

## 2 Flutes Square Endmills ES2-PL



### SIDE MILLING

Work-piece	Cast iron, Carbon steel, Alloy steel		Carbon steel, Alloy steel		Alloy steel, Tool steel (Free-Cutting)		Alloy steel, Tool steel, Stainless steel		Hardened steel, Tool steel, Alloy steel	
Mill DIA $\phi$ D (mm)	HRC25 $\geq$		~HRC30		HRC30~HRC38		HRC38~HRC45		HRC46~HRC52	
	V=90~150m/min		V=50~100m/min		V=40~85m/min		V=35~70m/min		V=25~60m/min	
	N (rpm)	F mm/min	N (rpm)	F mm/min	N (rpm)	F mm/min	N (rpm)	F mm/min	N (rpm)	F mm/min
3	10500	315	7400	185	5300	95	4750	70	3715	55
4	7950	315	5570	165	3980	80	3580	72	2785	55
5	6370	320	4500	180	3180	100	2850	85	2250	60
6	5300	318	3715	185	2650	105	2350	85	2000	70
8	3980	300	2950	175	2200	105	1850	85	1590	70
10	3185	285	2200	160	1590	90	1450	70	1365	65
12	2650	290	1850	150	1350	90	1200	70	1115	60
14	2275	260	1585	145	1155	85	1000	65	900	60
16	1990	240	1400	140	995	80	895	63	795	55
20	1590	220	1115	130	795	75	715	60	635	50

Depth of cut	$a_p \leq 1.5D$ $a_e \leq 0.1-0.2D$			$a_p \leq 1D$ $a_e \leq 0.05D$

1. These mill conditions are for a mill where the tool extension length is 5 times the diameter of the endmill. When length of the tool extension from the machines is long, reduce the speed and feed and milling depth.
2. Use high-stiffness and precise machine and holder; if the machine stiffness is low or the workpiece is not well installed, or chattering occurs, please reduce the speed and rate *proportionately*.
3. Reduce by 30% the above cutting parameters for uncoated endmills. The uncoated type endmills are not recommended for over HRC40.
4. High pressure coolant or air-jet to be supplied for good chip removal.

4 Flutes Square Endmills ES4-PL



SIDE MILLING

Work-piece	Cast iron, Carbon steel, Alloy steel		Carbon steel, Alloy steel		Alloy steel, Tool steel (Free-Cutting)		Alloy steel, Tool steel, Stainless steel		Hardened steel, Tool steel, Alloy steel	
Mill DIA $\phi$ D (mm)	HRC25 $\geq$		~HRC30		HRC30~HRC38		HRC38~HRC45		HRC46~HRC52	
	V=90~150m/min		V=60~120m/min		V=40~90m/min		V=35~75m/min		V=30~65m/min	
	N (rpm)	F mm/min	N (rpm)	F mm/min	N (rpm)	F mm/min	N (rpm)	F mm/min	N (rpm)	F mm/min
3	9800	585	6370	380	5300	225	3800	120	3185	90
4	7350	585	4800	400	3950	220	2850	135	2390	115
5	5850	585	3850	370	3150	220	2250	140	2050	125
6	4900	590	3800	420	3150	265	2200	175	1850	130
8	3650	510	2850	355	2350	230	1650	185	1590	135
10	2950	470	2250	315	1900	210	1300	165	1275	125
12	2450	440	1900	290	1590	200	1100	145	1065	115
14	2100	420	1650	280	1350	190	935	125	900	105
16	1850	405	1450	265	1200	185	835	110	795	95
20	1450	350	1150	225	955	165	665	95	635	80

