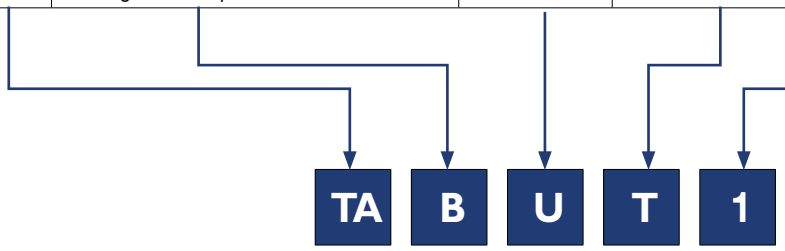
HSS TAPS

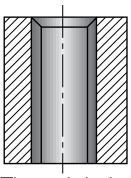
MORSE CUTTING TOOLS

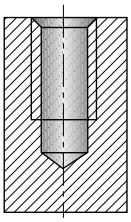
TA- Taps	Flutes	Thread Coarse	**T** - For Through Hole	Blank and Coating Type
	B- Straight Fluted Tap with Spiral Point	**U**- UNC /UNF	**B** - For Blind Hole	**0**- H.S.S
	C- Left-hand Spiral Fluted Tap	**M**- ISO		**1**- H.S.S 5%Co.
	D- Straight Fluted Tap with Long Chamfer Lead	**W**- Hand Tap		**2**- H.S.S 5%Co. TiN Coating
	E- Right-hand Spiral Fluted Tap	**F**- Forming Tap		**3**- H.S.S 5%Co. Black Oxide Coating
	F- Straight Fluted Tap with Short Chamfer Lead			



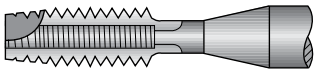
Tap Styles for Hole Types

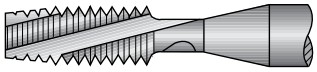
Type of Hole

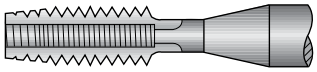

Through hole

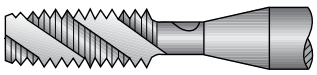

Blind hole

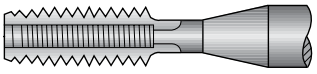
Recommendation of Application


B. Straight fluted tap with spiral point


C. Left-hand spiral fluted tap

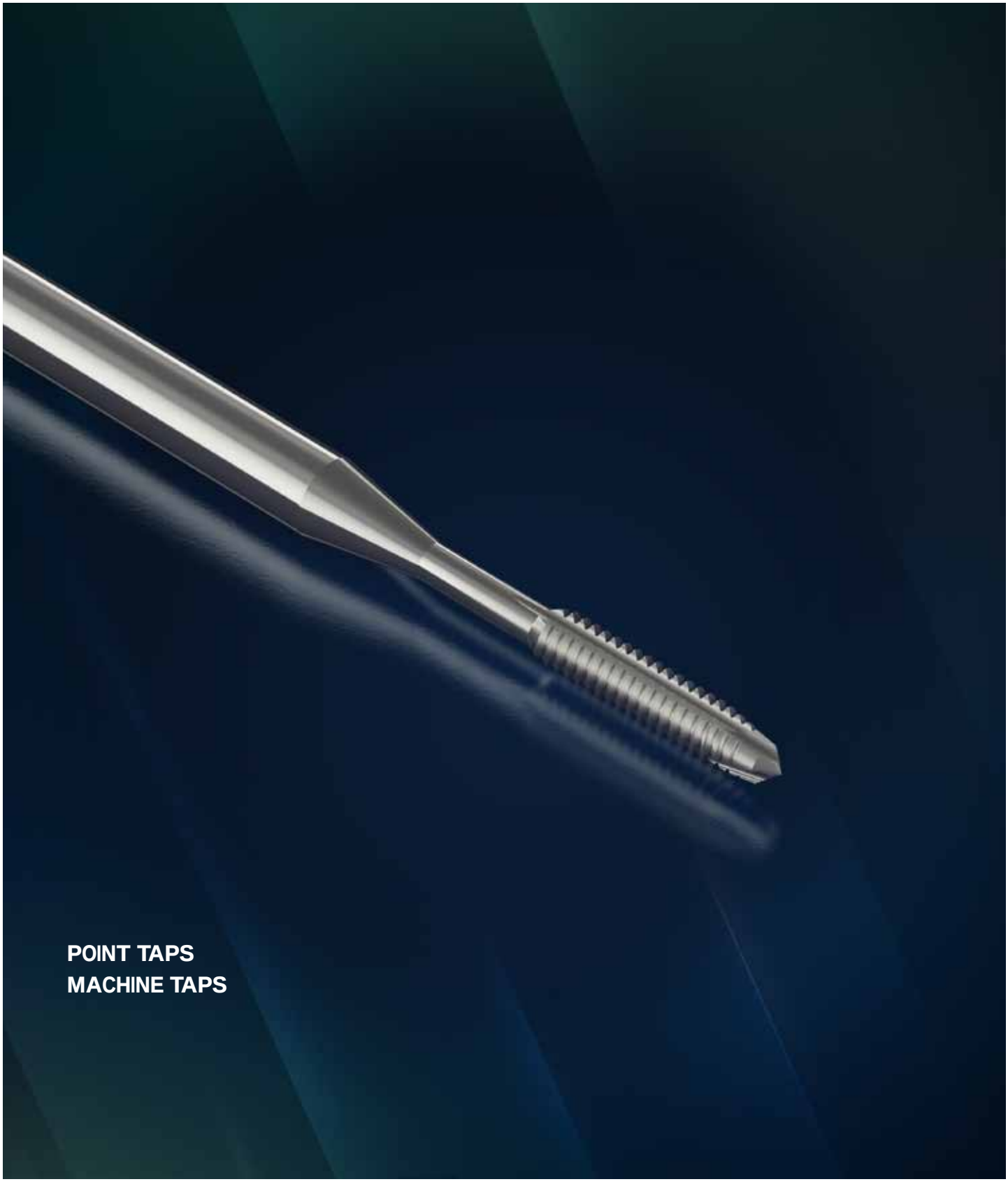

D. Straight fluted tap with long chamfer lead


E. Right-hand spiral fluted tap


F. Straight fluted tap with short chamfer lead

SERIES

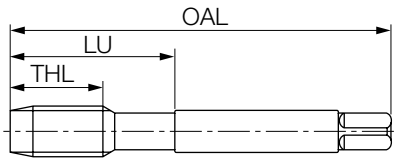
TABUT1 - TABUT3



MORSE TT

SERIES
TABUT1 - TABUT3

- UNC Coarse Thread
- Point Taps
- Machine Taps
- Through Hole



2B

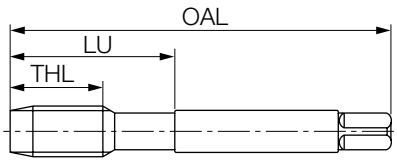
P M K S

TDZ	TPI	THL	LU	OAL	NOF	Uncoated	TiN Coating	Black Oxide Coating
#4	40	7/16	23/32	2.2	3	3409909	3409911	3409910
#5	40	7/16	23/32	2.2	3	3409912	3409914	3409913
#6	32	1/2	13/16	2.2	3	3409915	3409917	3409916
#8	32	33/64	13/16	2.48	3	3409918	3409919	
#10	24	19/32	63/64	2.75	3	3409903	3409905	3409904
1/4	20	11/16	1.18	3.15	3	3409923	3409925	3409924
5/16	18	13/16	1.37	3.54	3	3409932	3409934	3409933
3/8	16	7/8	1.53	4.00	3	3409929	3409931	3409930
7/16	14	7/8	-	4.00	3	3409938	3409940	3409939
1/2	13	63/64	-	4.33	3	3409920	3409922	3409921
9/16	12	1.00	-	4.33	3	3409944	3409946	3409945
5/8	11	1.06	-	4.33	3	3409935	3409937	3409936
3/4	10	1.18	-	5.00	4	3409926	3409928	3409927

• For technical data see pages: 123-142

SERIES
TABUT1 - TABUT3

- UNF Coarse Thread
- Point Taps
- Machine Taps
- Through Hole



2B

P M K S

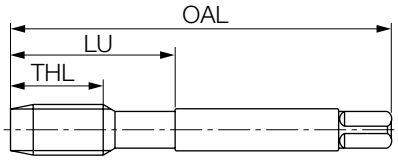
TDZ	TPI	THL	LU	OAL	NOF	Uncoated	TiN Coating	Black Oxide Coating
#10	32	19/32	63/64	2.75	3	3409947	3409949	3409948
1/4	28	11/16	1.18	3.15	3	3409968	3409970	3409969
5/16	24	11/16	1.37	3.54	3	3409977	3409979	3409978
3/8	24	23/32	1.53	4.00	3	3409974	3409976	3409975
7/16	20	7/8	-	4.00	3	3409983	3409985	3409984
1/2	20	7/8	-	4.00	3	3409965	3409967	3409966
9/16	18	7/8	-	4.00	3	3409989	3409991	3409990
5/8	18	13/16	-	4.00	3	#N/A	3409982	
3/4	16	63/64	-	4.33	4	3409971	3409973	3409972

• For technical data see pages: 123-142

MORSE TT

SERIES
TABMT1 - TABMT3

- ISO Coarse Thread
- Point Taps
- Machine Taps
- Through Hole



6H

P M K S

TDZ	TPI	THL	LU	OAL	NOF	Uncoated	TiN Coating	Black Oxide Coating
M2	0.4	8	13	45	3	3410124	3410126	3410125
M2.5	0.45	9	15	50	3	3410100	3410102	3410101
M3	0.5	11	18	56	3	3410136	3410138	3410137
M3.5	0.6	12	20	56	3	3410128	3410130	3410129
M4	0.7	13	21	63	3	3410146	3410148	3410147
M4.5	0.75	14	25	70	3	3410141	3410143	3410142
M5	0.8	15	25	70	3	3410151	3410153	3410152
M6	1	17	30	80	3	3410156	3410158	3410157
M7	1	17	30	80	3	3410161	3410163	3410162
M8	1.25	20	35	90	3	3410165	3410167	3410166
M9	1.25	20	35	90	3	3410170	3410172	3410171
M10	1.5	22	39	100	3	3410061	3410063	3410062
M12	1.75	24	-	110	3	3410071	3410073	3410072
M14	2	26	-	110	3	3410076	3410078	3410077
M16	2	27	-	110	4	3410080	3410082	3410081
M20	2.5	32	-	140	4	3410110	3410112	3410111
M24	3	34	-	160	4	3410117	3410119	3410118

• For technical data see pages: 123-142

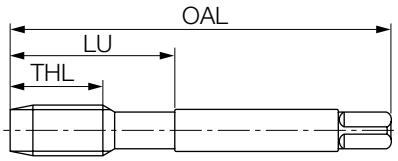
CUTTING DATA

Material	Cutting Speed Vc (m/min)	
	T - Through Hole	Cooalnt Type
Low Alloy Steel <25Hrc	10-40	Oil Emulsion
High Alloy Steel >25Hrc	6-24	Oil Emulsion
Stainless Steel	5-15	Cutting Oil
Cast Iron (GGG)	8-35	Oil Or Emulsion
Cast Iron (GG)	8-24	Oil Or Emulsion
Titanium	6-10	Cutting Oil
Inconel	4-8	Cutting Oil

MORSE TT

SERIES
TADMT1

- H.S.S 5%Co.
- ISO Coarse Thread
- Point Taps
- Machine Taps
- For Hardened Steel
- Through Hole



6H

P H

TDZ	TPI	THL	LU	OAL	NOF	EDP Number
M2	0.4	8	-	45	3	3410123
M2.3	0.4	8	-	45	3	3410094
M2.5	0.45	9	-	50	3	3410099
M2.6	0.45	9	-	50	3	3410104
M3	0.5	11	18	56	3	3410135
M3.5	0.6	12	20	56	3	3410127
M4	0.7	13	21	63	3	3410145
M4.5	0.75	14	25	70	3	3410140
M5	0.8	15	25	70	3	3410150
M6	1	17	30	80	3	3410155
M7	1	17	30	80	3	3410160
M8	1.25	20	35	90	3	3410164
M9	1.25	20	35	90	3	3410169
M10	1.5	22	39	100	3	3410060
M11	1.5	22	-	100	3	3410065
M12	1.75	24	-	110	3	3410070
M14	2	26	-	110	3	3410075
M16	2	27	-	110	3	3410079
M18	2.5	30	-	125	4	3410084
M20	2.5	32	-	140	4	3410109

