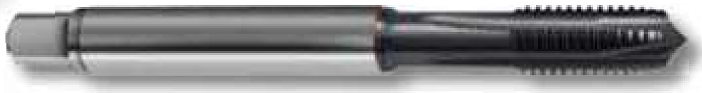
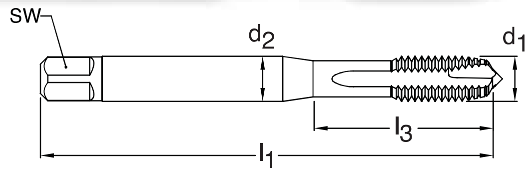
METRIC “J” *TI/NI and TI/NI Alloys*





Series **1057**
Standard **DIN 371/376**
Tool Material **HSS-E PM**
Spiral Point **Straight flute**

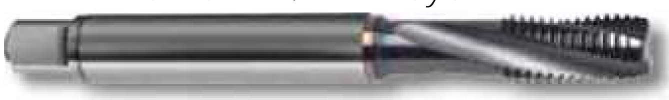
Chamfer Form B • 3.5 - 5

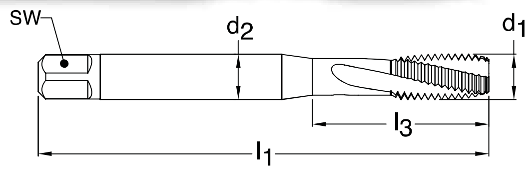
Class of Fit **4HX**

Through holes **TiCN coated** **External cooling**

d1 - P	D Limits	Tap Drill Range mm	Number of Flutes	d2 mm	SW mm	l1 mm	l3 mm	Order Code	EDP Number	Stock
M3 X 0.50	D1/D2	2.513 - 2.653	3	3.50	2.70	56.00	18.00	3.000	9010570030000	○
M4 X 0.70	D2/D3	3.318 - 3.498	3	4.50	3.40	63.00	21.00	4.000	9010570040000	○
M5 X 0.80	D2/D3	4.221 - 4.421	3	6.00	4.90	70.00	25.00	5.000	9010570050000	○
M6 X 1.00	D3/D4	5.026 - 5.216	3	6.00	4.90	80.00	30.00	6.000	9010570060000	●
M8 X 1.25	D3/D4	6.782 - 6.994	4	8.00	6.20	90.00	35.00	8.000	9010570080000	●
M10 X 1.50	D3/D4	8.539 - 8.775	4	10.00	8.00	100.00	39.00	10.000	9010570100000	●
M12 X 1.75	D4/D5	10.295 - 10.560	4	9.00	7.00	110.00	N/A	12.000	9010570120000	○
M16 X 2.00	D5/D6	14.051 - 14.351	4	12.00	9.00	110.00	N/A	16.000	9010570160000	○

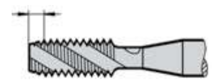
METRIC “J” *TI / TI Alloys*





Series **1061**
Standard **DIN 371/376**
Tool Material **HSS-E PM**
Spiral Flute **15° Helix**

Chamfer Form C • 2-3



Class of Fit **4HX**

Blind holes **TiCN coated** **External cooling**

d1 - P	D Limits	Tap Drill Range mm	Number of Flutes	d2 mm	SW mm	l1 mm	l3 mm	Order Code	EDP Number	Stock
M3 X 0.50	D1/D2	2.513 - 2.653	3	3.50	2.70	56.00	18.00	3.000	9010610030000	○
M4 X 0.70	D2/D3	3.318 - 3.498	3	4.50	3.40	63.00	21.00	4.000	9010610040000	○
M5 X 0.80	D2/D3	4.221 - 4.421	3	6.00	4.90	70.00	25.00	5.000	9010610050000	○
M6 X 1.00	D3/D4	5.026 - 5.216	3	6.00	4.90	80.00	30.00	6.000	9010610060000	●
M8 X 1.25	D3/D4	6.782 - 6.994	3	8.00	6.20	90.00	35.00	8.000	9010610080000	●
M10 X 1.50	D3/D4	8.539 - 8.775	3	10.00	8.00	100.00	39.00	10.000	9010610100000	●
M12 X 1.75	D4/D5	10.295 - 10.56	4	9.00	7.00	110.00	N/A	12.000	9010610120000	○
M16 X 2.00	D5/D6	14.051 - 14.351	4	12.00	9.00	110.00	N/A	16.000	9010610160000	○

