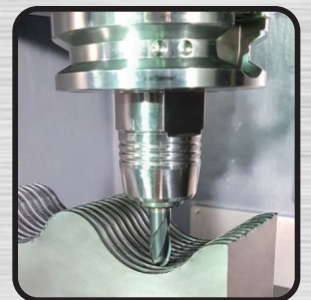
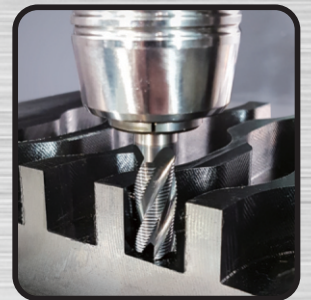




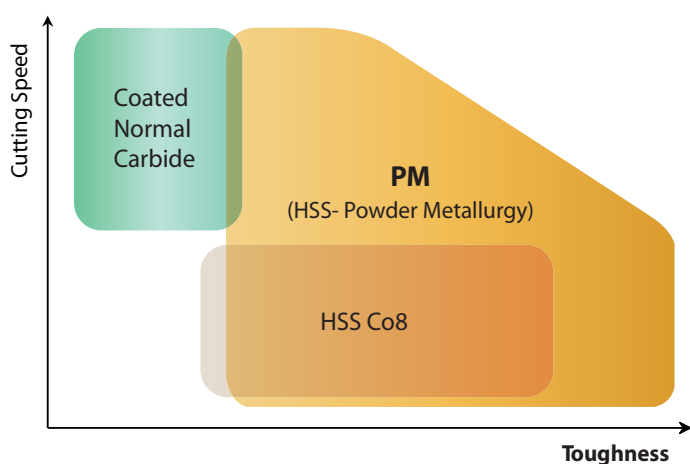
PM End Mills

- A. The PM material is based on powder metallurgy that ensures High Toughness performance which is one of the advantages of Cobalt HSS.
- B. The PM has Exceptional Wear Resistance which is another advantage of the micro-grain carbide tools.
- C. The PM has very strong toughness which can bring out better performances also on machines with unstable conditions such as vibration and irregular composition or work materials.
- D. The PM performs better without causing chipping than Normal coated carbide end mills under the same carbide cutting conditions.
- E. Excellent performance for Stainless Steels, Pre-hardened Steels, Carbon steels, Alloy steels and Cast Iron.

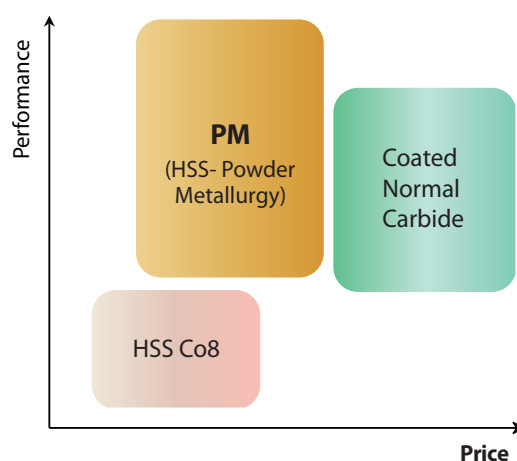
Note Not recommended for very high speed machining and for high hardness material above HRC50.



To protect chipping problems under the unstable machining conditions with vibration.



Higher Toughness than HSS Co8, Cutting Speed (V_c) is as high as Coated Normal Carbide.

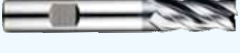
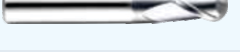
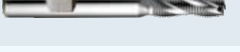
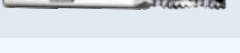
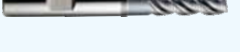


Better performance than HSS Co8, Better price than Coated Normal Carbide.

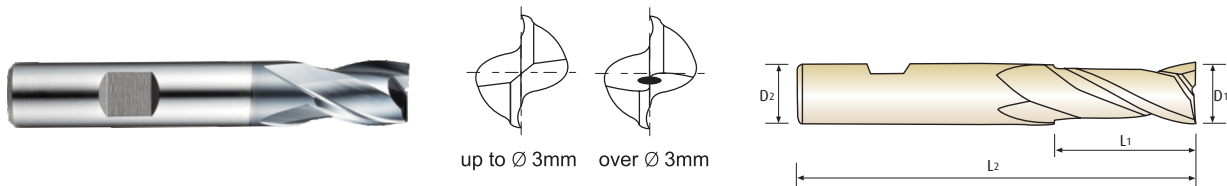
Icon Guide

PM	Powder Metallurgy HSS
	No. of Flutes
	Helix Angle
	Tolerance of Ball Radius
	Type of Shank
	Type of Periphery
	Cutting Condition of Tool See the Page 11

Index

Item	Model	Description	Size		Carbon Steels	Alloy Steels	Prehardened Steels	Hardened Steels	Stainless Steels	Cast Iron	Copper	Aluminum	Titanium	Page
			Min.	Max.	~HB225	HB225~352	HRC30~40	HRC40~50						
HEC-PM2 HEW-PM2		PM, 2 Flutes Short Length (Center Cut)	D1.0	D25.0	●	●	○	○	●	●	○			06
HEC-PM3		PM, 3 Flutes Short Length (Center Cut)	D1.0	D25.0	●	●	○	○	●	●	○			07
HEC-PM4 HEW-PM4		PM, 4 Flutes Short Length (Center Cut)	D1.0	D25.0	●	●	○	○	●	●	○			08
HEH-PM4		PM, 4 Flutes Multiple Helix Short Length (Center Cut)	D3.0	D25.0	●	●	○	○	●	●	○			09
HEC-PM4 HEW-PM4		PM, 4 Flutes Long Length (Center Cut)	D2.0	D25.0	●	●	○	○	●	●	○			10
HBC-PM2 HBW-PM2		PM, 2 Flutes Short Length Ball Nose	R0.5	R12.5	●	●	○	○	●	●	○			11
HRE-PM4		PM, Multi Flutes Short Length Roughing-Fine (Center Cut)	D6.0	D25.0	●	●	○	○	●	●	○			12
HRE-PM3		PM, Multi Flute Long Length Roughing-Fine (Center Cut)	D6.0	D25.0	●	●	○	○	●	●	○			13
HRC-PM4		PM, Multi Flutes Short Length Roughing-Coarse (Center Cut)	D6.0	D25.0	●	●	○	○	●	●	○			14
HER-PM4		PM, Multi Flutes Multiple Helix Short Length Corner Radius Roughing-Fine (Center Cut)	D6.0	D25.0	●	●	○	○	●	●	○			15

