



Leading Through Innovation

HSS-E & HSS-PM

YG TAP FORMING

YG INNENGEWINDEFORMER

- Tapping by Forming Soft Materials
- Gewindeherstellung durch Formen von weichen Materialien

SELECTION GUIDE



HSS-E & HSS-PM YG TAP FORMING

Tapping by Forming Soft Materials

Please visit global.yg1.com/mat for material search
 ◎ : Excellent ○ : Good
 Recommended cutting conditions : p.B293

ISO	VDI 3323	Material Description	Composition / Structure / Heat Treatment		HB	HRC	HOLE TYPE		
							Max. 3.0xD Blind / Through Hole		
P	1	Non-alloy steel	About 0.15% C	Annealed	125		C	HSS-E	
	2		About 0.45% C	Annealed	190	13			C
	3		About 0.45% C	Quenched & Tempered	250	25	-		
	4		About 0.75% C	Annealed	270	28	-		
	5		About 0.75% C	Quenched & Tempered	300	32	-		
	6	Low alloy steel		Annealed	180	10	◎		
	7			Quenched & Tempered	275	29	◎		
	8			Quenched & Tempered	300	32	◎		
	9			Quenched & Tempered	350	38	◎		
	10			Annealed	200	15	◎		
	11	High alloyed steel, and tool steel		Quenched & Tempered	325	35	◎		
	M	12	Stainless steel	Ferritic / Martensitic	Annealed	200	15		○
		13		Martensitic	Quenched & Tempered	240	23		○
		14		Austenitic		180	10		○
		15	Grey cast iron	Pearlitic / ferritic		180	10		○
	K	16	Nodular cast iron	Pearlitic (Martensitic)		260	26		○
		17		Ferritic		160	3		○
18			Pearlitic		250	25	○		
19		Malleable cast iron	Ferritic		130		○		
20			Pearlitic		230	21	○		
N	21	Aluminum-wrought alloy	Not Curable		60		◎		
	22		Curable	Hardened	100		◎		
	23	Aluminum-cast, alloyed	≤ 12% Si, Not Curable		75		○		
	24		≤ 12% Si, Curable	Hardened	90		○		
	25		> 12% Si, Not Curable		130		○		
	26	Copper and Copper Alloys (Bronze / Brass)	Cutting Alloys, PB>1%		110		○		
	27		CuZn, CuSnZn (Brass)		90		○		
	28		CuSn, lead-free copper and electrolytic copper		100		◎		
	29		Non Metallic Materials	Duroplastic, Fiber Reinforced Plastic Rubber, Wood, etc.				◎	
	S	31	Heat Resistant Super Alloys	Fe Based	Annealed	200	15	○	
32		Cured		280	30	○			
33		Annealed		250	25	○			
34		Ni or Co Based		Cured	350	38	○		
35			Cast	320	34	○			
36		Titanium Alloys	Pure Titanium		400 Rm		○		
37			Alpha + Beta Alloys	Hardened	1050 Rm		○		
H	38	Hardened steel		Hardened	550	55	○		
	39			Hardened	630	60	○		
	40	Chilled Cast Iron		Cast	400	42	○		
	41	Hardened Cast Iron		Hardened	550	55	○		

		HSS-E		HSS-PM		HSS-E		HSS-PM		HSS-E		
		C	C	C	C	C	C	C	C	C	C	
TY703 (p.B282)	TQ703 (p.B283)	TD713 (p.B284)	TE713 (p.B285)	TQ723 (p.B286)	TE723 (p.B287)	TD723 (p.B288)						M
												MF
												UNC
												UNF
												BSW
												G/BSP
												EG-M
												EG-UNC
												EG-UNF
SURFACE TREATMENT / COATING		TiN	NI	TiN	NI	VAP	NI	VAP	NI	TiN		
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TQ723 SERIES

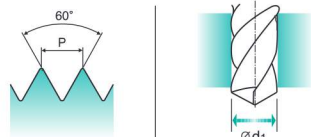
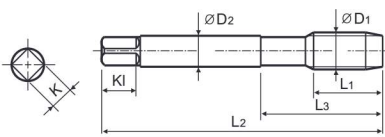
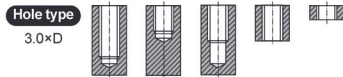
M ISO metric coarse threads DIN 13

- Metrisches ISO-Gewinde DIN 13
- ISO MÉTRIQUE DIN13
- ISO Metrico passo grosso DIN 13

Cold forming taps
Gewindeformer

- ▶ Suitable for threading soft materials with at least 8-10% elongation in the best substrate.
- ▶ The pre-drilling holes are bigger than normal sized holes.

