1920
Foundation of Präzisions-Werkzeugfabrik Nürnberg-Lauf Moschkau & Glimpel by Richard Glimpel

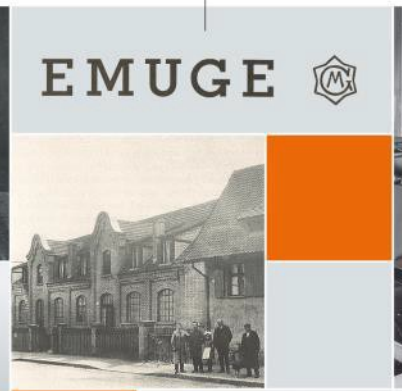
1933
Registration of brand name EMUGE (acronym of German phonetic spelling "M u G" for "Moschkau und Glimpel")

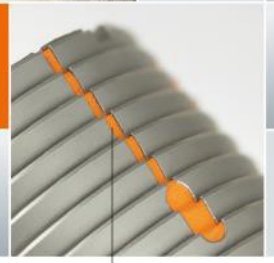
1950
Acquisition of production and sales license of "Spieth" clamping system

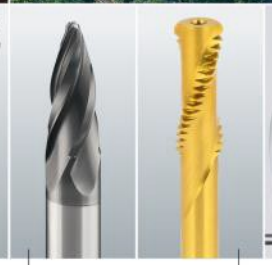
1956
Helmut Glimpel, the current owner and managing director joins the company

1958
Acquisition of company FRANKEN, Rückersdorf

2010
Completion of the new EMUGE company building







1920
Single-finishing tap with spiral point

1953
Tap with steep spiral flutes

1960
Clamping of workpiece with buttress thread

1981
TiN-coated taps

1998
Softsynchro® tap holders

2005
InnoForm cold-forming taps

2010
Speedsynchro® Modular collet holder

2012
Circle segment end mills oval form

2014
Punch Tap threading technology

TODAY
Two generations of the entrepreneurial family Glimpel: (LTR) Cornelia Glimpel-Pompe, Thomas Pompe, Helmut Glimpel, Gerhard Knienieder and Ulrike Glimpel-Knienieder

Shop 31

PHILADELPHIA NAVAL SHIPYARD
"MAINSTAY OF THE FLEET"

The United States Department of Labor
Bureau of Apprenticeship and Training
Certificate of Completion of Apprenticeship
THOMAS V. KOWALSKI
Machinist
PHILADELPHIA NAVAL SHIPYARD

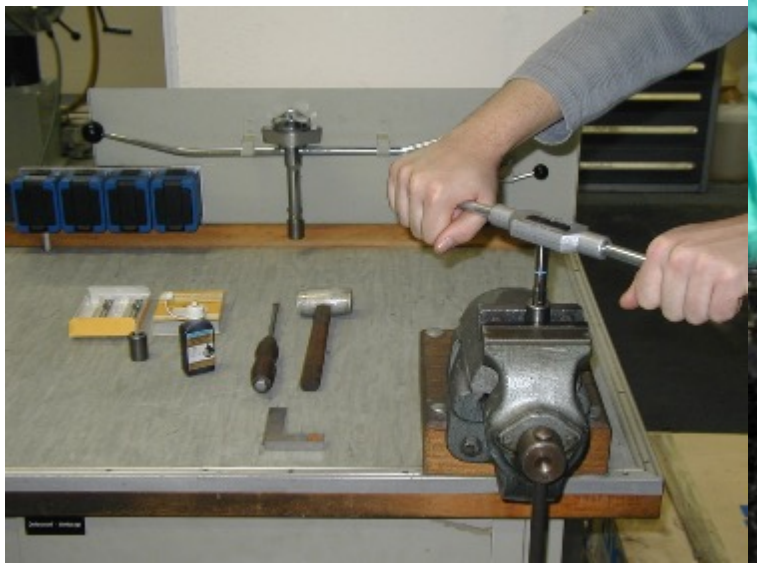

Department of the Navy
Certificate of Apprenticeship
THOMAS V. KOWALSKI
Machinist

Suggestion
AWARD
to
Thomas V. Kowalski

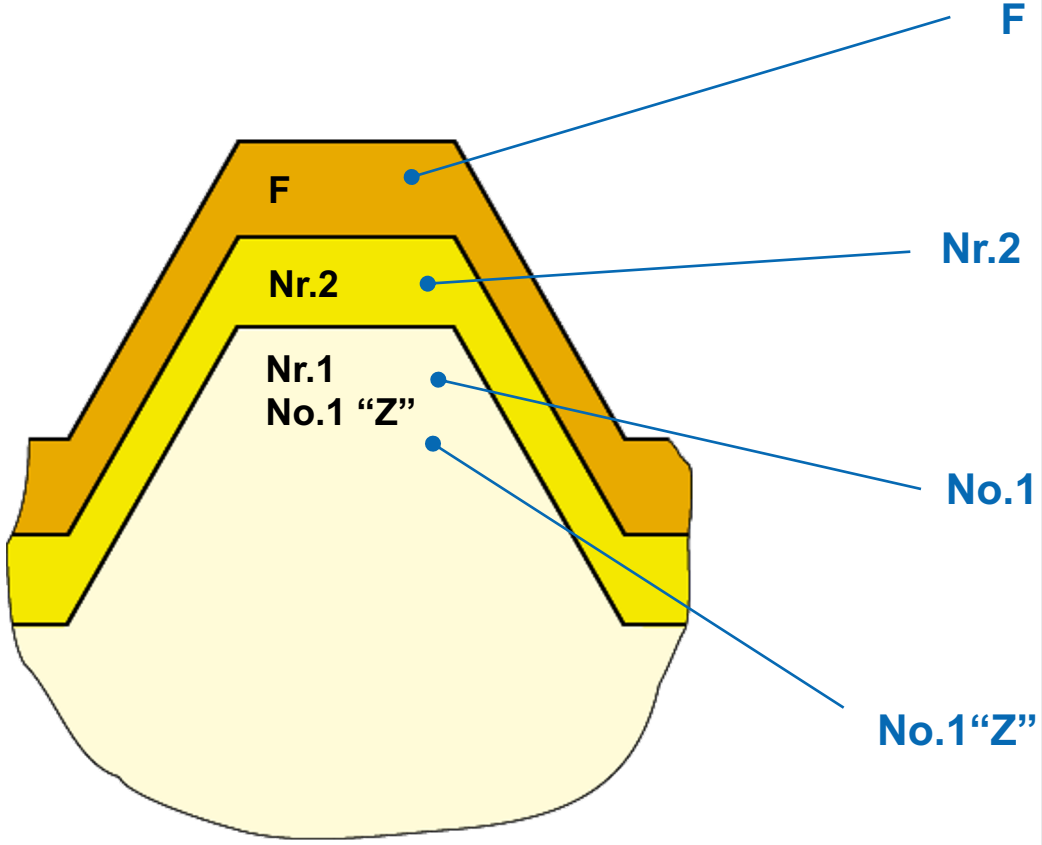

Commonwealth of Pennsylvania
Certificate of Completion of Apprenticeship
Thomas V. Kowalski

Hand Tapping

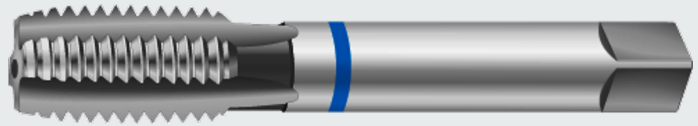
- Thread Cutting Sequence
- Thread Profile Development



