MOLDINO
The Edge To Innovation

TD6N type

Radius Mill TD6N

New Inserts Added to Range (3 items, 2 grades)

MOLDINO Tool Engineering, Ltd.

New Product News | No.1902E-6 | 2022-11

Unique R-shaped cutting edge has evolved to realize further high- efficiency machining.

Resolves issues in various applications.

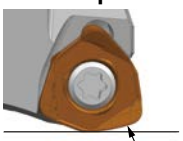
Issue 01

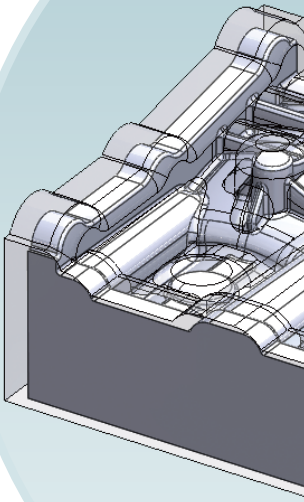
In high-feed cutting, sudden tool breakage occurs due to the shape and machining section of work-piece. If the cutting condition is lowered, machining time should be longer.

Proposed solutions

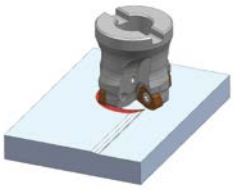
- The unique R-shaped cutting edge enables milling with a constant cutting thickness regardless of the machining section, such as face milling and die-sinking. Therefore, it can work under constant machining conditions in various shapes and sections.

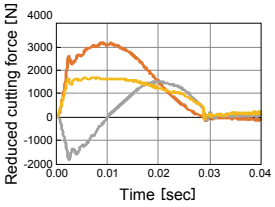
R-shaped cutting edge





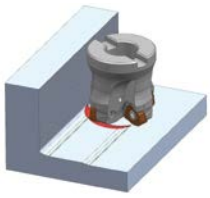
Cutting force of face milling

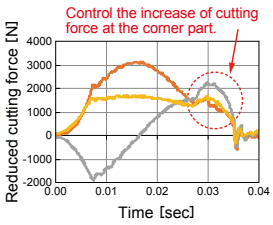




Tool dia. :ϕ50
Feed rate : f_z=1.5mm/t
Depth of cut : a_p×a_e=1×30mm
Work material:S50C(220HB)

Cutting force of shaping(Corner)



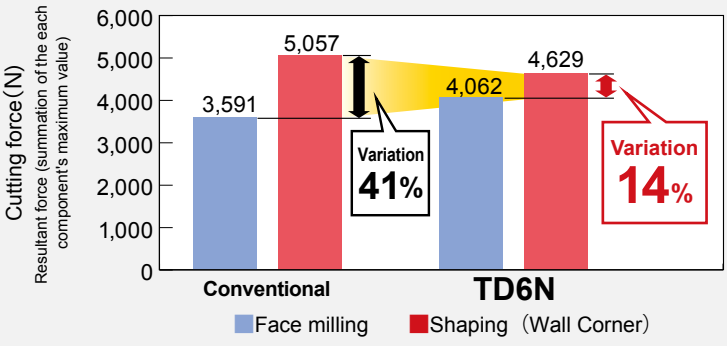


Suppresses the increase of cutting force even in shaping

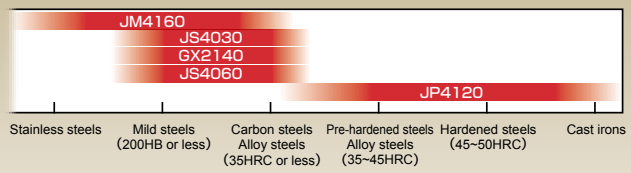
X-axis (Principal force)
Y-axis (Feed force)
Z-axis (Thrust force)

Point! Reduces the variation of cutting force

The optimized composite R shape suppresses the fluctuation of cutting force.



Tool dia. :ϕ63
Cutting speed : v_c =160m/min
Feed rate : f_z=1.5mm/t
Depth of cut : a_p×a_e=1×45mm
Overhang : OH=100mm
Cutting conditions : Dry, Single-edge cutting
Work material : S50C(220HB)

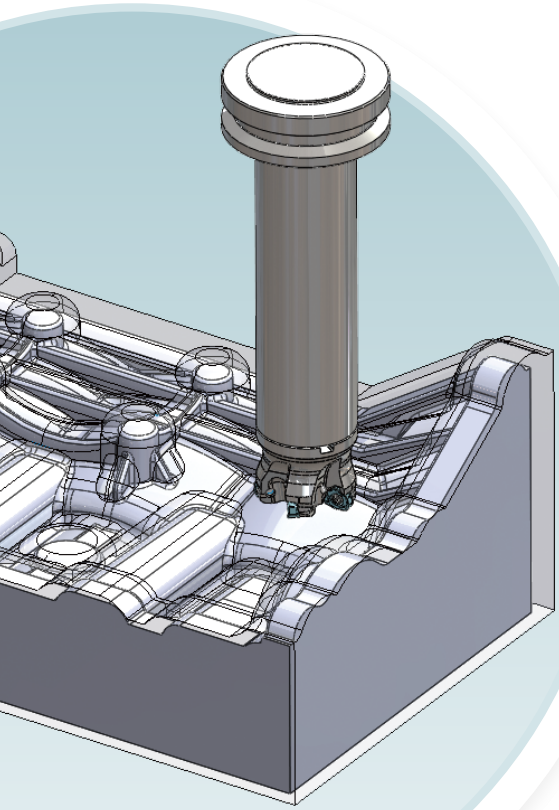


Applications

Economical double-sided multi-corner inserts

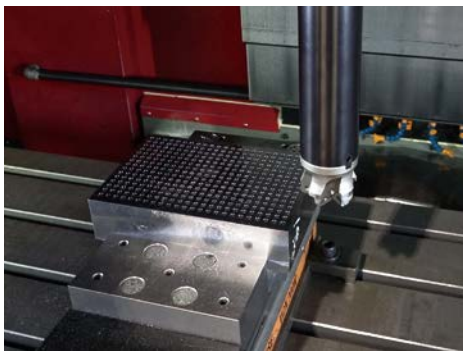
Issue 02

Machining of the cast surface with uneven machining allowance should be interrupted cutting, so it is apt to cause tool breakage.



