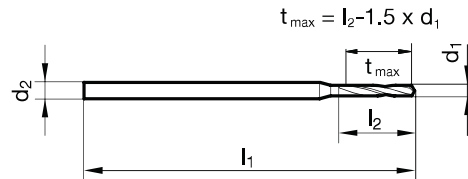


Tool material **HSS-E-PM**

Surface

- P** Steel ● facet point grinding • with reinforced shank • <math>\varnothing 0.15\text{ mm}</math> Co-alloyed high speed steel
  - M** Stainless steel ●
  - K** Cast iron ● high-alloyed steels
  - N** Aluminum ●
  - S** Titanium alloys ○
  - H** Hardened steel
- =Optimal  
○=Limited



Speeds and feeds information on pg. 489

Micro Drills

Diameter (d <sub>1</sub> )			d <sub>2</sub> h7	l <sub>1</sub>	t <sub>max</sub>	l <sub>2</sub>	EDP #
inch	wire/ltr	mm	mm	mm	mm	mm	
0.0051		0.13	1.00	25.00	0.61	0.80	9003030001300
0.0055		0.14	1.00	25.00	0.59	0.80	9003030001400
0.0059	#97	0.15	1.00	25.00	0.58	0.80	9003030001500
0.0063	#96	0.16	1.00	25.00	0.86	1.10	9003030001600
0.0067	#95	0.17	1.00	25.00	0.85	1.10	9003030001700
0.0071	#94	0.18	1.00	25.00	0.83	1.10	9003030001800
0.0073		0.19	1.00	25.00	0.82	1.10	9003030001850
0.0075	#93	0.19	1.00	25.00	0.82	1.10	9003030001900
0.0077		0.20	1.00	25.00	1.21	1.50	9003030001950
0.0079	#92	0.20	1.00	25.00	1.20	1.50	9003030002000
0.0083	#91	0.21	1.00	25.00	1.19	1.50	9003030002100
0.0085		0.22	1.00	25.00	1.18	1.50	9003030002150
0.0087	#90	0.22	1.00	25.00	1.17	1.50	9003030002200
0.0089		0.23	1.00	25.00	1.16	1.50	9003030002250
0.0091	#89	0.23	1.00	25.00	1.16	1.50	9003030002300
0.0094	#88	0.24	1.00	25.00	1.14	1.50	9003030002400
0.0096		0.25	1.00	25.00	1.53	1.90	9003030002450
0.0098	#87	0.25	1.00	25.00	1.53	1.90	9003030002500
0.0100		0.26	1.00	25.00	1.52	1.90	9003030002550
0.0102		0.26	1.00	25.00	1.51	1.90	9003030002600
0.0104		0.27	1.00	25.00	1.50	1.90	9003030002650
0.0106	#86	0.27	1.00	25.00	1.50	1.90	9003030002700
0.0110	#85	0.28	1.00	25.00	1.48	1.90	9003030002800
0.0114	#84	0.29	1.00	25.00	1.47	1.90	9003030002900
0.0116		0.30	1.00	25.00	1.46	1.90	9003030002950
0.0118		0.30	1.00	25.00	1.45	1.90	9003030003000
0.0122	#83	0.31	1.00	25.00	1.94	2.40	9003030003100
0.0126	#82	0.32	1.00	25.00	1.92	2.40	9003030003200
0.0130	#81	0.33	1.00	25.00	1.91	2.40	9003030003300
0.0134	#80	0.34	1.00	25.00	1.89	2.40	9003030003400
0.0138		0.35	1.00	25.00	1.88	2.40	9003030003500
0.0142		0.36	1.00	25.00	1.86	2.40	9003030003600
0.0146	#79	0.37	1.00	25.00	1.85	2.40	9003030003700
0.0150		0.38	1.00	25.00	1.83	2.40	9003030003800
0.0154		0.39	1.00	25.00	2.42	3.00	9003030003900
0.0157	1/64	0.40	1.00	25.00	2.40	3.00	9003030004000
0.0161	#78	0.41	1.00	25.00	2.39	3.00	9003030004100
0.0165		0.42	1.00	25.00	2.37	3.00	9003030004200
0.0169		0.43	1.00	25.00	2.36	3.00	9003030004300
0.0173		0.44	1.00	25.00	2.34	3.00	9003030004400
0.0177		0.45	1.00	25.00	2.33	3.00	9003030004500
0.0181	#77	0.46	1.00	25.00	2.31	3.00	9003030004600

