

MPX COATING

Long Neck Ball End Mill for 420 Hardened Stainless Steels

XRBH230

NEW

Total 83 sizes

Specialized small diameter ball end mill for SUS420J2,
as the same as 52HRC (STAVAX® ESR etc.)

Achieves outstanding tool life more than twice as long as conventional products.

H



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Long Neck Ball End Mill for 420 Hardened Stainless Steels

XRBH230 *New*

R0.05 ~ R1

Total 83 sizes



Point

Recommended cutting conditions for CAD/CAM operators reference

Newly added cutting conditions for "semi-finishing" and "finishing" processes to ensure that anyone can create tool paths at any time based on standard reference values.

Work Material			Hardened Steels STAVAX·HPM38·M333(As the same as 52HRC)						
Radius	Under Neck Length	L/D	Spindle speed	Feed	Feed per tooth	Depth of cut		Stock allowance	Material removal rate
			min ⁻¹	mm/min	mm/t	a _p mm	a _e mm	mm	mm ³ /min
R0.05	0.2	2	40,000	100	0.001	0.003	0.008	0.005	0.002
	0.3	3	40,000	100	0.001	0.003	0.008	0.005	0.002
	0.4	4	40,000	80	0.001	0.002	0.006	0.004	0.001
	0.5	5	40,000	60	0.001	0.002	0.005	0.004	0.001
R0.1	0.3	2	40,000	200	0.003	0.006	0.014	0.007	0.017
	0.4	2.7	40,000	200	0.003	0.006	0.014	0.007	0.017

[Roughing]

Added Feed per Tooth ·
Stock allowance ·
Metal Removal Rate

Work Material			Hardened Steels STAVAX·HPM38·M333(As the same as 52HRC)											
Radius	Under Neck Length	L/D	Semi-Finishing						Finishing					
			Spindle Speed	Feed	Feed per Tooth	Depth of Cut	Stock allowance	Cusp Height	Spindle Speed	Feed	Feed per Tooth	Depth of Cut	Stock allowance	Cusp Height
			min ⁻¹	mm/min	mm ³ /min	a _p mm or a _e mm	mm/t	μm	min ⁻¹	mm/min	mm ³ /min	a _p mm or a _e mm	mm	μm
R0.05	0.2	2	40,000	270	0.003	0.003	0.002	0.02	40,000	160	0.002	0.002	0	0.01
	0.3	3	40,000	270	0.003	0.003	0.002	0.02	40,000	160	0.002	0.002	0	0.01

[Semi-finishing] [Finishing]

Added Feed per Tooth ·
Stock allowance ·
Cusp Height

Features

Feature 1 **Long tool life** **MPX COATING**

Adopting new developed MPX coating for hardened steel SUS420J2 realizes tool life more than twice as long as conventional tools



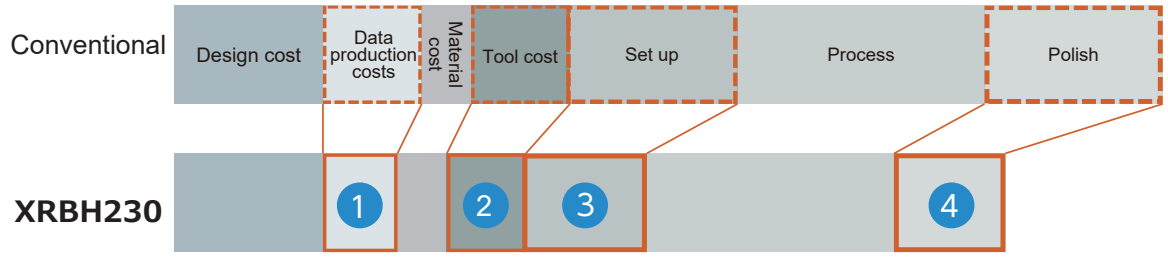
SUS420J2 H
As the same as 52HRC
⊙

Feature 2 **Cost reduction** Realizes cost reduction by improved tool life

Extending tool life can bring about various benefits, such as cost reduction and shortening work time



When the number of tools used changes from two to one

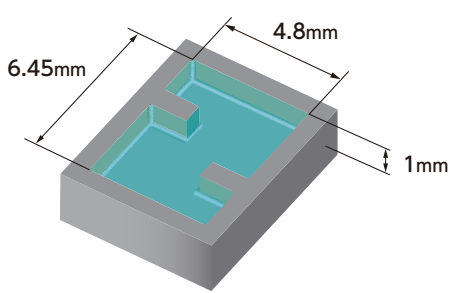


- ① Reduced CAM operation load
- ② Tool cost reduction
- ③ Reduce setup time + Tooling cost reduction
- ④ Reduce polishing time

■ Tool life comparison with conventional products

Work material : STAVAX®ESR 52HRC
Coolant : Oil mist

R0.2 × Under neck length 1



Spindle speed [min ⁻¹]	40,000
Cutting speed [m/min]	21.91(※ Actual cutting speed)
Feed [mm/min]	800
Feed per tooth [mm/t]	0.01
Depth of cut (ap×ae) [mm]	0.02 × 0.05
Cutting length	26 m/pc
Machining time	40 min/pc

※ Cutting speed calculated on actual diameter basis.