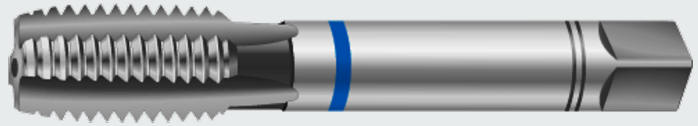
Thread Profile Development



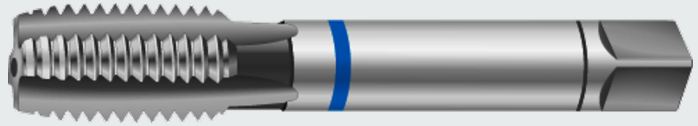
Emuge Toolmakers Set



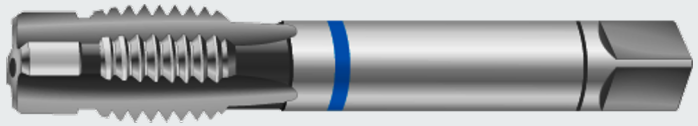
- F for Finisher



- No.2 Semi-Rough



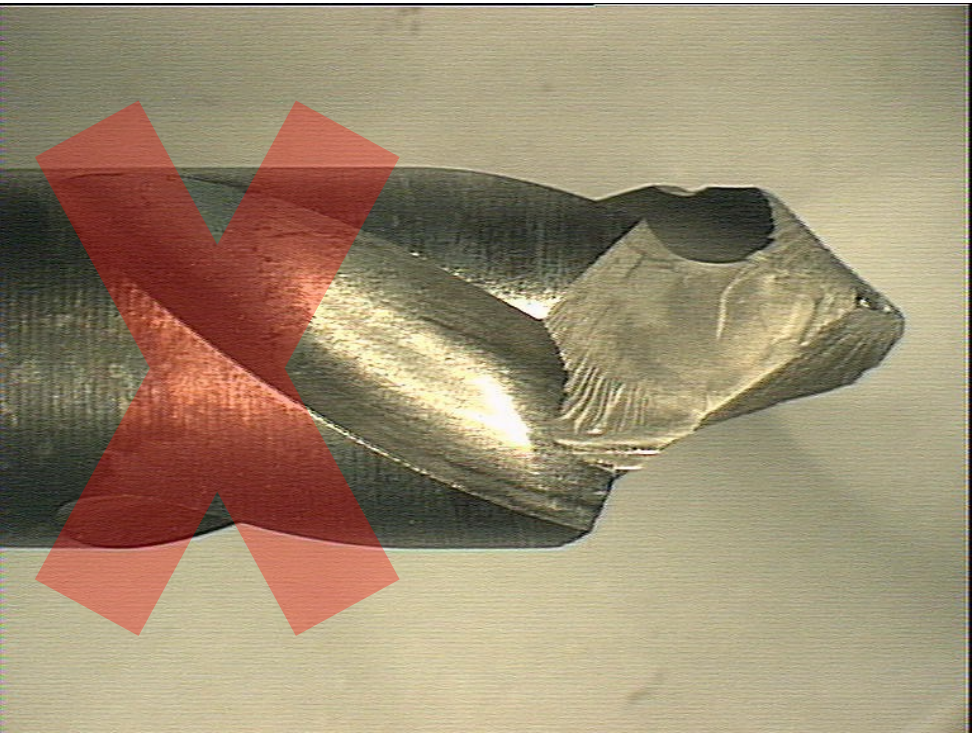
- Rougher

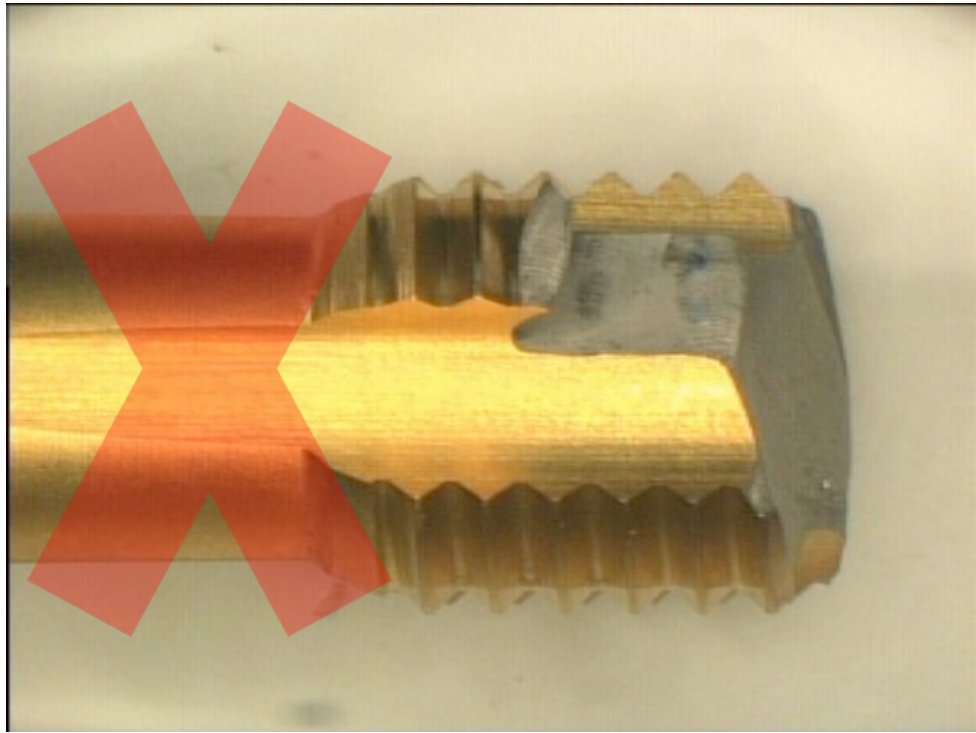


- Rougher with Pilot

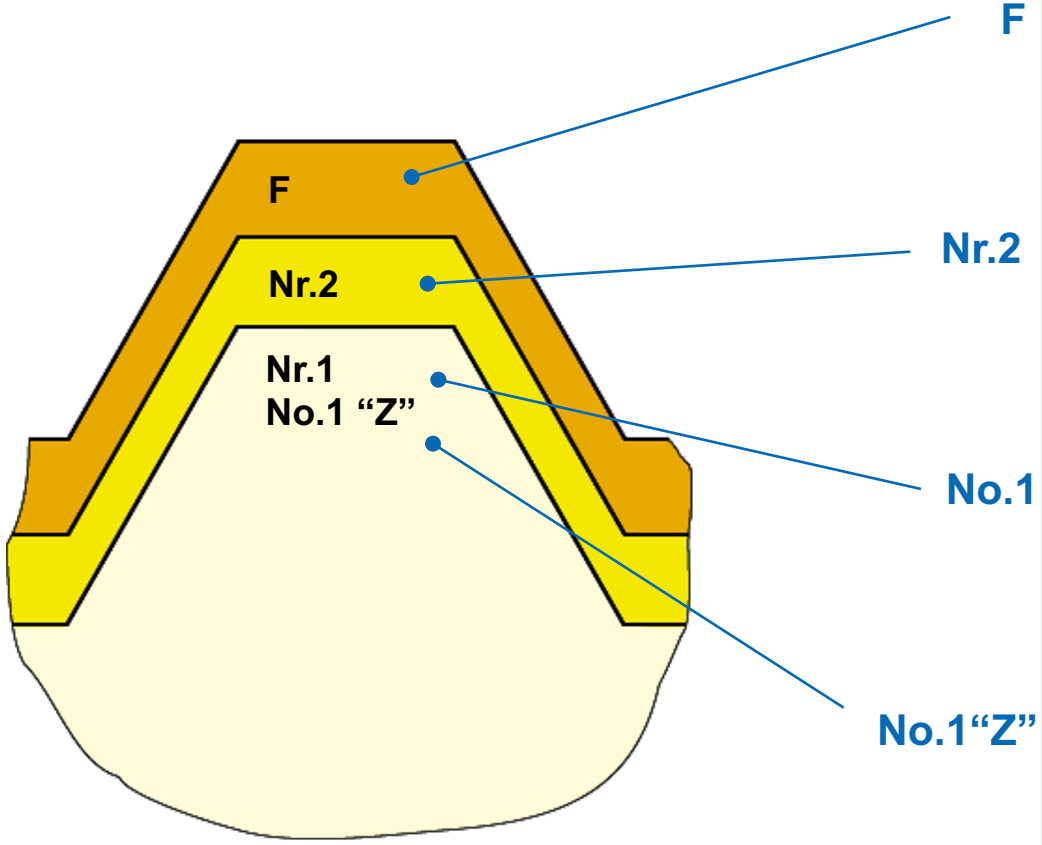

K 165
K 165

Avoid Tap Breakage and Smile More……

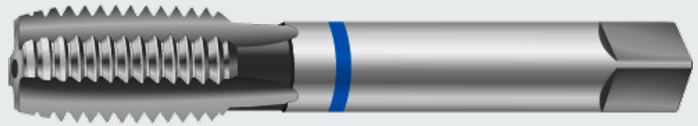




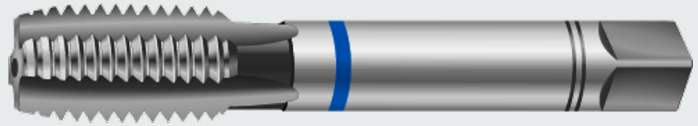
Thread Profile Development



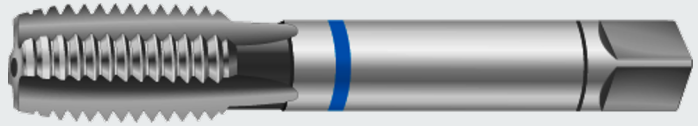
Emuge Toolmakers Set



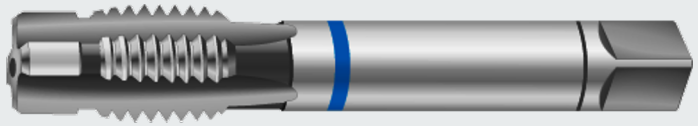
- F for Finisher



- No.2 Semi-Rough



- Rougher

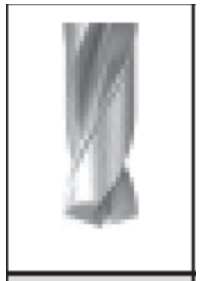


- Rougher with Pilot

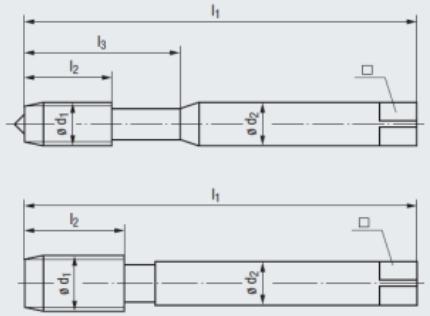
Drills and Taps are linked…….

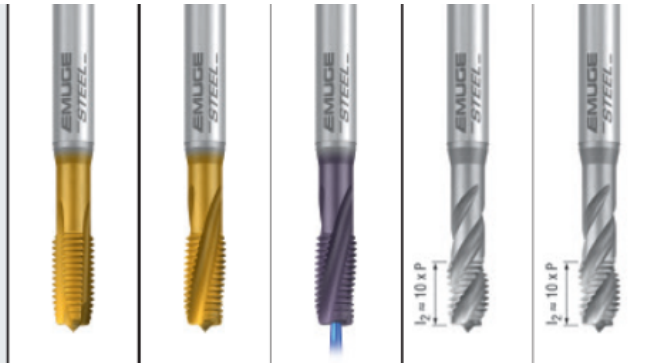
like Peanut Butter and Jelly!!!!!

