

MUGEN COATING PREMIUM

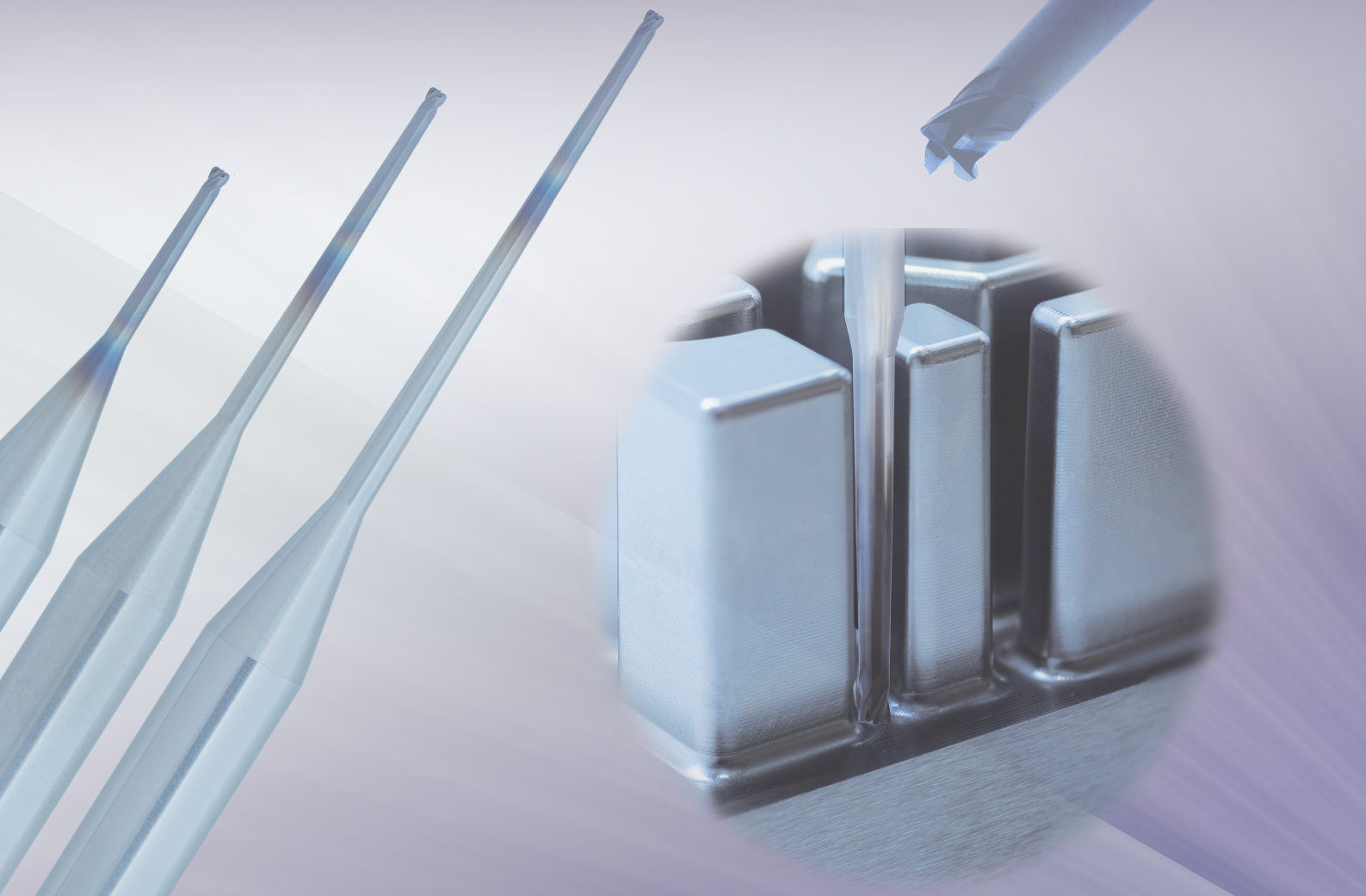
4-Flute Taper Neck Corner Radius End Mill

MTNH430R **NEW**

Total 93 sizes



Taper neck design increases tool rigidity that enables high precision deep machining
Even with small diameter, the 4-flute design realizes high-efficiency machining



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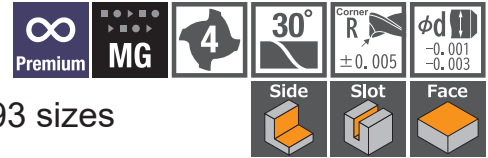
MUGEN COATING PREMIUM 4-Flute Taper Neck Corner Radius End Mill

MTNH430R New

ϕ 0.2×R0.03×Neck taper angle1°×1

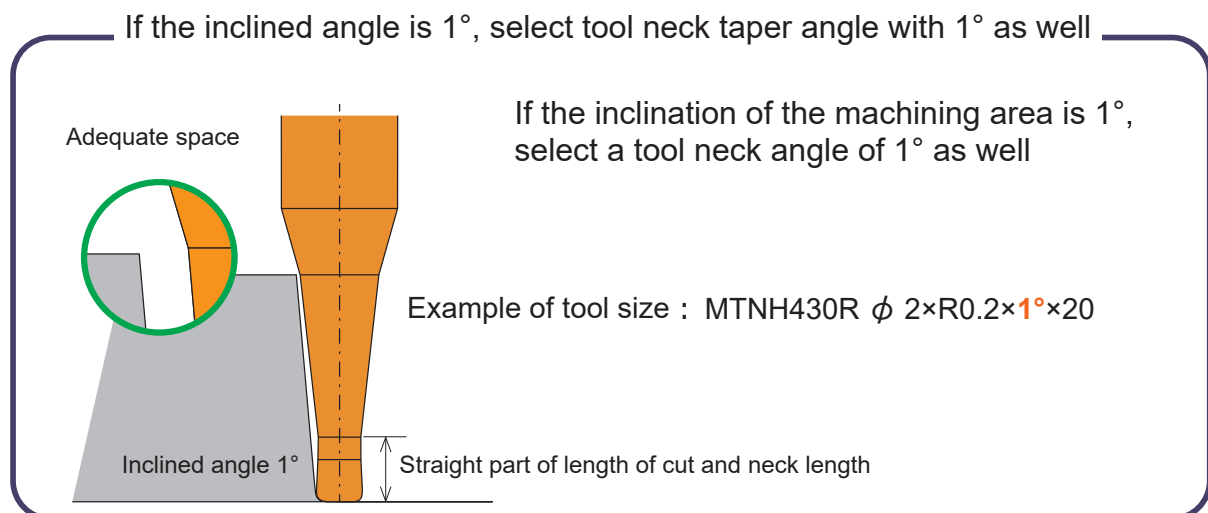
Total 93 sizes

~ ϕ 3×R0.5×Neck taper angle3°×30.1



Point 1

Available the same neck angle as the inclined angle of the milling surface



Point 2

Recommended cutting conditions for CAD/CAM operators reference

Newly added cutting conditions for "Roughing", "Stock Removal (Inner Corner)", "Semi-Finishing", "Finishing" processes to ensure that anyone can create tool paths at anytime based on standard reference values

Prehardened Steels HPM-NAK (~42HRC)									
Roughing					Stock removal (Inner Corner)				
Spindle Speed	Feed	Depth of Cut		Stock Allowance	Material Removal Rate	Spindle Speed	Feed	Depth of Cut	
min ⁻¹	mm/min	ap mm	ae mm	mm	mm ³ /min	min ⁻¹	mm/min	ap mm	ae mm
30,000	410	0.005	0.05	0.007	0.1	30,000	330	0.004	0.04
30,000	260	0.004	0.05	0.005	0.05	30,000	210	0.003	0.04
30,000	190	0.004	0.05	0.005	0.04	30,000	150	0.003	0.04
30,000	370	0.005	0.05	0.007	0.09	30,000	300	0.004	0.04
30,000	300	0.005	0.05	0.007	0.08	30,000	240	0.004	0.04
30,000	410	0.007	0.05	0.009	0.14	30,000	330	0.005	0.04
30,000	260	0.006	0.05	0.007	0.08	30,000	210	0.004	0.04

Prehardened Steels HPM-NAK (~42HRC)									
Semi-Finishing					Finishing				
Spindle Speed	Feed	Depth of Cut		Stock Allowance	Spindle Speed	Feed	Depth of Cut		Stock Allowance
min ⁻¹	mm/min	ap mm	ae mm	mm	min ⁻¹	mm/min	ap mm	ae mm	mm
30,000	310	0.004	0.038	0.003	30,000	290	0.003	0.035	0
30,000	200	0.003	0.038	0.002	30,000	180	0.002	0.035	0
30,000	140	0.003	0.038	0.002	30,000	130	0.002	0.035	0
30,000	280	0.004	0.038	0.003	30,000	260	0.003	0.035	0
30,000	230	0.004	0.038	0.003	30,000	210	0.003	0.035	0
30,000	310	0.005	0.038	0.004	30,000	290	0.004	0.035	0
30,000	200	0.004	0.038	0.003	30,000	180	0.003	0.035	0

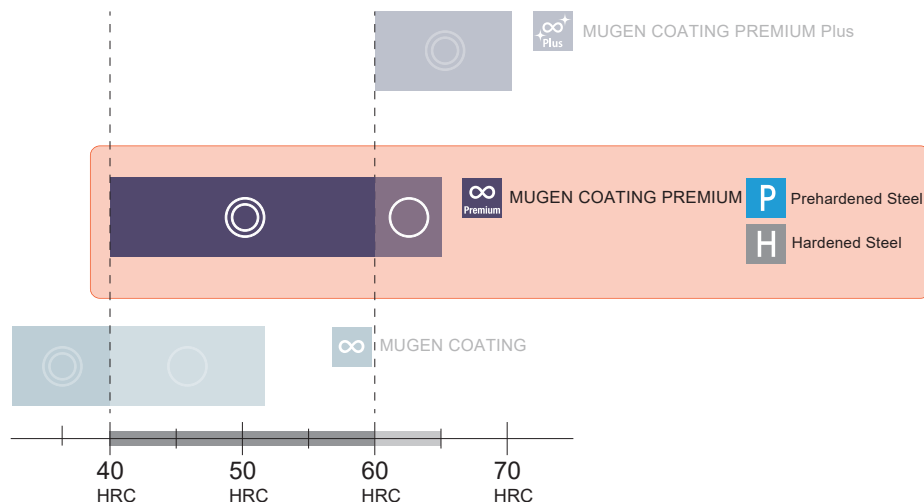
Features

Feature
1

Long tool life

MUGEN COATING PREMIUM

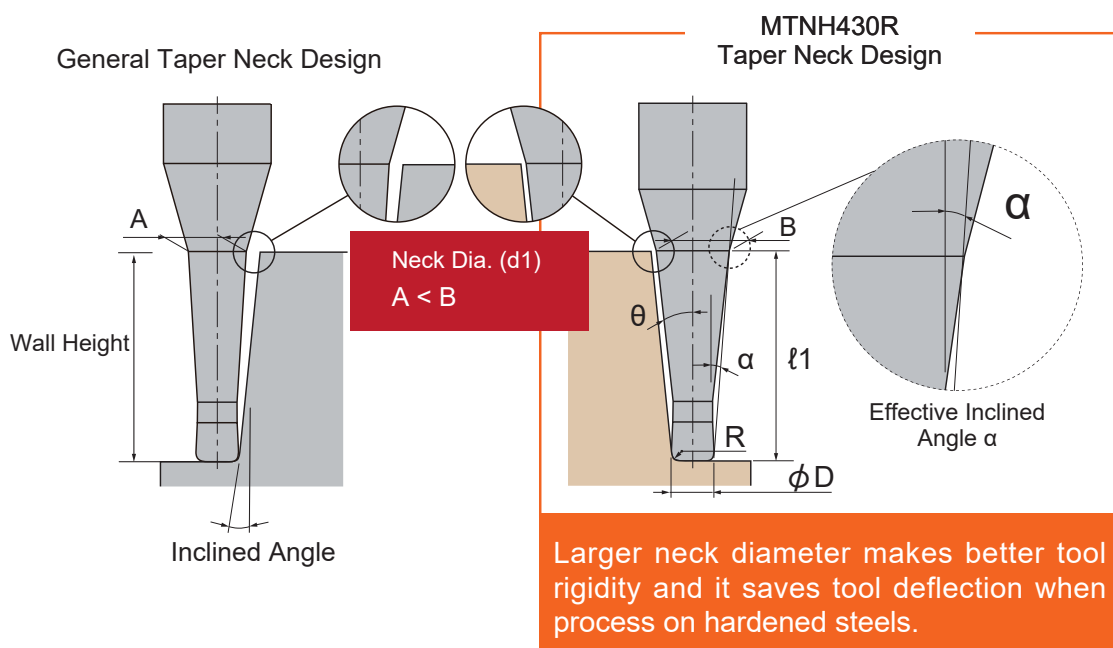
MUGEN COATING PREMIUM is a further improvement of the conventional MUGEN COATING that drastically extends tool life during direct milling on hardened steels
Effectively machining on work materials with hardness from 40 to 65 HRC

Feature
2

High rigidity

Taper neck design for maximum rigidity

Tool deflection is reduced by maximizing the rigidity to realize the high precision machining



Taper neck design increases tool rigidity that enables high precision deep machining Even with small diameter, the 4-flute design realizes high-efficiency machining