Depth of cut	$a_p \leq 1.5D$ $a_e \leq 0.1D$			$a_p \leq 1D$ $a_e \leq 0.05D$

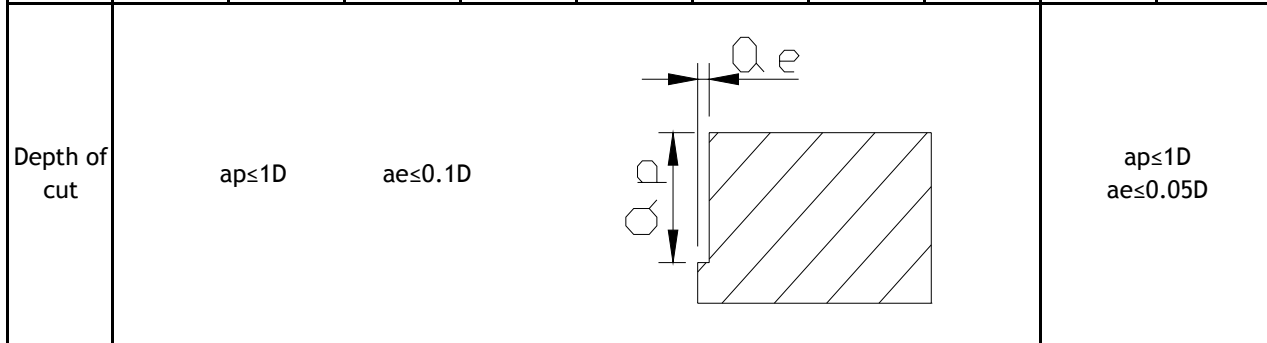
1. These mill conditions are for a mill where the tool extension length is 5 times the diameter of the endmill. When length of the tool extension from the machines is long, reduce the speed and feed and milling depth.
2. Use high-stiffness and precise machine and holder; if the machine stiffness is low or the workpiece is not well installed, or chattering occurs, please reduce the speed and rate *proportionately*.
3. Reduce by 30% the above cutting parameters for uncoated endmills. The uncoated type endmills are not recommended for over HRC40.
4. High pressure coolant or air-jet to be supplied for good chip removal.

4 Flutes Square Endmills ES4-PL



SIDE MILLING (High-Speed)

Work-piece	Cast iron, Carbon steel, Alloy steel		Carbon steel, Alloy steel		Alloy steel, Tool steel (Free-Cutting)		Alloy steel, Tool steel, Stainless steel		Hardened steel, Tool steel, Alloy steel	
Mill DIA $\phi$ D (mm)	HRC25 $\geq$		~HRC30		HRC30~HRC38		HRC38~HRC45		HRC46~HRC52	
	V=180m/min		V=180m/min		V=180m/min		V=150m/min		V=120m/min	
	N (rpm)	F mm/min	N (rpm)	F mm/min	N (rpm)	F mm/min	N (rpm)	F mm/min	N (rpm)	F mm/min
3	19100	1910	19100	1430	19100	840	15920	635	12730	485
4	14300	1830	14300	1430	14300	860	11950	715	9550	575
5	11450	1830	11450	1375	11450	825	9555	765	7640	615
6	9550	1910	9550	1335	9550	800	7960	795	6360	635
8	7165	1860	7165	1320	7165	800	5970	715	4777	550
10	5730	1600	5730	1150	5730	690	4775	670	3800	500
12	4775	1530	4775	1150	4775	690	3980	635	3180	485
14	4000	1440	4000	1080	4000	650	3400	610	2700	455
16	3580	1430	3580	1075	3580	645	2985	595	2380	440
20	2865	1300	2865	975	2865	585	2390	525	1910	385



1. These mill conditions are for a mill where the tool extension length is 5 times the diameter of the endmill. When length of the tool extension from the machines is long, reduce the speed and feed and milling depth.
2. Use high-stiffness and precise machine and holder; if the machine stiffness is low or the workpiece is not well installed, or chattering occurs, please reduce the speed and rate *proportionately*.
3. Reduce by 30% the above cutting parameters for uncoated endmills. The uncoated type endmills are not recommended for over HRC40.
4. High pressure coolant or air-jet to be supplied for good chip removal.

