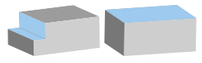
Clarkson

EUROPA TOOL

HSS-E-PM FLATTED SHANK END MILLS

General purpose HSS-E-PM end mills for use on a variety of materials

Clarkson

P			M		K		N					S		H		MACHINING GUIDE
1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39	40-41	
●	●		●		●	●										
●	●		●		●	●										
●	●		●		●	●										
●	●		●		●	●										

◆For material group examples, refer to page 2

◆For full material group tables, refer to pages 234-247

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3-FL THROWAWAY, SHORT LENGTH

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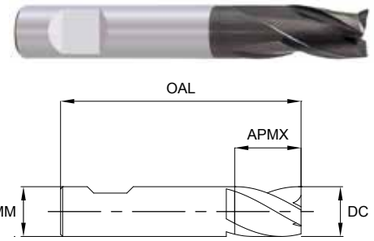
HSS-E PM | ZEFP 3 | FHA 30° | DIN 1835B



Series No. 128128

◆ cutting conditions : p.62-63

ASP60 powder metallurgy substrate
Unique VX high performance coating
DIN standard shanks

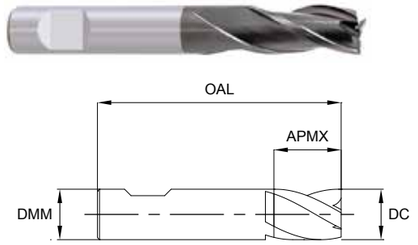
EUROPA CODE **ORDCODE**	DIAMETER **DC**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	O/ALL LENGTH **OAL**
1281280100	**1.0**	6	2.0	34
1281280150	**1.5**		3.0	34
1281280200	**2.0**		4.0	35
1281280250	**2.5**		5.0	36
1281280300	**3.0**		5.0	36
1281280350	**3.5**		6.0	37
1281280400	**4.0**		7.0	38
1281280450	**4.5**		7.0	38
1281280500	**5.0**		8.0	39
1281280550	**5.5**		8.0	39
1281280600	**6.0**		8.0	39
1281280650	**6.5**	8	10.0	42
1281280700	**7.0**		10.0	42
1281280750	**7.5**		10.0	42
1281280800	**8.0**		11.0	43
1281280850	**8.5**	10	11.0	48
1281280900	**9.0**		11.0	48
1281280950	**9.5**		11.0	48
1281281000	**10.0**		13.0	50
1281281200	**12.0**	12	16.0	58

Mill Dia. Tolerance **TCDC** (mm)	Shank Dia. Tolerance **TCDMM**
0.00 / -0.03	h6

ISO	P			M		K		N					S		H	
VDI GROUP	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39	40-41
● Primary ○ Secondary	●	●		●		●	●									

3-FL THROWAWAY, LONG LENGTH

Clarkson



HSS-E PM | ZEFP 3 | FHA 30° | DIN 1835B

Series No. 129128

◆ cutting conditions : p.62-63

ASP60 powder metallurgy substrate
Unique VX high performance coating
DIN standard shanks

EUROPA CODE **ORDCODE**	DIAMETER **DC**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	O/ALL LENGTH **OAL**
1291280150	**1.5**	6	4.0	35
1291280200	**2.0**		7.0	38
1291280250	**2.5**		8.0	39
1291280300	**3.0**		8.0	39
1291280350	**3.5**		10.0	41
1291280400	**4.0**		11.0	42
1291280450	**4.5**		11.0	42
1291280500	**5.0**		13.0	44
1291280550	**5.5**		13.0	44
1291280600	**6.0**		13.0	44
1291280650	**6.5**	8	16.0	48
1291280800	**8.0**		19.0	51
1291280850	**8.5**	10	19.0	56
1291281000	**10.0**		22.0	59

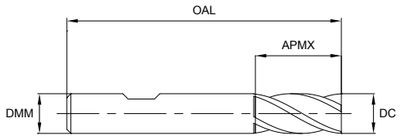
Mill Dia. Tolerance **TCDC** (mm)	Shank Dia. Tolerance **TCDMM**
0.00 / -0.03	h6

ISO	P			M		K		N					S		H	
VDI GROUP	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39	40-41
● Primary ○ Secondary	●	●		●		●	●									

4-FL STANDARD LENGTH

Clarkson

HSS-E PM | ZEFP 4 | FHA 35/37° | DIN 6535HB



Series No. PM75E

◆ cutting conditions : p.64-65

Specially designed to reduce vibration and improve workpiece finish. Excellent performance in unstable conditions.

