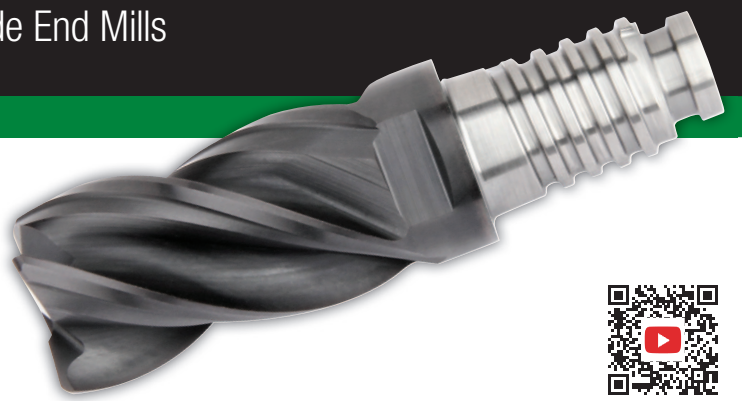
Modular End Mills

High-Performance Modular Solid Carbide End Mills



- High-performance geometries provide highest Metal Removal Rates (MRR).
- Unequal flute spacing reduces vibrations and improves surface finish.
- Intelligent thread ensures stress levels remain below critical values.
- Third-contact surface delivers high stiffness and highest accuracy below 5µm runout.

See me in action!

VariMill™ Modular Series

- Less cutting forces and pressure on cutting edge through tailored axial and radial rake angles.
- Proprietary tapered core provides highest tool stability in roughing and finishing operations.
- Eccentric relief design increases tool life through higher edge stability.

4X47 VariMill Series

- 4 flute.
- New asymmetrical fluting geometry.
- High metal removal rates and tool life in:
  – Stainless steels, steels, and alloyed steels.
  – High-temperature alloys and titanium.

5747 VariMill II™ Series

- 5 flute.
- High metal removal rates and tool life in:
  – Stainless steels, steels, and alloyed steels.
  – Cast iron.
  – High-temperature alloys and titanium.

4547 & 4548 High-Performance Finishing

- Multi-flute finishers.
- Radius corner.
- High metal removal rates and tool life in:
  – Stainless steels and steels.

4U40 High-Performance Roughing 45°

- Multi-flute roughers.
- Radius corner.
- High-temperature geometries.

4969 High-Performance Ball-Nose Roughing

- 4 Flute ball-nose rougher.
- Steel and stainless steel geometries.

4946 High-Performance Roughing 20°

- Multi-flute roughers.
- Chamfer corner.
- Steel and stainless steel geometries.

4XN0 VariMill Series

- 4 flute.
- Stainless steel and steel geometry design.
- Centre cutting ball nose.

4X48 VariMill Series

- 4 flute.
- New asymmetrical fluting geometry.
- Titanium geometry design.
- Extensive radii corner offering.

5748 VariMill II ER Series

- 5 flute.
- Titanium geometry design.
- Eccentric relief for edge stability and strength.
- Extensive radii corner offering.

774E VariMill III™ ER Series

- 7 flute.
- Titanium geometry design.
- Eccentric relief for edge stability and strength.
- Extensive radii corner offering.

5142 & 5143 — AluSurf™

- 2- and 3-flute finishers.
- Radius corner.
- Aluminium geometries.

8045 — Corner Rounding

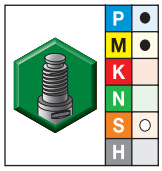
- 4 flute.
- Corner rounding.

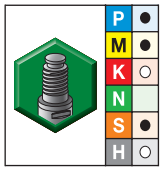
8046 — Corner Chamfering

- Multi-flute roughers.
- Chamfer corner.

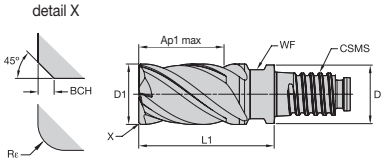
High-Performance DUO-λOCK® Modular End Mills • VariMill™

4X47 • 4X48 • 4 Flute • 38° Helix • Metric





● first choice
○ alternate choice



WIDIA HANITA

4X47 grade WP15PE AlTiN order #	4X48 grade WS15PE AlTiN order #	D1	D	length of cut Ap1 max	L1	CSMS system size	WF	BCH	Rε
6071019	**–**	10,0	9,60	15,00	23	DL10	8,00	0,50	–
–	**6071095**	10,0	9,60	15,00	23	DL10	8,00	–	0,50
–	**6071096**	10,0	9,60	15,00	23	DL10	8,00	–	1,00
–	**6071097**	10,0	9,60	15,00	23	DL10	8,00	–	2,00
6071020	**–**	12,0	11,50	18,00	27	DL12	9,50	0,50	–
–	**6071098**	12,0	11,50	18,00	27	DL12	9,50	–	0,50
–	**6071099**	12,0	11,50	18,00	27	DL12	9,50	–	1,00
–	**6071100**	12,0	11,50	18,00	27	DL12	9,50	–	2,00
6071091	**–**	16,0	15,50	24,00	36	DL16	13,00	0,50	–
–	**6071111**	16,0	15,50	24,00	36	DL16	13,00	–	1,00
–	**6071112**	16,0	15,50	24,00	36	DL16	13,00	–	2,00
–	**6071113**	16,0	15,50	24,00	36	DL16	13,00	–	3,00
6071092	**–**	20,0	19,30	30,00	45	DL20	16,00	0,50	–
–	**6071114**	20,0	19,30	30,00	45	DL20	16,00	–	1,00
–	**6071115**	20,0	19,30	30,00	45	DL20	16,00	–	2,00
–	**6071116**	20,0	19,30	30,00	45	DL20	16,00	–	3,00
–	**6071117**	20,0	19,30	30,00	45	DL20	16,00	–	4,00
6071093	**–**	25,0	24,00	37,50	57	DL25	21,00	0,50	–
–	**6071118**	25,0	24,00	37,50	57	DL25	21,00	–	1,00
–	**6071119**	25,0	24,00	37,50	57	DL25	21,00	–	2,00
–	**6071120**	25,0	24,00	37,50	57	DL25	21,00	–	3,00
–	**6071121**	25,0	24,00	37,50	57	DL25	21,00	–	4,00
6071094	**–**	32,0	31,00	48,00	72	DL32	28,00	0,50	–
–	**6071122**	32,0	31,00	48,00	72	DL32	28,00	–	2,00
–	**6071123**	32,0	31,00	48,00	72	DL32	28,00	–	3,00

NOTE: For application data, please see page 58.

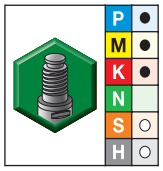
End Mill Tolerances

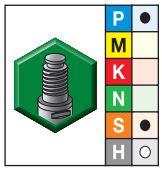
D1	tolerance e8
> 10–18	-0,032/-0,059
> 18–30	-0,040/-0,073
> 30	-0,050/-0,089

Modular End Mills

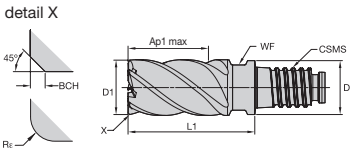
High-Performance DUO-λOCK® Modular End Mills • VariMill™

