



Thread milling cutters series

THREAD MILLS

Volume 3

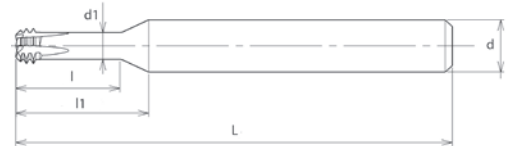


KEY FEATURES: WH-EM-PNC



WH-EM-PNC NEW

Threading | Thread milling | Metric



- Thread milling without pre-drilled hole
- WXS coating
- Left-hand (spindle rotation left)
- Direction of tool feed: right
- 4 flutes, strong & negative rake angle

P ○ C < 0,2%	P ○ 0,25 < C < 0,4	P ○ C > 0,45%	P ○ SCM	M ○ INOX	K ○ GG	K ○ GGG	N ○ Al	N ○ AC,ADC	S ● Ti	S ● Ni	H ● 25-45 HRC	H ● 45-55 HRC	
40-100	40-100	40-100	40-100	40-100	40-120	40-100	40-100	40-160	40-80	40-80	40-100	30-80	m/min
0,01~0,03	0,01~0,03	0,01~0,03	0,01~0,03	0,01~0,03	0,01~0,1	0,01~0,05	0,01~0,05	0,01~0,1	0,01~0,03	0,01~0,03	0,01~0,03	0,01~0,03	mm/t

M
CARBIDE
WXS
h6
LH

EDP	M	P	L	l	l1	d1	d	Z	Price
T1606081	3	0,5	50	7,5	12,3	1,70	6	4	
T1606082	4	0,7	50	9,9	14,2	2,18	6	4	
T1606083	5	0,8	50	12	15,5	2,97	6	4	
T1606084	6	1	50	14,5	17,5	3,36	6	4	
T1606085	8	1,25	70	19,2	24,1	4,66	10	4	
T1606086	10	1,5	70	23,7	27,7	5,78	10	4	
T1606087	12	1,75	80	28,4	31,4	6,92	10	4	

CUTTING DATA

Tool	WH-EM-PNC M4
Work Material	1.2379 (Cold work tool steel) 60HRC
Cutting speed	30 m/min (3.082 min ⁻¹)
Feed	123 mm/min (0.01 mm/t)
Depth of cut	8 mm
Coolant	Airblow
Machine	Exeron HSC600
Interface	HSK-40
Holder	Shrink holder
Hole type	Blind hole

Tool	WH-EM-PNC M4
Work Material	1.6582 (Alloy engineering steel) 1400-1550 N/mm ²
Cutting speed	50 m/min (5.137 min ⁻¹)
Feed	205 mm/min (0.01 mm/t)
Depth of cut	9 mm
Coolant	Airblow
Machine	Hermle C32U
Interface	HSK63-A
Holder	Hydraulic chuck
Hole type	Blind hole

Tool	WH-EM-PNC M4
Work Material	Vanadis (Cold work steel) 64HRC
Cutting speed	30 m/min (3.082 min ⁻¹)
Feed	123 mm/min (0.01 mm/t)
Depth of cut	8 mm
Coolant	Airblow
Machine	n.a.
Interface	n.a.
Holder	Shrink holder
Hole type	Blind hole

Threading | Thread milling

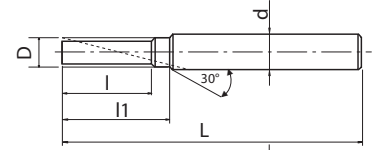
Metric

WX-PNC

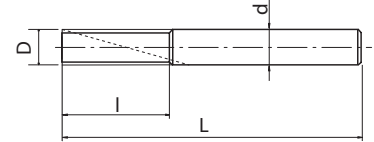
Threading | Thread milling | Metric & Metric Fine



Type 1



Type 2



- Carbide thread milling cutter
- WX coating
- For all materials
- "ThreadPro" NC code generator software available

Threading | Thread milling

P ○ C < 0,2%	P ○ 0,25 < C < 0,4	P ○ C > 0,45%	P ○ SCM	M ○ INOX	K ○ GG	K ○ GGG	N ○ Al	N ○ AC,ADC	S ● Ti	S ● Ni	H ○ 25-35 HRC	H ○ 35-45 HRC	m/min
50-75	50-75	40-70	15-30	20-40	50-100	50-65	50-70	65-130	20-60	20-60	15-30	15-30	

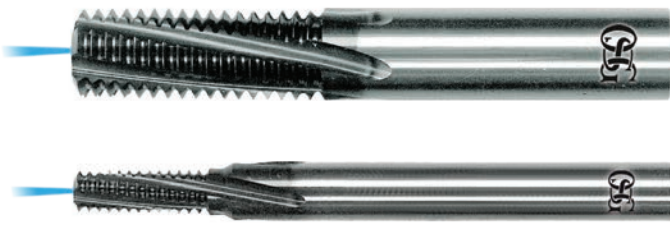
M	MF	CARBIDE	WX	30°	h6
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Metric & Metric Fine

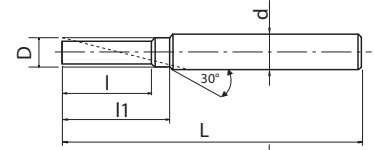
EDP	D	Minimum cutting bore Ø	P	L	l	l1	d	Z	Type
3900001	4,5	M6	1	60	13	15	6	3	1
3900011	6	M8	1	65	17	-	6	3	2
3900012	6	M8	1,25	65	17,5	-	6	3	2
3900021	7,5	M10	1	70	21	26	8	3	1
1004470640	7,5	M10	1,25	70	21,3	26	8	3	1
3900023	7,5	M10	1,5	70	22,5	26	8	3	1
3900032	9,5	M12	1,25	85	26,3	28	10	4	1
3900033	9,5	M12	1,5	85	25,5	28	10	4	1
3900034	9,5	M12	1,75	85	26,3	28	10	4	1
3900042	10	M14	1	85	29	-	10	4	2
3900043	10	M14	1,5	85	30	-	10	4	2
3900044	10	M14	2	85	30	-	10	4	2
3900052	12	M16	1	95	33	-	12	4	2
3900053	12	M16	1,5	95	34,5	-	12	4	2
3900054	12	M16	2	95	34	-	12	4	2
3900073	16	M20	1,5	105	42	-	16	4	2
3900075	16	M20	2,5	105	42,5	-	16	4	2
3900083	20	M27	1,5	120	49,5	-	20	5	2
3900084	20	M27	2	120	50	-	20	5	2
3900086	20	M27	3	120	51	-	20	5	2

