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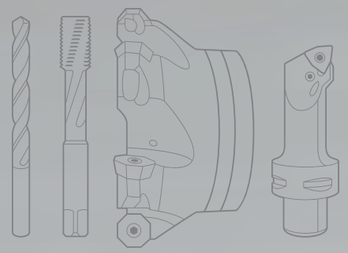

WALTER PROTOTYP

Supplementary catalog 2009

Threading & milling

_ WALTER PROTOTYP MILLING AND THREADING

Tool innovations

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These 2 catalogs illustrate the current Walter Prototyp range of products

You will find the complete range of Walter Prototyp milling and threading products clearly laid out in the three catalogs shown.

We reserve the right to make alterations due to technical improvements.

The future belongs to economic machining.
We recommend you order the current catalogs for our competence brands Walter and Walter Titex now.
In these catalogs you will find everything you need for productive turning, milling and drilling.

Threading tools

Milling tools

WALTER PROTOTYP

Product innovations 2009

Threading

_TOOLING INNOVATIONS FOR TAPS AND THREAD MILLS

New workpieces, new solutions.

Walter Prototyp Paradur Short Chip soft – Blind hole threads up to 3.5XD in long-chipping materials with the utmost process reliability.

DIMENSION RANGE
UNC: 1/4-20 to 3/4-10
UNF: 1/4-28 to 3/4-16
M: M5 to M20
MF: M8X1 to M16X1.5

THE TOOL

- HSS-Co taps with axial coolant through for process reliable production of deep blind holes up to 3.5XD in long chipping steels
- Combination of a slow helix and a special chip-breaking geometry eliminates bird-nesting
- Extended length fluting and axial coolant through provide optimum chip evacuation
- TiN coating and additional steam oxide treatment for outstanding tool life with no cold welding
- Semi-bottoming from C chamfer with a shortened guide length to reduce friction

PREREQUISITES

- Machine tools with internal coolant supply
- Conventional tap holders (tension - compression) or rigid tapping (PROTOFLEX C)

THE APPLICATION

- Deep hole threads up to 3.5XD
- Materials up to 25HRc
- Long-chipping steels, e.g. construction steels, or heat-treatable steels
- Ductile cast iron
- Short-chipping materials, e.g. grey cast iron or silicon aluminum alloys

YOUR ADVANTAGES

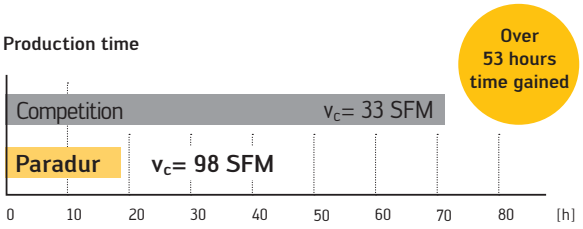
- Utmost process reliability thanks to ideal chip control
- Elimination of bird-nesting reduces down time and inconsistent tool life
- Optimum machine output
- TiN / VAP coating provides increased tool life

Note: See pages 16-19 of this brochure for additional item information regarding the PARADUR SHORT CHIP soft program.

Increase in productivity for tapping

PRODUCTION TIME

Material:	1024
Thread:	M10
Blind hole thread:	2.5 x d
No. of threads:	25,000
No. of threads with	
Competitor	**300**
Paradur Short Chip soft	**900**
Free machine capacity:	**53 h**



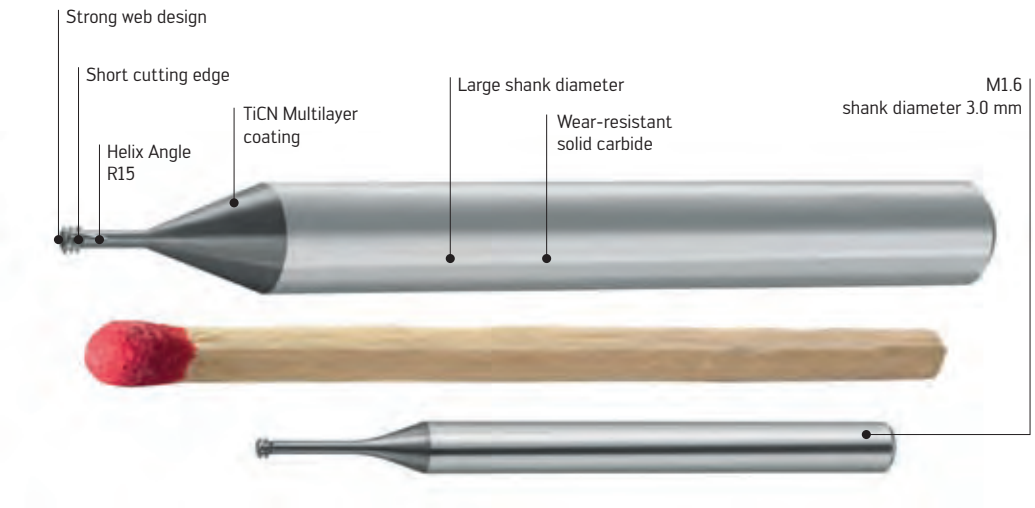
RESULT

- Considerable time gained thanks to greater cutting speeds
- Optimum chip formation and chip transport without bird nesting
- Greater productivity with simultaneously longer tool life

Perfectly controlled short chips from 1024 steel

Walter Prototyp – Solid carbide small diameter thread mills for depths up to 3XD.

MAIN DIMENSIONS
- Thread depth 2XD: M1.6 to M12
- Thread depth 3XD: 1-64 UNC to 5/16-18 UNC
  2-64 UNF to 5/16-24 UNF
  M1.6 to M8



Orbital thread mill

THE TOOL

- Wear-resistant solid carbide
- Stable basic construction with strong web design
- Large shank diameter for vibration-free use
- Short cutting edge, helix angle and positive rake angle for reduced cutting forces
- Design for 2XD and 3XD holes

THE APPLICATION

- Universal use in a broad material spectrum
- Particularly useful in materials that have tendency to jam (e.g. stainless steels and titanium alloys)
- Blind and through hole threads up to 3XD

PREREQUISITES

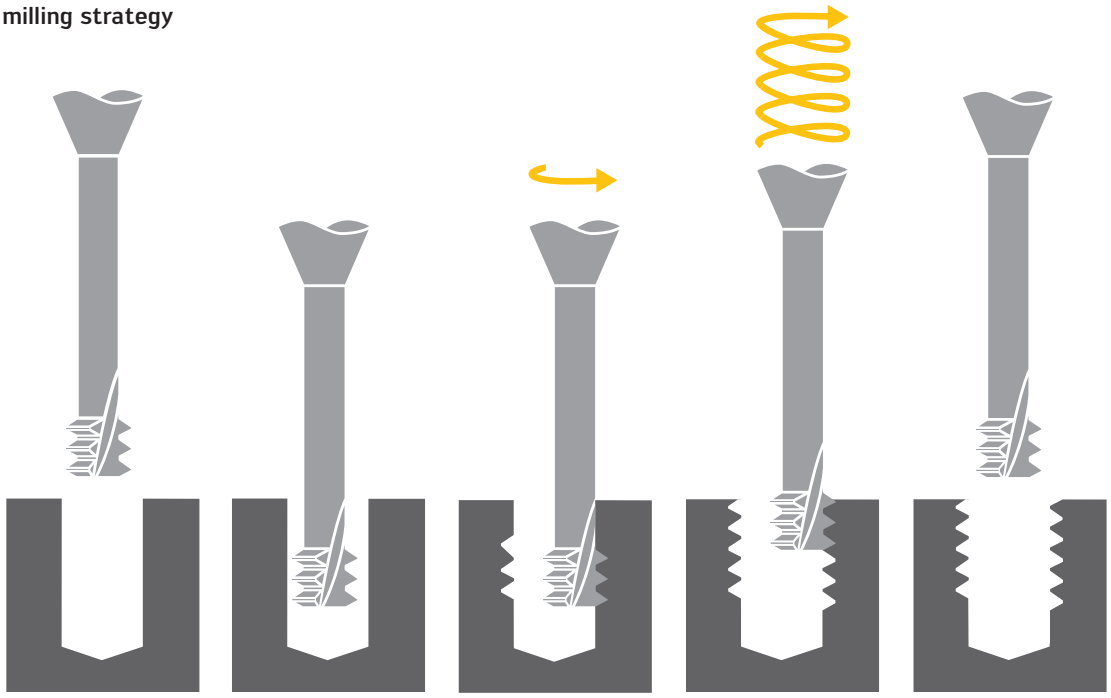
- CNC machine tool with helical interpolation

YOUR ADVANTAGES

- Utmost process reliability when producing small diameters e.g. M1.6 up to a thread depth of 3XD
- Alternative to tapping small diameter threads in difficult to machine materials
- Considerably reduced danger of tool breakage (especially if machining deep blind hole threads)
- High efficiency thanks to longer tool life
- Very good thread quality (surface quality, thread tolerance)

Note: See pages 20-23 of this brochure for additional item information regarding the solid carbide small diameter thread mill program.

Orbital thread milling strategy



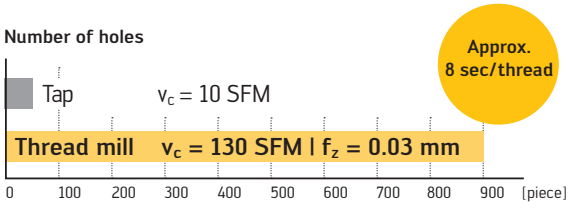
1. Position above core holes
2. Feed in to thread depth
3. Helical ramp-in at 180°/ half the lead
4. Thread generation using helical interpolation
5. Reset the tool to the center of core hole

Productivity increase

NUMBER OF THREADS

Material:	TiAl6V4
Hardness:	30 HRc
Through hole thread:	M2
Thread depth:	2XD

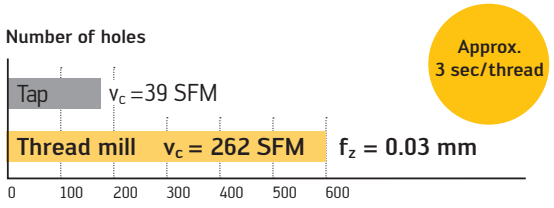
	HSSCo Tap	Solid carbide thread mill
Number of holes:	50	900
Coolant	Oil	Emulsion 5%



NUMBER OF THREADS

Material:	4140
Hardness:	33 HRc
Through hole thread:	M2
Thread depth:	2XD

	HSSCo Tap	Solid carbide thread mill
Number of holes:	180	600
Coolant	Oil	Emulsion 5%



RESULT

Optimum process security. Solid carbide small diameter thread mills can offer considerably longer tool life even when using an emulsion.