5747 • 5748 • 5 Flute • 38° Helix • Metric





● first choice
○ alternate choice



WIDIA HANITA

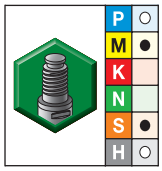
5747 grade WP15PE AlTiN order #	5748 grade WS15PE AlTiN order #	D1	D	length of cut Ap1 max	L1	CSMS system size	WF	BCH	Rε
6071260	–	10,0	9,60	15,00	23	DL10	8,00	0,50	–
–	6071366	10,0	9,60	15,00	23	DL10	8,00	–	0,50
–	6071367	10,0	9,60	15,00	23	DL10	8,00	–	1,00
–	6071368	10,0	9,60	15,00	23	DL10	8,00	–	2,00
6071361	–	12,0	11,50	18,00	27	DL12	9,50	0,50	–
–	6071369	12,0	11,50	18,00	27	DL12	9,50	–	0,50
–	6071370	12,0	11,50	18,00	27	DL12	9,50	–	1,00
–	6071371	12,0	11,50	18,00	27	DL12	9,50	–	2,00
6071362	–	16,0	15,50	24,00	36	DL16	13,00	0,50	–
–	6071372	16,0	15,50	24,00	36	DL16	13,00	–	1,00
–	6071373	16,0	15,50	24,00	36	DL16	13,00	–	2,00
–	6071374	16,0	15,50	24,00	36	DL16	13,00	–	3,00
6071363	–	20,0	19,30	30,00	45	DL20	16,00	0,50	–
–	6071375	20,0	19,30	30,00	45	DL20	16,00	–	1,00
–	6071376	20,0	19,30	30,00	45	DL20	16,00	–	2,00
–	6071377	20,0	19,30	30,00	45	DL20	16,00	–	3,00
–	6071378	20,0	19,30	30,00	45	DL20	16,00	–	4,00
6071364	–	25,0	24,00	37,50	57	DL25	21,00	0,50	–
–	6071379	25,0	24,00	37,50	56	DL25	21,00	–	1,00
–	6071380	25,0	24,00	37,50	56	DL25	21,00	–	2,00
–	6071391	25,0	24,00	37,50	56	DL25	21,00	–	3,00
–	6071392	25,0	24,00	37,50	56	DL25	21,00	–	4,00
6071365	–	32,0	31,00	48,00	72	DL32	28,00	0,50	–
–	6071393	32,0	31,00	48,00	72	DL32	28,00	–	2,00
–	6071394	32,0	31,00	48,00	72	DL32	28,00	–	3,00

NOTE: For application data, please see page 58.

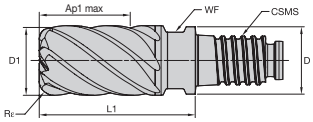
End Mill Tolerances

D1	tolerance e8
> 10–18	-0,032/-0,059
> 18–30	-0,040/-0,073
> 30	-0,050/-0,089

774E • 7 Flute with Eccentric Relief Grind • 38° Helix • Metric



● first choice
○ alternate choice

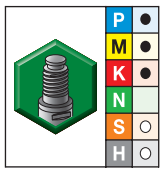


WIDIA HANITA

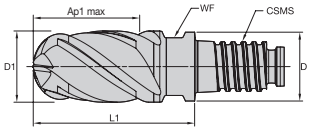
grade WS15PE AlTiN order #	D1	D	length of cut Ap1 max	L1	CSMS system size	WF	Rε
6071475	10,0	9,60	15,00	23	DL10	8,00	0,50
6071476	10,0	9,60	15,00	23	DL10	8,00	1,00
6071477	10,0	9,60	15,00	23	DL10	8,00	2,00
6071478	12,0	11,50	18,00	27	DL12	9,50	0,50
6071479	12,0	11,50	18,00	27	DL12	9,50	1,00
6071480	12,0	11,50	18,00	27	DL12	9,50	2,00
6071521	16,0	15,50	24,00	36	DL16	13,00	1,00
6071522	16,0	15,50	24,00	36	DL16	13,00	2,00
6071523	16,0	15,50	24,00	36	DL16	13,00	3,00
6071524	20,0	19,30	30,00	45	DL20	16,00	1,00
6071525	20,0	19,30	30,00	45	DL20	16,00	2,00
6071526	20,0	19,30	30,00	45	DL20	16,00	3,00
6071527	20,0	19,30	30,00	45	DL20	16,00	4,00
6071528	25,0	24,00	37,50	57	DL25	21,00	1,00
6071529	25,0	24,00	37,50	57	DL25	21,00	2,00
6071530	25,0	24,00	37,50	57	DL25	21,00	3,00
6071531	25,0	24,00	37,50	57	DL25	21,00	4,00
6071532	32,0	31,00	48,00	72	DL32	28,00	2,00
6071533	32,0	31,00	48,00	72	DL32	28,00	3,00

NOTE: For application data, please see page 59.

4XN0 • 4-Flute Ball Nose • 38° Helix • Metric



● first choice
○ alternate choice



WIDIA HANITA

grade WP15PE AlTiN order #	D1	D	length of cut Ap1 max	L1	CSMS system size	WF
6071128	10,0	9,60	15,00	23	DL10	8,00
6071130	12,0	11,50	18,00	27	DL12	9,50
6071151	16,0	15,50	24,00	36	DL16	13,00
6071152	20,0	19,30	30,00	45	DL20	16,00
6071153	25,0	24,00	37,50	57	DL25	21,00

NOTE: For application data, please see page 60.

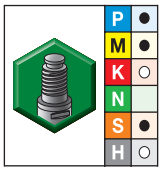
End Mill Tolerances

D1	tolerance e8
> 10–18	-0,032/-0,059
> 18–30	-0,040/-0,073
> 30	-0,050/-0,089

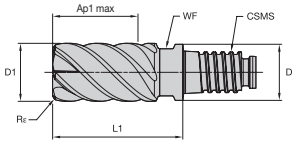
Modular End Mills

High-Performance DUO-λOCK® Modular End Mills • Finishing/Roughing

4547 • Multi-Flute Finisher • 45° Helix • Metric



● first choice
○ alternate choice



WIDIA HANITA

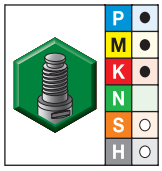
grade WP15PE AlTiN order #	D1	D	length of cut Ap1 max	L1	CSMS system size	WF	Rε	Z U
6127193	10,0	9,60	15,00	23	DL10	8,00	0,50	6
6127194	12,0	11,50	18,00	27	DL12	9,50	0,75	6
6127195	16,0	15,50	24,00	36	DL16	13,00	0,75	6
6127196	20,0	19,30	30,00	45	DL20	16,00	0,75	6
6127197	25,0	24,00	37,50	57	DL25	21,00	0,75	6

NOTE: For application data, please see page 60.
*For more information on the 4548 series, visit **widia.com** or **widia.com/novo**.*

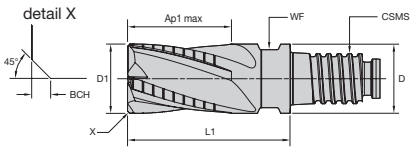
End Mill Tolerances

D1	tolerance e8
> 10–18	-0,032/-0,059
> 18–30	-0,040/-0,073
> 30	-0,050/-0,089

4946 • High-Performance Roughing • 20° Helix • Metric



● first choice
○ alternate choice



WIDIA HANITA

grade WP15PE AlTiN order #	D1	D	length of cut Ap1 max	L1	CSMS system size	WF	BCH	Z U
6127281	10,0	9,60	15,00	23	DL10	8,00	0,50	4
6127282	12,0	11,50	18,00	27	DL12	9,50	0,50	4
6127283	16,0	15,50	24,00	36	DL16	13,00	0,50	4
6127284	20,0	19,30	30,00	45	DL20	16,00	0,50	4
6127285	25,0	24,00	37,50	57	DL25	21,00	0,50	5

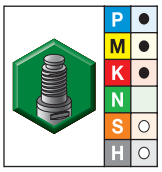
NOTE: For application data, please see page 61.

