

4 Flutes HARDMAX



Size  $\phi 0.2 \sim \phi 6$

# HLRS4000



Material Applications (★ Highly Recommended ● Recommended ○ Suggested)

Work Material																	
Carbon Steels S45C S55C	Alloy Steels SK / SCM SUS	Prehardened Steels NAK HPM	Hardened Steels					Cast Iron	Aluminum Alloys	Graphite	Copper	Plastics	Glass Filled Plastics	Titanium Alloys	Heat Resistant Alloys	Cemented Carbide	Hard Brittle (Non-Metallic) Materials
			~50HRC	~55HRC	~60HRC	~65HRC	~70HRC										
○	○	●	●	●	●	○	○				○			○			

- φ3mm Shank V Series
- UDC-PCD Series
- CBN Series
- Square
- Long Neck Square
- Radius
- Long Neck Radius
- Taper Neck Radius
- Ball / Long Shank Ball
- Long Neck Ball
- Taper Neck Ball
- Taper
- Barrel
- Spiral V Cutter
- Drill
- Technical Data

Total 381 models

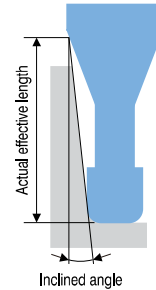
Unit (mm)

Model Number	Outside Diameter $\phi D$	Corner Radius CR	Effective Length $\ell_1$	Length of Cut $\ell$	Neck Diameter $\phi d_1$	Shank Taper Angle Bta	Overall Length L	Shank Diameter $\phi d$	Suggested Retail Price ¥	
HLRS 4002-002-003	0.2	R0.02	0.3	0.12	0.185	16°	50	4	14,100	
HLRS 4002-002-005			0.5				50			
HLRS 4002-002-010			1				50			
HLRS 4002-002-015			1.5				50			
HLRS 4002-002-020			2				50			
HLRS 4002-005-003			R0.05				0.3			50
HLRS 4003-002-003	0.3	R0.02	0.3	0.18	0.28	16°	50	4	14,100	
HLRS 4003-002-005			0.5				50			
HLRS 4003-002-010			1				50			
HLRS 4003-002-015			1.5				50			
HLRS 4003-002-020			2				50			
HLRS 4003-005-003			R0.05				0.3			50
HLRS 4003-005-005	0.5	50								
HLRS 4004-002-005	0.4	R0.02	0.5	0.24	0.385	16°	50	4	9,050	
HLRS 4004-002-010			1				50			
HLRS 4004-002-020			2				50			
HLRS 4004-005-005			0.5				50			
HLRS 4004-005-010			R0.05				1			50
HLRS 4004-005-015							1.5			50
HLRS 4004-005-020		2					50			
HLRS 4004-01-010		R0.1	1				50			
HLRS 4004-01-020			2				50			

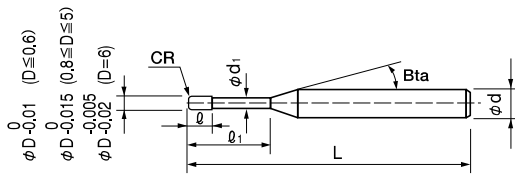
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## Features

Long Neck Radius design for high efficiency and high quality milling.  
 The rigid tool geometry offers longer tool life when milling Hard Materials.  
**HARDMAX** coat is adopted which maintains heat resistance, toughness and lubricity at a high level.  
 Both dry and wet coolant offer stable and long tool life.  
 Refer to page 324 for 2 flute HLRS.



4 Flutes



The shank taper angle shown is not an exact value and to avoid contact with the work piece, we recommend the user controls the precise value of this angle. Shank taper angle should not make contact with the work piece.

Unit (mm)

Model Number	Outside Diameter $\phi D$	Corner Radius CR	Effective Length $\ell_1$	Effective Length by Inclined Angles				
				30'	1°	1'30'	2°	3°
HLRS 4002-002-003	0,2	RO.02	0,3	0,39	0,41	0,44	0,46	0,51
HLRS 4002-002-005			0,5	0,60	0,63	0,67	0,70	0,75
HLRS 4002-002-010			1	1,13	1,18	1,22	1,27	1,36
HLRS 4002-002-015			1,5	1,65	1,71	1,77	1,84	1,98
HLRS 4002-002-020			2	2,17	2,25	2,32	2,41	2,59
HLRS 4002-005-003			RO.05	0,3	0,39	0,41	0,43	0,46
HLRS 4003-002-003	0,3	RO.02	0,3	0,41	0,43	0,46	0,48	0,52
HLRS 4003-002-005			0,5	0,62	0,65	0,68	0,71	0,77
HLRS 4003-002-010			1	1,15	1,19	1,24	1,28	1,38
HLRS 4003-002-015			1,5	1,67	1,73	1,79	1,85	1,99
HLRS 4003-002-020			2	2,19	2,26	2,34	2,42	2,60
HLRS 4003-005-003			RO.05	0,3	0,41	0,43	0,45	0,47
HLRS 4003-005-005	0,5	0,62	0,65	0,68	0,71	0,76		
HLRS 4004-002-005	0,4	RO.02	0,5	0,62	0,65	0,68	0,71	0,77
HLRS 4004-002-010			1	1,15	1,19	1,24	1,28	1,38
HLRS 4004-002-020			2	2,17	2,25	2,33	2,41	2,59
HLRS 4004-005-005		RO.05	0,5	0,62	0,65	0,68	0,71	0,76
HLRS 4004-005-010			1	1,14	1,19	1,23	1,28	1,37
HLRS 4004-005-015			1,5	1,65	1,72	1,77	1,84	1,97
HLRS 4004-005-020			2	2,17	2,25	2,32	2,41	2,59
HLRS 4004-01-010		RO.1	1	1,14	1,19	1,23	1,27	1,36
HLRS 4004-01-020			2	2,17	2,25	2,32	2,40	2,57

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## 4 Flutes HARDMAX

Unit (mm)

Model Number	Outside Diameter $\phi D$	Corner Radius CR	Effective Length $\ell_1$	Length of Cut $\ell$	Neck Diameter $\phi d_1$	Shank Taper Angle Bta	Overall Length L	Shank Diameter $\phi d$	Suggested Retail Price ¥	
HLRS 4005-002-010	0.5	R0.02	1	0.3	0.485	16°	50	4	7,370	
HLRS 4005-002-020			2				50	4	7,370	
HLRS 4005-005-010		R0.05	1				50	4	7,370	
HLRS 4005-005-020			2				50	4	7,370	
HLRS 4005-01-010		R0.1	1				50	4	7,370	
HLRS 4005-01-020			2				50	4	7,370	
HLRS 4006-005-020	0.6	R0.05	2	0.36	0.585	16°	50	4	7,370	
HLRS 4006-005-040			4				50	4	7,370	
HLRS 4006-01-020		R0.1	2				50	4	7,370	
HLRS 4006-01-040			4				50	4	7,370	
HLRS 4008-002-020	0.8	R0.02	2	0.48	0.78	16°	50	4	8,100	
HLRS 4008-002-030			3				50	4	8,100	
HLRS 4008-002-040			4				50	4	8,400	
HLRS 4008-002-060			6				50	4	8,400	
HLRS 4008-002-080			8				50	4	8,400	
HLRS 4008-005-020			R0.05				2	50	4	8,100
HLRS 4008-005-030		3					50	4	8,100	
HLRS 4008-005-040		4					50	4	8,400	
HLRS 4008-005-060		6					50	4	8,400	
HLRS 4008-01-020		R0.1					2	50	4	8,100
HLRS 4008-01-030							3	50	4	8,100
HLRS 4008-01-040			4				50	4	8,400	
HLRS 4008-01-060			6				50	4	8,400	
HLRS 4008-02-020			R0.2				2	50	4	8,100
HLRS 4008-02-030							3	50	4	8,100
HLRS 4008-02-040		4					50	4	8,400	
HLRS 4008-02-060		6					50	4	8,400	
HLRS 4010-002-020		1					R0.02	2	0.8	0.95
HLRS 4010-002-030	3			50	4	7,400				
HLRS 4010-002-040	4		50	4	7,400					
HLRS 4010-002-050	5		50	4	8,100					
HLRS 4010-002-060	6		50	4	8,100					
HLRS 4010-002-080	8		50	4	8,100					
HLRS 4010-002-100	10		50	4	8,100					
HLRS 4010-002-120	12		55	4	8,100					
HLRS 4010-005-020	R0.05		2	50	4	7,400				
HLRS 4010-005-030			3	50	4	7,400				
HLRS 4010-005-040			4	50	4	7,400				
HLRS 4010-005-040			4	50	4	7,400				

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Unit (mm)

Model Number	Outside Diameter $\phi D$	Corner Radius CR	Effective Length $l_e$	Effective Length by Inclined Angles				
				30°	1°	1°30'	2°	3°
HLRS 4005-002-010	0.5	R0.02	1	1.15	1.19	1.24	1.28	1.38
HLRS 4005-002-020			2	2.17	2.25	2.33	2.41	2.59
HLRS 4005-005-010		R0.05	1	1.14	1.19	1.23	1.28	1.37
HLRS 4005-005-020			2	2.17	2.25	2.32	2.41	2.59
HLRS 4005-01-010		R0.1	1	1.14	1.19	1.23	1.27	1.36
HLRS 4005-01-020			2	2.17	2.25	2.32	2.40	2.57
HLRS 4006-005-020	0.6	R0.05	2	2.17	2.25	2.32	2.41	2.59
HLRS 4006-005-040			4	4.24	4.38	4.53	4.68	5.03
HLRS 4006-01-020		R0.1	2	2.17	2.25	2.32	2.40	2.57
HLRS 4006-01-040			4	4.24	4.38	4.52	4.68	5.02
HLRS 4008-002-020	0.8	R0.02	2	2.51	2.70	2.87	3.02	3.29
HLRS 4008-002-030			3	3.59	3.82	4.02	4.19	4.51
HLRS 4008-002-040			4	4.66	4.92	5.14	5.34	5.74
HLRS 4008-002-060			6	6.78	7.10	7.36	7.61	8.19
HLRS 4008-002-080			8	8.88	9.25	9.56	9.89	10.63
HLRS 4008-005-020		R0.05	2	2.51	2.70	2.86	3.01	3.28
HLRS 4008-005-030			3	3.59	3.82	4.01	4.19	4.51
HLRS 4008-005-040			4	4.66	4.92	5.14	5.33	5.73
HLRS 4008-005-060		R0.1	6	6.77	7.09	7.35	7.61	8.18
HLRS 4008-01-020			2	2.51	2.69	2.86	3.00	3.27
HLRS 4008-01-030			3	3.58	3.81	4.01	4.18	4.50
HLRS 4008-01-040			4	4.65	4.92	5.13	5.33	5.72
HLRS 4008-01-060			6	6.77	7.09	7.35	7.60	8.17
HLRS 4008-02-020			R0.2	2	2.49	2.68	2.84	2.98
HLRS 4008-02-030		3		3.57	3.80	3.99	4.16	4.47
HLRS 4008-02-040		4		4.64	4.90	5.12	5.31	5.70
HLRS 4008-02-060		6		6.76	7.08	7.34	7.59	8.14
HLRS 4010-002-020		1	R0.02	2	2.57	2.75	2.90	3.05
HLRS 4010-002-030	3			3.64	3.86	4.05	4.22	4.54
HLRS 4010-002-040	4			4.70	4.96	5.17	5.36	5.76
HLRS 4010-002-050	5			5.76	6.04	6.28	6.50	6.99
HLRS 4010-002-060	6			6.81	7.12	7.38	7.64	8.21
HLRS 4010-002-080	8			8.91	9.27	9.58	9.92	10.66
HLRS 4010-002-100	10			11.00	11.40	11.78	12.19	13.11
HLRS 4010-002-120	12			13.08	13.53	13.98	14.47	15.55
HLRS 4010-005-020	R0.05		2	2.56	2.74	2.90	3.05	3.31
HLRS 4010-005-030			3	3.63	3.85	4.04	4.21	4.53
HLRS 4010-005-040			4	4.70	4.95	5.17	5.36	5.76