Proposed solutions

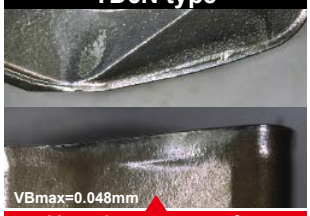
- The high strength insert design and high toughness material control sudden tool breakage due to interrupted cutting etc.



【Cutting conditions】

Tool : TD6N5063B-5
Insert : WOMU140620ER-FC ; JP4120
*V*c=110mm/min, *f*z=1.2mm/t
*a*p×*a*e=1.25×45mm
OH=300mm, AirBlow, Singe edge cutting
Work material : SCM440 (32HRC),
with holes (*ϕ*6×360 points)

TD6N type



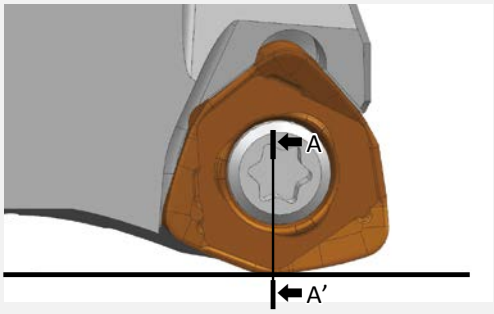
Nomal wear even after 90 minutes cutting

Conventional

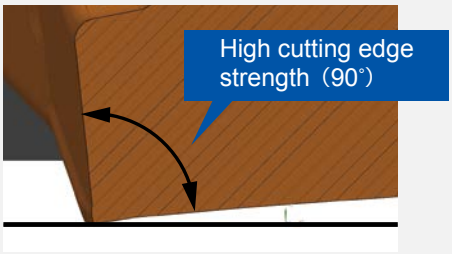
Chipping occurred after 43.5min cutting

Point! Cutting edge design fitting to interrupted cutting

Utilizing the features of the negative insert, realized high cutting edge strength.



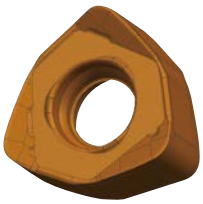
Cross section of cutting edge (A-A') of TD6N

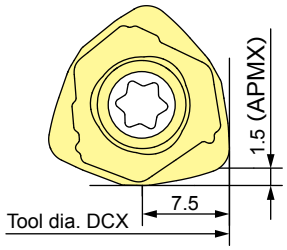


Newly developed "high depth type" insert for a wide range of applications.

New standard insert for high-feed cutting

WOMU140620ER-FC／WOMU140620ER-FB

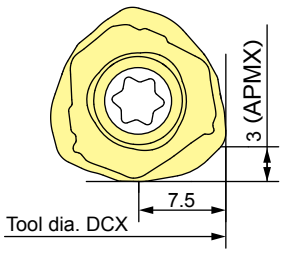




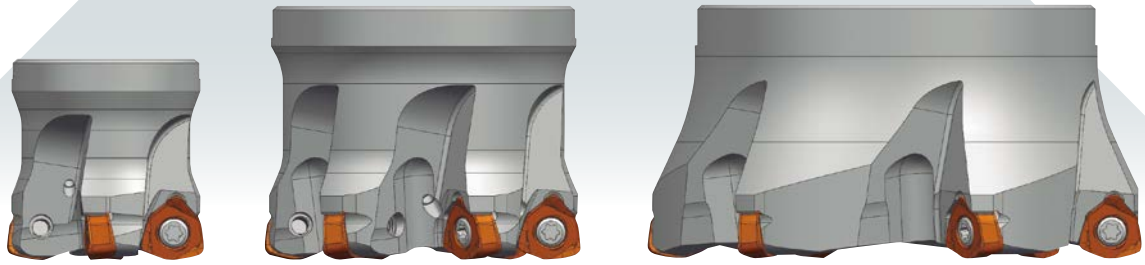
- Suitable for general high-feed cutting (APMX=1.5mm)

Newly developed high depth type insert

WOMU140630ER-HC



- Suitable for large allowance machining up to 1.0mm feed per tooth (APMX=3.0mm)



"High-feed type" and "High depth type" inserts can be set in all cutter body of TD6N.

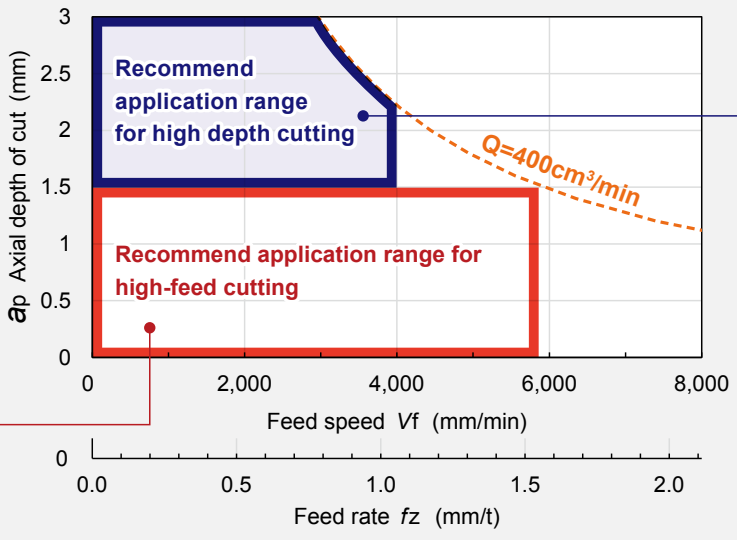
Please select the insert according to machine specifications.

- By selecting suitable inserts for the application, Possible to perform more efficient machining.