End Mill Tolerances

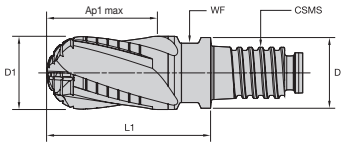
D1	tolerance d11
> 10–18	-0,050/-0,160
> 18–30	-0,065/-0,195

High-Performance DUO-λOCK® Modular End Mills • Roughing

4969 • Ball-Nose Roughing • 20° Helix • Metric



● first choice
○ alternate choice



WIDIA HANITA

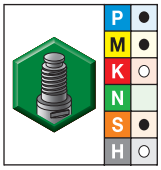
grade WP15PE AlTiN order #	D1	D	length of cut Ap1 max	L1	CSMS system size	WF	Z U
6126824	10,0	9,60	15,00	23	DL10	8,00	4
6126825	12,0	11,50	18,00	27	DL12	9,50	4
6126826	16,0	15,50	24,00	36	DL16	13,00	4
6126827	20,0	19,30	30,00	45	DL20	16,00	4
6126828	25,0	24,00	37,50	57	DL25	21,00	4

NOTE: For application data, please see page 61.

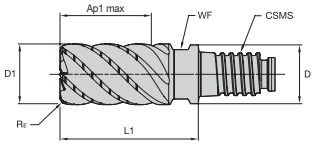
End Mill Tolerances

D1	tolerance d11
> 10–18	-0,050/-0,160
> 18–30	-0,065/-0,195

4U40 • Roughing • 45° Helix • Metric



● first choice
○ alternate choice



WIDIA HANITA

grade WS15PE AlTiN order #	D1	D	length of cut Ap1 max	L1	CSMS system size	WF	Rε	Z U
6126560	10,0	9,60	15,00	23	DL10	8,00	0,50	4
6126721	12,0	11,50	18,00	27	DL12	9,50	0,75	4
6126722	16,0	15,50	24,00	36	DL16	13,00	0,75	6
6126723	20,0	19,30	30,00	45	DL20	16,00	0,75	6
6126724	25,0	24,00	37,50	57	DL25	21,00	0,75	6

NOTE: For application data, please see page 62.

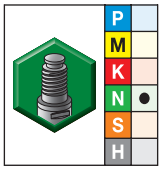
End Mill Tolerances

D1	tolerance e8
> 10–18	-0,032/-0,059
> 18–30	-0,040/-0,073
> 30	-0,050/-0,089

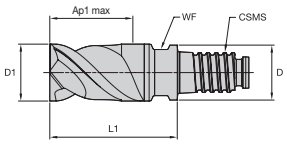
Modular End Mills

High-Performance DUO-λOCK® Modular End Mills • AluSurf™

AluSurf • 5142 • 2 Flute • 45° Helix • Aluminium



● first choice
○ alternate choice



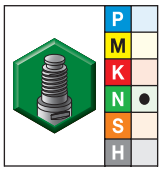
WIDIA HANITA

grade UNCOATED

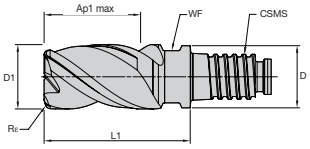
order #	D1	D	length of cut Ap1 max	L1	CSMS system size	WF
6151048	10,0	9,60	15,00	23	DL10	8,00
6151049	12,0	11,50	18,00	27	DL12	9,50
6151050	16,0	15,50	24,00	36	DL16	13,00
6151061	20,0	19,30	30,00	45	DL20	16,00

NOTE: For application data, please see page 62.

AluSurf • 5143 • 3 Flute • 38° Helix • Aluminium



● first choice
○ alternate choice



WIDIA HANITA

grade UNCOATED

order #	D1	D	length of cut Ap1 max	L1	CSMS system size	WF	Rε
6150886	10,0	9,60	15,00	23	DL10	8,00	0,50
6150887	10,0	9,60	15,00	23	DL10	8,00	1,00
6150888	10,0	9,60	15,00	23	DL10	8,00	2,00
6150889	12,0	11,50	17,50	27	DL12	9,50	0,50
6150890	12,0	11,50	18,00	27	DL12	9,50	1,00
6151011	12,0	11,50	18,00	27	DL12	9,50	2,00
6151013	16,0	15,50	24,00	36	DL16	13,00	1,00
6151014	16,0	15,50	24,00	36	DL16	13,00	2,00
6151015	16,0	15,50	24,00	36	DL16	13,00	3,00
6151016	20,0	19,30	30,00	45	DL20	16,00	1,00
6151017	20,0	19,30	30,00	45	DL20	16,00	2,00
6151018	20,0	19,30	30,00	45	DL20	16,00	3,00
6151019	20,0	19,30	30,00	45	DL20	16,00	4,00
6151020	25,0	24,00	37,50	57	DL25	21,00	1,00
6151021	25,0	24,00	37,50	57	DL25	21,00	2,00
6151022	25,0	24,00	37,50	57	DL25	21,00	3,00
6151024	25,0	24,00	37,50	57	DL25	21,00	4,00

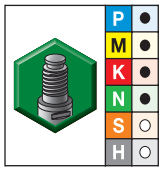
NOTE: For application data, please see page 62.

End Mill Tolerances

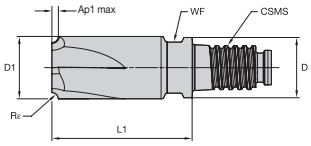
D1	tolerance e8
> 10–18	-0,032/-0,059
> 18–30	-0,040/-0,073
> 30	-0,050/-0,089

High-Performance DUO-λOCK® Modular End Mills • Corner Rounding/Chamfering

8045 • Corner Rounding



● first choice
○ alternate choice

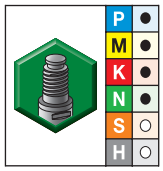


WIDIA HANITA

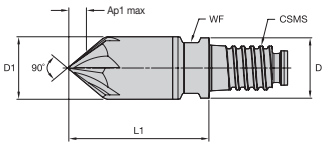
order #	D1	D	length of cut Ap1 max	L1	CSMS system size	WF	Rε	Z U
grade WP15PE AlTiN								
6127354	10,0	9,60	1,50	23	DL10	8,00	1,50	4
6127355	10,0	9,60	3,00	23	DL10	8,00	3,00	4
6127356	12,0	11,50	1,00	27	DL12	9,50	1,00	4
6127357	12,0	11,50	2,00	27	DL12	9,50	2,00	4
6127358	12,0	11,50	3,00	27	DL12	9,50	3,00	4
6127359	16,0	15,50	2,00	36	DL16	13,00	2,00	4
6127360	16,0	15,50	3,00	36	DL16	13,00	3,00	4
6127381	16,0	15,50	4,00	36	DL16	13,00	4,00	4

NOTE: For application data, please see page 63.

8046 • Chamfering



● first choice
○ alternate choice



WIDIA HANITA

order #	D1	D	length of cut Ap1 max	L1	CSMS system size	WF	BCH	Z U
grade WP15PE AlTiN								
6127401	10,0	9,60	2,00	23	DL10	8,00	2,00	4
6127402	12,0	11,50	3,00	27	DL12	9,50	3,00	5
6127403	16,0	15,50	4,00	36	DL16	13,00	4,00	6

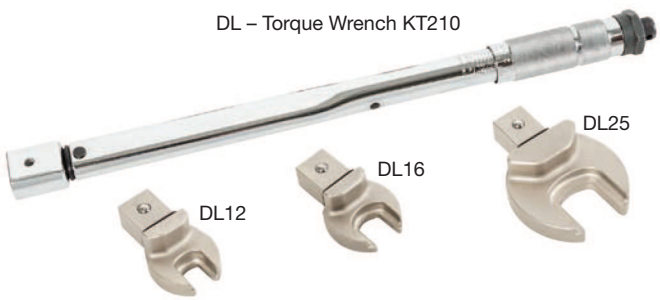
NOTE: For application data, please see page 63.

End Mill Tolerances

D1	tolerance e8
> 10–18	-0,032/-0,059
> 18–30	-0,040/-0,073
> 30	-0,050/-0,089

DUO-λOCK® Accessories

DL – Torque Wrench KT210



Torque Wrench

order number	catalogue number	description	quantity
6390382	**DL - Tourqe Wrench KT210**	Only Wrench 30-130 Nm	10
6390561	**DL - 12 Key**	Only Key 30 Nm	20
6390562	**DL - 16 Key**	Only Key 60 Nm	20
6390563	**DL - 20 Key**	Only Key 80 Nm	10
6390564	**DL - 25 Key**	Only Key 100 Nm	10
6390565	**DL - 32 Key**	Only Key 130 Nm	10
6390566	**DL10 - Tourqe Wrench + Key**	Wrench + Key 25 Nm	5

NOTE: Combine basic Duo-Lock™ wrench with selected torque wrench inserts needed.