- HEC-PM2 Series
- HEW-PM2 Series



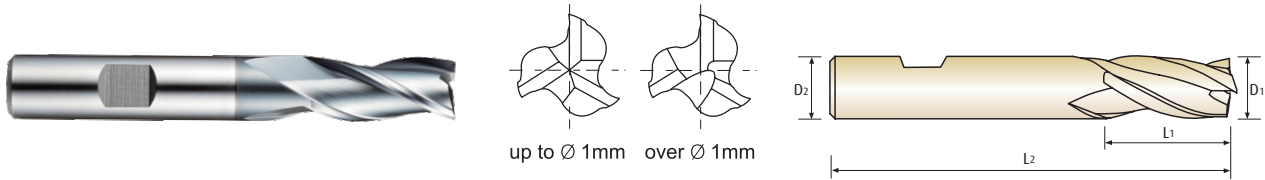
Unit:mm

Part Number Cylindrical	Part Number Weldon	Mill Diameter D1	Shank Dia D2	Length of Cut L1	Overall Length L2
HEC010S06047PM2	HEW010S06047PM2	1.0	6	2.5	47
HEC020S06048PM2	HEW020S06048PM2	2.0	6	4	48
HEC030S06049PM2	HEW030S06049PM2	3.0	6	5	49
HEC040S06051PM2	HEW040S06051PM2	4.0	6	7	51
HEC050S06052PM2	HEW050S06052PM2	5.0	6	8	52
HEC060S06052PM2	HEW060S06052PM2	6.0	6	8	52
HEC070S08060PM2	HEW070S08060PM2	7.0	8	10	60
HEC080S08061PM2	HEW080S08061PM2	8.0	8	11	61
HEC090S10061PM2	HEW090S10061PM2	9.0	10	11	61
HEC100S10063PM2	HEW100S10063PM2	10.0	10	13	63
HEC120S12073PM2	HEW120S12073PM2	12.0	12	16	73
HEC140S12073PM2	HEW140S12073PM2	14.0	12	16	73
HEC160S16079PM2	HEW160S16079PM2	16.0	16	19	79
HEC180S16079PM2	HEW180S16079PM2	18.0	16	19	79
HEC200S20088PM2	HEW200S20088PM2	20.0	20	22	88
HEC220S20088PM2	HEW220S20088PM2	22.0	20	22	88
HEC250S25102PM2	HEW250S25102PM2	25.0	25	26	102

Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
0~-0.03	h6



■ HEC-PM3 Series

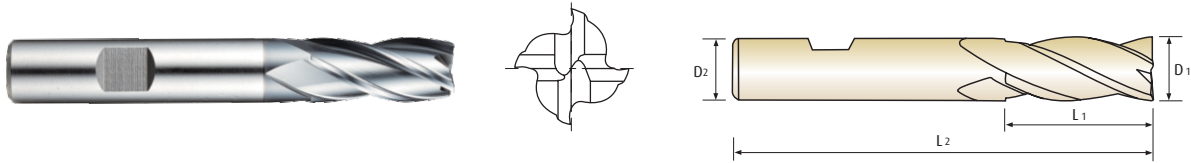


Unit:mm

Part Number Weldon	Mill Diameter D1	Shank Dia D2	Length of Cut L1	Overall Length L2
HEC010S06047PM3	1.0	6	3	47
HEC020S06051PM3	2.0	6	7	51
HEC030S06052PM3	3.0	6	8	52
HEC040S06055PM3	4.0	6	11	55
HEC050S06057PM3	5.0	6	13	57
HEC060S06057PM3	6.0	6	13	57
HEC070S08066PM3	7.0	8	16	66
HEC080S08069PM3	8.0	8	19	69
HEC090S10069PM3	9.0	10	19	69
HEC100S10072PM3	10.0	10	22	72
HEC120S12083PM3	12.0	12	26	83
HEC140S12083PM3	14.0	12	26	83
HEC160S16092PM3	16.0	16	32	92
HEC180S16092PM3	18.0	16	32	92
HEC200S20104PM3	20.0	20	38	104
HEC220S20104PM3	22.0	20	38	104
HEC250S25121PM3	25.0	25	45	121

Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
0~-0.03	h6

- HEC-PM4 Series
- HEW-PM4 Series



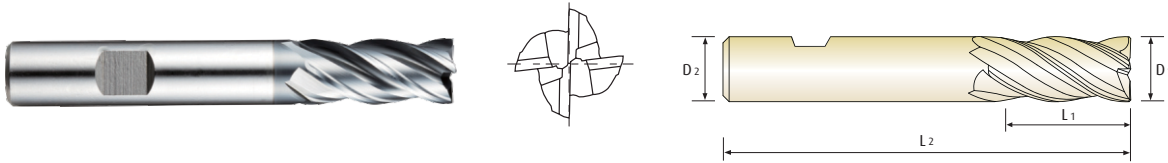
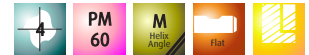
Unit:mm

Part Number Cylindrical	Part Number Weldon	Mill Diameter D1	Shank Dia D2	Length of Cut L1	Overall Length L2
HEC010S06049PM4	HEW010S06049PM4	1.0	6	3	49
HEC020S06051PM4	HEW020S06051PM4	2.0	6	7	51
HEC030S06052PM4	HEW030S06052PM4	3.0	6	8	52
HEC040S06055PM4	HEW040S06055PM4	4.0	6	11	55
HEC050S06057PM4	HEW050S06057PM4	5.0	6	13	57
HEC060S06057PM4	HEW060S06057PM4	6.0	6	13	57
HEC070S08066PM4	HEW070S08066PM4	7.0	8	16	66
HEC080S08069PM4	HEW080S08069PM4	8.0	8	19	69
HEC090S10069PM4	HEW090S10069PM4	9.0	10	19	69
HEC100S10072PM4	HEW100S10072PM4	10.0	10	22	72
HEC120S12083PM4	HEW120S12083PM4	12.0	12	26	83
HEC140S12083PM4	HEW140S12083PM4	14.0	12	26	83
HEC160S16092PM4	HEW160S16092PM4	16.0	16	32	92
HEC180S16092PM4	HEW180S16092PM4	18.0	16	32	92
HEC200S20104PM4	HEW200S20104PM4	20.0	20	38	104
HEC220S20104PM4	HEW220S20104PM4	22.0	20	38	104
HEC250S25121PM4	HEW250S25121PM4	25.0	25	45	121

Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
0~-0.03	h6



■ HEH-PM4 Series

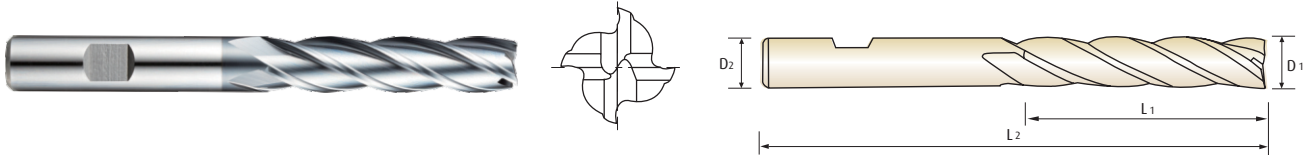


Unit:mm

Part Number Weldon	Mill Diameter D1	Shank Dia D2	Length of Cut L1	Overall Length L2
HEH030S06052PM4	3.0	6	8	52
HEH040S06055PM4	4.0	6	11	55
HEH050S06057PM4	5.0	6	13	57
HEH060S06057PM4	6.0	6	13	57
HEH070S08066PM4	7.0	8	16	66
HEH080S08069PM4	8.0	8	19	69
HEH090S10069PM4	9.0	10	19	69
HEH100S10072PM4	10.0	10	22	72
HEH120S12083PM4	12.0	12	26	83
HEH140S12083PM4	14.0	12	26	83
HEH160S16092PM4	16.0	16	32	92
HEH180S16092PM4	18.0	16	32	92
HEH200S20104PM4	20.0	20	38	104
HEH220S20104PM4	22.0	20	38	104
HEH250S25121PM4	25.0	25	45	121

Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
0~-0.03	h6

- HEC-PM4 Series
- HEW-PM4 Series



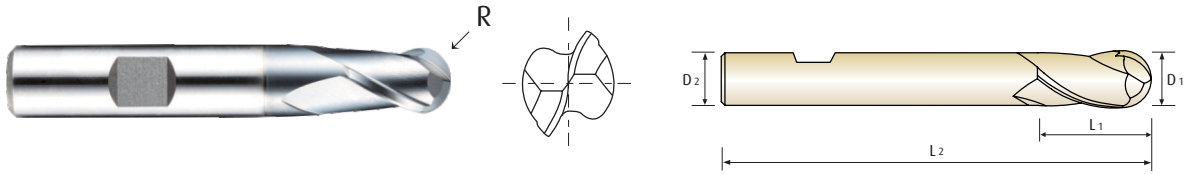
Unit:mm

Part Number Cylindrical	Part Number Weldon	Mill Diameter D1	Shank Dia D2	Length of Cut L1	Overall Length L2
HEC020S06054PM4	HEW020S06054PM4	2.0	6	10	54
HEC030S06056PM4	HEW030S06056PM4	3.0	6	12	56
HEC040S06063PM4	HEW040S06063PM4	4.0	6	19	63
HEC050S06068PM4	HEW050S06068PM4	5.0	6	24	68
HEC060S06068PM4	HEW060S06068PM4	6.0	6	24	68
HEC070S08080PM4	HEW070S08080PM4	7.0	8	30	80
HEC080S08088PM4	HEW080S08088PM4	8.0	8	38	88
HEC090S10088PM4	HEW090S10088PM4	9.0	10	38	88
HEC100S10095PM4	HEW100S10095PM4	10.0	10	45	95
HEC120S12110PM4	HEW120S12110PM4	12.0	12	53	110
HEC140S12110PM4	HEW140S12110PM4	14.0	12	53	110
HEC160S16123PM4	HEW160S16123PM4	16.0	16	63	123
HEC180S16123PM4	HEW180S16123PM4	18.0	16	63	123
HEC200S20141PM4	HEW200S20141PM4	20.0	20	75	141
HEC220S20141PM4	HEW220S20141PM4	22.0	20	75	141
HEC250S25166PM4	HEW250S25166PM4	25.0	25	90	166

Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
0~-0.03	h6



- HBC-PM2 Series
- HBW-PM2 Series

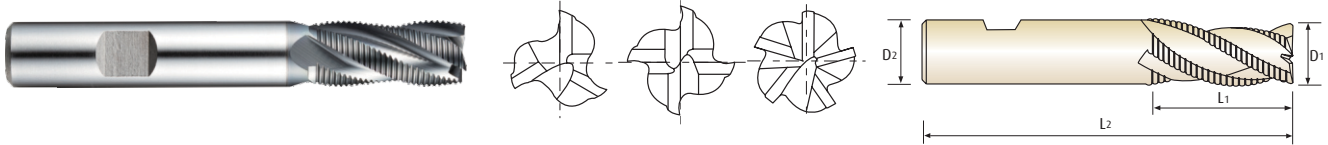


Unit:mm

Part Number Cylindrical	Part Number Weldon	Radius of Ball Nose R	Mill Diameter D1	Shank Dia D2	Length of Cut L1	Overall Length L2
HBC010S06047PM2	HBW010S06047PM2	R0.5	1.0	6	2.5	47
HBC020S06048PM2	HBW020S06048PM2	R1.0	2.0	6	4	48
HBC030S06049PM2	HBW030S06049PM2	R1.5	3.0	6	5	49
HBC040S06051PM2	HBW040S06051PM2	R2.0	4.0	6	7	51
HBC050S06052PM2	HBW050S06052PM2	R2.5	5.0	6	8	52
HBC060S06052PM2	HBW060S06052PM2	R3.0	6.0	6	8	52
HBC070S08060PM2	HBW070S08060PM2	R3.5	7.0	8	10	60
HBC080S08061PM2	HBW080S08061PM2	R4.0	8.0	8	11	61
HBC090S10061PM2	HBW090S10061PM2	R4.5	9.0	10	11	61
HBC100S10063PM2	HBW100S10063PM2	R5.0	10.0	10	13	63
HBC120S12073PM2	HBW120S12073PM2	R6.0	12.0	12	16	73
HBC140S12073PM2	HBW140S12073PM2	R7.0	14.0	12	16	73
HBC160S16079PM2	HBW160S16079PM2	R8.0	16.0	16	19	79
HBC180S16079PM2	HBW180S16079PM2	R9.0	18.0	16	19	79
HBC200S20088PM2H	HBW200S20088PM2	R10.0	20.0	20	22	88
BC250S25102PM2	HBW250S25102PM2	R12.5	25.0	25	26	102

Mill Dia. Tolerance (mm)	Shank Dia. Tolerance
0~-0.03	h6

■ HRE-PM4 Series



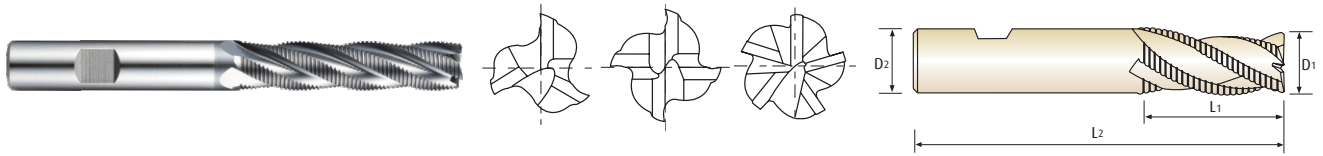
Unit:mm

Part Number Weldon	Mill Diameter D1	Shank Dia D2	Length of Cut L1	Overall Length L2	No. of Flute
HRE060S06057PM3	6.0	6	13	57	3
HRE070S10066PM3	7.0	10	16	66	3
HRE080S10069PM3	8.0	10	19	69	3
HRE090S10069PM3	9.0	10	19	69	3
HRE100S10072PM4	10.0	10	22	72	4
HRE120S12083PM4	12.0	12	26	83	4
HRE140S12083PM4	14.0	12	26	83	4
HRE160S16092PM4	16.0	16	32	92	4
HRE180S16092PM4	18.0	16	32	92	4
HRE200S20104PM4	20.0	20	38	104	4
HRE250S25121PM5	25.0	25	45	121	5

Tolerance Range in μm			
Nominal - Diameter in μm			
	over 6 to 10	over 10 to 18	over 18 to 30
js 12	± 75	± 90	± 105
h 6	0 -9	0 -11	0 -13