EUROPA CODE **ORDCODE**	DIAMETER **DC**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	O/ALL LENGTH **OAL**
PM75E0300	**3.0**	6	8.0	52
PM75E0400	**4.0**		11.0	55
PM75E0500	**5.0**		13.0	57
PM75E0600	**6.0**		13.0	57
PM75E0800	**8.0**	8	19.0	69
PM75E1000	**10.0**	10	22.0	72
PM75E1200	**12.0**	12	26.0	83
PM75E1400	**14.0**		26.0	83
PM75E1600	**16.0**	16	32.0	92
PM75E1800	**18.0**		32.0	92
PM75E2000	**20.0**	20	38.0	104
PM75E2500	**25.0**	25	45.0	121

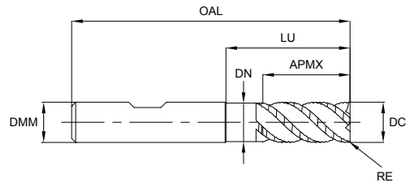
Mill Dia. Tolerance **TCDC** (mm)	Shank Dia. Tolerance **TCDMM**
0.00 / -0.03	h6

ISO	P			M		K		N					S		H	
VDI GROUP	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39	40-41
● Primary / ○ Secondary	●	●		●		●	●									

ROUGHING STANDARD LENGTH

Clarkson

HSS-E PM | ZEFP 4 | ZEFP 5 | FHA 44/45° | DIN 6535HB



Series No. PM75S

◆ cutting conditions : p.66

Specially designed to reduce vibration and improve workpiece finish. Excellent performance in unstable conditions.

EUROPA CODE **ORDCODE**	DIAMETER **DC**	CORNER RADIUS **RE**	SHANK DIAMETER **DMM**	LENGTH OF CUT **APMX**	O/ALL LENGTH **OAL**	NO. OF FLUTES **ZEFP**
PM75S0600	**6.0**	0.5	6	13.0	57	4
PM75S0800	**8.0**	0.5	10	19.0	69	4
PM75S1000	**10.0**	0.5		22.0	72	4
PM75S1200	**12.0**	0.5	12	26.0	83	4
PM75S1400	**14.0**	1.0		26.0	83	5
PM75S1600	**16.0**	1.0	16	32.0	92	5
PM75S1800	**18.0**	1.0		32.0	92	5
PM75S2000	**20.0**	1.0	20	38.0	104	5
PM75S2500	**25.0**	1.0	25	45.0	121	5

Mill Dia. **DC** (mm)	Mill Dia. Tolerance **TCDC** (mm)	Radius Tolerance (mm) **RETOLL**	Radius Tolerance (mm) **RETOLU**	Shank Dia. Tolerance **TCDMM**
6.0 - 10.0	0.075 / -0.075	-0.03	+0.03	h6
12.0 - 18.0	0.090 / -0.090			
20.0 - 25.0	0.105 / -0.105			

ISO	P			M		K		N					S		H	
VDI GROUP	1-5	6-9	10-11	12, 13	14	15-16	17-20	21-25	26-28	29.1	29.2	30	31-35	36-37	38-39	40-41
● Primary / ○ Secondary	●	●		●		●	●									

Clarkson

HSS-E-PM
CUTTING DATA

CUTTING DATA

Clarkson

128128, 129128 (3 Flute Throwaway)

VDI MATERIAL GROUP			HRc	SLOTTING	Size (mm)								
					1.0	2.0	3.0	4.0	5.0	6.0	8.0	10.0	12.0
P	1-5	Non-alloy Steel	<25	v_c (m/min)	30	36	38	45	49	52	54	54	54
				n	9550	5730	4000	3580	3120	2750	2150	1720	1430
				f_z	0.002	0.004	0.007	0.009	0.012	0.021	0.029	0.044	0.052
				f (mm/min)	57	70	85	95	110	170	185	225	220
	6-9	Low alloy Steel	25-35	v_c (m/min)	20	23	25	29	32	33	35	35	35
				n	6360	3660	2650	2300	2030	1750	1390	1115	925
				f_z	0.001	0.003	0.005	0.009	0.012	0.021	0.028	0.039	0.047
				f (mm/min)	15	30	40	60	70	110	115	125	130
M	12-13	Ferritic/ Martensitic Stainless Steel		v_c (m/min)	12	16	22	25	27	27	28	29	30
				n	3820	2545	2335	1990	1720	1430	1110	920	795
				f_z	0.003	0.005	0.008	0.012	0.014	0.023	0.031	0.044	0.052
				f (mm/min)	30	35	55	70	70	95	100	120	120
K	15-20	Cast Iron		v_c (m/min)	30	36	38	45	49	52	54	54	54
				n	9550	5730	4000	3580	3120	2750	2150	1720	1430
				f_z	0.002	0.004	0.007	0.009	0.012	0.021	0.029	0.044	0.052
				f (mm/min)	57	70	85	95	110	170	185	225	220