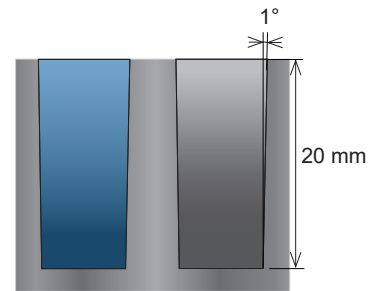
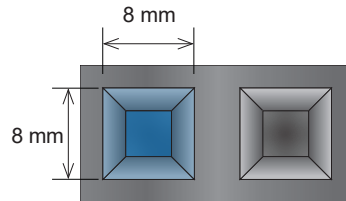
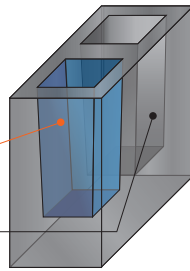
■ Comparison with long neck end mill

Work material : DAC-MAGIC
(44HRC)

Coolant : Oil mist

Machined by MTNH430R

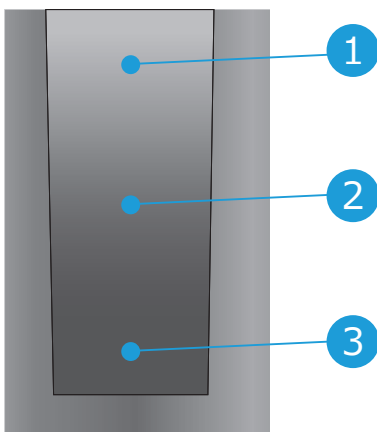
Machined by conventional tool



Tool	MTNH430R $\phi 2 \times R0.3 \times 1^\circ \times 20$			Conventional $\phi 2 \times R0.3 \times 20$		
Machining process	Roughing	Semi-finishing	Finishing	Roughing	Semi-finishing	Finishing
Spindle speed [min^{-1}]	10,000			8,000		
Cutting speed [m/min]	62.8			50.24		
Feed [mm/min]	1,500	800	800	650	650	650
Feed per tooth [mm/rev]	0.0375	0.02	0.02	0.02	0.02	0.02
Depth of cut $a_p \times a_e$ [mm]	0.07×1	0.05×0.02	0.02×0.02	0.02×0.6	0.02×0.02	0.02×0.02
Stock allowance [mm]	0.04	0.02	-	0.04	0.02	-
Machining time	28 min	13 min	33 min	2hr 36 min	38 min	38 min
Total machining time	1 hr 14 min			3 hr 52 min		

By using the high-rigidity tool **MTNH430R**, machining accuracy can be easily stabilized, resulting in a significant reduction in machining time and cost.

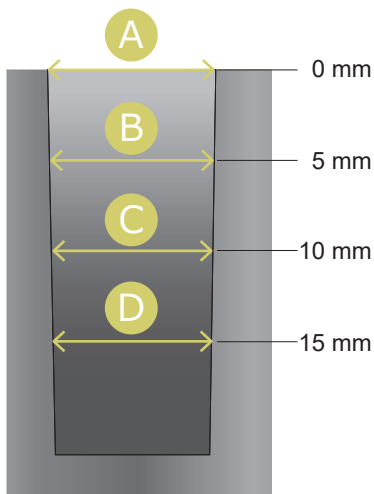
Surface roughness



Measuring position	MTNH430R $\phi 2 \times R0.3 \times 1^\circ \times 20$		Conventional $\phi 2 \times R0.3 \times 20$	
1		Ra : 0.132 Rz : 0.908		Ra : 0.362 Rz : 2.486
2		Ra : 0.206 Rz : 1.240		Ra : 0.291 Rz : 1.564
3		Ra : 0.192 Rz : 1.216		Ra : 0.300 Rz : 1.652

Taper neck shape increases tool rigidity, suppresses chattering even at deep-area machining, and achieves high surface quality.

Accuracy



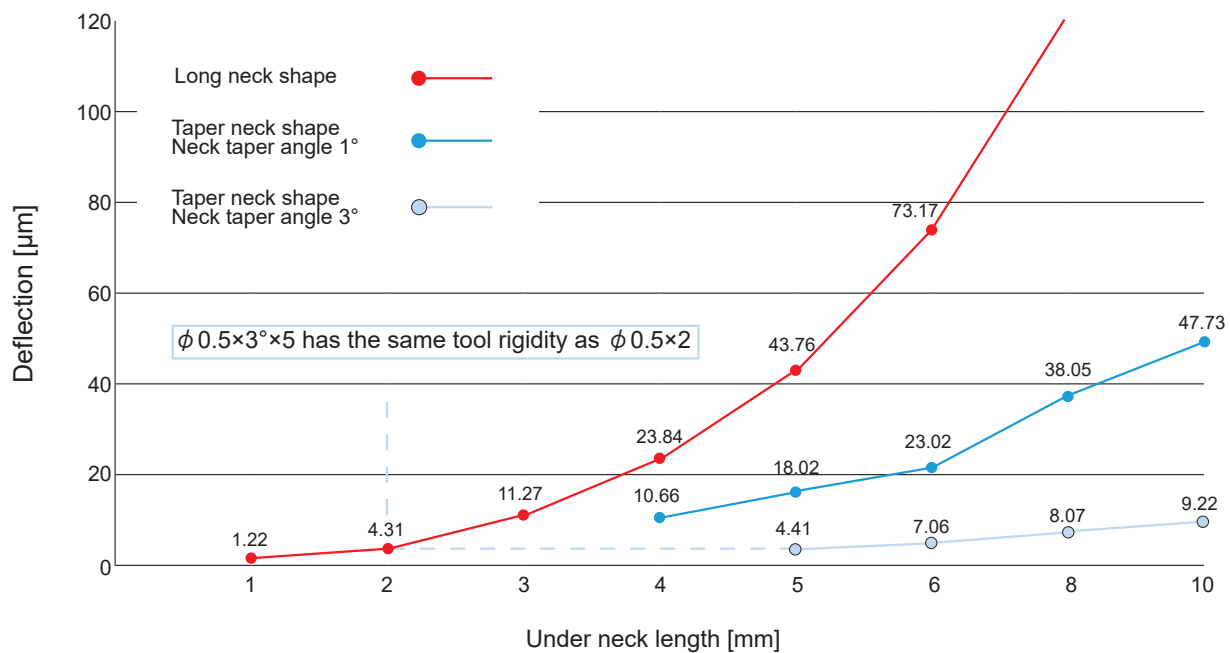
Unit [mm]

Measuring position	Target	MTNH430R $\phi 2 \times R0.3 \times 1^\circ \times 20$		Conventional $\phi 2 \times R0.3 \times 20$	
		Actual	Error	Actual	Error
A	8.000	7.992	-0.008	7.992	-0.008
B	7.825	7.816	-0.009	7.788	-0.037
C	7.651	7.637	-0.014	7.610	-0.041
D	7.476	7.457	-0.019	7.436	-0.04
Angle	1°	1°1'19"	+1'19"	1°3'43"	+3'43"

MTNH430R, featuring a tapered neck design that enhances tool rigidity, enables high-precision machining by minimizing tool deflection.

■ Tool rigidity comparison with long neck end mill

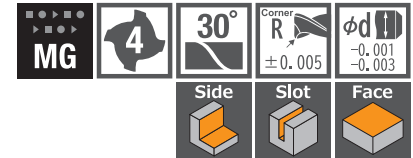
Deflection comparison under 1 N load on $\phi 0.5$, neck shape variation



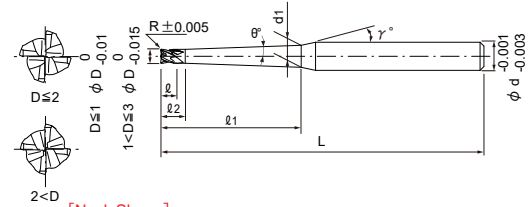
MUGEN COATING PREMIUM 4-Flute Taper Neck Corner Radius End Mill

Total 93 sizes

Taper neck design increases tool rigidity that enables high precision deep machining
Even with small diameter, the 4-flute design realizes high-efficiency machining



- Corner radius end mill with taper neck design that enables high precision deep machining with minimal deflection.
- Optimized taper neck design and MUGEN COATING PREMIUM realizes higher ability for hardened steels.
- 4-flute design even with small diameter, lineup of 93 sizes in total.



[Neck Shape]

(γ) is reference value. Tool measurement required in order to avoid interference to the work material.

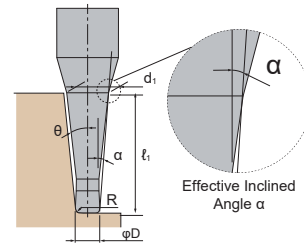
Please be aware of remaining stock since there is no cutting edge on its center from $\phi 0.2$ to $\phi 2$.

Work Material

Prehardened Steel P	Hardened Steel H	
	40~60HRC	~65HRC
		

◆ Release in Jul, 2025.

※ Please select the tool with the same neck angle as the inclined angle of the milling surface.
It does not indicate the shape of the tool.



Unit [Size : mm]

Code No.	Dia. (D)	Corner Radius (R)	Neck Taper Angle (θ)	Under Neck Length (ℓ)	Neck Dia. (d ₁)	Length of Cut (t)	Under Neck Length 2 (ℓ ₂)	Neck Taper Angle 2 (γ)	Effective Inclined Angle (α)	Shank Dia. (d)	Overall Length (L)
◆ 08-00777-02311	0.2	R0.03	1°	1	0.22	0.15	0.4	12°	0°59′	4	45
◆ 08-00777-02312				1.5	0.24	0.15	0.4	12°	0°59′	4	45
◆ 08-00777-02313				2	0.26	0.15	0.4	12°	0°59′	4	45
◆ 08-00777-02342			3°	1.5	0.34	0.15	0.4	12°	2°59′	4	45
◆ 08-00777-02343				2	0.39	0.15	0.4	12°	2°59′	4	45
◆ 08-00777-02411				1	0.22	0.15	0.4	12°	0°59′	4	45
◆ 08-00777-02412		R0.05	1°	1.5	0.24	0.15	0.4	12°	0°59′	4	45
◆ 08-00777-02413				2	0.26	0.15	0.4	12°	0°59′	4	45
◆ 08-00777-02442				1.5	0.34	0.15	0.4	12°	2°59′	4	45
◆ 08-00777-02443			3°	2	0.39	0.15	0.4	12°	2°59′	4	45
◆ 08-00777-03312	0.3	1°		1.5	0.34	0.25	0.6	12°	0°59′	4	45
◆ 08-00777-03313			2	0.35	0.25	0.6	12°	0°59′	4	45	
◆ 08-00777-03315			3	0.39	0.25	0.6	12°	0°59′	4	45	
◆ 08-00777-03343		3°	2	0.49	0.25	0.6	12°	2°59′	4	45	
◆ 08-00777-03345			3	0.6	0.25	0.6	12°	2°59′	4	45	
◆ 08-00777-03412			1.5	0.34	0.25	0.6	12°	0°59′	4	45	
◆ 08-00777-03413		R0.05	1°	2	0.35	0.25	0.6	12°	0°59′	4	45
◆ 08-00777-03415				3	0.39	0.25	0.6	12°	0°59′	4	45
◆ 08-00777-03443				2	0.49	0.25	0.6	12°	2°59′	4	45
◆ 08-00777-03445			3°	3	0.6	0.25	0.6	12°	2°59′	4	45
◆ 08-00777-05411	0.5	R0.05		1°	4	0.62	0.4	1	12°	0°59′	4
◆ 08-00777-05412			5		0.65	0.4	1	12°	0°59′	4	45
◆ 08-00777-05413			6		0.69	0.4	1	12°	0°59′	4	45
◆ 08-00777-05415			8		0.76	0.4	1	12°	0°59′	4	45
◆ 08-00777-05417			10		0.83	0.4	1	12°	0°59′	4	45
◆ 08-00777-05442			3°	5	1	0.4	1	12°	2°59′	4	45
◆ 08-00777-05445				8	1.31	0.4	1	12°	2°59′	4	45
◆ 08-00777-05447				10	1.52	0.4	1	12°	2°59′	4	45
◆ 08-00777-05511		R0.1	1°	4	0.61	0.4	1	12°	0°59′	4	45
◆ 08-00777-05512				5	0.65	0.4	1	12°	0°59′	4	45
◆ 08-00777-05513				6	0.68	0.4	1	12°	0°59′	4	45
◆ 08-00777-05515				8	0.75	0.4	1	12°	0°59′	4	45
◆ 08-00777-05517				10	0.82	0.4	1	12°	0°59′	4	45
◆ 08-00777-05542			3°	5	0.99	0.4	1	12°	2°59′	4	45
◆ 08-00777-05545				8	1.31	0.4	1	12°	2°59′	4	45
◆ 08-00777-05547				10	1.52	0.4	1	12°	2°59′	4	45

How to Order

When you order, indicate MTNH430R (D)×(R)×(θ)×(ℓ1).

※ (γ) is reference value.

※ Please select the tool with the same neck angle as the inclined angle of the milling surface.
It does not indicate the shape of the tool.