WXO-ST-PNC

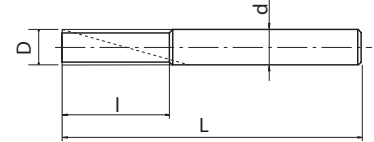
Threading | Thread milling | Metric & Metric Fine



Type 1



Type 2



- Carbide thread milling cutter with Centre through coolant
- WX coating
- For all materials and hardened steels up to 45 HRC
- "ThreadPro" NC code generator software available

P ○ C < 0,2%	P ● 0,25 < C < 0,4	P ● C > 0,45%	P ● SCM	M ○ INOX	K ○ GG	K ○ GGG	N ○ Al	N ○ AC,ADC	H ● 25-35 HRC	H ● 35-45 HRC	m/min
80-120	80-120	80-120	80-120	40-80	50-100	50-65	50-70	65-130	60-100	60-100	

M	MF	CARBIDE	WX	11°		h6
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EDP	D	Minimum cutting bore Ø	P	L	I	l1	d	Z	Type
8304700	4,5	M6	0,75	60	12,8	15	6	4	1
8304701	4,5	M6	1	60	13	15	6	4	1
8304710	6	M8	0,5	65	16,5	-	6	4	2
8304711	6	M8	1	65	17	-	6	4	2
8304712	6	M8	1,25	65	17,5	-	6	4	2
8304721	7,5	M10	1	70	21	26	8	4	1
8304723	7,5	M10	1,5	70	22,5	26	8	4	1
8304732	9,5	M12	1,25	85	26,3	28	10	5	1
8304733	9,5	M12	1,5	85	25,5	28	10	5	1
8304734	9,5	M12	1,75	85	26,3	28	10	5	1
8304740	10	M14	0,5	85	28,5	-	10	5	2
8304741	10	M14	0,75	85	29,3	-	10	5	2
8304742	10	M14	1	85	29	-	10	5	2
8304743	10	M14	1,5	85	30	-	10	5	2
8304744	10	M14	2	85	30	-	10	5	2
8304752	12	M16	1	95	33	-	12	5	2
8304753	12	M16	1,5	95	34	-	12	5	2
8304754	12	M16	2	95	34	-	12	5	2
8304773	16	M20	1,5	105	42	-	16	5	2
8304775	16	M20	2,5	105	42,5	-	16	5	2
8304783	20	M27	1,5	120	49,5	-	20	6	2
8304784	20	M27	2	120	50	-	20	6	2
8304786	20	M27	3	120	51	-	20	6	2

CUTTING CONDITIONS

Threading | Thread mills | Cutting conditions

WH-VM-PNC/WX-ST-PNC-3P

Work Material		Vc (m/min)	F (mm/tooth)
Low Tensile Strength Steel	C~0,25%	60~90	0,02~0,08
Medium Tensile Strength Steel	C~0,25% ~ 0,45%	60~90	0,02~0,08
High Tensile Strength Steel	C0,45%~	60~90	0,02~0,08
Alloy Steel	SCM	30~60	0,01~0,03
Hardened Steel	25~45 HRC	30~60	0,01~0,03
	45~55 HRC	30~60	0,01~0,03
	50~60 HRC	-	-
Stainless Steel	SUS	60~90	0,02~0,08
Tool Steel	SKD	-	-
Cast Steel	SC	40~65	0,02~0,09
Cast Iron	FC	50~100	0,03~0,1
Ductile Cast Iron	FCD	50~70	0,03~0,1
Copper	Cu	-	-
Brass	Bs	-	-
Brass Casting	BsC	50~100	0,02~0,06
Bronze	PB	50~100	0,02~0,06
Aluminium Rolled Steel	AL	50~100	0,02~0,06
Aluminium Alloy Casting	AC, ADC	50~100	0,02~0,06
Magnesium Alloy Casting	MC	50~100	0,02~0,06
Zinc Alloy Casting	ZDC	50~100	0,02~0,06
Titanium Alloys	Ti-6AL-4V	20~60	0,01~0,03
Nickel Alloys	Inconel®	20~60	0,01~0,03
Thermosetting plastic	-	50~100	0,02~0,06
Thermoplastic	-	50~100	0,02~0,06

WXO-ST-PNC

Work Material		Vc (m/min)	F (mm/tooth)
Low Tensile Strength Steel	C~0,25%	80~120	0,04~0,1
Medium Tensile Strength Steel	C~0,25% ~ 0,45%	80~120	0,04~0,1
High Tensile Strength Steel	C0,45%~	80~120	0,04~0,1
Alloy Steel	SCM	80~120	0,02~0,08
Hardened Steel	25~45 HRC	60~100	0,02~0,08
	45~55 HRC	-	-
	50~60 HRC	-	-
Stainless Steel	SUS	40~80	0,02~0,06
Tool Steel	SKD	-	-
Cast Steel	SC	40~65	0,02~0,09
Cast Iron	FC	50~100	0,03~0,1
Ductile Cast Iron	FCD	50~65	0,03~0,1
Copper	Cu	65~130	0,03~0,1
Brass	Bs	65~130	0,03~0,1
Brass Casting	BsC	65~130	0,03~0,1
Bronze	PB	65~130	0,03~0,1
Aluminium Rolled Steel	AL	50~70	0,03~0,1
Aluminium Alloy Casting	AC, ADC	65~130	0,03~0,1
Magnesium Alloy Casting	MC	65~130	0,03~0,1
Zinc Alloy Casting	ZDC	65~130	0,03~0,1
Titanium Alloys	Ti-6AL-4V	20~60	0,02~0,06
Nickel Alloys	Inconel®	20~60	0,01~0,03
Thermosetting plastic	-	65~130	0,03~0,13
Thermoplastic	-	65~130	0,03~0,13