4 Flutes


 3mm Shank V Series


 UDC-PCD Series


 CBN Series


 Square


 Long Neck Square


 Radius


 Long Neck Radius


 Taper Neck Radius


 Ball / Long Shank Ball


 Long Neck Ball


 Taper Neck Ball


 Taper


 Barrel


 Spiral V Cutter


 Drill


 Technical Data

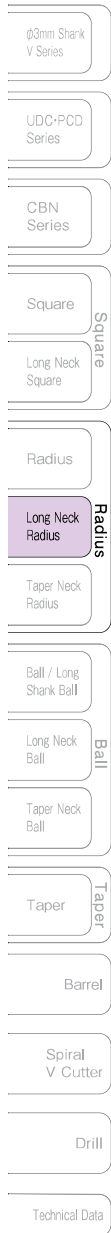
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## 4 Flutes HARDMAX

Unit (mm)

Model Number	Outside Diameter $\phi D$	Corner Radius CR	Effective Length $\ell_1$	Length of Cut $\ell$	Neck Diameter $\phi d_1$	Shank Taper Angle Bta	Overall Length L	Shank Diameter $\phi d$	Suggested Retail Price ¥	
HLRS 4010-005-050	1	RO.05	5	0.8	0.95	16°	50	4	8,100	
HLRS 4010-005-060			6				50	4	8,100	
HLRS 4010-005-080			8				50	4	8,100	
HLRS 4010-005-100			10				50	4	8,100	
HLRS 4010-005-120			12				55	4	8,100	
HLRS 4010-01-020		RO.1	2				50	4	7,400	
HLRS 4010-01-030			3				50	4	7,400	
HLRS 4010-01-040			4				50	4	7,400	
HLRS 4010-01-050			5				50	4	8,100	
HLRS 4010-01-060			6				50	4	8,100	
HLRS 4010-01-080			8				50	4	8,100	
HLRS 4010-01-100			10				50	4	8,100	
HLRS 4010-01-120			12				55	4	8,100	
HLRS 4010-02-020			RO.2				2	50	4	7,400
HLRS 4010-02-030							3	50	4	7,400
HLRS 4010-02-040							4	50	4	7,400
HLRS 4010-02-050							5	50	4	8,100
HLRS 4010-02-060		6					50	4	8,100	
HLRS 4010-02-080		8					50	4	8,100	
HLRS 4010-02-100		10					50	4	8,100	
HLRS 4010-02-120		12					55	4	8,100	
HLRS 4010-03-020		RO.3					2	50	4	7,400
HLRS 4010-03-030							3	50	4	7,400
HLRS 4010-03-040							4	50	4	7,400
HLRS 4010-03-050							5	50	4	8,100
HLRS 4010-03-060			6				50	4	8,100	
HLRS 4010-03-080			8				50	4	8,100	
HLRS 4010-03-100			10				50	4	8,100	
HLRS 4010-03-120			12				55	4	8,100	
HLRS 4010-03-160			16				60	4	10,740	
HLRS 4012-01-040	1.2		RO.1	4	0.96	1.14	16°	50	4	8,400
HLRS 4012-01-060		6		50				4	8,400	
HLRS 4012-01-100		10		50				4	8,400	
HLRS 4012-02-040		RO.2	4	50				4	8,400	
HLRS 4012-02-060			6	50				4	8,400	
HLRS 4012-02-100			10	50				4	8,400	
HLRS 4012-03-040		RO.3	4	50				4	8,400	
HLRS 4012-03-060			6	50				4	8,400	
HLRS 4012-03-100			10	50				4	8,400	
HLRS 4012-03-100			10	50				4	8,400	



Unit (mm)

Model Number	Outside Diameter $\phi D$	Corner Radius CR	Effective Length $l_e$	Effective Length by Inclined Angles					
				30'	1°	1°30'	2°	3°	
HLRS 4010-005-050	1	RO.05	5	5.76	6.04	6.28	6.50	6.98	
HLRS 4010-005-060			6	6.81	7.12	7.38	7.63	8.20	
HLRS 4010-005-080			8	8.91	9.27	9.58	9.91	10.65	
HLRS 4010-005-100			10	11.00	11.40	11.78	12.19	13.10	
HLRS 4010-005-120			12	13.08	13.53	13.98	14.47	15.55	
HLRS 4010-01-020		RO.1	2	2.56	2.74	2.89	3.04	3.30	
HLRS 4010-01-030			3	3.63	3.85	4.04	4.20	4.52	
HLRS 4010-01-040			4	4.70	4.95	5.16	5.35	5.75	
HLRS 4010-01-050			5	5.75	6.04	6.27	6.49	6.97	
HLRS 4010-01-060			6	6.81	7.12	7.37	7.63	8.19	
HLRS 4010-01-080			8	8.91	9.26	9.57	9.90	10.64	
HLRS 4010-01-100			10	11.00	11.39	11.77	12.18	13.09	
HLRS 4010-01-120			12	13.08	13.52	13.98	14.46	15.54	
HLRS 4010-02-020		RO.2	2	2.55	2.72	2.88	3.02	3.28	
HLRS 4010-02-030			3	3.62	3.84	4.02	4.19	4.50	
HLRS 4010-02-040			4	4.69	4.94	5.15	5.34	5.72	
HLRS 4010-02-050			5	5.75	6.03	6.26	6.47	6.95	
HLRS 4010-02-060			6	6.80	7.11	7.36	7.61	8.17	
HLRS 4010-02-080			8	8.90	9.26	9.56	9.89	10.62	
HLRS 4010-02-100			10	10.99	11.39	11.76	12.17	13.07	
HLRS 4010-02-120			12	13.07	13.52	13.97	14.45	15.51	
HLRS 4010-03-020		RO.3	2	2.54	2.71	2.86	3.00	3.25	
HLRS 4010-03-030			3	3.62	3.83	4.01	4.17	4.48	
HLRS 4010-03-040			4	4.68	4.93	5.14	5.32	5.70	
HLRS 4010-03-050			5	5.74	6.02	6.25	6.46	6.93	
HLRS 4010-03-060			6	6.80	7.10	7.35	7.60	8.15	
HLRS 4010-03-080			8	8.90	9.25	9.55	9.88	10.60	
HLRS 4010-03-100			10	10.99	11.38	11.75	12.15	13.04	
HLRS 4010-03-120			12	13.07	13.51	13.96	14.43	15.49	
HLRS 4010-03-160		16	17.22	17.77	18.36	18.99	20.39		
HLRS 4012-01-040		1.2	RO.1	4	4.13	4.27	4.41	4.56	4.90
HLRS 4012-01-060				6	6.20	6.40	6.61	6.84	7.34
HLRS 4012-01-100				10	10.32	10.66	11.01	11.39	12.24
HLRS 4012-02-040			RO.2	4	4.13	4.26	4.40	4.55	4.87
HLRS 4012-02-060				6	6.19	6.39	6.60	6.82	7.32
HLRS 4012-02-100				10	10.32	10.65	11.00	11.38	12.22
HLRS 4012-03-040	RO.3		4	4.13	4.25	4.39	4.53	4.85	
HLRS 4012-03-060			6	6.19	6.38	6.59	6.81	7.30	
HLRS 4012-03-100			10	10.32	10.64	10.99	11.36	12.20	

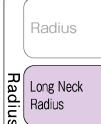
4 Flutes


 3mm Shank V Series


 UDC-PCD Series


 CBN Series


 Square  
 Long Neck Square


 Radius  
 Long Neck Radius


 Taper Neck Radius


 Ball / Long Shank Ball


 Long Neck Ball


 Taper Neck Ball


 Taper


 Barrel


 Spiral V Cutter


 Drill

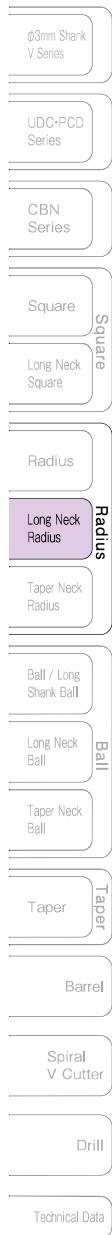

 Technical Data

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Unit (mm)



Model Number	Outside Diameter $\phi D$	Corner Radius CR	Effective Length $\ell_1$	Length of Cut $\ell$	Neck Diameter $\phi d_1$	Shank Taper Angle Bta	Overall Length L	Shank Diameter $\phi d$	Suggested Retail Price ¥	
HLRS 4015-005-030	1.5	R0.05	3	1.2	1.45	16°	50	4	7,900	
HLRS 4015-005-040			4				50	4	7,900	
HLRS 4015-005-060			6				50	4	7,900	
HLRS 4015-005-080			8				50	4	8,200	
HLRS 4015-005-120			12				55	4	8,200	
HLRS 4015-005-160			16				60	4	8,200	
HLRS 4015-01-030		R0.1	3				50	4	7,900	
HLRS 4015-01-040			4				50	4	7,900	
HLRS 4015-01-060			6				50	4	7,900	
HLRS 4015-01-080			8				50	4	8,200	
HLRS 4015-01-100			10				50	4	8,200	
HLRS 4015-01-120			12				55	4	8,200	
HLRS 4015-01-160			16				60	4	8,200	
HLRS 4015-01-180			18				60	4	8,200	
HLRS 4015-02-030			R0.2				3	50	4	7,900
HLRS 4015-02-040							4	50	4	7,900
HLRS 4015-02-060							6	50	4	7,900
HLRS 4015-02-080							8	50	4	8,200
HLRS 4015-02-100							10	50	4	8,200
HLRS 4015-02-120							12	55	4	8,200
HLRS 4015-02-160							16	60	4	8,200
HLRS 4015-02-180							18	60	4	8,200
HLRS 4015-03-030							R0.3	3	50	4
HLRS 4015-03-040			4					50	4	7,900
HLRS 4015-03-060		6	50					4	7,900	
HLRS 4015-03-080		8	50					4	8,200	
HLRS 4015-03-100		10	50					4	8,200	
HLRS 4015-03-120		12	55					4	8,200	
HLRS 4015-03-160		16	60					4	8,200	
HLRS 4015-03-180		18	60					4	8,200	
HLRS 4015-05-030		R0.5	3					50	4	7,900
HLRS 4015-05-040			4				50	4	7,900	
HLRS 4015-05-060			6				50	4	7,900	
HLRS 4015-05-080			8				50	4	8,200	
HLRS 4015-05-100			10				50	4	8,200	
HLRS 4015-05-120			12				55	4	8,200	
HLRS 4015-05-160	16		60	4	8,200					
HLRS 4015-05-180	18		60	4	8,200					