Diameter (d <sub>1</sub> )			d <sub>2</sub> h7	l <sub>1</sub>	t <sub>max</sub>	l <sub>2</sub>	EDP #
inch	wire/ltr	mm	mm	mm	mm	mm	
0.0185		0.47	1.00	25.00	2.30	3.00	9003030004700
0.0189		0.48	1.00	25.00	2.28	3.00	9003030004800
0.0193		0.49	1.00	25.00	2.67	3.40	9003030004900
0.0197		0.50	1.00	25.00	2.65	3.40	9003030005000
0.0201	#76	0.51	1.00	25.00	2.64	3.40	9003030005100
0.0205		0.52	1.00	25.00	2.62	3.40	9003030005200
0.0207		0.53	1.00	25.00	2.61	3.40	9003030005250
0.0209	#75	0.53	1.00	25.00	2.61	3.40	9003030005300
0.0211		0.54	1.00	25.00	3.10	3.90	9003030005350
0.0213		0.54	1.00	25.00	3.09	3.90	9003030005400
0.0215		0.55	1.00	25.00	3.08	3.90	9003030005450
0.0217		0.55	1.00	25.00	3.08	3.90	9003030005500
0.0219		0.56	1.00	25.00	3.07	3.90	9003030005550
0.0220		0.56	1.00	25.00	3.06	3.90	9003030005600
0.0222		0.57	1.00	25.00	3.05	3.90	9003030005650
0.0224	#74	0.57	1.00	25.00	3.05	3.90	9003030005700
0.0228		0.58	1.00	25.00	3.03	3.90	9003030005800
0.0232		0.59	1.00	25.00	3.02	3.90	9003030005900
0.0236		0.60	1.00	25.00	3.00	3.90	9003030006000
0.0240	#73	0.61	1.00	25.00	3.29	4.20	9003030006100
0.0244		0.62	1.00	25.00	3.27	4.20	9003030006200
0.0248		0.63	1.00	25.00	3.26	4.20	9003030006300
0.0252	#72	0.64	1.00	25.00	3.24	4.20	9003030006400
0.0256		0.65	1.00	25.00	3.23	4.20	9003030006500
0.0260	#71	0.66	1.00	25.00	3.21	4.20	9003030006600
0.0264		0.67	1.00	25.00	3.20	4.20	9003030006700
0.0266		0.68	1.00	25.00	3.79	4.80	9003030006750
0.0268		0.68	1.00	25.00	3.78	4.80	9003030006800
0.0272		0.69	1.00	25.00	3.77	4.80	9003030006900
0.0276		0.70	1.00	25.00	3.75	4.80	9003030007000
0.0280	#70	0.71	1.00	25.00	3.74	4.80	9003030007100
0.0283		0.72	1.00	25.00	3.72	4.80	9003030007200
0.0287		0.73	1.00	25.00	3.71	4.80	9003030007300
0.0291	#69	0.74	1.00	25.00	3.69	4.80	9003030007400
0.0295		0.75	1.00	25.00	3.68	4.80	9003030007500
0.0299		0.76	1.00	25.00	4.16	5.30	9003030007600
0.0303		0.77	1.00	25.00	4.15	5.30	9003030007700
0.0307		0.78	1.00	25.00	4.13	5.30	9003030007800
0.0311	1/32 #68	0.79	1.00	25.00	4.12	5.30	9003030007900
0.0315		0.80	1.50	25.00	4.10	5.30	9003030008000
0.0319	#67	0.81	1.50	25.00	4.09	5.30	9003030008100
0.0323		0.82	1.50	25.00	4.07	5.30	9003030008200