Unit [Size : mm]

Code No.	Dia. (D)	Corner Radius (R)	Neck Taper Angle (θ)	Under Neck Length (ℓ)	Neck Dia. (d1)	Length of Cut (ℓ)	Under Neck Length 2 (ℓ ₂)	Neck Taper Angle 2 (γ)	Effective Inclined Angle (α)	Shank Dia. (d)	Overall Length (L)
◆ 08-00777-10511	1	R0.1	1°	10	1.3	0.8	2	12°	0°59'	6	60
◆ 08-00777-10512				15	1.47	0.8	2	12°	0°59'	6	60
◆ 08-00777-10513				20	1.65	0.8	2	12°	0°59'	6	60
◆ 08-00777-10514				25	1.82	0.8	2	12°	0°59'	6	70
◆ 08-00777-10515				30	2	0.8	2	12°	0°59'	6	70
◆ 08-00777-10542			3°	15	2.52	0.8	2	12°	2°59'	6	60
◆ 08-00777-10611		R0.2	1°	10	1.3	0.8	2	12°	0°59'	6	60
◆ 08-00777-10612				15	1.47	0.8	2	12°	0°59'	6	60
◆ 08-00777-10613				20	1.65	0.8	2	12°	0°59'	6	60
◆ 08-00777-10614				25	1.82	0.8	2	12°	0°59'	6	70
◆ 08-00777-10615				30	1.99	0.8	2	12°	0°59'	6	70
◆ 08-00777-10642			3°	15	2.51	0.8	2	12°	2°59'	6	60
◆ 08-00777-10711		R0.3	1°	10	1.29	0.8	2	12°	0°59'	6	60
◆ 08-00777-10712				15	1.47	0.8	2	12°	0°59'	6	60
◆ 08-00777-10713				20	1.64	0.8	2	12°	0°59'	6	60
◆ 08-00777-10714				25	1.82	0.8	2	12°	0°59'	6	70
◆ 08-00777-10715				30	1.99	0.8	2	12°	0°59'	6	70
◆ 08-00777-10742			3°	15	2.5	0.8	2	12°	2°59'	6	60
◆ 08-00777-15612	1.5	R0.2	1°	15	1.97	1.2	3	12°	0°59'	6	60
◆ 08-00777-15613				20	2.14	1.2	3	12°	0°59'	6	60
◆ 08-00777-15615				30	2.49	1.2	3	12°	0°59'	6	70
◆ 08-00777-15643			3°	20	3.53	1.2	3	12°	2°59'	6	60
◆ 08-00777-15712		R0.3	1°	15	1.97	1.2	3	12°	0°59'	6	60
◆ 08-00777-15713				20	2.14	1.2	3	12°	0°59'	6	60
◆ 08-00777-15715				30	2.49	1.2	3	12°	0°59'	6	70
◆ 08-00777-15743			3°	20	3.52	1.2	3	12°	2°59'	6	60
◆ 08-00777-15812		R0.5	1°	15	1.96	1.2	3	12°	0°59'	6	60
◆ 08-00777-15813				20	2.13	1.2	3	12°	0°59'	6	60
◆ 08-00777-15815				30	2.48	1.2	3	12°	0°59'	6	70
◆ 08-00777-15843			3°	20	3.5	1.2	3	12°	2°59'	6	60
◆ 08-00777-20613	2	R0.2	1°	20	2.64	1.6	4	12°	0°59'	6	60
◆ 08-00777-20615				30	2.99	1.6	4	12°	0°59'	6	70
◆ 08-00777-20617				40	3.34	1.6	4	12°	0°59'	6	80
◆ 08-00777-20645			3°	30	5.07	1.6	4	12°	2°59'	6	70
◆ 08-00777-20713		R0.3	1°	20	2.64	1.6	4	12°	0°59'	6	60
◆ 08-00777-20715				30	2.99	1.6	4	12°	0°59'	6	70
◆ 08-00777-20717				40	3.34	1.6	4	12°	0°59'	6	80
◆ 08-00777-20745			3°	30	5.06	1.6	4	12°	2°59'	6	70
◆ 08-00777-20813		R0.5	1°	20	2.63	1.6	4	12°	0°59'	6	60
◆ 08-00777-20815				30	2.98	1.6	4	12°	0°59'	6	70
◆ 08-00777-20817				40	3.33	1.6	4	12°	0°59'	6	80
◆ 08-00777-20845			3°	30	5.04	1.6	4	12°	2°59'	6	70
◆ 08-00777-30611	3	R0.2	1°	30	3.94	2.5	6	12°	0°59'	6	70
◆ 08-00777-30613				40	4.29	2.5	6	12°	0°59'	6	80
◆ 08-00777-30615				50	4.64	2.5	6	12°	0°59'	6	90
◆ 08-00777-30617				60	4.99	2.5	6	12°	0°59'	6	100
◆ 08-00777-30642			3°	29.8	6	2.5	6	-	2°59'	6	70
◆ 08-00777-30711		R0.3	1°	30	3.93	2.5	6	12°	0°59'	6	70
◆ 08-00777-30713				40	4.28	2.5	6	12°	0°59'	6	80
◆ 08-00777-30715				50	4.63	2.5	6	12°	0°59'	6	90
◆ 08-00777-30717				60	4.98	2.5	6	12°	0°59'	6	100
◆ 08-00777-30742			3°	29.9	6	2.5	6	-	2°59'	6	70
◆ 08-00777-30811		R0.5	1°	30	3.93	2.5	6	12°	0°59'	6	70
◆ 08-00777-30813				40	4.28	2.5	6	12°	0°59'	6	80
◆ 08-00777-30815				50	4.63	2.5	6	12°	0°59'	6	90
◆ 08-00777-30817				60	4.98	2.5	6	12°	0°59'	6	100
◆ 08-00777-30842			3°	30.1	6	2.5	6	-	2°59'	6	70

Recommended Conditions

Work Material					Prehardened Steels HPM・NAK (~42HRC)										
Dia.	Corner Radius	Neck Taper Angle	Under Neck Length	L/D	Roughing						Stock Removal (Inner Corner)				
					Spindle Speed	Feed	Depth of Cut		Stock Allowance	Material Removal Rate	Spindle Speed	Feed	Depth of Cut		Stock Allowance
					min ⁻¹	mm/min	a _p mm	a _e mm	mm	mm ³ /min	min ⁻¹	mm/min	a _p mm	a _e mm	mm
0.2	R0.03	1°	1	5	30,000	410	0.005	0.05	0.007	0.1	30,000	330	0.004	0.04	0.007
			1.5	7.5	30,000	260	0.004	0.05	0.005	0.05	30,000	210	0.003	0.04	0.005
			2	10	30,000	190	0.004	0.05	0.005	0.04	30,000	150	0.003	0.04	0.005
		3°	1.5	7.5	30,000	370	0.005	0.05	0.007	0.09	30,000	300	0.004	0.04	0.007
			2	10	30,000	300	0.005	0.05	0.007	0.08	30,000	240	0.004	0.04	0.007
	R0.05	1°	1	5	30,000	410	0.007	0.05	0.009	0.14	30,000	330	0.005	0.04	0.009
			1.5	7.5	30,000	260	0.006	0.05	0.007	0.08	30,000	210	0.004	0.04	0.007
			2	10	30,000	190	0.005	0.05	0.005	0.05	30,000	150	0.003	0.04	0.005
		3°	1.5	7.5	30,000	370	0.007	0.05	0.009	0.13	30,000	300	0.005	0.04	0.009
			2	10	30,000	300	0.006	0.05	0.007	0.09	30,000	240	0.005	0.04	0.007
0.3	R0.03	1°	1.5	5	30,000	520	0.011	0.1	0.009	0.57	30,000	420	0.008	0.08	0.009
			2	6.7	30,000	400	0.008	0.1	0.008	0.32	30,000	320	0.006	0.08	0.008
			3	10	30,000	300	0.005	0.1	0.006	0.15	30,000	240	0.004	0.08	0.006
		3°	2	6.7	30,000	520	0.011	0.1	0.009	0.57	30,000	420	0.008	0.08	0.009
			3	10	30,000	420	0.008	0.1	0.008	0.34	30,000	340	0.006	0.08	0.008
	R0.05	1°	1.5	5	30,000	520	0.015	0.1	0.011	0.78	30,000	420	0.011	0.08	0.011
			2	6.7	30,000	400	0.011	0.1	0.009	0.44	30,000	320	0.008	0.08	0.009
			3	10	30,000	300	0.008	0.1	0.006	0.24	30,000	240	0.006	0.08	0.006
		3°	2	6.7	30,000	520	0.015	0.1	0.011	0.78	30,000	420	0.011	0.08	0.011
			3	10	30,000	420	0.011	0.1	0.01	0.46	30,000	340	0.009	0.08	0.01
0.5	R0.05	1°	4	8	30,000	800	0.016	0.16	0.012	2.05	30,000	640	0.012	0.128	0.012
			5	10	26,300	680	0.013	0.16	0.01	1.41	21,000	540	0.01	0.128	0.01
			6	12	25,600	610	0.011	0.16	0.008	1.07	20,500	490	0.008	0.128	0.008
			8	16	24,500	520	0.008	0.12	0.005	0.5	20,500	420	0.006	0.096	0.005
			10	20	23,800	310	0.006	0.08	0.004	0.15	19,000	250	0.004	0.064	0.004
		3°	5	10	30,000	860	0.019	0.16	0.014	2.61	24,000	690	0.014	0.128	0.014
			8	16	30,000	790	0.015	0.16	0.011	1.9	24,000	630	0.012	0.128	0.011
			10	20	30,000	760	0.014	0.16	0.01	1.7	24,000	610	0.011	0.128	0.01
	R0.1	1°	4	8	30,000	800	0.016	0.16	0.012	2.05	24,000	640	0.012	0.128	0.012
			5	10	26,300	680	0.013	0.16	0.01	1.41	21,000	540	0.01	0.128	0.01
			6	12	25,600	610	0.011	0.16	0.008	1.07	20,500	490	0.008	0.128	0.008
			8	16	24,500	520	0.008	0.12	0.005	0.5	19,600	420	0.006	0.096	0.005
		3°	10	20	23,800	310	0.006	0.08	0.004	0.15	19,000	250	0.004	0.064	0.004
			5	10	30,000	860	0.019	0.16	0.014	2.61	24,000	690	0.014	0.128	0.014
			8	16	30,000	790	0.015	0.16	0.011	1.9	24,000	630	0.012	0.128	0.011
			10	20	30,000	760	0.014	0.16	0.01	1.7	24,000	610	0.011	0.128	0.01
1	R0.1	1°	10	10	17,500	1,130	0.035	0.35	0.023	13.84	14,000	900	0.028	0.28	0.023
			15	15	15,100	570	0.015	0.25	0.008	2.14	12,100	460	0.012	0.2	0.008
			20	20	13,800	420	0.01	0.1	0.006	0.42	11,000	330	0.008	0.08	0.006
			25	25	12,900	360	0.005	0.05	0.004	0.09	10,300	290	0.004	0.04	0.004
			30	30	12,300	310	0.003	0.03	0.004	0.03	9,800	250	0.002	0.024	0.004
		3°	15	15	18,800	1,560	0.041	0.35	0.026	22.39	15,000	1,250	0.032	0.28	0.026
	R0.2	1°	10	10	17,500	1,130	0.035	0.35	0.023	13.84	14,000	900	0.028	0.28	0.023
			15	15	15,100	570	0.015	0.25	0.008	2.14	12,100	460	0.012	0.2	0.008
			20	20	13,800	420	0.01	0.1	0.006	0.42	11,000	330	0.008	0.08	0.006
			25	25	12,900	360	0.005	0.05	0.004	0.09	10,300	290	0.004	0.04	0.004
		3°	30	30	12,300	310	0.003	0.03	0.004	0.03	9,800	250	0.002	0.024	0.004
			15	15	18,800	1,560	0.041	0.35	0.026	22.39	15,000	1,250	0.032	0.28	0.026
R0.3	1°	10	10	17,500	1,130	0.035	0.35	0.023	13.84	14,000	900	0.028	0.28	0.023	
		15	15	15,100	570	0.015	0.25	0.008	2.14	12,100	460	0.012	0.2	0.008	
		20	20	13,800	420	0.01	0.1	0.006	0.42	11,000	330	0.008	0.08	0.006	
		25	25	12,900	360	0.005	0.05	0.004	0.09	10,300	290	0.004	0.04	0.004	
	3°	30	30	12,300	310	0.003	0.03	0.004	0.03	9,800	250	0.002	0.024	0.004	
		15	15	18,800	1,560	0.041	0.35	0.026	22.39	15,000	1,250	0.032	0.28	0.026	