■ HRE-PM4 Series

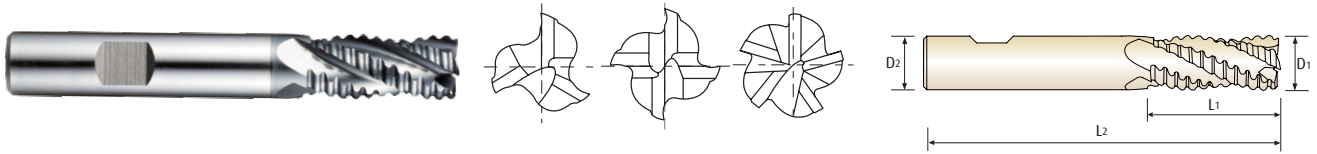


Unit:mm

Part Number Weldon	Mill Diameter D1	Shank Dia D2	Length of Cut L1	Overall Length L2	No. of Flute
HRE060S06068PM3	6.0	6	24	68	3
HRE070S10080PM3	7.0	10	30	80	3
HRE080S10088PM3	8.0	10	38	88	3
HRE090S10088PM3	9.0	10	38	88	3
HRE100S10095PM4	10.0	10	45	95	4
HRE120S12110PM4	12.0	12	53	110	4
HRE140S12110PM4	14.0	12	53	110	4
HRE160S16123PM4	16.0	16	63	123	4
HRE180S16123PM4	18.0	16	63	123	4
HRE200S20141PM4	20.0	20	75	141	4
HRE250S25166PM5	25.0	25	90	166	5

Tolerance Range in μm			
Nominal - Diameter in μm			
	over 6 to 10	over 10 to 18	over 18 to 30
js 12	± 75	± 90	± 105
h 6	$\begin{matrix} 0 \\ -9 \end{matrix}$	$\begin{matrix} 0 \\ -11 \end{matrix}$	$\begin{matrix} 0 \\ -13 \end{matrix}$

■ HRC-PM4 Series



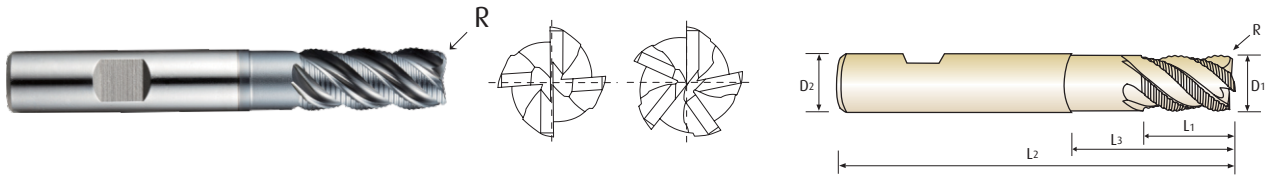
Unit:mm

Part Number Weldon	Mill Diameter D1	Shank Dia D2	Length of Cut L1	Overall Length L2	No. of Flute
HRC060S06057PM3	6.0	6	13	57	3
HRC070S10066PM3	7.0	10	16	66	3
HRC080S10069PM3	8.0	10	19	69	3
HRC090S10069PM3	9.0	10	19	69	3
HRC100S10072PM4	10.0	10	22	72	4
HRC120S12083PM4	12.0	12	26	83	4
HRC140S12083PM4	14.0	12	26	83	4
HRC160S16092PM4	16.0	16	32	92	4
HRC180S16092PM4	18.0	16	32	92	4
HRC200S20104PM4	20.0	20	38	104	4
HRC250S25121PM5	25.0	25	45	121	5

Tolerance Range in μm			
Nominal - Diameter in μm			
	over 6 to 10	over 10 to 18	over 18 to 30
js 12	± 75	± 90	± 105
h 6	0 -9	0 -11	0 -13



■ HER-PM5 Series



Unit:mm

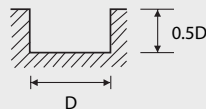
Part Number Weldon	Corner Radius R	Mill Diameter D1	Shank Dia D2	Length of Cut L1	Length Below Shank L3	Overall Length L2	No. of Flute
HER060S06057PM4	R0.5	6.0	6	13	-	57	4
HER070S10066PM4	R0.5	7.0	10	16	-	66	4
HER080S10069PM4	R0.5	8.0	10	19	-	69	4
HER090S10069PM4	R0.5	9.0	10	19	-	69	4
HER100S10072PM4	R0.5	10.0	10	22	31	72	4
HER120S12083PM4	R0.5	12.0	12	26	37	83	4
HER140S12083PM5	R1.0	14.0	12	26	-	83	5
HER160S16092PM5	R1.0	16.0	16	32	44	92	5
HER180S16092PM5	R1.0	18.0	16	32	-	92	5
HER200S20104PM5	R1.0	20.0	20	38	54	104	5
HER250S25121PM5	R1.0	25.0	25	45	63	121	5

Tolerance Range in μm			
Nominal - Diameter in μm			
	over 6 to 10	over 10 to 18	over 18 to 30
js 12	± 75	± 90	± 105
h 6	$\begin{matrix} 0 \\ -9 \end{matrix}$	$\begin{matrix} 0 \\ -11 \end{matrix}$	$\begin{matrix} 0 \\ -13 \end{matrix}$

■ HEC-PM2, HEW-PM2 Series

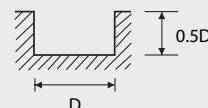
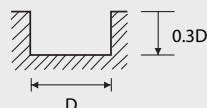
2 Flutes Short (Center Cut)

Material	Structural Steels Carbon Steels				Structural Steels Carbon Steels, Cast Irons				Carbon Steels Alloy Steels, Tool Steels				Prehardened Steels Alloy Steels, Tool Steels			
Hardness					~HRc 20				HRc 20~HRc30				HRc 30~HRc35			
Strength	~500 N/mm ²				500~800 N/mm ²				800~1000 N/mm ²				1000~1100 N/mm ²			
Diameter	RPM	Feed	VC	fz	RPM	Feed	VC	fz	RPM	Feed	VC	fz	RPM	Feed	VC	fz
2.0	8400	140	53	0.008	7080	110	44	0.008	5880	95	37	0.008	3780	80	24	0.011
3.0	6000	190	57	0.016	4920	160	46	0.016	4020	140	38	0.017	2760	95	26	0.017
4.0	5160	275	65	0.027	4320	210	54	0.024	3780	190	48	0.025	2400	110	30	0.023
5.0	4680	305	74	0.033	3900	240	61	0.031	3120	220	49	0.035	2040	120	32	0.029
6.0	4200	320	79	0.038	3480	250	66	0.036	2760	230	52	0.042	1740	130	33	0.037
8.0	3120	330	78	0.053	2640	290	66	0.055	2160	240	54	0.056	1380	140	35	0.051
10.0	2520	360	79	0.071	2160	320	68	0.074	1740	275	55	0.079	1080	150	34	0.069
12.0	2160	330	81	0.076	1740	290	66	0.083	1380	250	52	0.091	890	140	34	0.079
14.0	1920	320	84	0.083	1500	250	66	0.083	1200	235	53	0.098	760	130	33	0.086
16.0	1620	320	81	0.099	1380	235	69	0.085	1070	215	54	0.100	670	120	34	0.090
18.0	1380	290	78	0.105	1140	235	64	0.103	950	190	54	0.100	600	120	34	0.100
20.0	1140	265	72	0.116	940	200	59	0.106	840	180	53	0.107	530	110	33	0.104
22.0	1010	220	70	0.109	850	180	59	0.106	720	150	50	0.104	480	95	33	0.099
25.0	900	185	71	0.103	760	170	60	0.112	590	140	46	0.119	430	90	34	0.105