● USA Stock ○ International Stock (0-2 wks)

Technical Information

Cutting rate recommendations for CUT taps

Material group	Approximate Rc	Approximate HB	Recommended SFM					
			HSS-E		HSS-E-PM		Solid carbide	
			bright finish	hard coated	bright finish	hard coated	bright finish	hard coated
Structural steels, free-cutting steels		<180	30-50	40-70	50-70	55-95	-	-
Unalloyed case hardened steels	<20	<230	20-40	30-70	40-65	40-80	-	-
Unalloyed heat-treatable steels	<25	<250	15-35	25-50	30-60	35-75	-	-
Structural steels, free-cutting steels	<20	<230	40-50	40-75	40-65	40-80	-	-
Case hardened steels, heat-treatable steels	<25	<250	30-45	30-65	30-60	35-75	-	-
Nitriding steels, spheroidal graphite iron	<30	<280	20-30	30-55	30-50	35-65	-	-
	<35	<320	15-25	20-35	25-45	30-60	-	-
	<38	<380	10-25	20-40	20-45	30-55	-	-
Stainless- and acid-resistant steels, sulphured		<180	25-35	40-55	30-55	35-70	-	-
austenitic	<25	<250	20-30	30-40	30-50	35-60	-	-
martensitic	<30	<280	20-30	25-40	25-45	30-50	-	-
	<35	<320	10-20	20-30	20-35	25-50	-	-
Alloyed case hardened steels	<25	<250	10-20	30-40	30-50	35-70	-	-
Alloyed heat-treatable steels	<30	<280	25-35	30-50	25-45	35-65	-	-
Alloyed tool steels	<35	<320	15-30	20-40	20-45	30-60	-	-
High speed tool steels	<38	<380	8-15	10-30	15-35	25-55	-	-
	<44	<415	-	-	4-10	8-15	4-8	8-16
	<60		-	-	-	4-10	3-6	6-12
Cast iron		<180	50-70	60-90	55-85	65-110	70-100	80-130
Spheroidal graphite iron	<25	<250	30-50	45-85	40-70	60-100	70-100	80-130
Malleable cast iron	<35	<320	15-35	20-40	25-45	35-55	60-110	70-120
Aluminum and Al-alloys	SILICON CONTENT	WROUGHT AIUMINUM						
	< 6%	n/a	30-50	50-75	50-70	65-80	80-140	90-165
Al cast alloys	6-10%	n/a	25-35	40-50	40-65	65-80	80-140	90-165
	>10%	n/a	-	25-35	40-65	65-80	60-130	80-140
Al wrought alloys	n/a	30-80	50-65	65-100	-	-	-	-
	n/a	75-150	35-60	50-65	-	-	-	-
Titanium and Ti-alloys		140-275	-	-	12-25	20-30	-	-
		300-380	-	-	6-12	10-18	-	-
Nickel and Ni-alloys		200-300	-	-	6-12	10-18	-	-
		>300	-	-	3-6	6-12	-	-
Plastics			15-30	-	20-40	-	30-60	-
Magnesium-alloys			90-140	-	-	-	110-180	-
Brass, short-chipping			30-45	-	45-60	-	80-100	-
long-chipping			30-45	-	45-60	-	80-100	-

Tapping Formulas and Calculations

RPM for UNC/UNF Taps

$$\textbf{RPM} = \text{(revolution / minute)} = \frac{\text{cutting speed (SFM)} \times 3.82}{\text{tap diameter}}$$