High-feed type insert

Optimal for high-speed machining center.

If combined with TD6N of ϕ63 or less, covers general high-feed machining area.

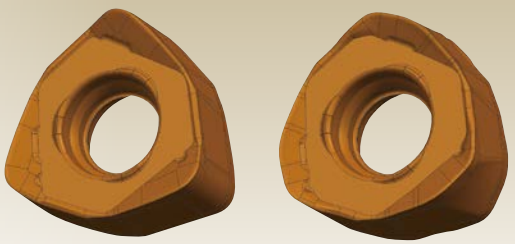


High depth type insert

High performance with high rigidity machining center.

If combined with TD6N of ϕ80 or over, more efficient machining can be expected.

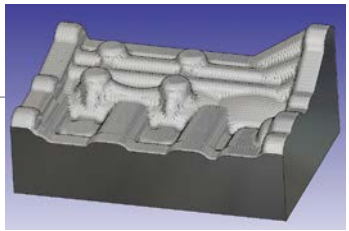
Work material : S50C, Machine : 3-axis MC vertical type(BT50,22kw), Tool dia. : ϕ63



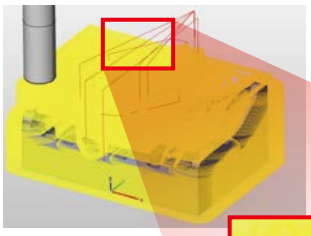
Issue
03

In case machine is old, the feed rate is low and could not machine efficiently.

Proposed solutions



- For machines with limited feed-rate, the machining path and time could be shortened by using high depth type insert.



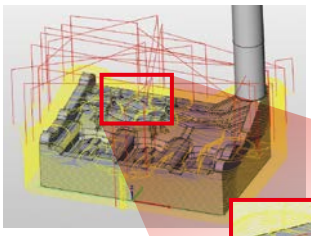
Machining path with a_p=1.0

▶Cutting distance: 648m

Shorten machining path(Distance) by 85%

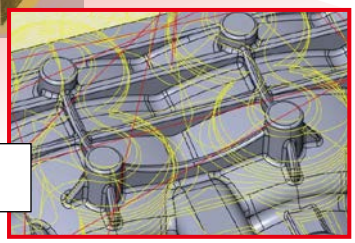
Application

Tool dia. : ϕ63
Cast iron material
(Cutting allowance 10mm)



Machining path with a_p=3.0

▶Cutting distance: 96m



Recommended combination

- For large plastic mold (ex: instrument panel, bumper)

Cutter body (ϕ80)

+ High depth type insert

= **M.R.R**
Metal removal rate
Q=400cm^3/min

- For machining the casting surface of stamping dies.

Cutter body (ϕ50-3NT)

+ High depth type insert

= **High depth type insert enables shorter machining path and time by deepened a_p.**

Line Up

Bore type TD6N5○○○B□-○

Numeric figure in a circle ○ and Alphabetical character comes in a square □.

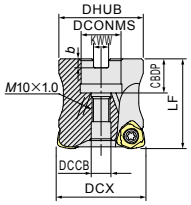


Fig.1 (With air hole)

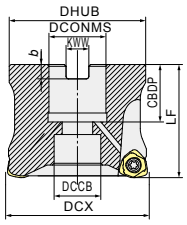


Fig.2 (With air hole)

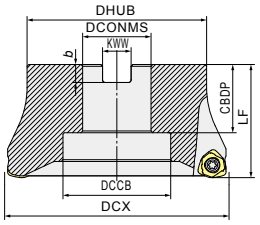


Fig.3 (Without air hole)

Type		Item code	Stock	No.of flutes	Size (mm) DCX	DHUB	LF	CBDP	KWW	b	DCONMS	DCCB	Shape	Recommended insert
Bore Type	Internal diameter inch size	TD6N5050B-3※1※2	●	3	50	47	50	19	8.4	5	22.225	11	Fig.1	【High-feed type insert】 WOMU140620ER-FB WOMU140620ER-FC 【High depth type insert】 WOMU140630ER-HC
		TD6N5050B-4※1※2※3	●	4										
		TD6N5063B-4	●	4	63	60	50	19	8.4	5	22.225	17	Fig.2	
		TD6N5063B-5	●	5										
		TD6N5080B-6	●	6	80	76	63	32	12.7	8	31.75	26		
		TD6N5100B-7	●	7	100	96								
		TD6N5125B-6	●	6	125	100	63	38	15.9	10	38.1	60	Fig.3	
		TD6N5125B-8	●	8										
	Internal diameter mm size	TD6N5050BM-3※1	●	3	50	47	50	20	10.4	6.3	22	11	Fig.1	
		TD6N5050BM-4※1※3	●	4										
		TD6N5063BM-4	●	4	63	60	50	20	10.4	6.3	22	17	Fig.2	
		TD6N5063BM-5	●	5										
		TD6N5080BM-6	●	6	80	76	63	22	12.4	7	27	20		
		TD6N5100BM-7	●	7	100	96		25.5	14.4	8	32	26		
		TD6N5125BM-6	●	6	125	100	63	38	16.4	9	40	60	Fig.3	
		TD6N5125BM-8	●	8										

※1：When using center through, please use Arbor with Coolant supply port. Regarding body installation to arbor, please check "How to install Φ50 body" on next page.
※2：Center through can not be used when using TD6N in combination with our "BT50-22.225-○○○-50"
※3：Recommended to use with ap=1mm or less.

High-feed type and high depth type inserts can be set on all bodies.