CUTTING CONDITIONS

Threading | Thread mills | Cutting conditions

WX-PNC

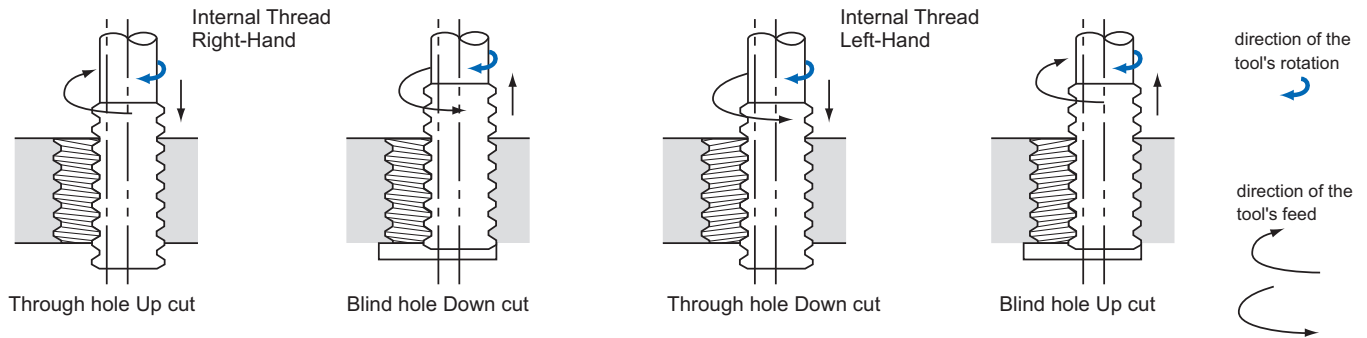


Work Material		Vc (m/min)	F (mm/tooth)
Low Tensile Strength Steel	C~0,25%	50~75	0,01~0,11
Medium Tensile Strength Steel	C~0,25% ~ 0,45%	40~70	0,01~0,11
High Tensile Strength Steel	C0,45%~	40~70	0,01~0,01
Alloy Steel	SCM	15~30	0,01~0,03
Hardened Steel	25~45 HRC	15~30	0,01~0,03
	45~55 HRC	-	-
	50~60 HRC	-	-
Stainless Steel	SUS	20~40	0,01~0,06
Tool Steel	SKD	-	-
Cast Steel	SC	40~65	0,02~0,09
Cast Iron	FC	50~100	0,03~0,1
Ductile Cast Iron	FCD	50~65	0,03~0,1
Copper	Cu	65~130	0,03~0,1
Brass	Bs	65~130	0,03~0,1
Brass Casting	BsC	65~130	0,03~0,1
Bronze	PB	65~130	0,03~0,1
Aluminium Rolled Steel	AL	50~70	0,03~0,1
Aluminium Alloy Casting	AC, ADC	65~130	0,03~0,1
Magnesium Alloy Casting	MC	65~130	0,03~0,1
Zinc Alloy Casting	ZDC	65~130	0,03~0,1
Titanium Alloys	Ti-6AL-4V	20~60	0,02~0,06
Nickel Alloys	Inconel®	20~60	0,01~0,03
Thermosetting plastic	-	65~130	0,03~0,13
Thermoplastic	-	65~130	0,03~0,13



Machining Technique

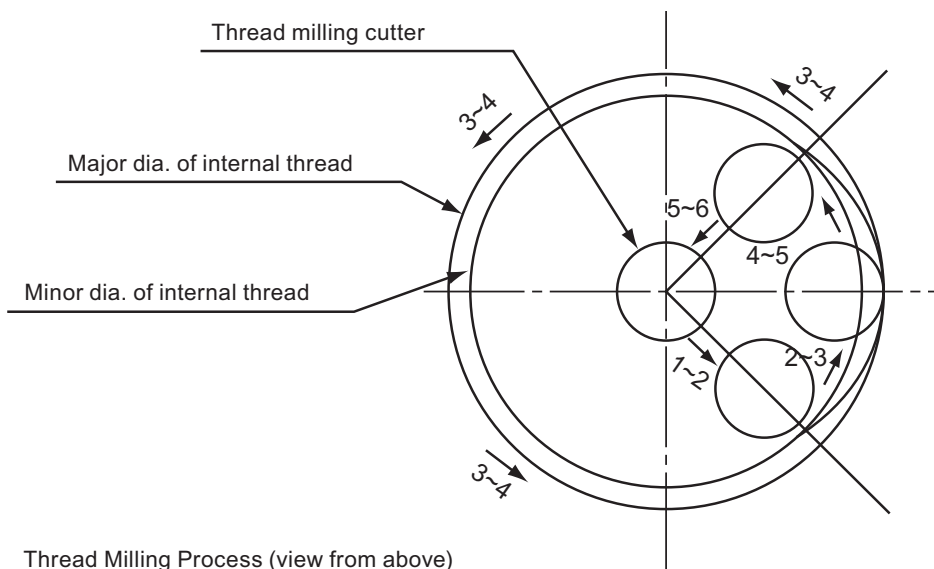
OSG's Thread Mills are developed for thread milling on a 3-Axis CNC controlled machine tool. Threads are produced by advancing one pitch feed per revolution in the axial direction, utilizing the planet-like rotation and revolution movements of the tool. Internal/external and right/left hand threads can all be produced with this one tool by simply changing the direction of rotation and/or feed



Threading Process

- 1-2 Move to edge (maintain clearance)
- 2-3 Cut with helical milling
- 3-4 Mill the circumference of the circle
- 4-5 Pull away from the edge
- 5-6 Remove tool

The transition between the start and finish of the milling operation must be smooth and the appropriate amount of feed is essential for minimizing milling resistance. There are many different methods for using this tool, but our research has shown that this technique provides the most precise and efficient operation.



Thread Milling Process (view from above)

Machining small diameter internal threads with stainless steel

Tool	WH-VM-PNC 0,72 P0,25	Competitor	Description	Tool Life	
	SUS304			100	200
Work Material	SUS304		WH-VM-PNC	212 Holes → Gauge-Out	
Cutting Speed	80m/min (35.367min ⁻¹)			235 Holes → Gauge-Out	
Feed	594mm/min (0.02mm/t)				
Internal Thread Size	M1x0.25				
Drill Hole Size	φ0.78x2.5mm (Blind)		Competitor	122 Holes → Gauge-Out	
Tapping Length	2mm (2D) (Blind)			198 Holes → Gauge-Out	
Machining Method	Up Cut 2 passes				
Coolant	Water Soluble				
Machine	(HSK-E25) Vertical Machining Center				

The WH-VM-PNC was able to perform stably with water-soluble coolant in stainless steel, a difficult process for cut taps. It was able to achieve long tool life and perform stably when tapping M1 threads. When processing threads with limited tap drill hole depth allowance for tap drill holes, the WH-VM-PNC was able to perform more stably than a conventional cut tap.