RPM = rev./min.
Feed = mm/min.
Vc = m/min.
fz = mm/tooth

Material	Alloy Steels Tool Steels				Alloy Steels Tool Steels				Stainless Steels			
Hardness	HRc35~HRc40				HRc40~HRc 45							
Strength	1100~1300 N/mm ²				1300~1400 N/mm ²							
Diameter	RPM	Feed	VC	fz	RPM	Feed	VC	fz	RPM	Feed	VC	fz
2.0	2400	50	15	0.010	1680	35	11	0.010	2640	55	17	0.010
3.0	2160	75	20	0.017	1510	55	14	0.018	2380	85	22	0.018
4.0	1920	90	24	0.023	1340	65	17	0.024	2110	100	27	0.024
5.0	1620	90	25	0.028	1130	65	18	0.029	1780	100	28	0.028
6.0	1380	100	26	0.036	970	70	18	0.036	1520	110	29	0.036
8.0	1070	100	27	0.047	750	70	19	0.047	1180	110	30	0.047
10.0	840	120	26	0.071	590	85	19	0.072	920	130	29	0.071
12.0	700	100	26	0.071	490	70	18	0.071	770	110	29	0.071
14.0	600	95	26	0.079	420	65	18	0.077	660	105	29	0.080
16.0	530	95	27	0.090	370	65	19	0.088	580	105	29	0.091
18.0	480	90	27	0.094	340	65	19	0.096	530	100	30	0.094
20.0	430	85	27	0.099	300	60	19	0.100	470	95	30	0.101
22.0	380	65	26	0.086	270	45	19	0.083	420	70	29	0.083
25.0	300	60	24	0.100	210	40	16	0.095	330	65	26	0.098



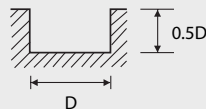
RPM = rev./min.
Feed = mm/min.
Vc = m/min.
fz = mm/tooth



■ HEC-PM3 Series

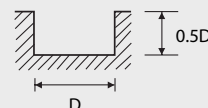
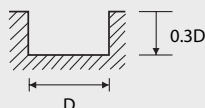
3 Flutes Short (Center Cut) - Slotting

Material	Structural Steels Carbon Steels				Structural Steels Carbon Steels, Cast Irons				Carbon Steels Alloy Steels, Tool Steels				Prehardened Steels Alloy Steels, Tool Steels			
Hardness					~HRc 20				HRc 20~HRc30				HRc 30~HRc35			
Strength	~500 N/mm ²				500~800 N/mm ²				800~1000 N/mm ²				1000~1100 N/mm ²			
Diameter	RPM	Feed	VC	fz	RPM	Feed	VC	fz	RPM	Feed	VC	fz	RPM	Feed	VC	fz
2.0	7800	85	49	0.004	6600	65	41	0.003	5760	55	36	0.003	3600	40	23	0.004
3.0	5520	120	52	0.007	4680	100	44	0.007	4020	60	38	0.005	2640	55	25	0.007
4.0	5160	170	65	0.011	4320	140	54	0.011	3600	95	45	0.009	2280	60	29	0.009
5.0	4560	190	72	0.014	3840	155	60	0.013	3120	110	49	0.012	2040	75	32	0.012
6.0	4020	275	76	0.023	3360	230	63	0.023	2760	170	52	0.021	1740	110	33	0.021
8.0	3120	290	78	0.031	2640	250	66	0.032	2160	180	54	0.028	1380	120	35	0.029
10.0	2520	300	79	0.040	2160	250	68	0.039	1680	190	53	0.038	1070	140	34	0.044
12.0	2160	330	81	0.051	1740	275	66	0.053	1440	205	54	0.047	890	140	34	0.052
14.0	1920	300	84	0.052	1620	265	71	0.055	1200	190	53	0.053	790	130	35	0.055
16.0	1620	290	81	0.060	1380	250	69	0.060	1070	180	54	0.056	670	120	34	0.060
18.0	1380	290	78	0.070	1070	230	61	0.072	950	180	54	0.063	600	115	34	0.064
20.0	1140	275	72	0.080	950	230	60	0.081	840	170	53	0.067	530	110	33	0.069
22.0	1010	275	70	0.091	880	235	61	0.089	720	180	50	0.083	480	115	33	0.080
25.0	900	290	71	0.107	760	250	60	0.110	590	190	46	0.107	430	120	34	0.093



RPM = rev./min.
Feed = mm/min.
Vc = m/min.
fz = mm/tooth

Material	Alloy Steels Tool Steels				Alloy Steels Tool Steels				Stainless Steels			
Hardness	HRc35~HRc40				HRc40~HRc 45							
Strength	1100~1300 N/mm ²				1300~1400 N/mm ²							
Diameter	RPM	Feed	VC	fz	RPM	Feed	VC	fz	RPM	Feed	VC	fz
2.0	2280	35	14	0.005	1600	25	10	0.005	2510	40	16	0.005
3.0	2160	55	20	0.008	1510	40	14	0.009	2380	60	22	0.008
4.0	1800	65	23	0.012	1260	45	16	0.012	1980	70	25	0.012
5.0	1560	65	25	0.014	1090	45	17	0.014	1720	70	27	0.014
6.0	1320	90	25	0.023	920	65	17	0.024	1450	100	27	0.023
8.0	1070	100	27	0.031	750	70	19	0.031	1180	110	30	0.031
10.0	820	110	26	0.045	570	75	18	0.044	900	120	28	0.044
12.0	700	110	26	0.052	490	75	18	0.051	770	120	29	0.052
14.0	600	100	26	0.056	420	70	18	0.056	660	110	29	0.056
16.0	530	100	27	0.063	370	70	19	0.063	580	110	29	0.063
18.0	480	95	27	0.066	340	65	19	0.064	530	105	30	0.066
20.0	430	95	27	0.074	300	65	19	0.072	470	105	30	0.074
22.0	380	100	26	0.088	270	70	19	0.086	420	110	29	0.087
25.0	300	100	24	0.111	210	70	16	0.111	330	110	26	0.111

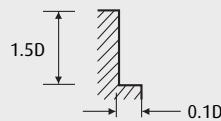


RPM = rev./min.
Feed = mm/min.
Vc = m/min.
fz = mm/tooth

■ HEC-PM3 Series

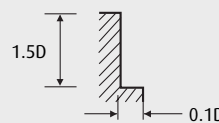
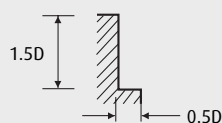
3 Flutes Short (Center Cut) - Side Cutting