• For technical data see pages: 123-142

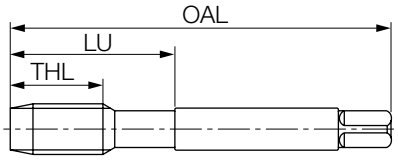
CUTTING DATA

Material	Cutting Speed Vc (m/min)	
	T - Through Hole	Cooalnt Type
Low Alloy Steel <25Hrc	10-40	Oil Emulsion
High Alloy Steel >25Hrc	6-24	Oil Emulsion
Hardened Steel	4-10	Cutting Oil

MORSE TT

SERIES
TAEMT3

- ISO Coarse Thread
- Point Taps
- Machine Taps
- Through Hole
- H.S.S 5%Co. Black Oxide Coating



6HX

P

TDZ	TPI	THL	LU	OAL	NOF	EDP Number
M2.2	0.45	8	-	45	3	3410092
M2.3	0.4	8	-	45	3	3410098
M2.5	0.45	9	-	50	3	3410103
M2.6	0.45	9	-	50	3	3410108
M3	0.5	11	18	56	3	3410139
M3.5	0.6	12	20	56	3	3410131
M4	0.7	13	21	63	3	3410149
M4.5	0.75	14	25	70	3	3410144
M5	0.8	15	25	70	3	3410154
M6	1	17	30	80	3	3410159
M8	1.25	20	35	90	3	3410168
M9	1.25	20	35	90	3	3410173
M10	1.5	22	39	100	3	3410064
M11	1.5	22	-	100	3	3410069
M12	1.75	24	-	110	4	3410074
M16	2	27	-	110	4	3410083
M18	2.5	30	-	125	4	3410088
M20	2.5	32	-	140	4	3410113

• For technical data see pages: 123-142

CUTTING DATA

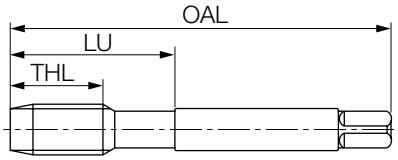
Material	Cutting Speed Vc (m/min)	
	T - Through Hole	Cooalnt Type
Low Alloy Steel <25Hrc	10-40	Oil Emulsion
High Alloy Steel >25Hrc	6-24	Oil Emulsion

SERIES
TAEUB1 - TAEUB3

MORSE TB

SERIES
TAEUB1 - TAEUB3

- UNC Coarse Thread
- Spiral Flute
- Machine Taps
- Blind Hole



2B

P M K S

TDZ	TPI	THL	LU	OAL	NOF	Uncoated	TiN Coating	Black Oxide Coating
#4	40	15/64	23/32	2.2	3	3409998	3410000	3409999
#5	40	1/4	23/32	2.2	3	3410001	3410003	3410002
#6	32	1/4	13/16	2.2	3	3410004	3410006	3410005
#8	32	5/16	13/16	2.48	3	3410007	3410009	3410008
#10	24	3/8	63/64	2.76	3	3409992	3409994	3409993
1/4	20	17/32	1.18	3.15	3	3410016	3410018	3410017
5/16	18	35/64	1.37	3.54	3	3410024	3410026	3410025
3/8	16	5/8	1.53	4.00	3	3410021	3410023	3410022
7/16	14	11/16	-	4.00	3	3410030	3410032	3410031
1/2	13	13/16	-	4.33	3	3410013	3410015	3410014
9/16	12	13/16	-	4.33	3	3410036	3410038	3410037
5/8	11	7/8	-	4.33	3	3410027	3410029	3410028
3/4	10	63/64	-	5.00	4		3410020	3410019
7/8	9	1.06	-	5.51	4	3410033	3410035	3410034
1	8	1.18	-	6.30	4	3410010	3410012	3410011

- For technical data see pages: 123-142

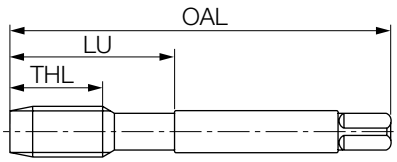
CUTTING DATA

Material	Cutting Speed Vc (m/min)	
	B - Blind Hole	Cooalnt Type
Low Alloy Steel <25Hrc	15-50	Oil Emulsion
High Alloy Steel >25Hrc	9-30	Oil Emulsion
Stainless Steel	5-10	Cutting Oil
Cast Iron (GGG)	10-40	Oil Or Emulsion
Cast Iron (GG)	8-30	Oil Or Emulsion
Titanium	6-10	Cutting Oil
Inconel	2-4	Cutting Oil

MORSE TB

SERIES
TAEMB3

- ISO Coarse Thread
- Spiral Flute
- Machine Taps
- Blind Hole
- H.S.S 5%Co. Black Oxide Coating



6H

H

TDZ	TPI	THL	LU	OAL	NOF	EDP Number
M2	0.4	8		45	3	3419124
M2.2	0.45	8		45	3	3419109
M2.3	0.4	8		45	3	3419111
M2.5	0.45	9		50	3	3419113
M2.6	0.45	9		50	3	3419117
M3	0.5	6	18	56	3	3419129
M3.5	0.6	7	20	56	3	3419127
M4	0.7	7	21	63	3	3419133
M4.5	0.75	8	25	70	3	3419131
M5	0.8	8	25	70	3	3419135
M6	1	10	30	80	3	3419137
M7	1	10	30	80	3	3419139
M8	1.25	13	35	90	3	3419141
M9	1.25	13	35	90	3	3419144
M10	1.5	15	39	100	3	3419092
M11	1.5	17		100	3	3419094
M12	1.75	18		110	3	3419099
M14	2	20		110	3	3419102
M16	2	20		110	3	3419104
M18	2.5	25		125	4	3419107
M20	2.5	25		140	4	3419120

- For technical data see pages: 123-142

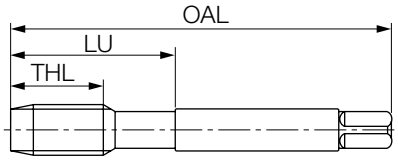
CUTTING DATA

Material	Cutting Speed Vc (m/min)	
	B - Blind Hole	Cooalnt Type
Hardened Steel	4-10	Cutting Oil

MORSE TB

SERIES
TAEMB3

- ISO Coarse Thread
- Spiral Flute
- Machine Taps
- Blind Hole
- H.S.S 5%Co. Black Oxide Coating



6H

P

TDZ	TPI	THL	LU	OAL	NOF	EDP Number
M2	0.4	8		45	3	3419126
M2.2	0.45	8		45	3	3419110
M2.3	0.4	8		45	3	3419112
M2.5	0.45	9		50	3	3419115
M2.6	0.45	9		50	3	3419119
M3	0.5	6	18	56	3	3419130
M3.5	0.6	7	20	56	3	3419128
M4	0.7	7	21	63	3	3419134
M4.5	0.75	8	25	70	3	3419132
M5	0.8	8	25	70	3	3419136
M6	1	10	30	80	3	3419138
M7	1	10	30	80	3	3419140
M8	1.25	13	35	90	3	3419142
M9	1.25	13	35	90	3	3419146
M10	1.5	15	39	100	3	3419093
M11	1.5	17		100	3	3419095
M12	1.75	18		110	3	3419100
M14	2	20		110	3	3419103
M16	2	20		110	3	3419105
M18	2.5	25		125	4	3419108
M20	2.5	25		140	4	3419123

- For technical data see pages: 123-142

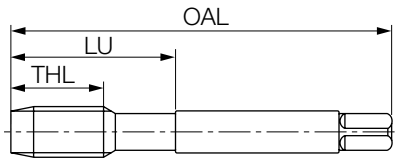
CUTTING DATA

Material	Cutting Speed Vc (m/min)	
	B - For Blind Hole	Coolant Type
Low Alloy Steel <25Hrc	5-15	Oil Emulsion
High Alloy Steel >25Hrc	3-9	Oil Emulsion

MORSE TB

SERIES
TAEMB1 - TAEMB3

- ISO Coarse Thread
- Spiral Flute
- Machine Taps
- Blind Hole



6H

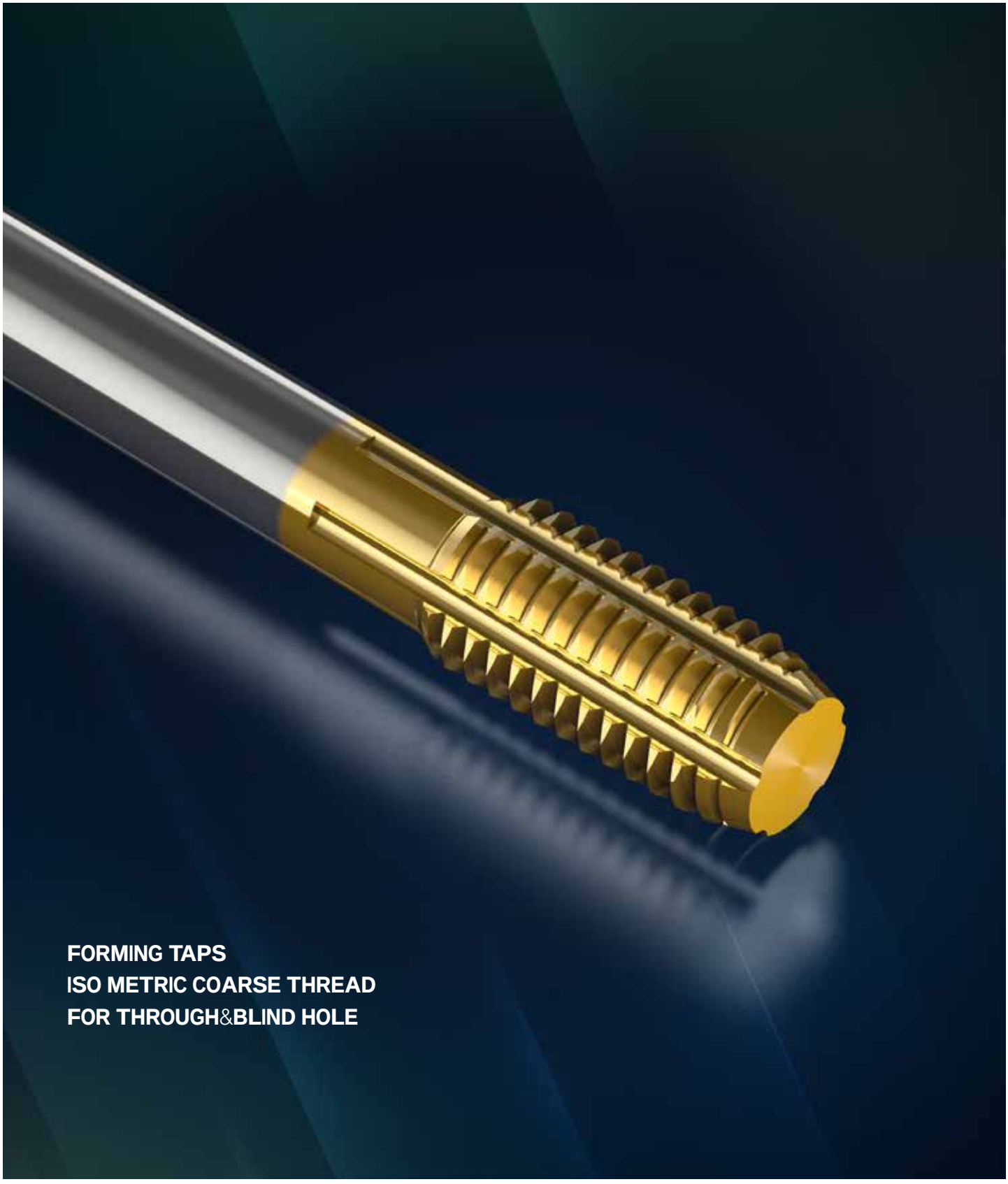
P M K S

TDZ	TPI	THL	LU	OAL	NOF	Uncoated	TiN Coating	Black Oxide Coating
M2	0.4	8	13	45	3	3410239	3410240	3410238
M2.2	0.45	8	13	45	3	3410215	3410216	3410214
M2.3	0.4	8	13	45	3	3410218	3410219	3410217
M2.5	0.45	9	15	50	3	3410221	3410222	3410220
M2.6	0.45	9	15	50	3	3410224	3410225	3410223
M3	0.5	6	18	56	3	3410248	3410249	3410247
M3.5	0.6	7	20	56	3	3410242	3410243	3410241
M4	0.7	7	21	63	3	3410254	3410255	3410253
M4.5	0.75	8	25	70	3	3410251	3410252	3410250
M5	0.8	8	25	70	3	3410257	3410258	3410256
M6	1	10	30	80	3	3410260	3410261	3410259
M7	1	10	30	80	3	3410263	3410264	3410262
M8	1.25	13	35	90	3	3410266	3410267	3410265
M9	1.25	13	35	90	3	3410269	3410270	3410268
M10	1.5	15	39	100	3	3410197	3410198	3410196
M11	1.5	17		100	3	3410200	3410201	3410199
M12	1.75	18		110	3	3410203	3410204	3410202
M14	2	20		110	3	3410206	3410207	3410205
M16	2	20		110	3	3410209	3410210	3410208
M18	2.5	25		125	4	3410212	3410213	3410211
M20	2.5	25		140	4	3410227	3410228	3410226
M22	2.5	25		140	4	3410229	3410231	3410230
M24	3	30		160	4	3410232	3410234	3410233
M27	3	30		160	4	3410235	3410237	3410236
M30	3.5	35		180	4	3410244	3410246	3410245