Machining small diameter internal threads with Inconel 718

Tool	WH-VM-PNC 3,2 x 2,4 U32		Cutting Speed	N° of Passes	Number of Holes				
	Inconel 718 (40HRC)				20	40	60	80	
Work Material	Inconel 718 (40HRC)		40m/min	4	50 Holes → Substantial tool chipping				
Cutting Speed	40m/min (3.980min ⁻¹)	60m/min (5.970min ⁻¹)			60 Holes → Substantial tool chipping				
Feed	120mm/min (0,03mm/t)	180mm/min (0,03mm/t)		60m/min	2	40 Holes → Substantial tool chipping			
Internal Thread Size	N°10~32 UNF								
Drill Hole Size	φ4,1x14mm (Blind)								
Tapping Length	9mm (1,9D) (Blind)								
Machining Method	Down Cut 2-4 passes								
Coolant	Water Soluble								
Machine	(HSK-A40) Vertical Machining Center								

Compared to taps, thread mills have fewer cutting condition limitations. There are no worries about chip management or coolant lubricity, and stable tapping is possible. In this example, we were able to improve the yield rate of small diameter internal threads in a high value workpiece. Further durability improvements and cost reductions can be expected by adjusting the feed rate and number of passes, and changing the cutting fluid.



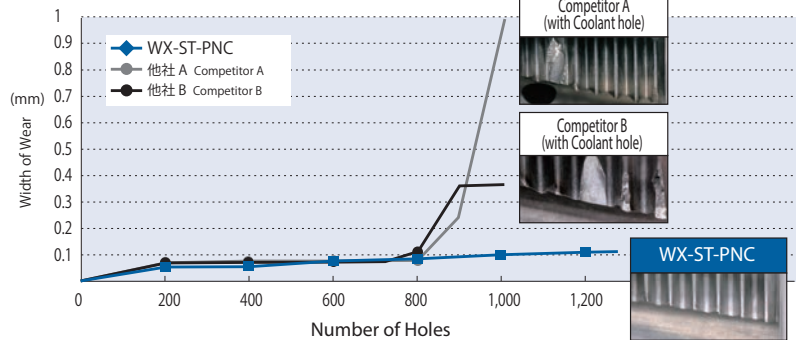
Outstanding Performance in Stainless with Water-Soluble Coolant

Tool	WX-ST-PNC 7,5x9,1RC 28
Work Material	SUS304
Cutting Speed	130m/min (9.970min ⁻¹)
Feed	607mm/min (0,1mm/t)
Internal Thread Size	Rc 1/8-28
Drill Hole Size	φ8,2x9mm (Though)
Tapping Length	6,2 mm
Machining Method	Down Cut
Coolant	Water Soluble
Machine	Vertical Machining Center

Description	Number of Holes		
	500	1.000	1.500
WH-ST-PNC	1.315 Holes → Gauge-Out		
Competitor A	1.217 Holes → Gauge-Out		
Competitor B	1.000 Holes → Gauge-Out		

Tool life comparison against other competitors under identical cutting condition in SUS304. The tool life of the WX-ST-PNC was slightly higher than other competitors. Also, in terms of tool wear, it was the only tool that was in fair enough condition for regrinding.

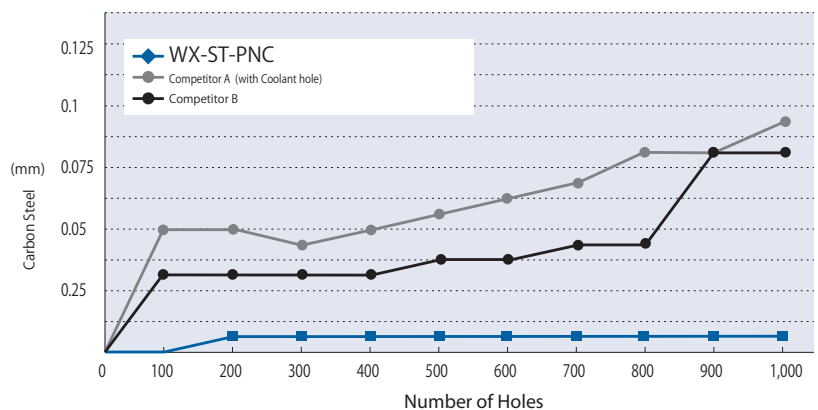
Tool Wear Amount



Stable performance in S45C

Tool	WX-ST-PNC 7,5x9,1RC 28
Work Material	S45C
Cutting Speed	100m/min (4.592min ⁻¹)
Feed	327mm/min (0,07mm/t)
Internal Thread Size	Rc 1/8-28
Drill Hole Size	φ8,2x9mm (Though)
Tapping Length	6,2 mm
Machining Method	Down Cut
Coolant	Water Soluble
Machine	Vertical Machining Center (BT30)

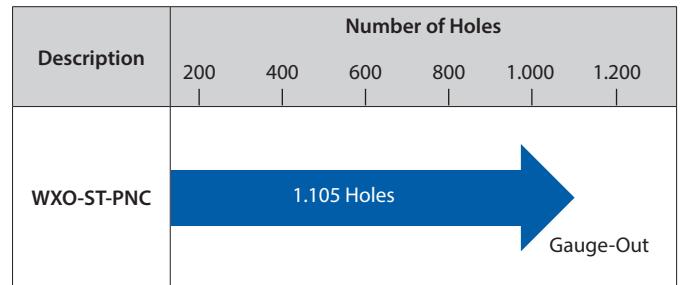
Pitch-dia. Reduced amount



Cutting results in S45C. The WX-ST-PNC was able to stably process 1,000 holes with minimal changes in the effective diameter.