## 2 Flutes Square Endmills ES2-PL



### SLOTTING

Work-piece	Cast iron, Carbon steel, Alloy steel		Carbon steel, Alloy steel		Alloy steel, Tool steel (Free-Cutting)		Alloy steel, Tool steel, Stainless steel		Hardened steel, Tool steel, Alloy steel	
Mill DIA $\phi$ D (mm)	HRC25 $\geq$		~HRC30		HRC30~HRC38		HRC38~HRC45		HRC46~HRC52	
	V=60~80m/min		V=40~60m/min		V=30~50m/min		V=20~40m/min		V=15~30m/min	
	N (rpm)	F mm/min	N (rpm)	F mm/min	N (rpm)	F mm/min	N (rpm)	F mm/min	N (rpm)	F mm/min
3	6800	140	5300	100	4200	70	3400	50	2120	25
4	5100	140	3980	100	3180	70	2550	50	1590	25
5	4100	140	3180	100	2550	70	2030	50	1275	25
6	3400	140	2650	100	2120	70	1700	50	1060	25
8	2550	140	1990	100	1590	70	1270	50	795	25
10	2000	140	1590	100	1270	70	1020	50	636	25
12	1700	140	1330	100	1060	70	850	50	530	25
14	1450	140	1140	100	910	70	735	50	455	25
16	1270	140	1000	100	800	70	636	50	400	25
20	1000	140	800	100	636	70	450	50	315	25
Depth of cut									$a_p \leq 0.05D$	

1. These mill conditions are for a mill where the tool extension length is 5 times the diameter of the endmill. When length of the tool extension from the machines is long, reduce the speed and feed and milling depth.
2. Use high-stiffness and precise machine and holder; if the machine stiffness is low or the workpiece is not well installed, or chattering occurs, please reduce the speed and rate *proportionately*.
3. Reduce by 30% the above cutting parameters for uncoated endmills. The uncoated type endmills are not recommended for over HRC40.
4. High pressure coolant or air-jet to be supplied for good chip removal.

# 4 Flutes Square Endmills ES4-PL



## SLOTTING

Work-piece	Cast iron, Carbon steel, Alloy steel		Carbon steel, Alloy steel		Alloy steel, Tool steel (Free-Cutting)		Alloy steel, Tool steel, Stainless steel		Hardened steel, Tool steel, Alloy steel	
Mill DIA $\phi$ D (mm)	HRC25 $\geq$		~HRC30		HRC30~HRC38		HRC38~HRC45		HRC46~HRC52	
	V=45~60m/min		V=40~55m/min		V=35~50m/min		V=25~40m/min		V=15~30m/min	
	N (rpm)	F mm/min	N (rpm)	F mm/min	N (rpm)	F mm/min	N (rpm)	F mm/min	N (rpm)	F mm/min
3	5300	210	4770	190	4245	170	3610	145	2120	85
4	3980	235	3580	215	3185	190	2700	160	1590	95
5	3185	255	2865	230	2550	205	2165	175	1275	100
6	2650	265	2388	238	2125	212	1805	180	1060	105
8	1990	240	1790	215	1590	190	1355	165	795	100
10	1590	220	1435	200	1275	180	1080	150	636	90
12	1325	215	1195	190	1060	170	900	145	530	85
14	1135	205	1025	185	910	165	775	140	455	80
16	995	200	895	180	795	160	675	135	400	75
20	795	175	725	160	635	140	540	120	315	70
Depth of cut									$ap \leq 0.05D$	

1. These mill conditions are for a mill where the tool extension length is 5 times the diameter of the endmill. When length of the tool extension from the machines is long, reduce the speed and feed and milling depth.
2. Use high-stiffness and precise machine and holder; if the machine stiffness is low or the workpiece is not well installed, or chattering occurs, please reduce the speed and rate *proportionately*.
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