	After machining 2pcs 1 hr 20 min	After machining 15pcs 10 hr
Conventional		
XRBH230		



Conventional product had a large wear range after machining 2pcs and end at 1hr 20min



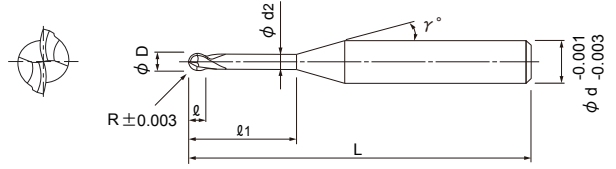
XRBH230 machined 15pcs in 10hr

Tool life difference more than 5 times

MPX COATING
Long Neck Ball End Mill for 420 Hardened Stainless Steels

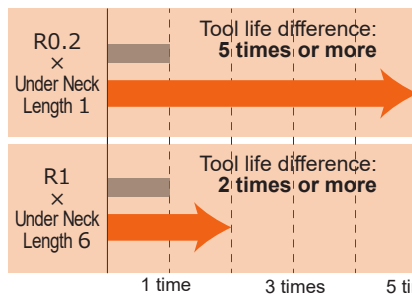
Total 83 sizes

Specialized small diameter ball end mill for SUS420J2, as the same as 52HRC (STAVAX® ESR etc.)
Achieves outstanding tool life more than twice as long as conventional products.

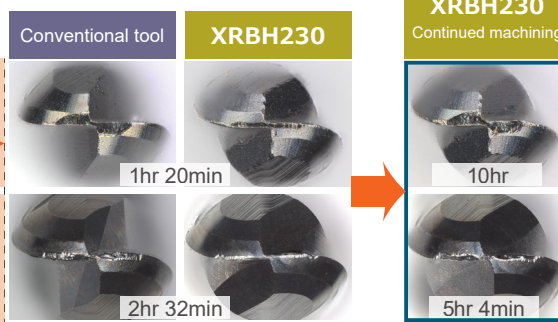


- New developed coating MPX specialized for SUS420J2, hardened steels.
- More than twice as long as conventional tools.

Tool life comparison with conventional products by each size

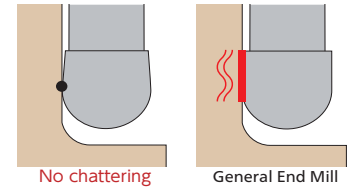


Work material: STAVAX® ESR 52HRC



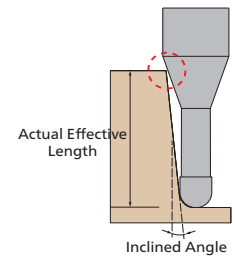
Work Material

SUS420J2	H
As the same as 52HRC	



※ Except for the tools, all other cutting conditions are under the same environment and conditions

Outstanding tool life from twice to five times compared to conventional products



◆ Released in Nov, 2024.

Unit [Size : mm]

Code No.	Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Dia. (D)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece				
									30°	1°	1°30'	2°	3°
◆ 08-00561-00502	R0.05	0.2	0.07	0.1	0.085	12°	4	45	0.24	0.25	0.26	0.27	0.29
◆ 08-00561-00503		0.3	0.07	0.1	0.085	12°	4	45	0.34	0.36	0.37	0.39	0.42
◆ 08-00561-00504		0.4	0.07	0.1	0.085	12°	4	45	0.45	0.46	0.48	0.51	0.56
◆ 08-00561-00505		0.5	0.07	0.1	0.085	12°	4	45	0.55	0.57	0.60	0.63	0.69
◆ 08-00561-00703		R0.075	0.3	0.1	0.15	0.13	12°	4	45	0.35	0.37	0.38	0.40
◆ 08-00561-00704	0.4		0.1	0.15	0.13	12°	4	45	0.46	0.48	0.49	0.52	0.56
◆ 08-00561-00705	0.5		0.1	0.15	0.13	12°	4	45	0.56	0.58	0.61	0.64	0.70
◆ 08-00561-00706	0.6		0.1	0.15	0.13	12°	4	45	0.67	0.69	0.72	0.75	0.83
◆ 08-00561-00707	0.75		0.1	0.15	0.13	12°	4	45	0.82	0.86	0.89	0.93	1.03
◆ 08-00561-00710	1	0.1	0.15	0.13	12°	4	45	1.08	1.13	1.18	1.23	1.36	
◆ 08-00561-01003	R0.1	0.3	0.15	0.2	0.18	12°	4	45	0.35	0.36	0.38	0.39	0.42
◆ 08-00561-01004		0.4	0.15	0.2	0.18	12°	4	45	0.46	0.47	0.49	0.51	0.56
◆ 08-00561-01005		0.5	0.15	0.2	0.18	12°	4	45	0.56	0.58	0.61	0.63	0.69
◆ 08-00561-01006		0.6	0.15	0.2	0.18	12°	4	45	0.67	0.69	0.72	0.75	0.82
◆ 08-00561-01007		0.75	0.15	0.2	0.18	12°	4	45	0.82	0.85	0.89	0.93	1.02
◆ 08-00561-01010		1	0.15	0.2	0.18	12°	4	45	1.08	1.13	1.18	1.23	1.35
◆ 08-00561-01012		1.25	0.15	0.2	0.18	12°	4	45	1.34	1.40	1.46	1.53	1.68
◆ 08-00561-01015		1.5	0.15	0.2	0.18	12°	4	45	1.60	1.67	1.75	1.83	2.02
◆ 08-00561-01020	2	0.15	0.2	0.18	12°	4	45	2.13	2.22	2.32	2.43	2.68	
◆ 08-00561-01505	R0.15	0.5	0.2	0.3	0.28	12°	4	45	0.56	0.58	0.60	0.62	0.67
◆ 08-00561-01506		0.6	0.2	0.3	0.28	12°	4	45	0.66	0.69	0.71	0.74	0.81
◆ 08-00561-01507		0.75	0.2	0.3	0.28	12°	4	45	0.82	0.85	0.88	0.92	1.01
◆ 08-00561-01510		1	0.2	0.3	0.28	12°	4	45	1.08	1.12	1.17	1.22	1.34

How to Order

When you order, indicate XRBH230 (R)×(ℓ1)×(d).

