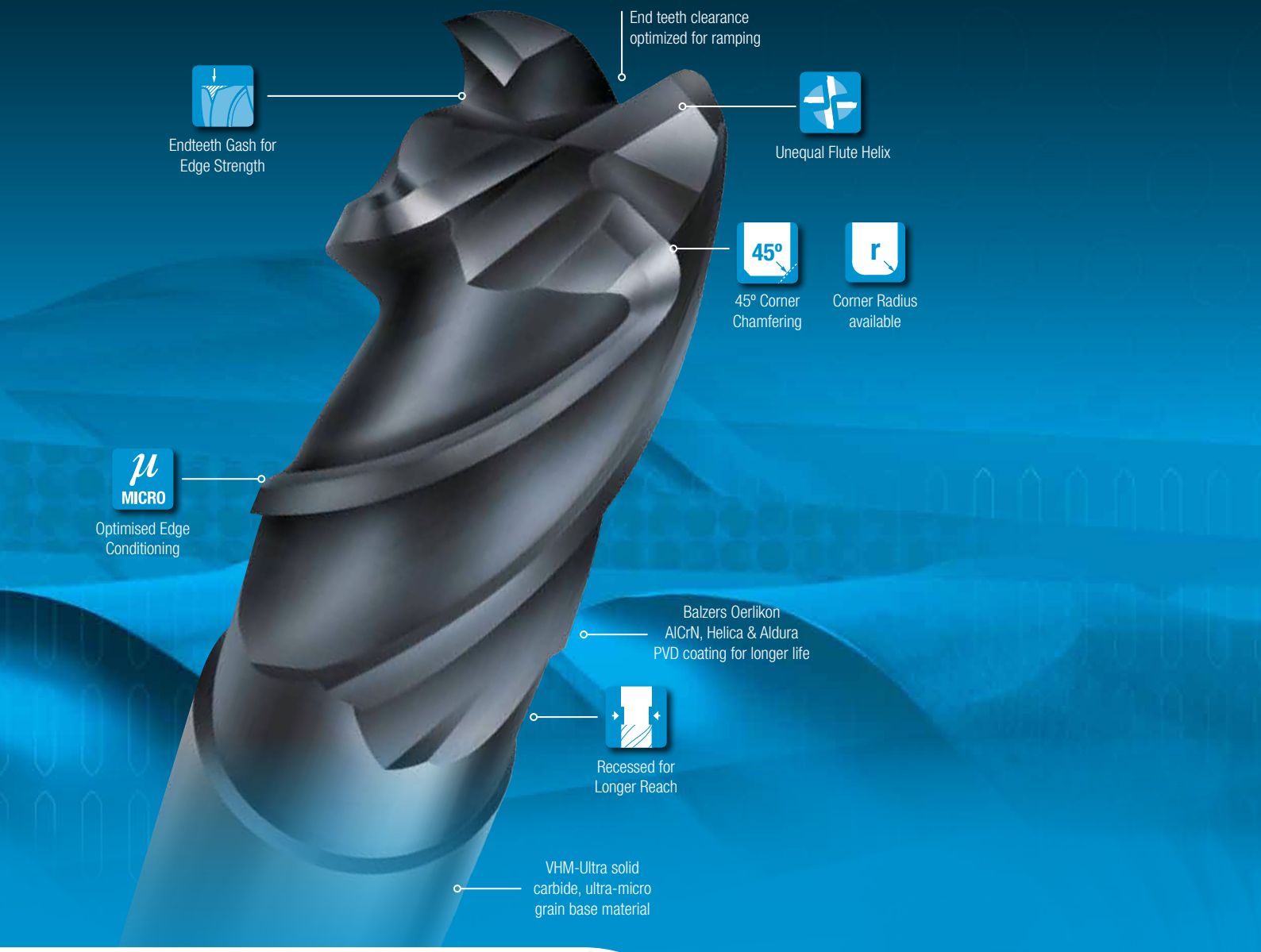
Performance Unequalled...

In all applications…



HARMONY

ENDMILL SERIES

suttontools

world class cutting tools

Performance Unequalled...

The Harmony range of endmills represents world's latest technologies to provide improved performance and tool life.

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 work piece, which can be detrimental to the tool life of the endmill. The Harmony Endmill overcomes vibration, through a combination of tool design, micro geometry, material and coating, without the need to sacrifice productivity.

Sutton Tools' Harmony family is a range of endmills that is constantly being expanded to enable component producers supporting a broad spectrum of industries to successfully mill new materials as they are introduced.

Harmony UNI

The general all-rounder in the Harmony range with a universal design which can be used in a wide range of steels, cast iron and exotic alloys. A combination of a 35/38 degree unequal flute helix and various optimization with regard to the end-teeth geometry, can reduce the potential harmonic build-up of vibration in the system. This results in chatter-free milling in many applications, increasing both productivity and cutting tool life – a winning combination.

The Sutton Tool Harmony UNI is made from VHM-ULTRA, an ultra-fine grain type (0.5µm), combined with Balzers Alcrona coating (AlCrN), and micro-geometry technology, which offers the best wear resistance in high performance milling applications.

Harmony VA

The Sutton Tools VA-Harmony endmill has been engineered specifically for milling stainless steels and super alloys – such as austenitic grades 304 and 316, duplex grades, as well as inconels 718 and 725. Available in diameters from 6mm to 20mm, the VA-Harmony endmill is ideal for a range of milling operations, including finishing, side cutting, oblique cuts, roughing and slotting, all with the one tool!

The tool design incorporates an ultra-fine micro grain carbide base material, combined with the Balzers Oerlikon Helica multi-layer coating for outstanding oxidation resistance and hot hardness. Together with the 40/42-degree unequal flute helix and the 45-degree corner chamfering edge-protection, the VA-Harmony endmill outperforms competing endmills in both bench testing and end-user assessments.

The VA-Harmony endmill is a versatile tool that offers an industry-leading performance - suppressing chattering, and facilitating higher feed-rates, longer tool-life and increased productivity compared with conventional endmills.

Harmony DUO

Sutton Tools Harmony DUO range can be used for roughing, cavity milling, pocket milling, profiling, ramping, slotting and finishing, and provides an ideal selection of endmills for machining tool-grade steels in the mould and die industry. Due to its various features, this range has the versatility to complete moulds in the hardest and toughest of materials, eliminating costly failures and downtime during the cycle.

The dual-stepped core design provides optimised performance, with the rigid construction of the thickened core section delivering enhanced tool stability and minimised vibration, while the deeper flute profile offers excellent chip-evacuation.

The ultra-fine grade of micro-grain carbide base material is enhanced by a choice of two Balzers Oerlikon coatings. A multi-layer Alcrona coating (AlCrN) optimises the machining of softer steels, while an Aldura coating, comprising bi-layered AlCrN and TiAlN provides superior hot-hardness and oxidation resistance for milling hardened tool-grade steels and alloys.

The Harmony DUO range has been subjected to a series of exacting internal benchmarking tests to compare its performance against leading German brands under identical operating conditions. The results indicated that Harmony DUO delivers comparable or better performance than the competition.