Modular End Mills

High-Performance DUO-λOCK® Modular End Mills • VariMill™

■ VariMill™ • 4X47 • 4X48 • Asymmetrical Flute Spacing

Material Group		Side Milling (A) and Slotting (B)			short			medium			long			Recommended feed per tooth (fz = mm/th) for side milling (A). For slotting (B), reduce fz by 20%.						
		A		B	adaptor reach WP15PE WS15PE Cutting Speed — vc m/min			adaptor reach WP15PE WS15PE Cutting Speed — vc m/min			adaptor reach WP15PE WS15PE Cutting Speed — vc m/min			D1 — Diameter						
		ap	ae	ap	min		max	min		max	min		max	mm	10,0	12,0	16,0	20,0	25,0	32,0
P	0	1,5 x D	0,5 x D	1 x D	150	–	200	135	–	180	135	–	180	fz	0,061	0,070	0,086	0,097	0,105	0,106
	1	1,5 x D	0,5 x D	1 x D	150	–	200	135	–	180	135	–	180	fz	0,061	0,070	0,086	0,097	0,105	0,106
	2	1,5 x D	0,5 x D	1 x D	140	–	190	126	–	171	126	–	171	fz	0,061	0,070	0,086	0,097	0,105	0,106
	3	1,5 x D	0,5 x D	1 x D	120	–	160	108	–	144	108	–	144	fz	0,051	0,060	0,074	0,086	0,097	0,105
	4	1,5 x D	0,5 x D	0,75 x D	90	–	150	81	–	135	81	–	135	fz	0,046	0,053	0,065	0,075	0,083	0,087
	5	1,5 x D	0,5 x D	1 x D	60	–	100	51	–	85	48	–	80	fz	0,041	0,048	0,059	0,069	0,077	0,084
	6	1,5 x D	0,5 x D	0,75 x D	50	–	75	42	–	64	40	–	60	fz	0,034	0,040	0,048	0,055	0,060	0,062
M	1	1,5 x D	0,5 x D	1 x D	90	–	115	72	–	92	63	–	80	fz	0,051	0,060	0,074	0,086	0,097	0,105
	2	1,5 x D	0,5 x D	1 x D	60	–	80	48	–	64	42	–	56	fz	0,041	0,048	0,059	0,069	0,077	0,084
	3	1,5 x D	0,5 x D	1 x D	60	–	70	48	–	56	42	–	49	fz	0,034	0,040	0,048	0,055	0,060	0,062
K	1	1,5 x D	0,5 x D	1 x D	120	–	150	108	–	135	108	–	135	fz	0,061	0,070	0,086	0,097	0,105	0,106
	2	1,5 x D	0,5 x D	1 x D	110	–	140	99	–	126	99	–	126	fz	0,051	0,060	0,074	0,086	0,097	0,105
	3	1,5 x D	0,5 x D	1 x D	110	–	130	99	–	117	99	–	117	fz	0,041	0,048	0,059	0,069	0,077	0,084
S	1	1,5 x D	0,3 x D	0,3 x D	50	–	90	40	–	72	30	–	54	fz	0,051	0,060	0,074	0,086	0,097	0,105
	2	1,5 x D	0,3 x D	0,3 x D	25	–	40	20	–	32	15	–	24	fz	0,027	0,032	0,039	0,046	0,052	0,057
	3	1,5 x D	0,5 x D	1 x D	60	–	80	48	–	64	36	–	48	fz	0,041	0,048	0,059	0,069	0,077	0,084
	4	1,5 x D	0,5 x D	1 x D	50	–	60	40	–	48	30	–	36	fz	0,038	0,044	0,055	0,063	0,071	0,077
H	1	1,5 x D	0,5 x D	0,75 x D	80	–	140	64	–	112	48	–	84	fz	0,046	0,053	0,065	0,075	0,083	0,087
	2	1,5 x D	0,2 x D	0,5 x D	70	–	120	56	–	96	42	–	72	fz	0,034	0,040	0,048	0,055	0,060	0,062

■ VariMill II™ • 5747 • 5748 • Unequal Flute Spacing

Material Group		Side Milling (A) and Slotting (B)			short			medium			long			Recommended feed per tooth (fz = mm/th) for side milling (A). For slotting (B), reduce fz by 20%.						
		A		B	adaptor reach WP15PE WS15PE Cutting Speed — vc m/min			adaptor reach WP15PE WS15PE Cutting Speed — vc m/min			adaptor reach WP15PE WS15PE Cutting Speed — vc m/min			D1 — Diameter						
		ap	ae	ap	min		max	min		max	min		max	mm	10,0	12,0	16,0	20,0	25,0	32,0
P	0	1,5 x D	0,5 x D	1 x D	150	–	200	135	–	180	135	–	180	fz	0,061	0,070	0,086	0,097	0,105	0,106
	1	1,5 x D	0,5 x D	1 x D	150	–	200	135	–	180	135	–	180	fz	0,061	0,070	0,086	0,097	0,105	0,106
	2	1,5 x D	0,5 x D	1 x D	140	–	190	126	–	171	126	–	171	fz	0,061	0,070	0,086	0,097	0,105	0,106
	3	1,5 x D	0,5 x D	1 x D	120	–	160	108	–	144	108	–	144	fz	0,051	0,060	0,074	0,086	0,097	0,105
	4	1,5 x D	0,5 x D	0,75 x D	90	–	150	81	–	135	81	–	135	fz	0,046	0,053	0,065	0,075	0,083	0,087
	5	1,5 x D	0,5 x D	1 x D	60	–	100	51	–	85	48	–	80	fz	0,041	0,048	0,059	0,069	0,077	0,084
	6	1,5 x D	0,5 x D	0,75 x D	50	–	75	42	–	64	40	–	60	fz	0,034	0,040	0,048	0,055	0,060	0,062
M	1	1,5 x D	0,5 x D	1 x D	90	–	115	72	–	92	63	–	80	fz	0,051	0,060	0,074	0,086	0,097	0,105
	2	1,5 x D	0,5 x D	1 x D	60	–	80	48	–	64	42	–	56	fz	0,041	0,048	0,059	0,069	0,077	0,084
	3	1,5 x D	0,5 x D	1 x D	60	–	70	48	–	56	42	–	49	fz	0,034	0,040	0,048	0,055	0,060	0,062
K	1	1,5 x D	0,5 x D	1 x D	120	–	150	108	–	135	108	–	135	fz	0,061	0,070	0,086	0,097	0,105	0,106
	2	1,5 x D	0,5 x D	1 x D	110	–	140	99	–	126	99	–	126	fz	0,051	0,060	0,074	0,086	0,097	0,105
	3	1,5 x D	0,5 x D	1 x D	110	–	130	99	–	117	99	–	117	fz	0,041	0,048	0,059	0,069	0,077	0,084
S	1	1,5 x D	0,3 x D	0,3 x D	50	–	90	40	–	72	30	–	54	fz	0,051	0,060	0,074	0,086	0,097	0,105
	2	1,5 x D	0,3 x D	0,3 x D	25	–	40	20	–	32	15	–	24	fz	0,027	0,032	0,039	0,046	0,052	0,057
	3	1,5 x D	0,5 x D	1 x D	60	–	80	48	–	64	36	–	48	fz	0,041	0,048	0,059	0,069	0,077	0,084
	4	1,5 x D	0,5 x D	1 x D	50	–	60	40	–	48	30	–	36	fz	0,038	0,044	0,055	0,063	0,071	0,077
H	1	1,5 x D	0,5 x D	0,75 x D	80	–	140	64	–	112	48	–	84	fz	0,046	0,053	0,065	0,075	0,083	0,087
	2	1,5 x D	0,2 x D	0,5 x D	70	–	120	56	–	96	42	–	72	fz	0,034	0,040	0,048	0,055	0,060	0,062

NOTE: Lower value of cutting speed is used for high stock removal applications or for higher hardness (machinability) within group.
Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.
Above parameters are based on ideal conditions. For smaller taper machining centres, please adjust parameters accordingly on diameters >12mm.
For side milling with ap larger than 1 x D, reduce fz by 20%!