Threading tools in HSSE, HSSE-PM and Solid Carbide

UNC Taps

Type	PROTOTEX ECO-HT	PARADUR ECO-HT	PARADUR SHORT CHIP Soft
Standard	DIN/ANSI	DIN/ANSI	DIN/ANSI
Chamfer / Spiral	B	C/R45	C/R15
Tool Material	HSSE-PM	HSSE-PM	HSSE
Surface Treatment	THL	THL	TIN/VAP
	 Radial	 Axial	 Axial
Range	(1/4...3/8)	(1/4...3/8)	(1/4...3/8)
Catalog No.	AE2221342	AE2251312	AC2241055
Catalog Page	10	11	16

UNF Taps

Type	PROTOTEX ECO-HT		PARADUR ECO-HT		PARADUR SHORT CHIP SOFT
Standard	DIN/ANSI		DIN/ANSI		DIN/ANSI
Chamfer / Spiral	B	B	C/R45	C/R45	C/R15
Tool Material	HSSE-PM	HSSE-PM	HSSE-PM	HSSE-PM	HSSE
Surface Treatment	THL	THL	THL	THL	TIN/VAP
		 Radial		 Axial	 Axial
Range	(#6...3/8)	(1/4...3/8)	(#6...3/8)	(1/4...3/8)	(1/4...3/8)
Catalog No.	AE2321002	AE2321342	AE2351302	AE2351312	AC2341055
Catalog Page	12	13	14	15	17

Type	PROTOTEX ECO-HT	PARADUR ECO-HT	PARADUR SHORT CHIP Soft
Standard	DIN/ANSI	DIN/ANSI	DIN/ANSI
Chamfer / Spiral	B	C/R45	C/R15
Tool Material	HSSE-PM	HSSE-PM	HSSE
Surface Treatment	THL	THL	TIN/VAP
	 Radial	 Axial	 Axial
Range	(1/2...5/8)	(1/2...3/4)	(1/2...3/4)
Catalog No.	AE2226342	AE2256312	AC2246055
Catalog Page	10	11	16

Type	PROTOTEX ECO-HT		PARADUR ECO-HT		PARADUR SHORT CHIP SOFT
Standard	DIN/ANSI		DIN/ANSI		DIN/ANSI
Chamfer / Spiral	B	B	C/R45	C/R45	C/R15
Tool Material	HSSE-PM	HSSE-PM	HSSE-PM	HSSE-PM	HSSE
Surface Treatment	THL	THL	THL	THL	TIN/VAP
		 Radial		 Axial	 Axial
Range	(7/16...3/4)	(7/16...5/8)	(7/16...3/4)	(7/16...3/4)	(7/16...3/4)
Catalog No.	AE2326002	AE2326342	AE2356302	AE2356312	AC2346055
Catalog Page	12	13	14	15	17

Threading tools in HSSE, HSSE-PM and Solid Carbide

M / MF Taps

Type	PARADUR SHORT CHIP SOFT
Standard	DIN/ANSI
Chamfer / Spiral	C/R15
Tool Material	HSSE
Surface Treatment	TIN/VAP
	 Axial
Range	(M5...M10)
Catalog No.	2041055
Catalog Page	18

Type	PARADUR SHORT CHIP SOFT	PARADUR SHORT CHIP Soft
Standard	DIN/ANSI	DIN/ANSI
Chamfer / Spiral	C/R15	C/R15
Tool Material	HSSE	HSSE
Surface Treatment	TIN/VAP	TIN/VAP
	 Axial	 Axial
Range	(M12...M20)	(M8...M16)
Catalog No.	2046055	2146055
Catalog Page	18	19

UNC, UNF and M-MF Thread Mills

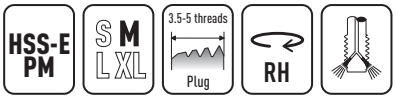
Type	15						
Thread Type	UNC	UNC	UNF	UNF	M-MF	M-MF	M-MF
Range	(#1...5/16)	(#1...5/16)	(#2...5/16)	(#2...5/16)	(M1.6...M12)	(M1.6...M8)	(M1.6...M8)
Shank	DIN 6535HA	DIN 6535HA	DIN 6535HA	DIN 6535HA	DIN 6535HA	DIN 6535HA	DIN 6535HA
Surface Treatment	Bright	TICN	Bright	TICN	TICN	Bright	TICN
							
Thread Depth	≤3xd	≤3xd	≤3xd	≤3xd	≤2xd	≤3xd	≤3xd
Catalog No.	H528800	H5288006	H538800	H5388006	H5087006	H508800	H5088006
Catalog Page	20	20	21	21	22	23	23

PROTOTEX ECO-HT

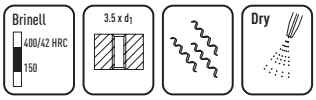
NEW

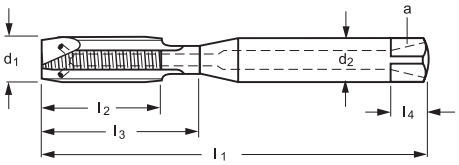
- High performance spiral point tap with a wide application range. Optimum choice for high volume production.
- **THL** (Hardlube) has excellent chip formation characteristics and provides increased productivity gains.
- Radial coolant through for improved cooling and chip evacuation.
- Suitable for dry or MQL machining.

Characteristics



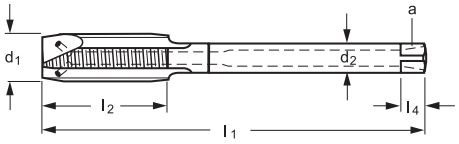
Application





DIN/ANSI - 2B

d_1-TPI	d_1	l_1	l_2	l_3	d_2	a	l_4		N	Code AE2221342 THL
	inch	inch	inch	inch	inch	inch	inch			
1/4-20	0.250	3.150	0.591	1.181	0.255	0.191	5/16	0.2008	3	-UNC1/4
5/16-18	0.313	3.543	0.709	1.378	0.318	0.238	3/8	0.2598	3	-UNC5/16
3/8-16	0.375	3.937	0.787	1.535	0.381	0.286	7/16	0.3150	3	-UNC3/8



DIN/ANSI - 2B

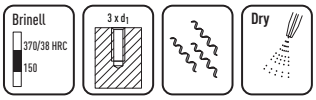
d_1-TPI	d_1	l_1	l_2	l_3	d_2	a	l_4		N	Code AE2226342 THL
	inch	inch	inch	inch	inch	inch	inch			
1/2-13	0.500	4.331	0.906	-	0.367	0.275	7/16	0.4252	4	-UNC1/2
5/8-11	0.625	4.331	0.984	-	0.480	0.360	9/16	0.5315	4	-UNC5/8

NEW

PARADUR ECO-HT

Characteristics

Application



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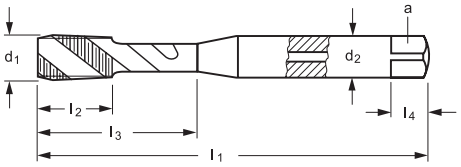
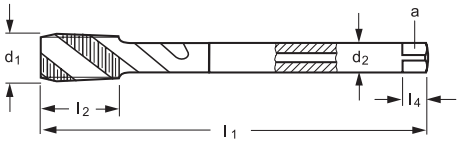


DIN/ANSI - 2B

d_1-TPI	d_1	l_1	l_2	l_3	d_2	a	l_4		N	Code AE2251312 THL
	inch	inch	inch	inch	inch	inch	inch			
1/4-20	0.250	3.150	0.394	1.075	0.255	0.191	5/16	0.2008	3	-UNC1/4
5/16-18	0.313	3.543	0.472	1.378	0.318	0.238	3/8	0.2598	3	-UNC5/16
3/8-16	0.375	3.937	0.591	1.535	0.381	0.286	7/16	0.3150	3	-UNC3/8

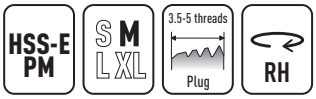


DIN/ANSI - 2B

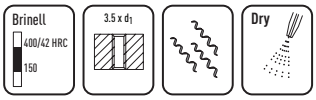
d_1-TPI	d_1	l_1	l_2	l_3	d_2	a	l_4		N	Code AE2256312 THL
	inch	inch	inch	inch	inch	inch	inch			
1/2-13	0.500	4.331	0.709	-	0.367	0.275	7/16	0.4252	4	-UNC1/2
5/8-11	0.625	4.331	0.787	-	0.480	0.360	9/16	0.5315	4	-UNC5/8
3/4-10	0.750	4.921	0.984	-	0.590	0.442	11/16	0.6496	4	-UNC3/4

PROTOTEX ECO-HT

Characteristics



Application



NEW Ø

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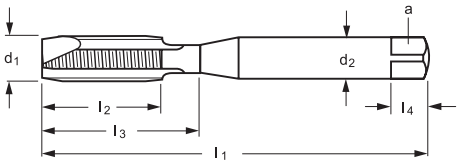
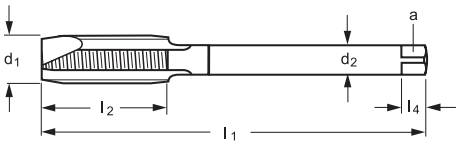


DIN/ANSI - 2B

d_1-TPI	d_1	l_1	l_2	l_3	d_2	a	l_4		N	Code AE2321002 THL
	inch	inch	inch	inch	inch	inch	inch			
No. 6-40	0.138	2.205	0.433	0.787	0.141	0.110	3/16	0.1161	3	-UNF6
No.10-32	0.190	2.756	0.512	0.984	0.194	0.152	1/4	0.1614	3	-UNF10
1/4-28	0.250	3.150	0.591	1.181	0.255	0.191	5/16	0.2165	3	-UNF1/4
5/16-24	0.313	3.543	0.709	1.378	0.318	0.238	3/8	0.2717	3	-UNF5/16
3/8-24	0.375	3.937	0.787	1.535	0.381	0.286	7/16	0.3346	3	-UNF3/8



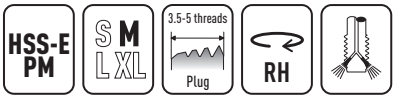
DIN/ANSI - 2B

d_1-TPI	d_1	l_1	l_2	l_3	d_2	a	l_4		N	Code AE2326002 THL
	inch	inch	inch	inch	inch	inch	inch			
7/16-20	0.438	3.937	0.787	-	0.323	0.242	13/32	0.3898	3	-UNF7/16
1/2-20	0.500	3.937	0.827	-	0.367	0.275	7/16	0.4528	4	-UNF1/2
5/8-18	0.625	3.937	0.827	-	0.480	0.360	9/16	0.5709	4	-UNF5/8
3/4-16	0.750	4.331	0.945	-	0.590	0.442	11/16	0.6890	4	-UNF3/4 *

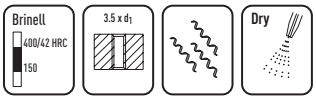
NEW

PROTOTEX ECO-HT

Characteristics



Application



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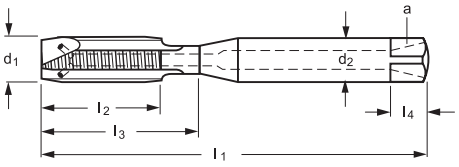
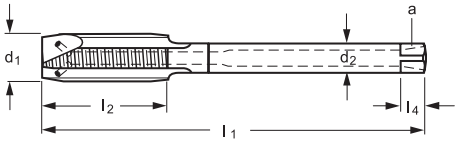


DIN/ANSI - 2B

d_1-TPI	d_1	l_1	l_2	l_3	d_2	a	l_4		N	Code AE2321342 THL
	inch	inch	inch	inch	inch	inch	inch			
1/4-28	0.250	3.150	0.591	1.181	0.255	0.191	5/16	0.2165	3	-UNF1/4
5/16-24	0.313	3.543	0.709	1.378	0.318	0.238	3/8	0.2717	3	-UNF5/16
3/8-24	0.375	3.937	0.787	1.535	0.381	0.286	7/16	0.3346	3	-UNF3/8

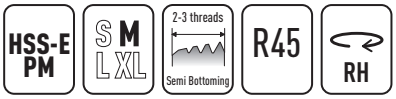


DIN/ANSI - 2B

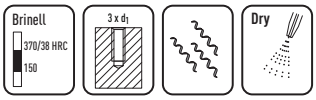
d_1-TPI	d_1	l_1	l_2	l_3	d_2	a	l_4		N	Code AE2326342 THL
	inch	inch	inch	inch	inch	inch	inch			
7/16-20	0.438	3.937	0.787	-	0.323	0.242	13/32	0.3898	3	-UNF7/16
1/2-20	0.500	3.937	0.827	-	0.367	0.275	7/16	0,4528	4	-UNF1/2
5/8-18	0.625	3.937	0.827	-	0.480	0.360	9/16	0.5709	4	-UNF5/8

PARADUR ECO-HT

Characteristics



Application



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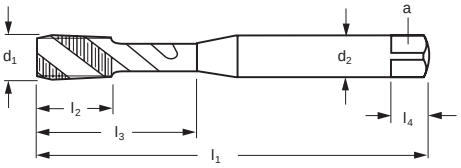
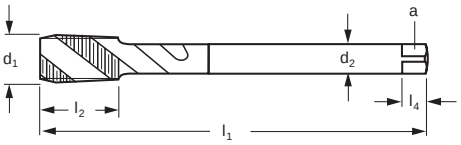


DIN/ANSI - 2B

d_1-TPI	d_1	l_1	l_2	l_3	d_2	a	l_4		N	Code AE2351302 THL
	inch	inch	inch	inch	inch	inch	inch			
No. 6-40	0.138	2.205	0.256	0.516	0.141	0.110	3/16	0.1161	3	-UNF6
No.10-32	0.190	2.756	0.315	0.791	0.194	0.152	1/4	0.1614	3	-UNF10
1/4-28	0.250	3.150	0.394	1.020	0.255	0.191	5/16	0.2165	3	-UNF1/4
5/16-24	0.313	3.543	0.472	1.378	0.318	0.238	3/8	0.2717	3	-UNF5/16
3/8-24	0.375	3.937	0.472	1.535	0.381	0.286	7/16	0.3346	3	-UNF3/8