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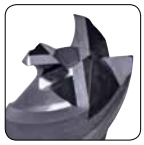
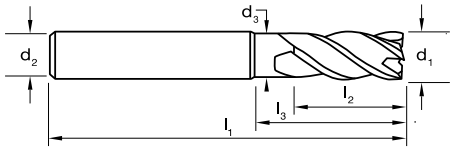
- VHM-ULTRA grade of carbide for high performance
- 35/38° variable flute helix for chatter free milling
- Suitable for materials up to 1600 N/mm²
- AlCrN for longer tool life

Check out the demo



DIN 6527L | 45° | MICRO | 6°



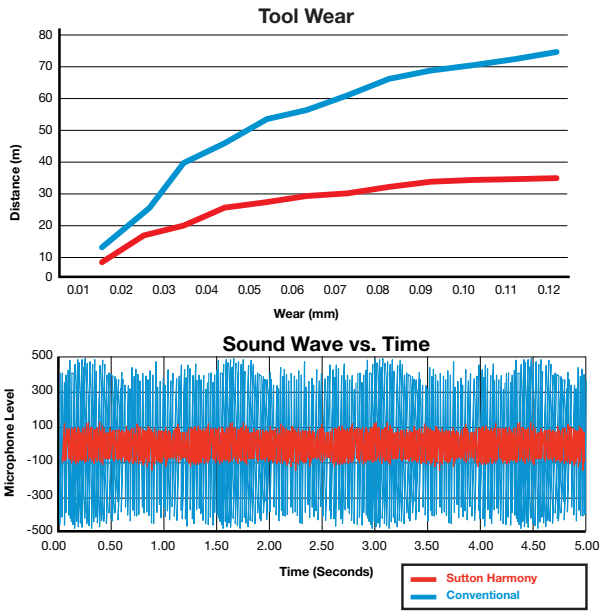
Catalogue Code	E535
Discount Group	B0210
Material	VHM-ULTRA
Surface Finish	AlCrN
Colour Ring & Application	UNI
Geometry	R35 / 38
Shank Form (DIN 6535)	HA
Shank Tolerance	h6

Size Ref.	d_1	l_1	l_2	l_3	d_2	d_3	z	Item #
0300	3.0	57	8	19	6	2.8	4	E535 0300
0400	4.0	57	11	19	6	3.7	4	E535 0400
0500	5.0	57	13	20	6	4.6	4	E535 0500
0600	6.0	57	13	21	6	5.5	4	E535 0600
0800	8.0	63	19	27	8	7.5	4	E535 0800
1000	10.0	72	22	32	10	9.5	4	E535 1000
1200	12.0	83	26	38	12	11.2	4	E535 1200
1400	14.0	83	26	38	14	13.0	4	E535 1400
1600	16.0	92	32	44	16	15.0	4	E535 1600
1800	18.0	92	32	44	18	17.0	4	E535 1800
2000	20.0	104	38	54	20	19.0	4	E535 2000

Case Study – Performance Comparison

A recent study was conducted comparing the harmonics produced in the workpiece, between the Harmony & a conventional endmill. The graph clearly indicates the smoother cutting action of the Harmony ▸

Tool	Harmony Endmill	Conventional Endmill
Machine	Haas VF2-SS Vertical Machining Centre	
Holder	Hydraulic Chuck	
Size	10mm	
Material:	AISI 1045/ 1.0503 / C45	AISI 1045/ 1.0503 / C45
V_c:	200 m/min	200 m/min
n:	6360 RPM	6360 RPM
f_z:	**0.07 mm/tooth**	0.058 mm/tooth
V_f:	**1781 mm/min**	1463 mm/min
z:	4 flutes	4 flutes
ae:	2 mm	2 mm
ap:	15 mm	15 mm



ISO	P													M			K							N								S												H					
VDI 3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14.1	14.2	14.3	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37.1	37.2	37.3	37.4	37.5	38.1	38.2	39.1	39.2	40	41
E535	●	●	●	●	●	●	●	●	○	●	○	○	○	○	○		●	○	●	○	●	●	○	○	○	○							○	○	○		○	○	○	○	○	○		○				●	○

HARMONY Endmill, 4 Flute, R35/38 UNI, Cnr Rad

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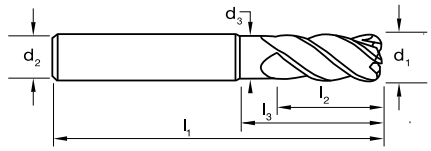
- For precision finishing applications
- Ideally suited to materials up to 1300 N/mm²
- AlCrN for longer tool life



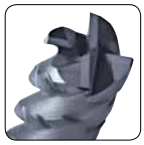
Catalogue Code	E559
Discount Group	B0210
Material	VHM-ULTRA
Surface Finish	AlCrN
Colour Ring & Application	UNI
Geometry	R35 / 38
Shank Form (DIN 6535)	HA
Shank Tolerance	h6

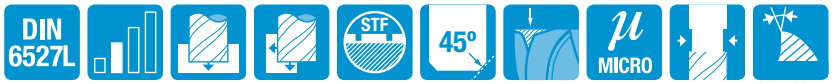
Size Ref.	d_1	l_1	l_2	l_3	d_2	d_3	z	Rad	Item #
0303	3.0	57	8	19	6	3.7	4	0.3	E559 0303
0305		57	8	19	6	3.7	4	0.5	E559 0305
0403	4.0	57	11	19	6	3.7	4	0.3	E559 0403
0405		57	11	19	6	3.7	4	0.5	E559 0405
0410		57	11	19	6	3.7	4	1.0	E559 0410
0503	5.0	57	13	20	6	4.6	4	0.3	E559 0503
0505		57	13	20	6	4.6	4	0.5	E559 0505
0510		57	13	20	6	4.6	4	1.0	E559 0510
0603	6.0	57	13	21	6	5.5	4	0.3	E559 0603
0605		57	13	21	6	5.5	4	0.5	E559 0605
0610		57	13	21	6	5.5	4	1.0	E559 0610
0803	8.0	63	19	27	8	7.5	4	0.3	E559 0803
0805		63	19	27	8	7.5	4	0.5	E559 0805
0810		63	19	27	8	7.5	4	1.0	E559 0810
0815		63	19	27	8	7.5	4	1.5	E559 0815
0820		63	19	27	8	7.5	4	2.0	E559 0820
1003	10.0	72	22	32	10	9.5	4	0.3	E559 1003
1005		72	22	32	10	9.5	4	0.5	E559 1005
1010		72	22	32	10	9.5	4	1.0	E559 1010
1015		72	22	32	10	9.5	4	1.5	E559 1015
1020		72	22	32	10	9.5	4	2.0	E559 1020
1203	12.0	83	26	38	12	11.2	4	0.3	E559 1203
1205		83	26	38	12	11.2	4	0.5	E559 1205
1210		83	26	38	12	11.2	4	1.0	E559 1210
1215		83	26	38	12	11.2	4	1.5	E559 1215
1220		83	26	38	12	11.2	4	2.0	E559 1220
1230		83	26	38	12	11.2	4	3.0	E559 1230
1605	16.0	92	32	44	16	15.0	4	0.5	E559 1605
1610		92	32	44	16	15.0	4	1.0	E559 1610
1615		92	32	44	16	15.0	4	1.5	E559 1615
1620		92	32	44	16	15.0	4	2.0	E559 1620
1630		92	32	44	16	15.0	4	3.0	E559 1630
2005	20.0	104	38	54	20	19.0	4	0.5	E559 2005
2010		104	38	54	20	19.0	4	1.0	E559 2010
2015		104	38	54	20	19.0	4	1.5	E559 2015
2020		104	38	54	20	19.0	4	2.0	E559 2020
2030		104	38	54	20	19.0	4	3.0	E559 2030