Diameter (d <sub>1</sub> )			d2 h7	l <sub>1</sub>	t <sub>max</sub>	l <sub>2</sub>	EDP #
inch	wire/ltr	mm	mm	mm	mm	mm	
0.0327		0.83	1.50	25.00	4.06	5.30	9003030008300
0.0331	#66	0.84	1.50	25.00	4.04	5.30	9003030008400
0.0335		0.85	1.50	25.00	4.03	5.30	9003030008500
0.0339		0.86	1.50	25.00	4.71	6.00	9003030008600
0.0343		0.87	1.50	25.00	4.70	6.00	9003030008700
0.0346		0.88	1.50	25.00	4.68	6.00	9003030008800
0.0350	#65	0.89	1.50	25.00	4.67	6.00	9003030008900
0.0354		0.90	1.50	25.00	4.65	6.00	9003030009000
0.0358	#64	0.91	1.50	25.00	4.64	6.00	9003030009100
0.0360		0.92	1.50	25.00	4.63	6.00	9003030009150
0.0362		0.92	1.50	25.00	4.62	6.00	9003030009200
0.0366		0.93	1.50	25.00	4.61	6.00	9003030009300
0.0368		0.94	1.50	25.00	4.60	6.00	9003030009350
0.0370	#63	0.94	1.50	25.00	4.59	6.00	9003030009400
0.0374		0.95	1.50	25.00	4.58	6.00	9003030009500
0.0378		0.96	1.50	25.00	5.36	6.80	9003030009600
0.0382	#62	0.97	1.50	25.00	5.35	6.80	9003030009700
0.0386		0.98	1.50	25.00	5.33	6.80	9003030009800
0.0390	#61	0.99	1.50	25.00	5.32	6.80	9003030009900
0.0394		1.00	1.50	25.00	5.30	6.80	9003030010000
0.0396		1.01	1.50	25.00	5.29	6.80	9003030010050
0.0398		1.01	1.50	25.00	5.29	6.80	9003030010100
0.0402	#60	1.02	1.50	25.00	5.27	6.80	9003030010200
0.0406		1.03	1.50	25.00	5.26	6.80	9003030010300
0.0409	#59	1.04	1.50	25.00	5.24	6.80	9003030010400

Diameter (d <sub>1</sub> )			d2 h7	l <sub>1</sub>	t <sub>max</sub>	l <sub>2</sub>	EDP #
inch	wire/ltr	mm	mm	mm	mm	mm	
0.0413		1.05	1.50	25.00	5.23	6.80	9003030010500
0.0417		1.06	1.50	25.00	5.21	6.80	9003030010600
0.0421	#58	1.07	1.50	25.00	6.00	7.60	9003030010700
0.0425		1.08	1.50	25.00	5.98	7.60	9003030010800
0.0429	#57	1.09	1.50	25.00	5.97	7.60	9003030010900
0.0433		1.10	1.50	25.00	5.95	7.60	9003030011000
0.0437		1.11	1.50	25.00	5.94	7.60	9003030011100
0.0441		1.12	1.50	25.00	5.92	7.60	9003030011200
0.0453		1.15	1.50	25.00	5.88	7.60	9003030011500
0.0461		1.17	1.50	25.00	5.85	7.60	9003030011700
0.0465	#56	1.18	1.50	25.00	5.83	7.60	9003030011800
0.0469	3/64	1.19	1.50	25.00	6.72	8.50	9003030011900
0.0472		1.20	1.50	25.00	6.70	8.50	9003030012000
0.0480		1.22	1.50	25.00	6.67	8.50	9003030012200
0.0492		1.25	1.50	25.00	6.63	8.50	9003030012500
0.0500		1.27	1.50	25.00	6.60	8.50	9003030012700
0.0508		1.29	1.50	25.00	6.57	8.50	9003030012900
0.0512		1.30	1.50	25.00	6.55	8.50	9003030013000
0.0520	#55	1.32	1.50	25.00	6.52	8.50	9003030013200
0.0524		1.33	1.50	25.00	7.51	9.50	9003030013300
0.0531		1.35	1.50	25.00	7.48	9.50	9003030013500
0.0535		1.36	1.50	25.00	7.46	9.50	9003030013600
0.0551	#54	1.40	1.50	25.00	7.40	9.50	9003030014000
0.0728	#49	1.85	2.00	30.00	9.03	11.80	9003030018500