- ▶ Aus bestem Werkstoff geeignet zum Gewindeformen weicher Werkstoffe mit mindestens 8-10% Dehnung.
- ▶ Die Kernlochbohrungen sind größer als normale Kernlöcher.



Material groups: **GV** HSS PM DIN 371/376 6HX 60° C Vap p.B293

Plain Shank Page: D215-220
TAPPING CHUCK D211-228
Recommended ToolHolder ONE STEP TAPPING CHUCK D211-213

Unit : mm

SIZE	Pitch	EDP No.	Thread Length	Overall Length	Neck Length	Shank Diameter	Square Size	Square Length	Tapping Drill Diameter
øD1	P	Vap	L1	L2	L3	øD2	K	Kl	ød1
M2	× 0.4	TQ723136	8	45	13	2.8	2.1	5	1.83
M2.2	× 0.45	TQ723156	8	45	13	2.8	2.1	5	2
*M2.3	× 0.4	TQ723196	8	45	13	2.8	2.1	5	2.1
M2.5	× 0.45	TQ723176	9	50	15	2.8	2.1	5	2.3
*M2.6	× 0.45	TQ723496	9	50	15	2.8	2.1	5	2.4
M3	× 0.5	TQ723206	11	56	18	3.5	2.7	6	2.8
M3.5	× 0.6	TQ723226	12	56	20	4	3	6	3.25
M4	× 0.7	TQ723246	13	63	21	4.5	3.4	6	3.7
M4.5	× 0.75	TQ723266	14	70	25	6	4.9	8	4.15
M5	× 0.8	TQ723286	15	70	25	6	4.9	8	4.65
M6	× 1	TQ723316	17	80	30	6	4.9	8	5.55
M7	× 1	TQ723346	17	80	30	7	5.5	8	6.55
M8	× 1.25	TQ723366	20	90	35	8	6.2	9	7.4
M9	× 1.25	TQ723396	20	90	35	9	7	10	8.4
M10	× 1.5	TQ723426	22	100	39	10	8	11	9.3
M11	× 1.5	TQ723466	22	100	40	8	6.2	9	10.3
M12	× 1.75	TQ723506	24	110	44	9	7	10	11.2
M14	× 2	TQ723546	26	110	44	11	9	12	13
M16	× 2	TQ723606	27	110	44	12	9	12	15
M18	× 2.5	TQ723656	30	125	50	14	11	14	16.8
M20	× 2.5	TQ723706	32	140	54	16	12	15	18.8

- ▶ DIN 371(M2~M10) and DIN 376(M11~M20)
- ▶ * DIN profile not ISO



TE723 SERIES

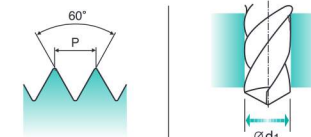
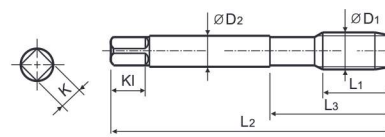
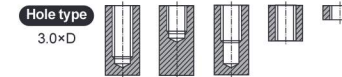
M ISO metric coarse threads DIN 13

- Metrisches ISO-Gewinde DIN 13
- ISO MÉTRIQUE DIN13
- ISO Metrico passo grosso DIN 13

Cold forming taps
Gewindeformer

- ▶ Suitable for threading soft materials with at least 8-10% elongation.
- ▶ The pre-drilling holes are bigger than normal sized holes.

- ▶ Geeignet zum Gewindeformen weicher Werkstoffe mit mindestens 8-10% Dehnung.
- ▶ Die Kernlochbohrungen sind größer als normale Kernlöcher.