Recommended Conditions

Work Material					Prehardened Steels HPM·NAK (~42HRC)											
Dia.	Corner Radius	Neck Taper Angle	Under Neck Length	L/D	Roughing						Stock Removal (Inner Corner)					
					Spindle Speed	Feed	Depth of Cut		Stock Allowance	Material Removal Rate	Spindle Speed	Feed	Depth of Cut		Stock Allowance	
							min ⁻¹	mm/min					a _p mm	a _e mm		mm
1.5	R0.2	1°	15	10	15,700	1,150	0.05	0.55	0.038	31.63	12,600	920	0.04	0.44	0.038	
			20	13.3	13,800	630	0.03	0.4	0.011	7.56	11,000	500	0.024	0.32	0.011	
			30	20	11,800	430	0.01	0.15	0.007	0.65	9,400	340	0.008	0.12	0.007	
	3°	20	13.3	17,700	1,590	0.065	0.55	0.046	56.84	14,200	1,270	0.052	0.44	0.046		
		R0.3	1°	15	10	15,700	1,150	0.05	0.55	0.038	31.63	12,600	920	0.04	0.44	0.038
				20	13.3	13,800	630	0.03	0.4	0.011	7.56	11,000	500	0.024	0.32	0.011
	30			20	11,800	430	0.01	0.15	0.007	0.65	9,400	340	0.008	0.12	0.007	
	3°	20	13.3	17,700	1,590	0.065	0.55	0.046	56.84	14,200	1,270	0.052	0.44	0.046		
		R0.5	1°	15	10	15,700	1,150	0.05	0.55	0.038	31.63	12,600	920	0.04	0.44	0.038
				20	13.3	13,800	630	0.03	0.4	0.011	7.56	11,000	500	0.024	0.32	0.011
	30			20	11,800	430	0.01	0.15	0.007	0.65	9,400	340	0.008	0.12	0.007	
	3°	20	13.3	17,700	1,590	0.065	0.55	0.046	56.84	14,200	1,270	0.052	0.44	0.046		
2		R0.2	1°	20	10	12,500	1,170	0.07	0.7	0.046	57.33	10,000	940	0.056	0.56	0.046
				30	15	9,500	740	0.04	0.5	0.029	14.8	7,600	590	0.032	0.4	0.022
	40			20	7,900	440	0.03	0.2	0.023	2.64	6,300	350	0.024	0.16	0.017	
	3°	30	15	14,400	1,570	0.08	0.7	0.053	87.92	11,500	1,260	0.064	0.56	0.053		
		R0.3	1°	20	10	12,500	1,170	0.07	0.7	0.046	57.33	10,000	940	0.056	0.56	0.046
				30	15	9,500	740	0.04	0.5	0.029	14.8	7,600	590	0.032	0.4	0.029
	40			20	7,900	440	0.03	0.2	0.023	2.64	6,300	350	0.024	0.16	0.023	
	3°	30	15	14,400	1,570	0.08	0.7	0.053	87.92	11,500	1,260	0.064	0.56	0.053		
		R0.5	1°	20	10	12,500	1,170	0.07	0.7	0.046	57.33	10,000	940	0.056	0.56	0.046
				30	15	9,500	740	0.04	0.5	0.029	14.8	7,600	590	0.032	0.4	0.029
	40			20	7,900	440	0.03	0.2	0.023	2.64	6,300	350	0.024	0.16	0.023	
	3°	30	15	14,400	1,570	0.08	0.7	0.053	87.92	11,500	1,260	0.064	0.56	0.053		
3		R0.2	1°	30	10	8,900	1,190	0.08	1	0.061	95.2	7,100	950	0.064	0.8	0.06
				40	13.3	7,800	650	0.06	0.8	0.032	31.2	6,200	520	0.048	0.64	0.032
	50			16.7	7,000	530	0.045	0.6	0.026	14.31	5,600	420	0.036	0.48	0.026	
	3°	60	20	6,500	450	0.035	0.3	0.023	4.73	5,200	360	0.028	0.24	0.023		
		R0.3	1°	30	10	8,900	1,190	0.08	1	0.061	95.2	7,100	950	0.064	0.8	0.06
				40	13.3	7,700	650	0.06	0.8	0.032	31.2	6,200	520	0.048	0.64	0.032
	50			16.7	7,000	530	0.045	0.6	0.026	14.31	5,600	420	0.036	0.48	0.026	
	3°	60	20	6,500	450	0.035	0.3	0.023	4.73	5,200	360	0.028	0.24	0.023		
		R0.5	1°	30	10	8,900	1,190	0.08	1	0.061	95.2	7,100	950	0.064	0.8	0.06
				40	13.3	7,700	650	0.06	0.8	0.032	31.2	6,200	520	0.048	0.64	0.032
	50			16.7	7,000	530	0.045	0.6	0.026	14.31	5,600	420	0.036	0.48	0.026	
	3°	60	20	6,500	450	0.035	0.3	0.023	4.73	5,200	360	0.028	0.24	0.023		
R0.5		1°	30	10	8,900	1,190	0.08	1	0.061	95.2	7,100	950	0.064	0.8	0.06	
			40	13.3	7,700	650	0.06	0.8	0.032	31.2	6,200	520	0.048	0.64	0.032	
	50		16.7	7,000	530	0.045	0.6	0.026	14.31	5,600	420	0.036	0.48	0.026		
3°	60	20	6,500	450	0.035	0.3	0.023	4.73	5,200	360	0.028	0.24	0.023			

Notes

- ※1 Depth of Cut: ap=Axial Depth of Cut / ae=Radial Depth of Cut.
 ※2 Adjust milling condition according to machine rigidity and clamp condition of work material.
 ※3 In case of chattering etc., please adjust cutting conditions if necessary.
 ※4 If the cutting load is high at corner, adjust the cutting conditions and tool path to reduce the cutting load.
 ※5 Recommend to apply helical or ramping for approaching into axial direction.
 ※6 If the maximum spindle speed of the machine tool is lower than the reference value, please reduce the spindle speed and feed rate at the same rate.
 ※7 Length of tool overhang must be as short as possible.
 ※8 Oil mist coolant is recommended.
 ※9 Coolant supply and chip disposal in the deep portion are very important.
 ※10 The stock allowance for this tool is a guideline.
 Please adjust it according to the machining condition of the previous process and the required accuracy.
 ※11 The parameters for the Stock Removal (Inner Corner) process are reference values based on the condition after roughing, where a corner radius end mill approximately 1.5 times larger than the tool used in this process was applied. Please adjust the depth of cut and feed rate according to the amount of remaining material from the previous roughing operation.
 Example
 Roughing: $\phi 3 \times R0.5 \rightarrow$ Stock removal (inner corner): $\phi 2 \times R0.2$

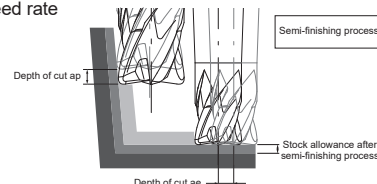
Recommended Conditions

Work Material					Prehardened Steels HPM·NAK (~42HRC)									
Dia.	Corner Radius	Neck Taper Angle	Under Neck Length	L/D	Semi-Finishing					Finishing				
					Spindle Speed	Feed	Depth of Cut		Stock Allowance	Spindle Speed	Feed	Depth of Cut		Stock Allowance
					min ⁻¹	mm/min	a _p mm	a _e mm	mm	min ⁻¹	mm/min	a _p mm	a _e mm	mm
0.2	R0.03	1°	1	5	30,000	310	0.004	0.038	0.003	30,000	290	0.003	0.035	0
			1.5	7.5	30,000	200	0.003	0.038	0.002	30,000	180	0.002	0.035	0
			2	10	30,000	140	0.003	0.038	0.002	30,000	130	0.002	0.035	0
		3°	1.5	7.5	30,000	280	0.004	0.038	0.003	30,000	260	0.003	0.035	0
			2	10	30,000	230	0.004	0.038	0.003	30,000	210	0.003	0.035	0
	R0.05	1°	1	5	30,000	310	0.005	0.038	0.004	30,000	290	0.004	0.035	0
			1.5	7.5	30,000	200	0.004	0.038	0.003	30,000	180	0.003	0.035	0
			2	10	30,000	140	0.003	0.038	0.002	30,000	130	0.002	0.035	0
		3°	1.5	7.5	30,000	280	0.005	0.038	0.004	30,000	260	0.004	0.035	0
			2	10	30,000	230	0.004	0.038	0.003	30,000	210	0.003	0.035	0
0.3	R0.03	1°	1.5	5	30,000	390	0.006	0.075	0.003	30,000	360	0.003	0.07	0
			2	6.7	30,000	300	0.006	0.075	0.002	30,000	280	0.002	0.07	0
			3	10	30,000	230	0.004	0.075	0.002	30,000	210	0.002	0.07	0
		3°	2	6.7	30,000	390	0.006	0.075	0.003	30,000	360	0.003	0.07	0
			3	10	30,000	320	0.006	0.075	0.002	30,000	290	0.002	0.07	0
	R0.05	1°	1.5	5	30,000	390	0.006	0.075	0.005	30,000	360	0.005	0.07	0
			2	6.7	30,000	300	0.006	0.075	0.003	30,000	280	0.003	0.07	0
			3	10	30,000	230	0.004	0.075	0.002	30,000	210	0.002	0.07	0
		3°	2	6.7	30,000	390	0.006	0.075	0.005	30,000	360	0.005	0.07	0
			3	10	30,000	320	0.006	0.075	0.004	30,000	290	0.004	0.07	0
0.5	R0.05	1°	4	8	30,000	600	0.007	0.12	0.005	30,000	560	0.005	0.112	0
			5	10	21,000	510	0.006	0.12	0.004	21,000	480	0.004	0.112	0
			6	12	20,500	460	0.005	0.12	0.003	20,500	430	0.003	0.112	0
			8	16	20,500	390	0.003	0.09	0.002	20,500	360	0.002	0.084	0
		3°	10	20	19,000	230	0.002	0.06	0.002	19,000	220	0.002	0.056	0
	R0.1	1°	5	10	24,000	650	0.008	0.12	0.006	24,000	600	0.006	0.112	0
			8	16	24,000	590	0.006	0.12	0.005	24,000	550	0.005	0.112	0
			10	20	24,000	570	0.006	0.12	0.004	24,000	530	0.004	0.112	0
		3°	4	8	24,000	600	0.007	0.12	0.005	24,000	560	0.005	0.112	0
1	R0.1	1°	5	10	21,000	510	0.006	0.12	0.004	21,000	480	0.004	0.112	0
			6	12	20,500	460	0.005	0.12	0.003	20,500	430	0.003	0.112	0
			8	16	19,600	390	0.003	0.09	0.002	19,600	360	0.002	0.084	0
			10	20	19,000	230	0.002	0.06	0.002	19,000	220	0.002	0.056	0
		3°	5	10	24,000	650	0.008	0.12	0.006	24,000	600	0.006	0.112	0
			8	16	24,000	590	0.006	0.12	0.005	24,000	550	0.005	0.112	0
	R0.2	1°	10	20	24,000	570	0.006	0.12	0.004	24,000	530	0.004	0.112	0
			10	10	14,000	850	0.013	0.263	0.01	14,000	790	0.01	0.245	0
			15	15	12,100	430	0.004	0.188	0.004	12,100	400	0.004	0.175	0
		3°	20	20	11,000	310	0.003	0.075	0.003	11,000	300	0.003	0.07	0
			25	25	10,300	270	0.002	0.038	0.002	10,300	250	0.002	0.035	0
1	R0.3	1°	30	30	9,800	230	0.002	0.023	0.002	9,800	220	0.002	0.021	0
			15	15	15,000	1,170	0.015	0.263	0.011	15,000	1,090	0.011	0.245	0
		3°	10	10	14,000	850	0.013	0.263	0.01	14,000	790	0.01	0.245	0
			15	15	12,100	430	0.004	0.188	0.004	12,100	400	0.004	0.175	0
		1°	20	20	11,000	310	0.003	0.075	0.003	11,000	300	0.003	0.07	0
			25	25	10,300	270	0.002	0.038	0.002	10,300	250	0.002	0.035	0
	R0.3	1°	30	30	9,800	230	0.002	0.023	0.002	9,800	220	0.002	0.021	0
			15	15	15,000	1,170	0.015	0.263	0.011	15,000	1,090	0.011	0.245	0
		3°	10	10	14,000	850	0.013	0.263	0.01	14,000	790	0.01	0.245	0
			15	15	12,100	430	0.004	0.188	0.004	12,100	400	0.004	0.175	0
		1°	20	20	11,000	310	0.003	0.075	0.003	11,000	300	0.003	0.07	0
			25	25	10,300	270	0.002	0.038	0.002	10,300	250	0.002	0.035	0

Work Material					Prehardened Steels HPM·NAK (~42HRC)									
Dia.	Corner Radius	Neck Taper Angle	Under Neck Length	L/D	Semi-Finishing					Finishing				
					Spindle Speed	Feed	Depth of Cut		Stock Allowance	Spindle Speed	Feed	Depth of Cut		Stock Allowance
					min ⁻¹	mm/min	ap mm	ae mm	mm	min ⁻¹	mm/min	ap mm	ae mm	mm
1.5	R0.2	1°	15	10	12,600	860	0.021	0.413	0.017	12,600	810	0.017	0.385	0
			20	13.3	11,000	470	0.006	0.3	0.005	11,000	440	0.005	0.28	0
		3°	30	20	9,400	320	0.004	0.113	0.003	9,400	300	0.003	0.105	0
			20	13.3	14,200	1,190	0.026	0.413	0.02	14,200	1,110	0.02	0.385	0
	R0.3	1°	15	10	12,600	860	0.021	0.413	0.017	12,600	810	0.017	0.385	0
			20	13.3	11,000	470	0.006	0.3	0.005	11,000	440	0.005	0.28	0
		3°	30	20	9,400	320	0.004	0.113	0.003	9,400	300	0.003	0.105	0
			20	13.3	14,200	1,190	0.026	0.413	0.02	14,200	1,110	0.02	0.385	0
	R0.5	1°	15	10	12,600	860	0.021	0.413	0.017	12,600	810	0.017	0.385	0
			20	13.3	11,000	470	0.006	0.3	0.005	11,000	440	0.005	0.28	0
		3°	30	20	9,400	320	0.004	0.113	0.003	9,400	300	0.003	0.105	0
			20	13.3	14,200	1,190	0.026	0.413	0.02	14,200	1,110	0.02	0.385	0
2	R0.2	1°	20	10	10,000	880	0.026	0.525	0.02	10,000	820	0.02	0.49	0
			30	15	7,600	560	0.016	0.375	0.013	7,600	520	0.013	0.35	0
		3°	40	20	6,300	330	0.013	0.15	0.01	6,300	320	0.01	0.14	0
			30	15	11,500	1,180	0.03	0.525	0.023	11,500	1,100	0.023	0.49	0
	R0.3	1°	20	10	10,000	880	0.026	0.525	0.02	10,000	820	0.02	0.49	0
			30	15	7,600	560	0.016	0.375	0.013	7,600	520	0.013	0.35	0
		3°	40	20	6,300	330	0.013	0.15	0.01	6,300	320	0.01	0.14	0
			30	15	11,500	1,180	0.03	0.525	0.023	11,500	1,100	0.023	0.49	0
	R0.5	1°	20	10	10,000	880	0.026	0.525	0.02	10,000	820	0.02	0.49	0
			30	15	7,600	560	0.016	0.375	0.013	7,600	520	0.013	0.35	0
		3°	40	20	6,300	330	0.013	0.15	0.01	6,300	320	0.01	0.14	0
			30	15	11,500	1,180	0.03	0.525	0.023	11,500	1,100	0.023	0.49	0
3	R0.2	1°	30	10	7,100	890	0.034	0.75	0.027	7,100	830	0.027	0.7	0
			40	13.3	6,200	490	0.018	0.6	0.014	6,200	460	0.014	0.56	0
		3°	50	16.7	5,600	400	0.015	0.45	0.011	5,600	370	0.011	0.42	0
			60	20	5,200	340	0.013	0.225	0.01	5,200	320	0.01	0.21	0
	R0.3	1°	29.8	9.9	9,000	1,230	0.056	0.75	0.03	9,000	1,150	0.043	0.7	0
			30	10	7,100	890	0.034	0.75	0.027	7,100	830	0.027	0.7	0
		3°	40	13.3	6,200	490	0.018	0.6	0.014	6,200	460	0.014	0.56	0
			50	16.7	5,600	400	0.015	0.45	0.011	5,600	370	0.011	0.42	0
	R0.5	1°	60	20	5,200	340	0.013	0.225	0.01	5,200	320	0.01	0.21	0
			29.9	10	9,000	1,230	0.056	0.75	0.03	9,000	1,150	0.043	0.7	0
		3°	30	10	7,100	890	0.034	0.75	0.027	7,100	830	0.027	0.7	0
			40	13.3	6,200	490	0.018	0.6	0.014	6,200	460	0.014	0.56	0

