GUHRING

THE NEW GENERATION

- torque reduction up to 30 %
- reduced axial forces
- increased tool life
- improved surface finish quality

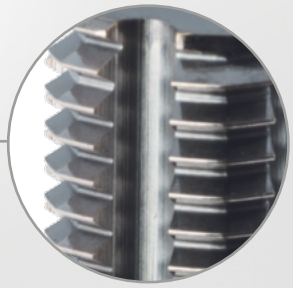
Pionex *the new generation* ***FLUTELESS MACHINE TAPS***

GUHRING – YOUR WORLD-WIDE PARTNER

Pionex

the new generation ***FLUTELESS MACHINE TAPS***

A special surface finish treatment in combination with the TiCN-coating ensures increased wear-resistance.



Optimised polygon form

Based to a geometric modification the contact surface between tool and functionality area could be optimised. This reduced torque by up to 30 %.

Tool material

Increased wear-resistance thanks to the application of a new powder metallurgical base material.

Shank tolerance h6

Due to the shank tolerance h6 the new fluteless tap generation can be applied in all standard clamping chucks.

New lubricating groove geometry

Thanks to the optimised lubricating grooves the lubricating effect has been clearly improved in the forming lead area.

	Thread depth		≤3xD			
	Tool material		HSS-E-PM			
	Lead form		C	E	C	E
	Surface		C	C	C	C
	Coolant delivery		☒	☒	r	a
	Shank tolerance		h6	h6	h6	h6
THROUGHHOLE **BLIND**HOLE						
● = Neat oil ◍ = Soluble oil △ = Paste ☐ = MQL	**Thread type**	**Tolerance**	**Article no./page**			
	M	6HX	4487 *p. 4*	4494 *p. 4*	4485 *p. 6*	4483 *p. 5*
		6GX	4488 *p. 4*			
	MF	6HX	4489 *p. 7*	4495 *p. 7*	4486 *p. 9*	4484 *p. 8*
		6GX	4490 *p. 7*			
	UNC	2BX	4491 *p. 10*			
	UNF	2BX	4492 *p. 11*			
	G	- X	4493 *p. 12*			
		Suitable lubricant:	◍/●/△	◍/●/△	◍/●/△/☐	◍/●/△/☐

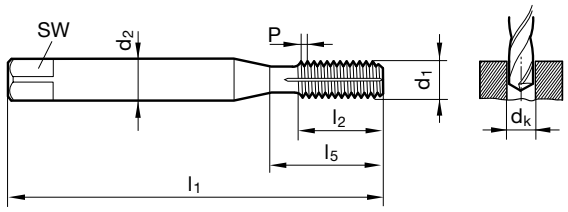
		Group of materials	Tensile strength	Material example	Material no.	Recommended cutting speed v_c [m/min]			
P	P1	Structural and free cutting steels, heat-treatable steels unalloyed	≤800 N/mm²	S235JR C15 11SMnPb30	1.0037 1.0401 1.0718	**25**	**25**	**25**	**25**
	P2	Free-cutting steels, unalloyed case hardened steels, nitriding steels	800 - 1000 N/mm²	S355J2 C60 31CrMo12	1.0577 1.0601 1.8515	**25**	**25**	**25**	**25**
	P3	Alloyed heat-treatable steels, tool steels, high speed steels	800 - 1200 N/mm²	42CrMo4 36CrNiMo4 X36CrMo17 HS 6-5-2	1.7225 1.6511 1.2316 1.3343	**15**	**15**	**15**	**15**
M	M1	Stainless steels, sulphured, austenitic	≤1000 N/mm²	X5CrNi18-10 X6CrNiTi18-10 X8CrNiS18-9	1.4301 1.4571 1.4305	**15**	**15**	**15**	**15**
	M2	Stainless- and acidresistant steels, martensitic	≤1000 N/mm²	X17CrNi16-2 X90CrMoV18 X2CrTi12	1.4057 1.4112 1.4512	**10**	**10**	**10**	**10**
	M3	Duplex and Super Duplex	≤1300 N/mm²	X2CrNiMoN22-5-3 X2CrNiMoN25-7-4 X2CrNiMoCuWN25-7-4	1.4462 1.4410 1.4501	6	6	6	6
K	K1	Cast Iron	300 HB	EN-GJL-150 EN-GJL-250 EN-GJL-300	0.6015 0.6025 0.6030				
	K2	Spheroidal graphite iron and malleable cast iron	350 HB	EN-GJS-400-15 EN-GJS-600-3 EN-GJS-700-2	0.7040 0.7060 0.7070	**30**	**30**	**30**	**30**
	K3	ADI GGV	1000 N/mm² 350 HB	EN-GJS1000-5 EN-GJV250 EN-GJV400		**25**	**25**	**25**	**25**
N	N1	Aluminium and wrought alloys	≤450 N/mm²	Al99,5H AlMgSi1 AlZn4,5Mg	3.0250 32315 3.4335	15	15	15	15
	N2	Al cast alloys	≤600 N/mm²	GD-AlSi5Cu1Mg GD-AlSi8Cu3 G-AlSi9Mg G-AlSi12	3.2134 3.2162 3.2373 3.2581	**30**	**30**	**30**	**30**
	N3	Magnesium alloys	≤500 N/mm²	GDMgAl8Zn1	3.5812.08				
	N4	Copper and copper alloys	long-chipping	CuZn20 CuZn37Pb0,5	2.0250 2.0332	**30**	**30**	**30**	**30**
			short-chipping	CuZn39Pb2 CuZn43Pb2	2.0380 2.0410				
	N5	Copper special alloys	≤1400 N/mm²	Ampco					
	N6	Plastics [Thermoplastics, Duroplastics]	long-chipping short-chipping	PMMA, POM,PVC Pertinax					
S	S1	Titanium and Titanium alloys	≤ 1200 N/mm²	Titan TiAl5Sn2 TiAl6V4	3.702<5 3.7115 3.7165	**8**	**8**	**8**	**8**
	S2	Nickel, cobalt, iron alloys	≤ 1400 N/mm²	Hastelloy C4 Inconel 718 Nimonic 105	2.4610 2.4668 2.4634	**8**	**8**	**8**	**8**
H	H1	High tensile/ hardened steels	45 - 55 HRC						
	H2		55 - 62 HRC						

Fluteless machine taps for ISO metric threads

P	●
M	●
K	●
N	○
S	●
H	

Tool material	HSS-E-PM		
Tolerance on Ø	4HX/6HX	6GX	6HX
Surface	C	C	C
Type	N	N	N
Form	C	C	E
Internal cooling	⊠	⊠	⊠

~ DIN 371



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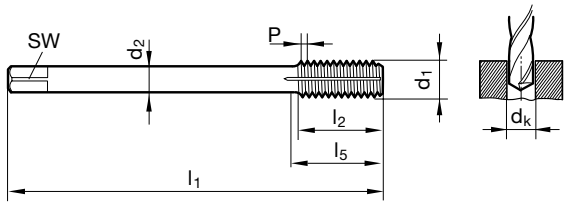