DIN/ANSI - 2B

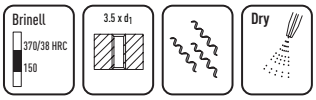
d_1-TPI	d_1	l_1	l_2	l_3	d_2	a	l_4		N	Code AE2356302 THL
	inch	inch	inch	inch	inch	inch	inch			
7/16-20	0.438	3.937	0.591	-	0.323	0.242	13/32	0.3898	3	-UNF7/16
1/2-20	0.500	3.937	0.512	-	0.367	0.275	7/16	0.4528	4	-UNF1/2
5/8-18	0.625	3.937	0.591	-	0.480	0.360	9/16	0.5709	4	-UNF5/8
3/4-16	0.750	4.331	0.669	-	0.590	0.442	11/16	0.6890	4	-UNF3/4 *

NEW

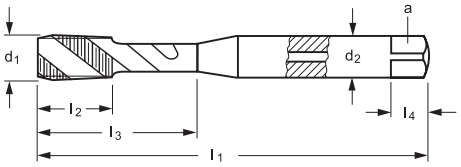
PARADUR ECO-HT

Characteristics

Application

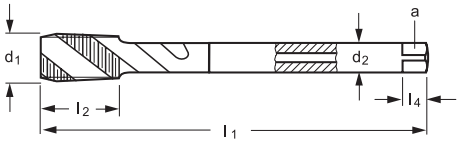


- High performance spiral flute tap with a wide application range. Optimum choice for high volume production.
- **THL** (Hardlube) has excellent chip formation characteristics and provides increased productivity gains.
- Axial coolant through for improved cooling and chip evacuation.
- Suitable for dry or MQL machining.



DIN/ANSI - 2B

d_1-TPI	d_1	l_1	l_2	l_3	d_2	a	l_4		N	Code AE2351312 THL
	inch	inch	inch	inch	inch	inch	inch			
1/4-28	0.250	3.150	0.394	1.020	0.255	0.191	5/16	0.2165	3	-UNF1/4
5/16-24	0.313	3.543	0.472	1.378	0.318	0.238	3/8	0.2717	3	-UNF5/16
3/8-24	0.375	3.937	0.472	1.535	0.381	0.286	7/16	0.3346	3	-UNF3/8



DIN/ANSI - 2B

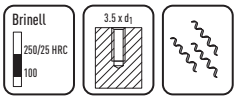
d_1-TPI	d_1	l_1	l_2	l_3	d_2	a	l_4		N	Code AE2356312 THL
	inch	inch	inch	inch	inch	inch	inch			
7/16-20	0.438	3.937	0.591	-	0.323	0.242	13/32	0.3898	3	-UNF7/16
1/2-20	0.500	3.937	0.512	-	0.367	0.275	7/16	0.4528	4	-UNF1/2
5/8-18	0.625	3.937	0.591	-	0.480	0.360	9/16	0.5709	4	-UNF5/8
3/4-16	0.750	4.331	0.669	-	0.590	0.442	11/16	0.6890	4	-UNF3/4

PARADUR SHORT CHIP Soft

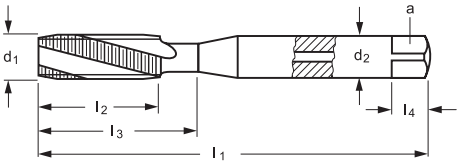
NEW

Characteristics

Application

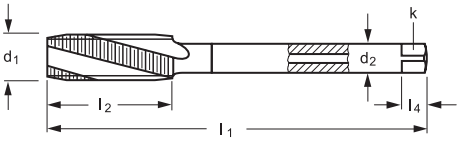


- A unique chip breaking chamfer, slow helix, extended flutes and axial coolant through eliminates bird-nesting in soft steels.
- **TIN/VAP** (Titanium Nitride+Steam Oxide) has excellent wear resistance and cutting fluid retention.
- Axial coolant through for improved cooling and chip evacuation.



DIN/ANSI - 2B

d_1-TPI	d_1	l_1	l_2	l_3	d_2	a	l_4		N	Code AC2241055 TIN/vap
	inch	inch	inch	inch	inch	inch	inch			
1/4-20	0.250	3.150	0.354	1.181	0.255	0.191	5/16	0.2008	3	-UNC1/4
5/16-18	0.313	3.543	0.433	1.378	0.318	0.238	3/8	0.2598	3	-UNC5/16
3/8-16	0.375	3.937	0.531	1.535	0.381	0.286	7/16	0.3150	3	-UNC3/8



DIN/ANSI - 2B

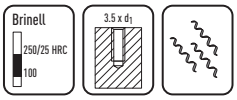
d_1-TPI	d_1	l_1	l_2	l_3	d_2	a	l_4		N	Code AC2246055 TIN/vap
	inch	inch	inch	inch	inch	inch	inch			
1/2-13	0.500	4.331	0.709	-	0.367	0.275	7/16	0.4252	3	-UNC1/2
5/8-11	0.625	4.331	0.866	-	0.480	0.360	9/16	0.5315	4	-UNC5/8
3/4-10	0.750	4.921	1.043	-	0.590	0.442	11/16	0.6496	4	-UNC3/4

NEW

PARADUR SHORT CHIP Soft

Characteristics

Application



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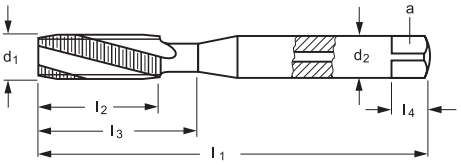
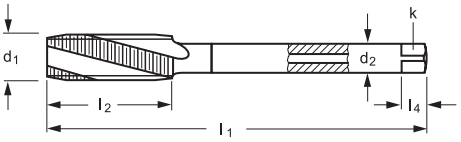


DIN/ANSI - 2B

d_1-TPI	d_1	l_1	l_2	l_3	d_2	a	l_4		N	Code AC2341055 TIN/vap
	inch	inch	inch	inch	inch	inch	inch			
1/4-28	0.250	3.150	0.354	1.181	0.255	0.191	5/16	0.2165	3	-UNF1/4
5/16-24	0.313	3.543	0.433	1.378	0.318	0.238	3/8	0.2717	3	-UNF5/16
3/8-24	0.375	3.937	0.531	1.535	0.381	0.286	7/16	0.3346	3	-UNF3/8



DIN/ANSI - 2B

d_1-TPI	d_1	l_1	l_2	l_3	d_2	a	l_4		N	Code AC2346055 TIN/vap
	inch	inch	inch	inch	inch	inch	inch			
7/16-20	0.438	3.937	0.610	-	0.323	0.242	13/32	0.3898	3	-UNF7/16
1/2-20	0.500	3.937	0.709	-	0.367	0.275	7/16	0.4528	3	-UNF1/2
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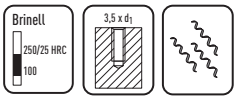
PARADUR SHORT CHIP Soft

NEW

Characteristics

Application



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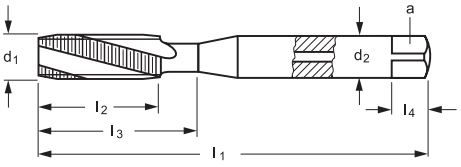
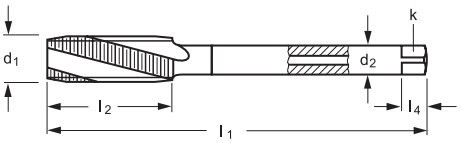


~DIN 371 - ISO2/6H

d_1 mm	P mm	l_1 js16 mm	l_2 mm	l_3 ± 1 mm	d_2 h9 mm	a h12 mm	l_4 mm		N	Code 2041055 TIN/vap
M 5	0.8	70	6.5	20.7	6	4.9	8	4.20	3	-M5
M 6	1	80	7.5	25	6	4.9	8	5.00	3	-M6
M 8	1.25	90	10	35	8	6.2	9	6.80	3	-M8
M 10	1.5	100	12.5	39	10	8	11	8.50	3	-M10



~DIN 376 - ISO2/6H

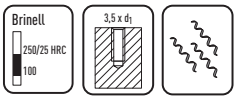
d_1 mm	P mm	l_1 js16 mm	l_2 mm	l_3 ± 1 mm	d_2 h9 mm	a h12 mm	l_4 mm		N	Code 2046055 TIN/vap
M 12	1.75	110	15	-	9	7	10	10.20	3	-M12
M 16	2	110	20	-	12	9	12	14.00	4	-M16
M 20	2.5	140	25	-	16	12	15	17.50	4	-M20

NEW

PARADUR SHORT CHIP Soft

Characteristics

Application



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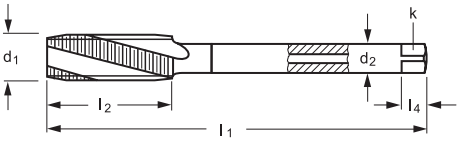


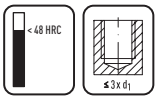
~DIN 374 - ISO2/6H

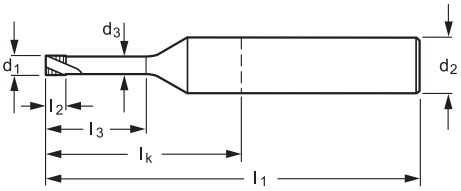
d_1 mm	P mm	l_1 js16 mm	l_2 mm	l_3 ± 1 mm	d_2 h9 mm	a h12 mm	l_4 mm		N	Code 2146055 TIN/vap
M8	1	90	10	-	6	4.9	8	7.00	3	-M8X1
M10	1	90	12.5	-	7	5.5	8	9.00	3	-M10X1
M12	1	100	15	-	9	7	10	11.00	3	-M12X1
M12	1.5	100	15	-	9	7	10	10.50	3	-M12X1.5
M14	1.5	100	17.5	-	11	9	12	12.50	4	-M14X1.5
M16	1.5	100	20	-	12	9	12	14.50	4	-M16X1.5

15

Characteristics

Application





NEW

- All-purpose thread mill for producing internal threads in all material groups up to 48HRC.
- **TICN** (Titanium Carbon-Nitride) is a universal coating with high toughness and shock resistance.
- Orbital thread milling is recommended. Our CCS software can readily generate the required program for all popular CNC controls.

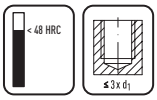
DIN 6535HA DIN 6535HA

	P No per Inch	d_1 mm	l_2 mm	l_1 mm	l_k mm	d_2 h6 mm	z	Code H528800	Code H5288006 TICN
1-UNC	64	1.35	0.794	57	21	6	3	-UNC1	-UNC1
2-UNC	56	1.6	0.908	57	21	6	3	-UNC2	-UNC2
3-UNC	48	1.95	1.587	57	21	6	3	-UNC3	-UNC3
4-UNC	40	2.1	1.905	57	21	6	3	-UNC4	-UNC4
6-UNC	32	2.6	2.382	57	21	6	3	-UNC6	-UNC6
8-UNC	32	3.25	2.381	57	21	6	3	-UNC8	-UNC8
10-UNC	24	3.55	3.175	57	21	6	3	-UNC10	-UNC10
1/4-UNC	20	4.85	3.810	57	21	6	3	-UNC1/4	-UNC1/4
5/16-UNC	18	6.2	4.233	63	27	8	3	-UNC5/16	-UNC5/16

NEW

Characteristics

Application



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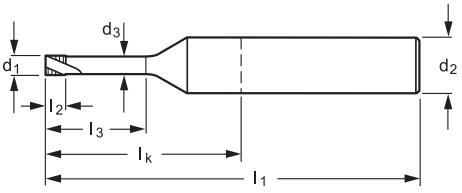