- For technical data see pages: 123-142

Material	Cutting Speed Vc (m/min)	
	B - For Blind Hole	Coolant Type
Low Alloy Steel <25Hrc	5-15	Oil Emulsion
High Alloy Steel >25Hrc	3-9	Oil Emulsion
Stainless Steel	2-3	Cutting Oil
Cast Iron (GGG)	3-12	Oil Or Emulsion
Cast Iron (GG)	2-9	Oil Or Emulsion
Titanium	2-3	Cutting Oil
Inconel	1-3	Cutting Oil

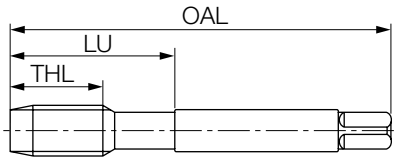
SERIES
TFBT2



MORSE TF

SERIES
TFBT2

- Forming Taps
- ISO Coarse Thread
- For Through&Blind Hole
- H.S.S 5%Co. TiN Coating



6H

P

TDZ	TPI	THL	LU	OAL	NOF	EDP Number
M2	0.4	8	-	45	5	3410050
M2.5	0.45	9	-	50	5	3410047
M2.6	0.45	9	-	50	5	3410048
M3	0.5	11	18	56	5	3410052
M3.5	0.6	12	20	56	5	3410051
M4	0.7	13	21	63	5	3410054
M4.5	0.75	14	25	70	5	3410053
M5	0.8	15	25	70	5	3410055
M6	1	17	30	80	5	3410056
M7	1	17	30	80	5	3410057
M8	1.25	20	35	90	5	3410058
M9	1.25	20	35	90	5	3410059
M10	1.5	22	39	100	5	3410039
M11	1.5	22	-	100	5	3410040
M12	1.75	24	-	110	5	3410041
M14	2	26	-	110	5	3410042
M16	2	27	-	110	6	3410043
M18	2.5	30	-	125	6	3410044
M20	2.5	32	-	140	6	3410049

- For technical data see pages: 123-142

CUTTING DATA

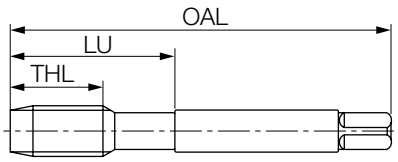
Material	Cutting Speed Vc (m/min)		
	B - For Blind Hole	T - For Through Hole	Coolant Type
Low Alloy Steel <25Hrc	3-15	3-12	Oil Emulsion
High Alloy Steel >25Hrc	3-10	2-8	Oil Emulsion

SERIES
TAWMBT0

MORSE TH

SERIES
TAWMBT0

- ISO Coarse Thread
- Hand Taps
- H.S.S



6H

P

TDZ	TPI	THL	OAL	NOF	EDP Number
M2	0.4	8	36	3	3410185
M2.2	0.45	9	36	3	3410180
M2.3	0.4	9	36	3	3410181
M2.5	0.45	9	40	3	3410182
M2.6	0.45	9	40	3	3410183
M3	0.5	11	40	3	3410187
M3.5	0.6	13	45	3	3410186
M4	0.7	13	45	3	3410189
M4.5	0.75	16	50	3	3410188
M5	0.8	16	52	3	3410191
M5.5	0.9	18	56	3	3410190
M6	1	18	56	3	3410192
M7	1	18	56	3	3410193
M8	1.25	20	63	3	3410194
M9	1.25	20	63	4	3410195
M10	1.5	22	70	4	3410174
M11	1.5	22	70	4	3410175
M12	1.75	24	80	4	3410176
M14	2	26	80	4	3410177
M16	2	27	80	4	3410178
M18	2.5	30	95	4	3410179
M20	2.5	32	95	4	3410184

• For technical data see pages: 123-142

Tap Surface Treatments and Coating Types

The high speed steels we use facilitate high wear resistance and toughness.
For machining certain materials, various surface treatments are an advantage.

Steam Tempered (ST)

The steam tempered is a Fe_3O_4 –oxyd-coating which **reduces the friction** between the tool and workpiece and **prevents cold welding**.

Nitriding (NI)

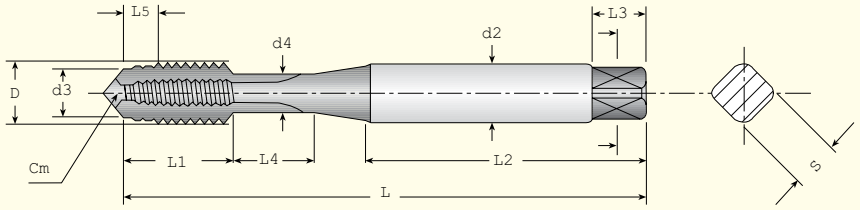
Recommended surface treatment **for machining hard wear/abrasive materials** such as **gray cast iron, aluminum alloys with high silicon percentage** (more than 10%).

TiN Coating (TI)

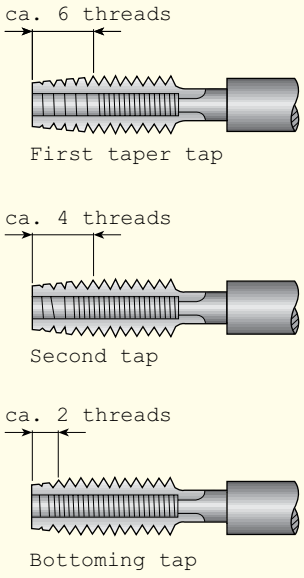
The TiN coating has a hardness of approximately 2,300 HV and is temperature resistant up to approximately 600°C. This is an excellent golden colored coating **for general applications**.

Tap Nomenclature and Standards

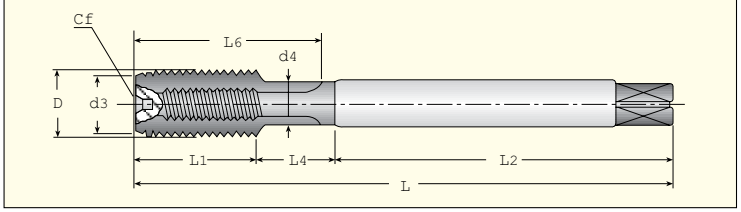
DIN 371



Chamfer Lead Length for Sets of 3 Hand Taps



DIN 376



D Major diameter
d_2 Shank diameter
d_3 Chamfer diameter
d_4 Neck diameter
L Total length
L_1 Thread length
L_1 Shank length
L_3 Square length
L_4 Neck length
L_5 Chamfer length
L_6 Flute length
S Square size
Cm Center male
Cf Center female

Pre-Tapping Hole Sizes

ISO Metric Threads Coarse Pitch			
M	Pitch mm	Max. Core Dia. mm	Drill Size mm
1	0.25	0.785	0.75
1,1	0.25	0.885	0.85
1,2	0.25	0.985	0.95
1,4	0.30	1.160	1.10
1,6	0.35	1.321	1.25
1,7	0.35	1.346	1.30
1,8	0.35	1.521	1.45
2	0.40	1.679	1.60
2,2	0.45	1.838	1.75
2,3	0.40	1.920	1.90
2,5	0.45	2.138	2.05
2,6	0.45	2.176	2.10
3	0.50	2.599	2.50
3,5	0.60	3.010	2.90
4	0.70	3.422	3.30
4,5	0.75	3.878	3.70
5	0.80	4.334	4.20
6	1.00	5.153	5.00
7	1.00	6.153	6.00
8	1.25	6.912	6.80
9	1,25	7.912	7.80
10	1.50	8.676	8.50
11	1.50	9.676	9.50
12	1.75	10.441	10.20
14	2.00	12.210	12.00
16	2.00	14.210	14.00
18	2.50	15.744	15.50
20	2.50	17.744	17.50
22	2.50	19.744	19.50
24	3.00	21.252	21.00
27	3.00	24.252	24.00
30	3.50	26.771	26.50
33	3.50	29.771	29.50
36	4.00	32.270	32.00
39	4.00	35.270	35.00
42	4.50	37.799	37.50
45	4.50	40.799	40.50
48	5.00	43.297	43.00
52	5.00	47.297	47.00
56	5.50	50.796	50.50
60	5.50	54.796	54.50
64	6.00	58.305	58.00
68	6.00	62.305	62.00

ISO Metric Threads Fine Pitch			
MF	Pitch mm	Max. Core Dia. mm	Drill Size mm
2,5	0.35	2.221	2.15
3	0.35	2.271	2.65
3,5	0.35	3.221	3.15
4	0.50	3.599	3.50
4,5	0.50	4.099	4.00
5	0.50	4.599	4.50
5,5	0.50	5.099	5.00
6	0.75	5.378	5.20
7	0.75	6.378	6.20
8	0.75	7.378	7.20
8	1.00	7.153	7.00
9	0.75	8.378	8.20
9	1.00	8.153	8.00
10	0.75	9.378	9.20
10	1.00	9.153	9.00
10	1.25	8.912	8.80
11	0.75	10.378	10.20
11	1.00	10.153	10.00
12	1.00	11.153	11.00
12	1,25	10.912	10.80
12	1,50	10.676	10.50
14	1,00	13.153	13.00
14	1,25	12.912	12.80
14	1.50	12.676	12.50
15	1.00	14.153	14.00
15	1.50	13.676	13.50
16	1.00	15.153	15.00
16	1.50	14.676	14.50
17	1.00	16.153	16.00
17	1.50	15.676	15.50
18	1.00	17.153	17.00
18	1.50	16.676	16.50
18	2.00	16.210	16.00
20	1.00	19.153	19.00
20	1.50	18.676	18.50
20	2.00	18.210	18.00
22	1,00	21.153	21.00
22	1.50	20.676	20.50
22	2.00	20.210	20.00
24	1.00	23.153	23.00
24	1,50	22.676	22.50
24	2,00	22.210	22.00
25	1.00	24.153	24.00
25	1.50	23.676	23.50

ISO Metric Threads Fine Pitch			
MF	Pitch mm	Max. Core Dia. mm	Drill Size mm
25	2.00	23.210	23.00
26	1.50	24.676	24.50
27	1.00	26.153	26.00
27	1.50	25.676	25.50
27	2.00	25.210	25.00
28	1.00	27.153	27.00
28	1.50	26.676	26.50
28	2.00	26.210	26.00
30	1.00	29.153	29.00
30	1.50	28.676	28.50
30	2.00	28.210	28.00
30	3.00	27.252	27.00
32	1.50	30.675	30.50
32	2.00	30.210	30.00
33	1.50	31.676	31.50
33	2.00	31.210	31.00
33	3.00	30.252	30.00
35	1.50	33.676	33.50
36	1.50	34.676	34.50
36	2.00	34.210	34.00
36	3.00	33.252	33.00
38	1.50	36.676	36.50
39	1.50	37.676	37.50
39	2.00	37.210	37.00
39	3.00	36.252	36.00
40	1,50	38.676	38.50
40	2.00	38.210	38.00
40	3,00	37.252	37.00
42	1,50	40.676	40.50
42	2,00	40.210	40.00
42	3,00	39.252	39.00
45	1.50	43.676	43.50
45	2.00	43.210	43.00
45	3.00	42.252	42.00
48	1.50	46.676	46.50
48	2.00	46.210	46.00
48	3.00	45.252	45.00
50	1.50	48.676	48.50
50	2.00	48.210	48.00
50	3.00	47.252	47.00
52	1.50	50.676	50.50
52	2.00	50.210	50.00
52	3.00	49.252	49.00