Material group	Hardness		SFM	Feed Rate - IPR									
	HRC	Bhn		.0039 in. .10 mm	.0063 in. .16 mm	.0098 in. .25 mm	.0118 in. .30 mm	.0197 in. .50 mm	.0248 in. .63 mm	.0315 in. .8 mm	.0394 in. 1.0 mm	.0591 in. 1.5 mm	.0787 in. 2.0 mm
Common structural steels	-	150	70	0.0003	0.0004	0.0004	0.0006	0.0007	0.0010	0.0012	0.0020	0.0024	0.0031
Free-cutting steels	25	255	60	0.0003	0.0004	0.0004	0.0006	0.0007	0.0010	0.0012	0.0020	0.0024	0.0031
Unalloyed heat-treatable steels	20	220	65	0.0002	0.0003	0.0004	0.0004	0.0006	0.0008	0.0009	0.0016	0.0020	0.0028
Alloyed heat-treatable steels	32	301	45	0.0002	0.0002	0.0003	0.0004	0.0004	0.0006	0.0008	0.0014	0.0018	0.0024
Unalloyed case hardened steels	25	255	60	0.0003	0.0004	0.0004	0.0006	0.0007	0.0010	0.0012	0.0020	0.0024	0.0031
Alloyed case hardened steels	32	301	45	0.0002	0.0002	0.0003	0.0004	0.0004	0.0006	0.0008	0.0014	0.0018	0.0024
Nitriding steels	32	301	45	0.0002	0.0002	0.0003	0.0004	0.0004	0.0006	0.0008	0.0014	0.0018	0.0024
Tool steels	25	255	50	0.0002	0.0002	0.0003	0.0004	0.0004	0.0006	0.0008	0.0014	0.0018	0.0024
High speed steels	43	402	45	0.0001	0.0002	0.0002	0.0003	0.0003	0.0005	0.0006	0.0011	0.0016	0.0021
Spring steels	38	354	25	0.0001	0.0001	0.0002	0.0002	0.0003	0.0004	0.0005	0.0009	0.0014	0.0018
Hardened steels	48	460											
Stainless steels, sulphured austenitic	28	273	60	0.0002	0.0002	0.0003	0.0004	0.0004	0.0006	0.0008	0.0014	0.0018	0.0024
Stainless steels, martensitic	36	337	45	0.0001	0.0002	0.0002	0.0003	0.0003	0.0005	0.0006	0.0011	0.0016	0.0021
Cast iron	23	242	85	0.0003	0.0004	0.0004	0.0006	0.0007	0.0010	0.0012	0.0020	0.0024	0.0031
Spheroidal graphite iron and malleable cast iron	23	242	60	0.0003	0.0004	0.0004	0.0006	0.0007	0.0010	0.0012	0.0020	0.0024	0.0031
Chilled cast iron	38	354											
New cast materials GGV	20	220											
New cast materials ADI	32	301											
Special alloys	54	549											
Ti and Ti-alloys	25	255											
Aluminium and Al-alloys	-	120											
Al wrought alloys	-	200											
Al cast alloys ≤ 10 % Si	-	180	85	0.0004	0.0005	0.0006	0.0007	0.0009	0.0013	0.0015	0.0024	0.0027	0.0037
Al cast alloys ≤ 24 % Si	-	180	60	0.0003	0.0004	0.0004	0.0006	0.0007	0.0010	0.0012	0.0020	0.0024	0.0031
Magnesium alloys	-	120	245	0.0003	0.0004	0.0004	0.0006	0.0007	0.0010	0.0012	0.0020	0.0024	0.0031
Copper, low-alloyed	-	150	140	0.0002	0.0003	0.0004	0.0004	0.0006	0.0008	0.0009	0.0016	0.0020	0.0028
Brass, short-chipping	-	180											
Brass, long-chipping	-	180	70	0.0002	0.0003	0.0004	0.0004	0.0006	0.0008	0.0009	0.0016	0.0020	0.0028
Bronze, short-chipping	-	180	70	0.0002	0.0002	0.0003	0.0004	0.0004	0.0006	0.0008	0.0014	0.0018	0.0024
Bronze, long-chipping	25	255	60	0.0002	0.0002	0.0003	0.0004	0.0004	0.0006	0.0008	0.0014	0.0018	0.0024
Duroplastics	32	301	50	0.0002	0.0002	0.0003	0.0004	0.0004	0.0006	0.0008	0.0014	0.0018	0.0024
Thermoplastics			60	0.0002	0.0002	0.0003	0.0004	0.0004	0.0006	0.0008	0.0014	0.0018	0.0024
Reinforced plastics - Kevlar													
Reinforced plastics - GFK / CFK													

