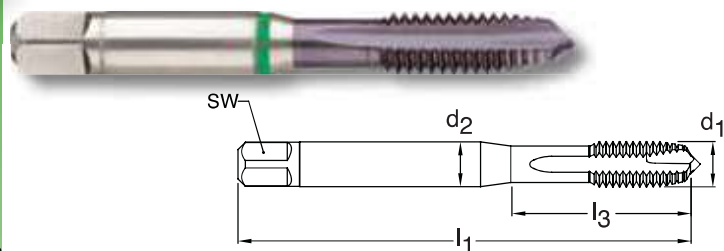
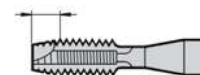


METRIC

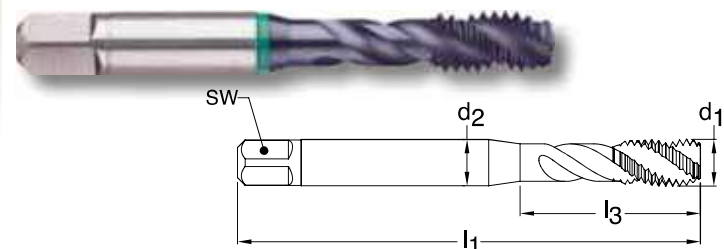

Series 3945
Standard ANSI
Tool Material HSS-E (Cobalt)
Spiral Point Straight flute
Chamfer Form B • 3.5 - 5
Class of Fit ISO 2(6H)

Through holes

TiCN coated

External cooling

d1 - P	D Limits	Tap Drill Range mm	Number of Flutes	d2 inch	SW inch	L1 inch	L3 inch	Order Code	EDP Number	Stock
M2 X 0.40	D2/D3	1.567 - 1.679	3	0.141	0.110	1.752	0.441	2.000	9039450020000	●
M3 X 0.50	D2/D3	2.459 - 2.599	3	0.141	0.110	1.941	0.709	3.000	9039450030000	●
M4 X 0.70	D3/D4	3.242 - 3.422	3	0.168	0.131	2.130	0.827	4.000	9039450040000	●
M5 X 0.80	D3/D4	4.134 - 4.334	3	0.194	0.152	2.382	0.945	5.000	9039450050000	●
M6 X 1.00	D4/D5	4.917 - 5.153	3	0.255	0.191	2.500	1.181	6.000	9039450060000	●
M8 X 1.25	D4/D5	6.647 - 6.912	3	0.318	0.238	2.721	1.377	8.000	9039450080000	●
M10 X 1.50	D4/D5	8.376 - 8.676	3	0.381	0.286	2.941	1.456	10.000	9039450100000	●
M12 X 1.75	D5/D6	10.106 - 10.441	4	0.367	0.275	3.382	N/A	12.000	9039450120000	●
M14 X 2.00	D5/D6	11.835 - 12.210	4	0.429	0.322	3.591	N/A	14.000	9039450140000	●
M16 X 2.00	D6/D7	13.835 - 14.210	4	0.480	0.360	3.811	N/A	16.000	9039450160000	●
M18 X 2.50	D6/D7	15.294 - 15.744	4	0.542	0.406	4.032	N/A	18.000	9039450180000	●
M20 X 2.50	D6/D7	17.294 - 17.744	4	0.652	0.489	4.469	N/A	20.000	9039450200000	●
M22 X 2.50	D6/D7	19.294 - 19.744	4	0.697	0.523	4.689	N/A	22.000	9039450220000	●
M24 X 3.00	D7/D8	20.752 - 21.252	4	0.760	0.570	4.910	N/A	24.000	9039450240000	●
M30 X 3.50	D8/D9	26.211 - 26.771	4	1.021	0.766	5.433	N/A	30.000	9039450300000	●

METRIC


Series 3948
Standard ANSI
Tool Material HSS-E (Cobalt)
Spiral Flute 40° Helix
Chamfer Form C • 2-3
Class of Fit ISO 2(6H)

Blind holes

TiCN coated

External cooling

d1 - P	D Limits	Tap Drill Range mm	Number of Flutes	d2 inch	SW inch	L1 inch	L3 inch	Order Code	EDP Number	Stock
M2 X 0.40	D2/D3	1.567 - 1.679	3	0.141	0.110	1.752	0.441	2.000	9039480020000	●
M3 X 0.50	D2/D3	2.459 - 2.599	3	0.141	0.110	1.941	0.709	3.000	9039480030000	●
M4 X 0.70	D3/D4	3.242 - 3.422	3	0.168	0.131	2.130	0.827	4.000	9039480040000	●
M5 X 0.80	D3/D4	4.134 - 4.334	3	0.194	0.152	2.382	0.945	5.000	9039480050000	●
M6 X 1.00	D4/D5	4.917 - 5.153	3	0.255	0.191	2.500	1.181	6.000	9039480060000	●
M8 X 1.25	D4/D5	6.647 - 6.912	3	0.318	0.238	2.721	1.377	8.000	9039480080000	●
M10 X 1.50	D4/D5	8.376 - 8.676	3	0.381	0.286	2.941	1.456	10.000	9039480100000	●
M12 X 1.75	D5/D6	10.106 - 10.441	3	0.367	0.275	3.382	N/A	12.000	9039480120000	●
M14 X 2.00	D5/D6	11.835 - 12.210	3	0.429	0.322	3.591	N/A	14.000	9039480140000	●
M16 X 2.00	D6/D7	13.835 - 14.210	4	0.480	0.360	3.811	N/A	16.000	9039480160000	●
M18 X 2.50	D6/D7	15.294 - 15.744	4	0.542	0.406	4.032	N/A	18.000	9039480180000	●
M20 X 2.50	D6/D7	17.294 - 17.744	4	0.652	0.489	4.469	N/A	20.000	9039480200000	●
M22 X 2.50	D6/D7	19.294 - 19.744	4	0.697	0.523	4.689	N/A	22.000	9039480220000	●
M24 X 3.00	D7/D8	20.752 - 21.252	4	0.760	0.570	4.910	N/A	24.000	9039480240000	●
M30 X 3.50	D8/D9	26.211 - 26.771	4	1.021	0.766	5.433	N/A	30.000	9039480300000	●