Unit (mm)

Model Number	Outside Diameter $\phi D$	Corner Radius CR	Effective Length $l_e$	Effective Length by Inclined Angles				
				30'	1°	1°30'	2°	3°
HLRS 4015-005-030	1.5	RO.05	3	3.10	3.20	3.31	3.43	3.68
HLRS 4015-005-040			4	4.14	4.27	4.41	4.57	4.91
HLRS 4015-005-060			6	6.20	6.40	6.61	6.84	7.35
HLRS 4015-005-080			8	8.26	8.53	8.82	9.12	9.80
HLRS 4015-005-120			12	12.39	12.79	13.22	13.68	14.70
HLRS 4015-005-160			16	16.51	17.05	17.62	18.23	19.59
HLRS 4015-01-030		RO.1	3	3.10	3.20	3.31	3.42	3.67
HLRS 4015-01-040			4	4.13	4.27	4.41	4.56	4.90
HLRS 4015-01-060			6	6.20	6.40	6.61	6.84	7.34
HLRS 4015-01-080			8	8.26	8.53	8.81	9.11	9.79
HLRS 4015-01-100			10	10.32	10.66	11.01	11.39	12.24
HLRS 4015-01-120			12	12.39	12.79	13.21	13.67	14.69
HLRS 4015-01-160			16	16.51	17.04	17.61	18.22	19.58
HLRS 4015-01-180			18	18.57	19.17	19.82	20.50	22.03
HLRS 4015-02-030		RO.2	3	3.10	3.20	3.30	3.41	3.65
HLRS 4015-02-040			4	4.13	4.26	4.40	4.55	4.87
HLRS 4015-02-060			6	6.19	6.39	6.60	6.82	7.32
HLRS 4015-02-080			8	8.26	8.52	8.80	9.10	9.77
HLRS 4015-02-100			10	10.32	10.65	11.00	11.38	12.22
HLRS 4015-02-120			12	12.38	12.78	13.20	13.66	14.66
HLRS 4015-02-160			16	16.51	17.04	17.60	18.21	19.56
HLRS 4015-02-180			18	18.57	19.17	19.81	20.49	22.01
HLRS 4015-03-030		RO.3	3	3.10	3.19	3.29	3.39	3.63
HLRS 4015-03-040			4	4.13	4.25	4.39	4.53	4.85
HLRS 4015-03-060			6	6.19	6.38	6.59	6.81	7.30
HLRS 4015-03-080			8	8.25	8.51	8.79	9.09	9.75
HLRS 4015-03-100			10	10.32	10.64	10.99	11.36	12.20
HLRS 4015-03-120			12	12.38	12.77	13.19	13.64	14.64
HLRS 4015-03-160			16	16.50	17.03	17.59	18.20	19.54
HLRS 4015-03-180			18	18.57	19.16	19.80	20.47	21.98
HLRS 4015-05-030		RO.5	3	3.09	3.17	3.27	3.36	3.58
HLRS 4015-05-040			4	4.12	4.24	4.37	4.50	4.81
HLRS 4015-05-060			6	6.18	6.37	6.57	6.78	7.25
HLRS 4015-05-080			8	8.25	8.50	8.77	9.06	9.70
HLRS 4015-05-100			10	10.31	10.63	10.97	11.34	12.15
HLRS 4015-05-120			12	12.37	12.76	13.17	13.61	14.60
HLRS 4015-05-160	16		16.50	17.02	17.57	18.17	19.49	
HLRS 4015-05-180	18		18.56	19.15	19.77	20.44	21.94	

4 Flutes


 3mm Shank V Series


 UDC-PCD Series


 CBN Series


 Square


 Long Neck Square


 Radius


 Long Neck Radius


 Taper Neck Radius


 Ball / Long Shank Ball


 Long Neck Ball


 Taper Neck Ball


 Taper


 Barrel


 Spiral V Cutter


 Drill


 Technical Data

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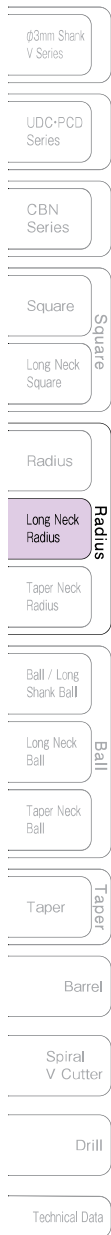
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## 4 Flutes HARDMAX

Unit (mm)

Model Number	Outside Diameter $\phi D$	Corner Radius CR	Effective Length $\ell_1$	Length of Cut $\ell$	Neck Diameter $\phi d_1$	Shank Taper Angle Bta	Overall Length L	Shank Diameter $\phi d$	Suggested Retail Price ¥	
HLRS 4018-02-080	1.8	R0.2	8	1.44	1.72	16°	50	4	8,200	
HLRS 4018-02-100			10				50	4	8,200	
HLRS 4018-02-120			12				55	4	8,200	
HLRS 4018-02-140			14				55	4	8,200	
HLRS 4018-02-160			16				60	4	8,200	
HLRS 4020-002-040	2	R0.02	4	1.6	1.92	16°	50	4	7,900	
HLRS 4020-002-060			6				50	4	7,900	
HLRS 4020-002-080			8				50	4	8,200	
HLRS 4020-002-100			10				50	4	8,200	
HLRS 4020-002-120			12				55	4	8,200	
HLRS 4020-002-160			16				60	4	8,200	
HLRS 4020-002-200			20				60	4	8,200	
HLRS 4020-005-040			R0.05				4	50	4	7,900
HLRS 4020-005-060							6	50	4	7,900
HLRS 4020-005-080							8	50	4	8,200
HLRS 4020-005-100		10					50	4	8,200	
HLRS 4020-005-120		12					55	4	8,200	
HLRS 4020-005-160		16					60	4	8,200	
HLRS 4020-005-200		20					60	4	8,200	
HLRS 4020-01-040		R0.1					4	50	4	7,900
HLRS 4020-01-060							6	50	4	7,900
HLRS 4020-01-080							8	50	4	8,200
HLRS 4020-01-100			10				50	4	8,200	
HLRS 4020-01-120			12				55	4	8,200	
HLRS 4020-01-160			16				60	4	8,200	
HLRS 4020-01-200			20				60	4	8,200	
HLRS 4020-01-240			24				70	4	8,200	
HLRS 4020-02-040			R0.2				4	50	4	7,900
HLRS 4020-02-060							6	50	4	7,900
HLRS 4020-02-080		8					50	4	8,200	
HLRS 4020-02-100		10					50	4	8,200	
HLRS 4020-02-120		12					55	4	8,200	
HLRS 4020-02-160		16					60	4	8,200	
HLRS 4020-02-200		20					60	4	8,200	
HLRS 4020-02-240		24					70	4	8,200	
HLRS 4020-03-040	R0.3	4		50	4	7,900				
HLRS 4020-03-060		6		50	4	7,900				
HLRS 4020-03-080		8	50	4	8,200					
HLRS 4020-03-100		10	50	4	8,200					
HLRS 4020-03-120		12	55	4	8,200					
HLRS 4020-03-160		16	60	4	8,200					
HLRS 4020-03-200		20	60	4	8,200					
HLRS 4020-03-240		24	70	4	8,200					



Unit (mm)

Model Number	Outside Diameter $\phi D$	Corner Radius CR	Effective Length $l_e$	Effective Length by Inclined Angles					
				30°	1°	1°30'	2°	3°	
HLRS 4018-02-080	1.8	R0.2	8	8.29	8.56	8.84	9.14	9.81	
HLRS 4018-02-100			10	10.36	10.69	11.04	11.42	12.26	
HLRS 4018-02-120			12	12.42	12.82	13.24	13.69	14.71	
HLRS 4018-02-140			14	14.48	14.95	15.44	15.97	17.15	
HLRS 4018-02-160			16	16.54	17.08	17.64	18.25	19.60	
HLRS 4020-002-040	2	R0.02	4	4.17	4.31	4.45	4.61	4.96	
HLRS 4020-002-060			6	6.24	6.44	6.66	6.89	7.40	
HLRS 4020-002-080			8	8.30	8.57	8.86	9.16	9.85	
HLRS 4020-002-100			10	10.36	10.70	11.06	11.44	12.30	
HLRS 4020-002-120			12	12.42	12.83	13.26	13.72	14.75	
HLRS 4020-002-160			16	16.55	17.09	17.66	18.27	No Interference	
HLRS 4020-002-200		20	20.67	21.35	22.06	22.83	No Interference		
HLRS 4020-005-040		R0.05	4	4.17	4.31	4.45	4.61	4.95	
HLRS 4020-005-060			6	6.23	6.44	6.65	6.88	7.40	
HLRS 4020-005-080			8	8.30	8.57	8.85	9.16	9.84	
HLRS 4020-005-100			10	10.36	10.70	11.05	11.44	12.29	
HLRS 4020-005-120			12	12.42	12.83	13.26	13.72	14.74	
HLRS 4020-005-160			16	16.55	17.08	17.66	18.27	No Interference	
HLRS 4020-005-200		20	20.67	21.34	22.06	22.82	No Interference		
HLRS 4020-01-040		R0.1	4	4.17	4.30	4.45	4.60	4.94	
HLRS 4020-01-060			6	6.23	6.43	6.65	6.88	7.39	
HLRS 4020-01-080			8	8.30	8.56	8.85	9.15	9.83	
HLRS 4020-01-100			10	10.36	10.69	11.05	11.43	12.28	
HLRS 4020-01-120			12	12.42	12.82	13.25	13.71	14.73	
HLRS 4020-01-160			16	16.55	17.08	17.65	18.26	No Interference	
HLRS 4020-01-200			20	20.67	21.34	22.05	22.82	No Interference	
HLRS 4020-01-240			24	24.80	25.60	26.46	27.37	No Interference	
HLRS 4020-02-040			R0.2	4	4.17	4.30	4.44	4.59	4.92
HLRS 4020-02-060				6	6.23	6.43	6.64	6.86	7.36
HLRS 4020-02-080		8		8.29	8.56	8.84	9.14	9.81	
HLRS 4020-02-100		10		10.36	10.69	11.04	11.42	12.26	
HLRS 4020-02-120		12		12.42	12.82	13.24	13.69	14.71	
HLRS 4020-02-160		16		16.54	17.08	17.64	18.25	19.60	
HLRS 4020-02-200		20		20.67	21.33	22.04	22.80	No Interference	
HLRS 4020-02-240		24		24.79	25.59	26.45	27.36	No Interference	
HLRS 4020-03-040		R0.3	4	4.16	4.29	4.43	4.57	4.90	
HLRS 4020-03-060			6	6.23	6.42	6.63	6.85	7.34	
HLRS 4020-03-080	8		8.29	8.55	8.83	9.13	9.79		
HLRS 4020-03-100	10		10.35	10.68	11.03	11.40	12.24		
HLRS 4020-03-120	12		12.41	12.81	13.23	13.68	14.68		
HLRS 4020-03-160	16		16.54	17.07	17.63	18.24	19.58		
HLRS 4020-03-200	20		20.67	21.33	22.03	22.79	No Interference		
HLRS 4020-03-240	24		24.79	25.59	26.44	27.35	No Interference		