Parts

Parts / Shape / Cutter body	Clamp screw	Fastening torque (N・m)	Arbor screw (Double-headed screw)	a	a'	b	c	d	e	Fastening torque (N・m)
TD6N5050B□-○	555-141	4.9	W50-1031	M10×1.0	M10×1.5	31	14	12	5	9.0
TD6N5063B□-○			–	–	–	–	–	–	–	–
TD6N5080BM-6			–	–	–	–	–	–	–	–
TD6N5080B-6 TD6N5100B□-7			–	–	–	–	–	–	–	–
TD6N5125B□-○			–	–	–	–	–	–	–	–

Parts / Shape / Cutter body	Arbor screw (With Air hole)	a	Φb	c	d	f	Wrench	Screw anti-seizure agent
TD6N5050B□-○	–	–	–	–	–	–	105-T20	P-37
TD6N5063B□-○	100-178	M10×1.5	16	35	25	8		
TD6N5080BM-6	100-179	M12×1.75	18	42	30	10		
TD6N5080B-6 TD6N5100B□-7	100-180	M16×2.0	24	51	35	14		
TD6N5125B□-○	–	–	–	–	–	–		

【Note】 The clamp screw is a consumable part. Since replacement life depends on the use environment, it is recommended that it be replaced at an early stage.

●：Stocked Items.

Insert

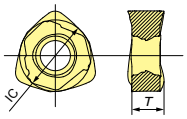


Fig.1 **FC breaker**
(High-feed type-general usage)

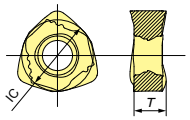


Fig.2 **FB breaker**
(High-feed type-low cutting force)

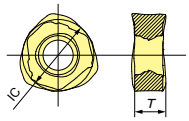


Fig.3 **HC breaker**
(High depth type)

		Pre- hardened steels	Carbon steels・Alloy steels・Mild steels			
P	Carbon steels	■	⊔	■	▙	■
M	SUS, etc.		■			
K	FC・FCD Cast irons	■		▙		□

■ : Stable cutting・First Recommended
□ : Stable cutting・Second Recommended
▙ : Unstable cutting・First Recommended
⊔ : Unstable cutting・Second Recommended

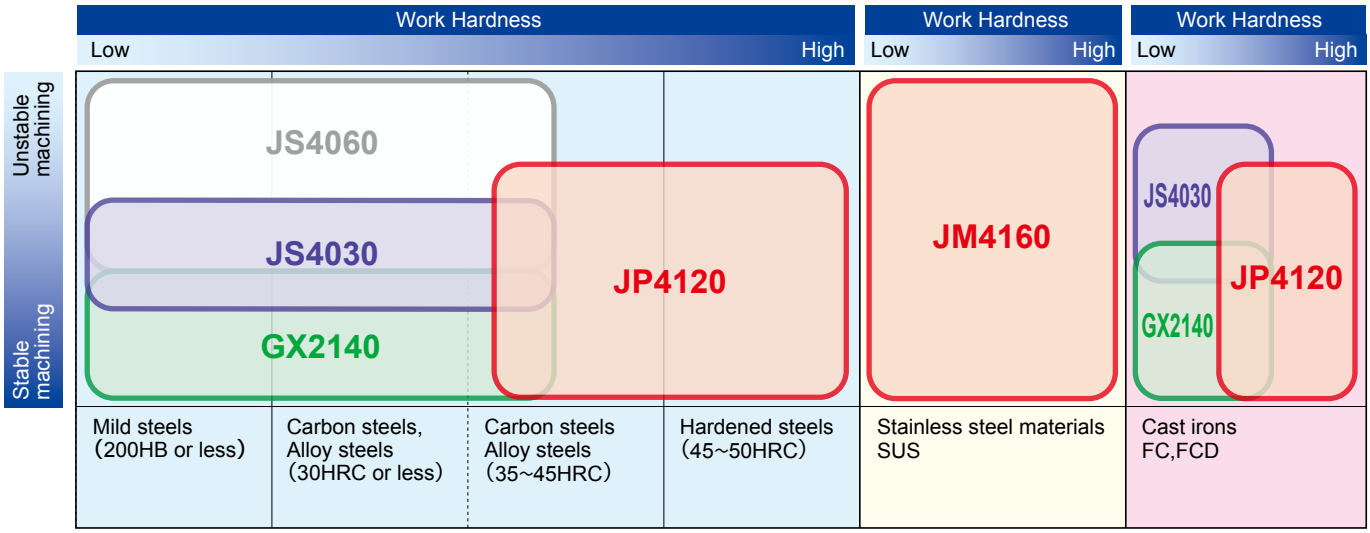
Item code	Tolerance class	AJ-Coating		JS-Coating		GX-Coating	Size (mm)		Shape
		JP4120	JM4160	JS4030	JS4060	GX2140	IC	T	
WOMU140620ER-FC	M	●	●	●	●	●	14	-FC/-FB 6.36	Fig.1
WOMU140620ER-FB		●※1	●	●	●	●		-HC 6.21	Fig.2
WOMU140630ER-HC		●	●	●	●	●			Fig.3

※1：Can be used to process the precipitation hardend stainless steel.

【Note】Please note that the GX Coating and JS Coating do not cause a reaction in conductive touch sensors.
●：Stocked items.

Matrix; insert grade selection

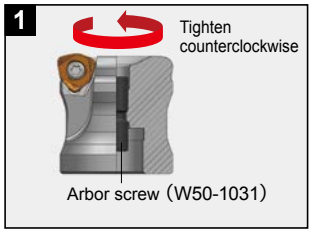
Grade map for work materials



How to install φ50 body to arbor

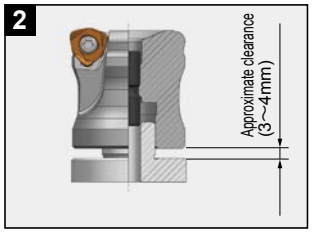
● Please set Φ50 body to Arbor as fallows.

1



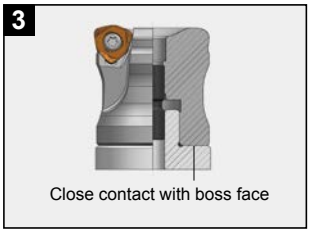
Tighten the Arbor-screw to the body until stops.