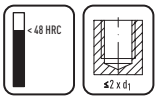
DIN 6535HA DIN 6539HA

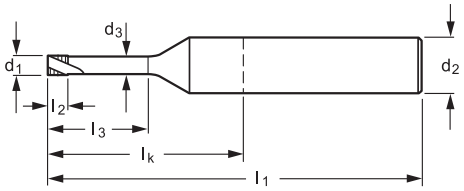
	P	d_1	l_2	l_1	l_k	d_2	z	Code	Code
	No per Inch	mm	mm	mm	mm	h6 mm		H538800	H5388006 TICN
2-UNF	64	1.7	0.794	57	21	6	3	-UNF2	-UNF2
3-UNF	56	1.95	0.908	57	21	6	3	-UNF3	-UNF3
4-UNF	48	2.15	1.587	57	21	6	3	-UNF4	-UNF4
6-UNF	40	2.75	1.905	57	21	6	3	-UNF6	-UNF6
10-UNF	32	3.85	2.382	57	21	6	3	-UNF10	-UNF10
1/4-UNF	28	5.25	2.381	57	21	6	3	-UNF1/4	-UNF1/4
5/16-UNF	24	6.55	3.175	63	27	8	3	-UNF5/16	-UNF5/16

15

Characteristics

Application





NEW Ø

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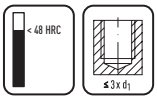
DIN 6535HA

	P	d_1	l_2	l_3	d_3	l_1	l_k	d_2 h6	z	Code H5087006 TICN
	mm	mm	mm	mm	mm	mm	mm	mm		
M1.6	**0.35**	1.2	1.2	3.725	0.74	38	10	3	3	-M1.6
M2	**0.4**	1.55	1.2	4.6	0.98	57	21	6	3	-M2
M2.5	**0.45**	1.95	1.35	5.675	1.3	57	21	6	3	-M2.5
M3	**0.5**	2.3	1.5	6.75	1.6	57	21	6	3	-M3
M4	**0.7**	3.1	2.1	9.05	2.1	57	21	6	3	-M4
M5	**0.8**	4	2.4	11.2	2.9	57	21	6	3	-M5
M6	**1**	4.8	3	13.5	3.4	57	21	6	3	-M6
M8	**1.25**	6.4	3.75	19.7	4.7	63	21	8	3	-M8 *
M10	**1.5**	8.2	4.5	22.3	6.16	72	32	10	4	-M10 *
M12	**1.75**	9.5	5.25	26.7	7.13	72	32	10	5	-M12 *

NEW

Characteristics

Application



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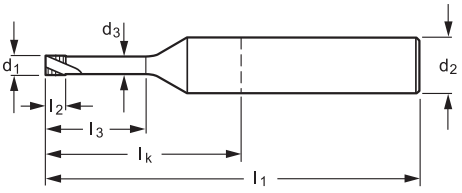


DIN 6535HA | DIN 6539HA

	P	d_1	l_2	l_3	d_3	l_1	l_k	d_2 h6	z	Code H508800	Code H5088006 TICN
	mm	mm	mm	mm	mm	mm	mm	mm			
M1.6	0.35	1.2	1.2	5.325	0.74	38	10	3	3	-M1.6	-M1.6
M2	0.4	1.55	1.2	6.6	0.98	57	21	6	3	-M2	-M2
M2.5	0.45	1.95	1.35	8.175	1.3	57	21	6	3	-M2.5	-M2.5
M3	0.5	2.3	1.5	9.75	1.6	57	21	6	3	-M3	-M3
M4	0.7	3.1	2.1	13.05	2.1	57	21	6	3	-M4	-M4
M5	0.8	4	2.4	16.2	2.9	57	21	6	3	-M5	-M5
M6	1	4.8	3	19.5	3.4	60	24	6	3	-M6	-M6
M8	1.25	6.4	3.75	25.875	4.7	63	27	8	3	-M8	-M8

Speed and Feed Chart: The speeds and feeds in this table are intended for intial setup. These values are a guide, depending on machining conditions, these parameters may need to be adjusted up or down until optimum settings are found.

How to use this chart:

1. Pick your material group
2. Move across to tap series
3. Read SFM
4. Calculate Speed and Feed

Page # in ■ = ANSI
Page # in ■ = DIN
SFM = Recommended
SFM = Suitable for limited application

Axial = Axial coolant through
Radial = Radial coolant through

ISO Material Group	PROTOTYP Material Group	PROTOTYP Material Group Description	Hardness	Examples	Page # Hole	Page # Program	Page # Lead	Page # Helix	Page # Coating	Page # UNC	Page # UNF	Page # M	Page # MF
		Steel											
P	1.1	Magnetic soft steel	60 - 120 HB	1005-1010, 1108-1115, A36									
	1.2	Structural steel, case carburizing steel	100 - 200 HB	1030-1095, 1146-1151									
	1.3	Plain carbon steel	100 - 250 HB	1020-1035, 1045, 1055, 1060									
	1.4	Alloy steel	150 - 250 HB	4140, A2, 4340, M42, M2									
	1.5	Alloy steel, Tempered steel	25 - 38 HRc	M42, D3, A2, M2, 4140, 8620									
	1.6.1	Alloy steel, Tempered steel	38 - 44 HRc	M42, D3, A2, 4140, 8130									
	1.6.2	Alloy steel, Tempered steel	44 - 49 HRc	02, D3									
		Stainless Steel											
M	2.1	Free machining stainless steel	120 - 250 HB	303, 416, 430F									
	2.2	Austinetic	130 - 250 HB	304, 316, 17-4PH, 15-5PH									
	2.3	Ferritic, austenitic, martensitic	130 - 320 HB	409, 430, 436									
	2.4	High tensile chrome-nickel alloys	33 - 44 HRc	660, A286, AMS									
		Cast Iron											
K	3.1	Cast Iron	50 - 150 HB	GG10, GG40, A48 class 20									
	3.2	Cast Iron	150 - 300 HB	GG25, GG40, A48 class 40									
	3.3	Ductile Iron	150 - 200 HB	GGG40-GGG70, ASTM A220 grade 40010									
	3.4	Ductile Iron	14 - 32 HRc	GGG40-GGG70, ASTM A602 grade 90001									
	3.5	Compacted graphite iron	14 - 32 HRc	CGI									
		Non-ferrous Material											
N	6.1	Copper, unalloyed	80 - 100 HB	Commercially pure									
	6.2	Short chip brass	100 - 200 HB	ASTM B30									
	6.3	Long chip brass	120 - 200 HB	ASTM B36									
	6.4	Cu-Al-Fe alloys	200 - 440 HB	Ampco									
	6.5	Cu-Al-Ni alloys (short chipping)	120 - 250 HB										
	6.6	Cu-Al-Ni alloys (long chipping)	120 - 250 HB										
	7.1	Al, Mg unalloyed	60 - 100 HB	Commercially pure, 1060									
	7.2	Al, alloyed Si<0.5%	90 - 180 HB	6061, 7025, 2024									
	7.3.1	Al, alloyed Si>=0.5%<4%	90 - 180 HB	4013, 8009, 296.2									
	7.3.2	Al, alloyed Si>=4%<12%	90 - 180 HB	356, 380, 319, A356.2									
	7.4	Al, alloyed Si>=12%	90 - 180 HB	390, 393									
	7.5.1	Magnesium Standard alloy	120 - 300 N/mm²	AZ 81, SAE 50									
	7.5.2	Magnesium -high tensile strength	70 - 120	SAE 520, SAE523									
	7.5.3	Heat resistant magnesium alloys	120 - 300 N/mm²										

	Through hole		Blind Hole		
	Prototex ECO-HT 	Prototex ECO-HT  Radial	Paradur ECO-HT 	Paradur ECO-HT  Axial	Paradur SHORT Chip Soft  Axial
	B	B	C	C	C
	Sp Pt	Sp Pt	R45	R45	R15
	THL	THL	THL	THL	TIN/VAP
		10		11	16
	12	13	14	15	17
					18
					19
			Speed Range in SFM		
	120 - 150	**120 - 150**	**120 - 150**	**120 - 150**	**120 - 150**
	120 - 150	**120 - 150**	**120 - 150**	**120 - 150**	**120 - 150**
	75 - 100	**75 - 100**	**75 - 100**	**75 - 100**	**75 - 100**
	45 - 60	**45 - 60**	**45 - 60**	**45 - 60**	
	30 - 40	**30 - 40**	**30 - 40**	**30 - 40**	
	25 - 35	**25 - 35**	**25 - 35**	**25 - 35**	
	15 - 25	**15 - 25**	**15 - 25**	**15 - 25**	
	10 - 15	**10 - 15**	**10 - 15**	**10 - 15**	
	10 - 15	**10 - 15**	**10 - 15**	**10 - 15**	
	60 - 90	60 - 90	60 - 90	60 - 90	**60 - 90**
	45 - 60	45 - 60	45 - 60	45 - 60	**45 - 60**
	60 - 90	**60 - 90**	**60 - 90**	**60 - 90**	**60 - 90**
	30 - 45	**30 - 45**	**30 - 45**	**30 - 45**	
	30 - 35	30 - 35	30 - 35	30 - 35	
	45 - 60	45 - 60	45 - 60	45 - 60	
	120 - 180	120 - 180	120 - 180	120 - 180	
	90 - 120	90 - 120	90 - 120	90 - 120	
	150 - 180	**150 - 180**	**150 - 180**	**150 - 180**	
	90 - 120	**90 - 120**	**90 - 120**	**90 - 120**	
	90 - 120	**90 - 120**	**90 - 120**	**90 - 120**	

WALTER PROTOTYP

Product innovations 2009

Milling

_TOOLING INNOVATIONS FOR MILLING

Optimum removal, more performance.

Walter Prototyp Protostar AL45
Solid carbide high performance end mill – for roughing and finishing

THE TOOL

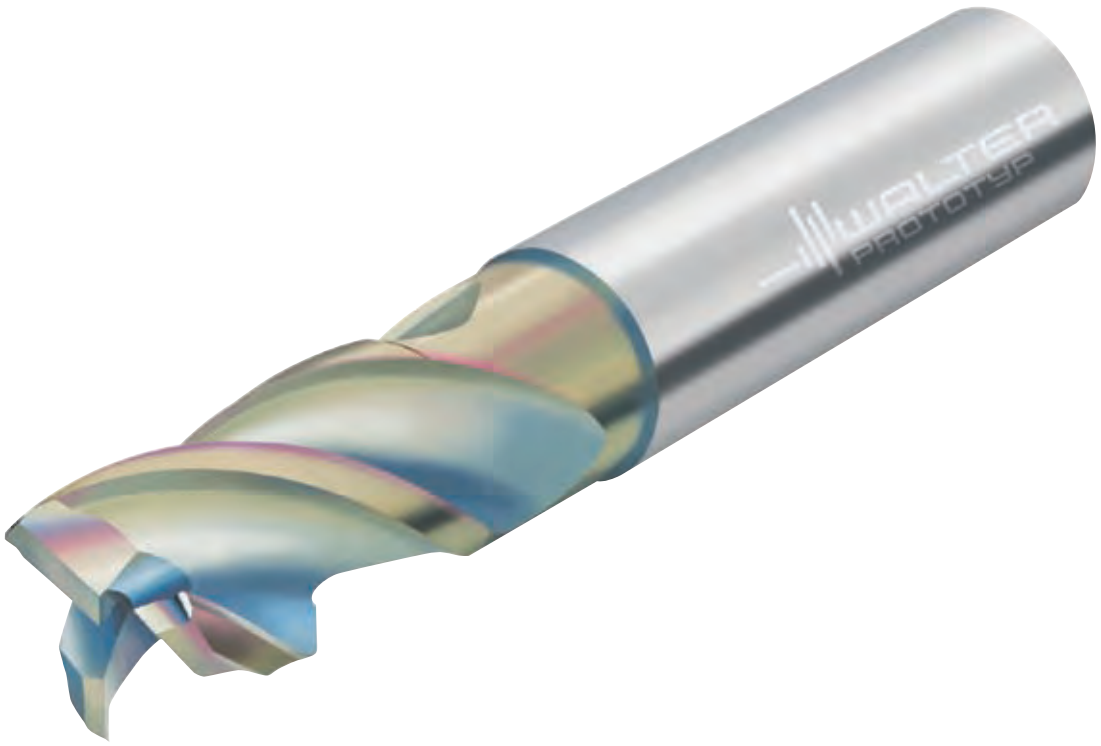
- Solid carbide high-speed milling cutters for machining aluminum with corner radii
- From R = 0.2 up to 0.5 mm
- Diameter range from 1 to 25 mm
- λ = 45° helix angle
- 3 flute
- Shank in accordance with DIN 6535 HA
- Manufacturing dimensions to DIN 6527 L
- With reduced neck (d_3)
- Bright and CRN coated