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 austenitic martensitic		<180	25-35	40-55	30-55	35-70	-	-
		<25	<250	20-30	30-40	30-50	35-60	-	-
		<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 ALUMINUM						
		< 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	-

Technical Information

Tapping Formulas and Calculations

RPM for UNC/UNF Taps

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

Feed Rate for UNC/UNF Taps

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

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

RPM for M/MF Taps

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

Feed Rate for M/MF Taps

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

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

To calculate Tap Drill Size

UNC/UNF and M/MF Cut Taps – General Requirements

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

UNC/UNF Cut Taps – Special Percentage of Thread Requirements

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

M/MF Cut Taps – Special Percentage of Thread Requirements

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

UNC/UNF and M/MF Form Taps – General Requirements

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

UNC/UNF Form Taps – Special Percentage of Thread Requirements

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

M/MF Form Taps – Special Percentage of Thread Requirements

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

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

Technical Information

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
- tapping size hole too small
- alignment error of tapping size hole or position
- machine spindle axially restricted
- cold welding at the flank of the tap
- lead of tap unsatisfactory due to insufficient thread depth
- cutting speed too high
- insufficient lubrication or coolant supply
- tolerance specification on tap does not correspond to specifications on drawing and/or thread gauge

- apply correct tap for the material to be machined
- observe tapping size hole table in the technical section. Note different tapping size hole diameters for fluteless taps.
- - check for correct tool clamping
- - apply floating tap holder
- - check core drill
- - use mechanical feed
- - apply tension/compression tap chuck
- - apply new tap
- - apply coated tap
- - optimize lubrication
- - tap with forced feed
- - apply tap with modified lead
- - reduce cutting speed
- - improve lubrication
- ensure sufficient and suitable coolant supply and check concentration
- 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
- initial tapping pressure too low for taps with spiral point corresponding to our form "B"

- with spiral-fluted taps only light pressure required for initial tapping. The tap should immediately be applied within the tension/compression range
- 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
- incorrect tap
- tap does not cut accurately (thread plug gauge)
- machine spindle is axially too rigid

- apply correct tap for required tolerance
- apply correct tap for the material to be machined
- avoid strong axial forces during the cutting process
- 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
- cutting speed too high
- insufficient coolant (concentration and supply)
- chip congestion
- tapping size hole too small
- with tough, hard materials loading on tool too much or pitch too steep
- built-up edge
- cold welding

- apply "correct" tap for the material to be machined
- - reduce cutting speed
- - optimize lubrication
- ensure suitable coolant and sufficient volume
- apply suitable tap type
- observe tapping size hole diameter specifications to DIN 336 or respective standards. Observe table for fluteless taps
- apply hand tap sets
- apply coated tap
- improve coolant supply

5 Tool life insufficient

- surface hardening of tapping size hole
- reasons listed under: "thread surface not according to requirements"
- chip congestion

- - check drill (cutting edge) for wear
- - heat or surface treatment following thread production
- reasons listed under: thread surface "not according to requirements"
- apply correct tap

6 Tool breakage during advance or return



- tapping size hole too small
- teeth of chamfer lead overloaded
- tap hits bottom of tapping size hole
- - lack of or incorrect chamfer of tapping size hole
- - position or angle error of tapping size hole
- - tool hardness not suitable for the application
- - cutting edge geometry not suitable for the application

- observe tapping size hole dia. acc. to DIN 336 or respective standards
- - longer chamfer lead (blind or through hole)
- - increase no. of teeth of chamfer lead by increasing no. of flutes
- - apply tap sets
- - check hole depth
- - apply tension/compression tap chuck
- - correct chamfer angle of tapping size hole
- - ensure correct tool clamping
- - apply floating tap holder
- - check core drill
- apply suitable tap for the individual application

GREEN RING CUT TAPS

Structural steels,
free-cutting steels
Case hardened steels,
heat-treatable steels
Nitriding steels,
spheroidal graphite iron

Material group	Approximate Rc	Approximate HB	Recommended SFM			
			HSS-E		HSS-E-PM	
			bright finish	hard coated	bright finish	hard coated
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	10-23	20-40	20-45	30-55