4 Flutes


 3mm Shank V Series


 UDC-PCD Series


 CBN Series


 Square


 Long Neck Square


 Radius


 Long Neck Radius


 Taper Neck Radius


 Ball / Long Shank Ball


 Long Neck Ball


 Taper Neck Ball


 Taper


 Barrel


 Spiral V Cutter


 Drill


 Technical Data

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## 4 Flutes HARDMAX

Unit (mm)

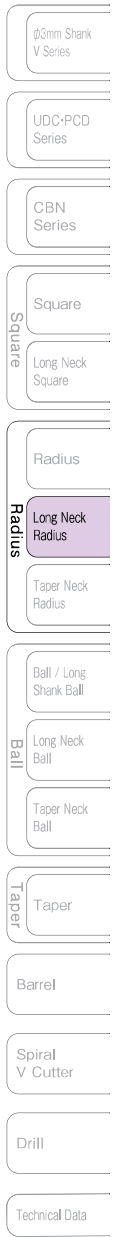
Model Number	Outside Diameter $\phi D$	Corner Radius CR	Effective Length $\ell_1$	Length of Cut $\ell$	Neck Diameter $\phi d_1$	Shank Taper Angle Bta	Overall Length L	Shank Diameter $\phi d$	Suggested Retail Price ¥
HLRS 4020-05-040	2	R0.5	4	1.6	1.92	16°	50	4	7,900
HLRS 4020-05-060			6				50	4	7,900
HLRS 4020-05-080			8				50	4	8,200
HLRS 4020-05-100			10				50	4	8,200
HLRS 4020-05-120			12				55	4	8,200
HLRS 4020-05-160			16				60	4	8,200
HLRS 4020-05-200			20				60	4	8,200
HLRS 4020-05-240			24				70	4	8,200
HLRS 4020-05-260			26				70	4	8,200
HLRS 4020-05-300			30				70	4	8,200
HLRS 4025-01-060	2.5	R0.1	6	2	2.42	16°	50	4	8,600
HLRS 4025-01-080			8				50	4	8,600
HLRS 4025-01-100			10				50	4	8,600
HLRS 4025-01-160			16				60	4	8,900
HLRS 4025-01-200			20				60	4	8,900
HLRS 4025-01-300		30	70				4	9,200	
HLRS 4025-02-060		R0.2	6				50	4	8,600
HLRS 4025-02-080			8				50	4	8,600
HLRS 4025-02-100			10				50	4	8,600
HLRS 4025-02-160			16				60	4	8,900
HLRS 4025-02-200			20				60	4	8,900
HLRS 4025-02-300		30	70				4	9,200	
HLRS 4025-03-060		R0.3	6				50	4	8,600
HLRS 4025-03-080			8				50	4	8,600
HLRS 4025-03-100			10				50	4	8,600
HLRS 4025-03-160			16				60	4	8,900
HLRS 4025-03-200			20				60	4	8,900
HLRS 4025-03-300		30	70				4	9,200	
HLRS 4025-05-060		R0.5	6				50	4	8,600
HLRS 4025-05-080			8				50	4	8,600
HLRS 4025-05-100	10		50	4	8,600				
HLRS 4025-05-160	16		60	4	8,900				
HLRS 4025-05-200	20		60	4	8,900				
HLRS 4025-05-300	30	70	4	9,200					

- φ3mm Shark V Series
- UDC-PCD Series
- CBN Series
- Square
- Long Neck Square
- Radius
- Long Neck Radius
- Taper Neck Radius
- Ball / Long Shank Ball
- Long Neck Ball
- Taper Neck Ball
- Taper
- Barrel
- Spiral V Cutter
- Drill
- Technical Data

Unit (mm)

Model Number	Outside Diameter $\phi D$	Corner Radius CR	Effective Length $l_e$	Effective Length by Inclined Angles				
				30'	1°	1°30'	2°	3°
HLRS 4020-05-040	2	R0.5	4	4.16	4.28	4.40	4.54	4.85
HLRS 4020-05-060			6	6.22	6.41	6.61	6.82	7.30
HLRS 4020-05-080			8	8.28	8.54	8.81	9.10	9.74
HLRS 4020-05-100			10	10.34	10.67	11.01	11.37	12.19
HLRS 4020-05-120			12	12.41	12.79	13.21	13.65	14.64
HLRS 4020-05-160			16	16.53	17.05	17.61	18.21	19.53
HLRS 4020-05-200			20	20.66	21.31	22.01	22.76	No Interference
HLRS 4020-05-240			24	24.78	25.57	26.41	27.32	No Interference
HLRS 4020-05-260			26	26.85	27.70	28.62	29.59	No Interference
HLRS 4020-05-300			30	30.97	31.96	33.02	No Interference	No Interference
HLRS 4025-01-060			2.5	R0.1	6	6.23	6.43	6.65
HLRS 4025-01-080	8	8.30			8.56	8.85	9.15	9.83
HLRS 4025-01-100	10	10.36			10.69	11.05	11.43	12.28
HLRS 4025-01-160	16	16.55			17.08	17.65	18.26	No Interference
HLRS 4025-01-200	20	20.67			21.34	22.05	No Interference	No Interference
HLRS 4025-01-300	30	30.99			31.99	No Interference	No Interference	No Interference
HLRS 4025-02-060	R0.2	6		6.23	6.43	6.64	6.86	7.36
HLRS 4025-02-080		8		8.29	8.56	8.84	9.14	9.81
HLRS 4025-02-100		10		10.36	10.69	11.04	11.42	12.26
HLRS 4025-02-160		16		16.54	17.08	17.64	18.25	No Interference
HLRS 4025-02-200		20		20.67	21.33	22.04	No Interference	No Interference
HLRS 4025-02-300		30		30.98	31.98	No Interference	No Interference	No Interference
HLRS 4025-03-060	R0.3	6		6.23	6.42	6.63	6.85	7.34
HLRS 4025-03-080		8		8.29	8.55	8.83	9.13	9.79
HLRS 4025-03-100		10		10.35	10.68	11.03	11.40	12.24
HLRS 4025-03-160		16		16.54	17.07	17.63	18.24	No Interference
HLRS 4025-03-200		20		20.67	21.33	22.03	No Interference	No Interference
HLRS 4025-03-300		30		30.98	31.98	No Interference	No Interference	No Interference
HLRS 4025-05-060	R0.5	6		6.22	6.41	6.61	6.82	7.30
HLRS 4025-05-080		8		8.28	8.54	8.81	9.10	9.74
HLRS 4025-05-100		10		10.34	10.67	11.01	11.37	12.19
HLRS 4025-05-160		16		16.53	17.05	17.61	18.21	No Interference
HLRS 4025-05-200		20		20.66	21.31	22.01	No Interference	No Interference
HLRS 4025-05-300		30		30.97	31.96	No Interference	No Interference	No Interference

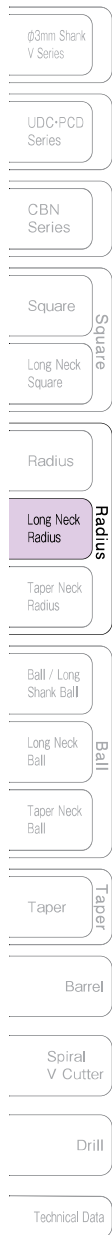
4 Flutes



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## 4 Flutes HARDMAX

Unit (mm)



Model Number	Outside Diameter $\phi D$	Corner Radius CR	Effective Length $\ell_1$	Length of Cut $\ell$	Neck Diameter $\phi d_1$	Shank Taper Angle Bta	Overall Length L	Shank Diameter $\phi d$	Suggested Retail Price ¥	
HLRS 4030-005-040	3	RO.05	4	2.4	2.92	16°	55	6	7,100	
HLRS 4030-005-060			6				55	6	7,100	
HLRS 4030-005-080			8				55	6	7,100	
HLRS 4030-005-100			10				55	6	7,100	
HLRS 4030-005-120			12				55	6	8,600	
HLRS 4030-005-160			16				60	6	10,600	
HLRS 4030-005-200			20				60	6	10,600	
HLRS 4030-01-040			RO.1				4	55	6	7,100
HLRS 4030-01-060							6	55	6	7,100
HLRS 4030-01-080							8	55	6	7,100
HLRS 4030-01-100							10	55	6	7,100
HLRS 4030-01-120							12	55	6	8,600
HLRS 4030-01-160		16					60	6	10,600	
HLRS 4030-01-180		18					60	6	10,600	
HLRS 4030-01-200		20					60	6	10,600	
HLRS 4030-01-240		24					70	6	10,600	
HLRS 4030-01-260		26					70	6	10,600	
HLRS 4030-01-300		30					70	6	12,000	
HLRS 4030-02-040		RO.2					4	55	6	7,100
HLRS 4030-02-060			6				55	6	7,100	
HLRS 4030-02-080			8				55	6	7,100	
HLRS 4030-02-100			10				55	6	7,100	
HLRS 4030-02-120			12				55	6	8,600	
HLRS 4030-02-160			16				60	6	10,600	
HLRS 4030-02-180			18				60	6	10,600	
HLRS 4030-02-200			20				60	6	10,600	
HLRS 4030-02-240			24				70	6	10,600	
HLRS 4030-02-260			26				70	6	10,600	
HLRS 4030-02-300			30				70	6	12,000	
HLRS 4030-02-360			36				80	6	12,000	
HLRS 4030-03-040		RO.3	4				55	6	7,100	
HLRS 4030-03-060			6				55	6	7,100	
HLRS 4030-03-080			8				55	6	7,100	
HLRS 4030-03-100			10				55	6	7,100	
HLRS 4030-03-120			12				55	6	8,600	
HLRS 4030-03-140			14				55	6	8,600	
HLRS 4030-03-160	16		60	6	10,600					
HLRS 4030-03-200	20		60	6	10,600					
HLRS 4030-03-240	24		70	6	10,600					
HLRS 4030-03-260	26		70	6	10,600					
HLRS 4030-03-300	30		70	6	12,000					
HLRS 4030-03-360	36		80	6	12,000					

Unit (mm)

