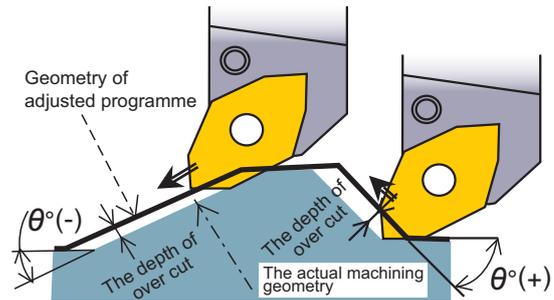
Adjustment toward Z-axis



A) Adjusting a Taper *Necessary to maintain a correct taper.

Adjust the relief angle toward the normal line.

Note) Adjust the angle toward the normal line in the case where the adjustment number is minus ($\theta = 60^\circ - 70^\circ$) and is not machined completely.



Classification

Nose Radius	Taper Angle θ°															
	-25-15	-10	-5	0	5	10	15	20-35	40	45	50	55	60-65	70	75-85	90
1.2	0.04	0.03	0.01	0	0.02	0.03	0.04	0.05	0.04	0.04	0.02	0.01	-0.01	0	0.01	0
0.8	0.03	0.02	0.01	0	0.01	0.02	0.03	0.04	0.03	0.03	0.02	0	-0.01	0	0.01	0
0.4	0.02	0.01	0.01	0	0.01	0.01	0.02	0.02	0.02	0.01	0.01	0	-0.01	-0.01	0	0

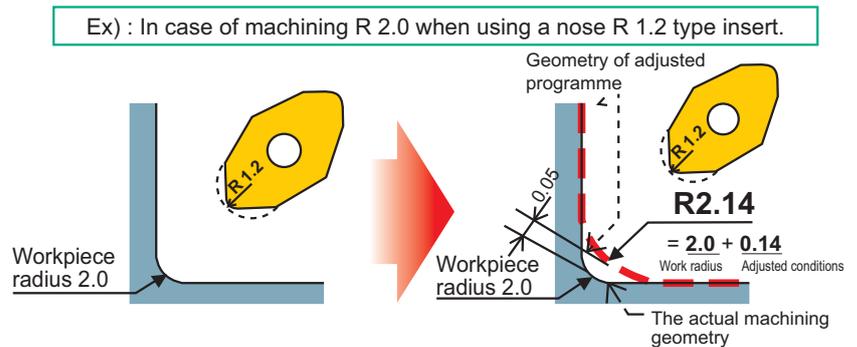
The number \rightarrow + numbers: adjustment of relief angle, - numbers: adjustment of drive-in angle (mm)

B) Adjusting a Corner R *Necessary to maintain a correct corner radius.

Adjust the work diameter to the same as the taper to prevent over-cut.

The value of adjustment to workpiece R = Workpiece R + the adjustment value
 *No adjusting of the nose radius in this case.

The nose radius of the insert	The adjustment amount on the workpiece radius.
Nose Radius 0.4	Work Radius +0.05(mm)
Nose Radius 0.8	Work Radius +0.11(mm)
Nose Radius 1.2	Work Radius +0.14(mm)



In correcting nose radius:

It is not necessary to adjust the machining programme, however, machining errors can occur within max. $\pm 0.03\text{mm}$ due to correcting by an approximate number.

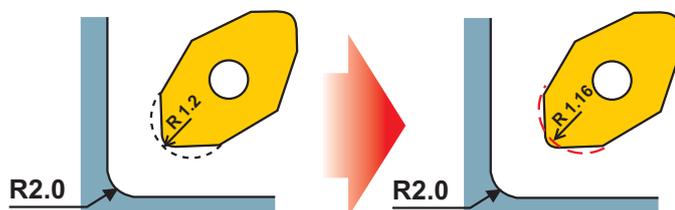
The Easy-to-correct Method

Nose Radius Correction Input the correction number of each nose radius.

The value of corrected nose radius = approximation
 *No need to adjust the programme in this case.

The nose radius of the insert	The value of corrected nose radius = approximation
Nose Radius 0.4	R0.36(mm)
Nose Radius 0.8	R0.76(mm)
Nose Radius 1.2	R1.16(mm)

Ex): In the case of machining a corner with a radius R 2.0 when using an insert with a nose radius R 1.2.