2

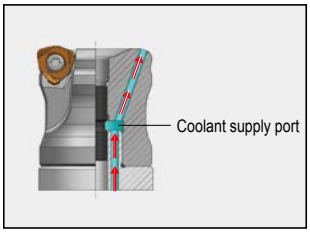


Align the key groove and insert the body into the arbor, and while holding the body with hand, tighten the arbor screw.(The indication of clearance at the start of tightening is about 3 to 4 mm)

3



Firmly tighten the arbor screw until it stops and make sure that the body is in close contact with arbor.



When using a center through, use an arbor with coolant supply port on the arbor side connection end.

Recommended Cutting Conditions

■ For high-feed type insert (-FC/-FB) ※4

Red indicates primary recommended insert grade.

Work material	Recommended inserts grade	Tool dia. DCX	φ50		φ50		φ63	
		flutes	3 flutes		4 flutes ※1※2		4 flutes	
		Overhang	～3DCX (150mm or less)	3DCX～5DCX (150～250mm)	～3DCX (150mm or less)	3DCX～5DCX (150～250mm)	～3DCX (200mm or less)	3DCX～5DCX (200～300mm)
Mild steels (200HB or less)	GX2140 JS4060 JS4030 JM4160	n (min-1)	950	950	950	950	760	760
		Vc(m/min)	150	150	150	150	150	150
		Vf(mm/min)	4,300	4,300	5,700	5,700	4,550	4,550
		fz(mm/t)	1.5	1.5	1.5	1.5	1.5	1.5
		ap(mm)	1.5	1.0	1.0	1.0	1.5	1.0
		ae(mm) Shaping	35 (0.7DCX)	35 (0.7DCX)	35 (0.7DCX)	35 (0.7DCX)	45 (0.7DCX)	45 (0.7DCX)
		(ae/DCX) Face milling	↑	↑	↑	↑	↑	↑
		Q (cm3/min) ※ Shaping	226	151	200	200	307	205
Carbon steels Alloy steels (35HRC or less)	GX2140 JS4060 JS4030 JM4160	n (min-1)	760	760	760	760	610	610
		Vc(m/min)	120	120	120	120	120	120
		Vf(mm/min)	2,750	2,750	3,650	3,650	2,950	2,950
		fz(mm/t)	1.2	1.2	1.2	1.2	1.2	1.2
		ap(mm)	1.5	1.0	1.0	1.0	1.5	1.0
		ae(mm) Shaping	35 (0.7DCX)	35 (0.7DCX)	35 (0.7DCX)	35 (0.7DCX)	45 (0.7DCX)	45 (0.7DCX)
		(ae/DCX) Face milling	↑	↑	↑	↑	↑	↑
		Q (cm3/min) ※ Shaping	144	96	128	128	199	133
Pre-hardened steels Alloy steels (35～45HRC)	JP4120	n (min-1)	640	640	640	640	510	510
		Vc(m/min)	100	100	100	100	100	100
		Vf(mm/min)	1,920	1,920	2,560	2,560	2,040	2,040
		fz(mm/t)	1.0	1.0	1.0	1.0	1.0	1.0
		ap(mm)	1.2	0.8	0.8	0.8	1.2	0.8
		ae(mm) Shaping	35 (0.7DCX)	35 (0.7DCX)	35 (0.7DCX)	35 (0.7DCX)	45 (0.7DCX)	45 (0.7DCX)
		(ae/DCX) Face milling	↑	↑	↑	↑	↑	↑
		Q (cm3/min) ※ Shaping	81	54	72	72	110	73
Stainless-steels (Wet cutting) SUS	JM4160	n (min-1)	640	640	640	640	510	510
		Vc(m/min)	100	100	100	100	100	100
		Vf(mm/min)	1,550	1,550	2,050	2,050	1,650	1,650
		fz(mm/t)	0.8	0.8	0.8	0.8	0.8	0.8
		ap(mm)	1.5	1.0	1.0	1.0	1.5	1.0
		ae(mm) Shaping	35 (0.7DCX)	35 (0.7DCX)	35 (0.7DCX)	35 (0.7DCX)	45 (0.7DCX)	45 (0.7DCX)
		(ae/DCX) Face milling	↑	↑	↑	↑	↑	↑
		Q (cm3/min) ※ Shaping	81	54	72	72	111	74
Cast irons FC FCD	JP4120 GX2140 JS4030	n (min-1)	950	950	950	950	760	760
		Vc(m/min)	150	150	150	150	150	150
		Vf(mm/min)	4,300	4,300	5,700	5,700	4,550	4,550
		fz(mm/t)	1.5	1.5	1.5	1.5	1.5	1.5
		ap(mm)	1.5	1.0	1.0	1.0	1.5	1.0
		ae(mm) Shaping	35 (0.7DCX)	35 (0.7DCX)	35 (0.7DCX)	35 (0.7DCX)	45 (0.7DCX)	45 (0.7DCX)
		(ae/DCX) Face milling	↑	↑	↑	↑	↑	↑
		Q (cm3/min) ※ Shaping	226	151	200	200	307	205
Hardened steels (45～50HRC)	JP4120	n (min-1)	510	510	510	510	400	400
		Vc(m/min)	80	80	80	80	80	80
		Vf(mm/min)	1,200	1,200	1,650	1,650	1,300	1,300
		fz(mm/t)	0.8	0.8	0.8	0.8	0.8	0.8
		ap(mm)	1.0	0.7	0.7	0.7	1.0	0.7
		ae(mm) Shaping	35 (0.7DCX)	35 (0.7DCX)	35 (0.7DCX)	35 (0.7DCX)	45 (0.7DCX)	45 (0.7DCX)
		(ae/DCX) Face milling	↑	↑	↑	↑	↑	↑
		Q (cm3/min) ※ Shaping	42	29	40	40	59	41

■ For high depth type insert (-HC) ※3 ※4

Red indicates primary recommended insert grade.