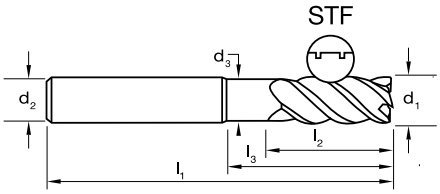
ISO	P													M			K						N									S												H					
VDI 3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14.1	14.2	14.3	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37.1	37.2	37.3	37.4	37.5	38.1	38.2	39.1	39.2	40	41
E559	●	●	●	●	●	●	●	●	○	●	○	○	○	○	○		●	○	●	○	●	●	○	○	○	○							○	○	○		○	○	○	○	○	○		○				●	○

suttontools

- VHM-ULTRA grade of carbide for high performance
- For finishing & semi-roughing applications
- Suitable for materials up to 1400 N/mm²
- Unequal flute design with Special Tooth Form (STF), produces excellent surface finish
- Eliminates the use of finishing endmills in many cases
- AlCrN for longer tool life







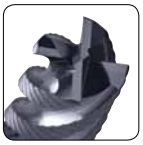
Catalogue Code	E545
Discount Group	B0210
Material	VHM-ULTRA
Surface Finish	AlCrN
Colour Ring & Application	UNI
Geometry	R45
Shank Form (DIN 6535)	HA
Shank Tolerance	h6

Size Ref.	d_1	l_1	l_2	l_3	d_2	d_3	z	Item #
0400	4.0	57	11	19	6	3.7	4	E545 0400
0500	5.0	57	13	20	6	4.6	4	E545 0500
0600	6.0	57	13	21	6	5.5	4	E545 0600
0800	8.0	63	19	27	8	7.5	4	E545 0800
1000	10.0	72	22	32	10	9.5	4	E545 1000
1200	12.0	83	26	38	12	11.2	4	E545 1200
1600	16.0	92	32	44	16	15.0	4	E545 1600
2000	20.0	104	38	54	20	19.0	4	E545 2000

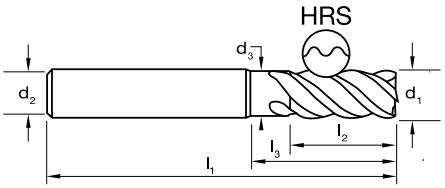
ISO	P													M			K						N									S												H					
VDI 3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14.1	14.2	14.3	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37.1	37.2	37.3	37.4	37.5	38.1	38.2	39.1	39.2	40	41
E545	●	●	●	●	●	●	●	●	○	●	○	●	●	●	○	○	●	○	●	○	●	●											○	○	○		○	○	○	○	○	○							

suttontools

- VHM-ULTRA grade of carbide for high performance
- For roughing applications
- HRS geometry allows for heavy cuts in short & long chipping materials
- Suitable for materials up to 1600 N/mm²
- AlCrN for longer tool life



DIN 6527L | HRS | 45° | MICRO | 5°



Catalogue Code	E549
Discount Group	B0210
Material	VHM-ULTRA
Surface Finish	AlCrN
Colour Ring & Application	UNI
Geometry	R45 HRS
Shank Form (DIN 6535)	HA
Shank Tolerance	h6

Size Ref.	d_1	l_1	l_2	l_3	d_2	d_3	z	Item #
0400	4.0	57	11	19	6	3.7	3	E549 0400
0500	5.0	57	13	20	6	4.6	4	E549 0500
0600	6.0	57	16	21	6	5.5	4	E549 0600
0800	8.0	63	19	27	8	7.5	4	E549 0800
1000	10.0	72	22	32	10	9.5	4	E549 1000
1200	12.0	83	26	38	12	11.2	4	E549 1200
1600	16.0	92	32	44	16	15.0	5	E549 1600
2000	20.0	104	38	54	20	19.0	6	E549 2000
2500	25.0	120	45	60	25	24.5	6	E549 2500

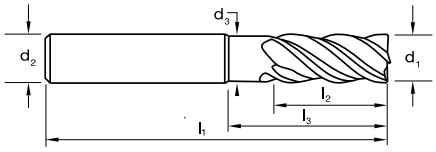
ISO	P													M			K						N									S											H					
VDI 3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14.1	14.2	14.3	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37.1	37.2	37.3	37.4	37.5	38.1	38.2	39.1	39.2	40	41
E549	●	●	●	●	●	●	●	●	○	●	○	●	○	●	○	○	●	○	●	○	●	●											○	○	○		○	○	○	○	○	○							

suttontools

- Excellent solution for stainless steels & difficult super alloy type materials
- Optimised geometry with variable helix design ensures high productivity
- Suitable for slotting, side cutting and finishing applications with the one tool
- HELICA for outstanding oxidation resistance and hot hardness
- VHM-ULTRA grade of carbide for high performance

Check out the demo

DIN 6527L | 45° | MICRO



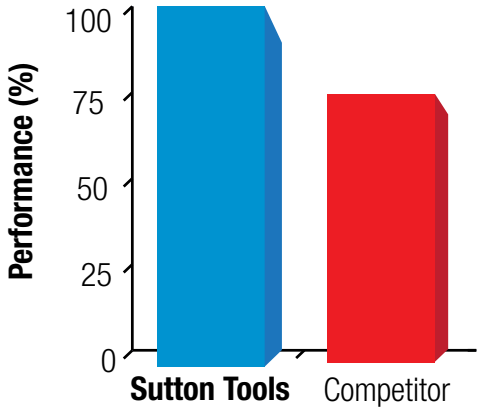
Catalogue Code	E459
Discount Group	B0210
Material	VHM-ULTRA
Surface Finish	HELICA
Colour Ring & Application	VA
Geometry	R40/42
Shank Form (DIN 6535)	HA
Shank Tolerance	h5

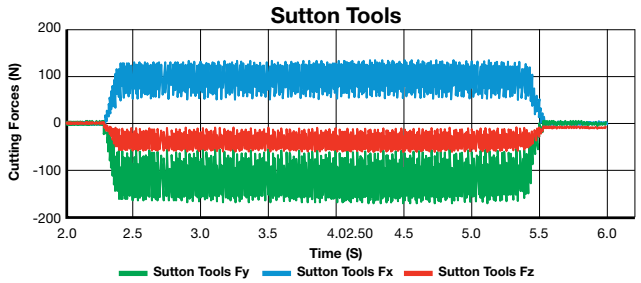
Size Ref.	d_1 (e8)	l_1	l_2	l_3	d_2	d_3	z	Item #
0300	3.0	57	8	14	6	2.8	4	E459 0300
0400	4.0	57	11	16	6	3.8	4	E459 0400
0500	5.0	57	13	18	6	4.8	4	E459 0500
0600	6.0	57	13	19	6	5.7	4	E459 0600
0800	8.0	63	19	25	8	7.6	4	E459 0800
1000	10.0	72	22	30	10	9.5	4	E459 1000
1200	12.0	83	26	36	12	11.5	4	E459 1200
1400	14.0	83	26	36	14	13.5	4	E459 1400
1600	16.0	92	32	42	16	15.5	4	E459 1600
1800	18.0	92	32	42	18	17.5	4	E459 1800
2000	20.0	104	38	52	20	19.5	4	E459 2000