Material	Structural Steels Carbon Steels				Structural Steels Carbon Steels, Cast Irons				Carbon Steels Alloy Steels, Tool Steels				Prehardened Steels Alloy Steels, Tool Steels			
Hardness					~HRc 20				HRc 20~HRc30				HRc 30~HRc35			
Strength	~500 N/mm ²				500~800 N/mm ²				800~1000 N/mm ²				1000~1100 N/mm ²			
Diameter	RPM	Feed	VC	fz	RPM	Feed	VC	fz	RPM	Feed	VC	fz	RPM	Feed	VC	fz
2.0	9840	120	62	0.004	8160	95	51	0.004	6600	80	41	0.004	4560	60	29	0.004
3.0	6960	175	66	0.008	5760	145	54	0.008	4560	90	43	0.007	3240	80	31	0.008
4.0	6240	220	78	0.012	5280	185	66	0.012	4200	130	53	0.010	2760	90	35	0.011
5.0	5640	250	89	0.015	4800	210	75	0.015	3480	150	55	0.014	2400	100	38	0.014
6.0	5040	360	95	0.024	4320	300	81	0.023	3120	230	59	0.025	2160	150	41	0.023
8.0	3840	395	97	0.034	3120	325	78	0.035	2400	240	60	0.033	1560	170	39	0.036
10.0	3000	420	94	0.047	2520	350	79	0.046	1920	250	60	0.043	1200	180	38	0.050
12.0	2520	420	95	0.056	2160	360	81	0.056	1680	275	63	0.055	1080	180	41	0.056
14.0	2160	420	95	0.065	1800	340	79	0.063	1380	250	61	0.060	940	170	41	0.060
16.0	1920	395	97	0.069	1560	330	78	0.071	1200	240	60	0.067	790	170	40	0.072
18.0	1620	370	92	0.076	1380	320	78	0.077	1070	235	61	0.073	700	155	40	0.074
20.0	1500	360	94	0.080	1260	305	79	0.081	940	230	59	0.082	620	150	39	0.081
22.0	1380	370	95	0.089	1140	320	79	0.094	890	235	62	0.088	560	155	39	0.092
25.0	1200	395	94	0.110	1010	330	79	0.109	760	250	60	0.110	500	160	39	0.107



RPM = rev./min.
Feed = mm/min.
Vc = m/min.
fz = mm/tooth

Material	Alloy Steels Tool Steels				Alloy Steels Tool Steels				Stainless Steels			
Hardness	HRc35~HRc40				HRc40~HRc 45							
Strength	1100~1300 N/mm ²				1300~1400 N/mm ²							
Diameter	RPM	Feed	VC	fz	RPM	Feed	VC	fz	RPM	Feed	VC	fz
2.0	2880	50	18	0.006	2020	35	13	0.006	3170	55	20	0.006
3.0	2640	80	25	0.010	1850	55	17	0.010	2900	90	27	0.010
4.0	2280	90	29	0.013	1600	65	20	0.014	2510	100	32	0.013
5.0	2040	90	32	0.015	1430	65	22	0.015	2240	100	35	0.015
6.0	1800	120	34	0.022	1260	85	24	0.022	1980	130	37	0.022
8.0	1320	140	33	0.035	920	100	23	0.036	1450	155	36	0.036
10.0	1070	150	34	0.047	750	105	24	0.047	1180	165	37	0.047
12.0	890	150	34	0.056	620	105	23	0.056	980	165	37	0.056
14.0	760	145	33	0.064	530	100	23	0.063	840	160	37	0.063
16.0	660	140	33	0.071	460	100	23	0.072	730	155	37	0.071
18.0	600	130	34	0.072	420	90	24	0.071	660	145	37	0.073
20.0	530	130	33	0.082	370	90	23	0.081	580	145	36	0.083
22.0	480	130	33	0.090	340	90	23	0.088	530	145	37	0.091
25.0	430	145	34	0.112	300	100	24	0.111	470	160	37	0.113



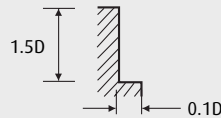
RPM = rev./min.
Feed = mm/min.
Vc = m/min.
fz = mm/tooth



■ HEC-PM4, HEW-PM4, HEC-PM4, HEW-PM4 Series

4 Flutes (Center Cut)

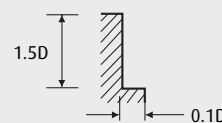
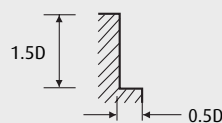
Material	Structural Steels Carbon Steels				Structural Steels Carbon Steels, Cast Irons				Carbon Steels Alloy Steels, Tool Steels				Prehardened Steels Alloy Steels, Tool Steels			
Hardness					~HRC 20				HRC 20~HRC30				HRC 30~HRC35			
Strength	~500 N/mm ²				500~800 N/mm ²				800~1000 N/mm ²				1000~1100 N/mm ²			
Diameter	RPM	Feed	VC	fz	RPM	Feed	VC	fz	RPM	Feed	VC	fz	RPM	Feed	VC	fz
2.0	11040	350	69	0.008	10080	290	63	0.007	7320	205	46	0.007	4920	150	31	0.008
3.0	7920	490	75	0.015	7200	420	68	0.015	5280	300	50	0.014	3240	215	31	0.017
4.0	6360	575	80	0.023	5640	480	71	0.021	4320	360	54	0.021	2760	240	35	0.022
5.0	5280	610	83	0.029	4800	505	75	0.026	3480	385	55	0.028	2400	265	38	0.028
6.0	4680	650	88	0.035	4320	540	81	0.031	3120	395	59	0.032	2160	275	41	0.032
8.0	3720	685	93	0.046	3120	575	78	0.046	2400	445	60	0.046	1680	290	42	0.043
10.0	2760	755	87	0.068	2520	635	79	0.063	1920	455	60	0.059	1200	320	38	0.067
12.0	2400	685	90	0.071	2160	575	81	0.067	1680	445	63	0.066	1070	290	40	0.068
14.0	2160	660	95	0.076	1920	550	84	0.072	1320	420	58	0.080	950	275	42	0.072
16.0	1920	610	97	0.079	1680	515	84	0.077	1200	410	60	0.085	820	265	41	0.081
18.0	1800	550	102	0.076	1500	480	85	0.080	1070	370	61	0.086	760	235	43	0.077
20.0	1500	530	94	0.088	1260	445	79	0.088	940	330	59	0.088	640	210	40	0.082
22.0	1260	490	87	0.097	1140	385	79	0.084	820	305	57	0.093	560	190	39	0.085
25.0	1200	445	94	0.093	1010	365	79	0.090	760	275	60	0.090	500	180	39	0.090



The Feed, in long & extra long types, should be reduced by around 50%.