Work material	Recommended inserts grade	Tool dia. DCX	φ50	φ63	φ80	φ100	φ125	φ125
		flutes	3 flutes	4 flutes	6 flutes	7 flutes	6 flutes	8 flutes
		Overhang	～3DCX (150mm or less)	～3DCX (189mm or less)	～3DCX (240mm or less)	～3DCX (300mm or less)	～3DCX (375mm or less)	～3DCX (375mm or less)
Mild steels (200HB or less)	GX2140 JS4060 JS4030 JM4160	n (min-1)	950	760	600	480	380	380
		Vc(m/min)	150	150	150	150	150	150
		Vf(mm/min)	2,300	2,450	2,900	2,700	1,800	2,450
		fz(mm/t)	0.8	0.8	0.8	0.8	0.8	0.8
		ap(mm)	3.0	3.0	3.0	3.0	3.0	3.0
		ae(mm) Shaping	35 (0.7DCX)	45 (0.7DCX)	50 (0.6DCX)	50 (0.5DCX)	50 (0.4DCX)	50 (0.4DCX)
		(ae/DCX) Face milling	↑	↑	60 (0.75DCX)	80 (0.8DCX)	100 (0.8DCX)	100 (0.8DCX)
		Q (cm3/min) ※ Shaping	242	331	435	405	270	368
Cast irons FC FCD	JP4120 GX2140 JS4030	n (min-1)	950	760	600	480	380	380
		Vc(m/min)	150	150	150	150	150	150
		Vf(mm/min)	2,850	3,050	3,600	3,350	2,300	3,050
		fz(mm/t)	1.0	1.0	1.0	1.0	1.0	1.0
		ap(mm)	3.0	3.0	3.0	3.0	3.0	3.0
		ae(mm) Shaping	35 (0.7DCX)	45 (0.7DCX)	50 (0.6DCX)	50 (0.5DCX)	50 (0.4DCX)	50 (0.4DCX)
		(ae/DCX) Face milling	↑	↑	60 (0.75DCX)	80 (0.8DCX)	100 (0.8DCX)	100 (0.8DCX)
		Q (cm3/min) ※ Shaping	299	412	540	503	345	458

	φ63		φ80		φ100		φ125		φ125	Work material
	5 flutes ※1		6 flutes		7 flutes		6 flutes		8 flutes	
	～3DCX (200mm or less)	3DCX～5DCX (200 ～ 300mm)	～3DCX (240mm or less)	3DCX～5DCX (240 ～ 400mm)	～3DCX (300mm or less)	3DCX～5DCX (300 ～ 500mm)	～3DCX (400mm or less)	3DCX～5DCX (400 ～ 600mm)	～3DCX (400mm or less)	
	760	760	600	600	480	480	380	380	380	Mild steels (200HB or less)
	150	150	150	150	150	150	150	150	150	
	5,700	5,700	5,400	5,400	5,050	5,050	3,400	3,400	4,550	
	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	
	1.5	1.0	1.5	1.0	1.5	1.0	1.5	1.0	1.5	
	45 (0.7DCX)	45 (0.7DCX)	50 (0.6DCX)	50 (0.6DCX)	50 (0.5DCX)	50 (0.5DCX)	50 (0.4DCX)	50 (0.4DCX)	50 (0.4DCX)	
	↑	↑	60 (0.75DCX)	60 (0.75DCX)	80 (0.8DCX)	80 (0.8DCX)	100 (0.8DCX)	100 (0.8DCX)	100 (0.8DCX)	
	385	257	405	270	379	253	255	170	341	
	610	610	480	480	380	380	310	310	310	Carbon steels Alloy steels (35HRC or less)
	120	120	120	120	120	120	120	120	120	
	3,650	3,650	3,450	3,450	3,200	3,200	2,250	2,250	3,000	
	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	
	1.5	1.0	1.5	1.0	1.5	1.0	1.5	1.0	1.5	
	45 (0.7DCX)	45 (0.7DCX)	50 (0.6DCX)	50 (0.6DCX)	50 (0.5DCX)	50 (0.5DCX)	50 (0.4DCX)	50 (0.4DCX)	50 (0.4DCX)	
	↑	↑	60 (0.75DCX)	60 (0.75DCX)	80 (0.8DCX)	80 (0.8DCX)	100 (0.8DCX)	100 (0.8DCX)	100 (0.8DCX)	
	246	164	259	173	240	160	169	113	225	
	510	510	400	400	320	320	250	250	250	Pre-hardened steels Alloy steels (35 ～ 45HRC)
	100	100	100	100	100	100	100	100	100	
	2,550	2,550	2,400	2,400	2,240	2,240	1,500	1,500	2,000	
	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
	1.2	0.8	1.2	0.8	1.2	0.8	1.2	0.8	1.2	
	45 (0.7DCX)	45 (0.7DCX)	50 (0.6DCX)	50 (0.6DCX)	50 (0.5DCX)	50 (0.5DCX)	50 (0.4DCX)	50 (0.4DCX)	50 (0.4DCX)	
	↑	↑	60 (0.75DCX)	60 (0.75DCX)	80 (0.8DCX)	80 (0.8DCX)	100 (0.8DCX)	100 (0.8DCX)	100 (0.8DCX)	
	138	92	144	96	134	90	90	60	120	
	510	510	400	400	320	320	250	250	250	Stainless-steels (Wet cutting) SUS
	100	100	100	100	100	100	100	100	100	
	2,050	2,050	1,900	1,900	1,800	1,800	1,200	1,200	1,600	
	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	
	1.5	1.0	1.5	1.0	1.5	1.0	1.5	1.0	1.5	
	45 (0.7DCX)	45 (0.7DCX)	50 (0.6DCX)	50 (0.6DCX)	50 (0.5DCX)	50 (0.5DCX)	50 (0.4DCX)	50 (0.4DCX)	50 (0.4DCX)	
	↑	↑	60 (0.75DCX)	60 (0.75DCX)	80 (0.8DCX)	80 (0.8DCX)	100 (0.8DCX)	100 (0.8DCX)	100 (0.8DCX)	
	138	92	143	95	135	90	90	60	120	
	760	760	600	600	480	480	380	380	380	Cast irons FC FCD
	150	150	150	150	150	150	150	150	150	
	5,700	5,700	5,400	5,400	5,050	5,050	3,400	3,400	4,550	
	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	
	1.5	1.0	1.5	1.0	1.5	1.0	1.5	1.0	1.5	
	45 (0.7DCX)	45 (0.7DCX)	50 (0.6DCX)	50 (0.6DCX)	50 (0.5DCX)	50 (0.5DCX)	50 (0.4DCX)	50 (0.4DCX)	50 (0.4DCX)	
	↑	↑	60 (0.75DCX)	60 (0.75DCX)	80 (0.8DCX)	80 (0.8DCX)	100 (0.8DCX)	100 (0.8DCX)	100 (0.8DCX)	
	385	257	405	270	379	253	255	170	341	
	400	400	320	320	250	250	200	200	200	Hardened steels (45～50HRC)
	80	80	80	80	80	80	80	80	80	
	1,600	1,600	1,550	1,550	1,400	1,400	950	950	1,300	
	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	
	1.0	0.7	1.0	0.7	1.0	0.7	1.0	0.7	1.0	
	45 (0.7DCX)	45 (0.7DCX)	50 (0.6DCX)	50 (0.6DCX)	50 (0.5DCX)	50 (0.5DCX)	50 (0.4DCX)	50 (0.4DCX)	50 (0.4DCX)	
	↑	↑	60 (0.75DCX)	60 (0.75DCX)	80 (0.8DCX)	80 (0.8DCX)	100 (0.8DCX)	100 (0.8DCX)	100 (0.8DCX)	
	72	50	78	54	70	49	48	33	65	