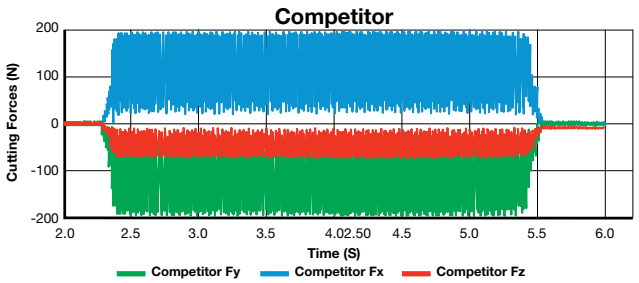
Case Study – R40/42-VA Harmony Endmills

A recent study was conducted comparing the harmonics produced in the workpiece, between the Sutton Tools VA Harmony & a competitor tool. The Sutton VA Harmony endmill had lighter load on the cutting edges and also less chatter ▸

Tool	Sutton Tools	Competitor
Machine	Haas VF2-SS Vertical Machining Centre	
Holder	Shrinkfit	
Size	12mm	
Material:	AISI 304 / 1.4301 / AS 304	AISI 304 / 1.4301 / AS 304
V_c:	120 m/min	120 m/min
n:	3185 RPM	3185 RPM
f_z:	**0.065 mm/tooth**	**0.065 mm/tooth**
V_f:	**828 mm/min**	**828 mm/min**
z:	4 flutes	4 flutes
ae:	0.24 mm	0.24 mm
ap:	18 mm	18 mm



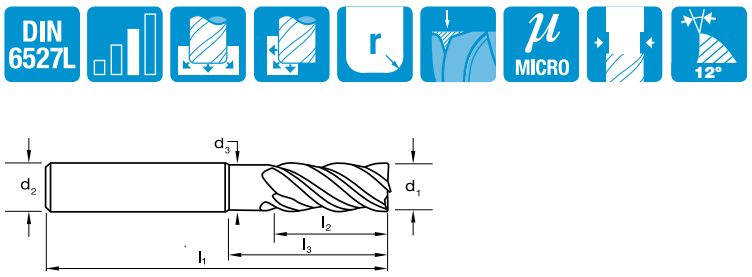




ISO	P													M			K						N								S												H					
VDI 3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14.1	14.2	14.3	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37.1	37.2	37.3	37.4	37.5	38.1	38.2	39.1	39.2	40	41
E459												○	○	●	●	●																	○	●	○	●	●	○	●	●		○	○							

suttontools

- Excellent solution for stainless steels & difficult super alloy type materials
- Optimised geometry with variable helix design ensures high productivity
- Suitable for slotting, side cutting and finishing applications with the one tool
- HELICA for outstanding oxidation resistance and hot hardness
- VHM-ULTRA grade of carbide for high performance



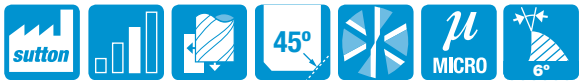
Catalogue Code	E462
Discount Group	B0210
Material	VHM-ULTRA
Surface Finish	HELICA
Colour Ring & Application	VA
Geometry	R40/42
Shank Form (DIN 6535)	HA
Shank Tolerance	h5

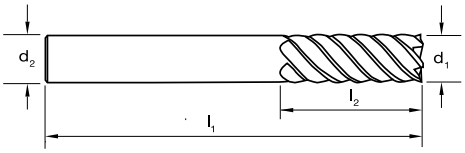
Size Ref.	d_1 (e8)	l_1	l_2	l_3	d_2	d_3	z	Rad	Item #
0603	6.0	57	13	21	6	5.5	4	0.3	E462 0603
0605		57	13	21	6	5.5	4	0.5	E462 0605
0610		57	13	21	6	5.5	4	1.0	E462 0610
0803	8.0	63	19	27	8	7.5	4	0.3	E462 0803
0805		63	19	27	8	7.5	4	0.5	E462 0805
0810		63	19	27	8	7.5	4	1.0	E462 0810
0815		63	19	27	8	7.5	4	1.5	E462 0815
0820		63	19	27	8	7.5	4	2.0	E462 0820
1003	10.0	72	22	32	10	9.5	4	0.3	E462 1003
1005		72	22	32	10	9.5	4	0.5	E462 1005
1010		72	22	32	10	9.5	4	1.0	E462 1010
1015		72	22	32	10	9.5	4	1.5	E462 1015
1020		72	22	32	10	9.5	4	2.0	E462 1020
1203	12.0	83	26	38	12	11.2	4	0.3	E462 1203
1205		83	26	38	12	11.2	4	0.5	E462 1205
1210		83	26	38	12	11.2	4	1.0	E462 1210
1215		83	26	38	12	11.2	4	1.5	E462 1215
1220		83	26	38	12	11.2	4	2.0	E462 1220
1230		83	26	38	12	11.2	4	3.0	E462 1230
1605	16.0	92	32	44	16	15.0	4	0.5	E462 1605
1610		92	32	44	16	15.0	4	1.0	E462 1610
1615		92	32	44	16	15.0	4	1.5	E462 1615
1620		92	32	44	16	15.0	4	2.0	E462 1620
1630		92	32	44	16	15.0	4	3.0	E462 1630
2005	20.0	104	38	54	20	19.0	4	0.5	E462 2005
2010		104	38	54	20	19.0	4	1.0	E462 2010
2015		104	38	54	20	19.0	4	1.5	E462 2015
2020		104	38	54	20	19.0	4	2.0	E462 2020
2030		104	38	54	20	19.0	4	3.0	E462 2030

ISO	P												M			K						N									S											H					
VDI 3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14.1	14.2	14.3	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37.1	37.2	37.3	37.4	37.5	38.1	38.2	39.1	39.2	40	41
E462												○	○	●	●	●																	○	●	○	●	●	○	●	●		○	○							

suttontools

- VHM-ULTRA grade of carbide for high performance
- For super fine finishing applications
- 50/35° variable flute helix for chatter free milling
- Suitable for hard, short chipping materials up to 48HRc
- AlCrN for longer tool life





Catalogue Code	E434
Discount Group	B0210
Material	VHM-ULTRA
Surface Finish	AlCrN
Colour Ring & Application	NH
Geometry	R50/35
Shank Form (DIN 6535)	HA
Shank Tolerance	h5

Size Ref.	d_1 (e8)	l_1	l_2	d_2	z	Item #
0600	6.0	62	18	6	6	E434 0600
0800	8.0	68	24	8	6	E434 0800
1000	10.0	80	30	10	6	E434 1000
1200	12.0	93	36	12	6	E434 1200
1600	16.0	108	48	16	6	E434 1600
2000	20.0	126	60	20	8	E434 2000
2500	25.0	150	85	25	8	E434 2500

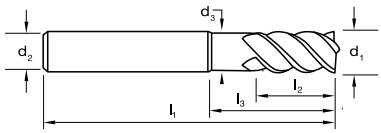
ISO	P													M			K						N									S												H					
VDI 3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14.1	14.2	14.3	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37.1	37.2	37.3	37.4	37.5	38.1	38.2	39.1	39.2	40	41
E434	○	○	●	●	●	○	●	●	●	●	●	○	●				●	●	●	●	●	●											○		●	○			○	●	○	●	●	●	○		●	○

suttontools

- VHM-ULTRA grade of carbide for high performance
- Dual stepped core for optimal strength
- Ideal design for pocket milling in MQL & HSC
- Suitable for materials up to 48HRc
- AlCrN for longer tool life