RPM = rev./min.
Feed = mm/min.
Vc = m/min.
fz = mm/tooth

Material	Alloy Steels Tool Steels				Alloy Steels Tool Steels				Stainless Steels			
Hardness	HRC35~HRC40				HRC40~HRC 45							
Strength	1100~1300 N/mm ²				1300~1400 N/mm ²							
Diameter	RPM	Feed	VC	fz	RPM	Feed	VC	fz	RPM	Feed	VC	fz
2.0	3960	100	25	0.006	2770	70	17	0.006	4360	110	27	0.006
3.0	2880	150	27	0.013	2020	105	19	0.013	3170	165	30	0.013
4.0	2400	180	30	0.019	1680	125	21	0.019	2640	200	33	0.019
5.0	2040	190	32	0.023	1430	135	22	0.024	2240	210	35	0.023
6.0	1740	215	33	0.031	1220	150	23	0.031	1910	235	36	0.031
8.0	1380	220	35	0.040	970	155	24	0.040	1520	240	38	0.039
10.0	1070	240	34	0.056	750	170	24	0.057	1180	265	37	0.056
12.0	860	220	32	0.064	600	155	23	0.065	950	240	36	0.063
14.0	760	205	33	0.067	530	145	23	0.068	840	225	37	0.067
16.0	660	200	33	0.076	460	140	23	0.076	730	220	37	0.075
18.0	600	180	34	0.075	420	125	24	0.074	660	200	37	0.076
20.0	530	170	33	0.080	370	120	23	0.081	580	185	36	0.080
22.0	480	155	33	0.081	340	110	23	0.081	530	170	37	0.080
25.0	430	150	34	0.087	300	105	24	0.088	470	165	37	0.088

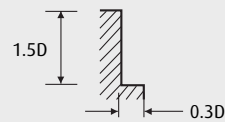
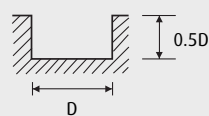


RPM = rev./min.
Feed = mm/min.
Vc = m/min.
fz = mm/tooth

■ HEH-PM4 Series

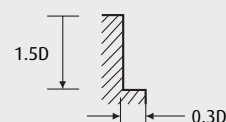
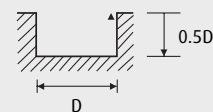
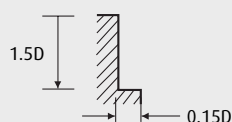
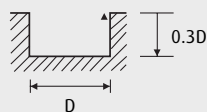
4 Flutes Multiple Helix Short (Center Cut)

Material	Structural Steels Carbon Steels, Cast Irons				Carbon Steels Alloy Steels, Tool Steels				Prehardened Steels Alloy Steels, Tool Steels				Alloy Steels Tool Steels			
Hardness	~HRc 20				HRc20~HRc 30				HRc 30~HRc35				HRc 35~HRc45			
Strength	~800 N/mm ²				800~1000 N/mm ²				1000~1100 N/mm ²				1100~1400 N/mm ²			
Diameter	RPM	Feed	VC	fz	RPM	Feed	VC	fz	RPM	Feed	VC	fz	RPM	Feed	VC	fz
3.0	7410	155	70	0.005	6740	140	64	0.005	4720	95	44	0.005	2830	50	27	0.004
4.0	5560	180	70	0.008	5050	165	63	0.008	3540	115	44	0.008	2120	60	27	0.007
5.0	4440	205	70	0.012	4040	185	63	0.011	2830	130	44	0.011	1700	65	27	0.010
6.0	3710	240	70	0.016	3370	220	64	0.016	2360	155	44	0.016	1420	80	27	0.014
8.0	2780	310	70	0.028	2530	280	64	0.028	1770	195	44	0.028	1060	100	27	0.024
10.0	2450	380	77	0.039	2230	345	70	0.039	1560	240	49	0.038	940	120	30	0.032
12.0	2050	385	77	0.047	1860	350	70	0.047	1300	245	49	0.047	780	125	29	0.040
14.0	1750	340	77	0.049	1590	310	70	0.049	1110	220	49	0.050	670	110	29	0.041
16.0	1530	325	77	0.053	1390	295	70	0.053	980	205	49	0.052	590	105	30	0.044
18.0	1360	320	77	0.059	1240	295	70	0.059	870	205	49	0.059	520	105	29	0.050
20.0	1220	320	77	0.065	1110	290	70	0.065	780	205	49	0.066	470	105	30	0.056
25.0	980	245	77	0.063	890	225	70	0.063	620	160	49	0.065	370	80	29	0.054



RPM = rev./min.
Feed = mm/min.
Vc = m/min.
fz = mm/tooth

Material	Stainless Steels				
Hardness					
Strength					
Diameter	RPM	Feed	VC	fz	
3.0	5090	100	48	0.005	
4.0	3800	125	48	0.008	
5.0	3060	155	48	0.013	
6.0	2550	180	48	0.018	
8.0	1910	220	48	0.029	
10.0	1530	295	48	0.048	
12.0	1270	285	48	0.056	
14.0	1090	260	48	0.060	
16.0	960	240	48	0.063	
18.0	850	240	48	0.071	
20.0	760	235	48	0.077	
25.0	610	190	48	0.078	



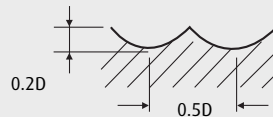
RPM = rev./min.
Feed = mm/min.
Vc = m/min.
fz = mm/tooth



■ HBC-PM2, HBW-PM2 Series

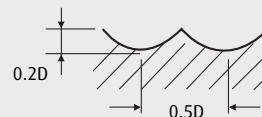
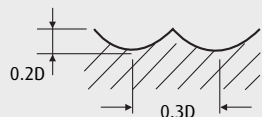
2 Flutes Short Ball

Material	Structural Steels Carbon Steels				Structural Steels Carbon Steels, Cast Irons				Carbon Steels Alloy Steels, Tool Steels				Prehardened Steels Alloy Steels, Tool Steels			
Hardness					~HRc 20				HRc 20~HRc30				HRc 30~HRc35			
Strength	~500 N/mm ²				500~800 N/mm ²				800~1000 N/mm ²				1000~1300 N/mm ²			
Diameter	RPM	Feed	VC	fz	RPM	Feed	VC	fz	RPM	Feed	VC	fz	RPM	Feed	VC	fz
R1.5×3.0	8760	410	83	0.023	6960	275	66	0.020	4680	150	44	0.016	2400	65	23	0.014
R2.0×4.0	7200	515	90	0.036	5540	350	70	0.032	3600	190	45	0.026	1920	90	24	0.023
R3.0×6.0	5280	575	100	0.054	4200	385	79	0.046	2760	215	52	0.039	1440	100	27	0.035
R4.0×8.0	4020	635	101	0.079	3120	420	78	0.067	2160	240	54	0.056	1070	100	27	0.047
R5.0×10.0	3300	720	104	0.109	2520	480	79	0.095	1680	275	53	0.082	820	120	26	0.073
R6.0×12.0	2760	635	104	0.115	2160	420	81	0.097	1440	240	54	0.083	700	100	26	0.071
R8.0×16.0	2040	575	103	0.141	1560	385	78	0.123	1070	215	54	0.100	530	95	27	0.090
R10.0×20.0	1620	505	102	0.156	1200	335	75	0.140	820	180	52	0.110	430	85	27	0.099
R12.5×25.0	1140	370	90	0.162	890	250	70	0.140	560	140	44	0.125	300	60	24	0.100