※1：Not recommended combination with hight depth type insert (HC).
※2：Regarding Φ50-4flutes, recommended to use with *a*p = 1 mm or less.
※3：Regarding high depth type insert recommended to use L / D = 3 or less.
※4：Inpossible to use with the high-feed type insert (FC / FB) and the high depth type insert (HC) installed at the same time.

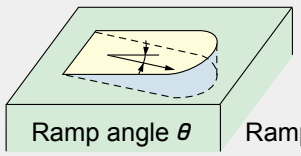
【Note】

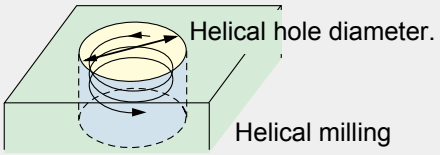
① These conditions are for general guidance for shoulder milling; in actual machining conditions adjust the parameters according to your actual machine and work-piece conditions. In particular, when performing shoulder milling in combination with slotting or machining of cutting widths close to slots, etc., chattering vibrations may occur, which can lead to trouble. Therefore, please consider the following when adjusting the conditions;
- Reduce rotation speed and table feed rate by 50 to 70%
- Reduce cutting depth *a*p by 50 to 70%
- Reduce cutting width *a*e by 50 to 70%

② GX Coating and JS Coating could not be used with conductive touch sensors.
③ For strongly interrupted cutting, when unsupported length is long, or for wet cutting, JM4160 is recommended.
④ To prevent tool damage due to chip clogging, always use a chip removal method such as an air blower, etc.
⑤ Since there is a danger of the removed chips flying out and causing injury to workers, fire, or damage to eyes, during use be sure to cover the work area with a safety cover and have workers wear protective equipment such as glasses, etc. to make the work area safe.
⑥ Perform insert replacement at an early stage to prevent chipping due to excessive use.
⑦ The following equation can be used to determine the metal removal rate per unit time *Q*;
$Q(cm^3/min) = ap(mm) \times ae(mm) \times Vf(mm/min) / 1000$

Programming guidance

Regarding ramping and helical milling





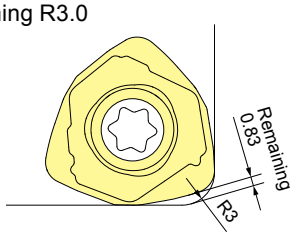
Process	Insert	Parameter	Tool dia. DCX (mm)				
			ϕ 50	ϕ 63	ϕ 80	ϕ 100	ϕ 125
Ramping	【High-feed type insert】 WOMU140620ER-FC WOMU140620ER-FB	Maximum ramp angle θ	2.6°	1.8°	1.2°	0.9°	0.7°
		Recommendation※1	1°			0.5°	
	【High depth type insert】 WOMU140630ER-HC	Maximum ramp angle θ	2.2°	1.5°	1.1°	0.8°	0.6°
		Recommendation※1	1°		0.5°		0.4°
Helical milling	【High-feed type insert】 WOMU140620ER-FC WOMU140620ER-FB 【High depth type insert】 WOMU140630ER-HC	Hole diameter	ϕ84～98	ϕ110～124	ϕ144～158	ϕ184～198	ϕ234～248
		Helical pitch※2 (mm)	0.5～1.5				

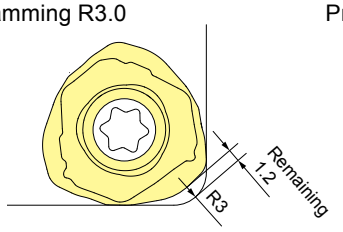
【Note】It is recommended that the tool be used while performing sufficient chip removal and checking that there are no abnormal vibrations.
※ 1 : Please set the ramp angle within the "maximum ramp angle θ" on the table above.Recommend using below the recommended value.
※ 2 : For helical cutting, please set the table feed rate to around 50% of recommended cutting condition.

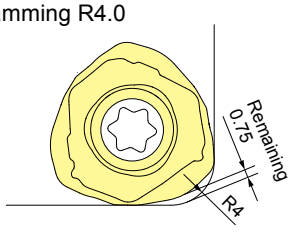
About define the programming R on the CAM

・Please define the tool shape on the CAM with reference as below table.