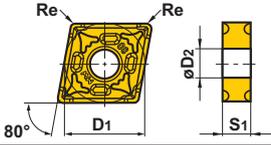
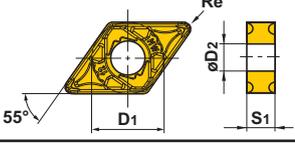
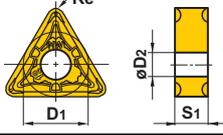
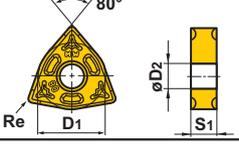


Others) The value of correction is same for both DNMX and TNMX. Discriminate them by the size of nose radius.

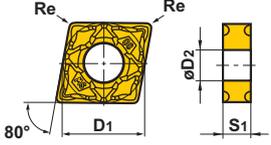
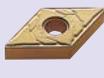
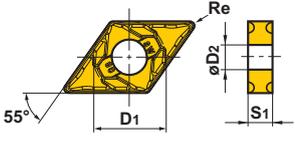
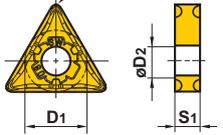
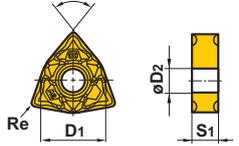
MW/SW breaker

● Negative Inserts

Standard Inserts for MW Breaker

Shape	Order Number	Class	Coated						Dimensions (mm)				Geometry	
			UE6005	UE6110	UE6020	UE6010	UC6010	US7020	UC5105	UC5115	D1	S1		Re
 MW Breaker Medium Cutting (Wiper)	CNMG120408-MW	M	●	●	●	▲	●	●	●	12.7	4.76	0.8	5.16	
	120412-MW	M	●	●	●	▲	●	●	●	12.7	4.76	1.2	5.16	
 MW Breaker Medium Cutting (Wiper)	DNMX150408-MW	M	●	●	□	●	□	□	□	12.7	4.76	0.8	5.16	
	150412-MW	M	●	●	□	●	□	□	□	12.7	4.76	1.2	5.16	
	150608-MW	M	●	●	□	●	□	□	□	12.7	6.35	0.8	5.16	
	150612-MW	M	●	●	□	●	□	□	□	12.7	6.35	1.2	5.16	
 MW Breaker Medium Cutting (Wiper)	TNMX160408-MW	M	●	●	□	●	□	□	□	9.525	4.76	0.8	3.81	
	160412-MW	M	●	●	□	●	□	□	□	9.525	4.76	1.2	3.81	
 MW Breaker Medium Cutting (Wiper)	WNMG060408-MW	M	●	□	□	●	□	□	□	9.525	4.76	0.8	3.81	
	060412-MW	M	●	□	□	●	□	□	□	9.525	4.76	1.2	3.81	
	080408-MW	M	●	●	●	▲	●	●	●	12.7	4.76	0.8	5.16	
	080412-MW	M	●	●	●	▲	●	●	●	12.7	4.76	1.2	5.16	

Standard Inserts for SW Breaker

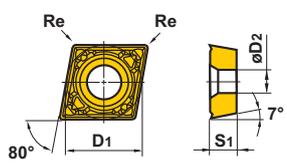
Shape	Order Number	Class	Coated			Cermet		Dimensions (mm)				Geometry	
			UE6005	UE6110	UE6020	US7020	UC5115	NX2525	NX3035	D1	S1		Re
 SW Breaker Light Cutting (Wiper)	CNMG120404-SW	M	●	●	●	●	●	●	12.7	4.76	0.4	5.16	
	120408-SW	M	●	●	●	●	●	●	12.7	4.76	0.8	5.16	
	NEW 120412-SW	M	●	●	●	●	●	●	12.7	4.76	1.2	5.16	
 SW Breaker Light Cutting (Wiper)	DNMX150404-SW	M	●	●	□	●	●	□	12.7	4.76	0.4	5.16	
	150408-SW	M	●	●	□	●	●	□	12.7	4.76	0.8	5.16	
	NEW 150412-SW	M	●	●	□	●	●	□	12.7	4.76	1.2	5.16	
	150604-SW	M	●	●	□	●	●	□	12.7	6.35	0.4	5.16	
	150608-SW	M	●	●	□	●	●	□	12.7	6.35	0.8	5.16	
NEW 150612-SW	M	●	●	□	●	●	□	12.7	6.35	1.2	5.16		
 SW Breaker Light Cutting (Wiper)	TNMX160404-SW	M	●	●	□	●	●	□	9.525	4.76	0.4	3.81	
	160408-SW	M	●	●	□	●	●	□	9.525	4.76	0.8	3.81	
 SW Breaker Light Cutting (Wiper)	WNMG060404-SW	M	●	□	□	●	□	□	9.525	4.76	0.4	3.81	
	060408-SW	M	●	□	□	●	□	□	9.525	4.76	0.8	3.81	
	080404-SW	M	●	●	●	●	●	●	12.7	4.76	0.4	5.16	
	080408-SW	M	●	●	●	●	●	●	12.7	4.76	0.8	5.16	
	NEW 080412-SW	M	●	●	●	●	●	●	12.7	4.76	1.2	5.16	

The hole geometry of the DNMX and TNMX type is the same as the DNMG and TNMG type.
 The "X" in the order number represents the special nose shape.