- All Taps need a Drilled Hole
- **A Precision Bore!!!!!**
- **Minor Diameter**
- Specific Size Range
- Larger Sizes for Machine Taps



Minor Diameter
0.0595
0.0700
0.0820
0.0890
0.1015
0.1110
0.1360
0.1520
0.1770
0.2040
0.2610
0.3160





UNC

60° P

Unified Coarse Thread
ASME B1.1

Class of Fit	2B	2B	2B	2B	3B
Coating	TIN	TIN	TICN		
Cutting Material	HSS Extra	HSS Extra	HSS Extra	HSS Extra	HSS Extra
Technical Characteristics		R15	R15	R35	R35
	B / 4-5	C / 2-3	C / 2-3	C / 2-3	C / 2-3
	E / 0	E / 0	E / 0	E / 0	E / 0
Thread Depth and Hole Shape	max. 3 x d_1	max. 2 x d_1		max. 2.5 x d_1	
Applications – Material	P 1.1-4.1 K 2.1 N 2.2, 2.4-5	P 1.1-4.1 K 1.1-4.2 N 1.4-5, 2.4-5	P 1.1-4.1 K 1.1-4.2 N 1.4-5, 2.4-5	P 1.1-3.1 N 2.2	P 1.1-3.1 N 2.2

Reinforced Shank

Nominal Size ø d_1	T.P.I.	l_1	l_2	inch l_3	ø d_2	□	Tool Identification Dimens. ID		BU208400 Rekord 1B-STEEL-L TIN	Flutes	BU451400 Rekord 1D-STEEL TIN	Flutes	BU979000 Rekord 1D-STEEL IKZ-TICN	Flutes	BU501000 Enorm 1-STEEL	Flutes	BU501010 Enorm 1-STEEL	Flutes
No. 1	64	1.772	0.276	0.472	0.141	0.110	0.0595	.5000	●	2	●	2			●	2	●	2
No. 2	56	1.772	0.276	0.472	0.141	0.110	0.0700	.5001	●	2	●	2			●	2	●	2
No. 3	48	1.969	0.354	0.551	0.141	0.110	0.0820	.5002	●	2	●	2			●	2	●	2
No. 4	40	2.205	0.433	0.709	0.141	0.110	0.0890	.5003	●	2	●	2			●	2	●	2
No. 5	40	2.205	0.433	0.709	0.141	0.110	0.1015	.5004	●	3	●	2			●	3	●	3
No. 6	32	2.205	0.472	0.787	0.141	0.110	0.1110	.5005	●	3	●	3			●	3	●	3
No. 8	32	2.480	0.512	0.827	0.168	0.131	0.1360	.5006	●	3	●	3			●	3	●	3
No. 10	24	2.756	0.591	0.984	0.194	0.152	0.1520	.5007	●	3	●	3	●	3	●	3	●	3
No. 12	24	3.150	0.630	1.142	0.220	0.165	0.1770	.5008	●	3	●	3			●	3	●	3
1/4	20	3.150	0.669	1.181	0.255	0.191	0.2040	.5009	●	3	●	3	●	3	●	3	●	3
5/16	18	3.543	0.787	1.378	0.318	0.238	0.2610	.5010	●	3	●	3	●	3	●	3	●	3
3/8	16	3.937	0.866	1.535	0.381	0.286	0.3160	.5011	●	3	●	3	●	3	●	3	●	3

UNC

Unified coarse thread
ASME B1.1, Table 2

Nominal Size D	P [T.P.I.]	Minor thread dia. of the internal thread (Tol. 2B) D_1 min.	D_1 max.	Rec. tap drill size
No. 1 (0.073)	64	0.0561	0.0622	**0.0595**
No. 2 (0.086)	56	0.0667	0.0737	**0.0700**
No. 3 (0.099)	48	0.0764	0.0845	**0.0820**
No. 4 (0.112)	40	0.0849	0.0939	**0.0890**
No. 5 (0.125)	40	0.0979	0.1062	**0.1015**
No. 6 (0.138)	32	0.1040	0.1140	**0.1110**
No. 8 (0.164)	32	0.1300	0.1390	**0.1360**
No. 10 (0.190)	24	0.1450	0.1550	**0.1520**
No. 12 (0.216)	24	0.1710	0.1810	**0.1770**
1/4	20	0.1960	0.2070	**0.2040**
5/16	18	0.2520	0.2650	**0.2610**
3/8	16	0.3070	0.3210	**0.3160**
7/16	14	0.3600	0.3760	**0.3680**
1/2	13	0.4170	0.4340	**0.4219**
9/16	12	0.4720	0.4900	**0.4844**
5/8	11	0.5270	0.5460	**0.5313**
3/4	10	0.6420	0.6630	**0.6563**
7/8	9	0.7550	0.7780	**0.7656**
1	8	0.8650	0.8900	**0.8750**

Minor Diameter Size Range (% of Thread)

- According to Thread Tolerance
- Larger Sizes for Machine Taps vs Hand Taps
- Larger for deeper threads
- Larger for stronger materials

1. Workpiece Material

2. Material Condition

3. Hole Type

4. Thread Depth or Thread Length

5. Thread Size and Tolerance

USA Catalog 520

671 pages

*Machine (Cutting) Taps

*Cold-Forming Taps

*MultiTAP

*Tap Extensions

*Solid Carbide Thread Mills and Thrillers

*Indexable Insert Thread Mills Gigant-IC

*EF Drills

*Thread Gages

*Tap Holders

1. Workpiece Material

Chart ISO P M K N S & H

Material Specification, Trade Name
…. 1018, 304, Inconel, & 6Al4V

2. Material Condition

Hardness, Tensile Strength
…. 17-4-PH H900 vs 17-4PH A

		Application – Material	Hardness Range HRC	BHN	N/mm²	Material Examples
P		**Steel materials**				
	1.1	Cold-extrusion steels, Construction steels, Free-cutting steels, etc.		≤ 180	≤ 600	1010 / 1018 / 1020 / 12L14 / 12L15 / A36 / T1
	2.1	Construction steels, Cementation steels, Steel castings, etc.	≤ 22	≤ 235	≤ 800	A36 / T1 / 1030-1095 / 4140 / 4340 / 8620
	3.1	Cementation steels, Heat-treatable steels, Cold work steels, etc.	≤ 31	≤ 295	≤ 1000	4140 / 4340 / 8620 / P20 / H13 / D2 / A2 / S7 / H1150
	4.1	Heat-treatable steels, Cold work steels, Nitriding steels, etc.	≤ 38	≤ 355	≤ 1200	4140 / 4340 / 8620 / P20 / H13 / D2 / 300M / 52100 / M1-M42
	5.1	High-alloyed steels, Cold work steels, Hot work steels, etc.	≤ 44	≤ 415	≤ 1400	4140 / 4340 / 8620 / P20 / H13 / D2 / 300M / 52100
M		**Stainless steel materials**				
	1.1	Ferritic, martensitic	≤ 29	≤ 280	≤ 950	410 / 440 / 440C / 17-4 PH
	2.1	Austenitic	≤ 29	≤ 280	≤ 950	303 / 304 / 316 / 316L / 321
	3.1	Austenitic-ferritic (Duplex)	≤ 35	≤ 325	≤ 1100	
	4.1	Austenitic-ferritic heat-resistant (Super Duplex)	≤ 39	≤ 370	≤ 1250	
K		**Cast materials**				
	1.1	Cast iron with lamellar graphite (GJL)		30 - 75	100 - 250	Grey cast irons G10-GG40
	1.2			75 - 135	250 - 450	
	2.1	Cast iron with nodular graphite (GJS)		105 - 150	350 - 500	Nodular GGG40-GGG70
	2.2			150 - 265	500 - 900	
	3.1	Cast iron with vermicular graphite (GJV)		90 - 120	300 - 400	
	3.2			120 - 150	400 - 500	Compact graphite iron (CGI)
	4.1	Malleable cast iron (GTMW, GTMB)		70 - 145	250 - 500	
	4.2			150 - 235	500 - 800	White iron
N		**Non ferrous materials**				
		Aluminum alloys				
	1.1	Aluminum wrought alloys		≤ 60	≤ 200	7075
	1.2			≤ 105	≤ 350	6061-T6 / 2024-T4
	1.3			≤ 165	≤ 550	
	1.4	Aluminum cast alloys Si ≤ 7%				
	1.5	Aluminum cast alloys 7% < Si ≤ 12%				
	1.6	Aluminum cast alloys 12% < Si ≤ 17%				
		Copper alloys				
	2.1	Pure copper, low-alloyed copper		≤ 120	≤ 400	
	2.2	Copper-zinc alloys (brass, long-chipping)		≤ 165	≤ 550	
	2.3	Copper-zinc alloys (brass, short-chipping)		≤ 165	≤ 550	
	2.4	Copper-aluminum alloys (alu bronze, long-chipping)		≤ 235	≤ 800	
	2.5	Copper-tin alloys (tin bronze, long-chipping)		≤ 205	≤ 700	
	2.6	Copper-tin alloys (tin bronze, short-chipping)		≤ 120	≤ 400	
	2.7	Special copper alloys		≤ 180	≤ 600	
	2.8		≤ 44	≤ 415	≤ 1400	
		Magnesium alloys				
	3.1	Magnesium wrought alloys		≤ 150	≤ 500	
	3.2	Magnesium cast alloys		≤ 150	≤ 500	
		Synthetics				
	4.1	Duroplastics (short-chipping)				
	4.2	Thermoplastics (long-chipping)				
	4.3	Fibre-reinforced synthetics (fibre content ≤ 30%)				
	4.4	Fibre-reinforced synthetics (fibre content > 30%)				
		Special materials				
	5.1	Graphite				
	5.2	Tungsten-copper alloys				
	5.3	Composite materials				
S		**Special materials**				
		Titanium alloys				
	1.1	Pure titanium		≤ 135	≤ 450	CP1 / CP2
	1.2	Titanium alloys	≤ 27	≤ 265	≤ 900	6AL4V
	1.3		≤ 39	≤ 370	≤ 1250	
		Nickel alloys, cobalt alloys and iron alloys				
	2.1	Pure nickel		≤ 180	≤ 600	
	2.2	Nickel-base alloys	≤ 31	≤ 295	≤ 1000	Monel 500, 718 Inconel annealed
	2.3		≤ 49	≤ 475	≤ 1600	718 Inconel
	2.4	Cobalt-base alloys	≤ 31	≤ 295	≤ 1000	
	2.5		≤ 49	≤ 475	≤ 1600	Haynes 25
	2.6	Iron-base alloys	≤ 46	≤ 445	≤ 1500	Incoloy 925
H		**Hard materials**				
	1.1	High strength steels, hardened steels, hard castings	44 - 50			
	1.2		50 - 55			
	1.3		55 - 60			
	1.4		60 - 63			
	1.5		63 - 66			