(γ) is reference value.

Unit [Size : mm]

Code No.	Radius (R)	Under Neck Length (ℓ_1)	Length of Cut (ℓ)	Dia. (D)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece				
									3°	1°	1°30'	2°	3°
◆ 08-00561-01512	R0.15	1.25	0.2	0.3	0.28	12°	4	45	1.34	1.39	1.45	1.52	1.67
◆ 08-00561-01515		1.5	0.2	0.3	0.28	12°	4	45	1.60	1.67	1.74	1.82	2.00
◆ 08-00561-01520		2	0.2	0.3	0.28	12°	4	45	2.12	2.21	2.31	2.42	2.66
◆ 08-00561-01525		2.5	0.2	0.3	0.28	12°	4	45	2.64	2.76	2.88	3.01	3.33
◆ 08-00561-01530		3	0.2	0.3	0.28	12°	4	45	3.17	3.30	3.45	3.61	3.99
◆ 08-00561-02005	R0.2	0.5	0.3	0.4	0.37	12°	4	45	0.58	0.60	0.62	0.64	0.69
◆ 08-00561-02008		0.8	0.3	0.4	0.37	12°	4	45	0.89	0.93	0.96	1.00	1.09
◆ 08-00561-02010		1	0.3	0.4	0.37	12°	4	45	1.10	1.14	1.19	1.24	1.35
◆ 08-00561-02015		1.5	0.3	0.4	0.37	12°	4	45	1.62	1.69	1.76	1.84	2.02
◆ 08-00561-02020		2	0.3	0.4	0.37	12°	4	45	2.15	2.23	2.33	2.43	2.68
◆ 08-00561-02025		2.5	0.3	0.4	0.37	12°	4	45	2.67	2.78	2.90	3.03	3.34
◆ 08-00561-02030		3	0.3	0.4	0.37	12°	4	45	3.19	3.32	3.47	3.63	4.01
◆ 08-00561-02040	4	0.3	0.4	0.37	12°	4	45	4.23	4.41	4.61	4.83	5.33	
◆ 08-00561-02510	R0.25	1	0.35	0.5	0.46	12°	4	45	1.13	1.16	1.21	1.26	1.37
◆ 08-00561-02515		1.5	0.35	0.5	0.46	12°	4	45	1.65	1.71	1.78	1.85	2.03
◆ 08-00561-02520		2	0.35	0.5	0.46	12°	4	45	2.17	2.25	2.35	2.45	2.69
◆ 08-00561-02525		2.5	0.35	0.5	0.46	12°	4	45	2.69	2.80	2.92	3.05	3.36
◆ 08-00561-02530		3	0.35	0.5	0.46	12°	4	45	3.21	3.34	3.49	3.65	4.02
◆ 08-00561-02540		4	0.35	0.5	0.46	12°	4	45	4.25	4.43	4.63	4.85	5.35
◆ 08-00561-02550	5	0.35	0.5	0.46	12°	4	45	5.30	5.52	5.77	6.04	6.68	
◆ 08-00561-03010	R0.3	1	0.45	0.6	0.56	12°	4	45	1.12	1.16	1.20	1.25	1.35
◆ 08-00561-03015		1.5	0.45	0.6	0.56	12°	4	45	1.64	1.71	1.77	1.84	2.02
◆ 08-00561-03020		2	0.45	0.6	0.56	12°	4	45	2.17	2.25	2.34	2.44	2.68
◆ 08-00561-03025		2.5	0.45	0.6	0.56	12°	4	45	2.69	2.79	2.91	3.04	3.34
◆ 08-00561-03030		3	0.45	0.6	0.56	12°	4	45	3.21	3.34	3.48	3.64	4.01
◆ 08-00561-03040		4	0.45	0.6	0.56	12°	4	45	4.25	4.43	4.62	4.84	5.33
◆ 08-00561-03050		5	0.45	0.6	0.56	12°	4	45	5.29	5.52	5.76	6.03	6.66
◆ 08-00561-03060	6	0.45	0.6	0.56	12°	4	45	6.34	6.61	6.90	7.23	7.99	
◆ 08-00561-04010	R0.4	1	0.6	0.8	0.76	12°	4	45	1.12	1.15	1.19	1.23	1.32
◆ 08-00561-04020		2	0.6	0.8	0.76	12°	4	45	2.16	2.24	2.33	2.42	2.65
◆ 08-00561-04030		3	0.6	0.8	0.76	12°	4	45	3.20	3.33	3.47	3.62	3.97
◆ 08-00561-04040		4	0.6	0.8	0.76	12°	4	45	4.25	4.42	4.61	4.82	5.30
◆ 08-00561-04050		5	0.6	0.8	0.76	12°	4	45	5.29	5.51	5.75	6.01	6.63
◆ 08-00561-04060		6	0.6	0.8	0.76	12°	4	45	6.33	6.60	6.89	7.21	7.96
◆ 08-00561-04080	8	0.6	0.8	0.76	12°	4	45	8.42	8.78	9.17	9.60	10.61	
◆ 08-00561-05020	R0.5	2	0.75	1	0.95	12°	4	45	2.18	2.26	2.34	2.43	2.65
◆ 08-00561-05030		3	0.75	1	0.95	12°	4	45	3.22	3.35	3.48	3.63	3.97
◆ 08-00561-05040		4	0.75	1	0.95	12°	4	45	4.27	4.44	4.62	4.83	5.30
◆ 08-00561-05050		5	0.75	1	0.95	12°	4	45	5.31	5.53	5.76	6.02	6.63
◆ 08-00561-05060		6	0.75	1	0.95	12°	4	45	6.35	6.62	6.90	7.22	7.96
◆ 08-00561-05080		8	0.75	1	0.95	12°	4	45	8.44	8.79	9.18	9.61	10.61
◆ 08-00561-05100	10	0.75	1	0.95	12°	4	45	10.52	10.97	11.46	12.01	13.26	
◆ 08-00561-07503	R0.75	3	1.1	1.5	1.45	12°	4	45	3.21	3.33	3.45	3.58	3.89
◆ 08-00561-07504		4	1.1	1.5	1.45	12°	4	45	4.26	4.41	4.59	4.78	5.22
◆ 08-00561-07506		6	1.1	1.5	1.45	12°	4	45	6.34	6.59	6.87	7.17	7.88
◆ 08-00561-07508		8	1.1	1.5	1.45	12°	4	45	8.43	8.77	9.15	9.56	10.53
◆ 08-00561-07510		10	1.1	1.5	1.45	12°	4	45	10.51	10.95	11.43	11.96	13.18
◆ 08-00561-07512		12	1.1	1.5	1.45	12°	4	45	12.60	13.13	13.71	14.35	15.84
◆ 08-00561-07514		14	1.1	1.5	1.45	12°	4	50	14.69	15.31	15.99	16.74	18.49
◆ 08-00561-07516	16	1.1	1.5	1.45	12°	4	50	16.77	17.49	18.27	19.14	21.15	
◆ 08-00561-10003	R1	3	1.5	2	1.94	12°	4	45	3.23	3.33	3.44	3.56	3.85
◆ 08-00561-10004		4	1.5	2	1.94	12°	4	45	4.27	4.42	4.58	4.76	5.17
◆ 08-00561-10006		6	1.5	2	1.94	12°	4	45	6.36	6.60	6.86	7.15	7.83
◆ 08-00561-10008		8	1.5	2	1.94	12°	4	45	8.44	8.78	9.14	9.54	10.48
◆ 08-00561-10010		10	1.5	2	1.94	12°	4	45	10.53	10.95	11.42	11.94	13.14
◆ 08-00561-10012		12	1.5	2	1.94	12°	4	45	12.61	13.13	13.70	14.33	15.79
◆ 08-00561-10014		14	1.5	2	1.94	12°	4	50	14.70	15.31	15.98	16.72	18.45
◆ 08-00561-10016		16	1.5	2	1.94	12°	4	50	16.78	17.49	18.27	19.12	Free
◆ 08-00561-10018		18	1.5	2	1.94	12°	4	55	18.87	19.67	20.55	21.51	Free
◆ 08-00561-10020		20	1.5	2	1.94	12°	4	55	20.96	21.85	22.83	23.90	Free