Pre-Tapping Hole Sizes - Forming Taps

Recommended Tap Drill Size		
M	Pitch mm	Drill Size mm
1	0.25	0.9
1.1	0.25	1
1.2	0.25	1.1
1.4	0.3	1.28
1.6	0.35	1.47
1.7	0.35	1.57
1.8	0.35	1.67
2	0.4	1.85
2.2	0.45	2.03
2.3	0.4	2.15
2.5	0.45	2.33
2.6	0.45	2.43
3	0.5	2.8
3.5	0.6	3.25
4	0.7	3.7
4.5	0.75	4.2
5	0.8	4.65
6	1	5.1
7	1	5.6
8	1.25	6.6
9	1.25	7.45
10	1.5	8.45
11	1.5	9.35
12	1.75	11.25
14	2	13.1
16	2	15.1
18	2.5	16.85
20	2.5	18.85
22	2.5	20.85
24	3	22.65
27	3	25.65
30	3.5	28.4
33	3.5	31.4
36	4	34.15
39	4	37.15
42	4.5	39.9
45	4.5	42.9
48	5	45.65

Recommended Tap Drill Size		
MF	Pitch mm	Drill Size mm
2.5	0.35	2.37
2.6	0.35	2.47
3	0.35	2.88
3.5	0.35	3.38
4	0.5	3.8
5	0.5	4.8
6	0.5	5.8
6	0.75	5.7
7	0.75	6.7
8	0.75	7.7
8	1	7.6
9	0.75	8.7
9	1	8.6
10	0.75	9.7
10	1	9.6
10	1.25	9.45
11	1	10.6
12	1	11.6
12	1.25	11.45
12	1.5	11.35
14	1	13.6
14	1.25	13.45
14	1.5	13.35
15	1	14.6
15	1.5	14.35
16	1	15.6
16	1.5	15.35
18	1	17.6
18	1.5	17.35
18	2	17.1
20	1	19.6
20	1.5	19.35
20	2	19.1
24	2	23.1
30	2	29.1
36	3	34.65
42	4	40.15
48	3	46.65

Pre-Tapping Hole Sizes - General Taps

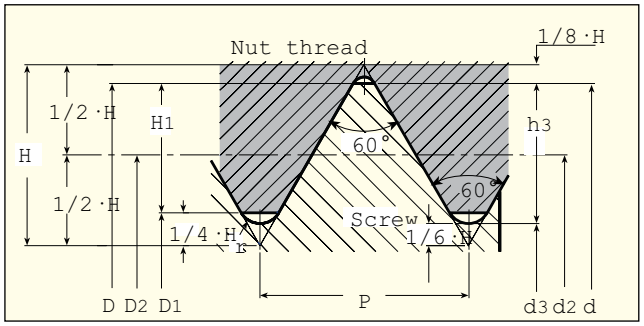
American Unified Coarse Threads			
UNC	T.P.I	Max. Core Dia. inch	Drill Size inch
#1	64	.062	.059
#2	56	.073	.070
#3	48	.084	.082
#4	40	.093	.090
#5	40	.106	.102
#6	32	.114	.112
#8	32	.138	.137
#10	24	.155	.153
#12	24	.180	.177
1/4"	20	.206	.204
5/16"	18	.262	.259
3/8"	16	.138	.314
7/16"	14	.371	.370
1/2"	13	.428	.423
9/16"	12	.484	.482
5/8"	11	.539	.531
3/4"	10	.654	.649
7/8"	9	.768	.767
1"	8	.879	.875
1*1/8"	7	.987	.984
1*1/4"	7	1.112	1.112
1*3/8"	6	1.214	1.210
1*1/2"	6	1.339	1.338
1*3/4"	5	1.557	1.555
2"	4.5	1.786	1.781

American Unified Fine Threads			
UNF	T.P.I	Max. Core Dia. inch	Drill Size inch
#0	80	.051	.051
#1	72	.063	.062
#2	64	.075	.074
#3	56	.086	.082
#4	48	.096	.094
#5	44	.107	.106
#6	40	.118	.118
#8	36	.141	.137
#10	32	.164	.161
#12	28	.185	.185
1/4"	28	.219	.216
5/16"	24	.275	.271
3/8"	24	.337	.334
7/16"	20	.391	.389
1/2"	20	.453	.452
9/16"	18	.510	.507
5/8"	18	.572	.570
3/4"	16	.690	.688
7/8"	14	.806	.807
1"	12	.919	.915
1*1/8"	12	1.044	1.043
1*1/4"	12	1.169	1.161
1*3/8"	12	1.294	1.287
1*1/2"	12	1.419	1.417

ISO Metric Thread

Nominal Dimensions According to UNI 4535-64

Tap flank diameter production tolerances for ISO 6H nut threads limit dimensions - nut threads ISO 6H



Coarse Pitch Threads
Dimensions in mm

$H = 0.86603P$

$H_1 = \frac{5}{8} H = 0.54127P$

$h_3 = \frac{17}{24} H = 0.61343P$

$d_2 = D_2 = d - \frac{3}{4} H = d - 0.64952P$

$d_3 = d - 2h_3 = d - 1.22687P$

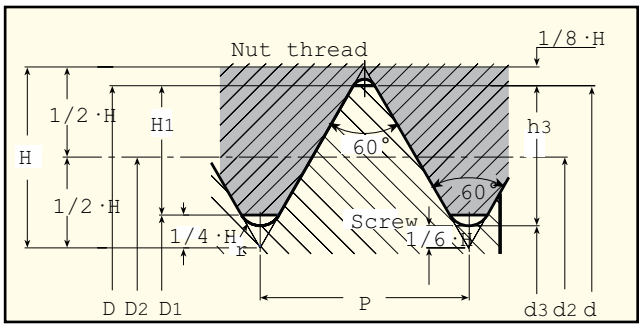
$r = \frac{H}{6} = 0.14434P$

Nominal Dia. d=D	Pitch P	Flank Dia. $d_2=D_2$	Minor Diameter		Thread Depth		Radius	Flank Dia. Tap Tolerance 6H d2		Flank Dia. Tap Tolerance 6H	
			Screw d_3	Nut D_1	Screw h_3	Nut H_1	r	Min.	Max.	Min.	Max.
M1.6	0.35	1.373	1.171	1.221	0.215	0.189	0.051	1.393	1.407	1.373	1.458
M1.8	0.35	1.573	1.371	1.421	0.215	0.189	0.051	1.593	1.607	1.573	1.658
M2	0.4	1.740	1.509	1.567	0.245	0.217	0.058	1.761	1.776	1.740	1.830
M2.2	0.45	1.908	1.648	1.713	0.276	0.244	0.065	1.931	1.946	1.908	2.003
M2.5	0.45	2.208	1.948	2.013	0.276	0.244	0.065	2.231	2.246	2.208	2.303
M3	0.5	2.675	2.387	2.459	0.307	0.271	0.072	2.699	2.715	2.675	2.775
M3.5	0.6	3.110	2.764	2.850	0.368	0.325	0.087	3.137	3.155	3.110	3.222
M4	0.7	3.545	3.141	3.242	0.429	0.379	0.101	3.574	3.593	3.545	3.663
M4.5	0.75	4.013	3.580	3.688	0.460	0.406	0.108	4.042	4.061	4.013	4.131
M5	0.8	4.480	4.019	4.134	0.491	0.433	0.115	4.510	4.530	4.480	4.605
M6	1	5.350	4.773	4.917	0.613	0.541	0.144	5.385	5.409	5.350	5.500
M7	1	6.350	5.773	5.917	0.613	0.541	0.144	6.385	6.409	6.350	6.500
M8	1.25	7.188	6.466	6.647	0.767	0.677	0.180	7.226	7.251	7.188	7.348
M9	1.25	8.188	7.466	7.647	0.767	0.677	0.180	8.226	8.251	8.188	8.348
M10	1.5	9.026	8.160	8.376	0.920	0.812	0.217	9.068	9.096	9.026	9.206
M11	1.5	10.026	9.160	9.376	0.920	0.812	0.217	10.068	10.096	10.026	10.206
M12	1.75	10.863	9.853	10.106	1.074	0.947	0.253	10.911	10.943	10.863	11.063
M14	2	12.701	11.546	11.835	1.227	1.083	0.289	12.752	12.786	12.701	12.913
M16	2	14.701	13.546	13.835	1.227	1.083	0.289	14.752	14.786	14.701	14.913
M18	2.5	16.376	14.933	15.294	1.534	1.353	0.361	16.430	16.466	16.376	16.600
M20	2.5	18.376	16.933	17.294	1.534	1.353	0.361	18.430	18.466	18.376	18.600
M22	2.5	20.376	18.933	19.294	1.534	1.353	0.361	20.430	20.466	20.376	20.600
M24	3	22.051	20.319	20.752	1.840	1.624	0.433	22.115	22.157	22.051	22.316
M27	3	25.051	23.319	23.752	1.840	1.624	0.433	25.115	25.157	25.051	25.316
M30	3.5	27.727	25.706	26.211	2.147	1.894	0.505	27.794	27.839	27.727	28.007
M33	3.5	30.727	28.706	29.211	2.147	1.894	0.505	30.794	30.839	30.727	31.007
M36	4	33.402	31.093	31.670	2.454	2.165	0.577	33.473	33.520	33.402	33.702
M39	4	36.402	34.093	34.670	2.454	2.165	0.577	36.473	36.520	36.402	36.702
M42	4.5	39.077	36.479	37.129	2.760	2.436	0.650	39.152	39.202	39.077	39.392
M45	4.5	42.077	39.479	40.129	2.760	2.436	0.650	42.152	42.202	42.077	42.392
M48	5	44.752	41.866	42.587	3.067	2.706	0.722	44.832	44.885	44.752	45.087
M52	5	48.752	45.866	46.587	3.067	2.706	0.722	48.832	48.885	48.752	49.087
M56	5.5	52.428	49.252	50.046	3.374	2.977	0.794	52.512	52.568	52.428	52.783
M60	5.5	56.428	53.252	54.046	3.374	2.977	0.794	56.512	56.568	56.428	56.783
M64	6	60.103	56.639	57.505	3.681	3.248	0.866	60.193	60.253	60.103	60.478
M68	6	64.103	60.639	61.505	3.681	3.248	0.866	64.193	64.253	64.103	64.478
Metric Thread MA (old UNI 159 profile)								**Nut Tolerance SH8**			
M1.7	0.35	1.473	1.246	1.246	0.227	0.227	0.040	1.493	1.507	1.473	1.529
M2.3	0.4	2.040	1.780	1.780	0.260	0.260	0.040	2.061	2.076	2.040	2.120
M2.6	0.45	2.308	2.016	2.016	0.292	0.292	0.050	2.331	2.346	2.308	2.388

ISO Metric Fine Thread

Nominal Dimensions According to UNI 4535-64

Tap flank diameter production tolerances for ISO 6H nut threads limit dimensions - nut threads ISO 6H