1. Workpiece Material

Why so Important????

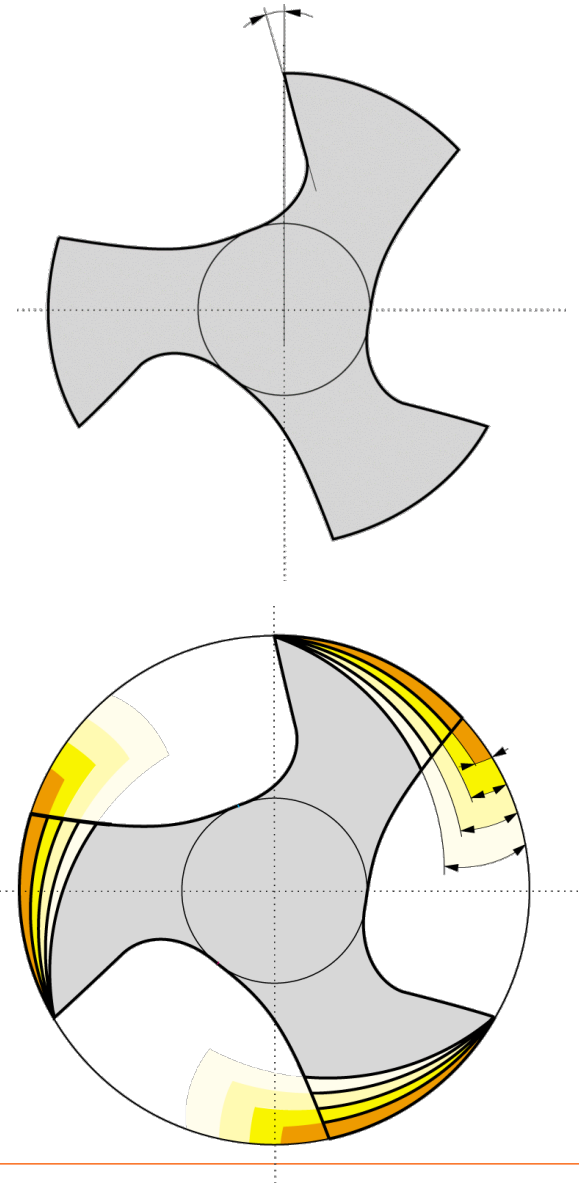
Tap Cutting Geometry…..

****Rake Angle***

****Profile Relief Angle***

Tap Geometry:

MG
MS
GAL
AL
GG
VA
TI
NI
STEEL
H
HCUT
Z
TILEG
SPEED
FK
GJV
PVC
MultiTAP



1. Workpiece Material

Why so Important????

Tap Forming Geometry…..

****Forming Lobe Polygon Shape***

****Number of Forming Lobes***

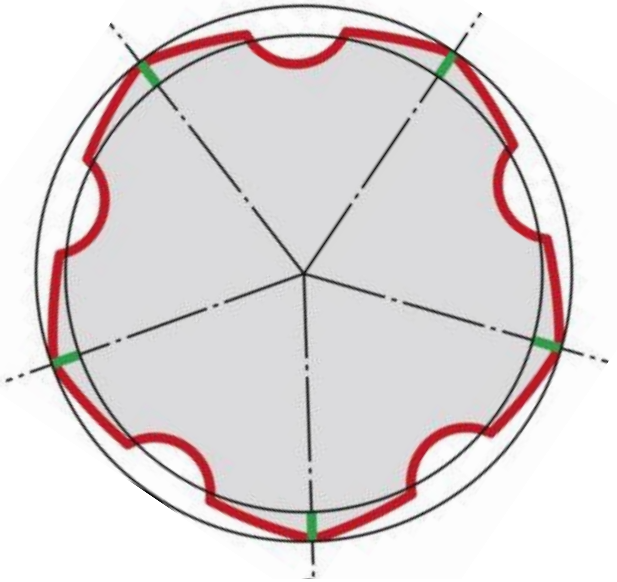
****Tap Coating Type***

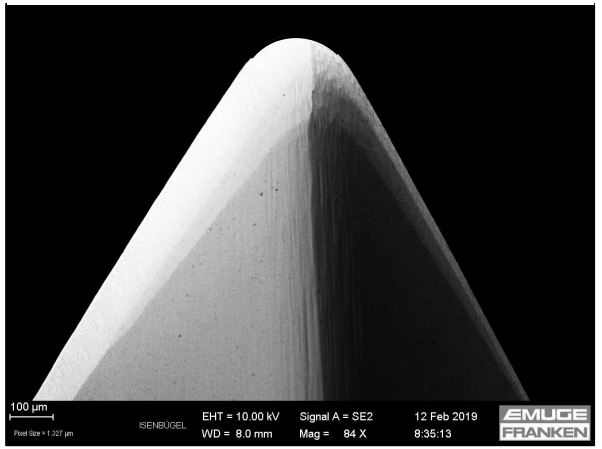
Tap Geometry:

DRUCK

INNOFORM
GAL
AL
VA
H
STEEL-M
STEEL-H
Z
SPEED

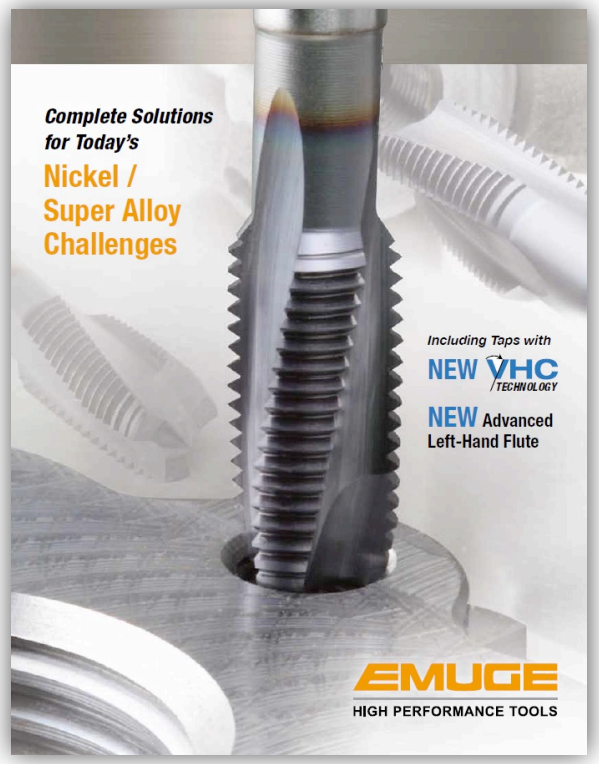
MultiTAP





Material Specific

Titanium



Nickel

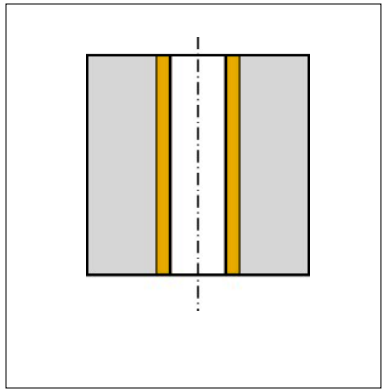
Stainless

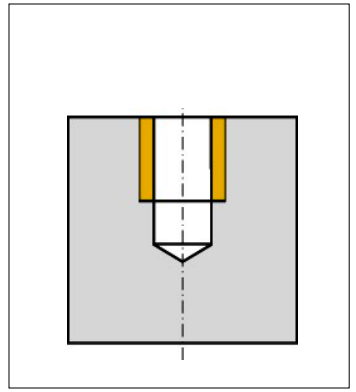
3. Hole Type

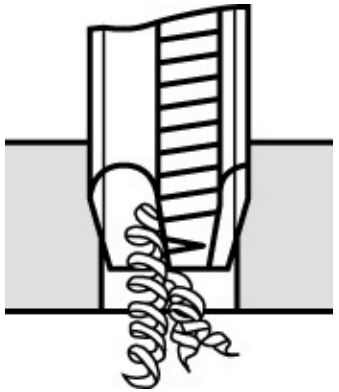
Through Hole or Blind Hole

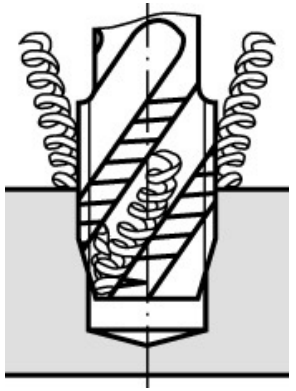
Why so Important????