Long tool life when high-speed machining hardened steels

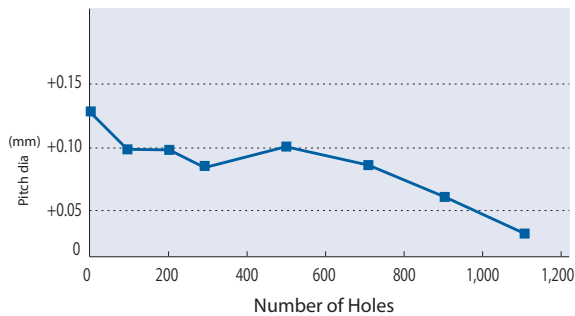
Tool	WXO-ST-PNC 9,5 x 26,3 P1,75
Work Material	SCM440 (40HRC)
Cutting Speed	100m/min (3.351min ⁻¹)
Feed	349mm/min (0.1mm/t)
Internal Thread Size	M12x1,75
Drill Hole Size	φ10,3
Tapping Length	20 mm
Machining Method	Down Cut 2 passes
Coolant	Water Soluble (10%) (Internal)
Machine	Vertical Machining Center



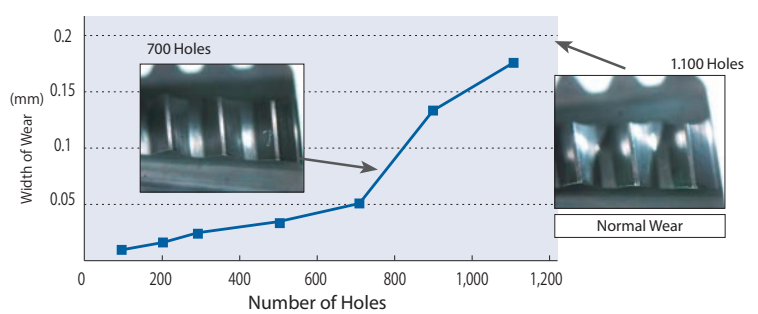
Machined continuously without making tool diameter corrections.

In this example, even when high-speed machining at 100m/min with internally supplied coolant, there was no chipping and long tool life was achieved. The internal threads' pitch diameter measurement was stable, demonstrating the effectiveness of this tool in mass production machining.

Pitch diameter of internal thread

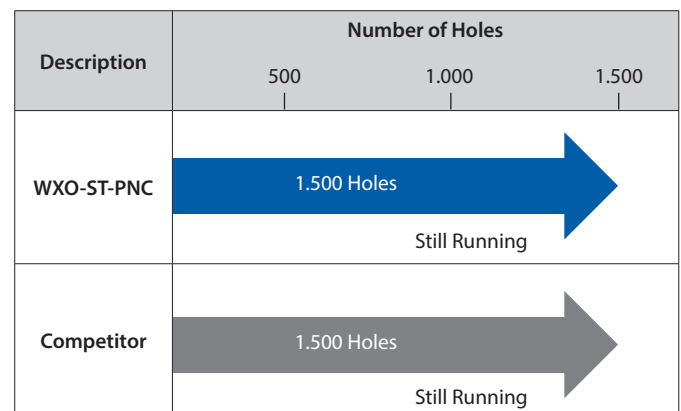


Changes in the extent of wear on the outer circumference



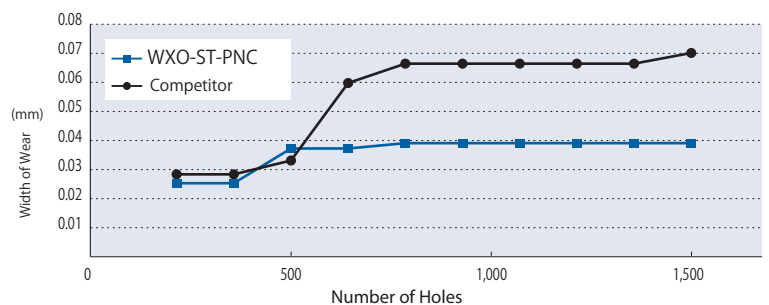
Stable machining in stainless steels, Wear is 40% less than the competitor

Tool	WXO-ST-PNC 9,5 x 26,6 P1,75
Work Material	SUS 304
Cutting Speed	80m/min (2.681min ⁻¹)
Feed	168mm/min (0,06 mm/t)
Internal Thread Size	M12x1,75
Tapping Length	23 mm
Coolant	Water Soluble
Machine	Vertical Machining Center (BT40)



Even when machining stainless steel at 80m/min, it was possible to machine over 1,500 holes, and tool wear was 40% less than the competitor's product. Low wear, slow wear progression and long, stable machining of internal threads were achieved.

Changes in the extent of wear on the outer circumference



In non-ferrous materials, WX-PNC has excellent durability

Tool	WX-PNC 7,6 x 14,3 U16	Number of Holes			
Description		2.000	4.000	6.000	8.000
Work Material	A7075				
Cutting Speed	160m/min (6.701min ⁻¹)				
Feed	650mm/min (0,16 mm/t)				
Internal Thread Size	3/8-16				
Tapping Length	12 mm				
Coolant	Water Soluble				
Machine	Vertical Machining Center (BT40)				

Even after machining 8,800 holes in A7075 with a cutting speed of 160m/min, tool wear was negligible. It was still possible for the WX-PNC to continue much more, effectively achieving stable machining of internal threads on a machining center.



No.1 (after cutting 8,800 threads)

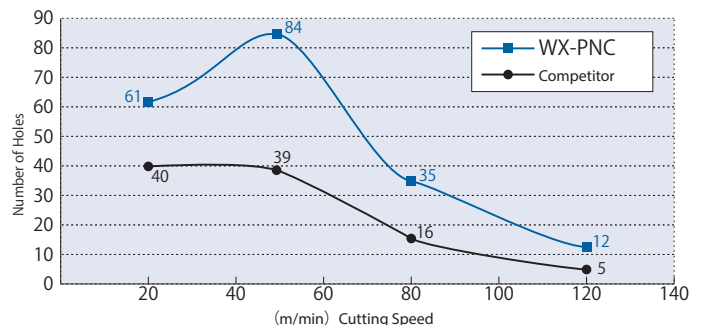


No.2 (after cutting 8,800 threads)

The WX-PNC is also for heat-resistant steels. It achieved twice the tool life of the competitor in Inconel 718

Tool	WX-PNC 4,55 x 10,8 U20
Work Material	Inconel 718 (43HRC)
Internal Thread Size	1/4--20 UNC
Tapping Length	9 mm
Feed per Tooth	0,03 mm/t
Coolant	Water Soluble (10%)
Machine	Horizontal Machining Center

Cutting Speed and Durability Count



These are the test results in Inconel® 718 at various cutting speeds. At cutting speeds under 50m/min, durability is better and this seems to be an effective machining range. The WX-PNC achieves twice the tool life of the competitor, no matter the cutting speed.