Model Number	Outside Diameter $\phi D$	Corner Radius CR	Effective Length $l_e$	Effective Length by Inclined Angles				
				30°	1°	1°30'	2°	3°
HLRS 4030-005-040	3	RO.05	4	4.17	4.31	4.45	4.60	4.95
HLRS 4030-005-060			6	6.23	6.43	6.65	6.88	7.40
HLRS 4030-005-080			8	8.30	8.56	8.85	9.16	9.84
HLRS 4030-005-100			10	10.36	10.69	11.05	11.44	12.29
HLRS 4030-005-120			12	12.42	12.82	13.25	13.71	14.74
HLRS 4030-005-160			16	16.55	17.08	17.66	18.27	19.63
HLRS 4030-005-200		20	20.67	21.34	22.06	22.82	24.53	
HLRS 4030-01-040		RO.1	4	4.17	4.30	4.44	4.60	4.94
HLRS 4030-01-060			6	6.23	6.43	6.65	6.87	7.38
HLRS 4030-01-080			8	8.29	8.56	8.85	9.15	9.83
HLRS 4030-01-100			10	10.36	10.69	11.05	11.43	12.28
HLRS 4030-01-120			12	12.42	12.82	13.25	13.71	14.73
HLRS 4030-01-160			16	16.54	17.08	17.65	18.26	19.62
HLRS 4030-01-180			18	18.61	19.21	19.85	20.54	22.07
HLRS 4030-01-200			20	20.67	21.34	22.05	22.82	24.52
HLRS 4030-01-240			24	24.80	25.60	26.45	27.37	No Interference
HLRS 4030-01-260			26	26.86	27.73	28.66	29.65	No Interference
HLRS 4030-01-300		30	30.98	31.99	33.06	34.20	No Interference	
HLRS 4030-02-040		RO.2	4	4.17	4.30	4.43	4.58	4.92
HLRS 4030-02-060			6	6.23	6.43	6.64	6.86	7.36
HLRS 4030-02-080			8	8.29	8.55	8.84	9.14	9.81
HLRS 4030-02-100			10	10.35	10.68	11.04	11.42	12.26
HLRS 4030-02-120			12	12.42	12.81	13.24	13.69	14.70
HLRS 4030-02-160			16	16.54	17.07	17.64	18.25	19.60
HLRS 4030-02-180			18	18.60	19.20	19.84	20.53	22.05
HLRS 4030-02-200			20	20.67	21.33	22.04	22.80	24.49
HLRS 4030-02-240			24	24.79	25.59	26.44	27.36	No Interference
HLRS 4030-02-260			26	26.86	27.72	28.65	29.63	No Interference
HLRS 4030-02-300		30	30.98	31.98	33.05	34.19	No Interference	
HLRS 4030-02-360		36	37.17	38.37	39.65	41.02	No Interference	
HLRS 4030-03-040		RO.3	4	4.16	4.29	4.42	4.57	4.89
HLRS 4030-03-060			6	6.22	6.42	6.63	6.85	7.34
HLRS 4030-03-080			8	8.29	8.55	8.83	9.12	9.79
HLRS 4030-03-100			10	10.35	10.68	11.03	11.40	12.24
HLRS 4030-03-120			12	12.41	12.81	13.23	13.68	14.68
HLRS 4030-03-140			14	14.48	14.94	15.43	15.96	17.13
HLRS 4030-03-160	16		16.54	17.07	17.63	18.23	19.58	
HLRS 4030-03-200	20		20.66	21.33	22.03	22.79	24.47	
HLRS 4030-03-240	24		24.79	25.59	26.43	27.34	No Interference	
HLRS 4030-03-260	26		26.85	27.71	28.64	29.62	No Interference	
HLRS 4030-03-300	30	30.98	31.97	33.04	34.18	No Interference		
HLRS 4030-03-360	36	37.17	38.36	39.64	41.01	No Interference		

4 Flutes


 3mm Shank V Series


 UDC-PCD Series


 CBN Series


 Square


 Long Neck Square


 Radius


 Long Neck Radius


 Taper Neck Radius


 Ball / Long Shank Ball


 Long Neck Ball


 Taper Neck Ball


 Taper


 Barrel


 Spiral V Cutter


 Drill


 Technical Data

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## 4 Flutes HARDMAX

Unit (mm)

Model Number	Outside Diameter $\phi D$	Corner Radius CR	Effective Length $\ell_1$	Length of Cut $\ell$	Neck Diameter $\phi d_1$	Shank Taper Angle Bta	Overall Length L	Shank Diameter $\phi d$	Suggested Retail Price ¥										
HLRS 4030-05-040	3	R0.5	4	2.4	2.92	16°	55	6	7,100										
HLRS 4030-05-060			6				55		7,100										
HLRS 4030-05-080			8				55		7,100										
HLRS 4030-05-100			10				55		7,100										
HLRS 4030-05-120			12				55		8,600										
HLRS 4030-05-160			16				60		10,600										
HLRS 4030-05-200			20				60		10,600										
HLRS 4030-05-240			24				70		10,600										
HLRS 4030-05-260			26				70		10,600										
HLRS 4030-05-300			30				70		12,000										
HLRS 4030-05-360			36				80		12,000										
HLRS 4030-10-060			R1				6		2.4	2.92	16°	55	6	7,100					
HLRS 4030-10-080							8					55		7,100					
HLRS 4030-10-100							10					55		7,100					
HLRS 4030-10-120							12					55		8,600					
HLRS 4030-10-160							16					60		10,600					
HLRS 4030-10-200							20					60		10,600					
HLRS 4030-10-240							24					70		10,600					
HLRS 4030-10-260	26	70		10,600															
HLRS 4030-10-300	30	70		12,000															
HLRS 4030-10-360	36	80		12,000															
HLRS 4040-005-080	4	R0.05		8	3.2	3.82	16°	65				6		10,600					
HLRS 4040-005-120				12				65						10,600					
HLRS 4040-005-160				16				65						10,600					
HLRS 4040-005-200				20				70						11,800					
HLRS 4040-005-240				24				70						11,800					
HLRS 4040-005-320				32				80						11,800					
HLRS 4040-01-080				R0.1				8						3.2	3.82	16°	65	6	10,600
HLRS 4040-01-120								12									65		10,600
HLRS 4040-01-160			16					65	10,600										
HLRS 4040-01-200			20					70	11,800										
HLRS 4040-01-240			24					70	11,800										
HLRS 4040-01-320			32					80	11,800										
HLRS 4040-01-480		48	100					18,800											
HLRS 4040-02-080		R0.2	8					3.2	3.82	16°	65		6				10,600		
HLRS 4040-02-120			12								65						10,600		
HLRS 4040-02-160			16								65						10,600		
HLRS 4040-02-200			20								70						11,800		
HLRS 4040-02-240			24								70						11,800		
HLRS 4040-02-320			32	80							11,800								
HLRS 4040-02-480			48	100							18,800								

- $\phi 3$ mm Shark V Series
- UDC-PCD Series
- CBN Series
- Square
- Long Neck Square
- Radius
- Long Neck Radius
- Taper Neck Radius
- Ball / Long Shank Ball
- Long Neck Ball
- Taper Neck Ball
- Taper
- Barrel
- Spiral V Cutter
- Drill
- Technical Data

Unit (mm)

Model Number	Outside Diameter $\phi D$	Corner Radius CR	Effective Length $l_e$	Effective Length by Inclined Angles				
				30°	1°	1°30'	2°	3°
HLRS 4030-05-040	3	R0.5	4	4.15	4.27	4.40	4.54	4.85
HLRS 4030-05-060			6	6.22	6.40	6.60	6.82	7.30
HLRS 4030-05-080			8	8.28	8.53	8.80	9.10	9.74
HLRS 4030-05-100			10	10.34	10.66	11.01	11.37	12.19
HLRS 4030-05-120			12	12.40	12.79	13.21	13.65	14.64
HLRS 4030-05-160			16	16.53	17.05	17.61	18.20	19.53
HLRS 4030-05-200			20	20.66	21.31	22.01	22.76	24.43
HLRS 4030-05-240			24	24.78	25.57	26.41	27.31	29.32
HLRS 4030-05-260			26	26.84	27.70	28.61	29.59	No Interference
HLRS 4030-05-300			30	30.97	31.96	33.02	34.15	No Interference
HLRS 4030-05-360		36	37.16	38.35	39.62	40.98	No Interference	
HLRS 4030-10-060		R1	6	6.20	6.37	6.55	6.75	7.18
HLRS 4030-10-080			8	8.26	8.50	8.75	9.03	9.63
HLRS 4030-10-100			10	10.32	10.63	10.95	11.30	12.08
HLRS 4030-10-120			12	12.39	12.76	13.16	13.58	14.53
HLRS 4030-10-160			16	16.51	17.02	17.56	18.13	19.42
HLRS 4030-10-200			20	20.64	21.28	21.96	22.69	24.32
HLRS 4030-10-240			24	24.76	25.54	26.36	27.24	29.21
HLRS 4030-10-260			26	26.83	27.67	28.56	29.52	No Interference
HLRS 4030-10-300			30	30.95	31.93	32.96	34.08	No Interference
HLRS 4030-10-360	36		37.14	38.31	39.57	40.91	No Interference	
HLRS 4040-005-080	4	R0.05	8	8.48	8.75	9.04	9.36	10.06
HLRS 4040-005-120			12	12.60	13.01	13.45	13.91	14.95
HLRS 4040-005-160			16	16.73	17.27	17.85	18.47	No Interference
HLRS 4040-005-200			20	20.85	21.53	22.25	23.02	No Interference
HLRS 4040-005-240			24	24.98	25.79	26.65	27.58	No Interference
HLRS 4040-005-320			32	33.23	34.31	35.46	No Interference	No Interference
HLRS 4040-01-080		R0.1	8	8.47	8.75	9.04	9.35	10.05
HLRS 4040-01-120			12	12.60	13.01	13.44	13.91	14.94
HLRS 4040-01-160			16	16.72	17.27	17.84	18.46	No Interference
HLRS 4040-01-200			20	20.85	21.52	22.24	23.01	No Interference
HLRS 4040-01-240			24	24.98	25.78	26.65	27.57	No Interference
HLRS 4040-01-320			32	33.23	34.30	35.45	No Interference	No Interference
HLRS 4040-01-480		48	49.73	51.34	No Interference	No Interference	No Interference	
HLRS 4040-02-080		R0.2	8	8.47	8.74	9.03	9.34	10.02
HLRS 4040-02-120			12	12.60	13.00	13.43	13.89	14.92
HLRS 4040-02-160			16	16.72	17.26	17.83	18.45	No Interference
HLRS 4040-02-200			20	20.85	21.52	22.23	23.00	No Interference
HLRS 4040-02-240			24	24.97	25.78	26.64	27.56	No Interference
HLRS 4040-02-320			32	33.22	34.30	35.44	No Interference	No Interference
HLRS 4040-02-480			48	49.73	51.33	No Interference	No Interference	No Interference