Recommended Conditions

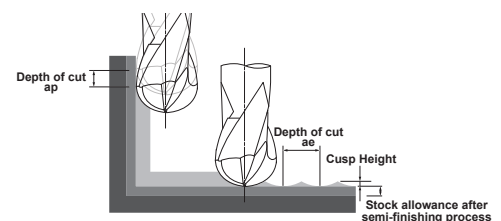
Roughing

Work Material			Hardened Steels STAVAX·HPM38·M333 (As the same as 52HRC)						
Radius	Under Neck Length	L/D	Spindle Speed	Feed	Feed per Tooth	Depth of Cut		Stock allowance	Material removal rate
			min ⁻¹	mm/min	mm/t	a _p mm	a _e mm	mm	mm ³ /min
R0.05	0.2	2	40,000	100	0.001	0.003	0.008	0.005	0.002
	0.3	3	40,000	100	0.001	0.003	0.008	0.005	0.002
	0.4	4	40,000	80	0.001	0.002	0.006	0.004	0.001
	0.5	5	40,000	60	0.001	0.002	0.005	0.004	0.001
R0.075	0.3	2	40,000	200	0.003	0.006	0.014	0.007	0.017
	0.4	2.7	40,000	200	0.003	0.006	0.014	0.007	0.017
	0.5	3.3	40,000	180	0.002	0.005	0.012	0.006	0.011
	0.6	4	40,000	150	0.002	0.004	0.010	0.005	0.006
	0.75	5	40,000	120	0.002	0.003	0.008	0.004	0.003
R0.1	1	6.7	40,000	90	0.001	0.003	0.006	0.004	0.002
	0.3	1.5	40,000	300	0.004	0.008	0.020	0.009	0.048
	0.4	2	40,000	300	0.004	0.008	0.020	0.009	0.048
	0.5	2.5	40,000	300	0.004	0.008	0.020	0.009	0.048
	0.6	3	40,000	300	0.004	0.008	0.020	0.009	0.048
	0.75	3.8	40,000	240	0.003	0.007	0.016	0.007	0.027
	1	5	40,000	180	0.002	0.005	0.012	0.005	0.011
	1.25	6.3	40,000	140	0.002	0.004	0.010	0.004	0.006
R0.15	1.5	7.5	40,000	120	0.002	0.003	0.008	0.004	0.003
	2	10	40,000	90	0.001	0.002	0.006	0.004	0.001
	0.5	1.7	40,000	600	0.008	0.014	0.036	0.013	0.30
	0.6	2	40,000	600	0.008	0.014	0.036	0.013	0.30
	0.75	2.5	40,000	600	0.008	0.014	0.036	0.013	0.30
	1	3.3	40,000	540	0.007	0.013	0.032	0.012	0.23
	1.25	4.2	40,000	430	0.005	0.010	0.026	0.009	0.11
	1.5	5	40,000	360	0.005	0.009	0.022	0.008	0.07
R0.2	2	6.7	40,000	270	0.003	0.007	0.016	0.006	0.03
	2.5	8.3	40,000	220	0.003	0.005	0.013	0.005	0.01
	3	10	40,000	180	0.002	0.004	0.011	0.004	0.01
	0.5	1.3	40,000	900	0.011	0.022	0.056	0.015	1.11
	0.8	2	40,000	900	0.011	0.022	0.056	0.015	1.11
	1	2.5	40,000	900	0.011	0.022	0.056	0.015	1.11
	1.5	3.8	40,000	720	0.009	0.018	0.044	0.012	0.57
	2	5	40,000	540	0.007	0.013	0.033	0.009	0.23
R0.25	2.5	6.3	40,000	430	0.005	0.011	0.027	0.007	0.13
	3	7.5	40,000	360	0.005	0.009	0.022	0.006	0.07
	4	10	40,000	270	0.003	0.007	0.017	0.005	0.03
	1	2	40,000	1,300	0.016	0.031	0.079	0.020	3.18
	1.5	3	40,000	1,300	0.016	0.031	0.079	0.020	3.18
	2	4	40,000	980	0.012	0.024	0.059	0.015	1.39
	2.5	5	40,000	780	0.010	0.019	0.047	0.012	0.70
	3	6	40,000	650	0.008	0.016	0.039	0.010	0.41
R0.3	4	8	40,000	490	0.006	0.012	0.030	0.008	0.18
	5	10	40,000	390	0.005	0.009	0.024	0.006	0.08
	1	1.7	40,000	1,700	0.021	0.042	0.106	0.023	7.57
	1.5	2.5	40,000	1,700	0.021	0.042	0.106	0.023	7.57
	2	3.3	40,000	1,530	0.019	0.038	0.095	0.021	5.52
	2.5	4.2	40,000	1,220	0.015	0.030	0.076	0.017	2.78
	3	5.0	40,000	1,020	0.013	0.025	0.063	0.014	1.61