Coarse Pitch Threads
Dimensions in mm

$H = 0.86603P$

$H_1 = \frac{5}{8} H = 0.54127P$

$h_3 = \frac{17}{24} H = 0.61343P$

$d_2 = D_2 = d - \frac{3}{4} H = d - 0.64952P$

$d_3 = d - 2h_3 = d - 1.22687P$

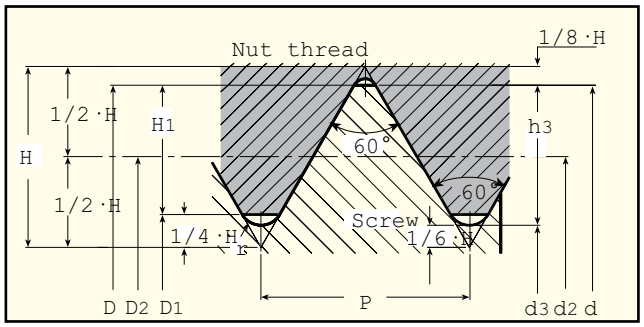
$r = \frac{H}{6} = 0.14434P$

Nominal Dia. d=D	Pitch P	Flank Dia. $d_2=D_2$	Minor Diameter		Thread Depth		Radius	Flank Dia. Tap Tolerance 6H d_2		Flank Dia. Tap Tolerance 6H	
			Screw d_3	Nut D_1	Screw h_3	Nut H_1	r	Min.	Max.	Min.	Max.
M 2	0.25	1.838	1.693	1.729	0.153	0.135	0.036	1.844	1.856	1.838	1.886
M 2.5	0.35	2.273	2.701	2.121	0.215	0.189	0.051	2.293	2.307	2.273	2.358
M 3	0.35	2.773	2.571	2.621	0.215	0.189	0.051	2.794	2.809	2.773	2.863
M 3.5	0.35	3.273	3.071	3.121	0.215	0.189	0.051	3.294	3.309	3.273	3.363
M 4	0.5	3.675	3.387	3.459	0.307	0.271	0.072	3.699	3.715	3.675	3.775
M 4.5	0.5	4.175	3.887	3.959	0.307	0.271	0.072	4.199	4.215	4.175	4.275
M 5	0.5	4.675	4.387	4.459	0.307	0.271	0.072	4.699	4.715	4.675	4.775
M 5.5	0.5	5.175	4.887	4.959	0.307	0.271	0.072	5.199	5.215	5.175	5.275
M 6	0.5	5.675	5.387	5.459	0.307	0.271	0.072	5.702	5.72	5.675	5.787
M 6	0.75	5.513	5.08	5.188	0.46	0.406	0.108	5.545	5.566	5.513	5.645
M 7	0.75	6.513	6.08	6.188	0.46	0.406	0.108	6.545	6.566	6.513	6.645
M 8	0.5	7.675	7.387	7.459	0.307	0.271	0.072	7.702	7.72	7.675	7.787
M 8	0.75	7.513	7.08	7.188	0.46	0.406	0.108	7.545	7.566	7.513	7.645
M 8	1	7.35	6.773	6.917	0.613	0.541	0.144	7.835	7.409	7.35	7.5
M 9	0.75	8.513	8.08	8.188	0.46	0.406	0.108	8.545	8.566	8.513	8.645
M 9	1	8.35	7.773	7.917	0.613	0.541	0.144	8.385	8.409	8.35	8.5
M 10	0.5	9.675	9.387	9.459	0.307	0.271	0.072	9.702	9.72	9.675	9.787
M 10	0.75	9.513	9.08	9.188	0.46	0.406	0.108	9.545	9.566	9.513	9.645
M 10	1	9.35	8.773	8.917	0.613	0.541	0.144	9.385	9.409	9.35	9.5
M 10	1.25	9.188	8.466	8.647	0.767	0.677	0.18	9.226	9.251	9.188	9.348
M 11	0.75	10.513	10.08	10.188	0.46	0.406	0.108	10.545	10.566	10.513	10.645
M 11	1	10.35	9.773	9.917	0.613	0.541	0.144	10.385	10.409	10.35	10.5
M 12	0.75	11.513	11.08	11.188	0.46	0.406	0.108	11.547	11.569	11.513	11.653
M 12	1	11.35	10.773	10.917	0.613	0.541	0.144	11.388	11.413	11.35	11.51
M 12	1.25	11.188	10.466	10.647	0.767	0.677	0.18	11.23	11.258	11.188	11.368
M 12	1.5	11.026	10.16	10.376	0.92	0.812	0.217	11.071	11.101	11.026	11.216
M 13	1	12.35	11.773	11.917	0.613	0.541	0.144	12.388	12.413	12.35	12.51
M 14	1	13.35	12.773	12.917	0.613	0.541	0.144	13.388	13.413	13.35	13.51
M 14	1.25	13.188	12.466	12.647	0.767	0.677	0.18	13.23	13.258	13.188	13.368
M 14	1.5	13.026	12.16	12.376	0.92	0.812	0.217	13.071	13.101	13.026	13.216
M 15	1	14.35	13.773	13.917	0.613	0.541	0.144	14.388	14.413	14.35	14.51
M 15	1.5	14.026	13.16	13.376	0.92	0.812	0.217	14.071	14.101	14.026	14.216
M 16	1	15.35	14.773	14.917	0.613	0.541	0.144	15.388	15.413	15.35	15.51
M 16	1.25	15.188	14.466	14.647	0.767	0.677	0.18	15.23	15.258	15.188	15.368
M 16	1.5	15.026	14.16	14.376	0.92	0.812	0.217	15.071	15.101	15.026	15.216
M 17	1	16.35	15.773	15.917	0.613	0.541	0.144	16.388	16.413	16.35	16.51
M 17	1.5	16.026	15.16	15.376	0.92	0.812	0.217	16.071	16.101	16.026	16.216
M 18	1	17.350	16.773	16.917	0.613	0.541	0.144	17.388	17.413	17.35	17.51
M 18	1.5	17.026	16.16	16.376	0.92	0.812	0.217	17.071	17.101	17.026	17.216
M 18	2	16.701	15.546	15.835	1.227	1.083	0.289	16.752	16.786	16.701	16.913

ISO Metric Fine Thread

Nominal Dimensions According to UNI 4535-64

Tap flank diameter production tolerances for ISO 6H nut threads limit dimensions - nut threads ISO 6H



Coarse Pitch Threads
Dimensions in mm

$H = 0.86603P$

$H_1 = \frac{5}{8} H = 0.54127P$

$h_3 = \frac{17}{24} H = 0.61343P$

$d_2 = D_2 = d - \frac{3}{4} H = d - 0.64952P$

$d_3 = d - 2h_3 = d - 1.22687P$

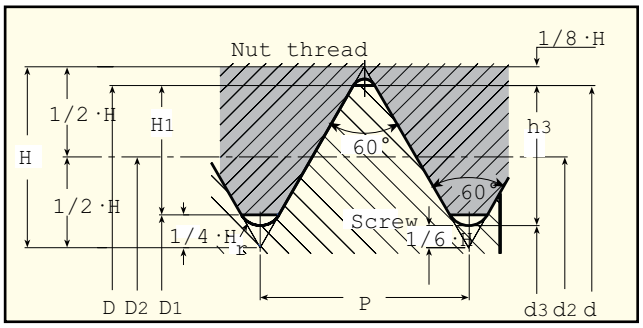
$r = \frac{H}{6} = 0.14434P$

Nominal Dia. d=D	Pitch P	Flank Dia. $d_2=D_2$	Minor Diameter		Thread Depth		Radius	Flank Dia. Tap Tolerance 6H d2		Flank Dia. Tap Tolerance 6H	
			Screw d_3	Nut D_1	Screw h_3	Nut H_1	r	Min.	Max.	Min.	Max.
M 20	1	19.35	18.773	18.917	0.613	0.541	0.144	19.388	19.413	19.35	19.51
M 20	1.5	19.026	18.16	18.376	0.92	0.812	0.217	19.071	19.101	19.026	19.216
M 20	2	18.701	17.546	17.835	1.227	1.083	0.289	18.752	18.786	18.701	18.913
M 22	1	21.35	20.773	20.917	0.613	0.541	0.144	21.388	21.413	21.35	21.51
M 22	1.5	21.026	20.16	20.376	0.92	0.812	0.217	21.071	21.101	21.026	21.216
M 22	2	20.701	19.546	19.835	1.227	1.083	0.289	20.752	20.786	20.701	20.913
M 24	1	23.350	22.773	22.917	0.613	0.541	0.144	23.390	23.416	23.350	23.520
M 24	1.5	23.026	22.160	22.376	0.920	0.812	0.217	23.074	23.106	23.026	23.226
M 24	2	22.701	21.546	21.835	1.227	1.083	0.289	22.754	22.791	22.701	22.925
M 25	1	24.350	23.773	23.917	0.613	0.541	0.144	24.390	24.416	24.350	24.520
M 25	1.5	24.026	23.160	23.376	0.920	0.812	0.217	24.074	24.106	24.026	24.226
M 25	2	23.701	22.546	22.835	1.227	1.083	0.289	23.754	23.791	23.701	23.925
M 26	1	25.350	24.773	24.917	0.613	0.541	0.144	25.390	25.416	25.350	25.520
M 26	1.5	25.026	24.160	24.376	0.920	0.812	0.217	25.074	25.106	25.026	25.226
M 26	2	24.701	23.546	23.835	1.227	1.083	0.289	24.754	24.791	24.701	24.925
M 27	1	26.350	25.773	25.917	0.613	0.541	0.144	26.390	26.416	26.350	26.520
M 27	1.5	26.026	25.160	25.376	0.920	0.812	0.217	26.074	26.106	26.026	26.226
M 27	2	25.701	24.546	24.835	1.227	1.083	0.289	25.754	25.791	25.701	25.925
M 28	1	27.350	26.773	26.917	0.613	0.541	0.144	27.390	27.416	27.350	27.520
M 28	1.5	27.026	26.160	26.376	0.920	0.812	0.217	27.074	27.106	27.026	27.226
M 28	2	26.701	25.546	25.835	1.227	1.083	0.289	26.754	26.791	26.701	26.925
M 30	1	29.350	28.773	28.917	0.613	0.541	0.144	29.390	29.416	29.350	29.520
M 30	1.5	29.026	28.160	28.376	0.920	0.812	0.217	29.074	29.106	29.026	29.226
M 30	2	28.701	27.546	27.835	1.227	1.083	0.289	28.754	28.791	28.701	28.925
M 30	3	28.051	26.319	26.752	1.840	1.624	0.433	28.115	28.157	28.051	28.316
M 32	1.5	31.026	30.160	30.376	0.920	0.812	0.217	31.074	31.106	31.026	31.226
M 32	2	30.701	29.546	29.835	1.227	1.083	0.289	30.754	30.791	30.701	30.925
M 33	1.5	32.026	31.160	31.376	0.920	0.812	0.217	32.074	32.106	32.026	32.226
M 33	2	31.701	30.546	30.835	1.227	1.083	0.289	31.754	31.791	31.701	31.925
M 33	3	31.051	29.319	29.752	1.840	1.624	0.433	31.115	31.157	31.051	31.316
M 35	1.5	34.026	33.160	33.376	0.920	0.812	0.217	34.074	34.106	34.026	34.226
M 35	2	33.701	32.546	32.835	1.227	1.083	0.289	33.754	33.791	33.701	33.925
M 36	1.5	35.026	34.160	34.376	0.920	0.812	0.217	35.074	35.106	35.026	35.226
M 36	2	34.701	33.546	33.835	1.227	1.083	0.289	34.754	34.791	34.701	34.925
M 36	3	34.051	32.319	32.752	1.840	1.624	0.433	34.115	34.157	34.051	34.316
M 38	1.5	37.026	36.160	36.376	0.920	0.812	0.217	37.074	37.106	37.026	37.226
M 39	1.5	38.026	37.160	37.376	0.920	0.812	0.217	38.074	38.106	38.026	38.226
M 39	2	37.701	36.546	36.835	1.227	1.083	0.289	37.754	37.791	37.701	37.925
M 39	3	37.051	35.319	35.752	1.840	1.624	0.433	37.115	37.157	37.051	37.316
M 40	1.5	39.026	38.160	38.376	0.920	0.812	0.217	39.074	39.106	39.026	39.226

ISO Metric Fine Thread

Nominal Dimensions According to UNI 4535-64

Tap flank diameter production tolerances for ISO 6H nut threads limit dimensions - nut threads ISO 6H



