

# Performance Unequaled...

with chatter free milling

Super Smooth  
TiAlN Coating

Unequal Flute Helix  
30° / 32°

- Vibration free milling
- Improved productivity
- Long tool life
- Suits a wide range of materials & operation types

## ***HARMONY ENDMILLS***

for an on-site demonstration contact  
Sutton Tools on 1800 335 350

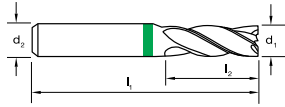
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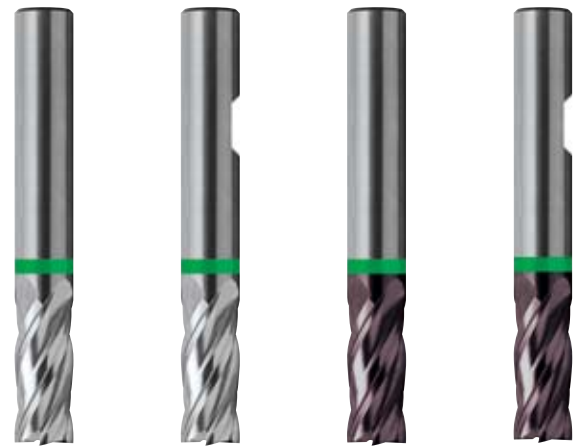
# Endmills 4 Flute - Regular *Harmony*



- Chatter free milling - Unequal flute index
- Operates in materials up to 1400 N/mm<sup>2</sup>
- **BrT** - for soft steels & non-ferrous material
- **TiAlN** - for various materials as well as abrasive & difficult materials, offering longer wear life
- SPM tool material offers higher edge hardness



**DIN 844K**



Catalogue Code	<b>E133</b>		<b>E218</b>		<b>E134</b>		<b>E219</b>					
Discount Group	B0610		B0610		B0610		B0610					
Material	<b>SPM</b>		<b>SPM</b>		<b>SPM</b>		<b>SPM</b>					
Surface Finish	<b>BrT</b>		<b>BrT</b>		<b>TiAlN</b>		<b>TiAlN</b>					
Colour Ring & Application	<b>UNI</b>		<b>UNI</b>		<b>UNI</b>		<b>UNI</b>					
Geometry	R30° / 32°		R30° / 32°		R30° / 32°		R30° / 32°					
Shank Form (DIN 1835 Part 1)	A		B		A		B					
Shank Tolerance	h6		h6		h6		h6					
d <sub>1</sub>	l <sub>1</sub>	l <sub>2</sub>	d <sub>2</sub>	z	Price	Item #	Price	Item #	Price	Item #	Price	Item #
1	49	3	6	4		•		•		•		•
2	51	7	6	4		•		•		•		•
3	52	8	6	4		•		•		•		•
4	55	11	6	4	-	407883	-	416359	-	409689	-	417875
5	57	13	6	4	-	407890	-	416366	-	409696	-	417882
6	57	13	6	4	-	407906	-	416373	-	409702	-	417899
8	69	19	10	4	-	407920	-	416397	-	409726	-	417912
10	72	22	10	4	-	407944	-	416410	-	409740	-	417936
12	83	26	12	4	-	407968	-	416434	-	409764	-	417950
14	83	26	12	4	-	407975	-	416441	-	409771	-	417967
16	92	32	16	4	-	407982	-	416458	-	409788	-	417974
18	92	32	16	4	-	407999	-	416465	-	409795	-	417981
20	104	38	20	4	-	408002	-	416472	-	409801	-	417998
22	121	45	20	4		•		•		•		•
25	121	45	25	4		•		•		•		•
30	133	45	25	4		•		•		•		•
32	133	53	32	4		•		•		•		•
40	155	63	32	4		•		•		•		•