	4	6.7	40,000	770	0.010	0.019	0.048	0.010	0.70
R0.3	5	8.3	40,000	610	0.008	0.015	0.038	0.008	0.35
	6	10	37,000	510	0.007	0.013	0.032	0.007	0.21

Work Material			Hardened Steels STAVAX·HPM38·M333 (As the same as 52HRC)						
Radius	Under Neck Length	L/D	Spindle Speed	Feed	Feed per Tooth	Depth of Cut		Stock allowance	Material removal rate
			min ⁻¹	mm/min	mm/t	a _p mm	a _e mm	mm	mm ³ /min
R0.4	1	1.3	40,000	2,700	0.034	0.068	0.170	0.029	31.21
	2	2.5	40,000	2,700	0.034	0.068	0.170	0.029	31.21
	3	3.8	37,400	2,160	0.029	0.054	0.136	0.023	15.86
	4	5	34,300	1,620	0.024	0.041	0.102	0.017	6.77
	5	6.3	32,100	1,300	0.020	0.033	0.082	0.014	3.52
	6	7.5	30,400	1,080	0.018	0.027	0.068	0.012	1.98
R0.5	8	10	27,900	810	0.015	0.020	0.051	0.009	0.83
	2	2	31,800	2,900	0.046	0.100	0.250	0.040	72.50
	3	3	31,800	2,900	0.046	0.100	0.250	0.040	72.50
	4	4	29,200	2,175	0.037	0.075	0.188	0.030	30.67
	5	5	27,300	1,740	0.032	0.060	0.150	0.024	15.66
	6	6	25,800	1,450	0.028	0.050	0.125	0.020	9.06
R0.75	8	8	23,700	1,088	0.023	0.038	0.094	0.015	3.88
	10	10	22,200	870	0.020	0.030	0.075	0.012	1.96
	3	2	21,200	2,900	0.068	0.150	0.375	0.056	163.13
	4	2.7	21,200	2,900	0.068	0.150	0.375	0.056	163.13
	6	4.0	19,400	2,180	0.056	0.113	0.281	0.042	69.22
	8	5.3	17,800	1,630	0.046	0.084	0.211	0.032	28.89
	10	6.7	16,700	1,310	0.039	0.068	0.169	0.025	15.05
R1	12	8	15,800	1,090	0.034	0.056	0.141	0.021	8.61
	14	9.3	15,100	930	0.031	0.048	0.121	0.018	5.40
	16	10.7	14,500	820	0.028	0.042	0.105	0.016	3.62
	3	1.5	15,900	2,900	0.091	0.200	0.500	0.068	290.00
	4	2	15,900	2,900	0.091	0.200	0.500	0.068	290.00
	6	3	15,900	2,900	0.091	0.200	0.500	0.068	290.00
	8	4	14,600	2,180	0.075	0.150	0.375	0.051	122.63
	10	5	13,600	1,740	0.064	0.120	0.300	0.041	62.64
R1	12	6	12,900	1,450	0.056	0.100	0.250	0.034	36.25
	14	7	12,300	1,240	0.050	0.086	0.214	0.029	22.82
	16	8	11,800	1,090	0.046	0.075	0.188	0.026	15.37
	18	9	11,400	970	0.043	0.067	0.167	0.023	10.85
	20	10	11,100	870	0.039	0.060	0.150	0.020	7.83

Notes

- ※1 Depth of Cut: a_p=Axial Depth of Cut / a_e=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 In case high-efficient machining, increase spindle speed and feed rate at the same rate.
- ※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. Water-insoluble, water-soluble, and air blow can also be used.
- ※9 The stock allowances of semi-finishing and finishing are guide values, please adjust them according to the machining condition of the previous process and the required accuracy.
- ※10 Feed per tooth, a_p and a_e of semi-finishing and finishing are set as reference values for the cusp height. The cusp height is a guideline, please adjust it according to the required accuracy.