DIN 2174 ~DIN 371/~DIN 376

Article no.	4487	4488	4494
Discount group	208	208	208

d1	P	d2	SW	dk	l1	l2	l5	Code no.	Availability		
	mm	mm	mm	mm	mm	mm	mm				
M1	0.250	2.500	2.100	0.90	40.000	4.000		1.000	●		
M1,2	0.250	2.500	2.100	1.10	40.000	4.800		1.200	●		
M1,4	0.300	2.500	2.100	1.25	40.000	5.600		1.400	●		
M1,6	0.350	2.500	2.100	1.45	40.000	6.400		1.600	●		
M1,7	0.350	2.500	2.100	1.55	40.000	6.800		1.700	●		
M1,8	0.350	2.500	2.100	1.65	40.000	7.300		1.800	●		
M2	0.400	2.800	2.100	1.85	45.000	8.000	13.500	2.000	●	●	●
M2,5	0.450	2.800	2.100	2.30	50.000	9.000	14.500	2.500	●	●	●
M3	0.500	3.500	2.700	2.80	56.000	10.000	18.000	3.000	●	●	●
M4	0.700	4.500	3.400	3.70	63.000	12.000	21.000	4.000	●	●	●
M5	0.800	6.000	4.900	4.65	70.000	14.000	25.000	5.000	●	●	●
M6	1.000	6.000	4.900	5.55	80.000	16.000	30.000	6.000	●	●	●
M8	1.250	8.000	6.200	7.40	90.000	17.000	35.000	8.000	●	●	●
M10	1.500	10.000	8.000	9.30	100.000	20.000	39.000	10.000	●	●	●
M12	1.750	9.000	7.000	11.20	110.000	24.000	49.000	12.000	●	●	●
M14	2.000	11.000	9.000	13.10	110.000	26.000	53.000	14.000	●	●	●
M16	2.000	12.000	9.000	15.10	110.000	26.000	54.000	16.000	●	●	●
M20	2.500	16.000	12.000	18.90	140.000	32.000	62.000	20.000	●	●	●

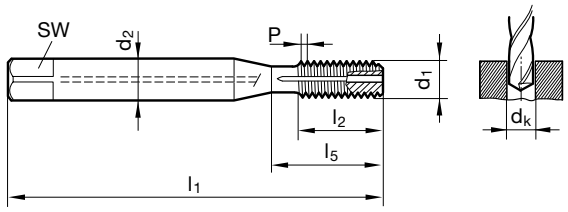
Article no. 4487 from Ø M2 with oil grooves, Ø tolerance ≤ M1.4 = 4HX

Oil feed fluteless taps f. ISO metric threads

P	●
M	●
K	●
N	○
S	●
H	

Tool material	**HSS-E-PM**
Tolerance on Ø	6HX
Surface	C
Type	N
Form	E
Internal cooling	

~ DIN 371



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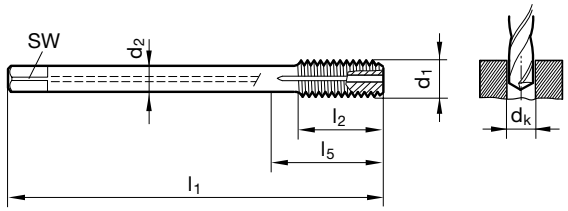


DIN 2174 ~DIN 371/~DIN 376 — Article no. **4483**

Discount group **208**

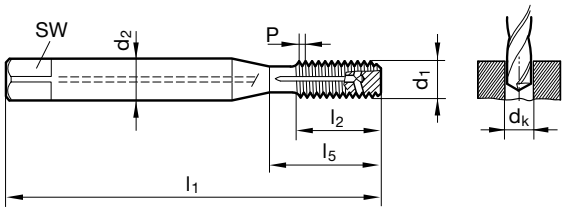
d1	P	d2	SW	dk	l1	l2	l5	Code no.	Availability
	mm	mm	mm	mm	mm	mm	mm		
M5	0.800	6.000	4.900	4.65	70.000	8.500	25.000	5.000	●
M6	1.000	6.000	4.900	5.55	80.000	11.000	30.000	6.000	●
M8	1.250	8.000	6.200	7.40	90.000	14.000	35.000	8.000	●
M10	1.500	10.000	8.000	9.30	100.000	16.000	39.000	10.000	●
M12	1.750	9.000	7.000	11.20	110.000	18.500	49.000	12.000	●
M14	2.000	11.000	9.000	13.10	110.000	20.000	53.000	14.000	●
M16	2.000	12.000	9.000	15.10	110.000	20.000	54.000	16.000	●
M20	2.500	16.000	12.000	18.90	140.000	25.000	62.000	20.000	●

Oil feed fluteless taps f. ISO metric threads

Tool material	HSS-E-PM
Tolerance on Ø	6HX
Surface	C
Type	N
Form	C
Internal cooling	

P	●
M	●
K	●
N	○
S	●
H	

~ DIN 371



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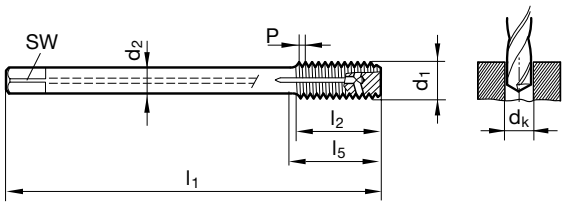


DIN 2174 ~DIN 371/~DIN 376 Article no. **4485**

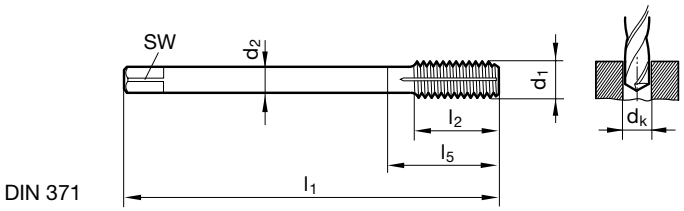
Discount group **208**

d1	P	d2	SW	dk	l1	l2	l5	Code no.	Availability
	mm	mm	mm	mm	mm	mm	mm		
M5	0.800	6.000	4.900	4.65	70.000	8.500	25.000	5.000	●
M6	1.000	6.000	4.900	5.55	80.000	11.000	30.000	6.000	●
M8	1.250	8.000	6.200	7.40	90.000	14.000	35.000	8.000	●
M10	1.500	10.000	8.000	9.30	100.000	16.000	39.000	10.000	●
M12	1.750	9.000	7.000	11.20	110.000	18.500	49.000	12.000	●
M14	2.000	11.000	9.000	13.10	110.000	20.000	53.000	14.000	●
M16	2.000	12.000	9.000	15.10	110.000	20.000	54.000	16.000	●
M20	2.500	16.000	12.000	18.90	140.000	25.000	62.000	20.000	●

Fluteless machine taps for ISO metric fine threads

P	●
M	●
K	●
N	○
S	●
H	

Tool material	HSS-E-PM		
Tolerance on Ø	6HX	6GX	6HX
Surface	C	C	C
Type	N	N	N
Form	C	C	E
Internal cooling	✕	✕	✕