Ø	ROUGHING			FINISHING		
	ae = 0.5 x Ø ap = 1.0 x Ø			ae = 0.125 x Ø ap = 1.0 x Ø		
	Soft Steels, Non-Alloy Steels & Grey Cast Iron	Alloy Steel up to 1000 N/mm <sup>2</sup> Soft Stainless Steels	Difficult to machine materials, Hard Stainless Steels, High Temperature Alloy Steels	Soft Steels, Non-Alloy Steels & Grey Cast Iron	Alloy Steel up to 1000 N/mm <sup>2</sup> Soft Stainless Steels	Difficult to machine materials, Hard Stainless Steels, High Temperature Alloy Steels
Vc (m/min)	40-60	20-30	10-15	70-90	30-40	15-20
Ø	fz (mm/tooth)	fz (mm/tooth)	fz (mm/tooth)	fz (mm/tooth)	fz (mm/tooth)	fz (mm/tooth)
1	0.006	0.003	0.003	0.008	0.005	0.005
2	0.012	0.005	0.005	0.017	0.008	0.008
3	0.017	0.010	0.010	0.024	0.015	0.015
4	0.020	0.015	0.015	0.028	0.023	0.023
5	0.026	0.020	0.020	0.036	0.030	0.030
6	0.033	0.020	0.020	0.046	0.030	0.030
8	0.041	0.029	0.029	0.057	0.044	0.044
10	0.058	0.036	0.036	0.081	0.054	0.054
12	0.072	0.046	0.046	0.101	0.069	0.069
14	0.080	0.049	0.049	0.112	0.074	0.074
16	0.087	0.052	0.052	0.122	0.078	0.078
18	0.094	0.058	0.058	0.132	0.087	0.087
20	0.100	0.065	0.065	0.140	0.098	0.098

**LEGEND**

n = rev. per minute  
 v<sub>c</sub> = cutting speed (m/min)  
 f<sub>z</sub> = feed per tooth (mm/tooth)  
 v<sub>f</sub> = feed rate (mm/min)  
 z = no. cutting edges  
 Q = metal removal rate (cm<sup>3</sup>/min)

**FORMULAS**

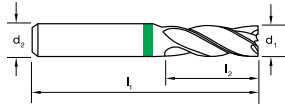
$n = (v_c \times 1000) / (\phi \times \pi)$   
 $v_c = (\phi \times \pi \times n) / 1000$   
 $f_z = v_f / (z \times n)$   
 $v_f = f_z \times z \times n$   
 $Q = (ae \times ap \times v_f) / 1000$

• Available on request as special manufacture. Subject to lead time.

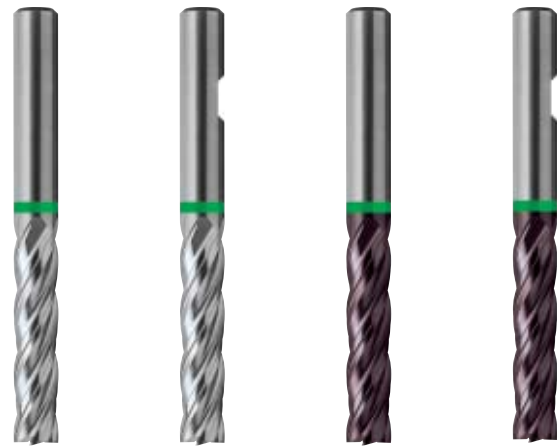
# Endmills 4 Flute - Long Harmony



- Chatter free milling - Unequal flute index
- Operates in materials up to 1400 N/mm<sup>2</sup>
- **Brt** - for soft steels & non-ferrous material
- **TiAIN** - for various materials as well as abrasive & difficult materials, offering longer wear life
- SPM tool material offers higher edge hardness