Chips must be transported









4. Thread Depth or Thread Length

Why so Important????

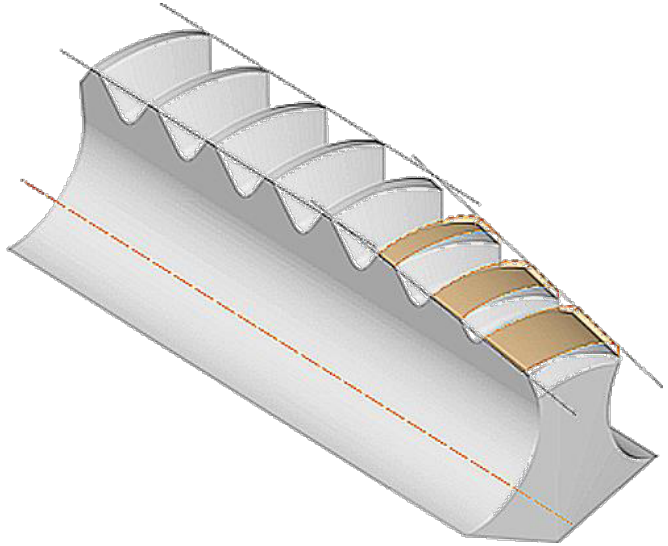
Chips must be transported…..

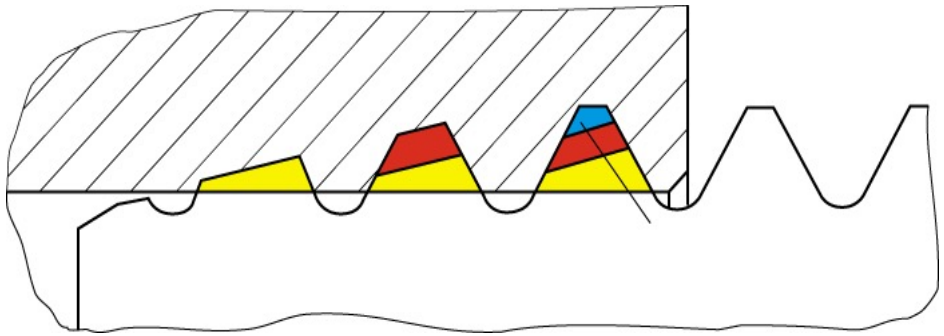
¾-10 UNC Spiral Flute Tap
Thread Depth 1.500 (2xD which is 15 turns)
(.750x3.14)x15 = 35 inches each flute
4x35x3 = 424 inches total chip length (35 feet)

4. Thread Depth or Thread Length

Why so Important????

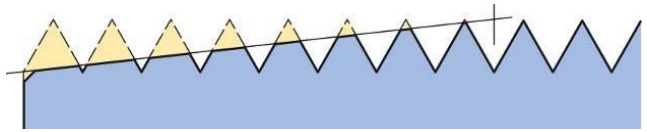
For Blind Holes…..
need to know
Max. drill depth vs Min. full thread depth





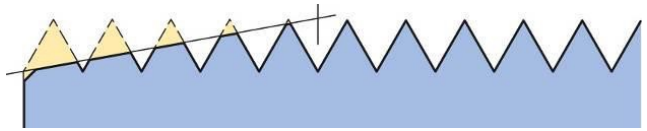
Geometry – Chamfer Forms acc. DIN 2197

Form A

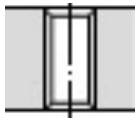


Chamfer length **6-8 threads**
for straight flutes

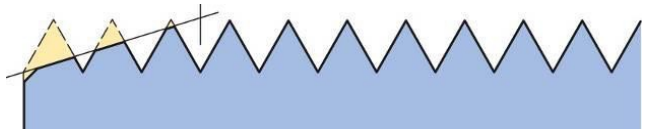
Form B



Chamfer length **3,5-5,5 threads**
for straight flutes with spiral point

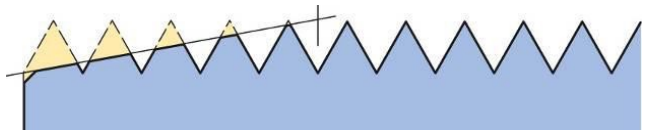


Form C

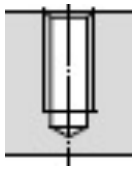


Chamfer length **2-3 threads**
for straight or spiral flutes

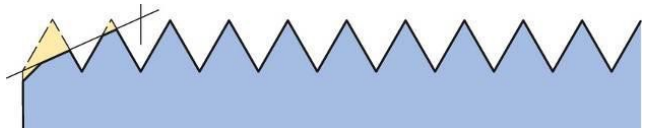
Form D



Chamfer length **3,5-5 threads**
for straight or spiral flutes

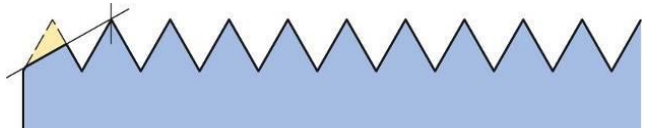


Form E



Chamfer length **1,5-2 threads**
for straight or spiral flutes

Form F



Chamfer length **1-1,5 threads**
for straight or spiral flutes

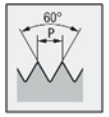
Chamfer length ≤ **1** thread is called **„SKA“**. The chamfer length of the EMUGE taps is adapted to the respective material in individual cases.

5. Thread Size and Tolerance

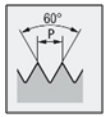
¾-10 UNC-2B
¾-16 UNF-3B
M8-6H
M16x1.5-6H
EG 3/8-24 (STI Thread)

Standard Emuge Taps are marked with the appropriate Class of Fit
…. Same as Thread Gages and Part Prints

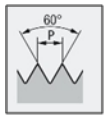
H & D Limit Values are not marked on Emuge taps



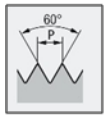
M Metric ISO coarse thread (DIN 13)



MF Metric ISO fine thread (DIN 13)

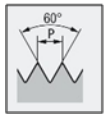


UNC Unified coarse thread (ASME B1.1)

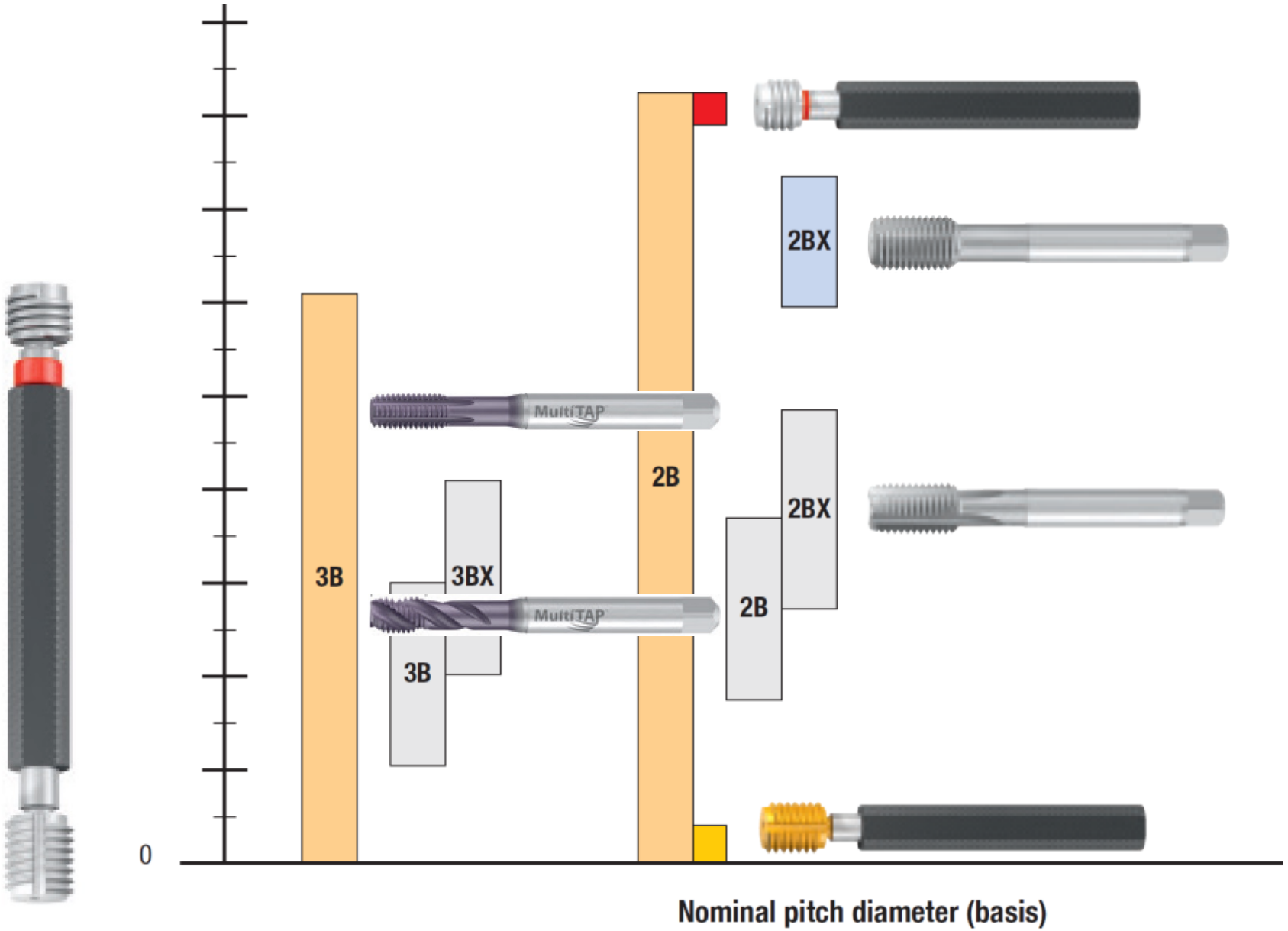


UNF Unified fine thread (ASME B1.1)