DIN 371

DIN 2174 ~DIN 374

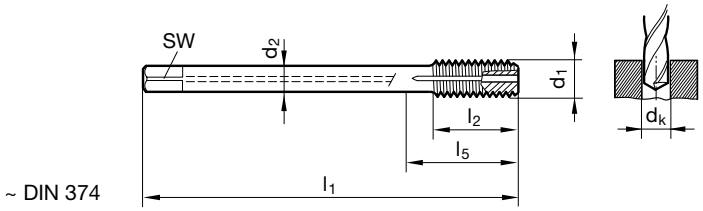
Article no.	4489	4490	4495
Discount group	208	208	208

d1	d2	SW	dk	l1	l2	l5	Code no.	Availability		
	mm	mm	mm	mm	mm	mm				
M8 x 1	6.000	4.900	7.55	90.000	16.000	35.000	8.005	●	●	●
M10 x 1	7.000	5.500	9.55	90.000	16.000	35.000	10.005	●	●	●
M10 x 1,25	7.000	5.500	9.40	100.000	20.000	39.000	10.006	●	●	●
M12 x 1,25	9.000	7.000	11.40	100.000	20.000	40.000	12.006	●	●	●
M12 x 1,5	9.000	7.000	11.30	100.000	20.000	40.000	12.007	●	●	●
M14 x 1,25	11.000	9.000	13.40	100.000	20.000	40.000	14.006	●	●	●
M14 x 1,5	11.000	9.000	13.30	100.000	20.000	40.000	14.007	●	●	●
M16 x 1,5	12.000	9.000	15.30	100.000	22.000	44.000	16.007	●	●	●
M20 x 1,5	16.000	12.000	19.30	125.000	25.000	44.000	20.007	●	●	●

Oil feed fluteless taps f. ISO metric fine threads

P	●
M	●
K	●
N	○
S	●
H	

Tool material	**HSS-E-PM**
Tolerance on Ø	6HX
Surface	C
Type	N
Form	E
Internal cooling	



~ DIN 374

DIN 2174 ~DIN 374 — Article no. **4484**

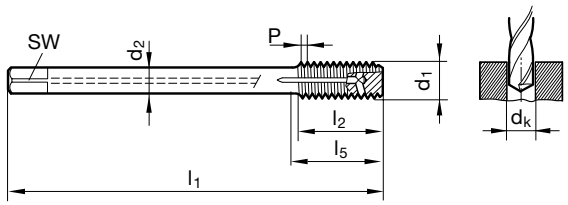
Discount group **208**

d1	d2	SW	dk	l1	l2	l5	Code no.	Availability
	mm	mm	mm	mm	mm	mm		
M8 x 1	6.000	4.900	7.55	90.000	11.000	35.000	8.005	●
M10 x 1	7.000	5.500	9.55	90.000	11.000	35.000	10.005	●
M10 x 1,25	7.000	5.500	9.40	100.000	14.000	39.000	10.006	●
M12 x 1,25	9.000	7.000	11.40	100.000	16.000	40.000	12.006	●
M12 x 1,5	9.000	7.000	11.30	100.000	16.000	40.000	12.007	●
M14 x 1,25	11.000	9.000	13.40	100.000	15.000	40.000	14.006	●
M14 x 1,5	11.000	9.000	13.30	100.000	15.000	40.000	14.007	●
M16 x 1,5	12.000	9.000	15.30	100.000	15.000	44.000	16.007	●
M20 x 1,5	16.000	12.000	19.30	125.000	16.000	44.000	20.007	●

Oil feed fluteless taps f. ISO metric fine threads

Tool material	HSS-E-PM
Tolerance on Ø	6HX
Surface	C
Type	N
Form	C
Internal cooling	

P	●
M	●
K	●
N	○
S	●
H	



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DIN 2174 ~DIN 374 — Article no. **4486**

Discount group **208**

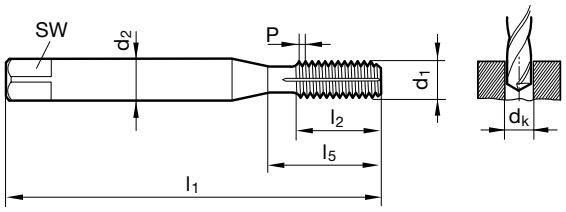
d1	d2	SW	dk	l1	l2	l5	Code no.	Availability
	mm	mm	mm	mm	mm	mm		
M8 x 1	6.000	4.900	7.55	90.000	11.000	35.000	8.005	●
M10 x 1	7.000	5.500	9.55	90.000	11.000	35.000	10.005	●
M10 x 1,25	7.000	5.500	9.40	100.000	14.000	39.000	10.006	●
M12 x 1,25	9.000	7.000	11.40	100.000	16.000	40.000	12.006	●
M12 x 1,5	9.000	7.000	11.30	100.000	16.000	40.000	12.007	●
M14 x 1,25	11.000	9.000	13.40	100.000	15.000	40.000	14.006	●
M14 x 1,5	11.000	9.000	13.30	100.000	15.000	40.000	14.007	●
M16 x 1,5	12.000	9.000	15.30	100.000	15.000	44.000	16.007	●
M20 x 1,5	16.000	12.000	19.30	125.000	16.000	44.000	20.007	●

Fluteless machine taps for UNC-threads

P	●
M	●
K	●
N	○
S	●
H	

Tool material	HSS-E-PM
Tolerance on Ø	2BX
Surface	C
Type	N
Form	C
Internal cooling	

~ DIN 371



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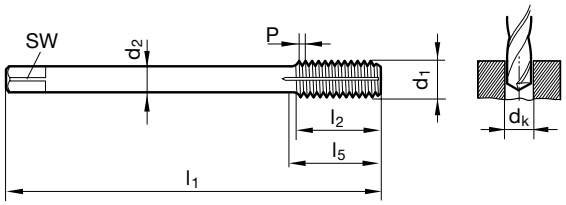


DIN 2184-1 ~DIN 371/~DIN 376 — Article no. **4491**

Discount group **208**

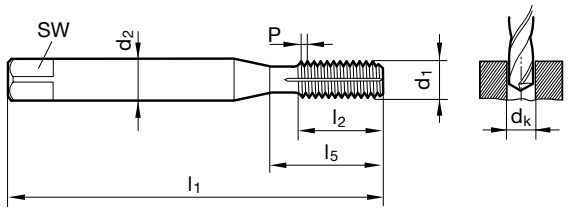
d1	d2	SW	dk	l1	l2	l5	Code no.	Availability
	mm	mm	mm	mm	mm	mm		
4 - 40	3.500	2.700	2.55	56.000	11.000	18.000	2.845	●
6 - 32	4.000	3.000	3.15	56.000	12.000	20.000	3.505	●
8 - 32	4.500	3.400	3.80	63.000	12.000	21.000	4.166	●
10 - 24	6.000	4.900	4.35	70.000	14.000	25.000	4.826	●
12 - 24	6.000	4.900	5.00	80.000	16.000	30.000	5.486	●
1/4 - 20	7.000	5.500	5.75	80.000	16.000	30.000	6.350	●
5/16 - 18	8.000	6.200	7.30	90.000	18.000	35.000	7.938	●
3/8 - 16	10.000	8.000	8.80	90.000	20.000	35.000	9.525	●
7/16 - 14	8.000	6.200	10.30	100.000	22.000	42.000	11.113	●
1/2 - 13	9.000	7.000	11.80	100.000	25.000	40.000	12.700	●
9/16 - 12	11.000	9.000	13.30	100.000	28.000	40.000	14.288	●
5/8 - 11	12.000	9.000	14.80	100.000	30.000	44.000	15.875	●
3/4 - 10	14.000	11.000	17.90	110.000	33.000	44.000	19.050	●

Fluteless machine taps for UNF-threads

P	●
M	●
K	●
N	○
S	●
H	

Tool material	HSS-E-PM
Tolerance on Ø	2BX
Surface	C
Type	N
Form	C
Internal cooling	

~ DIN 371



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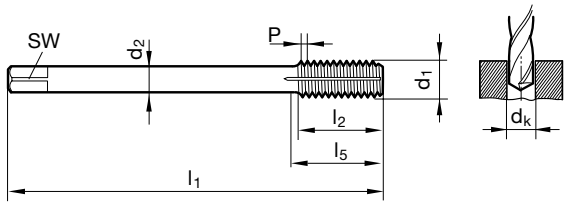