DIN 844L



Catalogue Code	<b>E135</b>		<b>E220</b>		<b>E136</b>		<b>E221</b>					
Discount Group	B0610		B0610		B0610		B0610					
Material	<b>SPM</b>		<b>SPM</b>		<b>SPM</b>		<b>SPM</b>					
Surface Finish	<b>Brt</b>		<b>Brt</b>		<b>TiAIN</b>		<b>TiAIN</b>					
Colour Ring & Application	<b>UNI</b>		<b>UNI</b>		<b>UNI</b>		<b>UNI</b>					
Geometry	R30° / 32°		R30° / 32°		R30° / 32°		R30° / 32°					
Shank Form (DIN 1835 Part 1)	A		B		A		B					
Shank Tolerance	h6		h6		h6		h6					
$d_1$	$l_1$	$l_2$	$d_2$	$z$	Price	Item #	Price	Item #	Price	Item #	Price	Item #
2	54	10	6	4		•		•		•		•
3	56	12	6	4		•		•		•		•
4	63	19	6	4		•		•		•		•
5	68	24	6	4		•		•		•		•
6	68	24	6	4	-	408095	-	416564	-	409894	-	418087
8	88	38	10	4	-	408118	-	416588	-	409917	-	418100
10	95	45	10	4	-	408132	-	416601	-	409931	-	418124
12	110	53	12	4	-	408156	-	416625	-	409955	-	418148
14	110	53	12	4	-	408163	-	416632	-	409962	-	418155
16	123	63	16	4	-	408170	-	416649	-	409979	-	418162
18	123	63	16	4	-	408187	-	416656	-	409986	-	418179
20	141	75	20	4	-	408194	-	416663	-	409993	-	418186
22	141	75	20	4		•		•		•		•
25	166	90	25	4		•		•		•		•
30	166	90	25	4		•		•		•		•



$\emptyset$	ROUGHING			FINISHING		
	$ae = 0.5 \times \emptyset \quad ap = 1.0 \times \emptyset$			$ae = 0.125 \times \emptyset \quad ap = 1.0 \times \emptyset$		
	Soft Steels, Non-Alloy Steels & Grey Cast Iron	Alloy Steel up to 1000 N/mm <sup>2</sup> Soft Stainless Steels	Difficult to machine materials, Hard Stainless Steels, High Temperature Alloy Steels	Soft Steels, Non-Alloy Steels & Grey Cast Iron	Alloy Steel up to 1000 N/mm <sup>2</sup> Soft Stainless Steels	Difficult to machine materials, Hard Stainless Steels, High Temperature Alloy Steels
Vc (m/min)	30-50	16-24	8-12	50-70	24-32	12-16
$\emptyset$	fz (mm/tooth)	fz (mm/tooth)	fz (mm/tooth)	fz (mm/tooth)	fz (mm/tooth)	fz (mm/tooth)
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**LEGEND**

n = rev. per minute  
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 $f_z$  = feed per tooth (mm/tooth)  
 $v_f$  = feed rate (mm/min)  
z = no. cutting edges  
Q = metal removal rate (cm<sup>3</sup>/min)

**FORMULAS**

$n = (v_c \times 1000) / (\emptyset \times \pi)$   
 $v_c = (\emptyset \times \pi \times n) / 1000$   
 $f_z = v_f / (z \times n)$   
 $v_f = f_z \times z \times n$   
 $Q = (ae \times ap \times v_f) / 1000$

• Available on request as special manufacture. Subject to lead time.

## Performance Unequaled... with vibration free milling.

With many years of cutting tool design & manufacturing behind it, Sutton Tools have applied their latest developments & resources to launch a new endmill, which caters for more than any before. Suitable to a wider range of materials as well as operation types, such as finishing, roughing, slotting, interpolating, angular entries, contouring & all with 1 tool!

The key to successful milling, is to minimise or eliminate the vibration produced in the cutting action. This is known as a build up of harmonics in the workpiece, which can be detrimental to the tool life of the endmill. Often this vibration has been rectified by slowing down the cutting speed and feeds, altering the size of the cut & increasing the rigidity of the set-up.

The Harmony Endmill overcomes vibration, through a combination of tool design, material & coating, without the need to sacrifice productivity.