Notes

- ※1 Depth of Cut: ap=Axial Depth of Cut / ae=Radial Depth of Cut.
 ※2 Adjust milling condition according to machine rigidity and clamp condition of work material.
 ※3 In case of chattering etc., please adjust cutting conditions if necessary.
 ※4 If the cutting load is high at corner, adjust the cutting conditions and tool path to reduce the cutting load.
 ※5 Recommend to apply helical or ramping for approaching into axial direction.
 ※6 If the maximum spindle speed of the machine tool is lower than the reference value, please reduce the spindle speed and feed rate at the same rate.
 ※7 Length of tool overhang must be as short as possible.
 ※8 Oil mist coolant is recommended.
 ※9 Coolant supply and chip disposal in the deep portion are very important.
 ※10 The stock allowance for this tool is a guideline.
 Please adjust it according to the machining condition of the previous process and the required accuracy.
 ※11 The parameters for the Stock Removal (Inner Corner) process are reference values based on the condition after roughing, where a corner radius end mill approximatel 1.5 times larger than the tool used in this process was applied. Please adjust the depth of cut and feed rate according to the amount of remaining material from the previous roughing operation.
 Example
 Roughing: $\phi 3 \times R0.5$
 ➔ Stock removal (inner corner): $\phi 2 \times R0.2$



Recommended Conditions

Work Material					Hardened Steels HPM38・STAVAX・SKD61 (~55HRC)										
Dia.	Corner Radius	Neck Taper Angle	Under Neck Length	L/D	Roughing						Stock Removal (Inner Corner)				
					Spindle Speed	Feed	Depth of Cut		Stock Allowance	Material Removal Rate	Spindle Speed	Feed	Depth of Cut		Stock Allowance
					min ⁻¹	mm/min	a _p mm	a _e mm	mm	mm ³ /min	min ⁻¹	mm/min	a _p mm	a _e mm	mm
0.2	R0.03	1°	1	5	30,000	360	0.003	0.04	0.006	0.04	30,000	290	0.003	0.032	0.006
			1.5	7.5	30,000	210	0.002	0.04	0.004	0.02	30,000	170	0.002	0.032	0.004
			2	10	30,000	150	0.002	0.04	0.004	0.01	30,000	120	0.002	0.032	0.004
		3°	1.5	7.5	30,000	320	0.003	0.04	0.005	0.04	30,000	260	0.003	0.032	0.005
			2	10	30,000	240	0.003	0.04	0.005	0.03	30,000	190	0.003	0.032	0.005
	R0.05	1°	1	5	30,000	360	0.003	0.04	0.006	0.04	30,000	290	0.003	0.032	0.006
			1.5	7.5	30,000	210	0.002	0.04	0.004	0.02	30,000	170	0.002	0.032	0.004
			2	10	30,000	150	0.002	0.04	0.004	0.01	30,000	120	0.002	0.032	0.004
		3°	1.5	7.5	30,000	320	0.003	0.04	0.005	0.04	30,000	260	0.003	0.032	0.005
			2	10	30,000	240	0.003	0.04	0.005	0.03	30,000	190	0.003	0.032	0.005
0.3	R0.03	1°	1.5	5	30,000	430	0.003	0.08	0.006	0.1	30,000	340	0.003	0.064	0.006
			2	6.7	30,000	320	0.003	0.08	0.005	0.08	30,000	260	0.003	0.064	0.005
			3	10	26,300	200	0.002	0.08	0.004	0.03	21,000	160	0.002	0.064	0.004
		3°	2	6.7	30,000	430	0.003	0.08	0.006	0.1	30,000	340	0.003	0.064	0.006
			3	10	30,000	330	0.003	0.08	0.005	0.08	30,000	260	0.003	0.064	0.005
	R0.05	1°	1.5	5	30,000	430	0.003	0.08	0.006	0.1	30,000	340	0.003	0.064	0.006
			2	6.7	30,000	320	0.003	0.08	0.006	0.08	30,000	260	0.003	0.064	0.006
			3	10	26,300	200	0.002	0.08	0.004	0.03	21,000	160	0.002	0.064	0.004
		3°	2	6.7	30,000	430	0.003	0.08	0.006	0.1	30,000	340	0.003	0.064	0.006
			3	10	30,000	330	0.003	0.08	0.006	0.08	30,000	260	0.003	0.064	0.006
0.5	R0.05	1°	4	8	25,000	690	0.006	0.15	0.012	0.62	20,000	550	0.006	0.12	0.012
			5	10	25,000	580	0.005	0.15	0.008	0.44	20,000	460	0.005	0.12	0.008
			6	12	25,000	450	0.004	0.15	0.007	0.27	20,000	360	0.004	0.12	0.007
			8	16	19,500	320	0.003	0.1	0.005	0.1	15,600	260	0.003	0.08	0.005
			10	20	17,900	260	0.002	0.05	0.004	0.03	14,300	210	0.002	0.04	0.004
		3°	5	10	25,000	750	0.007	0.15	0.012	0.79	20,000	600	0.007	0.12	0.012
			8	16	25,000	660	0.006	0.15	0.01	0.59	20,000	530	0.006	0.12	0.01
			10	20	25,000	620	0.005	0.15	0.009	0.47	20,000	500	0.005	0.12	0.009
	R0.1	1°	4	8	25,000	690	0.006	0.15	0.01	0.62	20,000	550	0.006	0.12	0.01
			5	10	25,000	580	0.005	0.15	0.008	0.44	20,000	460	0.005	0.12	0.008
			6	12	25,000	450	0.004	0.15	0.007	0.27	20,000	360	0.004	0.12	0.007
			8	16	19,500	320	0.003	0.1	0.005	0.1	15,600	260	0.003	0.08	0.005
			10	20	17,900	260	0.002	0.05	0.004	0.03	14,300	210	0.002	0.04	0.004
		3°	5	10	25,000	750	0.007	0.15	0.012	0.79	20,000	600	0.007	0.12	0.012
			8	16	25,000	660	0.006	0.15	0.01	0.59	20,000	530	0.006	0.12	0.01
			10	20	25,000	620	0.005	0.15	0.009	0.47	20,000	500	0.005	0.12	0.009
1	R0.1	1°	10	10	14,700	940	0.015	0.3	0.01	4.23	11,800	750	0.012	0.24	0.01
			15	15	12,400	480	0.008	0.2	0.007	0.77	9,900	380	0.006	0.16	0.007
			20	20	11,300	360	0.006	0.06	0.005	0.13	9,000	290	0.004	0.048	0.005
			25	25	10,600	300	0.004	0.03	0.004	0.04	8,500	240	0.003	0.024	0.004
			30	30	10,100	260	0.002	0.02	0.004	0.01	8,100	210	0.002	0.016	0.004
		3°	15	15	15,500	1,270	0.018	0.3	0.012	6.86	12,400	1,020	0.014	0.24	0.012
	R0.2	1°	10	10	14,700	940	0.015	0.3	0.01	4.23	11,800	750	0.012	0.24	0.01
			15	15	12,400	480	0.008	0.2	0.007	0.77	9,900	380	0.006	0.16	0.007
			20	20	11,300	360	0.006	0.06	0.005	0.13	9,000	290	0.004	0.048	0.005
			25	25	10,600	300	0.004	0.03	0.004	0.04	8,500	240	0.003	0.024	0.004
			30	30	10,100	260	0.002	0.02	0.004	0.01	8,100	210	0.002	0.016	0.004
		3°	15	15	15,500	1,270	0.018	0.3	0.012	6.86	12,400	1,020	0.014	0.24	0.012
R0.3	1°	10	10	14,700	940	0.015	0.3	0.01	4.23	11,800	750	0.012	0.24	0.01	
		15	15	12,400	480	0.008	0.2	0.007	0.77	9,900	380	0.006	0.16	0.007	
		20	20	11,300	360	0.006	0.06	0.005	0.13	9,000	290	0.004	0.048	0.005	
		25	25	10,600	300	0.004	0.03	0.004	0.04	8,500	240	0.003	0.024	0.004	
		30	30	10,100	260	0.002	0.02	0.004	0.01	8,100	210	0.002	0.016	0.004	
	3°	15	15	15,500	1,270	0.018	0.3	0.012	6.86	12,400	1,020	0.014	0.24	0.012	

Recommended Conditions

Work Material					Hardened Steels HPM38・STAVAX・SKD61 (~55HRC)										
Dia.	Corner Radius	Neck Taper Angle	Under Neck Length	L/D	Roughing						Stock Removal (Inner Corner)				
					Spindle Speed	Feed	Depth of Cut		Stock Allowance	Material Removal Rate	Spindle Speed	Feed	Depth of Cut		Stock Allowance
							mm ³ /min	mm/min					ap mm	ae mm	
1.5	R0.2	1°	15	10	12,700	950	0.025	0.5	0.028	11.88	10,200	760	0.02	0.4	0.028
			20	13.3	10,700	530	0.01	0.35	0.01	1.86	8,600	420	0.008	0.28	0.01
			30	20	8,600	360	0.006	0.1	0.006	0.22	6,900	290	0.005	0.08	0.006
		3°	20	13.3	14,900	1,280	0.03	0.5	0.033	19.2	11,900	1,020	0.024	0.4	0.033
	R0.3	1°	15	10	12,700	950	0.025	0.5	0.028	11.88	10,200	760	0.02	0.4	0.028
			20	13.3	10,700	530	0.01	0.35	0.01	1.86	8,600	420	0.008	0.28	0.01
			30	20	8,600	360	0.006	0.1	0.006	0.22	6,900	290	0.005	0.08	0.006
		3°	20	13.3	14,900	1,280	0.03	0.5	0.033	19.2	11,900	1,020	0.024	0.4	0.033
	R0.5	1°	15	10	12,700	950	0.025	0.5	0.028	11.88	10,200	760	0.02	0.4	0.028
			20	13.3	10,700	530	0.01	0.35	0.01	1.86	8,600	420	0.008	0.28	0.01
			30	20	8,600	360	0.006	0.1	0.006	0.22	6,900	290	0.005	0.08	0.006
		3°	20	13.3	14,900	1,280	0.03	0.5	0.033	19.2	11,900	1,020	0.024	0.4	0.033
2	R0.2	1°	20	10	10,800	960	0.03	0.6	0.035	17.28	8,600	770	0.024	0.48	0.035
			30	15	7,500	630	0.02	0.4	0.02	5.04	6,000	500	0.016	0.32	0.02
			40	20	6,200	370	0.015	0.18	0.015	1	5,000	300	0.012	0.144	0.015
		3°	30	15	12,100	1,270	0.035	0.6	0.041	26.67	9,700	1,020	0.028	0.48	0.041
	R0.3	1°	20	10	10,800	960	0.03	0.6	0.035	17.28	8,600	770	0.024	0.48	0.035
			30	15	7,500	630	0.02	0.4	0.02	5.04	6,000	500	0.016	0.32	0.02
			40	20	6,200	370	0.015	0.18	0.015	1	5,000	300	0.012	0.144	0.015
		3°	30	15	12,100	1,270	0.035	0.6	0.041	26.67	9,700	1,020	0.028	0.48	0.041
	R0.5	1°	20	10	10,800	960	0.03	0.6	0.035	17.28	8,600	770	0.024	0.48	0.035
			30	15	7,500	630	0.02	0.4	0.02	5.04	6,000	500	0.016	0.32	0.02
			40	20	6,200	370	0.015	0.18	0.015	1	5,000	300	0.012	0.144	0.015
		3°	30	15	12,100	1,270	0.035	0.6	0.041	26.67	9,700	1,020	0.028	0.48	0.041
3	R0.2	1°	30	10	7,400	970	0.04	0.8	0.041	31.04	5,900	780	0.031	0.64	0.041
			40	13.3	6,400	530	0.03	0.7	0.028	11.13	5,100	420	0.024	0.56	0.028
			50	16.7	5,800	430	0.025	0.5	0.024	5.38	4,600	340	0.02	0.4	0.024
		3°	60	20	5,300	370	0.02	0.2	0.02	1.48	4,200	300	0.016	0.16	0.02
	R0.3	1°	29.8	9.9	9,200	1,340	0.05	0.8	0.064	53.6	7,400	1,070	0.04	0.64	0.064
			30	10	7,400	970	0.04	0.8	0.041	31.04	5,900	780	0.031	0.64	0.041
			40	13.3	6,400	530	0.03	0.7	0.028	11.13	5,100	420	0.024	0.56	0.028
		3°	50	16.7	5,800	430	0.025	0.5	0.024	5.38	4,600	340	0.02	0.4	0.024
	R0.5	1°	60	20	5,300	370	0.02	0.2	0.02	1.48	4,200	300	0.016	0.16	0.02
			29.9	10	9,200	1,340	0.05	0.8	0.064	53.6	7,400	1,070	0.04	0.64	0.064
			30	10	7,400	970	0.04	0.8	0.041	31.04	5,900	780	0.031	0.64	0.041
		3°	40	13.3	6,400	530	0.03	0.7	0.028	11.13	5,100	420	0.024	0.56	0.028
R0.5	1°	50	16.7	5,800	430	0.025	0.5	0.024	5.38	4,600	340	0.02	0.4	0.024	
		60	20	5,300	370	0.02	0.2	0.02	1.48	4,200	300	0.016	0.16	0.02	
		30.1	10	9,200	1,340	0.05	0.8	0.064	53.6	7,400	1,070	0.04	0.64	0.064	
	3°	30	10	7,400	970	0.04	0.8	0.041	31.04	5,900	780	0.031	0.64	0.041	
R0.5	1°	40	13.3	6,400	530	0.03	0.7	0.028	11.13	5,100	420	0.024	0.56	0.028	
		50	16.7	5,800	430	0.025	0.5	0.024	5.38	4,600	340	0.02	0.4	0.024	
		60	20	5,300	370	0.02	0.2	0.02	1.48	4,200	300	0.016	0.16	0.02	
	3°	30.1	10	9,200	1,340	0.05	0.8	0.064	53.6	7,400	1,070	0.04	0.64	0.064	