DIN 2184-1 ~DIN 371/~DIN 374 — Article no. **4492**

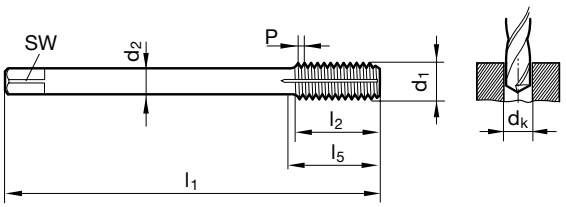
Discount group **208**

d1	d2	SW	dk	l1	l2	l5	Code no.	Availability
	mm	mm	mm	mm	mm	mm		
4 - 48	3.500	2.700	2.60	56.000	10.000	18.000	2.845	●
6 - 40	4.000	3.000	3.20	56.000	11.000	20.000	3.505	●
8 - 36	4.500	3.400	3.85	63.000	12.000	21.000	4.166	●
10 - 32	6.000	4.900	4.45	70.000	14.000	25.000	4.826	●
12 - 28	6.000	4.900	5.10	80.000	16.000	30.000	5.486	●
1/4 - 28	7.000	5.500	5.95	80.000	16.000	30.000	6.350	●
5/16 - 24	8.000	6.200	7.45	90.000	18.000	35.000	7.938	●
3/8 - 24	10.000	8.000	9.05	100.000	18.000	39.000	9.525	●
7/16 - 20	8.000	6.200	10.55	100.000	22.000	42.000	11.113	●
1/2 - 20	9.000	7.000	12.10	100.000	20.000	40.000	12.700	●
9/16 - 18	11.000	9.000	13.65	100.000	22.000	40.000	14.288	●
5/8 - 18	12.000	9.000	15.25	100.000	22.000	44.000	15.875	●
3/4 - 16	14.000	11.000	18.35	110.000	25.000	44.000	19.050	●

Fluteless machine taps for BSP-threads

P	●
M	●
K	●
N	○
S	●
H	

Tool material	HSS-E-PM
Tolerance on Ø	
Surface	C
Type	N
Form	C
Internal cooling	



DIN 2184-1 DIN 2189 — Article no. **4493**

Discount group **208**

d1	P	d2	SW	dk	l1	l2	l5	Code no.	Availability
	G/inch	mm	mm	mm	mm	mm	mm		
G1/8	28.000	7.000	5.500	9.30	90.000	18.000	35.000	9.728	●
G1/4	19.000	11.000	9.000	12.50	100.000	20.000	40.000	13.157	●
G3/8	19.000	12.000	9.000	16.00	100.000	22.000	44.000	16.662	●
G1/2	14.000	16.000	12.000	20.00	125.000	25.000	44.000	20.955	●

Recommended tapping size holes for thread forming

Std. ISO metric threads DIN 13

nom. Ø	pitch	tapp. size hole Ø	tapp. size hole Ø		core Ø of int. thread 7H*	
mm		mm	min. mm	max. mm	min. mm	max. mm
M1	0.25	**0.90**	0.89	0.92	0.729	0.819
M1.2	0.25	**1.10**	1.09	1.12	0.929	1.019
M1.4	0.30	**1.28**	1.27	1.30	1.075	1.181
M1.6	0.35	**1.46**	1.45	1.48	1.221	1.346
M1.7	0.35	**1.56**	1.55	1.58	1.321	1.446
M1.8	0.35	**1.66**	1.65	1.68	1.421	1.546
M 2	0.40	**1.85**	1.84	1.88	1.567	1.679
M 2.2	0.45	**2.00**	2.01	2.05	1.713	1.838
M 2.5	0.45	**2.30**	2.28	2.32	2.013	2.138
M 3	0.50	**2.80**	2.78	2.85	2.459	2.639
M 3.5	0.60	**3.25**	3.23	3.30	2.850	3.050
M 4	0.70	**3.70**	3.68	3.76	3.242	3.466
M 4.5	0.75	**4.20**				
M 5	0.80	**4.65**	4.62	4.71	4.134	4.384
M 6	1.00	**5.55**	5.52	5.62	4.917	5.217
M 7	1.00	**6.55**	6.52	6.62	5.917	6.217
M 8	1.25	**7.40**	7.36	7.47	6.647	6.982
M 9	1.25	**8.40**	8.36	8.47	7.647	7.982
M 10	1.50	**9.30**	9.26	9.38	8.376	8.751
M 11	1.50	**10.30**	10.26	10.38	9.376	9.751
M 12	1.75	**11.20**	11.15	11.29	10.106	10.531
M 14	2.00	**13.10**	13.05	13.20	11.835	12.310
M 16	2.00	**15.10**	15.05	15.20	13.835	14.310
M 18	2.50	**16.90**	16.83	17.02	15.294	15.854
M 20	2.50	**18.90**	18.83	19.02	17.294	17.854
M 22	2.50	**20.90**	20.83	21.02	19.294	19.854
M 24	3.00	**22.70**	22.62	22.80	20.752	21.382
M 27	3.00	**25.70**	25.62	25.80	23.752	24.382
M 30	3.50	**28.50**	28.40	28.60	26.211	26.921
M 33	3.50	**31.50**	31.40	31.60	29.211	29.921
M 36	4.00	**34.30**	34.17	34.40	31.670	32.420
M 39	4.00	**37.30**	37.17	37.40	34.670	35.420
M 42	4.50	**40.10**	39.95	40.20	37.129	37.979

* M 2 up to M 2.5 tapping size hole of int. thread 6H

ISO metric fine threads DIN 13

nom. x pitch Ø	tapp. size hole Ø	tapp. size hole Ø		core Ø of int. thread 7H*	
mm	mm	min. mm	max. mm	min. mm	max. mm
M 2.5 x 0.35	**2.35**	2.35	2.38	2.121	2.221
M 3 x 0.35	**2.85**	2.85	2.88	2.621	2.721
M 4 x 0.35	**3.85**	3.85	3.88	3.621	3.721
M 4 x 0.50	**3.80**	3.78	3.83	3.459	3.639
M 5 x 0.50	**4.80**	4.78	4.83	4.459	4.639
M 5.5 x 0.50	**5.30**	5.28	5.33	4.959	5.139
M 6 x 0.75	**5.65**	5.62	5.70	5.188	5.424
M 7 x 0.75	**6.65**	6.62	6.70	6.188	6.424
M 8 x 0.75	**7.65**	7.62	7.70	7.188	7.424
M 8 x 1.00	**7.55**	7.52	7.62	6.917	7.217
M 9 x 0.75	**8.65**	8.62	8.70	8.188	8.424
M 9 x 1.00	**8.55**	8.52	8.62	7.917	8.217
M 10 x 0.75	**9.65**	9.62	9.70	9.188	9.424
M 10 x 1.00	**9.55**	9.52	9.62	8.917	9.217
M 10 x 1.25	**9.40**	9.36	9.47	8.647	8.982
M 11 x 0.75	**10.65**	10.62	10.70	10.188	10.424
M 11 x 1.00	**10.55**	10.52	10.62	9.917	10.217
M 12 x 1.00	**11.55**	11.52	11.62	10.917	11.217
M 12 x 1.25	**11.40**	11.36	11.47	10.647	10.982
M 12 x 1.50	**11.30**	11.26	11.38	10.376	10.751
M 14 x 1.00	**13.55**	13.52	13.62	12.917	13.217
M 14 x 1.25	**13.40**	13.36	13.47	12.647	12.982
M 14 x 1.50	**13.30**	13.26	13.38	12.376	12.751
M 15 x 1.00	**14.55**	14.52	14.62	13.917	14.217
M 15 x 1.50	**14.30**	14.26	14.38	13.376	13.751
M 16 x 1.00	**15.55**	15.52	15.62	14.917	15.217
M 16 x 1.50	**15.30**	15.26	15.38	14.376	14.751
M 17 x 1.00	**16.55**	16.52	16.62	15.917	16.217