YOUR ADVANTAGES

- Useful in a wide variety of applications
- Increased tool life when finishing with CRN coated tools
- 50% higher feed rate compared to 2 flute tools with a 45° helix angle
- The new CRN coating provides greater process reliability by reducing built up edge
- Soft cutting action with a 45° helix angle and reliable chip evacuation
- Walter Prototyp's proven AL geometry guarantees smooth milling operations and low-vibration machining

THE APPLICATION

- For machining the ISO material group N (Aluminum, aluminum-alloys, copper, electrolytic copper)
- Roughing and finishing with just one tool
- Milling of pockets, angled entry and milling of contours
- Finishing with high cutting speeds using the newest CRN-coatings from Walter Prototyp

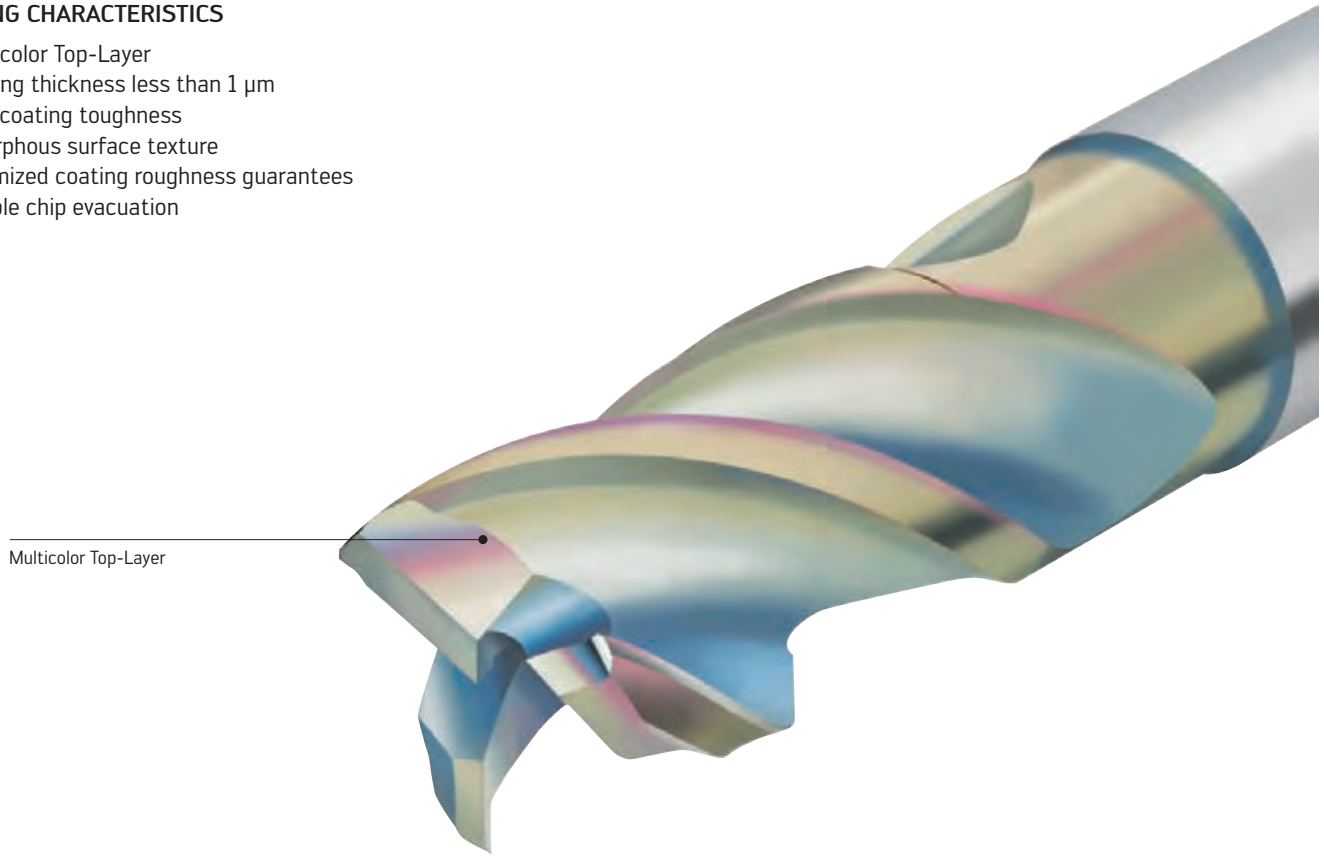


Protostar AL45

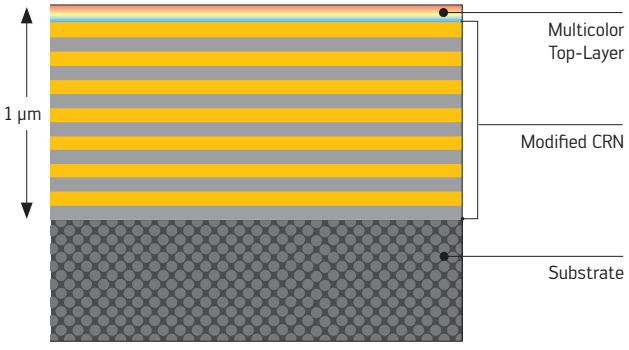
Types: H602311 & H6023114

COATING CHARACTERISTICS

- Multicolor Top-Layer
- Coating thickness less than 1 µm
- High coating toughness
- Amorphous surface texture
- Minimized coating roughness guarantees reliable chip evacuation



The new CRN-coating



Chromnitrid	
Abbreviation:	CRN
Coating material:	CrNO
Microhardness (HV 0.05):	2,250
Layer thickness (0.001 mm):	0.5…1
max. allowable temperature [°C]:	675
Color:	Mulitcolor top layer
Coating structure:	Multilayer

Solid Carbide Corner Radius

Inch Range

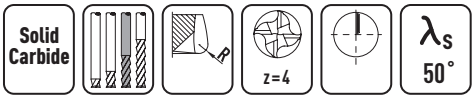
Type	Tough Guys N 50		Ti 40	Ti 45
Length	Standard	Long	Standard	Extra-Long
Helix	50°	50°	40°	45°
No. of flutes	3-4	3-4	4	4
Surface treatment	TAX	TAX	ACN	ACN
				
Coolant supply			Axial	
Range	(1/8...3/4)	(1/8...3/4)	(1/2...5/8)	(1/2...5/8)
Remarks			Titanium alloys	Titanium alloys
Catalog no.	AH3120317	AH4020117	AH7073717	AH7073417
Catalog page	31	32	33	34

Metric Range

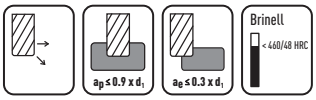
Type	Tough Guys N 50				AL 45	AL 45	Ti 40	Ti 45
Length	DIN 6527 L		P-Norm L		DIN 6527 L	DIN 6527 L	DIN 6527 L	P-Norm XL
Helix	50°	50°	50°	50°	45°	45°	40°	45°
No. of flutes	4	3-4	3-4	3-4	3	3	4	4-5
Surface treatment	TAX	TAX	TAX	TAX	Bright	CRN	ACN	ACN
								
Coolant supply							Axial	
Range	(6...20)	(2...20)	(4...20)	(4...20)	(1...25)	(1...25)	(12...25)	(16...25)
Remarks					Aluminum alloys	Aluminum alloys	Titanium alloys	Titanium alloys
Catalog no.	H3120317	H4120017	H3020117	H4020117	H602311	H6023114	H7073717	H7073417
Catalog page	35	36	38	39	40	40	41	42

Protostar Tough Guys N 50

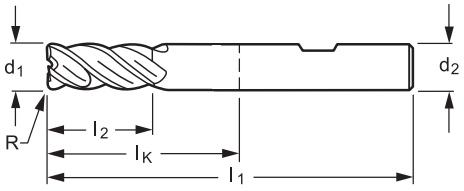
Characteristics



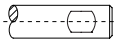
Application



- The combination of a variable flute depth with an offset tooth geometry provides a stable design for machining at up to 50% higher feed rates.
- **TAX** (Titanium Aluminum Nitride) is a mono-layer coating with high hardness and heat resistance.



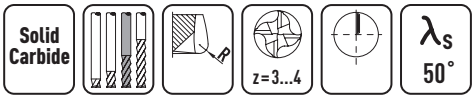
Standard



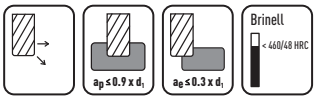
d_1 h9 inch	l_2 inch	R inch	l_1 inch	l_k inch	d_2 h6 inch	z	Code AH3120317 TAX
1/4	0.750	0.040	3.000	1.437	0.375	4	-1/4
5/16	0.813	0.080	3.000	1.437	0.375	4	-5/16
3/8	0.875	0.080	3.000	1.437	0.375	4	-3/8
7/16	1.000	0.080	3.500	1.717	0.500	4	-7/16
1/2	1.000	0.120	3.500	1.717	0.500	4	-1/2
5/8	1.250	0.125	3.500	1.594	0.625	4	-5/8-0.125 *
5/8	1.250	0.160	3.500	1.594	0.625	4	-5/8
3/4	1.500	0.125	4.000	1.969	0.750	4	-3/4-0.125 *
3/4	1.500	0.160	4.000	1.969	0.750	4	-3/4

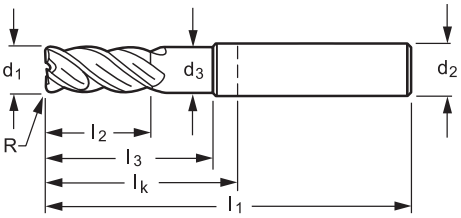
Protostar Tough Guys N 50

Characteristics



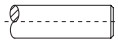
Application





- The combination of a variable flute depth with an offset tooth geometry provides a stable design for machining at up to 50% higher feed rates.
- **TAX** (Titanium Aluminum Nitride) is a mono-layer coating with high hardness and heat resistance.

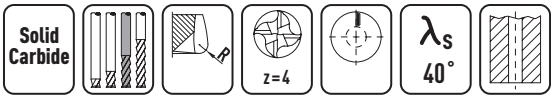
Long



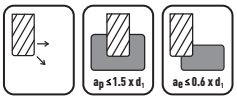
d_1 h9 inch	l_2 inch	R inch	l_3 inch	d_3 inch	l_1 inch	l_k inch	d_2 h6 inch	z	Code AH4020117 TAX
1/8	0.500	0.020	1.188	0.119	3.000	1.583	0.250	3	-1/8
3/16	0.625	0.020	1.125	0.178	3.000	1.583	0.250	3	-3/16
1/4	0.750	0.040	1.375	0.237	3.000	1.583	0.250	4	-1/4
5/16	0.813	0.080	1.500	0.297	3.500	1.937	0.375	4	-5/16
3/8	0.875	0.080	1.500	0.356	3.500	1.937	0.375	4	-3/8
7/16	1.000	0.080	2.875	0.416	4.750	2.967	0.500	4	-7/16
1/2	1.000	0.120	2.875	0.475	4.750	2.967	0.500	4	-1/2
5/8	1.250	0.125	3.000	0.594	5.000	3.094	0.625	4	-5/8-0.125 *
5/8	1.250	0.160	3.000	0.594	5.000	3.094	0.625	4	-5/8
3/4	1.500	0.125	3.000	0.713	5.250	3.219	0.750	4	-3/4-0.125 *
3/4	1.500	0.160	3.000	0.713	5.250	3.219	0.750	4	-3/4

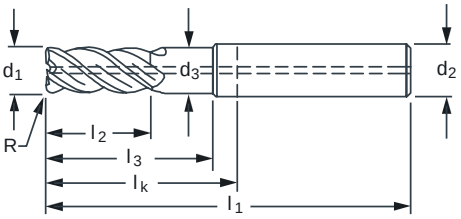
Protostar Ti 40

Characteristics



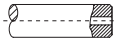
Application





- Special design for roughing and finishing of Titanium and Titanium alloys with the utmost in process security.
- **ACN** (Aluminum Chromium Nitride) has a high degree of hardness and heat resistance.
- Axial coolant through for improved cooling and chip evacuation.