Notes

- ※1 Depth of Cut: ap=Axial Depth of Cut / ae=Radial Depth of Cut.
 ※2 Adjust milling condition according to machine rigidity and clamp condition of work material.
 ※3 In case of chattering etc., please adjust cutting conditions if necessary.
 ※4 If the cutting load is high at corner, adjust the cutting conditions and tool path to reduce the cutting load.
 ※5 Recommend to apply helical or ramping for approaching into axial direction.
 ※6 If the maximum spindle speed of the machine tool is lower than the reference value, please reduce the spindle speed and feed rate at the same rate.
 ※7 Length of tool overhang must be as short as possible.
 ※8 Oil mist coolant is recommended.
 ※9 Coolant supply and chip disposal in the deep portion are very important.
 ※10 The stock allowance for this tool is a guideline.
 Please adjust it according to the machining condition of the previous process and the required accuracy.
 ※11 The parameters for the Stock Removal (Inner Corner) process are reference values based on the condition after roughing, where a corner radius end mill approximately 1.5 times larger than the tool used in this process was applied. Please adjust the depth of cut and feed rate according to the amount of remaining material from the previous roughing operation.
 Example
 Roughing: $\phi 3 \times R0.5 \rightarrow$ Stock removal (inner corner): $\phi 2 \times R0.2$

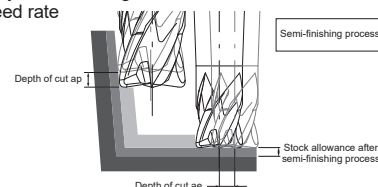
Recommended Conditions

Work Material					Hardened Steels HPM38・STAVAX・SKD61 (~55HRC)									
Dia.	Corner Radius	Neck Taper Angle	Under Neck Length	L/D	Semi-Finishing					Finishing				
					Spindle Speed	Feed	Depth of Cut		Stock Allowance	Spindle Speed	Feed	Depth of Cut		Stock Allowance
					min ⁻¹	mm/min	a _p mm	a _e mm	mm	min ⁻¹	mm/min	a _p mm	a _e mm	mm
0.2	R0.03	1°	1	5	30,000	270	0.003	0.03	0.003	30,000	250	0.003	0.028	0
			1.5	7.5	30,000	160	0.002	0.03	0.002	30,000	150	0.002	0.028	0
			2	10	30,000	110	0.002	0.03	0.002	30,000	110	0.002	0.028	0
		3°	1.5	7.5	30,000	240	0.003	0.03	0.002	30,000	220	0.002	0.028	0
			2	10	30,000	180	0.003	0.03	0.002	30,000	170	0.002	0.028	0
	R0.05	1°	1	5	30,000	270	0.003	0.03	0.003	30,000	250	0.003	0.028	0
			1.5	7.5	30,000	160	0.002	0.03	0.002	30,000	150	0.002	0.028	0
			2	10	30,000	110	0.002	0.03	0.002	30,000	110	0.002	0.028	0
		3°	1.5	7.5	30,000	240	0.003	0.03	0.002	30,000	220	0.002	0.028	0
			2	10	30,000	180	0.003	0.03	0.002	30,000	170	0.002	0.028	0
0.3	R0.03	1°	1.5	5	30,000	320	0.003	0.06	0.003	30,000	300	0.003	0.056	0
			2	6.7	30,000	240	0.003	0.06	0.002	30,000	220	0.002	0.056	0
			3	10	21,000	150	0.002	0.06	0.002	21,000	140	0.002	0.056	0
		3°	2	6.7	30,000	320	0.003	0.06	0.003	30,000	300	0.003	0.056	0
			3	10	30,000	250	0.003	0.06	0.002	30,000	230	0.002	0.056	0
	R0.05	1°	1.5	5	30,000	320	0.003	0.06	0.003	30,000	300	0.003	0.056	0
			2	6.7	30,000	240	0.003	0.06	0.003	30,000	220	0.003	0.056	0
			3	10	21,000	150	0.002	0.06	0.002	21,000	140	0.002	0.056	0
		3°	2	6.7	30,000	320	0.003	0.06	0.003	30,000	300	0.003	0.056	0
			3	10	30,000	250	0.003	0.06	0.003	30,000	230	0.003	0.056	0
0.5	R0.05	1°	4	8	20,000	520	0.006	0.113	0.006	20,000	480	0.006	0.105	0
			5	10	20,000	440	0.005	0.113	0.003	20,000	410	0.003	0.105	0
			6	12	20,000	340	0.004	0.113	0.003	20,000	320	0.003	0.105	0
			8	16	15,600	240	0.003	0.075	0.002	15,600	220	0.002	0.07	0
			10	20	14,300	200	0.002	0.038	0.002	14,300	180	0.002	0.035	0
		3°	5	10	20,000	560	0.007	0.113	0.005	20,000	530	0.005	0.105	0
			8	16	20,000	500	0.006	0.113	0.004	20,000	460	0.004	0.105	0
			10	20	20,000	470	0.005	0.113	0.004	20,000	430	0.004	0.105	0
	R0.1	1°	4	8	20,000	520	0.006	0.113	0.004	20,000	480	0.004	0.105	0
			5	10	20,000	440	0.005	0.113	0.003	20,000	410	0.003	0.105	0
			6	12	20,000	340	0.004	0.113	0.003	20,000	320	0.003	0.105	0
			8	16	15,600	240	0.003	0.075	0.002	15,600	220	0.002	0.07	0
		3°	10	20	14,300	200	0.002	0.038	0.002	14,300	180	0.002	0.035	0
			5	10	20,000	560	0.007	0.113	0.005	20,000	530	0.005	0.105	0
			8	16	20,000	500	0.006	0.113	0.004	20,000	460	0.004	0.105	0
			10	20	20,000	470	0.005	0.113	0.004	20,000	430	0.004	0.105	0
1	R0.1	1°	10	10	11,800	700	0.006	0.225	0.004	11,800	650	0.004	0.21	0
			15	15	9,900	360	0.004	0.15	0.003	9,900	340	0.003	0.14	0
			20	20	9,000	270	0.003	0.045	0.002	9,000	250	0.002	0.042	0
			25	25	8,500	230	0.002	0.023	0.002	8,500	210	0.002	0.021	0
		3°	30	30	8,100	200	0.002	0.015	0.002	8,100	180	0.002	0.014	0
			15	15	12,400	950	0.007	0.225	0.005	12,400	890	0.005	0.21	0
	R0.2	1°	10	10	11,800	700	0.006	0.225	0.004	11,800	650	0.004	0.21	0
			15	15	9,900	360	0.004	0.15	0.003	9,900	340	0.003	0.14	0
			20	20	9,000	270	0.003	0.045	0.002	9,000	250	0.002	0.042	0
			25	25	8,500	230	0.002	0.023	0.002	8,500	210	0.002	0.021	0
		3°	30	30	8,100	200	0.002	0.015	0.002	8,100	180	0.002	0.014	0
			15	15	12,400	950	0.007	0.225	0.005	12,400	890	0.005	0.21	0
	R0.3	1°	10	10	11,800	700	0.006	0.225	0.004	11,800	650	0.004	0.21	0
			15	15	9,900	360	0.004	0.15	0.003	9,900	340	0.003	0.14	0
			20	20	9,000	270	0.003	0.045	0.002	9,000	250	0.002	0.042	0
			25	25	8,500	230	0.002	0.023	0.002	8,500	210	0.002	0.021	0
		3°	30	30	8,100	200	0.002	0.015	0.002	8,100	180	0.002	0.014	0
			15	15	12,400	950	0.007	0.225	0.005	12,400	890	0.005	0.21	0

Work Material					Hardened Steels HPM38・STAVAX・SKD61 (~55HRC)									
Dia.	Corner Radius	Neck Taper Angle	Under Neck Length	L/D	Semi-Finishing					Finishing				
					Spindle Speed	Feed	Depth of Cut		Stock Allowance	Spindle Speed	Feed	Depth of Cut		Stock Allowance
					min ⁻¹	mm/min	ap mm	ae mm	mm	min ⁻¹	mm/min	ap mm	ae mm	mm
1.5	R0.2	1°	15	10	10,200	710	0.016	0.375	0.012	10,200	660	0.012	0.35	0
			20	13.3	8,600	400	0.006	0.263	0.004	8,600	370	0.004	0.245	0
			30	20	6,900	270	0.004	0.075	0.002	6,900	250	0.002	0.07	0
		3°	20	13.3	11,900	960	0.019	0.375	0.014	11,900	900	0.014	0.35	0
	R0.3	1°	15	10	10,200	710	0.016	0.375	0.012	10,200	660	0.012	0.35	0
			20	13.3	8,600	400	0.006	0.263	0.004	8,600	370	0.004	0.245	0
			30	20	6,900	270	0.004	0.075	0.002	6,900	250	0.002	0.07	0
		3°	20	13.3	11,900	960	0.019	0.375	0.014	11,900	900	0.014	0.35	0
	R0.5	1°	15	10	10,200	710	0.016	0.375	0.012	10,200	660	0.012	0.35	0
			20	13.3	8,600	400	0.006	0.263	0.004	8,600	370	0.004	0.245	0
			30	20	6,900	270	0.004	0.075	0.002	6,900	250	0.002	0.07	0
		3°	20	13.3	11,900	960	0.019	0.375	0.014	11,900	900	0.014	0.35	0
2	R0.2	1°	20	10	8,600	720	0.02	0.45	0.015	8,600	670	0.015	0.42	0
			30	15	6,000	470	0.012	0.3	0.008	6,000	440	0.008	0.28	0
			40	20	5,000	280	0.009	0.135	0.006	5,000	260	0.006	0.126	0
		3°	30	15	9,700	950	0.024	0.45	0.017	9,700	890	0.017	0.42	0
	R0.3	1°	20	10	8,600	720	0.02	0.45	0.015	8,600	670	0.015	0.42	0
			30	15	6,000	470	0.012	0.3	0.008	6,000	440	0.008	0.28	0
			40	20	5,000	280	0.009	0.135	0.006	5,000	260	0.006	0.126	0
		3°	30	15	9,700	950	0.024	0.45	0.017	9,700	890	0.017	0.42	0
	R0.5	1°	20	10	8,600	720	0.02	0.45	0.015	8,600	670	0.015	0.42	0
			30	15	6,000	470	0.012	0.3	0.008	6,000	440	0.008	0.28	0
			40	20	5,000	280	0.009	0.135	0.006	5,000	260	0.006	0.126	0
		3°	30	15	9,700	950	0.024	0.45	0.017	9,700	890	0.017	0.42	0
3	R0.2	1°	30	10	5,900	730	0.024	0.6	0.017	5,900	680	0.017	0.56	0
			40	13.3	5,100	400	0.016	0.525	0.012	5,100	370	0.012	0.49	0
			50	16.7	4,600	320	0.014	0.375	0.01	4,600	300	0.01	0.35	0
		3°	60	20	4,200	280	0.012	0.15	0.008	4,200	260	0.008	0.14	0
	R0.3	1°	29.8	9.9	7,400	1,010	0.037	0.6	0.027	7,400	940	0.027	0.56	0
			30	10	5,900	730	0.024	0.6	0.017	5,900	680	0.017	0.56	0
			40	13.3	5,100	400	0.016	0.525	0.012	5,100	370	0.012	0.49	0
		3°	50	16.7	4,600	320	0.014	0.375	0.01	4,600	300	0.01	0.35	0
	R0.5	1°	60	20	4,200	280	0.012	0.15	0.008	4,200	260	0.008	0.14	0
			29.9	10	7,400	1,010	0.037	0.6	0.027	7,400	940	0.027	0.56	0
			30	10	5,900	730	0.024	0.6	0.017	5,900	680	0.017	0.56	0
		3°	40	13.3	5,100	400	0.016	0.525	0.012	5,100	370	0.012	0.49	0
	R0.5	1°	50	16.7	4,600	320	0.014	0.375	0.01	4,600	300	0.01	0.35	0
			60	20	4,200	280	0.012	0.15	0.008	4,200	260	0.008	0.14	0
			30.1	10	7,400	1,010	0.037	0.6	0.027	7,400	940	0.027	0.56	0