* M 2.5 x 0.35 up to M 4 x 0.35 tapping size hole of int. thread 6H

nom. x pitch Ø	tapp. size hole Ø	tapp. size hole Ø		core Ø of int. thread 7H*	
mm	mm	min. mm	max. mm	min. mm	max. mm
M 17 x 1.50	**16.30**	16.26	16.38	15.376	15.751
M 18 x 1.00	**17.55**	17.52	17.62	16.917	17.217
M 18 x 1.50	**17.30**	17.26	17.38	16.376	16.751
M 18 x 2.00	**17.10**	17.05	17.20	15.835	16.310
M 20 x 1.00	**19.55**	19.52	19.62	18.917	19.217
M 20 x 1.50	**19.30**	19.26	19.38	18.376	19.751
M 24 x 1.00	**23.55**	23.52	23.62	22.917	23.217
M 24 x 1.50	**23.30**	23.26	23.38	22.376	22.751
M 24 x 2.00	**23.10**	23.05	23.20	21.835	22.310
M 27 x 1.50	**26.30**	26.26	26.38	25.376	25.751
M 30 x 1.50	**29.30**	29.26	29.38	28.376	28.751
M 33 x 1.50	**32.30**	32.26	32.38	31.376	31.751
M 36 x 1.50	**35.30**	35.26	35.38	34.376	34.751
M 39 x 1.50	**38.30**	38.26	38.38	37.376	37.751
M 42 x 1.50	**41.30**	41.26	41.38	42.376	42.751

Tapping size hole diameter tolerance zone for thread forming (to DIN 13. section 50)
Due to the tensile strength it is not necessary to adhere to the tapping size hole diameter tolerance class 6H; tolerance class 7H satisfies the requirement that the flank coverage of external and internal threads should not fall below 0.32 x P. In addition. formed threads generally possess a higher tensile strength in comparison to cut threads thanks to an uninterrupted grain flow and subsequent work hardening.

UNC-threads ASME B1.1

nom. Ø	pitch	tapp. size hole Ø	tapp. size hole Ø		core Ø of int. thread 2B	
	per inch	mm	min. mm	max. mm	min. mm	max. mm
Nr. 1	- 64	**1.68**	1.67	1.70	1.425	1.580
Nr. 2	- 56	**1.98**	1.97	2.01	1.694	1.872
Nr. 3	- 48	**2.28**	2.27	2.32	1.941	2.146
Nr. 4	- 40	**2.55**	2.54	2.59	2.157	2.385
Nr. 5	- 40	**2.90**	2.89	2.94	2.487	2.698
Nr. 6	- 32	**3.15**	3.14	3.19	2.642	2.896
Nr. 8	- 32	**3.80**	3.78	3.82	3.302	3.531
Nr. 10	- 24	**4.35**	4.33	4.39	3.683	3.937
Nr. 12	- 24	**5.00**	4.97	5.03	4.343	4.597
1/4	- 20	**5.75**	5.72	5.80	4.978	5.258
5/16	- 18	**7.30**	7.26	7.37	6.401	6.731
3/8	- 16	**8.80**	8.77	8.88	7.798	8.153
7/16	- 14	**10.30**	10.27	10.37	9.144	9.550
1/2	- 13	**11.80**	11.77	11.88	10.592	11.024
9/16	- 12	**13.30**	13.28	13.39	11.989	12.446
5/8	- 11	**14.80**	14.78	14.90	13.386	13.868
3/4	- 10	**17.90**	17.85	17.97	16.307	16.840
7/8	- 9	**21.00**	20.95	21.10	19.177	19.761
1	- 8	**24.00**	23.95	24.12	21.971	22.606

UNF-threads ASME B1.1

nom. Ø	pitch	tapp. size hole Ø	tapp. size hole Ø		core Ø of int. thread 2B	
	per inch	mm	min. mm	max. mm	min. mm	max. mm
Nr. 1	- 72	**1.70**	1.69	1.72	1.473	1.610
Nr. 2	- 64	**2.00**	1.99	2.03	1.755	1.910
Nr. 3	- 56	**2.30**	2.29	2.34	2.024	2.197
Nr. 4	- 48	**2.60**	2.59	2.63	2.271	2.459
Nr. 5	- 44	**2.90**	2.89	2.93	2.550	2.741
Nr. 6	- 40	**3.20**	3.19	3.24	2.819	3.023
Nr. 8	- 36	**3.85**	3.83	3.88	3.404	3.607
Nr. 10	- 32	**4.45**	3.43	4.49	3.962	4.166
Nr. 12	- 28	**5.10**	5.07	5.13	4.496	4.724
1/4	- 28	**5.95**	5.92	5.99	5.359	5.588
5/16	- 24	**7.45**	7.42	7.50	6.782	7.036
3/8	- 24	**9.05**	9.02	9.10	8.838	8.636
7/16	- 20	**10.55**	10.48	10.58	9.728	10.033
1/2	- 20	**12.10**	12.08	12.18	11.328	11.608
9/16	- 18	**13.65**	13.61	13.72	12.751	13.081
5/8	- 18	**15.25**	15.21	15.32	14.351	14.681
3/4	- 16	**18.35**	15.30	18.41	17.323	17.678
7/8	- 14	**21.40**	21.35	21.49	20.269	20.650
1	- 12	**24.45**	24.40	24.54	23.114	23.571

(Whitworth-) pipe thread G DIN EN ISO 228-1

nom. Ø	pitch	tapp. size hole Ø	tapp. size hole Ø		core Ø of int. thread	
inch	per inch	mm	min. mm	max. mm	min. mm	max. mm
G 1/16	28	**7.30**	7.28	7.35	6.561	6.843
G 1/8	28	**9.30**	9.28	9.35	8.566	8.848
G 1/4	19	**12.50**	12.48	12.55	11.445	11.890
G 3/8	19	**16.00**	15.98	16.05	14.950	15.395
G 1/2	14	**20.00**	19.98	20.12	18.631	19.172
G 5/8	14	**22.00**	21.98	22.12	20.587	21.128
G 3/4	14	**25.50**	25.48	25.62	24.117	24.658
G 7/8	14	**29.25**	29.23	29.37	27.877	28.418
G 1	11	**32.00**	31.98	32.15	30.291	30.931
G 1 1/4	11	**40.75**	40.70	40.85	38.952	39.592

Thread production by pressure deformation

Fluteless taps are used for the forming of internal threads without chip removal. In contrast to conventional tapping where material is cut from the workpiece, thread forming is a pressure deformation process without chip removal for the production of internal threads. During the process the material is cold formed without interrupting the grain flow.