Material group	Hardness		SFM	Feed Rate - IPR									
	HRC	Bhn		1/16 in. 1.590 mm	1/8 in. 3.170 mm	1/4 in. 6.350 mm	3/8 in. 9.520 mm	1/2 in. 12.700 mm	5/8 in. 15.870 mm	3/4 in. 19.050 mm	1 in. 25.400 mm	1 1/4 in. 31.750 mm	1 1/2 in. 38.100 mm
Common structural steels	-	150											
Free-cutting steels	25	255	90	0.0015	0.0040	0.0065	0.0080	0.0100					
Unalloyed heat-treatable steels	20	220											
Alloyed heat-treatable steels	32	301	45	0.0012	0.0030	0.0050	0.0065	0.0080					
Unalloyed case hardened steels	25	255	90	0.0015	0.0040	0.0065	0.0080	0.0100					
Alloyed case hardened steels	32	301	45	0.0012	0.0030	0.0050	0.0065	0.0080					
Nitriding steels	32	301	45	0.0012	0.0030	0.0050	0.0065	0.0080					
Tool steels	43	402	30	0.0010	0.0025	0.0040	0.0050	0.0065					
High speed steels	25	255	55	0.0012	0.0030	0.0050	0.0065	0.0080					
Spring steels	43	402	30	0.0010	0.0025	0.0040	0.0050	0.0065					
Hardened steels	38	354	25	0.0007	0.0020	0.0030	0.0040	0.0050					
Stainless steels, sulphured austenitic	48	460											
Stainless steels, martensitic	66	-											
Cast iron	28	273	45	0.0012	0.0030	0.0050	0.0065	0.0080					
Spheroidal graphite iron and malleable cast iron	36	337	30	0.0010	0.0025	0.0040	0.0050	0.0065					
Chilled cast iron	46	435	35	0.0010	0.0025	0.0040	0.0050	0.0065					
New cast materials GGV	23	242	115	0.0017	0.0050	0.0080	0.0100	0.0125					
New cast materials ADI	38	354	90	0.0017	0.0050	0.0080	0.0100	0.0125					
Special alloys	23	242	95	0.0017	0.0050	0.0080	0.0100	0.0125					
Ti and Ti-alloys	38	354	70	0.0017	0.0050	0.0080	0.0100	0.0125					
Aluminium and Al-alloys	38	354	25	0.0010	0.0025	0.0040	0.0050	0.0065					
Al wrought alloys	20	220											
Al cast alloys ≤ 10 % Si	32	301											
Al cast alloys ≤ 24 % Si	43	402											
Magnesium alloys	54	549											
Copper, low-alloyed	25	255	115	0.0015	0.0040	0.0065	0.0080	0.0100					
Brass, short-chipping	-	180											
Brass, long-chipping	-	180	145	0.0015	0.0040	0.0065	0.0080	0.0100					
Bronze, short-chipping	-	180	115	0.0012	0.0030	0.0050	0.0065	0.0080					
Bronze, long-chipping	25	255	95	0.0012	0.0030	0.0050	0.0065	0.0080					
Duroplastics	32	301	55	0.0012	0.0030	0.0050	0.0065	0.0080					
Thermoplastics													
Reinforced plastics - Kevlar													
Reinforced plastics - GFK / CFK													