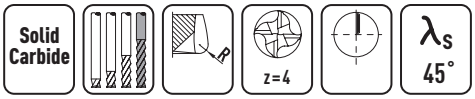
Standard



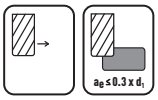
d_1 h9 inch	l_2 inch	R inch	l_3 inch	d_3 inch	l_1 inch	l_k inch	d_2 h6 inch	z	Code AH7073717 ACN
1/2	0.625	0.010	1.375	0.475	3.500	1.717	0.500	4	-1/2-0.010
1/2	0.625	0.040	1.375	0.475	3.500	1.717	0.500	4	-1/2-0.040
1/2	0.625	0.080	1.375	0.475	3.500	1.717	0.500	4	-1/2-0.080
5/8	0.875	0.010	1.500	0.594	3.500	1.594	0.625	4	-5/8-0.010
5/8	0.875	0.040	1.500	0.594	3.500	1.594	0.625	4	-5/8-0.040
5/8	0.875	0.080	1.500	0.594	3.500	1.594	0.625	4	-5/8-0.080
5/8	0.875	0.125	1.500	0.594	3.500	1.594	0.625	4	-5/8-0.125 *
3/4	1.000	0.010	2.000	0.713	4.000	1.969	0.750	4	-3/4-0.010
3/4	1.000	0.040	2.000	0.713	4.000	1.969	0.750	4	-3/4-0.040
3/4	1.000	0.080	2.000	0.713	4.000	1.969	0.750	4	-3/4-0.080
3/4	1.000	0.125	2.000	0.713	4.000	1.969	0.750	4	-3/4-0.125 *

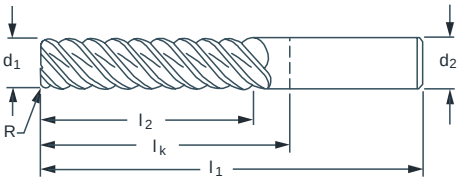
Protostar Ti 45

Characteristics



Application

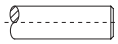




NEW Ø

- High-speed finishing of Titanium and Titanium alloys where surface quality and tool life are paramount.
- **ACN** (Aluminum Chromium Nitride) has a high degree of hardness and heat resistance.

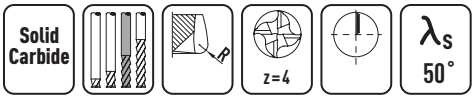
Extra-Long



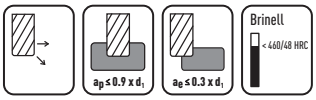
d_1 h9 inch	l_2 inch	R inch	l_1 inch	l_k inch	d_2 h6 inch	z	Code AH7073417 ACN
1/2	2.000	0.156	4.500	2.717	0.500	4	-1/2-2.000
5/8	2.250	0.125	5.000	3.094	0.625	4	-5/8-2.25-0.125 *
5/8	2.250	0.156	5.000	3.094	0.625	4	-5/8-2.250
3/4	2.250	0.125	5.000	2.969	0.750	4	-3/4-2.25-0.125 *
3/4	2.250	0.156	5.000	2.969	0.750	4	-3/4-2.250

Protostar Tough Guys N 50

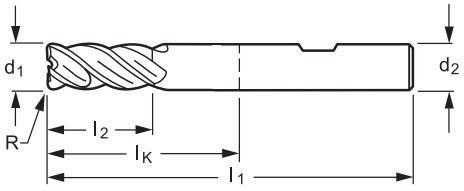
Characteristics



Application



- The combination of a variable flute depth with an offset tooth geometry provides a stable design for machining at up to 50% higher feed rates.
- **TAX** (Titanium Aluminum Nitride) is a mono-layer coating with high hardness and heat resistance.



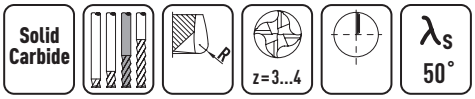
DIN 6527 L

DIN 6535HB

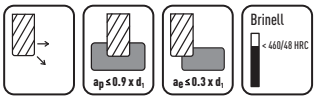
d_1 h9 mm	l_2 mm	R mm	l_1 mm	l_k mm	d_2 h6 mm	z	Code H3120317 TAX
6	13	1	57	21	6	4	-6
8	19	2	63	27	8	4	-8
10	22	2	72	32	10	4	-10
12	26	3	83	38	12	4	-12
14	26	3	83	38	14	4	-14
16	32	3	92	44	16	4	-16-3 *
16	32	4	92	44	16	4	-16
20	38	3	104	54	20	4	-20-3 *
20	38	4	104	54	20	4	-20

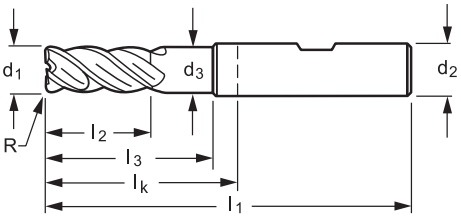
Protostar Tough Guys N 50

Characteristics



Application





NEW Ø

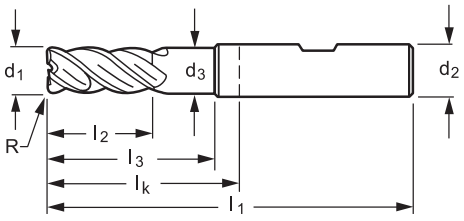
- The combination of a variable flute depth with an offset tooth geometry provides a stable design for machining at up to 50% higher feed rates.
- **TAX** (Titanium Aluminum Nitride) is a mono-layer coating with high hardness and heat resistance.

DIN 6527 L

DIN 6535HB

d_1 h9 mm	l_2 mm	R mm	l_3 mm	d_3 mm	l_1 mm	l_k mm	d_2 h6 mm	z	Code H4120017 TAX
2	7	0.2	9.5	1.92	57	21	6	3	-2-0.2
3	8	0.3	10	2.9	57	21	6	3	-3-0.3
4	11	0.5	15	3.8	57	21	6	3	-4-0.5
5	13	0.5	16	4.75	57	21	6	3	-5-0.5
6	13	0.5	19	5.7	57	21	6	4	-6-0.5
6	13	1	19	5.7	57	21	6	4	-6-1
8	19	0.5	25	7.6	63	27	8	4	-8-0.5
8	19	1	25	7.6	63	27	8	4	-8-1
8	19	1.5	25	7.6	63	27	8	4	-8-1.5
8	19	2	25	7.6	63	27	8	4	-8-2
10	22	0.5	30	9.5	72	32	10	4	-10-0.5
10	22	1	30	9.5	72	32	10	4	-10-1
10	22	1.5	30	9.5	72	32	10	4	-10-1.5
10	22	2	30	9.5	72	32	10	4	-10-2
12	26	0.5	36	11.4	83	38	12	4	-12-0.5
12	26	1	36	11.4	83	38	12	4	-12-1
12	26	1.5	36	11.4	83	38	12	4	-12-1.5
12	26	2	36	11.4	83	38	12	4	-12-2
12	26	2.5	36	11.4	83	38	12	4	-12-2.5
12	26	3	36	11.4	83	38	12	4	-12-3
14	26	1	36	13.3	83	38	14	4	-14-1
14	26	1.5	36	13.3	83	38	14	4	-14-1.5
14	26	2	36	13.3	83	38	14	4	-14-2
14	26	3	36	13.3	83	38	14	4	-14-3

Continuation - Protostar Tough Guys N 50



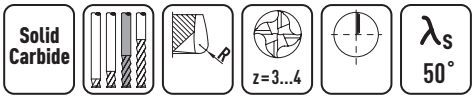
DIN 6527 L

DIN 6535HB

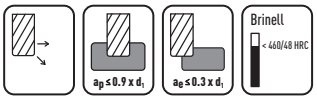
d_1 h9 mm	l_2 mm	R mm	l_3 mm	d_3 mm	l_1 mm	l_k mm	d_2 h6 mm	z	Code H4120017 TAX
16	32	0.5	42	15.2	92	44	16	4	-16-0.5
16	32	1	42	15.2	92	44	16	4	-16-1
16	32	2	42	15.2	92	44	16	4	-16-2
16	32	2.5	42	15.2	92	44	16	4	-16-2.5
16	32	3	42	15.2	92	44	16	4	-16-3 *
16	32	4	42	15.2	92	44	16	4	-16-4
20	38	0.5	52	19	104	54	20	4	-20-0.5
20	38	1	52	19	104	54	20	4	-20-1
20	38	2	52	19	104	54	20	4	-20-2
20	38	2.5	52	19	104	54	20	4	-20-2.5
20	38	3	52	19	104	54	20	4	-20-3 *
20	38	4	52	19	104	54	20	4	-20-4

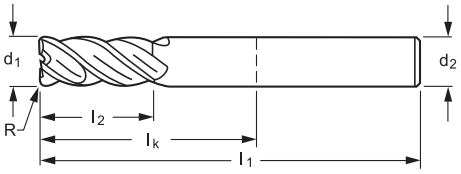
Protostar Tough Guys N 50

Characteristics



Application





NEW Ø

- The combination of a variable flute depth with an offset tooth geometry provides a stable design for machining at up to 50% higher feed rates.
- **TAX** (Titanium Aluminum Nitride) is a mono-layer coating with high hardness and heat resistance.

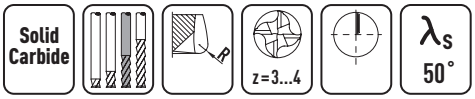
P-Norm L

DIN 6535HA

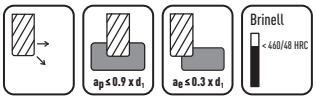
d_1 h9 mm	l_2 mm	R mm	l_1 mm	l_k mm	d_2 h6 mm	z	Code H3020117 TAX
4	11	1	57	21	6	3	-4
5	13	1	57	21	6	3	-5
6	13	1	65	29	6	4	-6
8	19	2	80	44	8	4	-8
10	22	2	100	60	10	4	-10
12	26	3	100	55	12	4	-12
14	26	3	104	59	14	4	-14
16	32	3	115	67	16	4	-16-3 *
16	32	4	115	67	16	4	-16
20	38	3	125	75	20	4	-20-3 *
20	38	4	125	75	20	4	-20

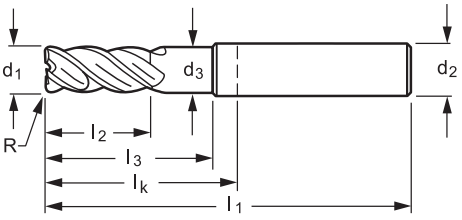
Protostar Tough Guys N 50

Characteristics



Application





- The combination of a variable flute depth with an offset tooth geometry provides a stable design for machining at up to 50% higher feed rates.
- **TAX** (Titanium Aluminum Nitride) is a mono-layer coating with high hardness and heat resistance.

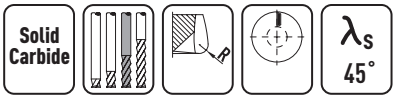
P-Norm L

DIN 6535HA

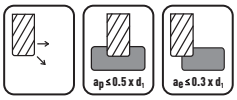
d_1 h9 mm	l_2 mm	R mm	l_3 mm	d_3 mm	l_1 mm	l_k mm	d_2 h6 mm	z	Code H4020117 TAX
4	11	0.5	15	3.8	57	21	6	3	-4-0.5
4	11	1	15	3.8	57	21	6	3	-4
5	13	0.5	16	4.75	57	21	6	3	-5-0.5
5	13	1	16	4.75	57	21	6	3	-5
6	13	0.5	27	5.7	65	29	6	4	-6-0.5
6	13	1	27	5.7	65	29	6	4	-6
8	19	0.5	42	7.6	80	44	8	4	-8-0.5
8	19	1	42	7.6	80	44	8	4	-8-1
8	19	2	42	7.6	80	44	8	4	-8
10	22	0.5	58	9.5	100	60	10	4	-10-0.5
10	22	1	58	9.5	100	60	10	4	-10-1
10	22	2	58	9.5	100	60	10	4	-10
12	26	0.5	53	11.4	100	55	12	4	-12-0.5
12	26	1	53	11.4	100	55	12	4	-12-1
12	26	3	53	11.4	100	55	12	4	-12
14	26	0.5	57	13.3	104	59	14	4	-14-0.5
14	26	1	57	13.3	104	59	14	4	-14-1
14	26	3	57	13.3	104	59	14	4	-14
16	32	0.5	65	15.2	115	67	16	4	-16-0.5
16	32	1	65	15.2	115	67	16	4	-16-1
16	32	2	65	15.2	115	67	16	4	-16-2
16	32	3	65	15.2	115	67	16	4	-16-3 *
16	32	4	65	15.2	115	67	16	4	-16
20	38	1	73	19	125	75	20	4	-20-1
20	38	2	73	19	125	75	20	4	-20-2
20	38	3	73	19	125	75	20	4	-20-3 *
20	38	4	73	19	125	75	20	4	-20

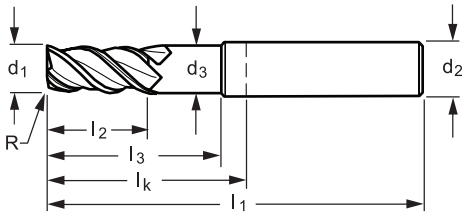
Protostar AL 45

Characteristics



Application





NEW

- Suitable for slot, pocket and shoulder milling in Aluminum and Aluminum alloys. An excellent choice for finishing operations.
- CrN (Chrome Nitride) is an excellent choice for non-ferrous alloys that tend to adhere.
- Long effective length.