FEEDBACK FROM THREADPRO USERS

"An increased variety of NC machines to select from has helped me a lot." (User)

"The RPRG is very convenient! Before RPRG, I set the depth of cut on a trial-and-error basis for the first session. Now I can confidently set the depth correctly the first time." (User)

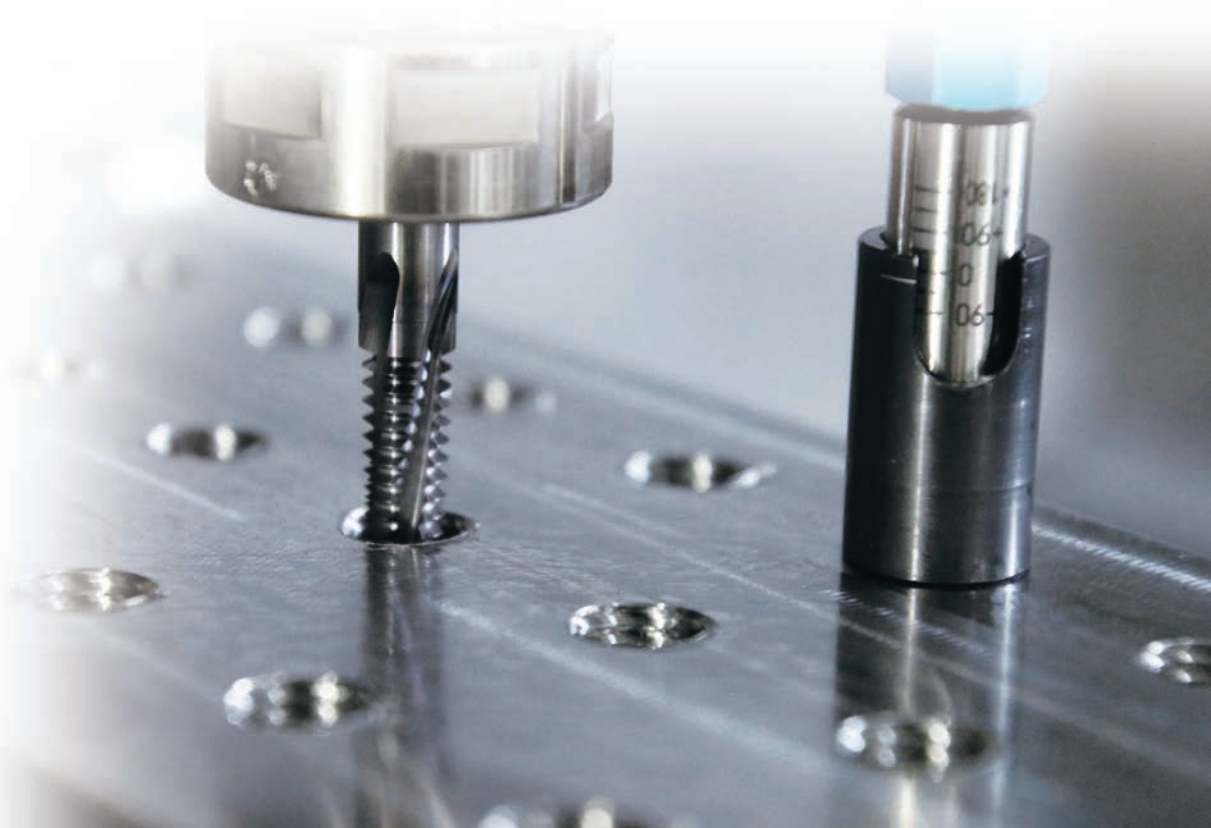
"I have no trouble selecting a tool, although it has been difficult for me to find the right combination of a holder and an insert . (Distributor)

"It is very convenient and easy to select the type of the tool or cutting edge according to the cutting context." (User)

"The search results show relevant tool profiles and dimensions, for which I am glad." (User)