According to DIN 8583, thread forming is described as “pressing the thread into the workpiece with a tool possessing a spiral working area”. The spiral threaded, polygonal portion of the fluteless tap is “screwed” into the pre-drilled workpiece with an appropriate constant feed rate equal to the thread pitch. Hereby the thread profile is pressed gradually via the forming lead into the material of the workpiece so to speak. Subsequently, the pressure in the deformation zone exceeds the compression limit, the workpiece becomes ductile and is deformed. The material yields radially, “flows” along the thread profile in the unoccupied base of the tool and forms the minor diameter of the nut thread. The flow process creates the process specific form pockets (claws).

The tapping size hole diameter is heavily dependent on the formability of the material, the workpiece geometry and the required effective depth of the thread. In comparison to conventional tapping, a larger diameter tapping size hole should be selected. With a larger diameter tapping size hole the load on the tool is reduced whilst increasing the tool life. Thanks to the uninterrupted grain flow, the loading capacity of the thread remains sufficient with a 50% effective thread depth.

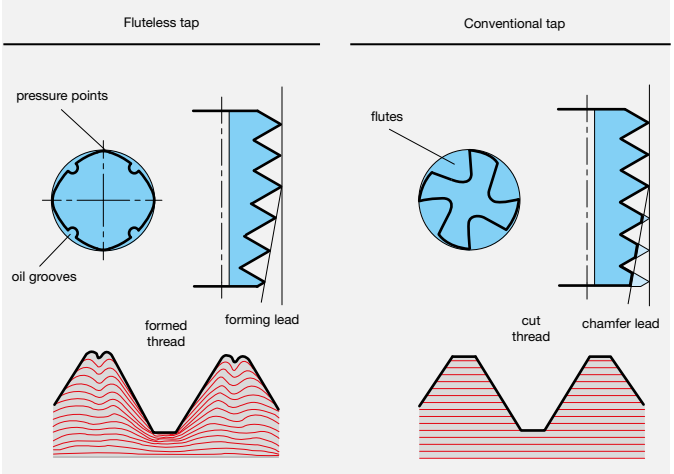
The partially formed crests of the thread with decreasing effective thread depth are a typical characteristic of threads produced by the thread forming process. With the flanks of the thread fully formed, they have no influence on the tensile strength of the thread. If necessary, the required deformation level of the thread should be determinded by performing a test.

Lubrication is of significant importance. The lubrication prevents material from building up on the thread flanks and ensures that the necessary torque for the forming process is not too high. Therefore, under no circumstances should there ever be a break-down in lubrication! Preference should be given to lubricants such as cooling agents of oils containing graphite such as those used in rolling processes. Always follow the rule: “The better the lubrication the easier the thread forming process!”

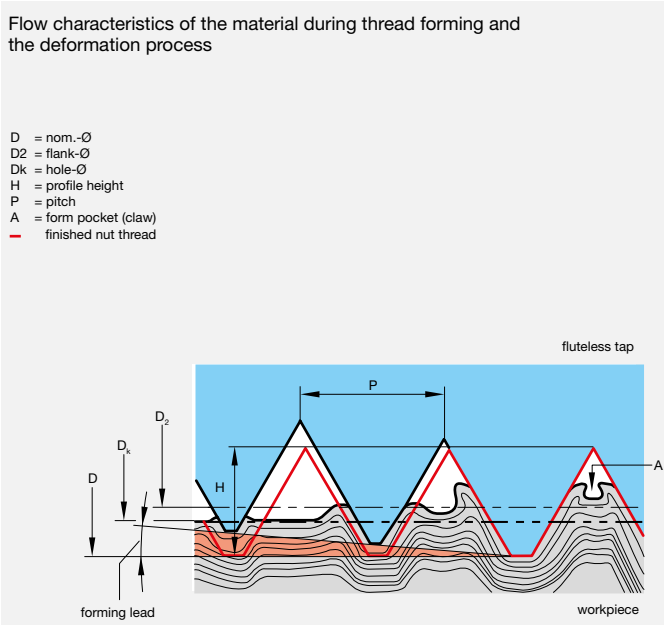
It offers the following advantages:

- no chip formation.
- one tool for the production of threads in through and blind holes.
- application in wide range of materials.
- no cutting errors.
- pitch and angle of thread errors that can occur with thread cutting are eliminated.
- internal threads produced by thread forming possess a higher tensile strength particularly at the thread flanks thanks to the so-called “uninterrupted grain flow” and the cold forming process.
- the surface of the thread is improved.
- fluteless taps can be applied at higher speeds because the formability of many materials increases with the forming speed. This does not have a negative effect on the tool life.
- reduced danger of breakage through rigid design

Process
The production of internal threads without chip removal (thread forming) in comparison to conventional tapping



Flow characteristics of the material during thread forming and the deformation process



“Profile“- Guhring’s new fluteless tap generation Characteristics and advantages

Conventional fluteless taps, produced by a grinding process only, show traces of microscopic, very fine grinding marks on the surface of the tool. This also applies to the threaded portion of the tool required to perform the thread forming operation.

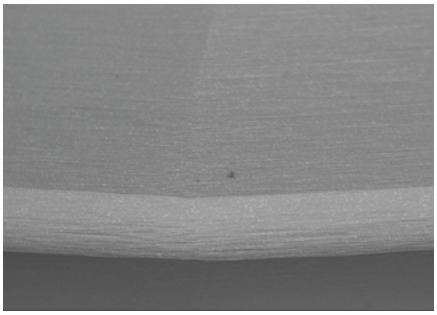
This surface topography (structure) has a negative effect on the friction between the tool and the material to be re-formed as well as on the herewith associated heat development, on the necessary torque and last but not least on the wear of the pressure points of the fluteless tap. In addition, the “grinding marks” encourage the build-up of the material to be re-formed in the thread flanks of the fluteless tap. This is also called cold welding.

Thanks to a special process to improve the surface topography (structure), Guhring’s new Profile fluteless taps no longer possess these “grinding marks”. This has been confirmed in research and tool life studies in varying materials under production conditions.

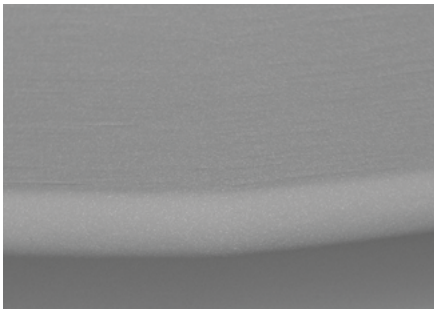
For the user, a longer tool life and increased cutting speeds are the benefits of this special process. The tool life can be increased considerably depending on the material to be machined and the application condi-tions. A 100% increase in tool life is not unusual.

The improved surface topography is not only of benefit to tools with bright finish. Particularly coated tools also benefit from the new process. Outer contour and forming lead greatly determine the performance of the fluteless tap. Numerous tests have shown that fluteless taps with optimal pressure point geometry and quantity achieve increased tool life and dimensional accuracy.

Further improvements in quality are achieved when the fluteless tap is produced completely in one setting and with one grinding wheel - set-up with a special roll. Pitch errors between the thread crests and former lead transition area do not occur as with the conventional grinding process.