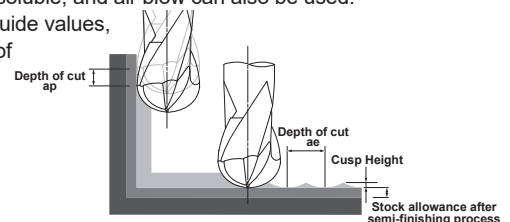
Recommended Conditions

Semi-Finishing			Finishing											
Work Material			Hardened Steels STAVAX·HPM38·M333 (As the same as 52HRC)											
Radius	Under Neck Length	L/D	Semi-Finishing						Finishing					
			Spindle Speed	Feed	Feed per Tooth	Depth of Cut	Stock allowance	Cusp Height	Spindle Speed	Feed	Feed per Tooth	Depth of Cut	Stock allowance	Cusp Height
			min ⁻¹	mm/min	min ⁻¹	ap mm or ae mm	mm/t	μm	min ⁻¹	mm/min	min ⁻¹	ap mm or ae mm	mm	μm
R0.05	0.2	2	40,000	270	0.003	0.003	0.002	0.02	40,000	160	0.002	0.002	0	0.01
	0.3	3	40,000	270	0.003	0.003	0.002	0.02	40,000	160	0.002	0.002	0	0.01
	0.4	4	40,000	270	0.003	0.003	0.002	0.02	40,000	160	0.002	0.002	0	0.01
	0.5	5	40,000	270	0.003	0.003	0.002	0.02	40,000	160	0.002	0.002	0	0.01
R0.075	0.3	2	40,000	390	0.005	0.005	0.003	0.04	40,000	270	0.003	0.003	0	0.02
	0.4	2.7	40,000	390	0.005	0.005	0.003	0.04	40,000	270	0.003	0.003	0	0.02
	0.5	3.3	40,000	390	0.005	0.005	0.003	0.04	40,000	270	0.003	0.003	0	0.02
	0.6	4	40,000	390	0.005	0.005	0.003	0.04	40,000	270	0.003	0.003	0	0.02
	0.75	5	40,000	390	0.005	0.005	0.002	0.04	40,000	270	0.003	0.003	0	0.02
	1	6.7	40,000	390	0.005	0.005	0.002	0.04	40,000	270	0.003	0.003	0	0.02
R0.1	0.3	1.5	40,000	450	0.006	0.006	0.004	0.04	40,000	320	0.004	0.004	0	0.02
	0.4	2	40,000	450	0.006	0.006	0.004	0.04	40,000	320	0.004	0.004	0	0.02
	0.5	2.5	40,000	450	0.006	0.006	0.004	0.04	40,000	320	0.004	0.004	0	0.02
	0.6	3	40,000	450	0.006	0.006	0.004	0.04	40,000	320	0.004	0.004	0	0.02
	0.75	3.8	40,000	450	0.006	0.006	0.003	0.04	40,000	320	0.004	0.004	0	0.02
	1	5	40,000	450	0.006	0.006	0.002	0.04	40,000	320	0.004	0.004	0	0.02
	1.25	6.3	40,000	450	0.006	0.006	0.002	0.04	40,000	320	0.004	0.004	0	0.02
	1.5	7.5	40,000	450	0.006	0.006	0.002	0.04	40,000	320	0.004	0.004	0	0.02
R0.15	0.5	1.7	40,000	610	0.008	0.008	0.006	0.05	40,000	480	0.006	0.006	0	0.03
	0.6	2	40,000	610	0.008	0.008	0.006	0.05	40,000	480	0.006	0.006	0	0.03
	0.75	2.5	40,000	610	0.008	0.008	0.006	0.05	40,000	480	0.006	0.006	0	0.03
	1	3.3	40,000	610	0.008	0.008	0.005	0.05	40,000	480	0.006	0.006	0	0.03
	1.25	4.2	40,000	610	0.008	0.008	0.004	0.05	40,000	480	0.006	0.006	0	0.03
	1.5	5	40,000	610	0.008	0.008	0.004	0.05	40,000	480	0.006	0.006	0	0.03
	2	6.7	40,000	610	0.008	0.008	0.003	0.05	40,000	480	0.006	0.006	0	0.03
	2.5	8.3	40,000	610	0.008	0.008	0.002	0.05	40,000	480	0.006	0.006	0	0.03
	3	10	40,000	610	0.008	0.008	0.002	0.05	40,000	480	0.006	0.006	0	0.03
	R0.2	0.5	1.3	40,000	780	0.010	0.010	0.007	0.06	40,000	560	0.007	0.007	0
0.8		2	40,000	780	0.010	0.010	0.007	0.06	40,000	560	0.007	0.007	0	0.03
1		2.5	40,000	780	0.010	0.010	0.007	0.06	40,000	560	0.007	0.007	0	0.03
1.5		3.8	40,000	780	0.010	0.010	0.006	0.06	40,000	560	0.007	0.007	0	0.03
2		5	40,000	780	0.010	0.010	0.004	0.06	40,000	560	0.007	0.007	0	0.03
2.5		6.3	40,000	780	0.010	0.010	0.003	0.06	40,000	560	0.007	0.007	0	0.03
3		7.5	40,000	780	0.010	0.010	0.003	0.06	40,000	560	0.007	0.007	0	0.03
4		10	40,000	780	0.010	0.010	0.002	0.06	40,000	560	0.007	0.007	0	0.03
R0.25	1	2	40,000	1,010	0.013	0.013	0.009	0.08	40,000	710	0.009	0.009	0	0.04
	1.5	3	40,000	1,010	0.013	0.013	0.009	0.08	40,000	710	0.009	0.009	0	0.04
	2	4	40,000	1,010	0.013	0.013	0.007	0.08	40,000	710	0.009	0.009	0	0.04
	2.5	5	40,000	1,010	0.013	0.013	0.005	0.08	40,000	710	0.009	0.009	0	0.04
	3	6	40,000	1,010	0.013	0.013	0.004	0.08	40,000	710	0.009	0.009	0	0.04
	4	8	40,000	1,010	0.013	0.013	0.003	0.08	40,000	710	0.009	0.009	0	0.04
R0.3	1	1.7	40,000	1,170	0.015	0.015	0.010	0.09	40,000	780	0.010	0.010	0	0.04
	1.5	2.5	40,000	1,170	0.015	0.015	0.010	0.09	40,000	780	0.010	0.010	0	0.04
	2	3.3	40,000	1,170	0.015	0.015	0.009	0.09	40,000	780	0.010	0.010	0	0.04
	2.5	4.2	40,000	1,170	0.015	0.015	0.007	0.09	40,000	780	0.010	0.010	0	0.04
	3	5.0	40,000	1,170	0.015	0.015	0.006	0.09	40,000	780	0.010	0.010	0	0.04
	4	6.7	40,000	1,170	0.015	0.015	0.004	0.09	40,000	780	0.010	0.010	0	0.04