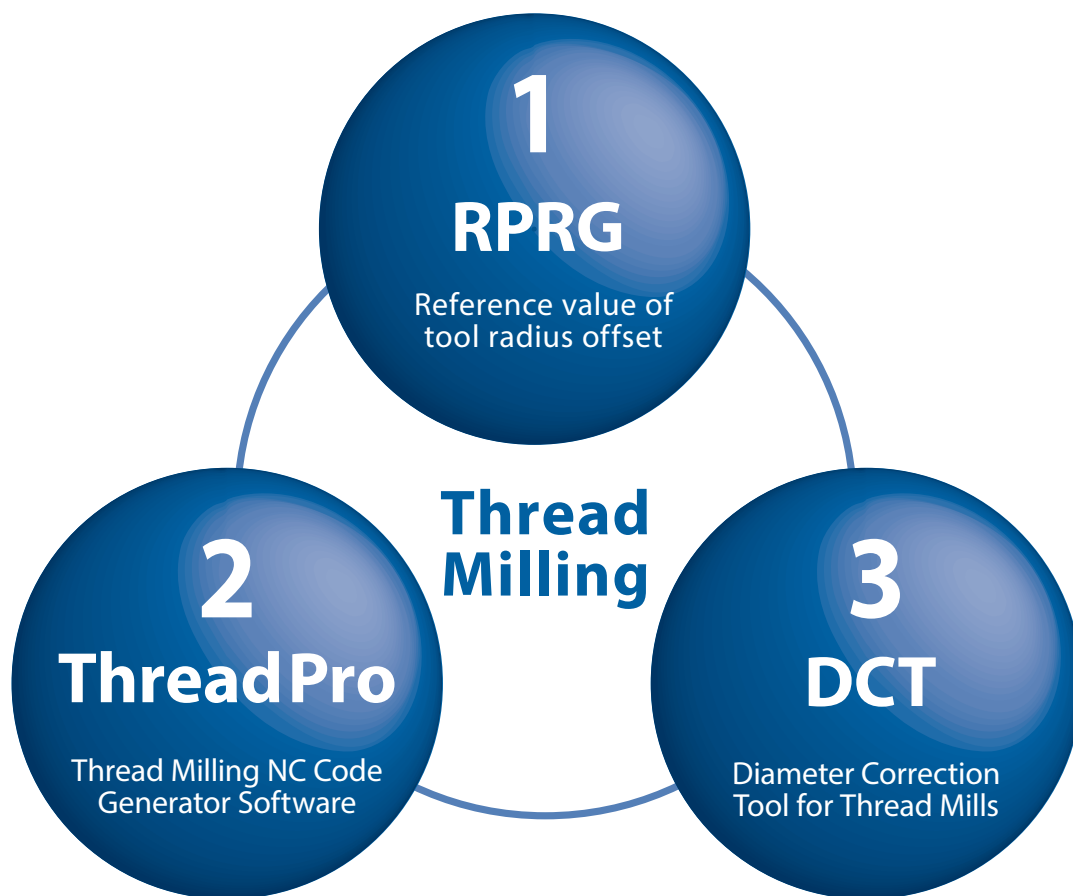
VOICE OF THREADPRO DEVELOPER

In recent years, various theories concerning cutting have been proposed for end milling, considering load control and cutting efficiency. This is due to higher flexibility in end milling than in tapping. Thread mill is a thread cutting tool. However, as cutting methods it is closer to end mills than taps. Accordingly, to achieve optimal thread milling, parameters should include the cutting path as well as other cutting conditions. Nevertheless, because the workings of a thread mill are inherently complex, it is very difficult for the user to achieve the proper arrangement. OSG has radically updated the NC program development software to enable users to realize their ideas with increased ease and make more effective use of their tools than before.



SUPPORT TOOLS FOR YOUR THREAD MILLING NEEDS

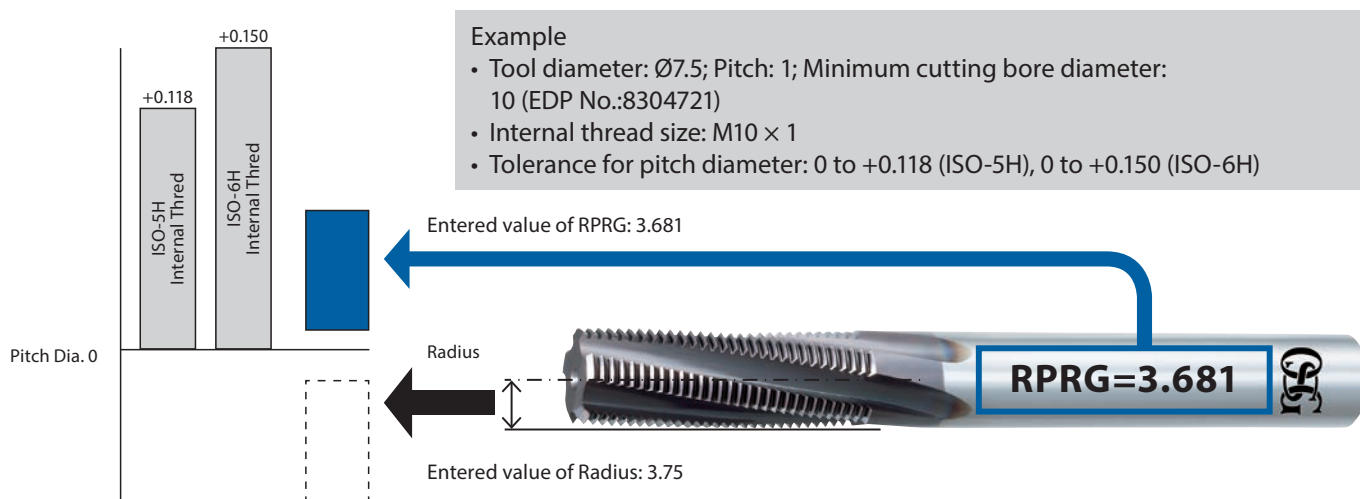
Reduce setup, machining time, and achieve stable tool life with these 3 support tools.



1 RPRG

RPRG is the reference value of tool radius offset

Conventionally, the tool radius was entered during setup as a parameter of the NC system, which was corrected by checking the thread with a gauge. However, it has become possible to reduce the checking and correction simply by entering the RPRG value indicated on the tool shank.

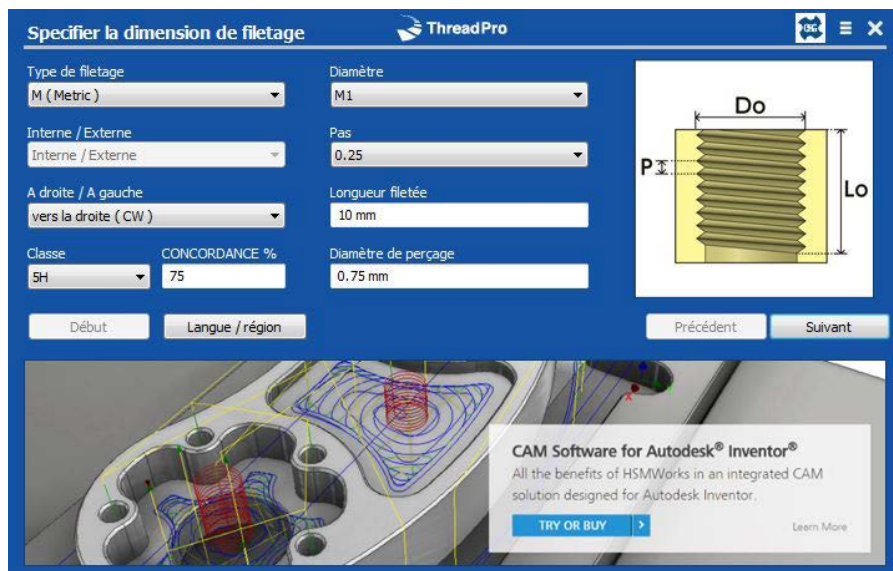


SUPPORT TOOLS FOR YOUR THREAD MILLING NEEDS

2 ThreadPro

Revamped thread milling NC Code Generator Software "ThreadPro"

Generate codes for complex machining couldn't be easier. Create machining programs at ease with OSG's revamped NC code generator software ThreadPro.