Notes

- ※1 Depth of Cut: ap=Axial Depth of Cut / ae=Radial Depth of Cut.
 ※2 Adjust milling condition according to machine rigidity and clamp condition of work material.
 ※3 In case of chattering etc., please adjust cutting conditions if necessary.
 ※4 If the cutting load is high at corner, adjust the cutting conditions and tool path to reduce the cutting load.
 ※5 Recommend to apply helical or ramping for approaching into axial direction.
 ※6 If the maximum spindle speed of the machine tool is lower than the reference value, please reduce the spindle speed and feed rate at the same rate.
 ※7 Length of tool overhang must be as short as possible.
 ※8 Oil mist coolant is recommended.
 ※9 Coolant supply and chip disposal in the deep portion are very important.
 ※10 The stock allowance for this tool is a guideline.
 Please adjust it according to the machining condition of the previous process and the required accuracy.
 ※11 The parameters for the Stock Removal (Inner Corner) process are reference values based on the condition after roughing, where a corner radius end mill approximately 1.5 times larger than the tool used in this process was applied. Please adjust the depth of cut and feed rate according to the amount of remaining material from the previous roughing operation.
 Example
 Roughing: $\phi 3 \times R0.5$
 ➡ Stock removal (inner corner): $\phi 2 \times R0.2$



Recommended Conditions

Work Material					Hardened Steels SKD11・PD613 (~62HRC)										
Dia.	Corner Radius	Neck Taper Angle	Under Neck Length	L/D	Roughing						Stock Removal (Inner Corner)				
					Spindle Speed	Feed	Depth of Cut		Stock Allowance	Material Removal Rate	Spindle Speed	Feed	Depth of Cut		Stock Allowance
					min ⁻¹	mm/min	a _p mm	a _e mm	mm	mm ³ /min	min ⁻¹	mm/min	a _p mm	a _e mm	mm
0.2	R0.03	1°	1	5	30,000	280	0.003	0.02	0.004	0.017	30,000	260	0.002	0.018	0.004
			1.5	7.5	30,000	170	0.002	0.02	0.002	0.007	30,000	150	0.001	0.018	0.002
			2	10	30,000	120	0.001	0.02	0.002	0.002	30,000	110	0.001	0.018	0.002
		3°	1.5	7.5	30,000	250	0.002	0.02	0.004	0.01	30,000	230	0.002	0.018	0.004
			2	10	30,000	200	0.002	0.02	0.003	0.008	30,000	180	0.002	0.018	0.003
	R0.05	1°	1	5	30,000	280	0.003	0.02	0.005	0.017	30,000	260	0.003	0.018	0.005
			1.5	7.5	30,000	170	0.002	0.02	0.004	0.007	30,000	150	0.002	0.018	0.004
			2	10	30,000	120	0.002	0.02	0.002	0.005	30,000	110	0.001	0.018	0.002
		3°	1.5	7.5	30,000	250	0.003	0.02	0.005	0.015	30,000	230	0.003	0.018	0.005
			2	10	30,000	200	0.003	0.02	0.004	0.012	30,000	180	0.002	0.018	0.004
0.3	R0.03	1°	1.5	5	30,000	360	0.003	0.04	0.005	0.04	30,000	320	0.003	0.036	0.005
			2	6.7	30,000	230	0.003	0.04	0.005	0.03	30,000	210	0.003	0.036	0.005
			3	10	26,300	160	0.002	0.04	0.003	0.01	21,000	150	0.002	0.036	0.003
		3°	2	6.7	30,000	350	0.003	0.04	0.005	0.04	30,000	310	0.003	0.036	0.005
			3	10	30,000	280	0.003	0.04	0.005	0.03	30,000	250	0.003	0.036	0.005
	R0.05	1°	1.5	5	30,000	360	0.003	0.04	0.005	0.04	30,000	320	0.003	0.036	0.005
			2	6.7	30,000	230	0.003	0.04	0.005	0.03	30,000	210	0.003	0.036	0.005
			3	10	26,300	160	0.002	0.04	0.003	0.01	21,000	150	0.002	0.036	0.003
		3°	2	6.7	30,000	350	0.003	0.04	0.005	0.04	30,000	310	0.003	0.036	0.005
			3	10	30,000	240	0.003	0.04	0.005	0.03	30,000	220	0.003	0.036	0.005
0.5	R0.05	1°	4	8	23,000	590	0.004	0.1	0.007	0.24	18,400	530	0.004	0.09	0.007
			5	10	23,000	370	0.003	0.1	0.005	0.11	18,400	340	0.003	0.09	0.005
			6	12	23,000	320	0.003	0.1	0.004	0.1	18,400	290	0.002	0.09	0.004
			8	16	17,500	210	0.002	0.07	0.004	0.03	14,000	190	0.002	0.056	0.004
			10	20	15,900	190	0.002	0.03	0.004	0.01	12,700	170	0.002	0.027	0.004
		3°	5	10	23,000	650	0.005	0.1	0.008	0.33	18,400	580	0.004	0.09	0.008
	8		16	23,000	570	0.004	0.1	0.006	0.23	18,400	510	0.003	0.09	0.006	
	10		20	23,000	520	0.004	0.1	0.006	0.21	18,400	470	0.003	0.09	0.006	
	4		8	23,000	590	0.004	0.1	0.007	0.24	18,400	530	0.004	0.09	0.007	
	5		10	23,000	370	0.003	0.1	0.005	0.11	18,400	340	0.003	0.09	0.005	
	R0.1	1°	6	12	23,000	320	0.003	0.1	0.004	0.1	18,400	290	0.002	0.09	0.004
			8	16	17,500	210	0.002	0.07	0.004	0.03	14,000	190	0.002	0.056	0.004
10			20	15,900	190	0.002	0.03	0.004	0.01	12,700	170	0.002	0.027	0.004	
5			10	23,000	650	0.005	0.1	0.008	0.33	18,400	580	0.004	0.09	0.008	
3°		8	16	23,000	570	0.004	0.1	0.006	0.23	18,400	510	0.003	0.09	0.006	
		10	20	23,000	520	0.004	0.1	0.006	0.21	18,400	470	0.003	0.09	0.006	
1	R0.1	1°	10	10	12,700	800	0.008	0.25	0.005	1.6	10,200	720	0.006	0.225	0.005
			15	15	10,600	410	0.005	0.12	0.004	0.25	8,500	370	0.004	0.108	0.004
			20	20	9,700	260	0.004	0.05	0.004	0.05	7,800	250	0.003	0.045	0.004
			25	25	9,100	260	0.003	0.025	0.004	0.02	7,300	230	0.002	0.023	0.004
			30	30	8,700	230	0.002	0.015	0.004	0.01	7,000	200	0.002	0.014	0.004
		3°	15	15	13,500	1,020	0.009	0.25	0.006	2.3	10,800	910	0.007	0.225	0.006
	R0.2	1°	10	10	12,700	800	0.008	0.25	0.005	1.6	10,200	720	0.006	0.225	0.005
			15	15	10,600	410	0.005	0.12	0.004	0.25	8,500	370	0.004	0.108	0.004
			20	20	9,700	260	0.004	0.05	0.004	0.05	7,800	250	0.003	0.045	0.004
			25	25	9,100	260	0.003	0.025	0.004	0.02	7,300	230	0.002	0.023	0.004
			30	30	8,700	230	0.002	0.015	0.004	0.01	7,000	200	0.002	0.014	0.004
		3°	15	15	13,500	1,020	0.009	0.25	0.006	2.3	10,800	910	0.007	0.225	0.006
R0.3	1°	10	10	12,700	800	0.008	0.25	0.005	1.6	10,200	720	0.006	0.225	0.005	
		15	15	10,600	410	0.005	0.12	0.004	0.25	8,500	370	0.004	0.108	0.004	
		20	20	9,700	260	0.004	0.05	0.004	0.05	7,800	250	0.003	0.045	0.004	
		25	25	9,100	260	0.003	0.025	0.004	0.02	7,300	230	0.002	0.023	0.004	
		30	30	8,700	230	0.002	0.015	0.004	0.01	7,000	200	0.002	0.014	0.004	
	3°	15	15	13,500	1,020	0.009	0.25	0.006	2.3	10,800	910	0.007	0.225	0.006	

Recommended Conditions

Work Material					Hardened Steels SKD11・PD613 (~62HRC)											
Dia.	Corner Radius	Neck Taper Angle	Under Neck Length	L/D	Roughing						Stock Removal (Inner Corner)					
					Spindle Speed	Feed	Depth of Cut		Stock Allowance	Material Removal Rate	Spindle Speed	Feed	Depth of Cut		Stock Allowance	
							min ⁻¹	mm/min					ap mm	ae mm		mm
1.5	R0.2	1°	15	10	10,700	810	0.017	0.4	0.017	5.51	8,600	730	0.013	0.36	0.017	
			20	13.3	8,800	430	0.007	0.3	0.007	0.9	7,000	380	0.005	0.27	0.007	
			30	20	6,800	270	0.004	0.08	0.004	0.09	5,400	250	0.003	0.072	0.004	
	3°	20	13.3	12,900	1,090	0.025	0.4	0.024	10.9	10,300	980	0.02	0.36	0.024		
		R0.3	1°	15	10	10,700	810	0.017	0.4	0.017	5.51	8,600	730	0.013	0.36	0.017
				20	13.3	8,800	430	0.007	0.3	0.007	0.9	7,000	380	0.005	0.27	0.007
	30			20	6,800	270	0.004	0.08	0.004	0.09	5,400	250	0.003	0.072	0.004	
	3°	20	13.3	12,900	1,090	0.025	0.4	0.024	10.9	10,300	980	0.02	0.36	0.024		
		R0.5	1°	15	10	10,700	810	0.017	0.4	0.017	5.51	8,600	730	0.013	0.36	0.017
				20	13.3	8,800	430	0.007	0.3	0.007	0.9	7,000	380	0.005	0.27	0.007
	30			20	6,800	270	0.004	0.08	0.004	0.09	5,400	250	0.003	0.072	0.004	
	3°	20	13.3	12,900	1,090	0.025	0.4	0.024	10.9	10,300	980	0.02	0.36	0.024		
2		R0.2	1°	20	10	9,300	820	0.02	0.5	0.024	8.2	7,400	740	0.016	0.45	0.024
				30	15	6,600	500	0.01	0.3	0.009	1.5	5,300	450	0.008	0.27	0.009
	40			20	5,600	280	0.008	0.15	0.005	0.34	4,500	260	0.006	0.135	0.005	
3°	30	15	10,300	1,090	0.025	0.5	0.03	13.63	8,200	980	0.02	0.45	0.03			
	R0.3	1°	20	10	9,300	820	0.02	0.5	0.024	8.2	7,400	740	0.016	0.45	0.024	
			30	15	6,600	500	0.01	0.3	0.009	1.5	5,300	450	0.008	0.27	0.009	
40			20	5,600	280	0.008	0.15	0.005	0.34	4,500	260	0.006	0.135	0.005		
3°	30	15	10,300	1,090	0.025	0.5	0.03	13.63	8,200	980	0.02	0.45	0.03			
	R0.5	1°	20	10	9,300	820	0.02	0.5	0.024	8.2	7,400	740	0.016	0.45	0.024	
			30	15	6,600	500	0.01	0.3	0.009	1.5	5,300	450	0.008	0.27	0.009	
40			20	5,600	280	0.008	0.15	0.005	0.34	4,500	260	0.006	0.135	0.005		
3°	30	15	10,300	1,090	0.025	0.5	0.03	13.63	8,200	980	0.02	0.45	0.03			
	3	R0.2	1°	30	10	6,400	830	0.025	0.7	0.026	14.53	5,100	750	0.02	0.63	0.026
				40	13.3	5,500	430	0.015	0.6	0.017	3.87	4,400	380	0.012	0.54	0.017
50				16.7	4,900	340	0.012	0.4	0.014	1.63	3,900	310	0.009	0.36	0.014	
3°	60	20	4,600	290	0.01	0.18	0.012	0.52	3,700	260	0.008	0.162	0.012			
	R0.3	1°	30	10	6,400	830	0.025	0.7	0.026	14.53	5,100	750	0.02	0.63	0.026	
			40	13.3	5,500	430	0.015	0.6	0.017	3.87	4,400	380	0.012	0.54	0.017	
50			16.7	4,900	340	0.012	0.4	0.014	1.63	3,900	310	0.009	0.36	0.014		
3°	60	20	4,600	290	0.01	0.18	0.012	0.52	3,700	260	0.008	0.162	0.012			
	R0.5	1°	30	10	6,400	830	0.025	0.7	0.026	14.53	5,100	750	0.02	0.63	0.026	
			40	13.3	5,500	430	0.015	0.6	0.017	3.87	4,400	380	0.012	0.54	0.017	
50			16.7	4,900	340	0.012	0.4	0.014	1.63	3,900	310	0.009	0.36	0.014		
3°	60	20	4,600	290	0.01	0.18	0.012	0.52	3,700	260	0.008	0.162	0.012			
	3	R0.5	1°	30.1	10	7,900	1,160	0.04	0.7	0.06	32.48	6,300	1,040	0.037	0.63	0.06