Feed Rate for UNC/UNF Taps

$$\textbf{IPR} = \text{(inch / revolution)} = \frac{\text{1 inch}}{\text{threads per inch (TPI)}}$$

$$\textbf{IPM} = \text{(inch / minute)} = \frac{\text{RPM}}{\text{threads per inch (TPI)}}$$

RPM for M/MF Taps

$$\textbf{RPM} = \text{(revolution / minute)} = \frac{\text{cutting speed (SFM)} \times 97.028}{\text{tap diameter (mm)}}$$

Feed Rate for M/MF Taps

$$\textbf{IPR} = \text{(inch / revolution)} = \text{pitch (mm)} \times 0.03937$$

$$\textbf{IPM} = \text{(inch / minute)} = \text{RPM} \times \text{pitch (mm)} \times 0.03937$$

To calculate Tap Drill Size

UNC/UNF and M/MF <u>Cut</u> Taps – General Requirements

$$\textbf{Tap Drill Size} = \text{Tap basic major diameter} - \text{pitch}$$

UNC/UNF <u>Cut</u> Taps – Special Percentage of Thread Requirements

$$\textbf{Drill Size} = \text{Basic major diameter} - \frac{0.01299 \times \text{desired percentage of thread}^{*}}{\text{threads per inch (TPI)}}$$

M/MF <u>Cut</u> Taps – Special Percentage of Thread Requirements

$$\textbf{Drill Size (mm)} = \text{Basic major diameter} - \frac{\text{desired percentage of thread}^{*} \times \text{pitch (mm)}}{76.98}$$

UNC/UNF and M/MF <u>Form</u> Taps – General Requirements

$$\textbf{Tap Drill Size} = \text{Basic major diameter} - \frac{\text{pitch}}{2}$$

UNC/UNF <u>Form</u> Taps – Special Percentage of Thread Requirements

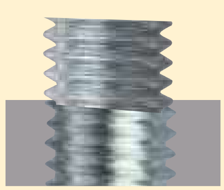
$$\textbf{Drill Size} = \text{Basic major diameter} - \frac{0.0068 \times \text{desired percentage of thread}^{*}}{\text{threads per inch (TPI)}}$$

M/MF <u>Form</u> Taps – Special Percentage of Thread Requirements

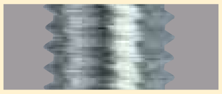
$$\textbf{Drill Size (mm)} = \text{Basic major diameter} - \frac{\text{desired percentage of thread}^{*} \times \text{pitch (mm)}}{147.06}$$

* *Actual percentage will vary from desired percentage due to runout of drilling operation.*

Troubleshooting - Application problems with new taps

Problem	Possible causes	Solution
1 Thread produced is too large 	incorrect tap, tap geometry not suitable for the application	apply correct tap for the material to be machined
	tapping size hole too small	observe tapping size hole table in the technical section. Note different tapping size hole diameters for fluteless taps.
	alignment error of tapping size hole or position	- check for correct tool clamping - apply floating tap holder - check core drill
	machine spindle axially restricted	- use mechanical feed - apply tension/compression tap chuck
	cold welding at the flank of the tap	- apply new tap - apply coated tap - optimize lubrication
	lead of tap unsatisfactory due to insufficient thread depth	- tap with forced feed - apply tap with modified lead
	cutting speed too high	- reduce cutting speed - improve lubrication
	insufficient lubrication or coolant supply	ensure sufficient and suitable coolant supply and check concentration
	tolerance specification on tap does not correspond to specifications on drawing and/or thread gauge	apply correct tap for required tolerances
2 Thread axially miscut 	spiral-fluted taps, corresponding to our design, are applied with too much pressure for initial tapping	with spiral-fluted taps only light pressure required for initial tapping. The tap should immediately be applied within the tension/compression range
	initial tapping pressure too low for taps with spiral point corresponding to our form "B"	taps with spiral point or left hand spiral require higher axial pressure. Ensure tap operates within the tension/compression range
3 Thread produced is too small 	tolerance specification on tap does not correspond to specifications on drawing and/or thread gauge	apply correct tap for required tolerance
	incorrect tap	apply correct tap for the material to be machined
	tap does not cut accurately (thread plug gauge)	avoid strong axial forces during the cutting process
	machine spindle is axially too rigid	apply tension/compression chuck