High-Performance DUO-λOCK® Modular End Mills • VariMill™ Roughing/Finishing

VariMill III™ • 774E • Unequal Flute Spacing • Roughing

Material Group																			
		Side Milling (A)		short			medium			long			Recommended feed per tooth (fz = mm/th) for side milling (A).						
		A		adaptor reach									D1 — Diameter						
				WS15PE			WS15PE			WS15PE									
				Cutting Speed — vc m/min			Cutting Speed — vc m/min			Cutting Speed — vc m/min									
		ap	ae	min		max	min		max	min		max	mm	10,0	12,0	16,0	20,0	25,0	32,0
P	4	Ap max	0,3 x D	90	–	150	81	–	135	81	–	135	fz	0,043	0,050	0,061	0,070	0,078	0,082
	5	Ap max	0,3 x D	60	–	100	51	–	85	48	–	80	fz	0,039	0,045	0,056	0,065	0,073	0,079
M	1	Ap max	0,3 x D	90	–	115	72	–	92	63	–	80,5	fz	0,048	0,056	0,070	0,081	0,091	0,099
	2	Ap max	0,3 x D	60	–	80	48	–	64	42	–	56	fz	0,039	0,045	0,056	0,065	0,073	0,079
	3	Ap max	0,3 x D	60	–	70	48	–	56	42	–	49	fz	0,032	0,037	0,046	0,052	0,057	0,058
S	1	Ap max	0,3 x D	50	–	90	40	–	72	30	–	54	fz	0,048	0,056	0,070	0,081	0,091	0,099
	2	Ap max	0,3 x D	25	–	40	20	–	32	15	–	24	fz	0,026	0,030	0,037	0,043	0,049	0,054
	3	Ap max	0,3 x D	60	–	80	48	–	64	36	–	48	fz	0,039	0,045	0,056	0,065	0,073	0,079
	4	Ap max	0,3 x D	50	–	60	40	–	48	30	–	36	fz	0,036	0,041	0,051	0,059	0,067	0,072
H	1	Ap max	0,3 x D	80	–	140	64	–	112	48	–	84	fz	0,043	0,050	0,061	0,070	0,078	0,082
	2	Ap max	0,3 x D	70	–	120	56	–	96	42	–	72	fz	0,032	0,037	0,046	0,052	0,057	0,058

VariMill III • 774E • Unequal Flute Spacing • Finishing

Material Group																			
		Side Milling (A)		short			medium			long			Recommended feed per tooth (fz = mm/th) for side milling (A).						
		A		adaptor reach									D1 — Diameter						
				WS15PE			WS15PE			WS15PE									
				Cutting Speed — vc m/min			Cutting Speed — vc m/min			Cutting Speed — vc m/min									
		ap	ae	min		max	min		max	min		max	mm	10,0	12,0	16,0	20,0	25,0	32,0
P	4	Ap max	0,06 x D	180	–	300	162	–	270	162	–	270	fz	0,052	0,060	0,074	0,084	0,094	0,098
	5	Ap max	0,06 x D	120	–	200	102	–	170	96	–	160	fz	0,046	0,054	0,067	0,078	0,087	0,095
M	1	Ap max	0,06 x D	180	–	230	144	–	184	126	–	161	fz	0,058	0,067	0,084	0,097	0,109	0,118
	2	Ap max	0,06 x D	120	–	160	96	–	128	84	–	112	fz	0,046	0,054	0,067	0,078	0,087	0,095
	3	Ap max	0,06 x D	120	–	140	96	–	112	84	–	98	fz	0,039	0,045	0,055	0,062	0,068	0,070
S	1	Ap max	0,06 x D	100	–	180	80	–	144	60	–	108	fz	0,058	0,067	0,084	0,097	0,109	0,118
	2	Ap max	0,06 x D	50	–	80	40	–	64	30	–	48	fz	0,031	0,036	0,045	0,052	0,059	0,065
	3	Ap max	0,06 x D	120	–	160	96	–	128	72	–	96	fz	0,046	0,054	0,067	0,078	0,087	0,095
	4	Ap max	0,06 x D	100	–	120	80	–	96	60	–	72	fz	0,043	0,050	0,062	0,071	0,080	0,087
H	1	Ap max	0,06 x D	160	–	280	128	–	224	96	–	168	fz	0,052	0,060	0,074	0,084	0,094	0,098
	2	Ap max	0,06 x D	140	–	240	112	–	192	84	–	144	fz	0,039	0,045	0,055	0,062	0,068	0,070

NOTE: Lower value of cutting speed is used for high stock removal applications or for higher hardness (machinability) within group.
Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.
Above parameters are based on ideal conditions. For smaller taper machining centres, please adjust parameters accordingly on diameters >12mm.

Modular End Mills

High-Performance DUO-λOCK® Modular End Mills • VariMill™ Finishing

■ VariMill Ball Nose • 4XN0 • Asymmetrical Flute Spacing

Material Group		Side Milling (A) and Slotting (B)			short			medium			long			Recommended feed per tooth (fz = mm/th) for side milling (A). For slotting (B), reduce fz by 20%.						
		A		B	adaptor reach									D1 — Diameter						
					WP15PE			WP15PE			WP15PE									
					Cutting Speed — vc m/min			Cutting Speed — vc m/min			Cutting Speed — vc m/min									
		ap	ae	ap	min		max	min		max	min		max	mm	10,0	12,0	16,0	20,0	25,0	32,0
P	0	1,25 x D	0,5 x D	1 x D	150	–	200	135	–	180	135	–	180	fz	0,061	0,070	0,086	0,097	0,105	0,106
	1	1,25 x D	0,5 x D	1 x D	150	–	200	135	–	180	135	–	180	fz	0,061	0,070	0,086	0,097	0,105	0,106
	2	1,25 x D	0,5 x D	1 x D	140	–	190	126	–	171	126	–	171	fz	0,061	0,070	0,086	0,097	0,105	0,106
	3	1,25 x D	0,5 x D	1 x D	120	–	160	108	–	144	108	–	144	fz	0,051	0,060	0,074	0,086	0,097	0,105
	4	1,25 x D	0,5 x D	0,75 x D	90	–	150	81	–	135	81	–	135	fz	0,046	0,053	0,065	0,075	0,083	0,087
	5	1,25 x D	0,5 x D	1 x D	60	–	100	51	–	85	48	–	80	fz	0,041	0,048	0,059	0,069	0,077	0,084
	6	1,25 x D	0,5 x D	0,75 x D	50	–	75	42	–	64	40	–	60	fz	0,034	0,040	0,048	0,055	0,060	0,062
M	1	1,25 x D	0,5 x D	1 x D	90	–	115	72	–	92	63	–	80	fz	0,051	0,060	0,074	0,086	0,097	0,105
	2	1,25 x D	0,5 x D	1 x D	60	–	80	48	–	64	42	–	56	fz	0,041	0,048	0,059	0,069	0,077	0,084
	3	1,25 x D	0,5 x D	1 x D	60	–	70	48	–	56	42	–	49	fz	0,034	0,040	0,048	0,055	0,060	0,062
K	1	1,25 x D	0,5 x D	1 x D	120	–	150	108	–	135	108	–	135	fz	0,061	0,070	0,086	0,097	0,105	0,106
	2	1,25 x D	0,5 x D	1 x D	110	–	140	99	–	126	99	–	126	fz	0,051	0,060	0,074	0,086	0,097	0,105
	3	1,25 x D	0,5 x D	1 x D	110	–	130	99	–	117	99	–	117	fz	0,041	0,048	0,059	0,069	0,077	0,084
S	1	1 x D	0,3 x D	0,3 x D	50	–	90	40	–	72	30	–	54	fz	0,051	0,060	0,074	0,086	0,097	0,105
	2	1 x D	0,3 x D	0,3 x D	25	–	40	20	–	32	15	–	24	fz	0,027	0,032	0,039	0,046	0,052	0,057
	3	1,25 x D	0,5 x D	1 x D	60	–	80	48	–	64	36	–	48	fz	0,041	0,048	0,059	0,069	0,077	0,084
	4	1,25 x D	0,5 x D	1 x D	50	–	60	40	–	48	30	–	36	fz	0,038	0,044	0,055	0,063	0,071	0,077
H	1	1,25 x D	0,5 x D	0,75 x D	80	–	140	64	–	112	48	–	84	fz	0,046	0,053	0,065	0,075	0,083	0,087
	2	1,25 x D	0,2 x D	0,5 x D	70	–	120	56	–	96	42	–	72	fz	0,034	0,040	0,048	0,055	0,060	0,062