◆ The feed rate for long length tools should be reduced by up to 50%

v_c - cutting speed (m/min)
n - RPM (rev/min)
f_Z - feed rate (mm/tooth)
f - feed rate (mm/rev)
z - No. of teeth
a_p - axial depth of cut
a_e - radial depth of cut

To calculate RPM from cutting speed: $n = \frac{v_c * 1000}{\pi * \varnothing}$

To calculate cutting speed from RPM: $v_c = \frac{n * \pi * \varnothing}{1000}$

All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

CUTTING DATA

Clarkson

128128, 129128 (3 Flute Throwaway)

VDI MATERIAL GROUP			HRc	SIDE CUTTING	Size (mm)							
					1.5	2.0	3.0	4.0	5.0	6.0	8.0	10.0
P	1-5	Non-alloy Steel	<25	v_c (m/min)	39	41	43	53	55	59	60	60
				n	8280	6525	4565	4220	3500	3130	2385	1910
				f_z	0.003	0.004	0.008	0.011	0.014	0.023	0.033	0.043
				f (mm/min)	75	75	110	135	145	215	235	245
	6-9	Low alloy Steel	25-35	v_c (m/min)	25	29	31	35	38	41	44	44
				n	5300	4615	3290	2785	2420	2175	1750	1400
				f_z	0.003	0.004	0.007	0.01	0.014	0.025	0.036	0.05
				f (mm/min)	45	55	65	80	100	160	185	210
M	12-13	Ferritic/ Martensitic Stainless Steel		v_c (m/min)	17	20	27	32	35	36	37	37
				n	3600	3180	2865	2545	2225	1910	1470	1175
				f_z	0.004	0.006	0.01	0.013	0.015	0.022	0.036	0.047
				f (mm/min)	40	55	85	95	100	125	155	165
K	15-20	Cast Iron		v_c (m/min)	39	41	43	53	55	59	60	60
				n	8280	6525	4565	4220	3500	3130	2385	1910
				f_z	0.003	0.004	0.007	0.01	0.015	0.025	0.033	0.043
				f (mm/min)	75	75	110	135	145	215	235	245

v_c - cutting speed (m/min)
n - RPM (rev/min)
f_Z - feed rate (mm/tooth)
f - feed rate (mm/rev)
z - No. of teeth
a_p - axial depth of cut
a_e - radial depth of cut

To calculate RPM from cutting speed: $n = \frac{v_c * 1000}{\pi * \varnothing}$

To calculate cutting speed from RPM: $v_c = \frac{n * \pi * \varnothing}{1000}$

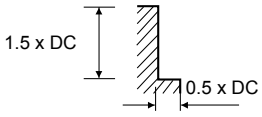
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

CUTTING DATA

Clarkson

PM75S (4 & 5 Flute Roughing)

VDI MATERIAL GROUP			HRc		Size (mm)								
					6.0	**8.0**	**10.0**	**12.0**	**14.0**	**16.0**	**18.0**	**20.0**	**25.0**
P	1-5	Non-alloy Steel	**<25**	v_c (m/min)	60	69	68	65	66	69	72	68	68
				n	3185	2745	2165	1725	1500	1370	1270	1080	865
				f_z	0.021	0.03	0.056	0.069	0.063	0.069	0.074	0.087	0.106
				f (mm/min)	268	330	485	476	473	474	470	470	459
	6-9	Low alloy Steel	**25-35**	v_c (m/min)	43	51	47	49	48	48	50	48	47
				n	2280	2030	1495	1300	1090	955	885	760	600
				f_z	0.018	0.028	0.046	0.063	0.061	0.069	0.086	0.086	0.107
				f (mm/min)	164	227	275	328	333	330	380	329	320
M	12-13	Ferritic/ Martensitic Stainless Steel		v_c (m/min)	39	43	43	43	44	43	45	44	44
				n	2070	1710	1365	1140	1000	855	795	700	560
				f_z	0.019	0.03	0.045	0.064	0.059	0.069	0.075	0.084	0.104
				f (mm/min)	157	205	246	292	295	295	299	294	290
K	15-20	Cast Iron		v_c (m/min)	40	50	45	45	45	50	50	50	45
				n	2120	1990	1430	1190	1020	995	885	795	570
				f_z	0.02	0.03	0.053	0.069	0.063	0.069	0.062	0.072	0.088
				f (mm/min)	170	239	304	330	322	343	274	287	252



v_c - cutting speed (m/min)
n - RPM (rev/min)
f_z - feed rate (mm/tooth)
f - feed rate (mm/rev)
z - No. of teeth
a_p - axial depth of cut
a_e - radial depth of cut