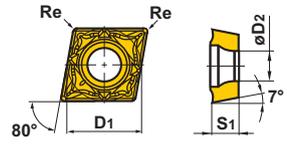
- : Inventory maintained. □ : Non stock, produced to order only.
- ▲ : Inventory maintained. To be replaced by new products.

● Positive Inserts

Standard Inserts for MW Breaker

Shape	Order Number	Class	Coated				Cermets	Coated Cermets	Dimensions (mm)				Geometry
			UE6020	US7020	UC5115	NX2525			D1	S1	Re	D2	
MW Breaker  Medium Cutting (Wiper)	CCMT060204-MW	M	●	●	●	●	□	6.35	2.38	0.4	2.8		
	060208-MW	M	●	●	●	●	□	6.35	2.38	0.8	2.8		
	09T304-MW	M	●	●	●	●	□	9.525	3.97	0.4	4.4		
	09T308-MW	M	●	●	●	●	□	9.525	3.97	0.8	4.4		
	120404-MW	M	●	●	□	●	□	12.7	4.76	0.4	5.5		
	120408-MW	M	●	●	□	●	□	12.7	4.76	0.8	5.5		

Standard Inserts for SW Breaker

Shape	Order Number	Class	Coated				Cermets	Coated Cermets	Dimensions (mm)				Geometry
			UE6020	US7020	UC5115	NX2525			D1	S1	Re	D2	
SW Breaker  Light Cutting (Wiper)	CCMT060202-SW	M	●	●	●	●	□	6.35	2.38	0.2	2.8		
	060204-SW	M	●	●	□	●	□	6.35	2.38	0.4	2.8		
	09T302-SW	M	●	●	□	●	□	9.525	3.97	0.2	4.4		
	09T304-SW	M	●	●	□	●	□	9.525	3.97	0.4	4.4		

Recommended Cutting Conditions

● MW Breaker (Negative Inserts)

Work Material	Hardness	Grade	Cutting Speed (m/min)
P Mild Steel	≤180HB	UE6005	330 (235–430)
		UE6010	310 (230–390)
		UE6110	310 (230–390)
		UE6020	200 (155–250)
		US7020	200 (155–250)
Carbon Steel Alloy Steel	180–280HB	UE6005	250 (175–325)
		UE6010	210 (150–260)
		UE6110	210 (150–260)
		UE6020	170 (125–205)
M Stainless Steel	180–220HB	US7020	170 (95–245)
K Cast Iron	Tensile Strength ≤350MPa	UC5105	240 (165–305)
		UC5115	230 (160–295)

● MW Breaker (Positive Inserts)

Work Material	Hardness	Grade	Cutting Speed (m/min)
P Mild Steel	≤180HB	UE6020	160 (120–195)
		NX2525	160 (130–185)
		VP25N	200 (155–245)
Carbon Steel Alloy Steel	180–280HB	UE6020	130 (100–165)
		NX2525	120 (95–135)
		VP25N	150 (115–180)
M Stainless Steel	180–220HB	US7020	140 (95–195)
K Cast Iron	Tensile Strength ≤350MPa	UC5115	180 (130–235)

● SW Breaker (Negative Inserts)

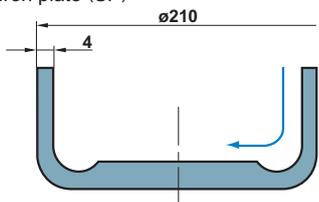
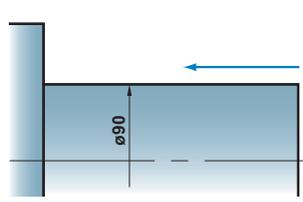
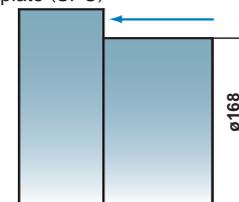
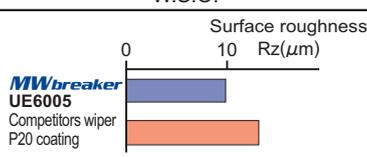
Work Material	Hardness	Grade	Cutting Speed (m/min)
P Mild Steel	≤180HB	UE6005	370 (260–470)
		UE6010	340 (250–430)
		UE6110	340 (250–430)
		US7020	230 (170–280)
		NX2525	220 (185–260)
		NX3035	210 (175–250)
Carbon Steel Alloy Steel	180–280HB	UE6005	280 (195–335)
		UE6110	230 (170–285)
		NX2525	160 (135–190)
		NX3035	160 (130–180)
M Stainless Steel	180–220HB	US7020	190 (105–270)
K Cast Iron	Tensile Strength ≤350MPa	UC5115	250 (175–325)