RPM = rev./min.
Feed = mm/min.
Vc = m/min.
fz = mm/tooth

Material	Alloy Steels Tool Steels				Stainless Steels			
Hardness	HRc40~HRc45							
Strength	1300~1400 N/mm ²							
Diameter	RPM	Feed	VC	fz	RPM	Feed	VC	fz
R1.5×3.0	1680	45	16	0.013	2640	70	25	0.013
R2.0×4.0	1340	65	17	0.024	2110	95	27	0.023
R3.0×6.0	1010	70	19	0.035	1580	115	30	0.036
R4.0×8.0	750	70	19	0.047	1180	115	30	0.049
R5.0×10.0	570	85	18	0.075	900	130	28	0.072
R6.0×12.0	490	70	18	0.071	770	115	29	0.075
R8.0×16.0	370	65	19	0.088	590	110	30	0.093
R10.0×20.0	300	60	19	0.100	480	95	30	0.099
R12.5×25.0	210	40	16	0.095	330	65	26	0.098

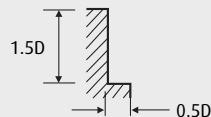


RPM = rev./min.
Feed = mm/min.
Vc = m/min.
fz = mm/tooth

■ HRE-PM4, HRE-PM4, HRC-PM4 Series

Multi Flute Roughing (Center Cut)

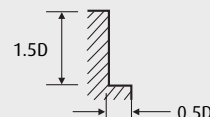
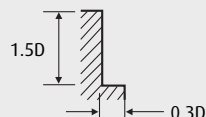
Material	Structural Steels Carbon Steels				Structural Steels Carbon Steels, Cast Irons				Carbon Steels Alloy Steels, Tool Steels				Prehardened Steels Alloy Steels, Tool Steels			
Hardness					~HRc 20				HRc 20~HRc30				HRc 30~HRc40			
Strength	~500 N/mm ²				500~800 N/mm ²				800~1000 N/mm ²				1000~1300 N/mm ²			
Diameter	RPM	Feed	VC	fz	RPM	Feed	VC	fz	RPM	Feed	VC	fz	RPM	Feed	VC	fz
6.0	3360	275	63	0.027	2640	215	50	0.027	1920	140	36	0.024	1560	125	29	0.027
8.0	2880	350	72	0.041	2280	275	57	0.040	1680	190	42	0.038	1260	150	32	0.040
10.0	2280	500	72	0.055	1800	380	57	0.053	1260	235	40	0.047	1070	190	34	0.044
12.0	1920	500	72	0.065	1440	395	54	0.069	1080	275	41	0.064	890	215	34	0.060
14.0	1680	500	74	0.074	1260	395	55	0.078	910	275	40	0.076	760	215	33	0.071
16.0	1440	500	72	0.087	1140	395	57	0.087	790	275	40	0.087	660	215	33	0.081
18.0	1260	500	71	0.099	1070	395	61	0.092	730	275	41	0.094	590	215	33	0.091
20.0	1150	510	72	0.111	910	395	57	0.109	640	275	40	0.107	530	215	33	0.101
25.0	950	500	75	0.105	720	380	57	0.106	500	265	39	0.106	430	215	34	0.100



The Feed, in long & extra long types, should be reduced by around 50%.

RPM = rev./min.
Feed = mm/min.
Vc = m/min.
fz = mm/tooth

Material	Alloy Steels Tool Steels				Stainless Steels			
Hardness	HRc40~HRc45							
Strength	1300~1400 N/mm ²							
Diameter	RPM	Feed	VC	fz	RPM	Feed	VC	fz
6.0	1090	90	21	0.028	1740	130	33	0.025
8.0	880	105	22	0.040	1440	170	36	0.039
10.0	750	135	24	0.045	1140	205	36	0.045
12.0	620	150	23	0.060	960	245	36	0.064
14.0	530	150	23	0.071	830	245	37	0.074
16.0	460	150	23	0.082	720	245	36	0.085
18.0	410	150	23	0.091	660	245	37	0.093
20.0	370	150	23	0.101	580	245	36	0.106
25.0	300	150	24	0.100	470	240	37	0.102



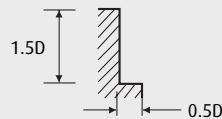
RPM = rev./min.
Feed = mm/min.
Vc = m/min.
fz = mm/tooth



■ HER-PM5 Series

Multi Flute Multiple Helix Short Roughing (Center Cut)

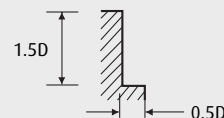
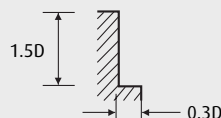
Material	Structural Steels Carbon Steels				Structural Steels Carbon Steels, Cast Irons				Carbon Steels Alloy Steels, Tool Steels				Prehardened Steels Alloy Steels, Tool Steels			
Hardness					~HRc 20				HRc 20~HRc30				HRc 30~HRc35			
Strength	~500 N/mm ²				500~800 N/mm ²				800~1000 N/mm ²				1000~1300 N/mm ²			
Diameter	RPM	Feed	VC	fz	RPM	Feed	VC	fz	RPM	Feed	VC	fz	RPM	Feed	VC	fz
6.0	4030	330	76	0.020	3170	260	60	0.021	2300	170	43	0.018	1870	150	35	0.020
8.0	3460	420	87	0.030	2740	330	69	0.030	2020	230	51	0.028	1510	180	38	0.030
10.0	2740	600	86	0.055	2160	455	68	0.053	1510	280	47	0.046	1280	230	40	0.045
12.0	2300	600	87	0.065	1730	475	65	0.069	1300	330	49	0.063	1070	260	40	0.061
14.0	2020	600	89	0.059	1510	475	66	0.063	1090	330	48	0.061	910	260	40	0.057
16.0	1730	600	87	0.069	1370	475	69	0.069	950	330	48	0.069	790	260	40	0.066
18.0	1510	600	85	0.079	1280	475	72	0.074	880	330	50	0.075	710	260	40	0.073
20.0	1380	610	87	0.088	1090	475	68	0.087	770	330	48	0.086	640	260	40	0.081
25.0	1140	600	90	0.105	860	455	68	0.106	600	320	47	0.107	520	260	41	0.100



The Feed, in long & extra long types, should be reduced by around 50%.

RPM = rev./min.
Feed = mm/min.
Vc = m/min.
fz = mm/tooth

Material	Alloy Steels Tool Steels				Stainless Steels			
Hardness	HRc40~HRc45							
Strength	1300~1400 N/mm ²							
Diameter	RPM	Feed	VC	fz	RPM	Feed	VC	fz
6.0	1310	105	25	0.020	2090	155	39	0.019
8.0	1060	125	27	0.029	1730	205	43	0.030
10.0	900	160	28	0.044	1370	245	43	0.045
12.0	750	180	28	0.060	1150	295	43	0.064
14.0	640	180	28	0.056	1000	295	44	0.059
16.0	550	180	28	0.065	860	295	43	0.069
18.0	500	180	28	0.072	790	295	45	0.075
20.0	450	180	28	0.080	700	295	44	0.084
25.0	360	180	28	0.100	560	290	44	0.104



RPM = rev./min.
Feed = mm/min.
Vc = m/min.
fz = mm/tooth



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