Coarse Pitch Threads
Dimensions in mm

$H = 0.86603P$

$H_1 = \frac{5}{8} H = 0.54127P$

$h_3 = \frac{17}{24} H = 0.61343P$

$d_2 = D_2 = d - \frac{3}{4} H = d - 0.64952P$

$d_3 = d - 2h_3 = d - 1.22687P$

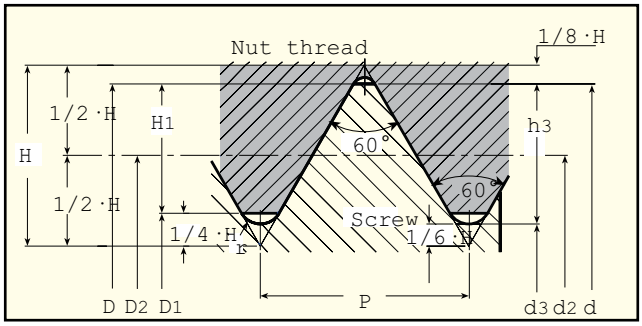
$r = \frac{H}{6} = 0.14434P$

Nominal Dia. d=D	Pitch P	Flank Dia. $d_2=D_2$	Minor Diameter Screw d_3	Minor Diameter Nut D_1	Thread Depth Screw h_3	Thread Depth Nut H_1	Radius r	Flank Dia. Tap Tolerance 6H d_2 Min.	Flank Dia. Tap Tolerance 6H d_2 Max.	Flank Dia. Tap Tolerance 6H Min.	Flank Dia. Tap Tolerance 6H Max.
M 40	2	38.701	37.546	37.835	1.227	1.083	0.289	38.754	38.791	38.701	38.925
M 40	3	38.051	36.319	36.752	1.840	1.624	0.433	38.115	38.157	38.051	38.316
M 42	1.5	41.026	40.160	40.376	0.920	0.812	0.217	41.074	41.106	41.026	41.226
M 42	2	40.701	39.546	39.835	1.227	1.083	0.289	40.754	40.791	40.701	40.925
M 42	3	40.051	38.319	38.752	1.840	1.624	0.433	40.115	40.157	40.051	40.316
M 45	1.5	44.026	43.160	43.376	0.920	0.812	0.217	44.074	44.106	44.026	44.226
M 45	2	43.701	42.546	42.835	1.227	1.083	0.289	43.754	43.791	43.701	43.925
M 45	3	43.051	41.319	41.752	1.840	1.624	0.433	43.115	43.157	43.051	43.316
M 48	1.5	47.026	46.160	46.376	0.920	0.812	0.217	47.077	47.111	47.026	47.238
M 48	2	46.701	45.546	45.835	1.227	1.083	0.289	46.758	46.796	46.701	46.937
M 48	3	46.051	44.319	44.752	1.840	1.624	0.433	46.118	46.163	46.051	46.331
M 50	1.5	49.026	48.160	48.376	0.920	0.812	0.217	49.077	49.111	49.026	49.238
M 50	2	48.701	47.546	47.835	1.227	1.083	0.289	48.758	48.796	48.701	48.937
M 50	3	48.051	46.319	46.752	1.840	1.624	0.433	48.118	48.163	48.051	48.331
M 52	1.5	51.026	50.160	50.376	0.920	0.812	0.217	51.077	51.111	51.026	51.238
M 52	2	50.701	49.546	49.835	1.227	1.083	0.289	50.758	50.796	50.701	50.937
M 52	3	50.051	48.319	48.752	1.840	1.624	0.433	50.118	50.163	50.051	50.331
M 55	1.5	54.026	53.160	53.376	0.920	0.812	0.217	54.077	54.111	54.026	54.238
M 55	2	53.701	52.546	52.835	1.227	1.083	0.289	53.758	53.796	53.701	53.937
M 55	3	53.051	51.319	51.752	1.840	1.624	0.433	53.118	53.163	53.051	53.331
M 56	1.5	55.026	54.160	54.376	0.920	0.812	0.217	55.077	55.111	55.026	55.238
M 56	2	54.701	53.546	53.835	1.227	1.083	0.289	54.758	54.796	54.701	54.937
M 56	3	54.051	52.319	52.752	1.840	1.624	0.433	54.118	54.163	54.051	54.331
M 58	1.5	57.026	56.160	56.376	0.920	0.812	0.217	57.077	57.111	57.026	57.238
M 58	2	56.701	55.546	55.835	1.227	1.083	0.289	56.758	56.796	56.701	56.937
M 58	3	56.051	54.319	54.752	1.840	1.624	0.433	56.118	56.163	56.051	56.331
M 60	1.5	59.026	58.160	58.376	0.920	0.812	0.217	59.077	59.111	59.026	59.238
M 60	2	58.701	57.546	57.835	1.227	1.083	0.289	58.758	58.796	58.701	58.937
M 60	3	58.051	56.319	56.752	1.840	1.624	0.433	58.118	58.163	58.051	58.331
Metric thread MA (old UNI 160 Profile)										**Nut Tolerance SH8**	
M 2,3	0.25	2.138	1.976	1.976	0.162	0.162	0.03	2.144	2.156	2.138	2.194
M 2,6	0.35	2.373	2.146	2.146	0.227	0.227	0.04	2.393	2.407	2.373	2.429

UNIFIED Coarse Thread

Nominal Dimensions According to ANSI B1.1

Tap flank diameter production tolerances for ISO 2B nut threads limit dimensions - nut threads ANSI B1.1, 2B-3B



Coarse Pitch Threads
Dimensions in mm

$H = 0.86603P$

$H_1 = \frac{5}{8} H = 0.54127P$

$h_3 = \frac{17}{24} H = 0.61343P$

$d_2 = D_2 = d - \frac{3}{4} H = d - 0.64952P$

$d_3 = d - 2h_3 = d - 1.22687P$

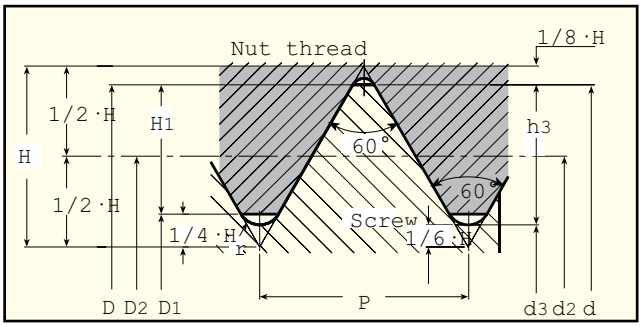
$r = \frac{H}{6} = 0.14434P$

Nominal Dia.	T.P.I	Pitch P	External Dia. d=D	Flank Dia. $d_2=D_2$	Minor diameter Nut D1	Minor diameter Screw d3	Pitch diameter Tap tolerance 2B min.	Pitch diameter Tap tolerance 2B max.	Pitch diameter Nut tolerance max. 2B/3B	Pitch diameter Nut tolerance max. 2B	Pitch diameter Nut tolerance max. 3B
UNC#1	- 64	0.397	1.854	1.598	1.425	1.367	1.610	1.623	1.598	1.664	1.646
UNC# 2	- 64	0.454	2.184	1.890	1.694	1.628	1.902	1.915	1.890	1.961	1.943
UNC#3	- 48	0.529	2.515	2.172	1.941	1.864	2.184	2.197	2.172	2.248	2.228
UNC# 4	- 40	0.635	2.845	2.433	2.156	2.065	2.446	2.459	2.433	2.517	2.494
UNC# 5	- 40	0.635	3.175	2.764	2.487	2.395	2.776	2.789	2.764	2.847	2.827
UNC# 6	- 32	0.794	3.505	2.990	2.647	2.532	3.105	3.028	2.990	3.084	3.058
UNC# 8	- 32	0.794	4.166	3.650	3.307	3.193	3.675	3.688	3.650	3.746	3.721
UNC# 10	- 24	1.058	4.826	4.138	3.680	3.528	4.163	4.176	4.138	4.247	4.219
UNC# 12	- 24	1.058	5.486	4.798	4.341	4.188	4.823	4.836	4.798	4.910	4.882
UNC 1/4"	- 20	1.270	6.350	5.524	4.976	4.793	5.575	5.588	5.524	5.646	5.616
UNC 5/16"	- 18	1.411	7.938	7.021	6.411	6.205	7.071	7.084	7.021	7.155	7.120
UNC 3/8"	- 16	1.588	9.525	8.494	7.805	7.577	8.545	8.557	8.494	8.639	8.603
UNC 7/16"	- 14	1.814	11.112	9.934	9.149	8.887	9.985	9.997	9.934	10.089	10.051
UNC 1/2"	- 13	1.954	12.700	11.430	10.584	10.302	11.481	11.494	11.430	11.595	11.552
UNC 9/16"	- 12	2.117	14.288	12.913	11.996	11.692	12.964	12.977	12.913	13.086	13.043
UNC 5/8"	- 11	2.309	15.875	14.376	13.376	13.043	14.427	14.440	14.376	14.559	14.514
UNC 3/4"	- 10	2.540	19.050	17.399	16.229	15.933	17.450	17.463	17.399	17.595	17.544
UNC 7/8"	- 9	2.822	22.225	20.391	19.169	18.763	20.455	20.467	20.391	20.599	20.546
UNC 1"	- 8	3.175	25.400	23.338	21.963	21.504	23.401	23.414	23.338	23.561	23.505
UNC 1 1/8"	- 7	3.629	28.575	26.218	24.648	24.122	26.294	26.319	26.218	26.457	26.398
UNC 1 1/4"	- 7	3.629	31.750	29.393	27.823	27.297	29.469	29.494	29.393	29.637	29.576
UNC 1 3/8"	- 6	4.233	34.925	32.174	30.343	29.731	32.250	32.276	32.174	32.438	32.372
UNC 1 1/2"	- 6	4.233	38.100	35.349	33.518	32.906	35.425	35.451	35.349	35.616	35.550
UNC 1 3/4"	- 5	5.080	44.450	41.151	38.951	38.217	41.241	41.266	41.151	41.445	41.372
UNC 2"	- 4 1/2	5.644	50.800	47.135	44.689	43.876	47.235	47.260	47.135	47.450	47.371
UNC 2 1/4"	- 4 1/2	5.644	57.150	53.485	51.039	50.226			53.485	53.805	53.726
UNC 2 1/2"	- 4	6.350	63.500	59.375	56.627	55.710			59.375	59.718	59.632
UNC 2 3/4"	- 4	6.350	69.850	65.725	62.977	62.060			65.725	66.073	65.987
UNC 3"	- 4	6.350	76.200	72.075	69.327	68.410			72.075	72.428	72.339
UNC 3 1/4"	- 4	6.350	82.550	78.425	75.677	74.760			78.425	78.783	78.694
UNC 3 1/2"	- 4	6.350	88.900	84.775	82.027	81.110			84.775	85.183	85.049
UNC 3 3/4"	- 4	6.350	95.250	91.125	88.377	87.460			91.125	91.493	91.402
UNC 4"	- 4	6.350	101.600	97.475	94.727	93.810			97.475	97.848	97.757

UNIFIED Fine Thread

Nominal Dimensions According to ANSI B1.1

Tap flank diameter production tolerances for ISO 2B nut threads limit dimensions - nut threads ANSI B1.1, 2B-3B