Material groups: **GV** HSS-E DIN 371/376 6HX 60° C Nitride p.B293

Plain Shank Page: D215-220
TAPPING CHUCK D211-228
Recommended ToolHolder ONE STEP TAPPING CHUCK D211-213

Unit : mm

SIZE	Pitch	EDP No.	Thread Length	Overall Length	Neck Length	Shank Diameter	Square Size	Square Length	Tapping Drill Diameter
øD1	P	Ni	L1	L2	L3	øD2	K	Kl	ød1
M2	× 0.4	TE723136	8	45	13	2.8	2.1	5	1.83
M2.2	× 0.45	TE723156	8	45	13	2.8	2.1	5	2
*M2.3	× 0.4	TE723196	8	45	13	2.8	2.1	5	2.1
M2.5	× 0.45	TE723176	9	50	15	2.8	2.1	5	2.3
*M2.6	× 0.45	TE723496	9	50	15	2.8	2.1	5	2.4
M3	× 0.5	TE723206	11	56	18	3.5	2.7	6	2.8
M3.5	× 0.6	TE723226	12	56	20	4	3	6	3.25
M4	× 0.7	TE723246	13	63	21	4.5	3.4	6	3.7
M4.5	× 0.75	TE723266	14	70	25	6	4.9	8	4.15
M5	× 0.8	TE723286	15	70	25	6	4.9	8	4.65
M6	× 1	TE723316	17	80	30	6	4.9	8	5.55
M7	× 1	TE723346	17	80	30	7	5.5	8	6.55
M8	× 1.25	TE723366	20	90	35	8	6.2	9	7.4
M9	× 1.25	TE723396	20	90	35	9	7	10	8.4
M10	× 1.5	TE723426	22	100	39	10	8	11	9.3
M11	× 1.5	TE723466	22	100	40	8	6.2	9	10.3
M12	× 1.75	TE723506	24	110	44	9	7	10	11.2
M14	× 2	TE723546	26	110	44	11	9	12	13
M16	× 2	TE723606	27	110	44	12	9	12	15
M18	× 2.5	TE723656	30	125	50	14	11	14	16.8
M20	× 2.5	TE723706	32	140	54	16	12	15	18.8

- ▶ DIN 371(M2~M10) and DIN 376(M11~M20)
- ▶ * DIN profile not ISO

⊙ : Excellent ○ : Good

ISO Material Description	P										M																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
	Non-alloy steel					Low alloy steel					High alloyed steel and tool steel					Stainless steel					Grey cast iron					Nodular cast iron					Malleable cast iron																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
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TD733 SERIES

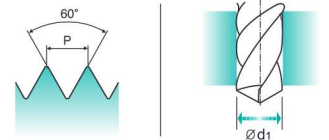
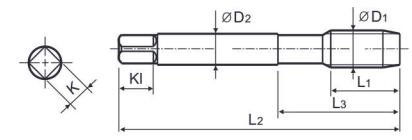
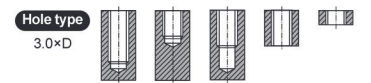
MF ISO metric fine threads DIN 13

● Metrisches ISO-Feingewinde DIN 13
 ○ ISO MÉTRIQUE PAS FINS DIN 13
 ○ ISO Metrico passo fine DIN 13

Cold forming taps with oil grooves
 Gewindeformer mit Schmiernuten

- Suitable for threading soft materials with at least 8-10% elongation.
- The pre-drilling holes are bigger than normal sized holes.

- Geeignet zum Gewindeformen weicher Werkstoffe mit mindestens 8-10% Dehnung.
- Die Kernlochbohrungen sind größer als normale Kernlöcher.



Material groups: **GV** HSS-E DIN 374 6HX 60° C TIN p.B293

Recommended ToolHolder: Plain Shank TAPPING CHUCK D215-220 D221-228 ONE STEP TAPPING CHUCK D211-213