Work Material			Hardened Steels STAVAX·HPM38·M333 (As the same as 52HRC)											
Radius	Under Neck Length	L/D	Semi-Finishing						Finishing					
			Spindle Speed	Feed	Feed per Tooth	Depth of Cut	Stock allowance	Cusp Height	Spindle Speed	Feed	Feed per Tooth	Depth of Cut	Stock allowance	Cusp Height
			min ⁻¹	mm/min	min ⁻¹	ap mm or ae mm	mm/t	μm	min ⁻¹	mm/min	min ⁻¹	ap mm or ae mm	mm	μm
R0.3	5	8.3	40,000	1,170	0.015	0.015	0.004	0.09	40,000	780	0.010	0.010	0	0.04
	6	10	37,000	1,080	0.015	0.015	0.003	0.09	37,000	720	0.010	0.010	0	0.04
R0.4	1	1.3	40,000	1,430	0.018	0.018	0.013	0.10	40,000	1,010	0.013	0.013	0	0.05
	2	2.5	40,000	1,430	0.018	0.018	0.013	0.10	40,000	1,010	0.013	0.013	0	0.05
	3	3.8	37,400	1,330	0.018	0.018	0.010	0.10	37,400	940	0.013	0.013	0	0.05
	4	5	34,300	1,220	0.018	0.018	0.008	0.10	34,300	860	0.013	0.013	0	0.05
	5	6.3	32,100	1,140	0.018	0.018	0.006	0.10	32,100	810	0.013	0.013	0	0.05
	6	7.5	30,400	1,080	0.018	0.018	0.005	0.10	30,400	760	0.013	0.013	0	0.05
	8	10	27,900	990	0.018	0.018	0.004	0.10	27,900	700	0.013	0.013	0	0.05
R0.5	2	2	31,800	1,550	0.024	0.024	0.017	0.14	31,800	1,060	0.017	0.017	0	0.07
	3	3	31,800	1,550	0.024	0.024	0.017	0.14	31,800	1,060	0.017	0.017	0	0.07
	4	4	29,200	1,430	0.024	0.024	0.013	0.14	29,200	970	0.017	0.017	0	0.07
	5	5	27,300	1,330	0.024	0.024	0.010	0.14	27,300	910	0.017	0.017	0	0.07
	6	6	25,800	1,260	0.024	0.024	0.008	0.14	25,800	860	0.017	0.017	0	0.07
	8	8	23,700	1,160	0.024	0.024	0.006	0.14	23,700	790	0.017	0.017	0	0.07
	10	10	22,200	1,080	0.024	0.024	0.005	0.14	22,200	740	0.017	0.017	0	0.07
R0.75	3	2	21,200	1,350	0.032	0.032	0.022	0.17	21,200	920	0.022	0.022	0	0.08
	4	2.7	21,200	1,350	0.032	0.032	0.022	0.17	21,200	920	0.022	0.022	0	0.08
	6	4.0	19,400	1,230	0.032	0.032	0.016	0.17	19,400	850	0.022	0.022	0	0.08
	8	5.3	17,800	1,130	0.032	0.032	0.012	0.17	17,800	770	0.022	0.022	0	0.08
	10	6.7	16,700	1,060	0.032	0.032	0.010	0.17	16,700	730	0.022	0.022	0	0.08
	12	8	15,800	1,000	0.032	0.032	0.008	0.17	15,800	690	0.022	0.022	0	0.08
	14	9.3	15,100	960	0.032	0.032	0.007	0.17	15,100	660	0.022	0.022	0	0.08
R1	3	1.5	15,900	1,270	0.040	0.040	0.028	0.2	15,900	890	0.028	0.028	0	0.1
	4	2	15,900	1,270	0.040	0.040	0.028	0.2	15,900	890	0.028	0.028	0	0.1
	6	3	15,900	1,270	0.040	0.040	0.028	0.2	15,900	890	0.028	0.028	0	0.1
	8	4	14,600	1,160	0.040	0.040	0.021	0.2	14,600	820	0.028	0.028	0	0.1
	10	5	13,600	1,080	0.040	0.040	0.017	0.2	13,600	760	0.028	0.028	0	0.1
	12	6	12,900	1,030	0.040	0.040	0.014	0.2	12,900	720	0.028	0.028	0	0.1
	14	7	12,300	980	0.040	0.040	0.012	0.2	12,300	690	0.028	0.028	0	0.1
	16	8	11,800	940	0.040	0.040	0.011	0.2	11,800	660	0.028	0.028	0	0.1
	18	9	11,400	910	0.040	0.040	0.009	0.2	11,400	640	0.028	0.028	0	0.1
	20	10	11,100	880	0.040	0.040	0.008	0.2	11,100	620	0.028	0.028	0	0.1