4 Flutes

- Ø3mm Shank V Series
- UDC-PCD Series
- CBN Series
- Square
- Long Neck Square
- Radius
- Long Neck Radius
- Taper Neck Radius
- Ball / Long Shank Ball
- Long Neck Ball
- Taper Neck Ball
- Taper
- Barrel
- Spiral V Cutter
- Drill
- Technical Data

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## 4 Flutes HARDMAX

Unit (mm)

Model Number	Outside Diameter $\phi D$	Corner Radius CR	Effective Length $\ell_1$	Length of Cut $\ell$	Neck Diameter $\phi d_1$	Shank Taper Angle Bta	Overall Length L	Shank Diameter $\phi d$	Suggested Retail Price ¥	
HLRS 4040-03-080	4	R0.3	8	3.2	3.82	16°	65	6	10,600	
HLRS 4040-03-120			12				65	6	10,600	
HLRS 4040-03-140			14				65	6	10,600	
HLRS 4040-03-160			16				65	6	10,600	
HLRS 4040-03-200			20				70	6	11,800	
HLRS 4040-03-240			24				70	6	11,800	
HLRS 4040-03-320			32				80	6	11,800	
HLRS 4040-03-480			48				100	6	18,800	
HLRS 4040-05-080		R0.5	8				65	6	10,600	
HLRS 4040-05-120			12				65	6	10,600	
HLRS 4040-05-160			16				65	6	10,600	
HLRS 4040-05-200			20				70	6	11,800	
HLRS 4040-05-240			24				70	6	11,800	
HLRS 4040-05-320			32				80	6	11,800	
HLRS 4040-05-400			40				100	6	17,500	
HLRS 4040-05-480			48				100	6	18,800	
HLRS 4040-10-080			R1				8	65	6	10,600
HLRS 4040-10-120							12	65	6	10,600
HLRS 4040-10-160							16	65	6	10,600
HLRS 4040-10-200							20	70	6	11,800
HLRS 4040-10-240							24	70	6	11,800
HLRS 4040-10-320							32	80	6	11,800
HLRS 4040-10-480							48	100	6	18,800
HLRS 4050-005-160							5	R0.05	16	4
HLRS 4050-005-200	20	70	6	14,000						
HLRS 4050-005-400	40	100	6	17,500						
HLRS 4050-01-160	R0.1	16	65	6	14,300					
HLRS 4050-01-200		20	70	6	14,000					
HLRS 4050-01-400		40	100	6	17,500					
HLRS 4050-02-160	R0.2	16	65	6	14,000					
HLRS 4050-02-200		20	70	6	14,000					
HLRS 4050-02-400		40	100	6	17,500					
HLRS 4050-03-160	R0.3	16	65	6	14,000					
HLRS 4050-03-200		20	70	6	14,000					
HLRS 4050-03-400		40	100	6	17,500					
HLRS 4050-05-160	R0.5	16	65	6	14,000					
HLRS 4050-05-200		20	70	6	14,000					
HLRS 4050-05-400		40	100	6	17,500					
HLRS 4050-10-160		R1	16	65	6	14,000				
HLRS 4050-10-200			20	70	6	14,000				
HLRS 4050-10-400			40	100	6	17,500				

- φ3mm Shark V Series
- UDC-PCD Series
- CBN Series
- Square
- Long Neck Square
- Radius
- Long Neck Radius
- Taper Neck Radius
- Ball / Long Shank Ball
- Long Neck Ball
- Taper Neck Ball
- Taper
- Barrel
- Spiral V Cutter
- Drill
- Technical Data

Unit (mm)

Model Number	Outside Diameter $\phi D$	Corner Radius CR	Effective Length $l_1$	Effective Length by Inclined Angles					
				30°	1°	1°30'	2°	3°	
HLRS 4040-03-080	4	R0.3	8	8.47	8.73	9.02	9.32	10.00	
HLRS 4040-03-120			12	12.59	12.99	13.42	13.88	14.90	
HLRS 4040-03-140			14	14.66	15.12	15.62	16.16	17.34	
HLRS 4040-03-160			16	16.72	17.25	17.82	18.43	No Interference	
HLRS 4040-03-200			20	20.84	21.51	22.22	22.99	No Interference	
HLRS 4040-03-240			24	24.97	25.77	26.63	27.54	No Interference	
HLRS 4040-03-320			32	33.22	34.29	35.43	No Interference	No Interference	
HLRS 4040-03-480			48	49.72	51.33	No Interference	No Interference	No Interference	
HLRS 4040-05-080		R0.5	8	8.46	8.72	9.00	9.29	9.96	
HLRS 4040-05-120			12	12.58	12.98	13.40	13.85	14.85	
HLRS 4040-05-160			16	16.71	17.24	17.80	18.40	19.75	
HLRS 4040-05-200			20	20.84	21.50	22.20	22.96	No Interference	
HLRS 4040-05-240			24	24.96	25.76	26.60	27.51	No Interference	
HLRS 4040-05-320			32	33.21	34.27	35.41	No Interference	No Interference	
HLRS 4040-05-400			40	41.46	42.79	No Interference	No Interference	No Interference	
HLRS 4040-05-480			48	49.71	51.31	No Interference	No Interference	No Interference	
HLRS 4040-10-080		R1	8	8.44	8.69	8.95	9.22	9.84	
HLRS 4040-10-120			12	12.57	12.94	13.35	13.78	14.74	
HLRS 4040-10-160			16	16.69	17.20	17.75	18.33	19.63	
HLRS 4040-10-200			20	20.82	21.46	22.15	22.89	No Interference	
HLRS 4040-10-240			24	24.94	25.72	26.55	27.44	No Interference	
HLRS 4040-10-320			32	33.20	34.24	35.36	No Interference	No Interference	
HLRS 4040-10-480			48	49.70	51.28	No Interference	No Interference	No Interference	
HLRS 4050-005-160			5	R0.05	16	16.73	17.27	17.85	No Interference
HLRS 4050-005-200		20			20.85	21.53	No Interference	No Interference	No Interference
HLRS 4050-005-400		40			41.48	No Interference	No Interference	No Interference	No Interference
HLRS 4050-01-160		R0.1		16	16.72	17.27	17.84	No Interference	No Interference
HLRS 4050-01-200				20	20.85	21.52	No Interference	No Interference	No Interference
HLRS 4050-01-400	40			41.48	No Interference	No Interference	No Interference	No Interference	
HLRS 4050-02-160	R0.2	16		16.72	17.26	17.83	No Interference	No Interference	
HLRS 4050-02-200		20		20.85	21.52	No Interference	No Interference	No Interference	
HLRS 4050-02-400		40		41.47	No Interference	No Interference	No Interference	No Interference	
HLRS 4050-03-160	R0.3	16		16.72	17.25	17.82	No Interference	No Interference	
HLRS 4050-03-200		20		20.84	21.51	No Interference	No Interference	No Interference	
HLRS 4050-03-400		40		41.47	No Interference	No Interference	No Interference	No Interference	
HLRS 4050-05-160	R0.5	16		16.71	17.24	17.80	No Interference	No Interference	
HLRS 4050-05-200		20		20.83	21.50	No Interference	No Interference	No Interference	
HLRS 4050-05-400		40		41.46	No Interference	No Interference	No Interference	No Interference	
HLRS 4050-10-160	R1	16		16.69	17.20	17.74	No Interference	No Interference	
HLRS 4050-10-200		20		20.81	21.46	No Interference	No Interference	No Interference	
HLRS 4050-10-400		40		41.44	No Interference	No Interference	No Interference	No Interference	

4 Flutes


 3mm Shank V Series

UDC-PCD Series

CBN Series

Square

Long Neck Square

Radius

Long Neck Radius

Taper Neck Radius

Ball / Long Shank Ball

Long Neck Ball

Taper Neck Ball

Taper

Barrel

Spiral V Cutter

Drill

Technical Data

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## 4 Flutes HARDMAX

Unit (mm)

Model Number	Outside Diameter $\phi D$	Corner Radius CR	Effective Length $\ell_1$	Length of Cut $\ell$	Neck Diameter $\phi d_1$	Shank Taper Angle Bta	Overall Length L	Shank Diameter $\phi d$	Suggested Retail Price ¥
HLRS 4060-005-120	6	R0.05	12	4.8	5.82	—	65	6	15,400
HLRS 4060-005-160			16				65	6	15,400
HLRS 4060-005-200			20				70	6	15,400
HLRS 4060-005-240			24				70	6	15,400
HLRS 4060-005-300			30				100	6	18,000
HLRS 4060-005-480			48				120	6	24,000
HLRS 4060-01-120		R0.1	12				65	6	15,400
HLRS 4060-01-160			16				65	6	15,400
HLRS 4060-01-180			18				70	6	15,400
HLRS 4060-01-200			20				70	6	15,400
HLRS 4060-01-240			24				70	6	15,400
HLRS 4060-01-300			30				100	6	18,000
HLRS 4060-01-480		48	120				6	24,000	
HLRS 4060-02-120		R0.2	12				65	6	15,400
HLRS 4060-02-160			16				65	6	15,400
HLRS 4060-02-180			18				70	6	15,400
HLRS 4060-02-200			20				70	6	15,400
HLRS 4060-02-240			24				70	6	15,400
HLRS 4060-02-300			30				100	6	18,000
HLRS 4060-02-480		48	120				6	24,000	
HLRS 4060-03-120		R0.3	12				65	6	15,400
HLRS 4060-03-160			16				65	6	15,400
HLRS 4060-03-180			18				70	6	15,400
HLRS 4060-03-200			20				70	6	15,400
HLRS 4060-03-240			24				70	6	15,400
HLRS 4060-03-300			30				100	6	18,000
HLRS 4060-03-480		48	120				6	24,000	
HLRS 4060-05-120		R0.5	12				65	6	15,400
HLRS 4060-05-160			16				65	6	15,400
HLRS 4060-05-180			18				70	6	15,400
HLRS 4060-05-200			20				70	6	15,400
HLRS 4060-05-240			24				70	6	15,400
HLRS 4060-05-300			30				100	6	18,000
HLRS 4060-05-400		40	100				6	18,000	
HLRS 4060-05-480		48	120				6	24,000	
HLRS 4060-10-120		R1	12				65	6	15,400
HLRS 4060-10-160			16				65	6	15,400
HLRS 4060-10-180			18				70	6	15,400
HLRS 4060-10-200			20				70	6	15,400
HLRS 4060-10-240			24				70	6	15,400
HLRS 4060-10-300			30				100	6	18,000
HLRS 4060-10-400			40				100	6	18,000
HLRS 4060-10-480			48				120	6	24,000

- $\phi 3$ mm Shark V Series
- UDC-PCD Series
- CBN Series
- Square
- Long Neck Square
- Radius
- Long Neck Radius
- Taper Neck Radius
- Ball / Long Shank Ball
- Long Neck Ball
- Taper Neck Ball
- Taper
- Barrel
- Spiral V Cutter
- Drill
- Technical Data

Unit (mm)