NOTE: Lower value of cutting speed is used for high stock removal applications or for higher hardness (machinability) within group.
Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.
Above parameters are based on ideal conditions. For smaller taper machining centres, please adjust parameters accordingly on diameters >12mm.
For side milling with ap larger than 1 x D, reduce fz by 20%!

■ 4547 • 4548 • Multi-Flute Finisher • Metric

Material Group		Side Milling (A)		short			medium			long			Recommended feed per tooth (fz = mm/th) for side milling (A).						
		A		adaptor reach									D1 — Diameter						
				WP15PE			WP15PE			WP15PE									
				Cutting Speed — vc m/min			Cutting Speed — vc m/min			Cutting Speed — vc m/min									
		ap	ae	min		max	min		max	min		max	mm	10,0	12,0	16,0	20,0	25,0	32,0
P	0	1,5 x D	0,05 x D	150	–	200	135	–	180	135	–	180	fz	0,072	0,083	0,101	0,114	0,124	0,125
	1	1,5 x D	0,05 x D	150	–	200	135	–	180	135	–	180	fz	0,072	0,083	0,101	0,114	0,124	0,125
	2	1,5 x D	0,05 x D	140	–	190	126	–	171	126	–	171	fz	0,072	0,083	0,101	0,114	0,124	0,125
	3	1,5 x D	0,05 x D	120	–	160	108	–	144	108	–	144	fz	0,061	0,070	0,087	0,101	0,114	0,123
	4	1,5 x D	0,05 x D	90	–	150	81	–	135	81	–	135	fz	0,054	0,062	0,077	0,088	0,098	0,102
	5	1,5 x D	0,05 x D	60	–	100	51	–	85	48	–	80	fz	0,048	0,056	0,070	0,081	0,091	0,099
	6	1,5 x D	0,05 x D	50	–	75	42,5	–	63,75	40	–	60	fz	0,040	0,047	0,057	0,065	0,071	0,073
M	1	1,5 x D	0,05 x D	90	–	115	72	–	92	63	–	80,5	fz	0,061	0,070	0,087	0,101	0,114	0,123
	2	1,5 x D	0,05 x D	60	–	80	48	–	64	42	–	56	fz	0,048	0,056	0,070	0,081	0,091	0,099
	3	1,5 x D	0,05 x D	60	–	70	48	–	56	42	–	49	fz	0,040	0,047	0,057	0,065	0,071	0,073
K	1	1,5 x D	0,05 x D	120	–	150	108	–	135	108	–	135	fz	0,072	0,083	0,101	0,114	0,124	0,125
	2	1,5 x D	0,05 x D	110	–	140	99	–	126	99	–	126	fz	0,061	0,070	0,087	0,101	0,114	0,123
	3	1,5 x D	0,05 x D	110	–	130	99	–	117	99	–	117	fz	0,048	0,056	0,070	0,081	0,091	0,099
S	1	1,5 x D	0,05 x D	50	–	90	40	–	72	30	–	54	fz	0,061	0,070	0,087	0,101	0,114	0,123
	2	1,5 x D	0,05 x D	25	–	40	20	–	32	15	–	24	fz	0,032	0,037	0,046	0,054	0,061	0,067
	3	1,5 x D	0,05 x D	25	–	40	20	–	32	15	–	24	fz	0,032	0,037	0,046	0,054	0,061	0,067
	4	1,5 x D	0,05 x D	50	–	60	40	–	48	30	–	36	fz	0,045	0,052	0,064	0,074	0,084	0,090
H	1	1,5 x D	0,05 x D	80	–	140	64	–	112	48	–	84	fz	0,054	0,062	0,077	0,088	0,098	0,102
	2	1,5 x D	0,05 x D	70	–	120	56	–	96	42	–	72	fz	0,040	0,047	0,057	0,065	0,071	0,073

NOTE: Lower value of cutting speed is used for high stock removal applications or for higher hardness (machinability) within group.
Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.
Above parameters are based on ideal conditions.
For smaller taper machining centres, please adjust parameters accordingly on diameters > 12mm.

High-Performance DUO-λOCK® Modular End Mills • VariMill™ Roughing

4946 • High-Performance Roughing • Metric

Material Group		Side Milling (A) and Slotting (B)			short			medium			long			Recommended feed per tooth (fz = mm/th) for side milling (A). For slotting (B), reduce fz by 20%.						
		A		B	adaptor reach															
					WP15PE			WP15PE			WP15PE									
					Cutting Speed — vc m/min			Cutting Speed — vc m/min			Cutting Speed — vc m/min			D1 — Diameter						
		ap	ae	ap	min		max	min		max	min		max	mm	10,0	12,0	16,0	20,0	25,0	32,0
P	0	1,5 x D	0,5 x D	1 x D	120	–	160	108	–	144	108	–	144	fz	0,061	0,070	0,086	0,097	0,105	0,106
	1	1,5 x D	0,5 x D	1 x D	120	–	160	108	–	144	108	–	144	fz	0,061	0,070	0,086	0,097	0,105	0,106
	2	1,5 x D	0,5 x D	1 x D	112	–	152	100,8	–	136,8	100,8	–	136,8	fz	0,061	0,070	0,086	0,097	0,105	0,106
	3	1,5 x D	0,4 x D	0,75 x D	96	–	128	86,4	–	115,2	86,4	–	115,2	fz	0,051	0,060	0,074	0,086	0,097	0,105
	4	1,5 x D	0,3 x D	0,30 x D	72	–	120	64,8	–	108	64,8	–	108	fz	0,046	0,053	0,065	0,075	0,083	0,087
	5	1,5 x D	0,4 x D	0,75 x D	48	–	80	40,8	–	68	38,4	–	64	fz	0,041	0,048	0,059	0,069	0,077	0,084
M	1	1,5 x D	0,4 x D	0,75 x D	72	–	92	57,6	–	73,6	50,4	–	64,4	fz	0,051	0,060	0,074	0,086	0,097	0,105
	2	1,5 x D	0,4 x D	0,75 x D	48	–	64	38,4	–	51,2	33,6	–	44,8	fz	0,041	0,048	0,059	0,069	0,077	0,084
	3	1,5 x D	0,4 x D	0,75 x D	48	–	56	38,4	–	44,8	33,6	–	39,2	fz	0,034	0,040	0,048	0,055	0,060	0,062
K	1	1,5 x D	0,5 x D	1 x D	96	–	120	86,4	–	108	86,4	–	108	fz	0,061	0,070	0,086	0,097	0,105	0,106
	2	1,5 x D	0,4 x D	1 x D	88	–	112	79,2	–	100,8	79,2	–	100,8	fz	0,051	0,060	0,074	0,086	0,097	0,105
	3	1,5 x D	0,4 x D	1 x D	88	–	104	79,2	–	93,6	79,2	–	93,6	fz	0,041	0,048	0,059	0,069	0,077	0,084
S	1	1,5 x D	0,4 x D	0,75 x D	40	–	72	32	–	57,6	24	–	43,2	fz	0,051	0,060	0,074	0,086	0,097	0,105
	3	1,5 x D	0,4 x D	0,75 x D	20	–	32	16	–	25,6	12	–	19,2	fz	0,027	0,032	0,039	0,046	0,052	0,057
H	1	1,5 x D	0,3 x D	0,30 x D	64	–	112	51,2	–	89,6	38,4	–	67,2	fz	0,046	0,053	0,065	0,075	0,083	0,087

NOTE: Lower value of cutting speed is used for high stock removal applications or for higher hardness (machinability) within group.
Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.
Above parameters are based on ideal conditions. For smaller taper machining centres, please adjust parameters according to system's stability.
For side milling with ap larger than 1 x D, reduce fz by 20%! Do not use cylindrical shank for full slotting!