Coarse Pitch Threads
Dimensions in mm

$H = 0.86603P$

$H_1 = \frac{5}{8} H = 0.54127P$

$h_3 = \frac{17}{24} H = 0.61343P$

$d_2 = D_2 = d - \frac{3}{4} H = d - 0.64952P$

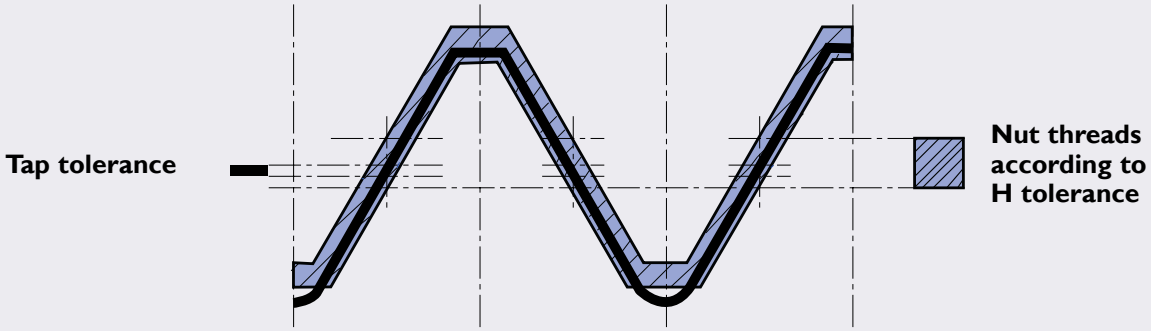
$d_3 = d - 2h_3 = d - 1.22687P$

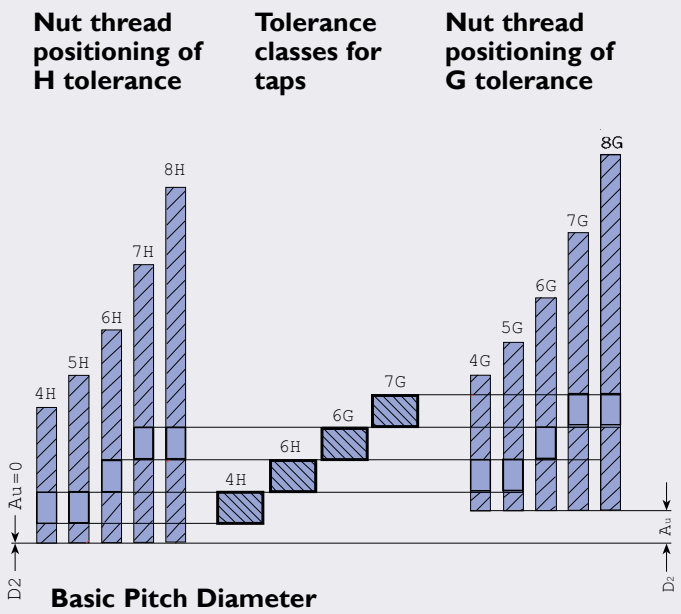
$r = \frac{H}{6} = 0.14434P$

Nominal Dia.	T.P.I	Pitch P	External Dia. d=D	Flank Dia. $d_2=D_2$	Minor diameter		Pitch diameter Tap tolerance 2B		Pitch diameter Nut tolerance		
					Nut D1	Screw d3	min.	max.	max. 2B/3B	max. 2B	max. 3B
UNF#0	- 80	0.318	1.524	1.318	1.181	1.135	1.331	1.344	1.318	1.377	1.361
UNF#1	- 72	0.353	1.854	1.626	1.473	1.422	1.638	1.651	1.626	1.689	1.674
UNF#2	- 64	0.397	2.184	1.928	1.755	1.697	1.941	1.953	1.928	1.996	1.979
UNF#3	- 56	0.454	2.515	2.220	2.024	1.958	2.233	2.245	2.220	2.291	2.273
UNF#4	- 48	0.529	2.845	2.502	2.271	2.195	2.515	2.527	2.502	2.581	2.560
UNF#5	- 44	0.577	3.175	2.799	2.550	2.466	2.812	2.824	2.799	2.880	2.860
UNF#6	- 40	0.635	3.505	3.094	2.817	2.725	3.108	3.119	3.094	3.180	3.157
UNF#8	- 36	0.706	4.166	3.708	3.401	3.299	3.721	3.734	3.708	3.800	3.777
UNF#10	- 32	0.794	4.826	4.310	3.967	3.853	4.336	4.348	4.310	4.409	4.384
UNF#12	- 28	0.907	5.486	4.897	4.503	4.374	4.923	4.935	4.897	5.004	4.976
UNF 1/4"	- 28	0.907	6.350	5.761	5.367	5.237	5.799	5.812	5.761	5.870	5.842
UNF 5/16"	- 24	1.058	7.938	7.249	6.792	6.640	7.287	7.300	7.249	7.371	7.341
UNF 3/8"	- 24	1.058	9.525	8.837	8.379	8.227	8.875	8.887	8.837	8.961	8.931
UNF 7/16"	- 20	1.270	11.112	10.287	9.738	9.555	10.338	10.351	10.287	10.424	10.391
UNF 1/2"	- 20	1.270	12.700	11.874	11.326	11.143	11.925	11.938	11.874	12.017	11.981
UNF 9/16"	- 18	1.411	14.288	13.371	12.761	12.555	13.421	13.434	13.371	13.520	13.482
UNF 5/8"	- 18	1.411	15.875	14.958	14.348	14.143	15.009	15.022	14.958	15.110	15.072
UNF 3/4"	- 16	1.588	19.050	18.019	17.330	17.102	18.070	18.082	18.019	18.184	18.143
UNF 7/8"	- 14	1.814	22.225	21.046	20.262	20.000	21.110	21.123	21.046	21.224	21.181
UNF 1"	- 12	2.117	25.400	24.026	23.109	22.804	24.089	24.102	24.026	24.219	24.171
UNF 1*1/8"	- 12	2.117	28.575	27.201	26.284	25.979	27.252	27.277	27.201	27.339	27.351
UNF 1*1/4"	- 12	2.117	31.750	30.376	29.459	29.154	30.427	30.452	30.376	30.579	30.528
UNF 1*3/8"	- 12	2.117	34.925	33.551	32.634	32.329	33.602	33.627	33.551	33.759	33.706
UNF 1*1/2"	- 12	2.117	38.100	36.726	35.809	35.504	36.777	36.802	36.726	36.937	36.886

Tap Tolerances

Tolerance classes of taps and tolerance positions for screw threads as per ISO metric standard.





Au = Basic Deviation of Pitch

For optimum tapping conditions, reduced machining times and increased tap life.

Selection of the most suitable tap

As a general rule, materials with deformation capability of at least 10% can be cold-formed.

Pre-tapping holes

Check that the holes are within the prescribed size range, depending on the application (see table on page 133). The holes should be clean and swarf-free.

Lubrication

Frequently the lubricant content of the coolant used for general machining is too low for tapping.
If it is not possible to increase the lubricant content, following are some possible solutions:

- A separate lubricating unit can be connected to the machine control, to deliver the required quantity of concentrated emulsion into the core hole or onto the tap.
- Tapping in separate operations allows the use of the ideal tapping lubricant.

Tapping speeds

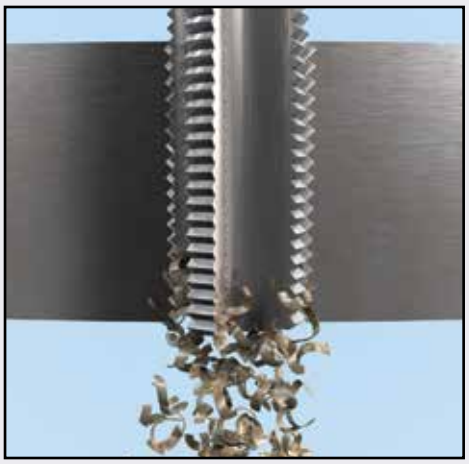
The tapping speed has a great influence on chip flow and the life of the tap.
It is worthwhile to establish the ideal speed by tapping trials.
For recommended initial values, see table on family page. In addition, the following should be taken into consideration: characteristics of the material, machine and clamping method.

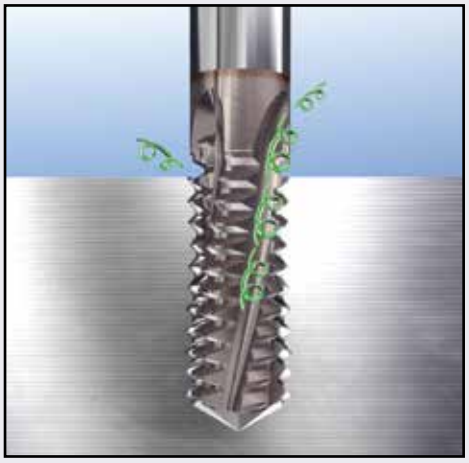
Effects of unsuitable tapping speed

- Forced tapping
- Tap lead chipping caused by overloaded cutting tooth
- Torn threads
- Unsatisfactory tap life
- Rejected threads

Chip Explusion

Tap selection is also influenced by the type of hole being threaded. Through hole tapping usually requires a tap that pushes the chips out in front of the cutting edge and through the other end of the hole. A bottom hole tap must pull chips up and out of the hole.





Tap Jamming

Some possible causes of tap jamming are:

- Unsuitable tap
- Tap with incorrect cutting geometry
- Unsuitable coolant for material
- Insufficient coolant
- Axial pressure (pull or push) on the tap
- Core hole too small
- Breaks in walls of core hole
- Speed too high or too low
- Swarf trapped in the hole
- Incorrect alignment of tap and core hole
- Tap eccentricity

Results of Tap Jamming

- Torn threads
- Short tap life
- Rejected threads
- Tap breakage
- Scrap workpieces

Tap Mounting

The tap must be mounted on the axis of the core hole.
On non-synchronized machines (feed/speed) we recommend the use of a tapping spindle.

Tapping Heads

With non-synchronized machine spindles (feed/speed) the feed rate should be, as a rule, programmed approximately 5-10% lower than the thread pitch. In these cases a tapping chuck must be used which will compensate the difference between the feed rate and the thread pitch.
It is important that the tension spring in the axial compensation is set to a minimum pressure to avoid axially loading the tap.
The compression spring should be tensioned so the tap starts to cut by compressing the spring up to one-half pitch.

Important

Verify that the correct speed has been selected.
Ensure that ample lubricating coolant is being used.
Machine and equipment stability are essential for optimal performance and results.

Forming Taps

Forming taps (roll forming or cold forming) produce threads by deforming the material near the hole walls, rather than by cutting the material. This method often works well in ductile materials. However, in brittle materials it often results in unsatisfactory threads.
Torque requirements for forming taps are considerably higher than for cutting taps. When forming taps are used, chuck capacity must be decreased by 25%. Forming taps do not produce chips.

Troubleshooting

Problem	Cause	Solution
Tapped hole oversized	Incorrect tap (cutting geometry unsuitable for application)	Use tap selected from the relevant material group
	Faulty alignment	Ensure that the tap is correctly aligned with the core hole axis
	Tap jamming	Improve lubrication and direction of coolant Adjust cutting speed
	Incorrectly reground tap (lead tip is not concentric)	Regrind tap

Problem	Cause	Solution
Stripped threads	Incorrect tap (cutting geometry incorrect for application)	Use a tap from the relevant material group
	Spindle speed and feed rate are not synchronized	Check feed rate programming and/or pitch of leading spindle Use a tapping spindle with axial float (GTI/GTIN)
	Insufficient starting pressure exerted on tap (causes peeling)	Increase starting pressure

Problem	Cause	Solution
Bell mouthed tapped hole	Incorrect starting pressure	Use a tapping spindle with axial float (GTI/GTIN)

Problem	Cause	Solution
Unsatisfactory thread surface finish	Incorrect tap (cutting geometry unsuitable for application)	Select tap for the relevant material group
	The tap is blunt	Replace or regrind tap
	Tap badly re-ground	Regrind tap Check that cutting geometry is suitable for material
	Incorrect lubricant, concentration or quantity	Ensure the use of a suitable coolant and an ample supply

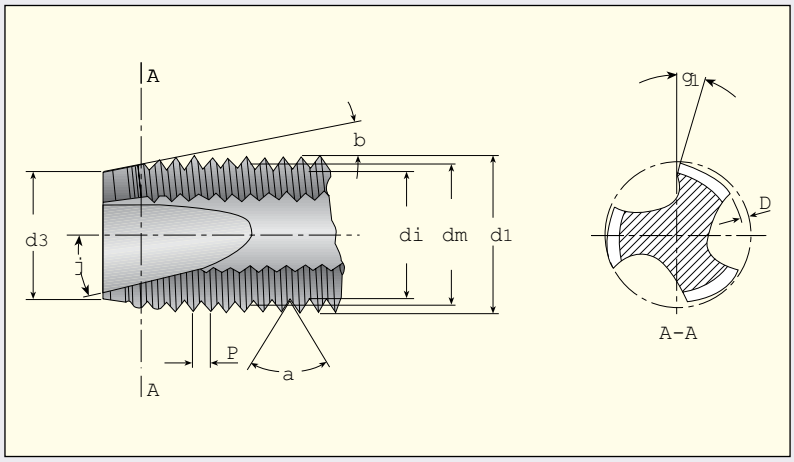
Troubleshooting

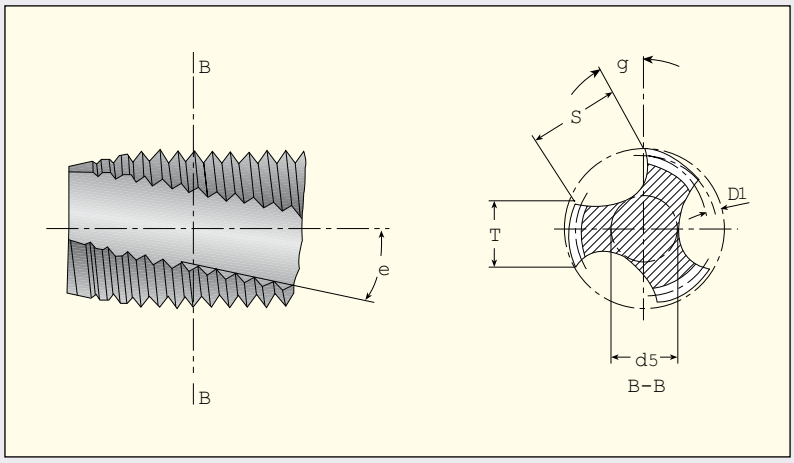
Problem	Cause	Solution
Partial chipping of tap	Swarf jamming	Check cutting speed Use alternative tap
	Tap has jammed against bottom of pre-hole	Check hole and thread depths Drill a deeper pre-hole
	Tap incorrectly reground (lead-in diameter too short, therefore too few cutting teeth)	Ensure that correct dimensions are maintained when regrinding
	Irregular workpiece material structure	Adjust cutting speed Improve lubricant quality of coolant