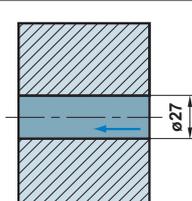
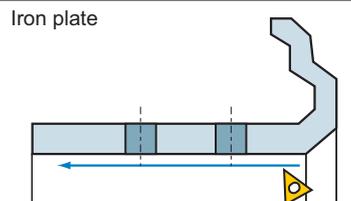
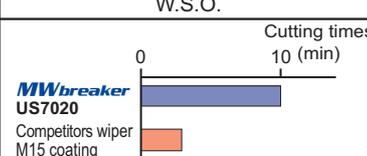
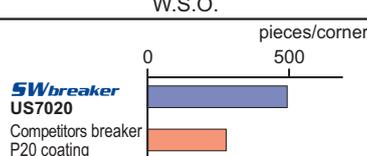
● SW Breaker (Positive Inserts)

Work Material	Hardness	Grade	Cutting Speed (m/min)
P Mild Steel	≤180HB	UE6020	190 (145–240)
		NX2525	190 (160–225)
		VP25N	240 (190–295)
Carbon Steel Alloy Steel	180–280HB	UE6020	160 (125–200)
		NX2525	140 (115–165)
		VP25N	180 (140–220)
M Stainless Steel	180–220HB	US7020	170 (95–235)
K Cast Iron	Tensile Strength ≤350MPa	UC5115	220 (155–285)

MW/SWbreaker

Application Examples

Insert (Grade)	CNMG120408-MW(UE6005)	CNMG120408-MW(UE6005)	CNMG120404-SW(UE6005)	
Workpiece	Iron plate (SP) 	JIS S45C 	Iron plate (SPC) 	
Cutting Conditions	Cutting Speed (m/min)	570	200	400
	Feed (mm/rev)	0.45→0.6	0.4	0.4
	Depth of Cut (mm)	0.5	1.5	0.5
	Coolant	W.S.O.	W.S.O.	W.S.O.
Results	 MWbreaker UE6005 Competitors breaker P20 coating A feed rate increase from 0.45 to 0.6 shortens cycle times. When changing to high feed conditions, wear is reduced and tool life is increased. When combined with a high-grade substrate material, plastic deformation is improved.	 MWbreaker UE6005 Competitors wiper P20 coating By using the same conditions as a conventional insert, the surface finish was improved, therefore eliminating the finishing operation and reducing the cycle time.	Conventional product (General nose radius R 0.8) : Chips cannot be divided. SW : Chips can be divided. Chip control was improved when using a smaller nose radius but surface finish deteriorated. A wiper type insert using a high feed rate solved the problem.	

Insert (Grade)	CCMT09T308-MW(US7020)	TNMX160408-SW(US7020)	
Workpiece	JIS SUS304 (L/D=2.5) 	Iron plate 	
Cutting Conditions	Cutting Speed (m/min)	160	350
	Feed (mm/rev)	0.3	0.35
	Depth of Cut (mm)	1.0	0.09→0.15
	Coolant	W.S.O.	W.S.O.
Results	 MWbreaker US7020 Competitors wiper M15 coating Longer tool life than competitor's insert for boring stainless steel. Finished surface roughness is improved with almost no burrs.	 SWbreaker US7020 Competitors breaker P20 coating When high feed conditions were used, chip packing problems were solved. The number of machined parts is increased. The surface roughness is improved.	

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 spanner.

MITSUBISHI MATERIALS CORPORATION



The Scope of the Registration: Design, Development and Production of Cemented Carbide Tools and Carbide Inserts



The Scope of the Registration: Design, Development and Production of Cutting Tools, Wear-resistant Tools, Rock Drilling Tools, Cemented Carbide Blanks and Coated Products



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(Tools specifications subject to change without notice.)