Model Number	Outside Diameter $\phi D$	Corner Radius CR	Effective Length $l_e$	Effective Length by Inclined Angles				
				30°	1°	1°30'	2°	3°
HLRS 4060-005-120	6	RO.05	12	No Interference	No Interference	No Interference	No Interference	No Interference
HLRS 4060-005-160			16	No Interference	No Interference	No Interference	No Interference	No Interference
HLRS 4060-005-200			20	No Interference	No Interference	No Interference	No Interference	No Interference
HLRS 4060-005-240			24	No Interference	No Interference	No Interference	No Interference	No Interference
HLRS 4060-005-300			30	No Interference	No Interference	No Interference	No Interference	No Interference
HLRS 4060-005-480			48	No Interference	No Interference	No Interference	No Interference	No Interference
HLRS 4060-01-120		RO.1	12	No Interference	No Interference	No Interference	No Interference	No Interference
HLRS 4060-01-160			16	No Interference	No Interference	No Interference	No Interference	No Interference
HLRS 4060-01-180			18	No Interference	No Interference	No Interference	No Interference	No Interference
HLRS 4060-01-200			20	No Interference	No Interference	No Interference	No Interference	No Interference
HLRS 4060-01-240			24	No Interference	No Interference	No Interference	No Interference	No Interference
HLRS 4060-01-300			30	No Interference	No Interference	No Interference	No Interference	No Interference
HLRS 4060-01-480		48	No Interference	No Interference	No Interference	No Interference	No Interference	
HLRS 4060-02-120		RO.2	12	No Interference	No Interference	No Interference	No Interference	No Interference
HLRS 4060-02-160			16	No Interference	No Interference	No Interference	No Interference	No Interference
HLRS 4060-02-180			18	No Interference	No Interference	No Interference	No Interference	No Interference
HLRS 4060-02-200			20	No Interference	No Interference	No Interference	No Interference	No Interference
HLRS 4060-02-240			24	No Interference	No Interference	No Interference	No Interference	No Interference
HLRS 4060-02-300			30	No Interference	No Interference	No Interference	No Interference	No Interference
HLRS 4060-02-480		48	No Interference	No Interference	No Interference	No Interference	No Interference	
HLRS 4060-03-120		RO.3	12	No Interference	No Interference	No Interference	No Interference	No Interference
HLRS 4060-03-160			16	No Interference	No Interference	No Interference	No Interference	No Interference
HLRS 4060-03-180			18	No Interference	No Interference	No Interference	No Interference	No Interference
HLRS 4060-03-200			20	No Interference	No Interference	No Interference	No Interference	No Interference
HLRS 4060-03-240			24	No Interference	No Interference	No Interference	No Interference	No Interference
HLRS 4060-03-300			30	No Interference	No Interference	No Interference	No Interference	No Interference
HLRS 4060-03-480		48	No Interference	No Interference	No Interference	No Interference	No Interference	
HLRS 4060-05-120		RO.5	12	No Interference	No Interference	No Interference	No Interference	No Interference
HLRS 4060-05-160			16	No Interference	No Interference	No Interference	No Interference	No Interference
HLRS 4060-05-180			18	No Interference	No Interference	No Interference	No Interference	No Interference
HLRS 4060-05-200			20	No Interference	No Interference	No Interference	No Interference	No Interference
HLRS 4060-05-240			24	No Interference	No Interference	No Interference	No Interference	No Interference
HLRS 4060-05-300			30	No Interference	No Interference	No Interference	No Interference	No Interference
HLRS 4060-05-400		40	No Interference	No Interference	No Interference	No Interference	No Interference	
HLRS 4060-05-480		48	No Interference	No Interference	No Interference	No Interference	No Interference	
HLRS 4060-10-120		R1	12	No Interference	No Interference	No Interference	No Interference	No Interference
HLRS 4060-10-160			16	No Interference	No Interference	No Interference	No Interference	No Interference
HLRS 4060-10-180			18	No Interference	No Interference	No Interference	No Interference	No Interference
HLRS 4060-10-200			20	No Interference	No Interference	No Interference	No Interference	No Interference
HLRS 4060-10-240			24	No Interference	No Interference	No Interference	No Interference	No Interference
HLRS 4060-10-300			30	No Interference	No Interference	No Interference	No Interference	No Interference
HLRS 4060-10-400			40	No Interference	No Interference	No Interference	No Interference	No Interference
HLRS 4060-10-480			48	No Interference	No Interference	No Interference	No Interference	No Interference

4 Flutes


 3mm Shank V Series


 UDC-PCD Series


 CBN Series


 Square


 Long Neck Square


 Radius


 Long Neck Radius


 Taper Neck Radius


 Ball / Long Shank Ball


 Long Neck Ball


 Taper Neck Ball


 Taper


 Barrel


 Spiral V Cutter


 Drill


 Technical Data

Milling Conditions for HLRS (4 Flutes)

- φ3mm Shank V Series
- UDC-PCD Series
- CBN Series
- Square
- Long Neck Square
- Radius
- Long Neck Radius
- Taper Neck Radius
- Ball / Long Shank Ball
- Long Neck Ball
- Taper Neck Ball
- Taper
- Barrel
- Spiral V Cutter
- Drill
- Technical Data

WORK MATERIAL			PREHARDENED STEELS HARDENED STEELS NAK / SKD (30~45HRC)				HARDENED STEELS SKD / SKT (45~55HRC)				HARDENED STEELS SKD / SKH (55~65HRC)			
Model Number	Outside Diameter (mm)	Effective Length (mm)	Spindle Speed (min <sup>-1</sup> )	Feed Rate (mm/min)	a <sub>p</sub> Axial Depth (mm)	a <sub>e</sub> Radial Depth (mm)	Spindle Speed (min <sup>-1</sup> )	Feed Rate (mm/min)	a <sub>p</sub> Axial Depth (mm)	a <sub>e</sub> Radial Depth (mm)	Spindle Speed (min <sup>-1</sup> )	Feed Rate (mm/min)	a <sub>p</sub> Axial Depth (mm)	a <sub>e</sub> Radial Depth (mm)
4002	0.2	0.3	27,000	620	0.005	0.05	27,000	500	0.003	0.04	27,000	390	0.003	0.01
		0.5	24,000	500	0.005	0.05	24,000	410	0.003	0.04	24,000	250	0.003	0.01
		1	21,000	380	0.004	0.05	21,000	320	0.002	0.04	21,000	110	0.002	0.009
		1.5	18,000	260	0.004	0.05	18,000	240	0.002	0.03	18,000	80	0.002	0.007
		2	15,000	140	0.004	0.05	15,000	160	0.002	0.03	15,000	60	0.002	0.007
4003	0.3	0.3	24,500	660	0.01	0.075	23,700	530	0.006	0.07	20,000	330	0.003	0.028
		0.5	23,300	600	0.008	0.075	22,500	490	0.006	0.07	18,500	270	0.003	0.028
		1	20,400	460	0.006	0.075	19,500	400	0.005	0.07	17,000	180	0.003	0.028
		1.5	17,500	320	0.004	0.05	16,500	310	0.005	0.07	16,000	140	0.003	0.025
		2	14,600	180	0.004	0.05	13,500	220	0.005	0.07	14,500	100	0.003	0.025
4004	0.4	0.5	25,400	870	0.015	0.12	22,500	750	0.011	0.1	16,200	360	0.003	0.05
		1	22,600	700	0.012	0.12	20,500	600	0.009	0.1	15,000	250	0.003	0.045
		1.5	21,200	610	0.01	0.12	19,500	520	0.008	0.095	14,400	150	0.003	0.043
4005	0.5	2	19,800	530	0.009	0.12	18,500	450	0.007	0.09	13,800	100	0.003	0.04
		1	22,000	800	0.017	0.155	20,000	670	0.012	0.125	13,500	300	0.003	0.065
4006	0.6	2	21,300	900	0.018	0.17	19,000	750	0.015	0.145	11,500	240	0.003	0.083
		4	18,600	690	0.013	0.17	15,500	520	0.013	0.14	10,300	50	0.003	0.07
4008	0.8	2	20,000	1,100	0.025	0.2	18,500	950	0.02	0.2	10,000	280	0.005	0.12
		3	18,800	950	0.021	0.2	16,500	830	0.018	0.2	9,200	200	0.005	0.116
		4	17,500	840	0.018	0.2	15,000	730	0.016	0.2	8,800	120	0.004	0.112
		6	14,600	700	0.015	0.2	12,500	600	0.015	0.2	8,500	60	0.004	0.108
		8	13,100	450	0.008	0.13	11,150	425	0.008	0.125	7,500	50	0.003	0.057
4010	1	2	17,600	1,470	0.056	0.27	15,300	1,200	0.038	0.27	10,900	710	0.03	0.27
		3	15,500	1,390	0.048	0.27	13,200	1,150	0.037	0.27	9,400	680	0.027	0.27
		4	13,800	1,310	0.039	0.27	12,000	1,070	0.031	0.243	8,500	640	0.015	0.243
		5	12,500	1,150	0.03	0.24	11,000	960	0.027	0.232	7,800	570	0.013	0.144
		6	11,300	1,040	0.021	0.216	9,800	860	0.016	0.209	7,000	510	0.01	0.108
		8	9,800	780	0.02	0.189	8,500	720	0.012	0.16	6,100	420	0.008	0.094
		10	8,800	510	0.011	0.126	7,600	510	0.009	0.1	5,400	350	0.006	0.05
		12	8,100	320	0.008	0.1	7,000	400	0.006	0.05	5,000	300	0.006	0.03
4012	1.2	16	7,000	150	0.005	0.06	6,100	330	0.006	0.05	4,300	250	0.005	0.01
		4	13,200	1,360	0.032	0.45	11,900	1,100	0.024	0.3	9,200	1,300	0.02	0.2
		6	11,200	1,160	0.028	0.36	9,600	980	0.022	0.252	7,400	1,200	0.011	0.095
4015	1.5	10	9,000	800	0.017	0.18	7,300	600	0.009	0.15	6,300	800	0.006	0.05
		3	16,400	1,520	0.063	0.569	14,800	1,330	0.052	0.54	11,200	780	0.035	0.315
		4	13,200	1,360	0.054	0.54	13,200	1,280	0.042	0.495	10,100	700	0.033	0.292
		6	11,600	1,280	0.041	0.486	10,600	1,210	0.038	0.445	8,100	460	0.025	0.202
		8	10,200	1,080	0.037	0.378	9,300	1,020	0.031	0.346	7,100	390	0.015	0.157
		10	9,300	930	0.032	0.345	8,500	870	0.029	0.316	6,600	340	0.011	0.172
		12	8,500	830	0.029	0.324	7,800	780	0.026	0.297	5,900	300	0.01	0.162
		16	7,400	670	0.018	0.216	6,800	600	0.014	0.198	5,100	230	0.005	0.108
		18	6,000	550	0.015	0.2	5,800	420	0.01	0.15	4,200	150	0.005	0.08
4018	1.8	8	10,700	1,120	0.047	0.495	9,800	1,060	0.043	0.497	7,700	500	0.02	0.222
		10	9,600	1,010	0.04	0.436	8,900	950	0.038	0.421	7,100	390	0.015	0.203
		12	8,100	850	0.035	0.303	7,500	740	0.032	0.306	5,900	290	0.013	0.159
		14	7,400	770	0.027	0.24	6,900	660	0.024	0.24	5,400	270	0.008	0.13
		16	7,200	730	0.021	0.207	6,700	630	0.019	0.198	5,200	260	0.006	0.113