UNEF Unified extra fine thread (ASME B1.1)



UN-8 Unified thread (ASME B1.1 8 Thread series)


3B
3BX
3B
MultiTAP
MultiTAP
2B
2B
2BX
2BX
0
Nominal pitch diameter (basis)

Tap Holders

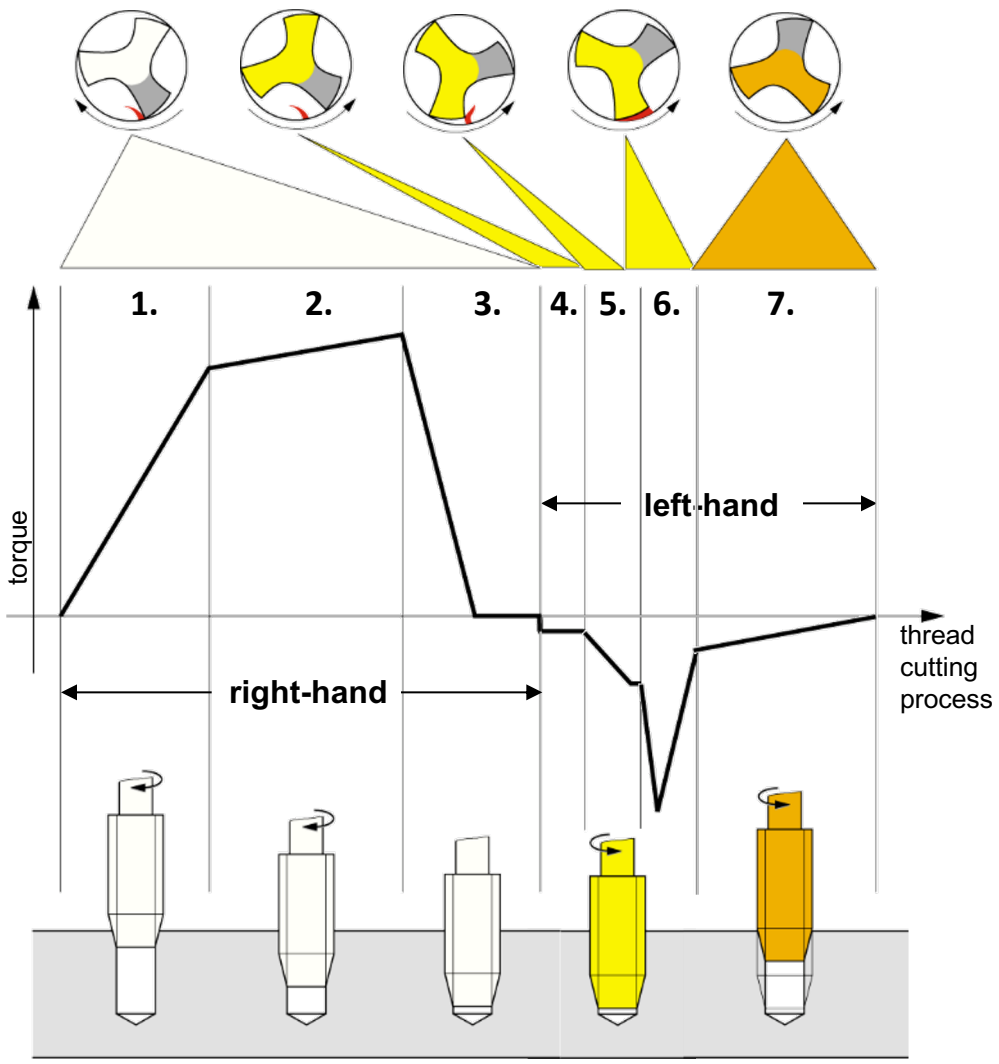








Tapping Cycle Stages



1. **First cutting stage** of the tap, until all chamfer teeth are in contact with the component

2. **Cutting torque of the tap** which is now **cutting with all chamfer teeth**

3. **Braking** of the machine spindle to a complete stop

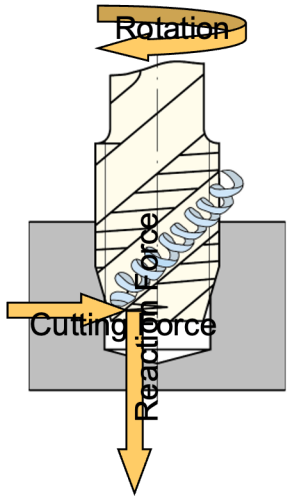
4. **Beginning reversal** of the spindle, until there is contact between the back of the tooth and the remaining chip that was cut by the following tooth

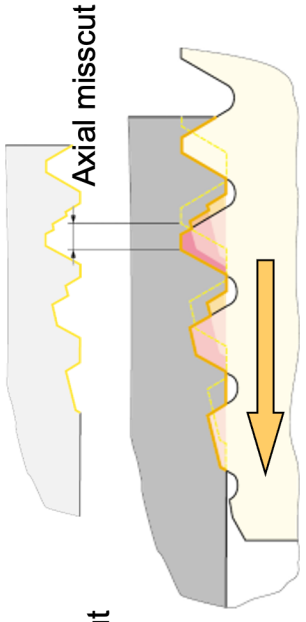
5. **Shearing off of the remaining chip**

6. **Squashing back** of the **chip root** which remains after the remaining chip was sheared off (its size depends on the chamfer relief angle of the tap and the rear cutting angle of the tooth)

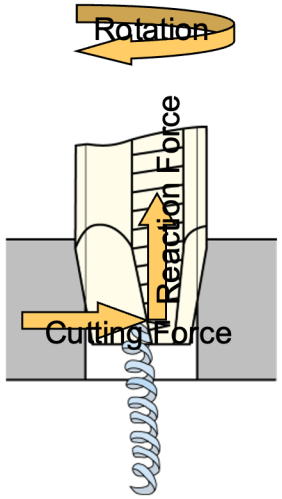
7. **Sliding friction** between **tap** and **workpiece**