3 Key Revamped Features

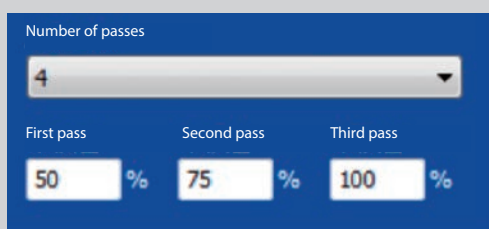
- Available in 12 different languages
- Supports 8 NC programming languages
- Calculates the most appropriate RPRG value

Scan to download ThreadPro.

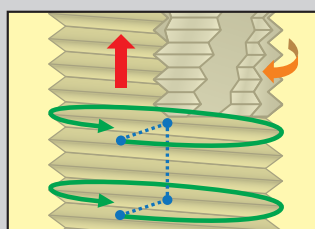


ThreadPro with Comprehensive Features

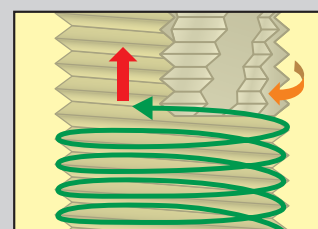
1. Generate programs for zero cut at ease
2. High quality machining by stair passes
3. Capability to review machining trajectory to reduce tool damage



Pass type: continuous

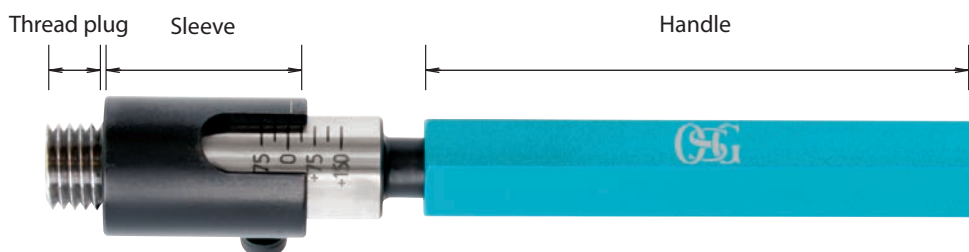


Pass type: stairs



3 Reduce setup & machining time

The internal thread effective diameter, which used to be difficult to determine, can now be measured with readable values.



KEY FEATURES: DCT



1 Reduce setup & machining time

RPRG values are indicated on tool shank manufactured from November 2014. Now possible to reduce the checking and correction simply by entering the RPRG value.

2 Scale sleeve

Measurable range 100% ~ 50% tolerance of thread size (6H)

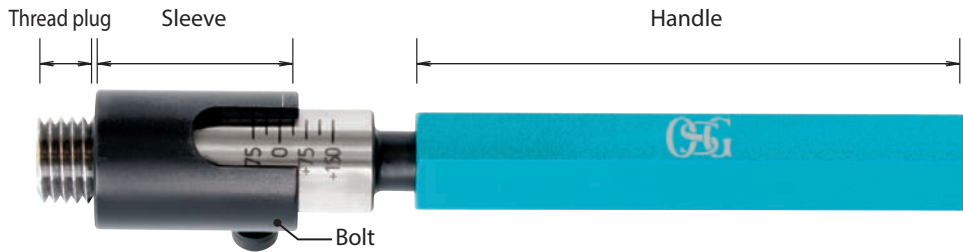
3 7 positions on the reading scale

With an attached reading scale, the effective diameter's position can be confirmed at a glance.

KEY FEATURES & BENEFITS

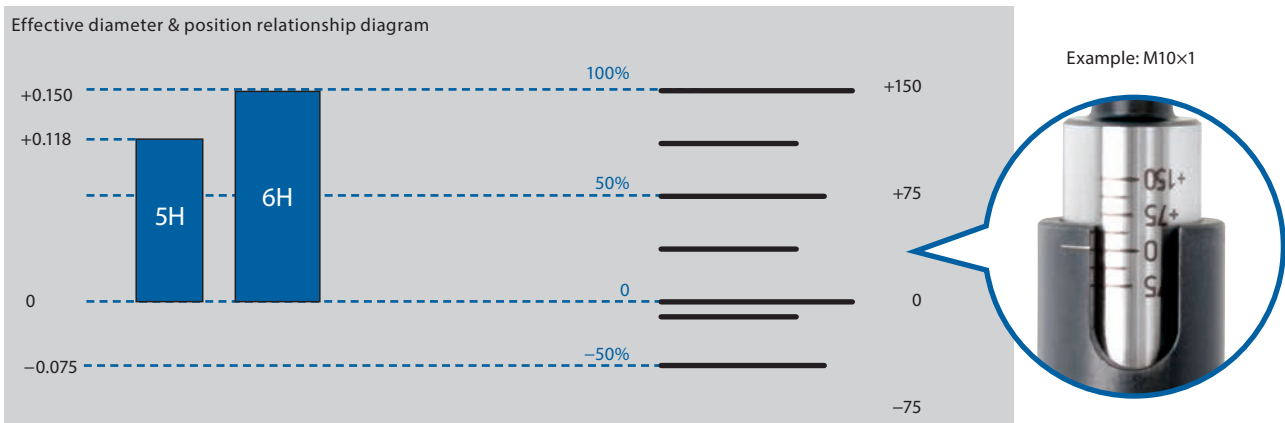
1 Reduce setup & machining time

The internal thread effective diameter, which used to be difficult to determine, can now be measured with readable values.



2 Scale sleeve

The DCT is made up of three components – the thread plug, scale sleeve and bolt for fixing the position. Measurable range from 100% ~ -50% tolerance of thread size (6H); with 7 positions on the reading scale.



3 Measuring method

1

Insert the DCT into the thread. Turn the tool until it has reached the deepest position.

2

Release the reading sleeve so that it touches the top of the thread. Fix the bolt by screwing it tight.

3

Turn the tool in reverse to remove it from the thread.

4

Read the value on the scale.

* The reading value should be used as reference only. To inspect the screw thread please use the limit gauge (refer to p.6).
 * Depending on work environment this product may not be applicable.



shaping your dreams

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