Check out the demo

DIN 6527L | 45° | MICRO | HSC



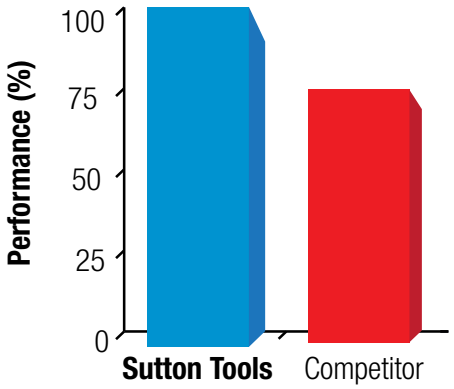
Catalogue Code	E562
Discount Group	B0210
Material	VHM-ULTRA
Surface Finish	AlCrN
Colour Ring & Application	NH
Geometry	R50
Shank Form (DIN 6535)	HA
Shank Tolerance	h6

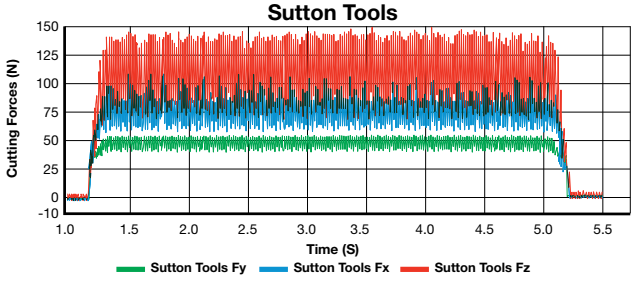
Size Ref.	d_1 (h10)	l_1	l_2	l_3	d_2	d_3	z	Item #
0600	6.0	57	13	21	6	5.5	4	E562 0600
0800	8.0	63	19	27	8	7.5	4	E562 0800
1000	10.0	72	22	32	10	9.5	4	E562 1000
1200	12.0	83	26	38	12	11.2	4	E562 1200
1400	14.0	83	26	38	14	13.0	4	E562 1400
1600	16.0	92	32	44	16	15.0	4	E562 1600
2000	20.0	104	38	54	20	19.0	4	E562 2000

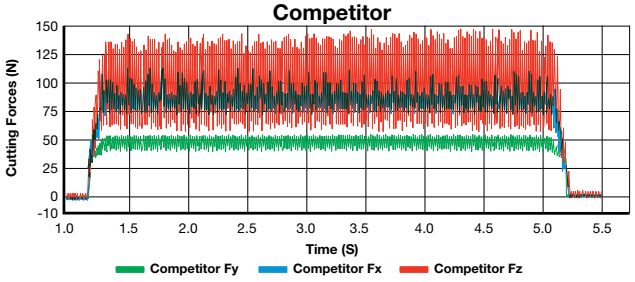
Case Study – Harmony DUO NH Endmills

Sutton Tools has conducted a series of internal benchmarking tests to compare the performance of its Harmony DUO Endmill against a leading German brand under identical operating conditions. The results of these tests indicate that Harmony DUO delivers comparable or better performance than the competition. Furthermore, with measurably less vibration exhibited, longer tool life can be expected. ▸

Tool	Sutton Tools	Competitor
Machine	Haas VF2-SS Vertical Machining Centre	
Holder	Shrinkfit	
Size	10mm	
Material:	Tool Steel P20 of 34 HRc	Tool Steel P20 of 34 HRc
V_c:	120 m/min	120 m/min
n:	3816 RPM	3816 RPM
f_z:	**0.077 mm/tooth**	**0.077 mm/tooth**
V_f:	**1175 mm/min**	**1175 m/min**
z:	4 flutes	4 flutes
ae:	1.0 mm	1.0 mm
ap:	15 mm	15 mm







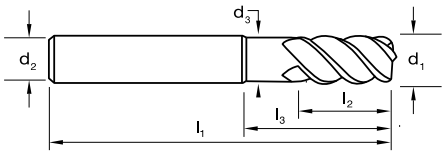
ISO	P													M			K						N								S												H				
VDI 3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14.1	14.2	14.3	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37.1	37.2	37.3	37.4	37.5	38.1	38.2	39.1	39.2	40	41
E562					●			●	●		●		●		●	●		●		●													●		●	●		●	●		●		○				●	

suttontools

- VHM-ULTRA grade of carbide for high performance
- Dual stepped core for optimal stability
- Ideal design for pocket milling in MQL & HSC
- Suitable for materials up to 48HRc
- AlCrN for longer tool life

Check out the demo

DIN 6527L | MICRO | HSC



Catalogue Code	E564
Discount Group	B0210
Material	VHM-ULTRA
Surface Finish	AlCrN
Colour Ring & Application	NH
Geometry	R50
Shank Form (DIN 6535)	HA
Shank Tolerance	h6

Size Ref.	d_1 (h10)	l_1	l_2	l_3	d_2	d_3	z	Rad	Item #
0603	6.0	57	13	21	6	5.5	4	0.3	E564 0603
0605		57	13	21	6	5.5	4	0.5	E564 0605
0610		57	13	21	6	5.5	4	1.0	E564 0610
0803	8.0	63	19	27	8	7.5	4	0.3	E564 0803
0805		63	19	27	8	7.5	4	0.5	E564 0805
0810		63	19	27	8	7.5	4	1.0	E564 0810
0815		63	19	27	8	7.5	4	1.5	E564 0815
0820		63	19	27	8	7.5	4	2.0	E564 0820
1003	10.0	72	22	32	10	9.5	4	0.3	E564 1003
1005		72	22	32	10	9.5	4	0.5	E564 1005
1010		72	22	32	10	9.5	4	1.0	E564 1010
1015		72	22	32	10	9.5	4	1.5	E564 1015
1020		72	22	32	10	9.5	4	2.0	E564 1020
1203	12.0	83	26	38	12	11.2	4	0.3	E564 1203
1205		83	26	38	12	11.2	4	0.5	E564 1205
1210		83	26	38	12	11.2	4	1.0	E564 1210
1215		83	26	38	12	11.2	4	1.5	E564 1215
1220		83	26	38	12	11.2	4	2.0	E564 1220
1230		83	26	38	12	11.2	4	3.0	E564 1230
1430	14.0	83	26	38	14	13.0	4	0.3	E564 1403
1405		83	26	38	14	13.0	4	0.5	E564 1405
1410		83	26	38	14	13.0	4	1.0	E564 1410
1415		83	26	38	14	13.0	4	1.5	E564 1415
1420		83	26	38	14	13.0	4	2.0	E564 1420
1430		83	26	38	14	13.0	4	3.0	E564 1430
1605	16.0	92	32	44	16	15.0	4	0.5	E564 1605
1610		92	32	44	16	15.0	4	1.0	E564 1610
1615		92	32	44	16	15.0	4	1.5	E564 1615
1620		92	32	44	16	15.0	4	2.0	E564 1620
1630		92	32	44	16	15.0	4	3.0	E564 1630
1630		92	32	44	16	15.0	4	4.0	E564 1640
2005	20.0	104	38	54	20	19.0	4	0.5	E564 2005
2010		104	38	54	20	19.0	4	1.0	E564 2010
2015		104	38	54	20	19.0	4	1.5	E564 2015
2020		104	38	54	20	19.0	4	2.0	E564 2020
2030		104	38	54	20	19.0	4	3.0	E564 2030
2040		104	38	54	20	19.0	4	4.0	E564 2040