Recommended Cutting Page : P.285 Unit : mm

SIZE	Pitch	EDP No.	Thread Length	Overall Length	Neck Length	Shank Diameter	Square Size	Square Length	Tapping Drill Diameter
ØD1	P	TiN	L1	L2	L3	ØD2	K	Kl	Ød1
M4	× 0.5	TD733256	10	63	21	2.8	2.1	5	3.75
M5	× 0.5	TD733296	11	70	25	3.5	2.7	6	4.75
M6	× 0.75	TD733326	13	80	30	4.5	3.4	6	5.65
M6	× 0.5	TD733336	13	80	30	4.5	3.4	6	5.75
M7	× 0.75	TD733356	14	80	30	5.5	4.3	7	6.65
M8	× 1	TD733376	17	90	36	6	4.9	8	7.5
M8	× 0.75	TD733386	14	80	30	6	4.9	8	7.65
M10	× 1.25	TD733436	22	100	40	7	5.5	8	9.4
M10	× 1	TD733446	18	90	36	7	5.5	8	9.5
M10	× 0.75	TD733456	18	90	36	7	5.5	8	9.65
M12	× 1.5	TD733516	22	100	40	9	7	10	11.25
M12	× 1.25	TD733526	22	100	40	9	7	10	11.4
M12	× 1	TD733536	18	100	40	9	7	10	11.5
M14	× 1.5	TD733556	22	100	40	11	9	12	13.25
M14	× 1.25	TD733566	22	100	40	11	9	12	13.4
M16	× 1.5	TD733616	22	100	40	12	9	12	15.25
M18	× 1.5	TD733676	25	110	44	14	11	14	17.25
M20	× 1.5	TD733726	25	125	50	16	12	15	19.25

► DIN 371(M2~M10) and DIN 376(M11~M20)
 ► * DIN profile not ISO

◎ : Excellent ○ : Good

ISO Material Description	P					M					F									
	Non-alloy steel					Low alloy steel					High alloyed steel and tool steel									
VDI 3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
HRc	13	25	28	32	38	10	29	32	38	15	35	15	23	10	10	26	3	25	21	
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	160	260	160	250	130	230
Recommended	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	○	○	○	○	○	○	○	○	○



TD723 SERIES

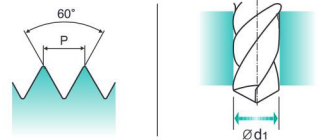
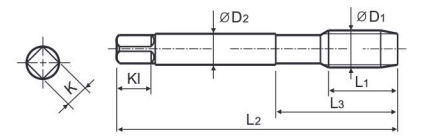
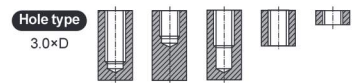
M ISO metric coarse threads DIN 13

● Metrisches ISO-Gewinde DIN 13
 ○ ISO MÉTRIQUE DIN 13
 ○ ISO Metrico passo grosso DIN 13

Cold forming taps
 Gewindeformer

- Suitable for threading soft materials with at least 8-10% elongation.
- The pre-drilling holes are bigger than normal sized holes.

- Geeignet zum Gewindeformen weicher Werkstoffe mit mindestens 8-10% Dehnung.
- Die Kernlochbohrungen sind größer als normale Kernlöcher.



Material groups: **GV** HSS-E DIN 371/376 6HX 60° C TIN p.B293

Recommended ToolHolder: Plain Shank TAPPING CHUCK D215-220 D221-228 ONE STEP TAPPING CHUCK D211-213

Recommended Cutting Page : P.285 Unit : mm

SIZE	Pitch	EDP No.	Thread Length	Overall Length	Neck Length	Shank Diameter	Square Size	Square Length	Tapping Drill Diameter
ØD1	P	TiN	L1	L2	L3	ØD2	K	Kl	Ød1
M2	× 0.4	TD723136	8	45	13	2.8	2.1	5	1.83
M2.2	× 0.45	TD723156	8	45	13	2.8	2.1	5	2
*M2.3	× 0.4	TD723196	8	45	13	2.8	2.1	5	2.1
M2.5	× 0.45	TD723176	9	50	15	2.8	2.1	5	2.3
*M2.6	× 0.45	TD723496	9	50	15	2.8	2.1	5	2.4
M3	× 0.5	TD723206	11	56	18	3.5	2.7	6	2.8
M3.5	× 0.6	TD723226	12	56	20	4	3	6	3.25
M4	× 0.7	TD723246	13	63	21	4.5	3.4	6	3.7
M4.5	× 0.75	TD723266	14	70	25	6	4.9	8	4.15
M5	× 0.8	TD723286	15	70	25	6	4.9	8	4.65
M6	× 1	TD723316	17	80	30	6	4.9	8	5.55
M7	× 1	TD723346	17	80	30	7	5.5	8	6.55
M8	× 1.25	TD723366	20	90	35	8	6.2	9	7.4
M9	× 1.25	TD723396	20	90	35	9	7	10	8.4
M10	× 1.5	TD723426	22	100	39	10	8	11	9.3
M11	× 1.5	TD723466	22	100	40	8	6.2	9	10.3
M12	× 1.75	TD723506	24	110	44	9	7	10	11.2
M14	× 2	TD723546	26	110	44	11	9	12	13
M16	× 2	TD723606	27	110	44	12	9	12	15
M18	× 2.5	TD723656	30	125	50	14	11	14	16.8
M20	× 2.5	TD723706	32	140	54	16	12	15	18.8