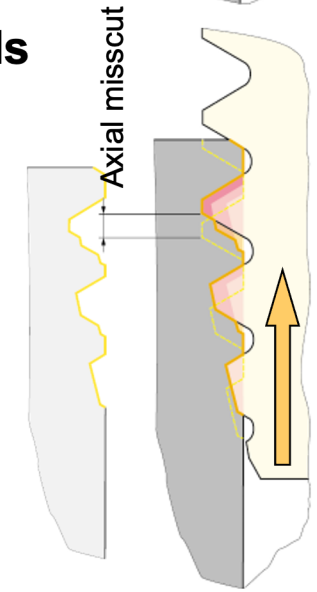
Tap Over Feeds



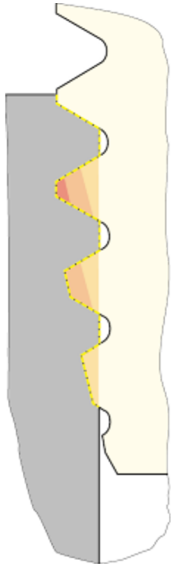


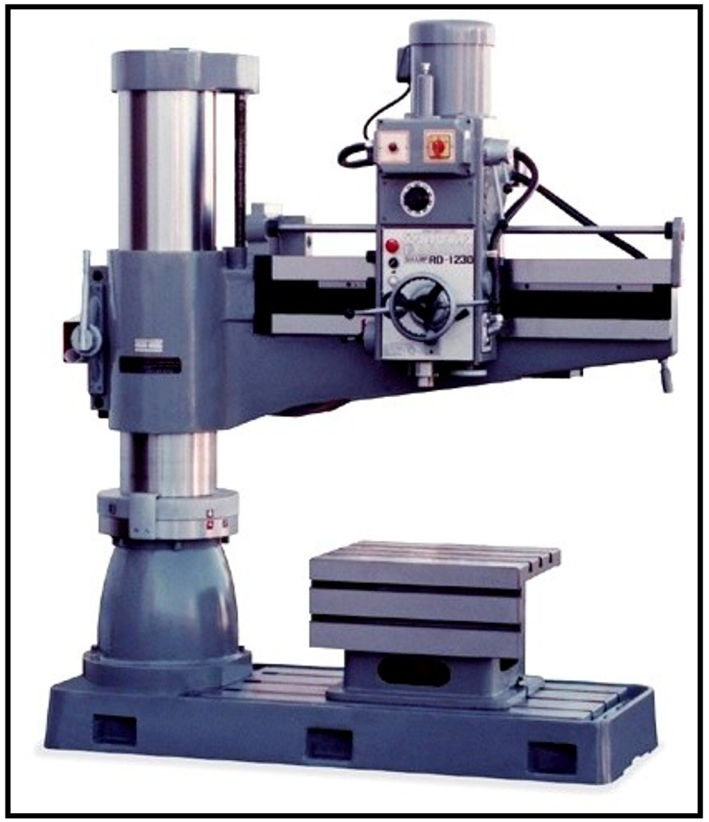
Tap Under Feeds





Correct Thread Profile

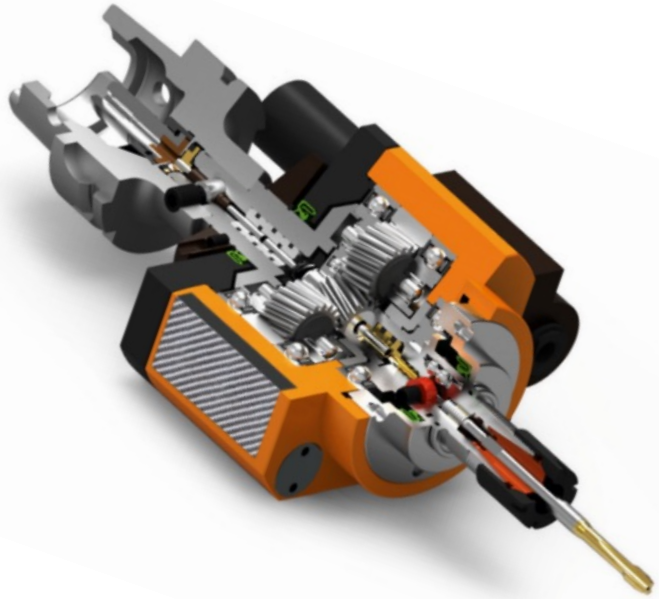




1. Machine Tool (Feed Type)

2. Tap Size Range

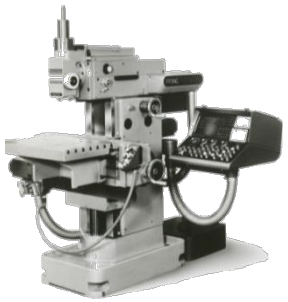
3. Tapping Speed



Feed Types / Examples

CNC machine – synchronous feed

Using a minimal length compensation is **recommended**



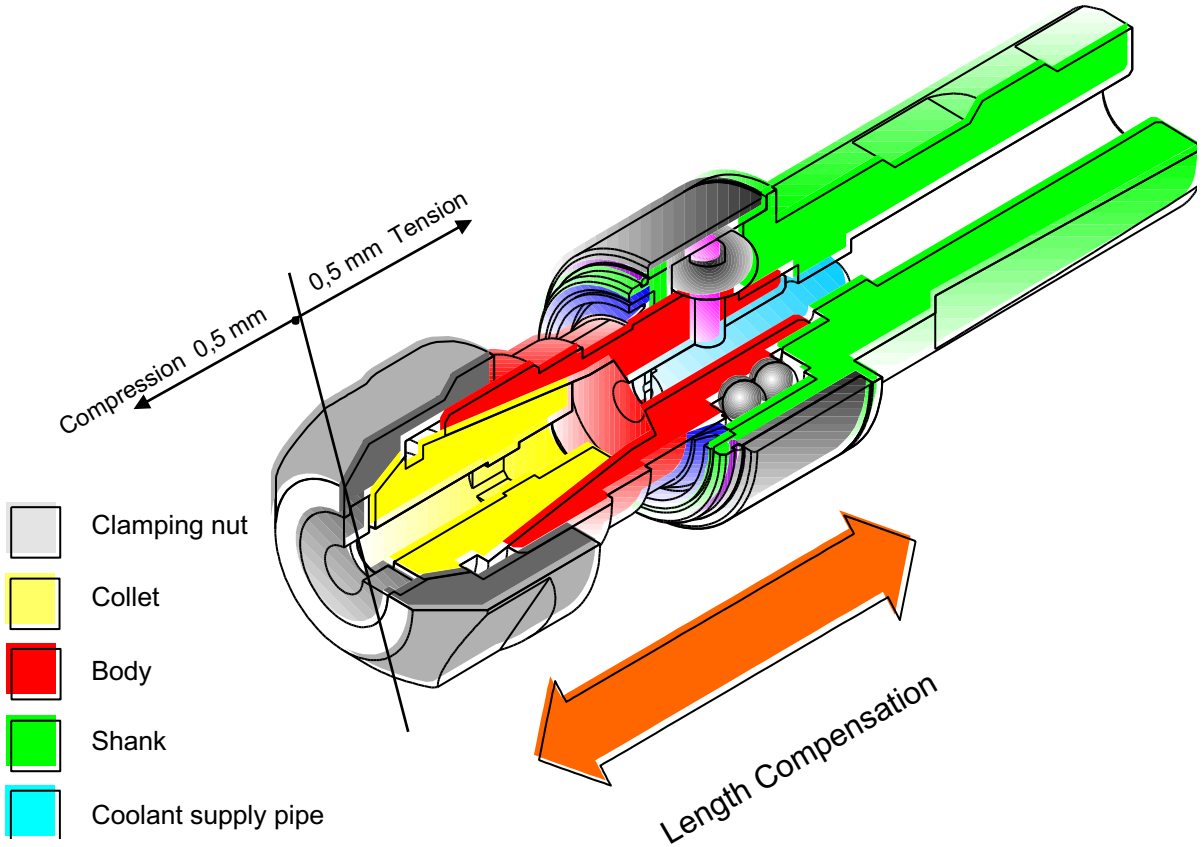
NC machine – non synchronous feed

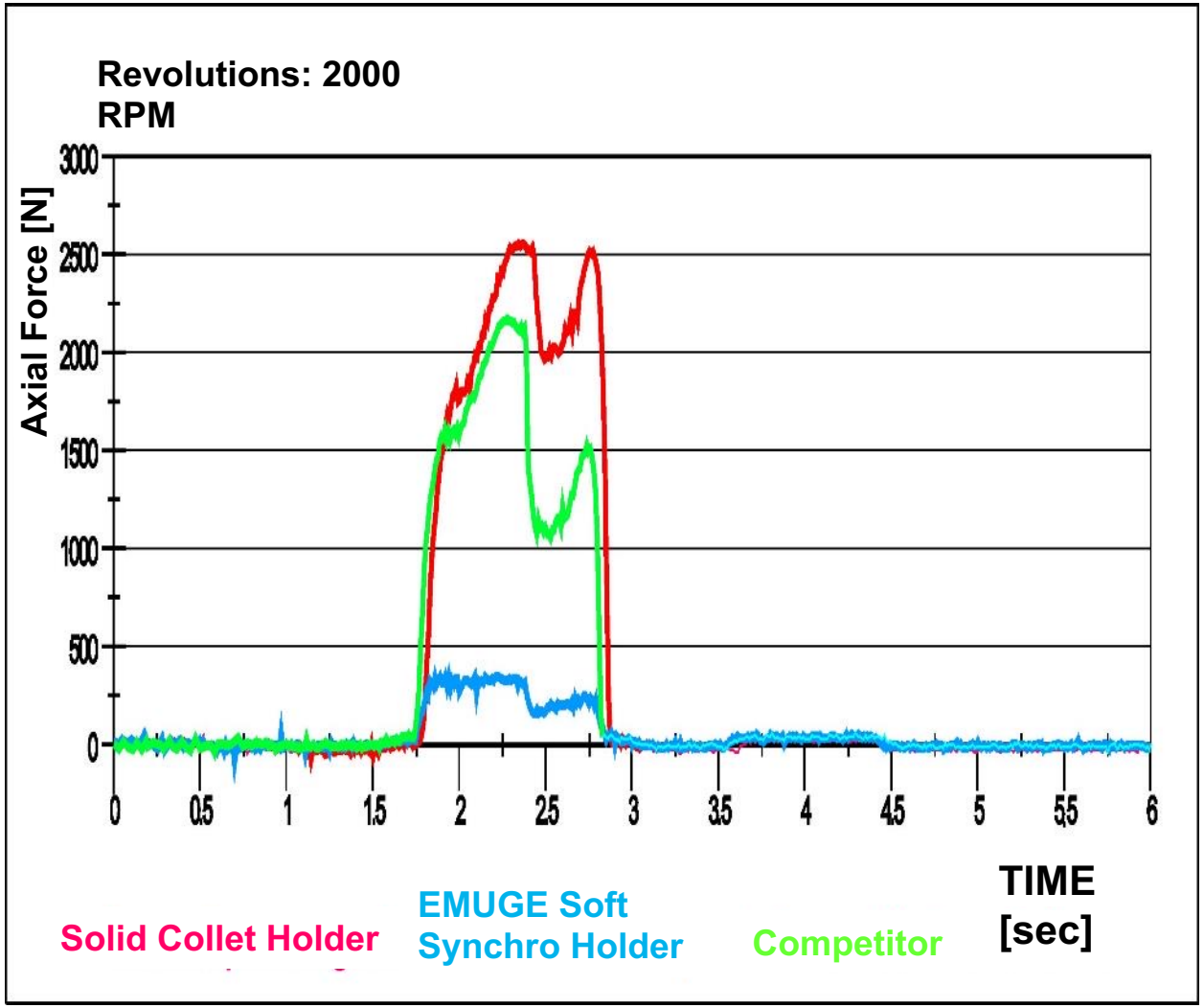
Since there are major compensation errors, a „compensation tap holder“ is **required**