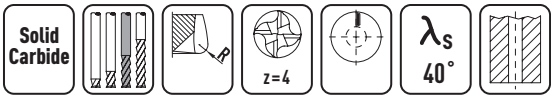
DIN 6527 L

DIN 6535HA

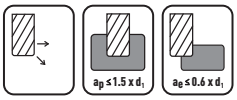
d_1 h9 mm	l_2 mm	R mm	l_3 mm	d_3 mm	l_1 mm	l_k mm	d_2 h5 mm	z	Code H602311	Code H6023114 CRN
1	3	0.2	6.5	0.96	57	21	6	3	-1	-1
2	6	0.2	9.5	1.92	57	21	6	3	-2	-2
3	7	0.3	10	2.9	57	21	6	3	-3	-3
4	8	0.5	15	3.8	57	21	6	3	-4	-4
5	10	0.5	16	4.75	57	21	6	3	-5	-5
6	10	0.5	19	5.7	57	21	6	3	-6	-6
8	16	0.5	25	7.6	63	27	8	3	-8	-8
10	19	0.5	30	9.5	72	32	10	3	-10	-10
12	22	0.5	36	11.4	83	38	12	3	-12	-12
14	22	0.5	36	13.3	83	38	14	3	-14	-14
16	26	0.5	42	15.2	92	44	16	3	-16	-16
18	26	0.5	42	17.1	92	44	18	3	-18	-18
20	32	0.5	52	19	104	54	20	3	-20	-20
25	45	0.5	63	23.75	121	65	25	3	-25	-25

Protostar Ti 40

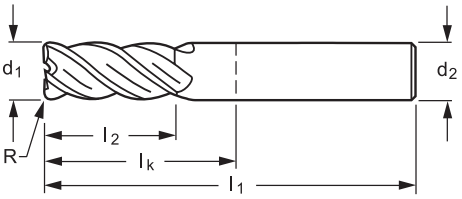
Characteristics



Application



- Special design for roughing and finishing of Titanium and Titanium alloys with the utmost in process security.
- **ACN** (Aluminum Chromium Nitride) has a high degree of hardness and heat resistance.
- Axial coolant through for improved cooling and chip evacuation.



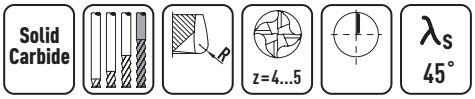
DIN 6527 L

DIN 6535HA

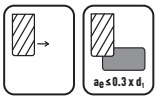
d_1 h9 mm	l_2 mm	R mm	l_3 mm	d_3 mm	l_1 mm	l_k mm	d_2 h6 mm	z	Code H7073717 ACN
12	19	0.2	36	11.4	83	38	12	4	-12-0.2
12	19	2	36	11.4	83	38	12	4	-12-2
12	19	2.5	36	11.4	83	38	12	4	-12-2.5
16	26	0.2	42	15.2	92	44	16	4	-16-0.2
16	26	2	42	15.2	92	44	16	4	-16-2
16	26	2.5	42	15.2	92	44	16	4	-16-2.5
16	26	3	42	15.2	92	44	16	4	-16-3 *
16	26	4	42	15.2	92	44	16	4	-16-4
20	32	0.2	52	19	104	54	20	4	-20-0.2
20	32	2	52	19	104	54	20	4	-20-2
20	32	2.5	52	19	104	54	20	4	-20-2.5
20	32	3	52	19	104	54	20	4	-20-3 *
20	32	4	52	19	104	54	20	4	-20-4
25	40	0.2	63	23.75	121	65	25	4	-25-0.2
25	40	2	63	23.75	121	65	25	4	-25-2
25	40	2.5	63	23.75	121	65	25	4	-25-2.5
25	40	3	63	23.75	121	65	25	4	-25-3 *
25	40	4	63	23.75	121	65	25	4	-25-4

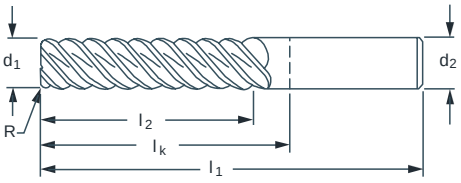
Protostar Ti 45

Characteristics



Application





NEW Ø

- High-speed finishing of Titanium and Titanium alloys where surface quality and tool life are paramount.
- **ACN** (Aluminum Chromium Nitride) has a high degree of hardness and heat resistance.

P-Norm XL

DIN 6535HA

d_1 h9 mm	l_2 mm	R mm	l_1 mm	l_k mm	d_2 h6 mm	z	Code H7073417 ACN
16	50	3	115	67	16	4	-16X50-3 *
16	50	4	115	67	16	4	-16X50
16	90	3	145	97	16	4	-16X90-3 *
16	90	4	145	97	16	4	-16X90
20	55	3	125	75	20	4	-20X55-3 *
20	55	4	125	75	20	4	-20X55
20	100	3	170	120	20	4	-20X100-3 *
20	100	4	170	120	20	4	-20X100
25	90	3	153	74	25	5	-25X90-3 *
25	90	4	153	74	25	5	-25X90
25	125	3	188	132	25	5	-25X125-3 *
25	125	4	188	132	25	5	-25X125

Application guide - Corner Radius

Speed and Feed Chart: The speeds and feeds in this table are intended for intial setup. These values are a guide, depending on machining conditions, these parameters may need to be adjusted up or down until optimum settings are found.

How to use this chart:

1. Pick your material group
2. Move across to mill series
3. Read SFM and Feed Chart (FC) Letter
4. Go to the Feed Charts on pages 46-47 and convert to feed per tooth
5. Calculate Speed and Feed using formulas on page 46

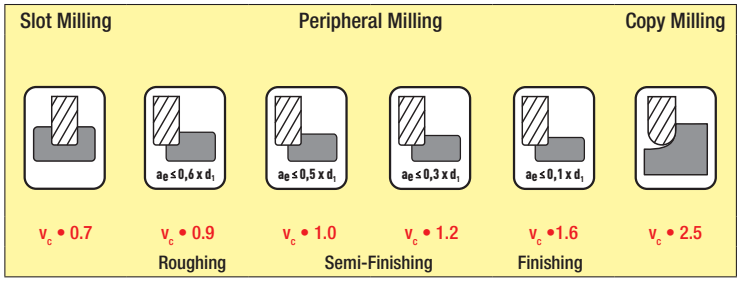
			Type	Tough Guys N 50							
			Length inch	Standard						Long	
			Length metric	DIN 6527 L		DIN 6527 L		P-Norm L		P-Norm L	
			Helix	50°		50°		50°		50°	
			No. of flutes	3-4		3-4		3-4		3-4	
			Surface treatment	TAX		TAX		TAX		TAX	
											
			Remarks								
		INCH	Range	(1/4...3/4)						(1/8...3/4)	
		INCH	**Catalog No.**	**AH3120317**						**AH4020117**	
		INCH	Catalog Page	31						32	
		METRIC	Range	(6...20)		(2...20)		(4...20)		(4...20)	
		METRIC	**Catalog No.**	**H3120317**		**H4120017**		**H3020117**		**H4020117**	
		METRIC	Catalog Page	35		36		38		39	
ISO Material Group	PROTOTYP Material Group	PROTOTYP Material Group Description	Hardness	SFM	FC	SFM	FC	SFM	FC	SFM	FC
P	**Steel**										
P	1.1	Magnetic soft steel	61 - 120 HB	855	A	855	A	655	A	655	A
P	1.2	Structural steel, case carburizing steel	101 - 200 HB	855	A	855	A	655	A	655	A
P	1.3	Plain carbon steel	100 - 250 HB	820	A	820	A	690	A	690	A
P	1.4	Alloy steel	150 - 250 HB	690	A	690	A	590	A	590	A
P	1.5	Alloy steel, Tempered steel	26 - 38 HRc	425	A	490	A	425	A	425	A
P	1.6.1	Alloy steel, Tempered steel	39 - 44 HRc	360	A	425	A	330	A	330	A
P	1.6.2	Alloy steel, Tempered steel	44 - 49 HRc			360	B	295	B	295	B
M	**Stainless Steel**										
M	2.1	Free machining stainless steel	120 - 250 HB	360	B	360	B	295	B	295	B
M	2.2	Austinetic	130 - 250 HB	295	B	295	B	230	B	230	B
M	2.3	Ferritic, austenitic, martensitic	130 - 320 HB	230	B	230	B	195	B	195	B
M	2.4	High tensile chrome-nickel alloys	33 - 44 HRc	165	B	165	B	150	B	150	B
K	**Cast Iron**										
K	3.1	Cast Iron	50 - 150 HB	655	A	655	A	525	A	525	A
K	3.2	Cast Iron	150 - 300 HB	560	A	560	A	460	A	460	A
K	3.3	Ductile Iron	150 - 200 HB	655	A	655	A	560	A	560	A
K	3.4	Ductile Iron	14 - 32 HRc	525	A	525	A	425	A	425	A
K	3.5	Compacted graphite iron	14 - 32 HRc	460	A	425	A	360	A	360	A
N	**Non-ferrous Materials**										
N	6.1	Copper, unalloyed	80 - 100 HB	1835	C	1835	C	1445	C	1445	C
N	6.2	Short chip brass	100 - 200 HB	1835	C	1835	C	1445	C	1445	C
N	6.3	Long chip brass	120 - 200 HB	1835	C	1835	C	1445	C	1445	C
N	6.4	Cu-Al-Fe alloys	200 - 440 HB	260	C	260	C	230	C	230	C
N	6.5	Cu-Al-Ni alloys (short chipping)	120 - 250 HB	490	C	490	C	425	C	425	C
N	6.6	Cu-Al-Ni alloys (long chipping)	120 - 250 HB	490	C	490	C	425	C	425	C
N	7.1	Al, Mg unalloyed	60 - 100 HB	5970	C	5970	C	5350	C	5350	C
N	7.2	Al, alloyed Si<0.5%	90 - 180 HB	5970	C	5970	C	5085	C	5085	C
N	7.3.1	Al, alloyed Si>=0.5%<4%	90 - 180 HB	5775	C	5775	C	4790	C	4790	C
N	7.3.2	Al, alloyed Si>=4%<12%	90 - 180 HB	2560	C	2560	C	1970	C	1970	C
N	7.4	Al, alloyed Si>=12%	90 - 180 HB	855	C	855	C	655	C	655	C
N	7.5.1	Magnesium Standard alloy	120 - 300 N/mm²								
N	7.5.2	Magnesium -high tensile strength	70 - 120 HB								
N	7.5.3	Heat resistant magnesium alloys	120 - 300 N/mm²								
S	**High Temp Alloys and Titanium Alloys**										
S	4.1	Titanium, unalloyed	120 - 200 HB	755	A	755	A	560	A	560	A
S	4.2	Titanium, alloyed	14 - 28 HRc	295	A	295	A	230	A	230	A
S	4.3	Titanium, alloyed	28 - 44 HRc	230	A	230	A	165	A	165	A
S	5.1	Nickel, unalloyed	120 - 150 HB	1115	A	1115	A	855	A	855	A
S	5.2	Nickel, alloyed	150 - 270 HB	230	B	230	B	165	B	165	B
S	5.3	Nickel, alloyed	28 - 49 HRc	130	B	130	B	100	B	100	B
S	9.1	TIC Hard materials	48 - 51 HRc								
S	9.2	Tungsten alloys	44 - 52 HRc	280	B	280	B	230	B	230	B
S	9.3	Alloys on Cobalt base	150 - 350 HB	130	B	130	B	100	B	100	B
S	9.4	Molybdenum alloyed	150 - 350 HB								
H	**Hardened Materials**										
H	1.7.1	Steel (hardened), short chipping	49 - 55 HRc								
H	1.7.2	Steel (hardened), long chipping	49 - 55 HRc								
H	1.8.1	Steel (hardened)	55 - 60 HRc								
H	1.8.2	Steel (hardened)	60 - 65 HRc								
O	**Synthetic Materials / Others**										
O	8.1	Thermoplastics	<50 N/mm²	1575	C	1575	C	1215	C	1215	C
O	8.2	Thermosetting plastics	<80 N/mm²	720	C	720	C	560	C	560	C
O	8.3	Reinforced plastic materials	240 - 440 N/mm²	330	C	330	C	260	C	260	C
O	10.1	Standard graphite	<100 N/mm²	855	C	855	C	855	C	855	C
O	10.2	Wear resistant graphite	<100 N/mm²	855	C	855	C	855	C	855	C