► DIN 371(M2~M10) and DIN 376(M11~M20)
 ► * DIN profile not ISO

◎ : Excellent ○ : Good

ISO Material Description	P					M					F									
	Non-alloy steel					Low alloy steel					High alloyed steel and tool steel									
VDI 3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
HRc	13	25	28	32	38	10	29	32	38	15	35	15	23	10	10	26	3	25	21	
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	160	260	160	250	130	230
Recommended	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	○	○	○	○	○	○	○	○	○



TE733 SERIES

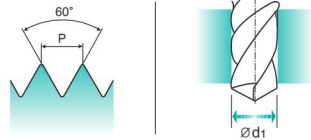
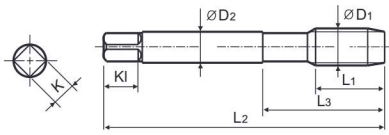
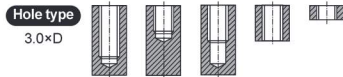
MF ISO metric fine threads DIN 13

- Metrisches ISO-Feingewinde DIN 13
- ISO MÉTRIQUE PAS FINS DIN13
- ISO Metrico passo fine DIN 13

Cold forming taps with oil grooves
Gewindeformer mit Schmiernuten

- Suitable for threading soft materials with at least 8-10% elongation.
- The pre-drilling holes are bigger than normal sized holes.

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Material groups: **GV** HSS-E DIN 374 6HX 60° C Nitride p.B293

Plain Shank Page D215-220
TAPPING CHUCK D215-228
Recommended ToolHolder ONE STEP TAPPING CHUCK D211-213

Recommended Cutting Page : P.285

Unit : mm

SIZE	Pitch	EDP No.	Thread Length	Overall Length	Neck Length	Shank Diameter	Square Size	Square Length	Tapping Drill Diameter
∅D1	P	Ni	L1	L2	L3	∅D2	K	Kl	∅d1
M4 × 0.5		TE733256	10	63	21	2.8	2.1	5	3.75
M5 × 0.5		TE733296	11	70	25	3.5	2.7	6	4.75
M6 × 0.75		TE733326	13	80	30	4.5	3.4	6	5.65
M6 × 0.5		TE733336	13	80	30	4.5	3.4	6	5.75
M7 × 0.75		TE733356	14	80	30	5.5	4.3	7	6.65
M8 × 1		TE733376	17	90	36	6	4.9	8	7.5
M8 × 0.75		TE733386	14	80	30	6	4.9	8	7.65
M10 × 1.25		TE733436	22	100	40	7	5.5	8	9.4
M10 × 1		TE733446	18	90	36	7	5.5	8	9.5
M10 × 0.75		TE733456	18	90	36	7	5.5	8	9.65
M12 × 1.5		TE733516	22	100	40	9	7	10	11.25
M12 × 1.25		TE733526	22	100	40	9	7	10	11.4
M12 × 1		TE733536	18	100	40	9	7	10	11.5
M14 × 1.5		TE733556	22	100	40	11	9	12	13.25
M14 × 1.25		TE733566	22	100	40	11	9	12	13.4
M16 × 1.5		TE733616	22	100	40	12	9	12	15.25
M18 × 1.5		TE733676	25	110	44	14	11	14	17.25
M20 × 1.5		TE733726	25	125	50	16	12	15	19.25