To calculate RPM from cutting speed: $n = \frac{v_c * 1000}{\pi * \varnothing}$

To calculate cutting speed from RPM: $v_c = \frac{n * \pi * \varnothing}{1000}$

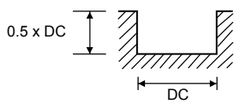
All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

CUTTING DATA

Clarkson

PM75E (4 Flute End Mill)

VDI MATERIAL GROUP			HRc	SLOTTING	Size (mm)								
					6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	25.0
P	1-5	Non-alloy Steel	<25	v_c (m/min)	70	70	77	77	77	77	77	77	77
				n	3715	2785	2450	2040	1750	1530	1360	1225	980
				f_z	0.016	0.028	0.039	0.047	0.049	0.053	0.059	0.065	0.063
				f (mm/min)	238	312	383	384	343	325	322	319	247
	6-9	Low alloy Steel	25-35	v_c (m/min)	44	44	49	49	49	49	49	49	49
				n	2335	1750	1560	1300	1115	975	865	780	620
				f_z	0.016	0.028	0.038	0.047	0.05	0.052	0.058	0.066	0.065
				f (mm/min)	149	196	237	244	223	203	201	206	162
M	12-13	Ferritic/ Martensitic Stainless Steel		v_c (m/min)	48	48	48	48	48	48	48	48	48
				n	2545	1910	1525	1270	1090	955	850	760	610
				f_z	0.018	0.029	0.048	0.056	0.06	0.063	0.081	0.077	0.078
				f (mm/min)	183	222	294	285	262	241	275	235	191
K	15-20	Cast Iron		v_c (m/min)	45	55	50	50	50	55	55	55	50
				n	2385	2185	1590	1325	1135	1095	970	875	635
				f_z	0.018	0.028	0.038	0.047	0.05	0.052	0.059	0.066	0.065
				f (mm/min)	172	245	242	249	227	228	230	231	166



v_c - cutting speed (m/min)
n - RPM (rev/min)
f_Z - feed rate (mm/tooth)
f - feed rate (mm/rev)
z - No. of teeth
a_p - axial depth of cut
a_e - radial depth of cut

To calculate RPM from cutting speed: $n = \frac{v_c * 1000}{\pi * \varnothing}$

To calculate cutting speed from RPM: $v_c = \frac{n * \pi * \varnothing}{1000}$

All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.

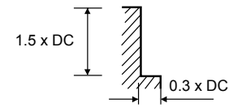
HSS-E-PM END MILLS

CUTTING DATA

Clarkson

PM75E (4 Flute End Mill)

VDI MATERIAL GROUP			HRc	SIDE CUTTING	Size (mm)								
					6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	25.0
P	1-5	Non-alloy Steel	<25	v_c (m/min)	70	70	77	77	77	77	77	77	77
				n	3715	2785	2450	2040	1750	1530	1360	1225	980
				f_z	0.016	0.028	0.039	0.047	0.049	0.053	0.059	0.065	0.063
				f (mm/min)	238	312	383	384	343	325	322	319	247
	6-9	Low alloy Steel	25-35	v_c (m/min)	44	44	49	49	49	49	49	49	49
				n	2335	1750	1560	1300	1115	975	865	780	620
				f_z	0.016	0.028	0.038	0.047	0.05	0.052	0.058	0.066	0.065
				f (mm/min)	149	196	237	244	223	203	201	206	162
M	12-13	Ferritic/ Martensitic Stainless Steel		v_c (m/min)	48	48	48	48	48	48	48	48	48
				n	2545	1910	1525	1270	1090	955	850	760	610
				f_z	0.018	0.029	0.048	0.056	0.06	0.063	0.081	0.077	0.078
				f (mm/min)	183	222	294	285	262	241	275	235	191
K	15-20	Cast Iron		v_c (m/min)	45	55	50	50	50	55	55	55	50
				n	2385	2185	1590	1325	1135	1095	970	875	635
				f_z	0.018	0.028	0.038	0.047	0.05	0.052	0.059	0.066	0.065
				f (mm/min)	172	245	242	249	227	228	230	231	166



v_c - cutting speed (m/min)
n - RPM (rev/min)
f_Z - feed rate (mm/tooth)
f - feed rate (mm/rev)
z - No. of teeth
a_p - axial depth of cut
a_e - radial depth of cut

To calculate RPM from cutting speed: $n = \frac{v_c * 1000}{\pi * \varnothing}$

To calculate cutting speed from RPM: $v_c = \frac{n * \pi * \varnothing}{1000}$

All recommendations are based on ideal machining conditions. Adjustments may need to be made according to your set-up. The recommendations for speeds, feeds and other parameters presented in this chart are nominal recommendations and should be considered only as good starting points.