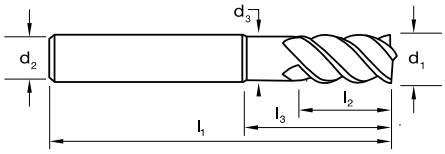
ISO	P													M			K						N										S												H					
VDI 3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14.1	14.2	14.3	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37.1	37.2	37.3	37.4	37.5	38.1	38.2	39.1	39.2	40	41
E564					●			●	●		●		●		●	●		●		●														●		●	●		●	●		●		○				●	

suttontools

- VHM-ULTRA grade of carbide for high performance
- Dual stepped core for optimal strength
- Ideal design for hard machining
- Suitable for materials up to 63HRc
- Aldura for longer tool life

Check out the demo

DIN 6527L | 45º | MICRO



Catalogue Code	E566
Discount Group	B0210
Material	VHM-ULTRA
Surface Finish	Aldura
Colour Ring & Application	VH
Geometry	R50
Shank Form (DIN 6535)	HA
Shank Tolerance	h6

Size Ref.	d_1 (h10)	l_1	l_2	l_3	d_2	d_3	z	Item #
0600	6.0	57	13	21	6	5.5	4	E566 0600
0800	8.0	63	19	27	8	7.5	4	E566 0800
1000	10.0	72	22	32	10	9.5	4	E566 1000
1200	12.0	83	26	38	12	11.2	4	E566 1200
1400	14.0	83	26	38	14	13.0	4	E566 1400
1600	16.0	92	32	44	16	15.0	4	E566 1600
2000	20.0	104	38	54	20	19.0	4	E566 2000

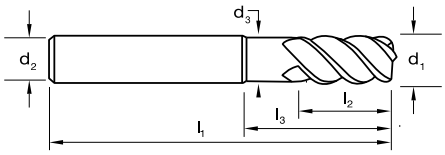
ISO	P												M			K						N									S												H					
VDI 3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14.1	14.2	14.3	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37.1	37.2	37.3	37.4	37.5	38.1	38.2	39.1	39.2	40	41
E566																																													●	●	●		●

suttontools

- VHM-ULTRA grade of carbide for high performance
- Dual stepped core for optimal strength
- Ideal design for hard machining
- Suitable for materials up to 63HRc
- Aldura for longer tool life

Check out the demo

DIN 6527L | MICRO



Catalogue Code	E568
Discount Group	B0210
Material	VHM-ULTRA
Surface Finish	Aldura
Colour Ring & Application	VH
Geometry	R50
Shank Form (DIN 6535)	HA
Shank Tolerance	h6

Size Ref.	d_1 (h10)	l_1	l_2	l_3	d_2	d_3	z	Rad	Item #
0610	6.0	57	13	21	6	5.5	4	1.0	E568 0610
0820	8.0	63	19	27	8	7.5	4	2.0	E568 0820
1020	10.0	72	22	32	10	9.5	4	2.0	E568 1020
1230	12.0	83	26	38	12	11.2	4	3.0	E568 1230
1430	14.0	83	26	38	14	13.0	4	3.0	E568 1430
1640	16.0	92	32	44	16	15.0	4	4.0	E568 1640
2040	20.0	104	38	54	20	19.0	4	4.0	E568 2040

ISO	P													M			K							N										S														H					
VDI 3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14.1	14.2	14.3	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37.1	37.2	37.3	37.4	37.5	38.1	38.2	39.1	39.2	40	41
E568																																													●	●	●		●

suttontools

ISO	VDI	Material Group	Sutton	
P	A	Steel	N	UNI
M	R	Stainless Steel	VA	
K	F	Cast Iron	GG	
N	N	Non-Ferrous Metals, Aluminiums & Coppers	Al	W
S	S	Titaniums & Super Alloys	Ti	Ni
H	H	Hard Materials (≥ 45 HRC)	H	

	E535	E559	E545	E549
Material	VHM-ULTRA			
Surface Finish	AlCrN			
Sutton Designation	UNI			
Type of Cut: *Slotting*			●	●
Finishing	●	●		
Universal	●	●	●	●
Roughing				
Profiling				
ap × Ø	1.5	1.5	0.5	1.0
ae × Ø	0.1	0.4	1.0	1.0