### Tool design

A combination of an optimised unequal flute helix & relief angle geometries that stabilise the cutting action.

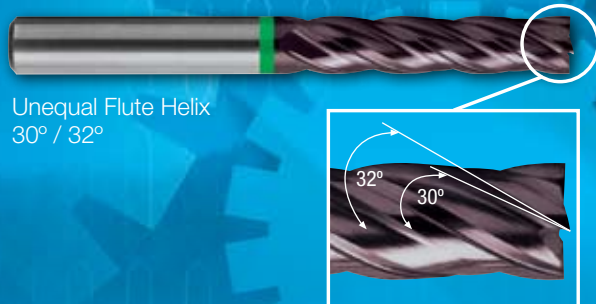
### Tool material

SPM, which the most advanced grade of Powder Metallurgy High Speed Steel available specifically for milling tools, offering higher edge hardness with the HSS benefit of toughness.

### Tool coating

TiAlN (Futura Nano) coating & is a great all round coating especially in applications where there is high thermal load. TiAlN has a nanolayered structure which was engineered to give an optimum balance between hardness & internal stress, also has improved sliding properties.

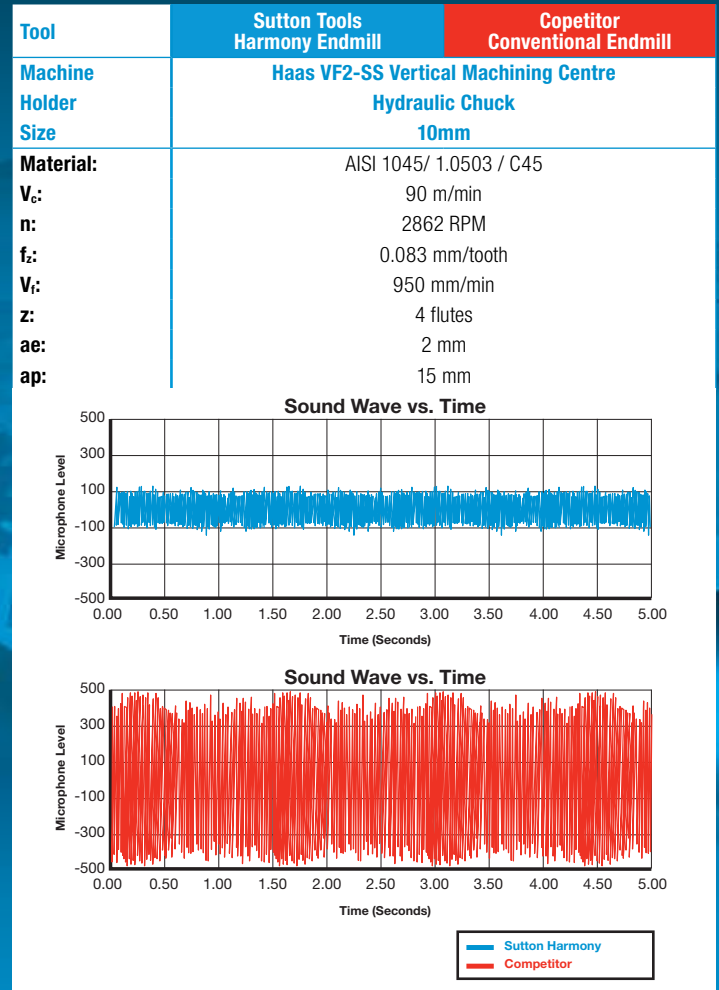
With above in mind, a recent case study conducted (left) comparing the harmonics produced in the workpiece, between the new 'Harmony' & a conventional endmill. The graph clearly indicates the smoother cutting action of the Harmony ▶



Unequal Flute Helix  
30° / 32°

## Case Study

Tool Harmonics comparison between Sutton Harmony Endmill & competitors conventional endmill, 10mm diameter.



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