Notes

- ※1 Depth of Cut: ap=Axial Depth of Cut / ae=Radial Depth of Cut.
 ※2 Adjust milling condition according to machine rigidity and clamp condition of work material.
 ※3 In case of chattering etc., please adjust cutting conditions if necessary.
 ※4 If the cutting load is high at corner, adjust the cutting conditions and tool path to reduce the cutting load.
 ※5 Recommend to apply helical or ramping for approaching into axial direction.
 ※6 If the maximum spindle speed of the machine tool is lower than the reference value, please reduce the spindle speed and feed rate at the same rate.
 ※7 Length of tool overhang must be as short as possible.
 ※8 Oil mist coolant is recommended.
 ※9 Coolant supply and chip disposal in the deep portion are very important.
 ※10 The stock allowance for this tool is a guideline.
 Please adjust it according to the machining condition of the previous process and the required accuracy.
 ※11 The parameters for the Stock Removal (Inner Corner) process are reference values based on the condition after roughing, where a corner radius end mill approximately 1.5 times larger than the tool used in this process was applied. Please adjust the depth of cut and feed rate according to the amount of remaining material from the previous roughing operation.
 Example
 Roughing: $\phi 3 \times R0.5 \rightarrow$ Stock removal (inner corner): $\phi 2 \times R0.2$

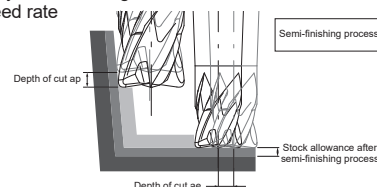
Recommended Conditions

Work Material					Hardened Steels SKD11・PD613 (~62HRC)									
Dia.	Corner Radius	Neck Taper Angle	Under Neck Length	L/D	Semi-Finishing					Finishing				
					Spindle Speed	Feed	Depth of Cut		Stock Allowance	Spindle Speed	Feed	Depth of Cut		Stock Allowance
					min ⁻¹	mm/min	a _p mm	a _e mm	mm	min ⁻¹	mm/min	a _p mm	a _e mm	mm
0.2	R0.03	1°	1	5	30,000	220	0.002	0.015	0.002	30,000	200	0.002	0.014	0
			1.5	7.5	30,000	140	0.001	0.015	0.001	30,000	120	0.001	0.014	0
			2	10	30,000	100	0.001	0.015	0.001	30,000	80	0.001	0.014	0
		3°	1.5	7.5	30,000	200	0.002	0.015	0.002	30,000	180	0.002	0.014	0
			2	10	30,000	160	0.002	0.015	0.001	30,000	140	0.001	0.014	0
	R0.05	1°	1	5	30,000	220	0.003	0.015	0.002	30,000	200	0.002	0.014	0
			1.5	7.5	30,000	140	0.002	0.015	0.002	30,000	120	0.002	0.014	0
			2	10	30,000	100	0.001	0.015	0.001	30,000	80	0.001	0.014	0
		3°	1.5	7.5	30,000	200	0.003	0.015	0.002	30,000	180	0.002	0.014	0
			2	10	30,000	160	0.002	0.015	0.002	30,000	140	0.002	0.014	0
0.3	R0.03	1°	1.5	5	30,000	290	0.003	0.03	0.002	30,000	250	0.002	0.028	0
			2	6.7	30,000	180	0.003	0.03	0.002	30,000	160	0.002	0.028	0
			3	10	21,000	130	0.002	0.03	0.001	21,000	110	0.001	0.028	0
		3°	2	6.7	30,000	280	0.003	0.03	0.002	30,000	250	0.002	0.028	0
			3	10	30,000	220	0.003	0.03	0.002	30,000	200	0.002	0.028	0
	R0.05	1°	1.5	5	30,000	290	0.003	0.03	0.002	30,000	250	0.002	0.028	0
			2	6.7	30,000	180	0.003	0.03	0.002	30,000	160	0.002	0.028	0
			3	10	21,000	130	0.002	0.03	0.001	21,000	110	0.001	0.028	0
		3°	2	6.7	30,000	280	0.003	0.03	0.002	30,000	250	0.002	0.028	0
			3	10	30,000	190	0.003	0.03	0.002	30,000	170	0.002	0.028	0
0.5	R0.05	1°	4	8	18,400	470	0.004	0.075	0.003	18,400	410	0.003	0.07	0
			5	10	18,400	300	0.003	0.075	0.002	18,400	260	0.002	0.07	0
			6	12	18,400	260	0.002	0.075	0.002	18,400	220	0.002	0.07	0
			8	16	14,000	170	0.002	0.053	0.002	14,000	150	0.002	0.049	0
			10	20	12,700	150	0.002	0.023	0.002	12,700	130	0.002	0.021	0
		3°	5	10	18,400	520	0.004	0.075	0.004	18,400	460	0.004	0.07	0
			8	16	18,400	460	0.003	0.075	0.003	18,400	400	0.003	0.07	0
			10	20	18,400	420	0.003	0.075	0.003	18,400	360	0.003	0.07	0
	R0.1	1°	4	8	18,400	470	0.004	0.075	0.003	18,400	410	0.003	0.07	0
			5	10	18,400	300	0.003	0.075	0.002	18,400	260	0.002	0.07	0
			6	12	18,400	260	0.002	0.075	0.002	18,400	220	0.002	0.07	0
			8	16	14,000	170	0.002	0.053	0.002	14,000	150	0.002	0.049	0
		3°	10	20	12,700	150	0.002	0.023	0.002	12,700	130	0.002	0.021	0
			5	10	18,400	520	0.004	0.075	0.004	18,400	460	0.004	0.07	0
			8	16	18,400	460	0.003	0.075	0.003	18,400	400	0.003	0.07	0
			10	20	18,400	420	0.003	0.075	0.003	18,400	360	0.003	0.07	0
1	R0.1	1°	10	10	10,200	630	0.003	0.188	0.002	10,200	550	0.002	0.175	0
			15	15	8,500	330	0.002	0.09	0.002	8,500	290	0.002	0.084	0
			20	20	7,800	230	0.002	0.038	0.002	7,800	200	0.002	0.035	0
			25	25	7,300	210	0.002	0.019	0.002	7,300	180	0.002	0.018	0
			30	30	7,000	180	0.002	0.011	0.002	7,000	160	0.002	0.011	0
		3°	15	15	10,800	820	0.004	0.188	0.002	10,800	710	0.002	0.175	0
	R0.2	1°	10	10	10,200	630	0.003	0.188	0.002	10,200	550	0.002	0.175	0
			15	15	8,500	330	0.002	0.09	0.002	8,500	290	0.002	0.084	0
			20	20	7,800	230	0.002	0.038	0.002	7,800	200	0.002	0.035	0
			25	25	7,300	210	0.002	0.019	0.002	7,300	180	0.002	0.018	0
			30	30	7,000	180	0.002	0.011	0.002	7,000	160	0.002	0.011	0
		3°	15	15	10,800	820	0.004	0.188	0.002	10,800	710	0.002	0.175	0
	R0.3	1°	10	10	10,200	630	0.003	0.188	0.002	10,200	550	0.002	0.175	0
			15	15	8,500	330	0.002	0.09	0.002	8,500	290	0.002	0.084	0
			20	20	7,800	230	0.002	0.038	0.002	7,800	200	0.002	0.035	0
			25	25	7,300	210	0.002	0.019	0.002	7,300	180	0.002	0.018	0
			30	30	7,000	180	0.002	0.011	0.002	7,000	160	0.002	0.011	0
		3°	15	15	10,800	820	0.004	0.188	0.002	10,800	710	0.002	0.175	0

Work Material					Hardened Steels SKD11・PD613 (~62HRC)									
Dia.	Corner Radius	Neck Taper Angle	Under Neck Length	L/D	Semi-Finishing					Finishing				
					Spindle Speed	Feed	Depth of Cut		Stock Allowance	Spindle Speed	Feed	Depth of Cut		Stock Allowance
					min ⁻¹	mm/min	ap mm	ae mm	mm	min ⁻¹	mm/min	ap mm	ae mm	mm
1.5	R0.2	1°	15	10	8,600	640	0.01	0.3	0.007	8,600	560	0.007	0.28	0
			20	13.3	7,000	340	0.004	0.225	0.003	7,000	300	0.003	0.21	0
			30	20	5,400	230	0.002	0.06	0.002	5,400	200	0.002	0.056	0
		3°	20	13.3	10,300	870	0.014	0.3	0.01	10,300	760	0.01	0.28	0
	R0.3	1°	15	10	8,600	640	0.01	0.3	0.007	8,600	560	0.007	0.28	0
			20	13.3	7,000	340	0.004	0.225	0.003	7,000	300	0.003	0.21	0
			30	20	5,400	230	0.002	0.06	0.002	5,400	200	0.002	0.056	0
		3°	20	13.3	10,300	870	0.014	0.3	0.01	10,300	760	0.01	0.28	0
	R0.5	1°	15	10	8,600	640	0.01	0.3	0.007	8,600	560	0.007	0.28	0
			20	13.3	7,000	340	0.004	0.225	0.003	7,000	300	0.003	0.21	0
			30	20	5,400	230	0.002	0.06	0.002	5,400	200	0.002	0.056	0
		3°	20	13.3	10,300	870	0.014	0.3	0.01	10,300	760	0.01	0.28	0
2	R0.2	1°	20	10	7,400	650	0.014	0.375	0.01	7,400	570	0.01	0.35	0
			30	15	5,300	400	0.005	0.225	0.004	5,300	350	0.004	0.21	0
			40	20	4,500	230	0.003	0.113	0.002	4,500	200	0.002	0.105	0
		3°	30	15	8,200	870	0.018	0.375	0.012	8,200	760	0.012	0.35	0
	R0.3	1°	20	10	7,400	650	0.014	0.375	0.01	7,400	570	0.01	0.35	0
			30	15	5,300	400	0.005	0.225	0.004	5,300	350	0.004	0.21	0
			40	20	4,500	230	0.003	0.113	0.002	4,500	200	0.002	0.105	0
		3°	30	15	8,200	870	0.018	0.375	0.012	8,200	760	0.012	0.35	0
	R0.5	1°	20	10	7,400	650	0.014	0.375	0.01	7,400	570	0.01	0.35	0
			30	15	5,300	400	0.005	0.225	0.004	5,300	350	0.004	0.21	0
			40	20	4,500	230	0.003	0.113	0.002	4,500	200	0.002	0.105	0
		3°	30	15	8,200	870	0.018	0.375	0.012	8,200	760	0.012	0.35	0
3	R0.2	1°	30	10	5,100	660	0.015	0.525	0.011	5,100	580	0.011	0.49	0
			40	13.3	4,400	340	0.01	0.45	0.007	4,400	300	0.007	0.42	0
			50	16.7	3,900	270	0.008	0.3	0.006	3,900	240	0.006	0.28	0
		3°	60	20	3,700	230	0.007	0.135	0.005	3,700	200	0.005	0.126	0
	R0.3	1°	29.8	9.9	6,300	930	0.035	0.525	0.025	6,300	810	0.025	0.49	0
			30	10	5,100	660	0.015	0.525	0.011	5,100	580	0.011	0.49	0
			40	13.3	4,400	340	0.01	0.45	0.007	4,400	300	0.007	0.42	0
		3°	50	16.7	3,900	270	0.008	0.3	0.006	3,900	240	0.006	0.28	0
	R0.5	1°	60	20	3,700	230	0.007	0.135	0.005	3,700	200	0.005	0.126	0
			29.9	10	6,300	930	0.035	0.525	0.025	6,300	810	0.025	0.49	0
			30	10	5,100	660	0.015	0.525	0.011	5,100	580	0.011	0.49	0
		3°	40	13.3	4,400	340	0.01	0.45	0.007	4,400	300	0.007	0.42	0

Notes

- ※1 Depth of Cut: ap=Axial Depth of Cut / ae=Radial Depth of Cut.
 ※2 Adjust milling condition according to machine rigidity and clamp condition of work material.
 ※3 In case of chattering etc., please adjust cutting conditions if necessary.
 ※4 If the cutting load is high at corner, adjust the cutting conditions and tool path to reduce the cutting load.
 ※5 Recommend to apply helical or ramping for approaching into axial direction.
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 Please adjust it according to the machining condition of the previous process and the required accuracy.
 ※11 The parameters for the Stock Removal (Inner Corner) process are reference values based on the condition after roughing, where a corner radius end mill approximately 1.5 times larger than the tool used in this process was applied. Please adjust the depth of cut and feed rate according to the amount of remaining material from the previous roughing operation.
 Example
 Roughing: $\phi 3 \times R0.5$
 ➔ Stock removal (inner corner): $\phi 2 \times R0.2$



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CAUTION

Attention on Safety

- 1) When removing tools from cases, be careful of getting-out of tools and don't touch directly the cutting edges.
- 2) Never touch the cutting edges directly with bare hand.
- 3) Use safety covers and eye protection, as tools may be broken.
- 4) Use holders, etc. that match the tools and nature of the processing operations. The tool should be firmly attached to the holder to prevent shaking.
- 5) The work materials clamp firmly.
- 6) Make sure of dimensions of tools and work pieces before starting operation.
- 7) It is necessary to adjust conditions according to the dimensions of work materials and the machine.
- 8) Select a cutting fluid appropriate to the particular usage. Using a non-water cutting fluid could lead to fires due to sparks generated during processing or heat caused by breakage. Ensure that you take proper fire-prevention measures.
- 9) If abnormal sound, etc. occurs during processing, stop the machine immediately.
- 10) Don't modify tools.

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