Pillar drilling machine – manual feed

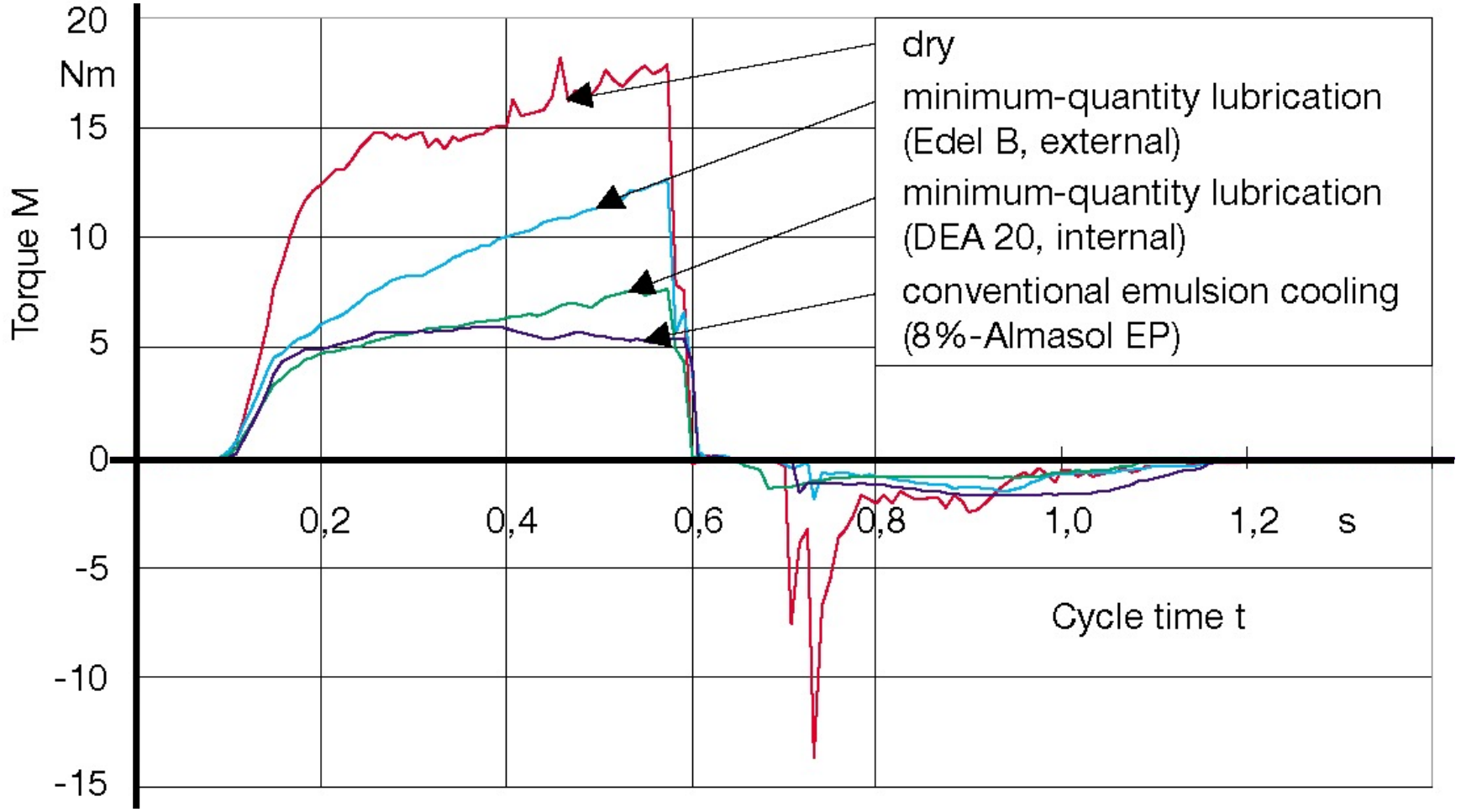
Since there is no feed control, a compensation is **mandatory**
Exception: When using lead screws a lead control between feed and rotary motion is given.

EF SoftSynchro





Influence of Lubrication for Cold-Forming Torque



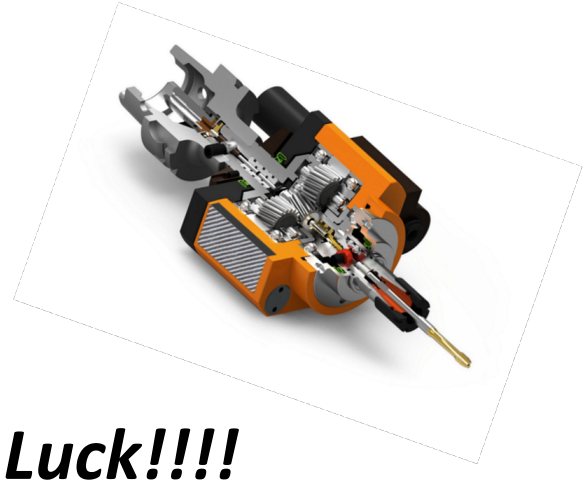
Tool:	Cold-forming tap (nitrided) M10 x 1,5
Hole:	Blind hole 3 x dia. / Drill dia. 9,3 mm
Material:	Aluminium (GK - Al Si 9 Cu 3)
Forming speed:	v = 80 m/min

Good Tap Fluid does not burn &
Reduces Tap Torque…..
by providing effective Lubrication to the Work Surfaces

Tool recommendation - determined in tests in Toolox®

Material	EMUGE MG	Core-hole	Tool type / Geometry (Example)	Item number (Example)	Vc (m/min)	Coolant	Tool picture
Toolox® 33	P 3.1 (980 N/mm²)	Blind	Enorm-Z-TIN	C0503700. …	8 - 12	E / O	
		Through	Rek. B-Z-PM-TIN-70	C0208F01. …	8 - 12	E / O	
		Blind/ Through	Rek. A-Z-TICN	C0109401. …	8 - 12	E / O	
			IF-Z-SN-PM-TIN-80	C521Z700. …	10 - 15	E / O	
			IF-STEEL-M-SN-PM-TIN-66	C5217F00. …	10 - 15	E / O	
Toolox® 40	P 5.1 (1260 N/mm²)	Blind	Rek. D-TI-TICN	C0459601. …	5 - 8	E / O	
		Through	Rek. B-STEEL-TIN	C0201400. …	5 - 8	E / O	
		Blind/ Through	InnoForm-H-SN-TIN-T26	C521W700. …	8 - 10	E / O	
			Rek. A-Z-TICN	C0109401. …	5 - 8	E / O	
Toolox® 44	H 1.1 (45 HRC) (1450 N/mm²)	Blind	Rek. D-TI-TICN	C0459601. …	3 – 5	E / O / P	
		Through	Rek. C-TI-TICN	C0309601. …	3 - 5	E / O / P	
		Blind/ Through	Rek. A-HCUT-TICN	C010J901. …	3 - 4	E / O / P	
			InnoForm-H-SN-TIN-T26	C521W700. …	3 - 6	(E)/O / P	

Tapping Speeds and Feeds



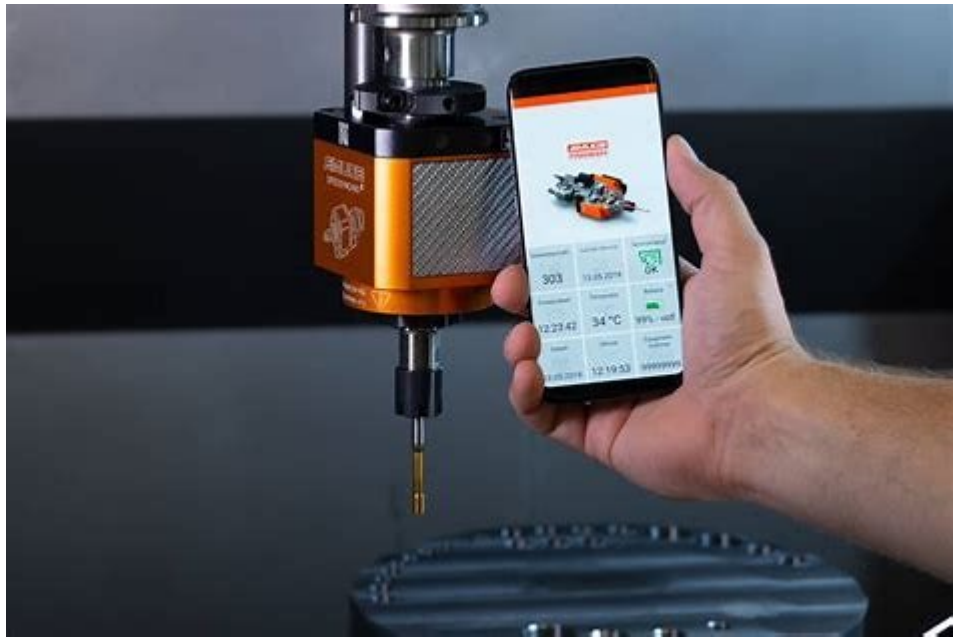
Tap Feeds are fixed = Thread Pitch (pitch x rpm)

Tap Speeds range between 3 to 262 SFM……Good Luck!!!!

**Workpiece Material*

**Machine and Tap Holder Types*

**Coolant Type and Delivery*



Tom Kowalski

Product Application Specialist

Northeast Regional Manager


nnoForm-STEEL-M