Problem	Cause	Solution
Excessive tap wear	Incorrect cutting speed	Adjust cutting speed to suit workpiece material
	Coolant lacking in lubricating qualities and/or quantity	Ensure the use of a suitable coolant and an ample supply Check that coolant is reaching the cutting zone
	Surface of the pre-hole is compacted	Check pre-hole drilling conditions (drill carefully to reduce risk of surface compacting) Check drill cutting edges

Problem	Cause	Solution
Tap breakage	Incorrect tap in use (cutting geometry unsuitable for application)	Use tap from the relevant material group
	Centering error	Ensure that axes of tap and pre-hole are aligned
	Blunt tap	Re-grind tap
	Tap has reached bottom of pre-hole	Use tapping spindle with axial float and slipping clutch (GTI/GTIN)
	Pre-hole too small	Check for correct pre-hole size see page 202

Tap Nomenclature (Regrinding)





d_1 Major diameter
dm Flank diameter
di Minor diameter
d_3 Chamfer diameter
P Pitch
a Flank angle
ß Chamfer angle
φ Gun nose angle
ϒ Gun nose front rake angle
Δ Chamfer relief
Δ_1 Pitch diameter relief on the land
γ_1 Rake angle
T Width of land
S Flute width
d_5 Web thickness
ε Angle of spiral flute

Regrinding

Regrinding

The tap regrinding takes place in two steps:
a) regrinding of relieved chamfer
b) regrinding of flutes (see picture 1)

Regrinding of Relieved Chamfer

It is recommended that the resharpening should be executed either on specific tap regrinding machines or on conventional resharpening machines equipped with an auxiliary device to geneate the circular back relief.

Picture 2 shows the regrinding done with the cylindrical surface of a grinding wheel.
Before regrinding, verify that the tap, fixed between points or on pincer, runs concentrical. Verify also angle b, which has to be correct in order to keep the same number of threads on chamfer.

Resharpening of Flutes

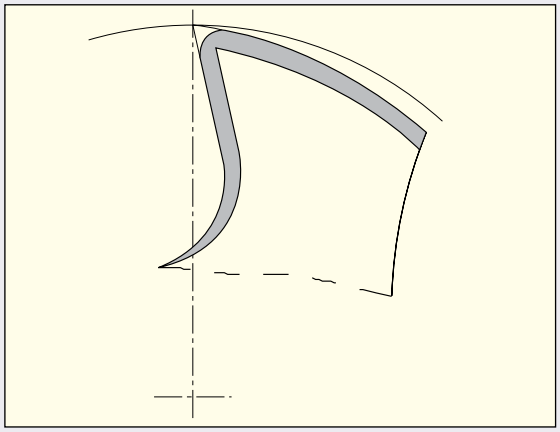
The rake angle g is obtained by moving the tap axis, in relation to the regrinding surface, of an amount X to be calculated with the formula: $X = 1/2\ d1 \sin(\gamma)$ (see picture 3).
(d1 =tap major diameter)

Example:

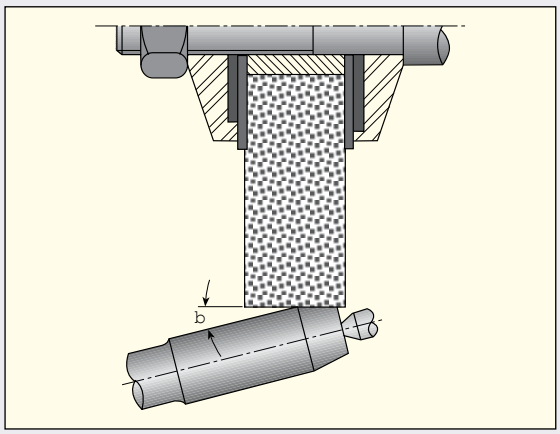
Tap 10 X 1,5 to cut on steel strength = 600 N/mm^2
$d_1 = 10$ mm ; $\gamma = 15°$; $\sin(\gamma) = 0{,}25882$;

$$X = \frac{0.25885 \times 10}{2} \; ; X = 1.29 \text{ mm}$$

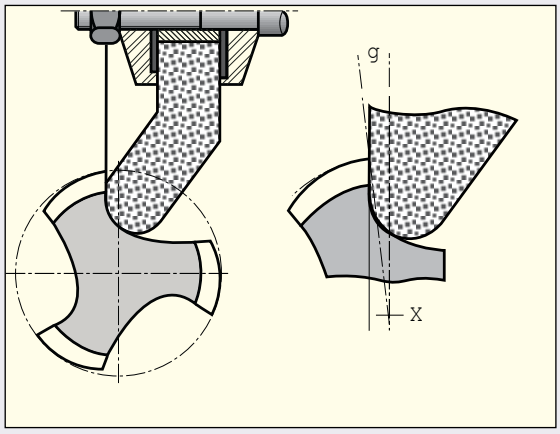
Picture 1



Picture 2



Picture 3



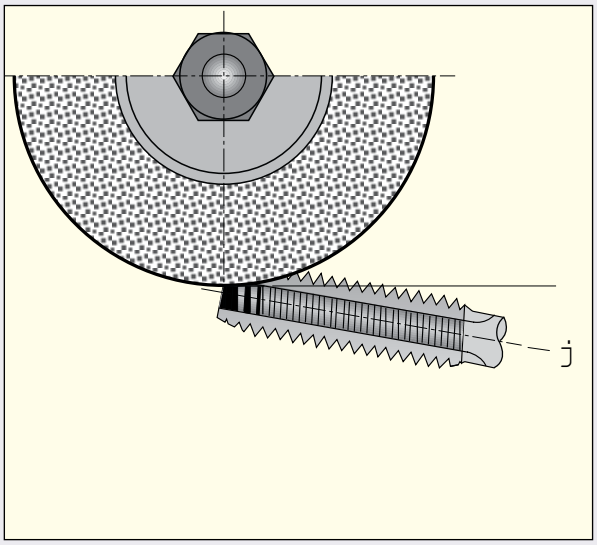
Regrinding

On all taps with spiral flutes, it is possible to find the pitch of the spiral in reference to the lead screw necessary for resharpening. In case of use of taps equipped with a deburring tool, it is necessary to extend the flutes according to supplier>s recommendation.
As the wear on a tap is mainly on the chamfer area, for taps with gun nose, the regrinding of the flutes can be done on the front area only (see picture 4).

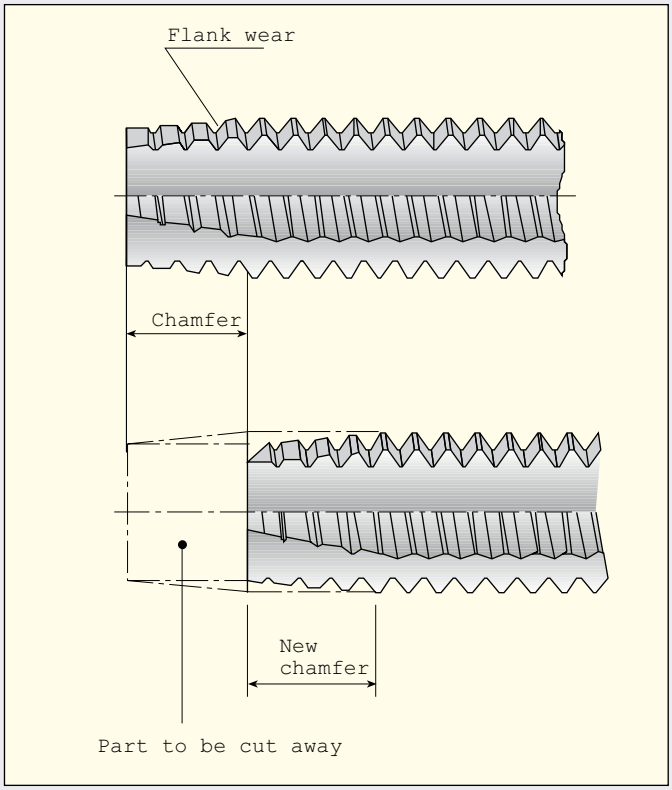
In cases where the thread flanks are worn (in addition to the active edges), the regrinding as described above is impractical. In this case restoration is done, by cutting the chamfer away (thus creating a shorter tap) and then reproducing the chamfer with same angle and relief.
(see picture 5)

In the absence of special regrinding machines, such restoration is advisable for regrinding taps with spiral flutes. This is because regrinding the flutes becomes unnecessary.

Picture 4



Picture 5



General Recommendations (Regrinding)

Maintenance

It is important to periodically regrind the worn tap. This is to avoid permanent damage or even tool breakage.

The Grinding Wheels

The structure and grain of grinding wheels must be appropriate for the tap to be resharpened.

Taps for Cast Iron

Taps used on cast iron can rarely be resharpened, as it is very abrasive and tends to wear the flank in such a manner that it becomes grossly out of tolerance.

Taps for Aluminun

After regrinding it is advisable to remove the steel burrs with a wire brush.

Tap Inspection

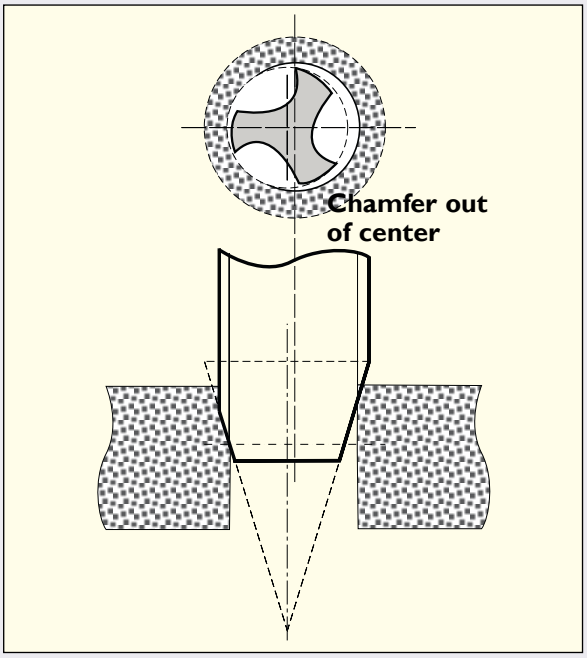
It is important to inspect the tap after regrinding to ensure that all of the dimensions and angles have remained according to the specifications.

Controls (tests)

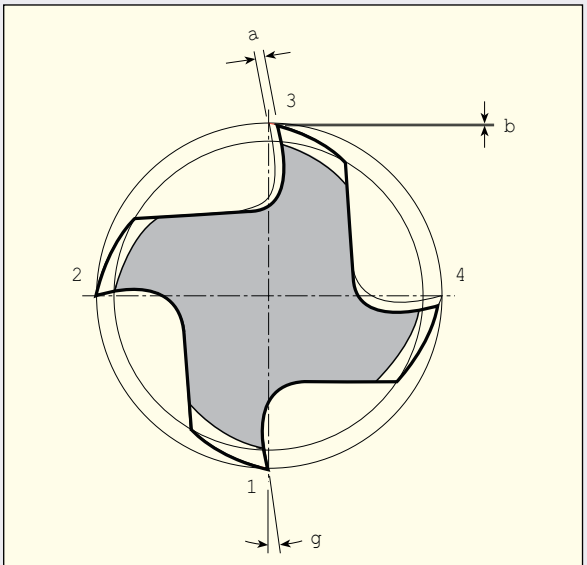
Once the tap is resharpened, it is always best to test them to correctly obtain the same threads as when the tap was new.
The chamfer must be perfectly on axis in order to avoid the effects of picture 6.

- The cutters must have correct divisions. The results of resharpening with an incorrect division is shown in picture 7.
- The length and number of threads in chamfer must be precisely identical to those of the new tap.

Picture 6



Picture 7



Incorrect division-cutters not concentric