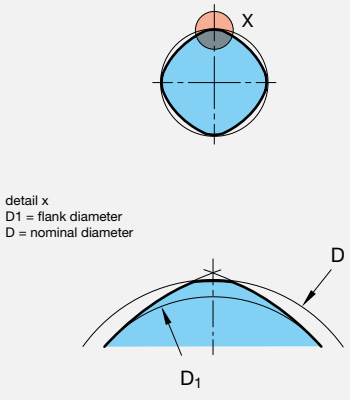


Surface of a conventional fluteless tap

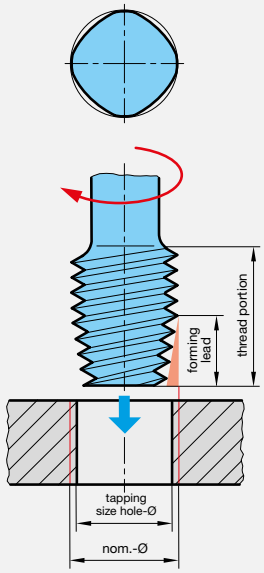


Optimised surface of a Guhring Profile fluteless tap

Cross section of fluteless tap



The principle



Types of tapping size hole

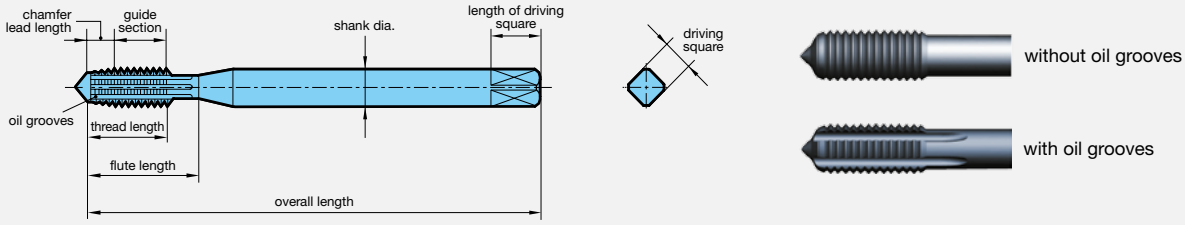
with fluteless taps without oil grooves for thread depth ≤ 1 x D

for thread depth ≥ 1 x D

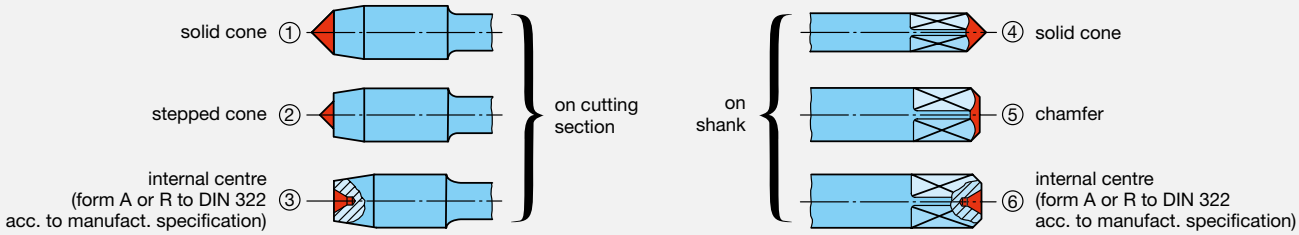
with fluteless taps with oil grooves for all thread depths

Definitions, angles, centres, thread tolerances and fits

Thread portion



Types of centres (standard, to DIN 2197/DIN 2175)



Thread dia. range mm	Centre on cutting section		Centre on shank
	with chamfer forms A, C, D, E	with chamfer form B	
≤ 5.6	①	①	④⑤⑥
> 5.6 ... 12.8	①②③	①②③	④⑤⑥
> 12.8	③	③	⑥

Thread tolerances and fits

Fits between internal and external threads are separated by a diagonal stroke, as for example 6H/6g (internal/external thread). The fit has to be selected in conjunction with the appropriate thread connection.
The tolerance zones of the tolerance classes fine, medium and coarse are allocated to three screw-in lengths short S), normal (N) and long (L). Generally, the following rules apply for selecting a tolerance class:

Fine tolerance zone (S):
For precision threads, when only a small variation in the fit is permitted.

Medium tolerance zone (N):
General application

Coarse tolerance zone (L):
There are no special precision requirements and in cases where production difficulties may occur, e.g. thread production in hot-rolled rods, deep blind holes or plastic components.

Screw-in lengths
The quality of thread connection is also affected by the screwin length. The ISO tolerance system was, especially as regards the pitch diameter, divided into three groups, i.e.

S (Short) = short screw-in length
N (Normal) = normal screw-in length
L (Long) = long screw-in length

The following fit should be selected for normal screw-in length N: To ensure a tighter fit of thread connections, we recommend for short screw-in lengths a narrower fit.

Tapping size hole diameter

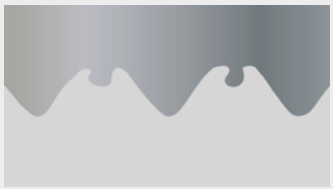
With fluteless tapping, the tapping size hole diameter influences the distinction of the formed thread. A too small tapping size hole diameter results in an over-forming of the thread which must definitely be prevented because this can lead to tool breakage. A too large tapping size hole is acceptable with certain tolerances because formed threads have a sufficient loading capacity from a 50% bearing depth.

The thread M18x1.5 mm example clearly shows the influence of the tapping size hole diameter selection:

M 18 x 1.00	**17.55**	**17.52**	**17.62**	**16.917**	**17.217**
M 18 x 1.50	**17.30**	**17.26**	**17.38**	**16.376**	**16.751**
M 18 x 2.00	**17.10**	**17.05**	**17.20**	**15.835**	**16.310**

Pre-drilling Ø 17.1 mm

Pre-drilling Ø 17.3 mm

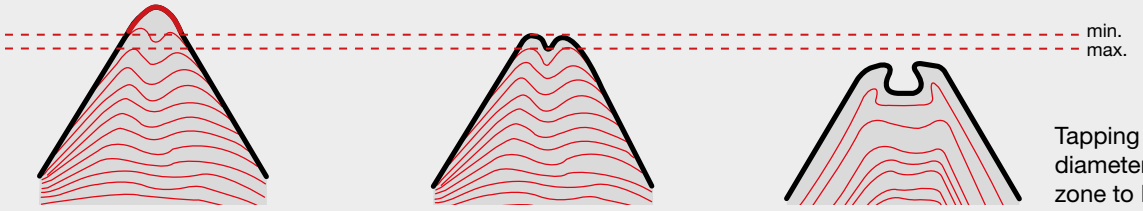


Pre-drilling Ø 17.4 mm

Tapping size hole diameter is too small:
- thread over-formed
- no form pocket (claw)
- profile too high

Optimal tapping size hole diameter:
- thread fully formed
- small form pocket (claw)
- optimal height of profile

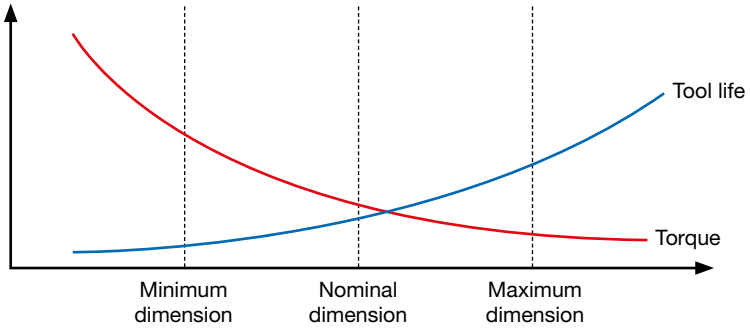
Tapping size hole diameter is too large:
- thread not formed
- large form pocket (claw)
- height of profile too low