4969 • Ball Nose Roughing • Metric

Material Group		Side Milling (A) and Slotting (B)			short			medium			long			Recommended feed per tooth (fz = mm/th) for side milling (A). For slotting (B), reduce fz by 20%.						
		A		B	adaptor reach															
					WP15PE			WP15PE			WP15PE									
					Cutting Speed — vc m/min			Cutting Speed — vc m/min			Cutting Speed — vc m/min			D1 — Diameter						
		ap	ae	ap	min		max	min		max	min		max	mm	10,0	12,0	16,0	20,0	25,0	32,0
P	0	1,5 x D	0,5 x D	1 x D	150	–	200	135	–	180	135	–	180	fz	0,061	0,070	0,086	0,097	0,105	0,106
	1	1,5 x D	0,5 x D	1 x D	150	–	200	135	–	180	135	–	180	fz	0,061	0,070	0,086	0,097	0,105	0,106
	2	1,5 x D	0,5 x D	1 x D	140	–	190	126	–	171	126	–	171	fz	0,061	0,070	0,086	0,097	0,105	0,106
	3	1,5 x D	0,4 x D	0,75 x D	120	–	160	108	–	144	108	–	144	fz	0,051	0,060	0,074	0,086	0,097	0,105
	4	1,5 x D	0,3 x D	0,30 x D	90	–	150	81	–	135	81	–	135	fz	0,046	0,053	0,065	0,075	0,083	0,087
	5	1,5 x D	0,4 x D	0,75 x D	60	–	100	51	–	85	48	–	80	fz	0,041	0,048	0,059	0,069	0,077	0,084
	6	1,5 x D	0,3 x D	0,30x D	50	–	75	42,5	–	63,75	40	–	60	fz	0,034	0,040	0,048	0,055	0,060	0,062
M	1	1,5 x D	0,4 x D	0,75 x D	90	–	115	72	–	92	63	–	80,5	fz	0,051	0,060	0,074	0,086	0,097	0,105
	2	1,5 x D	0,4 x D	0,75 x D	60	–	80	48	–	64	42	–	56	fz	0,041	0,048	0,059	0,069	0,077	0,084
	3	1,5 x D	0,4 x D	0,75 x D	60	–	70	48	–	56	42	–	49	fz	0,034	0,040	0,048	0,055	0,060	0,062
K	1	1,5 x D	0,5 x D	1 x D	120	–	150	108	–	135	108	–	135	fz	0,061	0,070	0,086	0,097	0,105	0,106
	2	1,5 x D	0,4 x D	1 x D	110	–	140	99	–	126	99	–	126	fz	0,051	0,060	0,074	0,086	0,097	0,105
	3	1,5 x D	0,4 x D	1 x D	110	–	130	99	–	117	99	–	117	fz	0,041	0,048	0,059	0,069	0,077	0,084
S	1	1,5 x D	0,4 x D	0,75 x D	50	–	90	40	–	72	30	–	54	fz	0,051	0,060	0,074	0,086	0,097	0,105
	2	1,5 x D	0,3 x D	0,30 x D	25	–	40	20	–	32	15	–	24	fz	0,027	0,032	0,039	0,046	0,052	0,057
	3	1,5 x D	0,3 x D	0,30 x D	25	–	40	20	–	32	15	–	24	fz	0,027	0,032	0,039	0,046	0,052	0,057
	4	1,5 x D	0,3 x D	0,75 x D	50	–	60	40	–	48	30	–	36	fz	0,038	0,044	0,055	0,063	0,071	0,077
H	1	1,5 x D	0,3 x D	0,30 x D	80	–	140	64	–	112	48	–	84	fz	0,046	0,053	0,065	0,075	0,083	0,087
	2	1,5 x D	0,2 x D	0,20 x D	70	–	120	56	–	96	42	–	72	fz	0,034	0,040	0,048	0,055	0,060	0,062
	3	1,5 x D	0,2 x D	0,20 x D	60	–	90	48	–	72	36	–	54	fz	0,027	0,032	0,039	0,046	0,052	0,057

NOTE: Lower value of cutting speed is used for high stock removal applications or for higher hardness (machinability) within group.
Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.
Above parameters are based on ideal conditions. Please adjust parameters accordingly on diameters > 12mm.
For side milling with ap bigger than 1 x D reduce fz by 20%! Do not use cylindrical shank for full slotting!

Modular End Mills

High-Performance DUO-λOCK® Modular End Mills • Roughing/AluSurf™

■ 4U40 • Roughing

Material Group		Side Milling (A) and Slotting (B)			short			medium			long			Recommended feed per tooth (fz = mm/th) for side milling (A). For slotting (B), reduce fz by 20%.						
		A		B	adaptor reach WS15PE Cutting Speed — vc m/min			adaptor reach WS15PE Cutting Speed — vc m/min			adaptor reach WS15PE Cutting Speed — vc m/min			D1 — Diameter						
		ap	ae	ap	min		max	min		max	min		max	mm	10,0	12,0	16,0	20,0	25,0	32,0
P	3	1,0 x D	0,5 x D	0,75 x D	120	–	160	108	–	144	108	–	144	fz	0,051	0,060	0,074	0,086	0,097	0,105
	4	1,0 x D	0,3 x D	0,75 x D	90	–	150	81	–	135	81	–	135	fz	0,046	0,053	0,065	0,075	0,083	0,087
	5	1,0 x D	0,5 x D	0,75 x D	60	–	100	51	–	85	48	–	80	fz	0,041	0,048	0,059	0,069	0,077	0,084
	6	1,0 x D	0,3 x D	0,30 x D	50	–	75	42,5	–	63,75	40	–	60	fz	0,034	0,040	0,048	0,055	0,060	0,062
M	1	1,0 x D	0,4 x D	0,75 x D	90	–	115	72	–	92	63	–	80,5	fz	0,051	0,060	0,074	0,086	0,097	0,105
	2	1,0 x D	0,4 x D	0,75 x D	60	–	80	48	–	64	42	–	56	fz	0,041	0,048	0,059	0,069	0,077	0,084
	3	1,0 x D	0,4 x D	0,75 x D	60	–	70	48	–	56	42	–	49	fz	0,034	0,040	0,048	0,055	0,060	0,062
K	1	1,0 x D	0,5 x D	1 x D	120	–	150	108	–	135	108	–	135	fz	0,061	0,070	0,086	0,097	0,105	0,106
	2	1,0 x D	0,5 x D	1 x D	110	–	140	99	–	126	99	–	126	fz	0,051	0,060	0,074	0,086	0,097	0,105
	3	1,0 x D	0,5 x D	1 x D	110	–	130	99	–	117	99	–	117	fz	0,041	0,048	0,059	0,069	0,077	0,084
S	1	1,0 x D	0,3 x D	0,75 x D	50	–	90	40	–	72	30	–	54	fz	0,051	0,060	0,074	0,086	0,097	0,105
	2	1,0 x D	0,3 x D	0,75 x D	25	–	40	20	–	32	15	–	24	fz	0,027	0,032	0,039	0,046	0,052	0,057
	3	1,0 x D	0,3 x D	0,75 x D	25	–	40	20	–	32	15	–	24	fz	0,027	0,032	0,039	0,046	0,052	0,057
	4	1,0 x D	0,4 x D	0,75 x D	50	–	60	40	–	48	30	–	36	fz	0,038	0,044	0,055	0,063	0,071	0,077
H	1	1,0 x D	0,3 x D	0,30 x D	80	–	140	64	–	112	48	–	84	fz	0,046	0,053	0,065	0,075	0,083	0,087
	2	1,0 x D	0,2 x D	0,20 x D	70	–	120	56	–	96	42	–	72	fz	0,034	0,040	0,048	0,055	0,060	0,062
	3	1,0 x D	0,2 x D	0,20 x D	60	–	90	48	–	72	36	–	54	fz	0,027	0,032	0,039	0,046	0,052	0,057