ISO	VDI 3323	Material		Condition	HB	N/mm²	E535 Vc	E535 Feed #		E559 Vc	E559 Feed #		E545 Vc	E545 Feed #			E549 Vc	E549 Feed #		
P	1	Steel - Non-alloy, cast & free cutting	~ 0.15 %C	A	125	440	**210**	**8**	**11**	**210**	**8**	**11**	**180**	**5**	**5**	**9**	**180**	**9**	**5**	**13**
	2		~ 0.45 %C	A	190	640	**210**	**8**	**11**	**210**	**8**	**11**	**180**	**5**	**5**	**9**	**180**	**9**	**5**	**13**
	3			QT	250	840	**175**	**8**	**11**	**175**	**8**	**11**	**100**	**5**	**5**	**9**	**100**	**9**	**5**	**13**
	4		~ 0.75 %C	A	270	910	**175**	**8**	**11**	**175**	**8**	**11**	**100**	**5**	**5**	**9**	**100**	**9**	**5**	**13**
	5			QT	300	1010	**175**	**8**	**11**	**175**	**8**	**11**	**100**	**5**	**5**	**9**	**100**	**9**	**5**	**13**
	6	Steel - Low alloy & cast < 5% of alloying elements		A	180	610	**210**	**8**	**11**	**210**	**8**	**11**	**180**	**5**	**5**	**9**	**180**	**9**	**5**	**13**
	7			QT	275	930	**175**	**8**	**11**	**175**	**8**	**11**	**100**	**5**	**5**	**9**	**100**	**9**	**5**	**13**
	8			QT	300	1010	**175**	**8**	**11**	**175**	**8**	**11**	**100**	**5**	**5**	**9**	**100**	**9**	**5**	**13**
	9			QT	350	1180	120	8	11	120	8	11	80	5	5	9	80	9	5	13
	10	Steel - High alloy, cast & tool		A	200	680	**175**	**8**	**11**	**175**	**8**	**11**	**100**	**5**	**5**	**9**	**100**	**9**	**5**	**13**
	11			HT	325	1100	**120**	8	11	**120**	8	11	80	5	5	9	80	9	5	13
	12	Steel - Corrosion resistant & cast	Ferritic / Martensitic	A	200	680	90	8	11	90	8	11	**90**	**5**	**5**	**9**	**90**	**9**	**5**	**13**
	13		Martensitic	QT	240	810	80	8	11	80	8	11	**80**	**5**	**5**	**9**	80	9	5	13
M	14.1	Stainless Steel	Austenitic	AH	180	610	-	8	11	-	8	11	**90**	**5**	**5**	**9**	**90**	**9**	**5**	**13**
	14.2		Duplex		250	840	-	8	11	-	8	11	90	5	5	9	90	9	5	13
	14.3		Precipitation Hardening		250	840	-	-	-	-	-	-	80	5	5	9	80	9	5	13
K	15	Cast Iron - Grey (GG)	Ferritic / Pearlitic		180	610	**150**	**8**	**11**	**150**	**8**	**11**	**140**	**5**	**5**	**9**	**140**	**9**	**5**	**13**
	16		Pearlitic		260	880	150	8	11	150	8	11	140	5	5	9	140	9	5	13
	17	Cast Iron - Nodular (GGG)	Ferritic		160	570	**150**	**8**	**11**	**150**	**8**	**11**	**140**	**5**	**5**	**9**	**140**	**9**	**5**	**13**
	18		Pearlitic		250	840	150	8	11	150	8	11	140	5	5	9	140	9	5	13
	19	Cast Iron - Malleable	Ferritic		130	460	**110**	**8**	**11**	**110**	**8**	**11**	**100**	**5**	**5**	**9**	**100**	**9**	**5**	**13**
	20		Pearlitic		230	780	**110**	**8**	**11**	**110**	**8**	**11**	**100**	**5**	**5**	**9**	**100**	**9**	**5**	**13**
N	21	Aluminum & Magnesium - wrought alloy	Non Heat Treatable		60	210	200	8	11	200	8	11	-	-	-	-	-	-	-	-
	22		Heat Treatable	AH	100	360	200	8	11	200	8	11	-	-	-	-	-	-	-	-
	23	Aluminum & Magnesium - cast alloy ≤12% Si	Non Heat Treatable		75	270	200	8	11	200	8	11	-	-	-	-	-	-	-	-
	24		Heat Treatable	AH	90	320	200	8	11	200	8	11	-	-	-	-	-	-	-	-
	25	Al & Mg - cast alloy >12% Si	Non Heat Treatable		130	460	200	8	11	200	8	11	-	-	-	-	-	-	-	-
	26	Copper & Cu alloys (Brass/Bronze)	Free cutting, Pb > 1%		110	390	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	27		Brass (CuZn, CuSnZn)		90	320	200	8	11	200	8	11	-	-	-	-	-	-	-	-
	28		Bronze (CuSn)		100	360	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	29	Non-metallic - Thermosetting & fiber-reinforced plastics					-	-	-	-	-	-	-	-	-	-	-	-	-	-
	30	Non-metallic - Hard rubber, wood etc.					-	-	-	-	-	-	-	-	-	-	-	-	-	-
S	31	High temp. alloys	Fe based	A	200	680	50	8	11	50	8	11	50	5	5	9	50	9	5	13
	32			AH	280	950	50	8	11	50	8	11	50	5	5	9	50	9	5	13
	33		Ni / Co based	A	250	840	50	8	11	50	8	11	50	5	5	9	50	9	5	13
	34			AH	350	1180	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	35			C	320	1080	50	8	11	50	8	11	50	5	5	9	50	9	5	13
	36	Titanium & Ti alloys	CP Titanium		400 MPa		**70**	8	11	**70**	8	11	70	5	5	9	70	9	5	13
	37.1		Alpha alloys		860 MPa		**70**	8	11	**70**	8	11	70	5	5	9	70	9	5	13
	37.2		Alpha / Beta alloys	A	960 MPa		**70**	8	11	**70**	8	11	70	5	5	9	70	9	5	13
	37.3			AH	1170 MPa		**70**	8	11	**70**	8	11	70	5	5	9	70	9	5	13
	37.4		Beta alloys	A	830 MPa		**70**	8	11	**70**	8	11	70	5	5	9	70	9	5	13
	37.5			AH	1400 MPa		-	-	-	-	-	-	-	-	-	-	-	-	-	-
H	38.1	Hardened steel		HT	45 HRC		**120**	8	11	**120**	8	11	-	-	-	-	-	-	-	-
	38.2			HT	55 HRC		-	-	-	-	-	-	-	-	-	-	-	-	-	-
	39.1			HT	58 HRC		-	-	-	-	-	-	-	-	-	-	-	-	-	-
	39.2			HT	62 HRC		-	-	-	-	-	-	-	-	-	-	-	-	-	-
	40	Cast Iron	Chilled	C	400	1350	**120**	**8**	**11**	**120**	**8**	**11**	-	-	-	-	-	-	-	-
	41			HT	55 HRC		**100**	8	11	**100**	8	11	-	-	-	-	-	-	-	-

Condition: **A** (Annealed), **AH** (Age Hardened), **C** (Cast), **HT** (Hardened & Tempered), **QT** (Quenched & Tempered)

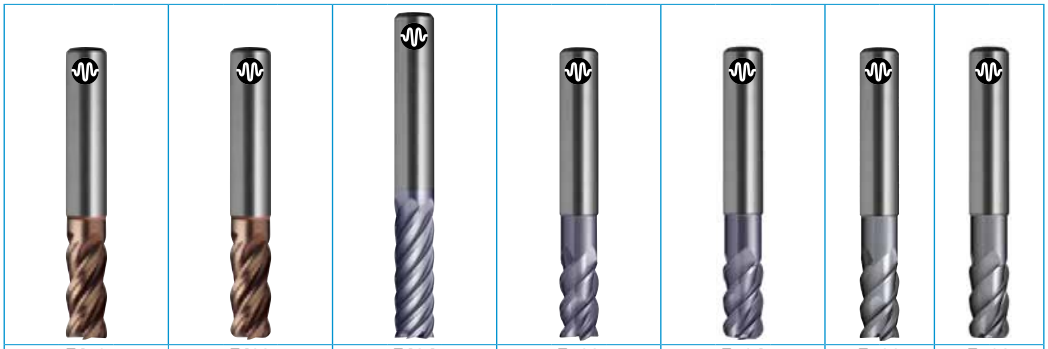
Bold = Optimal | Regular = Effective

Feed Table (f_z) (mm/tooth)

Ø	Feed # 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
2	0.001	0.002	0.002	0.003	0.004	0.005	0.006	0.007	0.008	0.010	0.011	0.013	0.014	0.016	0.018	0.020	0.022	0.024	0.026	0.030
3	0.002	0.003	0.004	0.005	0.006	0.008	0.009	0.010	0.012	0.014	0.016	0.018	0.020	0.023	0.025	0.028	0.032	0.034	0.038	0.042
4	0.004	0.005	0.006	0.007	0.009	0.010	0.012	0.014	0.016	0.018	0.021	0.023	0.026	0.030	0.032	0.036	0.040	0.044	0.045	0.050
5	0.005	0.006	0.008	0.009	0.011	0.013	0.015	0.017	0.020	0.023	0.025	0.030	0.032	0.036	0.040	0.044	0.050	0.055	0.060	0.065
6	0.006	0.008	0.009	0.011	0.013	0.016	0.018	0.021	0.024	0.028	0.030	0.034	0.038	0.042	0.045	0.050	0.055	0.060	0.070	0.075
8	0.010	0.012	0.014	0.017	0.019	0.022	0.025	0.028	0.032	0.036	0.040	0.045	0.050	0.055	0.060	0.065	0.075	0.080	0.085	0.095
10	0.013	0.015	0.018	0.021	0.024	0.028	0.032	0.036	0.040	0.045	0.050	0.055	0.060	0.070	0.075	0.085	0.090	0.100	0.11	0.12
12	0.016	0.019	0.022	0.026	0.030	0.034	0.038	0.044	0.050	0.055	0.060	0.065	0.075	0.080	0.090	0.100	0.11	0.12	0.13	0.14
16	0.020	0.024	0.028	0.034	0.038	0.044	0.050	0.055	0.060	0.070	0.080	0.085	0.095	0.11	0.12	0.13	0.14	0.16	0.17	0.18
20	0.022	0.028	0.032	0.038	0.044	0.050	0.060	0.065	0.075	0.085	0.095	0.11	0.12	0.13	0.15	0.16	0.18	0.19	0.21	0.23
25	0.025	0.032	0.038	0.045	0.055	0.060	0.070	0.080	0.090	0.10	0.12	0.13	0.15	0.16	0.18	0.20	0.22	0.24	0.26	0.29

Notes on Milling

1. Above values are guidelines for the size and type of cut nominated.
2. For long series tools, reduce speed by 40% and feed by 20%.