TD704 SERIES

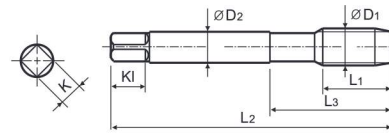
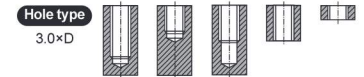
UNC Unified coarse threads

- Unified Grobgewinde
- UNC
- Unificato passo grosso

Cold forming taps with oil grooves
Gewindeformer mit Schmiernuten

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Material groups: **GV** HSS-E DIN 371/376 2BX 60° C TIN p.B293

Plain Shank Page D215-220
TAPPING CHUCK D215-228
Recommended ToolHolder ONE STEP TAPPING CHUCK D211-213

Recommended Cutting Page : P.285

Unit : mm

SIZE	TPI	EDP No.	Thread Length	Overall Length	Neck Length	Shank Diameter	Square Size	Square Length	Tapping Drill Diameter
∅D1	TPI	TiN	L1	L2	L3	∅D2	K	Kl	∅d1
#5 - 40 UNC		TD704202	11	56	18	3.5	2.7	6	2.87
#6 - 32 UNC		TD704242	12	56	20	4	3	6	3.1
#8 - 32 UNC		TD704282	13	63	21	4.5	3.4	6	3.8
#10 - 24 UNC		TD704322	15	70	25	6	4.9	8	4.3
#12 - 24 UNC		TD704362	16	80	30	6	4.9	8	4.95
1/4 - 20 UNC		TD704402	17	80	30	7	5.5	8	5.75
5/16 - 18 UNC		TD704442	20	90	35	8	6.2	9	7.25
3/8 - 16 UNC		TD704482	22	100	39	9	7	10	8.75
7/16 - 14 UNC		TD704522	22	100	40	8	6.2	9	10.2
1/2 - 13 UNC		TD704562	25	110	44	9	7	10	11.7
9/16 - 12 UNC		TD704602	26	110	40	11	9	12	13.2
5/8 - 11 UNC		TD704642	27	110	44	12	9	12	14.7
3/4 - 10 UNC		TD704702	30	125	50	14	11	14	17.8

►DIN 371(#4~3/8) and DIN 376(7/16~3/4)

◎ : Excellent ○ : Good

ISO Material Description	P										M				F					
	Non-alloy steel					Low alloy steel					High alloyed steel and tool steel		Stainless steel		Grey cast iron		Nodular cast iron		Malleable cast iron	
VDI 3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
HRC	13	25	28	32	38	10	29	32	38	15	35	15	23	10	29	3	25	13	21	
HB	125	190	250	270	300	180	275	300	350	200	325	180	240	180	160	260	160	250	130	230
Recommended	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎

ISO Material Description	N				S				H													
	Aluminum-wrought alloy		Aluminum-cast alloyed		Copper and Copper Alloys (Bronze / Brass)		Non Metallic Materials		Heat Resistant Super Alloys		Titanium Alloys		Hardened steel		Chilled Cast Iron		Hardened Cast Iron					
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	
HRC	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	
HB	60	100	75	90	130	110	90	100	200	280	250	350	320	400Rm	1050Rm	550	630	400	400	550	550	
Recommended	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎

TD704 SERIES

- Suitable for threading soft materials with at least 8-10% elongation.
- The pre-drilling holes are bigger than normal sized holes.





TE704 SERIES

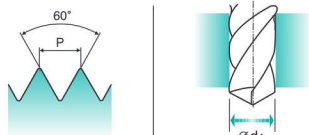
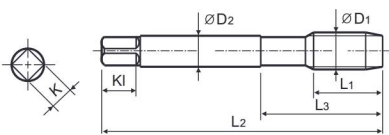
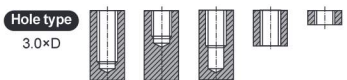
UNC Unified coarse threads