Troubleshooting - Application problems with new taps

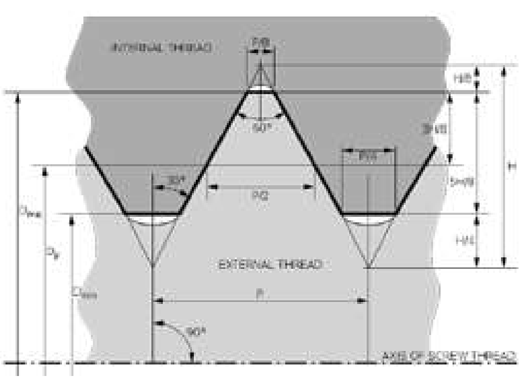
Problem	Possible causes	Solution
4 Thread surface not according to requirements 	cutting edge geometry not suitable for the application	apply “correct” tap for the material to be machined
	cutting speed too high	- reduce cutting speed - optimize lubrication
	insufficient coolant (concentration and supply)	ensure suitable coolant and sufficient volume
	chip congestion	apply suitable tap type
	tapping size hole too small	observe tapping size hole diameter specifi-cations to DIN 336 or respective standards. Observe table for fluteless taps
	with tough, hard materials loading on tool too much or pitch too steep	apply hand tap sets
	built-up edge	apply coated tap
	cold welding	improve coolant supply
5 Tool life insufficient	surface hardening of tapping size hole	- check drill (cutting edge) for wear - heat or surface treatment following thread production
	reasons listed under: “thread surface not according to requirements“	reasons listed under: thread surface “not according to requirements“
	chip congestion	apply correct tap
6 Tool breakage during advance or return 	tapping size hole too small	observe tapping size hole dia. acc. to DIN 336 or respective standards
	teeth of chamfer lead overloaded	- longer chamfer lead (blind or through hole) - increase no. of teeth of chamfer lead by increasing no. of flutes - apply tap sets
	tap hits bottom of tapping size hole	- check hole depth - apply tension/compression tap chuck
	- lack of or incorrect chamfer of tapping size hole - position or angle error of tapping size hole	- correct chamfer angle of tapping size hole - ensure correct tool clamping - apply floating tap holder - check core drill
	- tool hardness not suitable for the application - cutting edge geometry not suitable for the application	apply suitable tap for the individual application

TI / NI CUT TAPS

Titanium and Ti-alloys
Nickel and Ni-alloys

Material group	Approximate Rc	Approximate HB	Recommended SFM					
			HSS-E		HSS-E-PM		Solid carbide	
			bright finish	hard coated	bright finish	hard coated	bright finish	hard coated
Titanium and Ti-alloys	—	140-275	—	—	—	20-30	—	—
	—	300-380	—	—	—	10-18	—	—
Nickel and Ni-alloys	—	200-300	—	—	—	10-18	—	—
	—	>300	—	—	—	6-12	—	—

If you have customers who are suppliers to the aerospace or military Industries, you will encounter “J” or “Controlled root radius” thread requirements.



The differences between these and UNC or UNF threads are as follows:

The external thread is manufactured with radii in the root of the thread for added strength, and to extend the integrity of the threading tool.

The internal thread is manufactured to 3B class of fit tolerancing for the pitch diameter, and will need to use a larger drill for the minor diameter to accommodate the root radius in the bolt.

ANY UN-3B tap will produce a legitimate “UNJ” internal thread.