Tapping size hole diameter tolerance zone to DIN 13, part 50

Influence of the tapping size hole on tool life, torque and process reliability

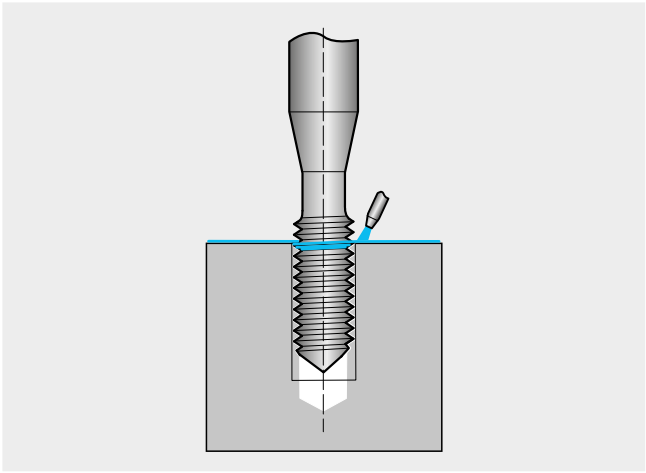
The optimisation of the pre-drilling diameter is especially worthwhile in mass production.
The larger it is, the longer the tool life and the less the required torque is. The graphic clearly shows the relationship.



Lubrication for thread forming

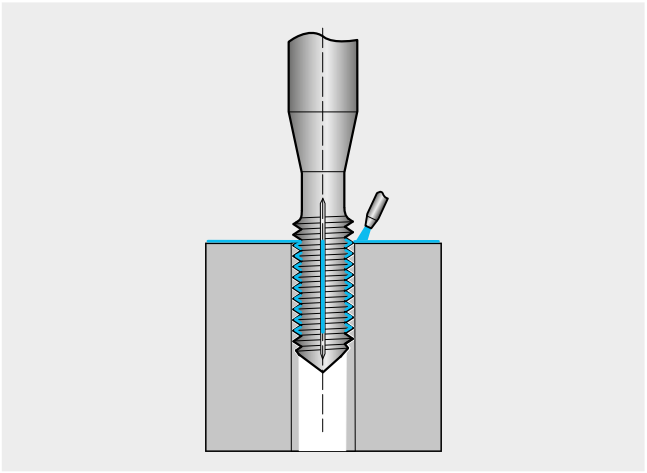
For tool design four different cases should be differentiated between.

Vertical machining of a blind hole



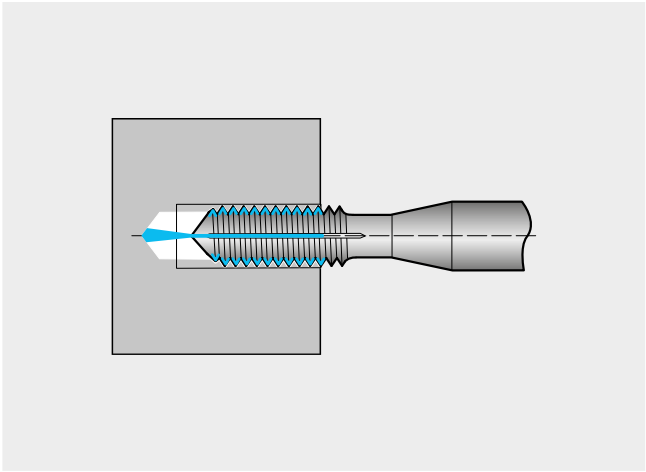
Lubrication grooves and internal coolant delivery is not necessary; external coolant delivery is sufficient
(Axial coolant is recommended for very deep threads).

Vertical machining of a through hole (> 1.5xD_N)



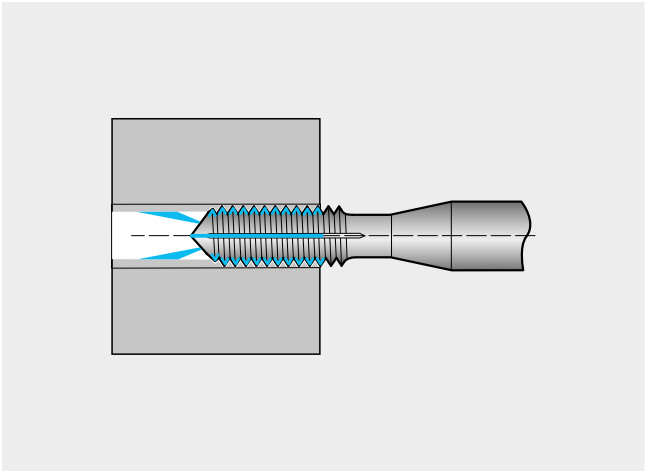
Lubrication grooves are required; internal coolant delivery is not necessary. Via the lubrication grooves the externally delivered coolant can advance to the form edges
(Radial coolant is recommended for very deep threads).

Horizontal machining of blind hole



Lubrication grooves and internal coolant delivery is necessary. Axial coolant exit is sufficient.

Horizontal machining of through hole



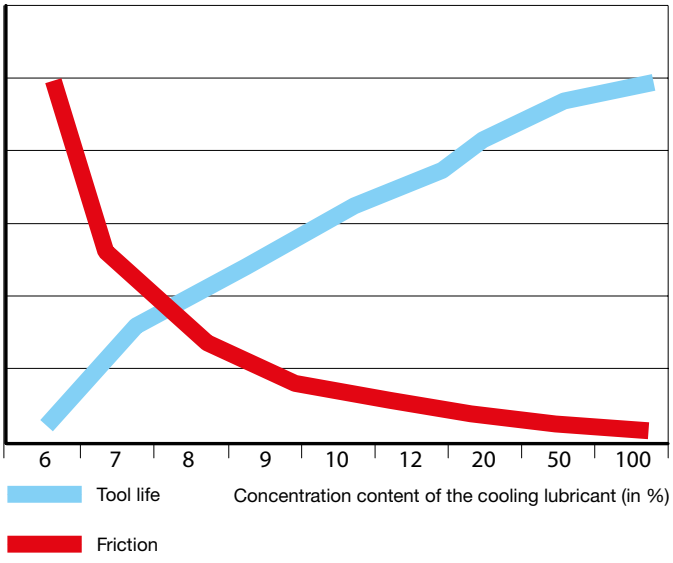
Lubrication grooves are required. Internal coolant delivery with radial exit is recommended.

Cooling lubricants with fluteless taps

With fluteless taps the main task of the coolant is lubrication. The better the lubrication with the maximum concentration, the longer the tool life.
There are two different types of lubricant:

Oil based lubricants
These are mineral oils with the best lubricating characteristics. They reduce friction and achieve optimal life.

Soluble lubricants
These soluble lubricants are a concentrate thinned to an emulsion prior to the use with water. The concentration must not be below 6%. A content more than 12% is ideal in order to achieve a long life thanks to a good lubrication effect.



ISO code

P	Steel, high-alloyed steel
M	Stainless steel
K	Grey cast iron, spher, graphite/mall. cast iron
N	Aluminium and other non-ferrous metals
S	Special, super and titanium alloys
H	Hardened steel and chilled cast iron

On the following price and programme pages you will find for every tool recommendations regarding suitability for the application groups and details of max. tensile strength and hardness:

● optimal suitability
○ limited suitability

Pictograms

Tool material	HSS-E-PM	
	High-speed steel	
Tolerance on Ø	2BX 4HX 6GX	6HX
Thread type		
	Blind hole	Through holes and blind holes
Cutting direction		
	right	
Internal coolant		
	with IC	without IC
Form	C E	
Type	N	

Coatings

C TiCN

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