E459	E462	E434	E562	E564	E566	E568
VHM-ULTRA						
HELICA		AlCrN			Aldura	
VA		NH			VH	
●	●		●	●		
		●				
●	●	●	●	●	●	●
1.0	1.0	2.0	2.0	0.5	1.0	0.5	1.0	1.0	1.0
1.0	0.3	1.0	0.3	0.05	0.025	1.0	0.4	1.0	0.4	0.05	0.05

Vc	Feed #		Vc	Feed #		Vc	Feed #		Vc	Feed #		Vc	Feed #		Vc	Feed #	Vc	Feed #	VDI^ 3323	ISO
-	-	-	-	-	-	125	9	12	-	-	-	-	-	-	-	-	-	-	1	
-	-	-	-	-	-	125	9	12	-	-	-	-	-	-	-	-	-	-	2	
-	-	-	-	-	-	**105**	**9**	**12**	-	-	-	-	-	-	-	-	-	-	3	
-	-	-	-	-	-	**105**	**9**	**12**	-	-	-	-	-	-	-	-	-	-	4	
-	-	-	-	-	-	**105**	**9**	**12**	**175**	**9**	**10**	**175**	**9**	**10**	-	-	-	-	5	
-	-	-	-	-	-	125	9	12	-	-	-	-	-	-	-	-	-	-	6	
-	-	-	-	-	-	**105**	**9**	**12**	-	-	-	-	-	-	-	-	-	-	7	P
-	-	-	-	-	-	**105**	**9**	**12**	**175**	**9**	**10**	**175**	**9**	**10**	-	-	-	-	8	
-	-	-	-	-	-	**70**	**9**	**12**	**120**	**9**	**10**	**120**	**9**	**10**	-	-	-	-	9	
-	-	-	-	-	-	**105**	**9**	**12**	-	-	-	-	-	-	-	-	-	-	10	
-	-	-	-	-	-	**70**	**9**	**12**	**120**	**9**	**10**	**120**	**9**	**10**	-	-	-	-	11	
120	9	12	120	9	12	70	9	12	-	-	-	-	-	-	-	-	-	-	12	
100	9	12	100	9	12	**60**	**9**	**12**	**100**	**9**	**10**	**100**	**9**	**10**	-	-	-	-	13	
120	**9**	**12**	**120**	**9**	**12**	-	-	-	-	-	-	-	-	-	-	-	-	-	14.1	
120	**9**	**12**	**120**	**9**	**12**	-	-	-	**120**	**9**	**10**	**120**	**9**	**10**	-	-	-	-	14.2	M
100	**9**	**12**	**100**	**9**	**12**	-	-	-	**100**	**9**	**10**	**100**	**9**	**10**	-	-	-	-	14.3	
-	-	-	-	-	-	**90**	**9**	**12**	-	-	-	-	-	-	-	-	-	-	15	
-	-	-	-	-	-	**90**	**9**	**12**	150	9	10	150	9	10	-	-	-	-	16	
-	-	-	-	-	-	**90**	**9**	**12**	-	-	-	-	-	-	-	-	-	-	17	K
-	-	-	-	-	-	**90**	**9**	**12**	**150**	**9**	**10**	**150**	**9**	**10**	-	-	-	-	18	
-	-	-	-	-	-	**65**	**9**	**12**	-	-	-	-	-	-	-	-	-	-	19	
-	-	-	-	-	-	**65**	**9**	**12**	-	-	-	-	-	-	-	-	-	-	20	
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-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	
70	8	11	70	8	11	-	-	-	-	-	-	-	-	-	-	-	-	-	31	
70	8	11	**70**	8	11	30	9	12	**50**	**9**	**10**	**50**	**9**	**10**	-	-	-	-	32	
70	8	11	70	8	11	-	-	-	-	-	-	-	-	-	-	-	-	-	33	
70	8	11	**70**	8	11	**30**	**9**	**12**	**50**	**9**	**10**	**50**	**9**	**10**	-	-	-	-	34	
70	8	11	**70**	8	11	30	9	12	**50**	**9**	**10**	**50**	**9**	**10**	-	-	-	-	35	
90	8	11	90	8	11	-	-	-	-	-	-	-	-	-	-	-	-	-	36	S
90	8	11	**90**	8	11	-	-	-	-	**9**	**10**	-	**9**	**10**	-	-	-	-	37.1	
90	8	11	**90**	8	11	40	9	12	**70**	**9**	**10**	**70**	**9**	**10**	-	-	-	-	37.2	
-	-	-	-	-	-	**40**	**9**	**12**	-	-	-	-	-	-	-	-	-	-	37.3	
90	8	11	**90**	8	11	40	9	12	**70**	**9**	**10**	**70**	**9**	**10**	-	-	-	-	37.4	
90	8	11	90	8	11	**40**	**9**	**12**	-	-	-	-	-	-	-	-	-	-	37.5	
-	-	-	-	-	-	**70**	**9**	**12**	120	9	10	120	9	10	-	-	-	-	38.1	
-	-	-	-	-	-	**70**	**9**	**12**	-	-	-	-	-	-	**60**	**12**	**60**	**12**	38.2	
-	-	-	-	-	-	60	9	12	-	-	-	-	-	-	**50**	**12**	**50**	**12**	39.1	H
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**30**	**12**	**30**	**12**	39.2	
-	-	-	-	-	-	**70**	**9**	**12**	**120**	**9**	**10**	**120**	**9**	**10**	**-**	-	**-**	-	40	
-	-	-	-	-	-	60	9	12	-	-	-	-	-	-	**140**	**12**	**140**	**12**	41	

IMPERIAL ENDMILLS (inch size)

Ø = nominal tool diameter (inch)
n = Spindel speed (RPM)
v_c = Cutting speed (SFM)
f_z = Feed rate per tooth (inch/tooth)
v_f = Feed rate (inch/min)
z = No. cutting edges
Q = Metal removal rate (in^3/min)
a_p = Cutting depth (inch)
a_e = Cutting width (inch)

$$n = \frac{v_c \times 12}{Ø \times \pi} \simeq \frac{v_c}{Ø} \times 3.82$$

$$v_c = \frac{n \times Ø \times \pi}{12} \simeq \frac{n \times Ø}{3.82}$$

$$f_z = \frac{V_f}{z \times n} \qquad v_f = f_z \times z \times n$$

$$Q = \frac{a_p \times a_e \times v_f}{1000}$$

METRIC ENDMILLS (mm size)

Ø = nominal tool diameter (mm)
n = Spindel speed (RPM)
v_c = Cutting speed (m/min)
f_z = Feed rate per tooth (mm/tooth)
v_f = Feed rate (mm/min)
z = No. cutting edges
Q = Metal removal rate (cm^3/min)
a_p = Cutting depth (mm)
a_e = Cutting width (mm)

$$n = \frac{v_c \times 1000}{Ø \times \pi} \simeq \frac{v_c}{Ø} \times 318$$

$$v_c = \frac{n \times Ø \times \pi}{1000} \simeq \frac{n \times Ø}{318}$$

$$f_z = \frac{V_f}{z \times n} \qquad v_f = f_z \times z \times n$$

$$Q = \frac{a_p \times a_e \times v_f}{1000}$$

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