【High-feed type insert】 WOMU140620ER-FC WOMU140620ER-FB		【High depth type insert】 WOMU140630ER-HC		
Programming R	R3.0	Programming R	R3.0	R4.0
Remains (mm)	0.83	Remains (mm)	1.2	0.75
High-feed type insert Programming R3.0		High depth type insert Programming R3.0		High depth type insert Programming R4.0

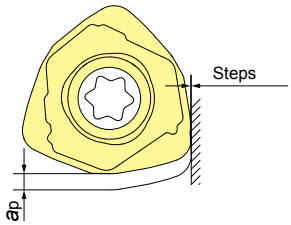






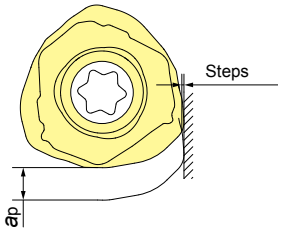
Correlation table of ap and steps when standing wall cutting

【High-feed type insert】
WOMU140620ER-FC
WOMU140620ER-FB



ap (mm)	Steps (mm)
0.5	0.01
1.0	0.03
1.5	0.05

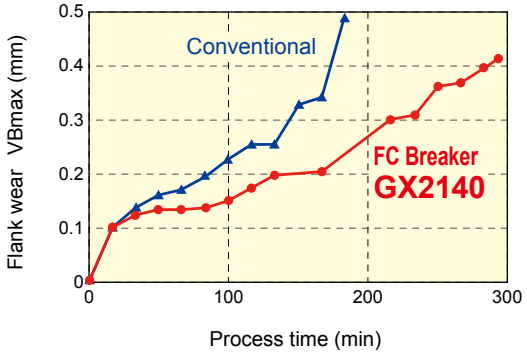
【High depth type insert】
WOMU140630ER-HC



ap (mm)	Steps (mm)
1.0	0.04
2.0	0.10
3.0	0.20

Cutting performance

Tool life on carbon steels (220HB).

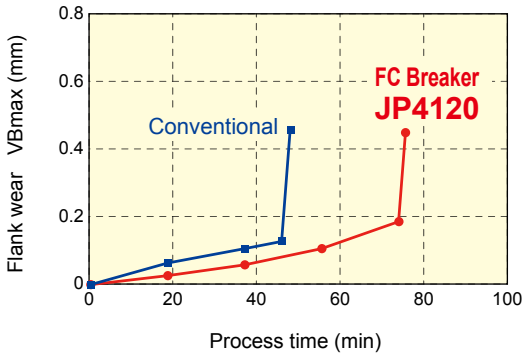


Cutting Conditions

Work Material	Carbon steels S50C(220HB)
Tool	TD6N5063B-5
Insert Model	WOMU140620ER-FC ; GX2140
Cutting Speed	v_c = 120m/min
Speed per flute	f_z = 1.5mm/t
Cutting depth	$a_p \times a_e$ = 1.0×45mm
Overhang	200mm

Air-blow, Single edge cutting

Tool life on alloy steels (SKD61, 45HRC).



Cutting Conditions

Work Material	Alloy steels SKD61(45HRC)
Tool	TD6N5063B-5
Insert Model	WOMU140620ER-FC ; JP4120
Cutting Speed	v_c = 100m/min
Speed per flute	f_z = 0.8mm/t
Cutting depth	$a_p \times a_e$ = 1.0× 40mm
Overhang	200mm

Air-blow, Single edge cutting

High-feed tools lineup

Application Matrix: Rough Machining

Type	Feature				Holder	Insert			Programming R (mm)	APMX (mm)
	Economical (No. of corners)	High accuracy (Less uncut remnants)	Supports for high-hardened steel	Efficiency (No. of Flutes)	Tool dia. (mm)	No. of corners	Shape	Inscribed circle code		
TD4N	◎	◎	○ ~62HRC	◎ High Efficiency multiflutes	ϕ16~40	4		06	2.0	1.0
ASR Multi-Flutes		○	○ ~62HRC	◎ High Efficiency multiflutes	ϕ16~66	2		06	2.0	1.5
								12	3.0	2.0
ASRF-mini	◎		○ ~62HRC	○ General	ϕ20~63	4		07	2.0	1.2
ASR		○	○ ~60HRC	○ General	ϕ20~100	2		08~15	3.0	2.0
ASRT	○	○	○ ~62HRC	○ General	ϕ25~100	3		09~14		
ASRF	◎		○ ~60HRC	○ General	ϕ32~100	4		12	4.5	
TD6N	◎	○	~50HRC	○ General	ϕ50~125	6		14	3.0	1.5
								14		3.0
TR4F	◎		○ ~60HRC	○ General	ϕ32~125	4		12		1.2
								15		2.0

※ Various other tools for roughing are also available.
※ For more information on tool specifications, please refer to our general catalog or visit our website. (http://www.moldino.com)

MOLDINO

The Edge To Innovation

The diagrams and table data are examples of test results, and are not guaranteed values.
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⚠ Attentions on Safety

1. Handling

(1) When removing tool from packaging, be careful not to drop the tool on your foot or fingers.
(2) When actually setting the inserts, be careful not to touch the cutting flute directly with your bare hands.

2. Mounting

(1) When preparing to use, be sure that the insert is firmly screwed in the pocket and cutter is properly mounted on the tool holder.
(2) If abnormal chattering occurs during use, stop the machine immediately, identify the cause of the chatter and take corrective action.

3. Usage

(1) Before use confirm all dimensions, verify work material and programmed tool rotation.
(2) The numerical values in the standard cutting conditions table should be used as criteria when starting new work. The cutting conditions should be adjusted as appropriate when the cutting depth is large, the rigidity of the machine being used is low, or according to the conditions of the work material.
(3) Inserts are made of hard material and may break and be expelled from cutter at high speeds. Since there is a danger of injury to workers from chip evacuation, insert breakage or fire safety precautions must be observed at all times. Including, but not limited to: safety glasses, machine enclosures or other means to create a safe environment for work. If you have questions on safety, contact your supervisor.
・Do not use where there is a risk of fire or explosion.
・Do not use non-water-soluble cutting oils. Such oils may result in fire.
(4) Do not use the tool for any purpose other than that for which it is intended, and do not modify it.

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