	AL 45				Ti 40		Ti 45	
					Standard		Long	
	DIN 6527 L		DIN 6527 L		DIN 6527 L		P-Norm XL	
	45°		45°		40°		45°	
	3		3		4		4-5	
	Bright		CRN		ACN		ACN	
					 Axial			
	Aluminum		Aluminum		Titanium alloys		Titanium alloys	
					(1/2...5/8)		(1/2...5/8)	
					AH7073717		**AH7073417**	
					33		34	
	(1...25)		(1...25)		(12...25)		(16...25)	
	H602311		**H6023114**		**H7073717**		**H7073417**	
	40		40		41		42	
	SFM	FC	SFM	FC	SFM	FC	SFM	FC
							655	A
							655	A
							655	A
							560	A
							395	A
							330	A
							295	B
							260	B
							230	B
							195	B
							130	B
							490	A
							460	A
							525	A
							425	A
							360	A
	1445	C	2200	C				
	1445	C	2200	C				
	1445	C	2200	C				
	230	C	260	C				
	420	C	490	C				
	420	C	490	C				
	5350	C	7000	C				
	5085	C	7000	C				
	4790	C	6000	C				
	1970	C	2560	C				
	655	C	855	C				
	1400	C	2000	C				
	1100	C	1700	C				
	800	C	1200	C				
	300	A	400	A	750	A	655	A
					335	A	295	A
					250	A	230	A
	550	A	700	A	1085	A	820	A
					230	B	165	B
					130	B	100	B
					35	B	35	B
					260	B	230	B
					130	B	100	B
					260	B	195	B
	1215	C	1575	C				
	560	C	720	C				

Values

Description	Unit Inch	Unit Metric
Revolutions per minute	min^{-1}	min^{-1}
Cutting Speed	v_c [ft/min]	v_c [m/min]
Feed rate	v_f [inch/min]	v_f [mm/min]
Cutting diameter	d_1 [inch]	d_1 [mm]
Feed per tooth	f_z [inch]	f_z [mm]
Number of teeth	z	z
Axial depth of cut	a_p [inch]	a_p [mm]
Radial width of cut	a_e [inch]	a_e [mm]

Cutting speed factors



Conversions

To m/min from SFM

v_c [m/min] = v_c [ft/min] • 0.3048

To mm from inch

[mm] = [inch] • 25.4

Calculations

RPM with SFM and cutter diameter

$min^{-1} = (v_c$ [ft/min] • 3.82) / d_1 [inch]

RPM with m/min and cutter diameter

$min^{-1} = (v_c$ [m/min] • 1000) / (3.14 • d_1 [mm])

IPM with FPT, number of teeth and RPM

v_f [inch/min] = (f_z [inch] • z • min^{-1})

mm/min with FPT, number of teeth and RPM

v_f [mm/min] = (f_z [mm] • z • min^{-1})

A

a_e [inch] radial width of cut	Feed per tooth in inches f_z [inch]														
	Ø 0.3mm	Ø 1/64“ Ø 0.5mm	Ø 1/32“ Ø 1mm	Ø 1/16“ Ø 2mm	Ø 1/8“ Ø 3mm	Ø 3/16“ Ø 4mm	Ø 1/4“ Ø 6mm	Ø 5/16“ Ø 8mm	Ø 3/8“ Ø 10mm	Ø 1/2“ Ø 12mm	Ø 9/16“ Ø 14mm	Ø 5/8“ Ø 16mm	Ø 11/16“ Ø 18mm	Ø 3/4“ Ø 20mm	Ø 1“ Ø 25mm
0.0005	0.0008	0.0008	0.0012	0.0024	0.0035	0.0047	0.0059	0.0059	0.0079						
0.0020	0.0006	0.0006	0.0010	0.0016	0.0028	0.0039	0.0047	0.0059	0.0079						
0.0040	0.0004	0.0005	0.0008	0.0014	0.0020	0.0031	0.0039	0.0059	0.0079	0.0079	0.0079	0.0079			
0.0080	0.0004	0.0004	0.0006	0.0012	0.0016	0.0024	0.0031	0.0059	0.0071	0.0079	0.0079	0.0079	0.0079	0.0098	
1/64“		0.0004	0.0005	0.0010	0.0012	0.0020	0.0028	0.0047	0.0059	0.0059	0.0059	0.0059	0.0079	0.0098	0.0098
1/32“			0.0004	0.0010	0.0012	0.0016	0.0024	0.0035	0.0047	0.0047	0.0047	0.0047	0.0059	0.0079	0.0098
1/16“				0.0008	0.0012	0.0012	0.0020	0.0031	0.0043	0.0047	0.0047	0.0047	0.0059	0.0079	0.0079
1/8“					0.0008	0.0010	0.0018	0.0030	0.0041	0.0047	0.0047	0.0047	0.0053	0.0069	0.0079
3/16“						0.0008	0.0016	0.0028	0.0039	0.0047	0.0047	0.0047	0.0047	0.0059	0.0079
1/4“							0.0012	0.0024	0.0031	0.0039	0.0039	0.0047	0.0047	0.0059	0.0079
5/16“								0.0020	0.0028	0.0035	0.0039	0.0047	0.0047	0.0059	0.0079
3/8“									0.0024	0.0031	0.0039	0.0047	0.0047	0.0055	0.0063
1/2“										0.0028	0.0035	0.0043	0.0047	0.0055	0.0063
9/16“											0.0031	0.0039	0.0047	0.0051	0.0059
5/8“												0.0035	0.0039	0.0047	0.0059
11/16“													0.0039	0.0043	0.0051
3/4“														0.0039	0.0047
1“															0.0039

B

a_e [inch] radial width of cut	Feed per tooth in inches f_z [inch]														
	Ø 0.3mm	Ø 1/64“ Ø 0.5mm	Ø 1/32“ Ø 1mm	Ø 1/16“ Ø 2mm	Ø 1/8“ Ø 3mm	Ø 3/16“ Ø 4mm	Ø 1/4“ Ø 6mm	Ø 5/16“ Ø 8mm	Ø 3/8“ Ø 10mm	Ø 1/2“ Ø 12mm	Ø 9/16“ Ø 14mm	Ø 5/8“ Ø 16mm	Ø 11/16“ Ø 18mm	Ø 3/4“ Ø 20mm	Ø 1“ Ø 25mm
0.0005	0.0006	0.0006	0.0012	0.0020	0.0031	0.0039	0.0047	0.0047	0.0063						
0.0020	0.0005	0.0005	0.0008	0.0016	0.0024	0.0031	0.0039	0.0047	0.0063						
0.0040	0.0003	0.0004	0.0006	0.0012	0.0016	0.0024	0.0031	0.0047	0.0063	0.0063	0.0063	0.0063			
0.0080	0.0003	0.0003	0.0005	0.0010	0.0014	0.0020	0.0024	0.0047	0.0055	0.0063	0.0063	0.0063	0.0063	0.0079	
1/64“		0.0003	0.0004	0.0008	0.0010	0.0016	0.0024	0.0039	0.0047	0.0047	0.0047	0.0047	0.0063	0.0079	0.0079
1/32“			0.0004	0.0008	0.0010	0.0012	0.0019	0.0031	0.0039	0.0039	0.0039	0.0039	0.0047	0.0063	0.0079
1/16“				0.0006	0.0008	0.0010	0.0020	0.0028	0.0035	0.0039	0.0039	0.0039	0.0047	0.0063	0.0063
1/8“					0.0006	0.0009	0.0018	0.0026	0.0033	0.0039	0.0039	0.0039	0.0043	0.0055	0.0063
3/16“						0.0008	0.0016	0.0024	0.0031	0.0039	0.0039	0.0039	0.0039	0.0047	0.0063
1/4“							0.0012	0.0020	0.0028	0.0031	0.0031	0.0039	0.0039	0.0047	0.0063
5/16“								0.0016	0.0024	0.0031	0.0031	0.0039	0.0039	0.0047	0.0063
3/8“									0.0020	0.0028	0.0031	0.0039	0.0039	0.0047	0.0055
1/2“										0.0024	0.0028	0.0035	0.0039	0.0047	0.0055
9/16“											0.0028	0.0031	0.0039	0.0047	0.0055
5/8“												0.0028	0.0031	0.0039	0.0047
11/16“													0.0031	0.0039	0.0047
3/4“														0.0031	0.0039
1“															0.0039

C

a_e [inch] radial width of cut	Feed per tooth in inches f_z [inch]														
	Ø 0.3mm	Ø 1/64“ Ø 0.5mm	Ø 1/32“ Ø 1mm	Ø 1/16“ Ø 2mm	Ø 1/8“ Ø 3mm	Ø 3/16“ Ø 4mm	Ø 1/4“ Ø 6mm	Ø 5/16“ Ø 8mm	Ø 3/8“ Ø 10mm	Ø 1/2“ Ø 12mm	Ø 9/16“ Ø 14mm	Ø 5/8“ Ø 16mm	Ø 11/16“ Ø 18mm	Ø 3/4“ Ø 20mm	Ø 1“ Ø 25mm
0.0005	0.0014	0.0016	0.0024	0.0039	0.0063	0.0079	0.0098	0.0098	0.0098						
0.0020	0.0012	0.0012	0.0020	0.0031	0.0047	0.0071	0.0079	0.0098	0.0098						
0.0040	0.0008	0.0010	0.0016	0.0024	0.0039	0.0055	0.0071	0.0098	0.0098	0.0098	0.0098	0.0098			
0.0080	0.0008	0.0008	0.0012	0.0020	0.0031	0.0039	0.0055	0.0098	0.0098	0.0098	0.0098	0.0098	0.0098	0.0098	
1/64“		0.0008	0.0008	0.0020	0.0024	0.0035	0.0047	0.0079	0.0098	0.0098	0.0098	0.0098	0.0098	0.0098	0.0098
1/32“			0.0006	0.0020	0.0024	0.0028	0.0039	0.0063	0.0087	0.0087	0.0087	0.0087	0.0098	0.0098	0.0098
1/16“				0.0016	0.0020	0.0024	0.0031	0.0055	0.0087	0.0087	0.0087	0.0087	0.0098	0.0098	0.0098
1/8“					0.0016	0.0020	0.0030	0.0051	0.0087	0.0087	0.0087	0.0087	0.0093	0.0098	0.0098
3/16“						0.0016	0.0028	0.0047	0.0087	0.0087	0.0087	0.0087	0.0087	0.0098	0.0098
1/4“							0.0020	0.0039	0.0055	0.0071	0.0079	0.0087	0.0087	0.0098	0.0098
5/16“								0.0035	0.0047	0.0063	0.0079	0.0087	0.0087	0.0098	0.0098
3/8“									0.0039	0.0055	0.0071	0.0087	0.0087	0.0098	0.0098
1/2“										0.0047	0.0063	0.0079	0.0087	0.0098	0.0098
9/16“											0.0055	0.0071	0.0087	0.0098	0.0098
5/8“												0.0063	0.0071	0.0087	0.0098
11/16“													0.0071	0.0079	0.0098
3/4“														0.0071	0.0079
1“															0.0079

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