## Milling Conditions for HLRS (4 Flutes)

WORK MATERIAL			PREHARDENED STEELS HARDENED STEELS NAK / SKD (30~45HRC)				HARDENED STEELS SKD / SKT (45~55HRC)				HARDENED STEELS SKD / SKH (55~65HRC)			
Model Number	Outside Diameter (mm)	Effective Length (mm)	Spindle Speed (min <sup>-1</sup> )	Feed Rate (mm/min)	a <sub>p</sub> Axial Depth (mm)	a <sub>e</sub> Radial Depth (mm)	Spindle Speed (min <sup>-1</sup> )	Feed Rate (mm/min)	a <sub>p</sub> Axial Depth (mm)	a <sub>e</sub> Radial Depth (mm)	Spindle Speed (min <sup>-1</sup> )	Feed Rate (mm/min)	a <sub>p</sub> Axial Depth (mm)	a <sub>e</sub> Radial Depth (mm)
4020	2	4	15,300	1,570	0.069	0.72	14,300	1,460	0.065	0.81	11,500	860	0.031	0.36
		6	12,800	1,280	0.064	0.648	12,000	1,200	0.06	0.729	9,700	700	0.028	0.324
		8	11,200	1,160	0.058	0.612	10,400	1,100	0.055	0.648	8,400	600	0.026	0.288
		10	10,000	1,090	0.049	0.526	9,300	1,020	0.047	0.526	7,600	450	0.019	0.234
		12	9,100	1,030	0.046	0.405	8,500	960	0.044	0.405	6,900	420	0.018	0.18
		16	7,800	860	0.042	0.283	7,300	700	0.039	0.315	5,900	270	0.016	0.157
		20	7,000	800	0.025	0.198	6,600	650	0.024	0.198	5,300	290	0.007	0.118
		24	6,500	740	0.02	0.17	5,600	500	0.019	0.14	4,700	270	0.007	0.1
	26	6,000	680	0.013	0.15	5,000	440	0.012	0.12	4,000	220	0.005	0.08	
	30	5,500	620	0.01	0.1	4,400	390	0.009	0.09	3,400	180	0.005	0.08	
4025	2.5	6	13,000	1,600	0.078	0.7	12,000	1,500	0.074	0.7	9,900	830	0.05	0.476
		8	11,300	1,430	0.075	0.62	10,500	1,240	0.072	0.62	9,100	650	0.05	0.42
		10	10,500	1,400	0.067	0.54	10,000	1,150	0.067	0.54	8,400	510	0.048	0.324
		16	8,900	1,400	0.059	0.36	8,500	790	0.049	0.3	7,200	350	0.03	0.15
		20	7,800	1,200	0.048	0.27	7,500	670	0.031	0.225	6,300	300	0.022	0.09
	30	6,300	600	0.011	0.18	6,000	500	0.014	0.18	5,000	220	0.01	0.054	
4030	3	4	15,000	3,070	0.128	0.72	14,000	2,640	0.08	0.72	11,500	980	0.052	0.576
		6	14,000	2,890	0.12	0.72	13,300	2,500	0.075	0.72	10,800	900	0.05	0.576
		8	12,500	2,530	0.105	0.7	11,800	2,200	0.07	0.7	9,900	810	0.047	0.56
		10	11,300	2,160	0.096	0.7	10,500	2,090	0.06	0.7	9,000	730	0.045	0.56
		12	10,500	2,020	0.084	0.67	10,000	1,950	0.052	0.67	8,100	660	0.037	0.502
		14	9,700	1,800	0.072	0.65	9,300	1,700	0.044	0.65	7,500	600	0.032	0.43
		16	9,200	1,680	0.064	0.63	8,800	1,600	0.04	0.63	7,100	570	0.027	0.378
		18	8,600	1,610	0.061	0.605	8,300	1,540	0.038	0.605	6,700	560	0.023	0.348
		20	8,400	1,540	0.058	0.58	7,900	1,490	0.036	0.58	6,300	550	0.022	0.319
		24	7,900	1,490	0.052	0.513	7,500	1,420	0.029	0.513	6,000	510	0.017	0.258
			26	7,500	1,440	0.046	0.446	7,100	1,360	0.023	0.446	5,700	480	0.012
	30	7,000	1,260	0.04	0.38	6,500	1,230	0.015	0.38	5,400	390	0.007	0.144	
	36	6,500	1,100	0.035	0.3	6,100	1,110	0.01	0.18	5,100	300	0.005	0.1	
4040	4	8	10,200	1,480	0.133	1.35	8,500	1,420	0.104	1.35	7,300	810	0.091	0.945
		12	8,900	1,440	0.116	1.15	7,600	1,390	0.091	1.15	6,400	780	0.065	0.805
		14	8,500	1,400	0.1	1.08	7,100	1,350	0.078	1.08	6,000	760	0.051	0.76
		16	7,900	1,370	0.091	1	6,600	1,330	0.071	1	5,600	740	0.043	0.7
		20	6,900	1,320	0.076	0.9	5,800	1,260	0.059	0.9	4,900	720	0.032	0.63
		24	6,200	1,200	0.06	0.8	5,200	1,120	0.047	0.8	4,500	630	0.022	0.56
		32	5,500	960	0.037	0.648	4,600	920	0.029	0.648	3,900	600	0.011	0.388
		40	5,000	790	0.025	0.55	4,300	800	0.02	0.482	3,600	560	0.008	0.3
		48	4,600	700	0.012	0.45	3,900	680	0.01	0.315	3,300	500	0.005	0.1
4050	5	16	7,200	1,700	0.15	1.5	5,300	1,200	0.125	1.15	4,200	820	0.063	1.03
		20	6,700	1,500	0.14	1.4	4,800	1,100	0.1	1.1	4,000	740	0.045	1
		40	4,600	880	0.068	1	3,300	700	0.06	0.68	2,800	500	0.025	0.44
4060	6	12	8,000	2,370	0.2	2.43	4,700	1,360	0.2	1.35	4,000	1,080	0.075	1.35
		16	6,700	2,020	0.19	2.394	4,000	1,150	0.19	1.33	3,400	900	0.073	1.33
		18	6,300	1,890	0.185	2.376	3,750	1,060	0.185	1.32	3,200	830	0.071	1.32
		20	5,800	1,730	0.18	2.358	3,500	1,000	0.18	1.31	3,000	760	0.07	1.31
		24	5,200	1,540	0.17	2.322	3,100	860	0.17	1.29	2,700	680	0.068	1.29
		30	4,500	1,290	0.158	2.268	2,600	740	0.158	1.26	2,200	580	0.066	1.26
		40	3,000	800	0.1	1.35	1,700	480	0.1	0.75	1,400	360	0.04	0.55
	48	2,000	510	0.05	0.9	1,200	330	0.04	0.5	1,000	240	0.02	0.3	

4 Flutes

φ3mm Shank  
V Series

UDC-PCD  
Series

CBN  
Series

Square

Long Neck  
Square

Radius

Long Neck  
Radius

Taper Neck  
Radius

Ball / Long  
Shank Ball

Long Neck  
Ball

Taper Neck  
Ball

Taper

Barrel

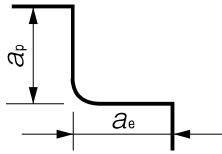
Spiral  
V Cutter

Drill

Technical Data

## 4 Flutes HARDMAX

### Side Milling

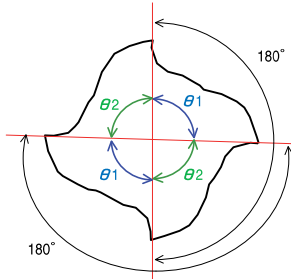


#### Note:

- Decrease both spindle speed and feed rate proportionally when the milling parameters exceed the machine's maximum spindle speed.
- Every coolant offers stable milling.
- Recommend oil coolant for Stainless Steels and Heat Resistant Alloys.
- Recommend wet coolant for Copper.

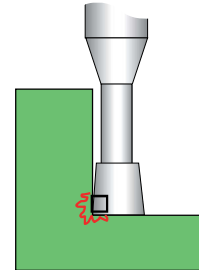
- Ø3mm Shark V Series
- UDC-PCD Series
- CBN Series
- Square
  - Square
  - Long Neck Square
- Radius
  - Radius
  - Long Neck Radius**
  - Taper Neck Radius
- Ball / Long Shank Ball
  - Ball / Long Shank Ball
  - Long Neck Ball
  - Taper Neck Ball
- Taper
  - Taper
- Barrel
- Spiral V Cutter
- Drill
- Technical Data

### Feature 1 : Variable pitch



$\theta 1 > \theta 2$  : The unequal division reduces chattering and tip damage.  
 $\theta 1 + \theta 2 = 180^\circ$  : Easy to measure outside diameter.

### Feature 2 : Back taper geometry



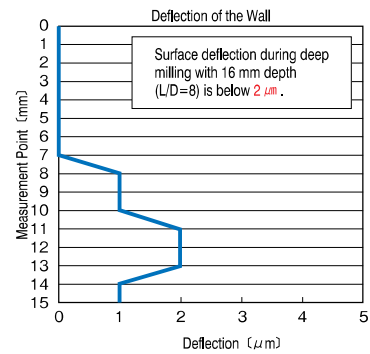
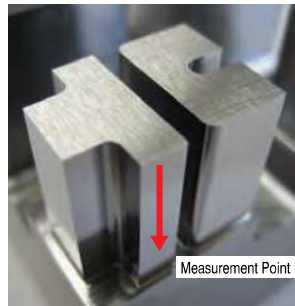
The back taper geometry reduces cutting resistance, which enables stable milling on vertical walls.

4 Flutes

### Milling Example for Deep Milling HLRS4000 $\phi 2 \times \text{CR0.3} \times \text{EL16}$ ( $L / D = 8$ )

DAC10 (48HRC)

Tool	HLRS 4020-03-160
Spindle Speed	7,300 $\text{min}^{-1}$
Feed Rate	1,260 $\text{mm}/\text{min}$
$a_p$	0.02 $\text{mm}$
$a_e$	0.015 $\text{mm}$
Cycle Time	112 $\text{min}$
Coolant	Oil Mist
Work Size	20 $\times$ 15 $\text{mm}$



$\phi 3\text{mm}$  Shank  
V Series

UDC-PCD  
Series

CBN  
Series

Square

Long Neck  
Square

Radius

Long Neck  
Radius

Taper Neck  
Radius

Ball / Long  
Shank Ball

Long Neck  
Ball

Taper Neck  
Ball

Taper

Barrel

Spiral  
V Cutter

Drill

Technical Data