NOTE: Lower value of cutting speed is used for high stock removal applications or for higher hardness (machinability) within group.
Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.
Above parameters are based on ideal conditions. Please adjust parameters according to system's stability.
For side milling with ap bigger than 1 x D reduce fz by 20%! Do not use cylindrical shank for full slotting!

■ AluSurf • 5142 • 5143 • Aluminium

Material Group		Side Milling (A) and Slotting (B)			short			medium			long			Recommended feed per tooth (fz = mm/th) for side milling (A). For slotting (B), reduce fz by 20%.						
		A		B	adaptor reach UNCOATED Cutting Speed — vc m/min			adaptor reach UNCOATED Cutting Speed — vc m/min			adaptor reach UNCOATED Cutting Speed — vc m/min			D1 — Diameter						
		ap	ae	ap	min		max	min		max	min		max	mm	10,0	12,0	16,0	20,0	25,0	32,0
N	1	1,5 x D	0,3 x D	1,0 x D	500	–	2000	400	–	1200	300	–	1200	fz	0,077	0,092	0,122	0,153	0,191	0,245
	2	1,5 x D	0,3 x D	1,0 x D	500	–	1500	400	–	900	300	–	900	fz	0,069	0,083	0,110	0,138	0,172	0,220
	3	1,5 x D	0,3 x D	1,0 x D	500	–	1500	400	–	900	300	–	900	fz	0,054	0,064	0,086	0,107	0,134	0,171
	4	1,5 x D	0,3 x D	1,0 x D	400	–	750	320	–	450	240	–	450	fz	0,054	0,064	0,086	0,107	0,134	0,171
	5	1,5 x D	0,3 x D	1,0 x D	250	–	1000	200	–	600	150	–	600	fz	0,069	0,083	0,110	0,138	0,172	0,220

NOTE: ap for spindle with ceramic bearings multiply by 0.5.
For better surface finish, reduce feed per tooth.
Above parameters are based on ideal conditions. Please adjust parameters according to system's stability.
For side milling with ap bigger than 1 x D, reduce fz by 20%! Do not use cylindrical shank for full slotting!

High-Performance DUO-λOCK® Modular End Mills • Corner Rounding/Chamfering

■ 8045 Corner Rounding • 8046 Chamfering

Material Group																
		Side Milling (A)		short			medium			long			Recommended feed per tooth (fz = mm/th) for side milling (A).			
		A		adaptor reach									D1 — Diameter			
				WP15PE			WP15PE			WP15PE						
				Cutting Speed — vc m/min			Cutting Speed — vc m/min			Cutting Speed — vc m/min						
		ap	ae	min		max	min		max	min		max	mm	10,0	12,0	16,0
P	0	0,35 x D	0,35 x D	150	–	200	135	–	180	135	–	180	fz	0,058	0,066	0,081
	1	0,35 x D	0,35 x D	150	–	200	135	–	180	135	–	180	fz	0,058	0,066	0,081
	2	0,35 x D	0,35 x D	140	–	190	126	–	171	126	–	171	fz	0,058	0,066	0,081
	3	0,35 x D	0,35 x D	120	–	160	108	–	144	108	–	144	fz	0,048	0,056	0,070
	4	0,35 x D	0,35 x D	90	–	150	81	–	135	81	–	135	fz	0,043	0,050	0,061
	5	0,35 x D	0,35 x D	60	–	100	51	–	85	48	–	80	fz	0,039	0,045	0,056
	6	0,35 x D	0,35 x D	50	–	75	42,5	–	63,75	40	–	60	fz	0,032	0,037	0,046
M	1	0,35 x D	0,35 x D	90	–	115	72	–	92	63	–	80,5	fz	0,048	0,056	0,070
	2	0,35 x D	0,35 x D	60	–	80	48	–	64	42	–	56	fz	0,039	0,045	0,056
	3	0,35 x D	0,35 x D	60	–	70	48	–	56	42	–	49	fz	0,032	0,037	0,046
K	1	0,35 x D	0,35 x D	120	–	150	108	–	135	108	–	135	fz	0,058	0,066	0,081
	2	0,35 x D	0,35 x D	110	–	140	99	–	126	99	–	126	fz	0,048	0,056	0,070
	3	0,35 x D	0,35 x D	110	–	130	99	–	117	99	–	117	fz	0,039	0,045	0,056
N	1	0,35 x D	0,35 x D	500	–	2000	400	–	1600	300	–	1200	fz	0,080	0,096	0,128
	2	0,35 x D	0,35 x D	500	–	1500	400	–	1200	300	–	900	fz	0,072	0,086	0,115
	3	0,35 x D	0,35 x D	500	–	1500	400	–	1200	300	–	900	fz	0,056	0,067	0,090
	4	0,35 x D	0,35 x D	400	–	750	320	–	600	240	–	450	fz	0,056	0,067	0,090
	5	0,35 x D	0,35 x D	250	–	1000	200	–	800	150	–	600	fz	0,072	0,086	0,115
	6	0,35 x D	0,35 x D	100	–	750	80	–	600	60	–	450	fz	0,080	0,096	0,128
	7	0,35 x D	0,35 x D	100	–	750	80	–	600	60	–	450	fz	0,056	0,067	0,090
S	1	0,35 x D	0,35 x D	50	–	90	40	–	72	30	–	54	fz	0,048	0,056	0,070
	2	0,35 x D	0,35 x D	25	–	40	20	–	32	15	–	24	fz	0,026	0,030	0,037
	3	0,35 x D	0,35 x D	25	–	40	20	–	32	15	–	24	fz	0,026	0,030	0,037
	4	0,35 x D	0,35 x D	50	–	60	40	–	48	30	–	36	fz	0,036	0,041	0,051
H	1	0,35 x D	0,35 x D	80	–	140	64	–	112	48	–	84	fz	0,043	0,050	0,061

NOTE: Lower value of cutting speed is used for high stock removal applications or for higher hardness (machinability) within group.
Higher value of cutting speed is used for finishing applications or for lower hardness (machinability) within group.
Above parameters are based on ideal conditions. Please adjust parameters according to system's stability.

Modular End Mills

High-Performance DUO-λOCK® Modular End Mills

System Assembly Information

Please wear sufficient personal safety equipment such as gloves and eye protection during assembly.

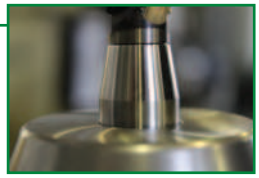
1 Clean the Duo-Lock™ cutting insert and shank coupling.

2 Mount the Duo-Lock™ adaptor in a mounting block with a clamping chuck sufficient to enable torque transmission.

3 Screw the Duo-Lock™ cutting tip into adaptor by hand.

Attention: Use of protective gloves is mandatory!

4 A gap of approx. 0,15–0,3mm should be visible.



5 Apply the torque shown in the table. Use of a high quality common torque wrench is mandatory. The ERICKSON™ Torque Master wrench is recommended.

Duo-Lock™ Size	Torque Nm
DL 16	60
DL 20	80
DL 25	100
DL 32	130