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 In case high-efficient machining, increase spindle speed and feed rate at the same rate.
- ※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. Water-insoluble, water-soluble, and air blow can also be used.
- ※9 The stock allowances of semi-finishing and finishing are guide values, please adjust them according to the machining condition of the previous process and the required accuracy.
- ※10 Feed per tooth, ap and ae of semi-finishing and finishing are set as reference values for the cusp height. The cusp height is a guideline, please adjust it according to the required accuracy.



STAVAX®ESR (52HRC) The pentagon

Achieves longer tool life when compared to conventional products of the same size (machined under the same cutting conditions).



Machining video

Work material : **STAVAX®ESR (52HRC)**
 Work size : **100 × 200 × 30 mm (Machining depth 24 mm)**
 Coolant : **Oil mist**
 Total machining time : **9 hr 12 min**

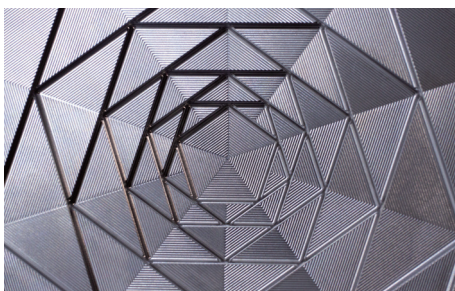
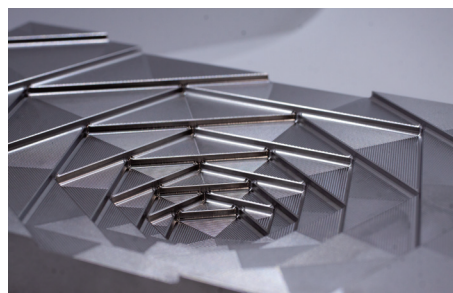
Comparison of machining with XRBH230 and conventional products under the same cutting conditions and size.

Process	Roughing	
Tool	XRBH230 R1 × 6	Conventional R1 × 6
Spindle speed [min ⁻¹]	15,900	
Feed [mm/min]	3,200	
Depth of cut ap × ae [mm]	0.2 × 0.5	
Machining time	9 hr 12 min	8 hr 29 min (Broken)



Result

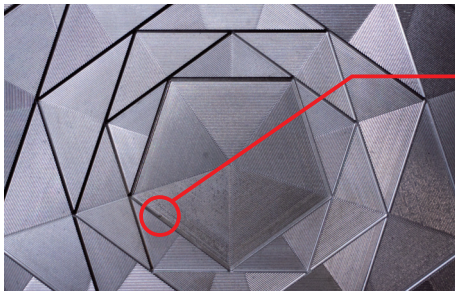
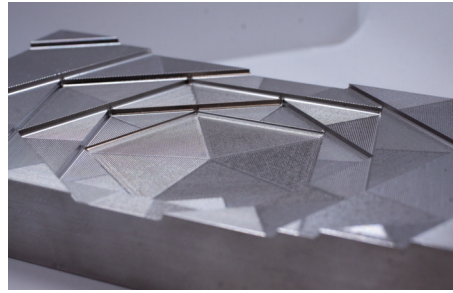
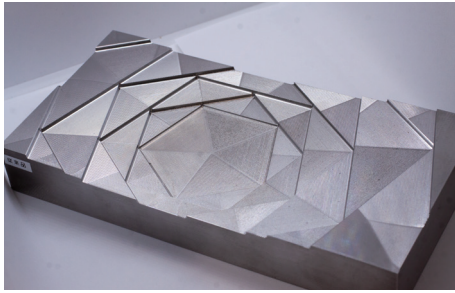
XRBH230



XRBH230 completes machining in a single tool

Tool	Machining depth [mm]	Removal volume [cm ³]
XRBH230 R1 × 6	24	160

Conventional



Broken point

The conventional product breaks during machining

Tool	Machining depth [mm]	Removal volume [cm ³]
Conventional R1 × 6	13.532	150

Tool wear condition

	Time passage	New tool	After machining 6 hr 54 min	After machining 9 hr 12 min
Near the center of the ball	Conventional R1 × 6			Broken at 8 hr 29 min
	Tool wear		0.169	
	XR BH230 R1 × 6			
	Tool wear		0.083	0.107
Rake face	Conventional R1 × 6			Broken at 8 hr 29 min
	XR BH230 R1 × 6			
Peripheral	Conventional R1 × 6			Broken at 8 hr 29 min
	XR BH230 R1 × 6			

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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.