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Unit : mm

SIZE ØD1	TPI	EDP No. Ni	Thread Length		Neck Length L3	Shank Diameter ØD2	Square Size K	Square Length Kl	Tapping Drill Diameter Ød1
			L1	L2					
#5 - 40 UNC		TE704202	11	56	18	3.5	2.7	6	2.87
#6 - 32 UNC		TE704242	12	56	20	4	3	6	3.1
#8 - 32 UNC		TE704282	13	63	21	4.5	3.4	6	3.8
#10 - 24 UNC		TE704322	15	70	25	6	4.9	8	4.3
#12 - 24 UNC		TE704362	16	80	30	6	4.9	8	4.95
1/4 - 20 UNC		TE704402	17	80	30	7	5.5	8	5.75
5/16 - 18 UNC		TE704442	20	90	35	8	6.2	9	7.25
3/8 - 16 UNC		TE704482	22	100	39	9	7	10	8.75
7/16 - 14 UNC		TE704522	22	100	40	8	6.2	9	10.2
1/2 - 13 UNC		TE704562	25	110	44	9	7	10	11.7
9/16 - 12 UNC		TE704602	26	110	40	11	9	12	13.2
5/8 - 11 UNC		TE704642	27	110	44	12	9	12	14.7
3/4 - 10 UNC		TE704702	30	125	50	14	11	14	17.8

►DIN 371(#4~3/8) and DIN 376(7/16~3/4)



RECOMMENDED CUTTING CONDITIONS EMPFOHLENE SCHNEIDKONDITIONEN

ISO	VDI 3323	Material Description	HB	HRc	Vc (m/min)											
					TD703 TD733 TD704	TE703 TE733 TE704	TY703	TQ703	TD713	TE713	TQ723	TE723	TD723			
P	1	Non-alloy steel	125		15-20	15-20	15-20	15-20	15-20	15-20	15-20	15-20	15-20	15-20		
	2		190	13	15-20	15-20	15-20	15-20	15-20	15-20	15-20	15-20	15-20	15-20		
	3	250	25	12-18	12-18	12-18	12-18	12-18	12-18	12-18	12-18	12-18	12-18	12-18		
6		Low alloy steel	180	10	10-15	10-15	10-15	10-15	10-15	10-15	10-15	10-15	10-15	10-15		
M	12	Stainless steel	200	15	10-13	7-10	10-13	7-10	10-13	7-10	7-10	7-10	7-10	10-13		
	13		240	23	8-11	5-8	8-11	5-8	8-11	5-8	5-8	5-8	8-11			
	14		180	10	6-8	4-6	6-8	4-6	6-8	4-6	4-6	4-6	6-8			
N	21	Aluminum-wrought alloy	60		10-15	10-15	10-15	10-15	10-15	10-15	10-15	10-15	10-15	10-15		
	22		100		10-15	10-15	10-15	10-15	10-15	10-15	10-15	10-15	10-15	10-15		
	23	Aluminum-cast, alloyed	75		15-20	15-20	15-20	15-20	15-20	15-20	15-20	15-20	15-20	15-20		
	24		90		10-15	10-15	10-15	10-15	10-15	10-15	10-15	10-15	10-15	10-15		
	26		Copper and Copper Alloys (Bronze / Brass)	110		25-35	25-35	25-35	25-35	25-35	25-35	25-35	25-35	25-35	25-35	
	28			100		15-20	15-20	15-20	15-20	15-20	15-20	15-20	15-20	15-20	15-20	

◎ : Excellent ○ : Good

ISO	P										M						K			
	Non-alloy steel					Low alloy steel					High alloyed steel and tool steel		Stainless steel		Grey cast iron	Nodular cast iron	Malleable cast iron			
VDI 3323	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
HRc																				
HB	125	190	250	270	300	180	275	300	350	200	325	200	240	180	160	250	160	250	130	230
Recommended	◎	◎	◎			◎						○	○	○						

ISO	N				S						H										
	Aluminum-wrought alloy	Aluminum-cast, alloyed	Copper and Copper Alloys (Bronze / Brass)	Non Metallic Materials	Heat Resistant Super Alloys						Titanium Alloys	Hardened steel	Chilled Cast Iron	Hardened Cast Iron							
VDI 3323	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
HRc											15	30	25	38	34	36	37	55	60	42	55
HB	60	100	75	90	130	110	90	100			200	280	250	350	320	400Rm	1050Rm	550	630	400	550
Recommended	◎	◎	○	○		○															