

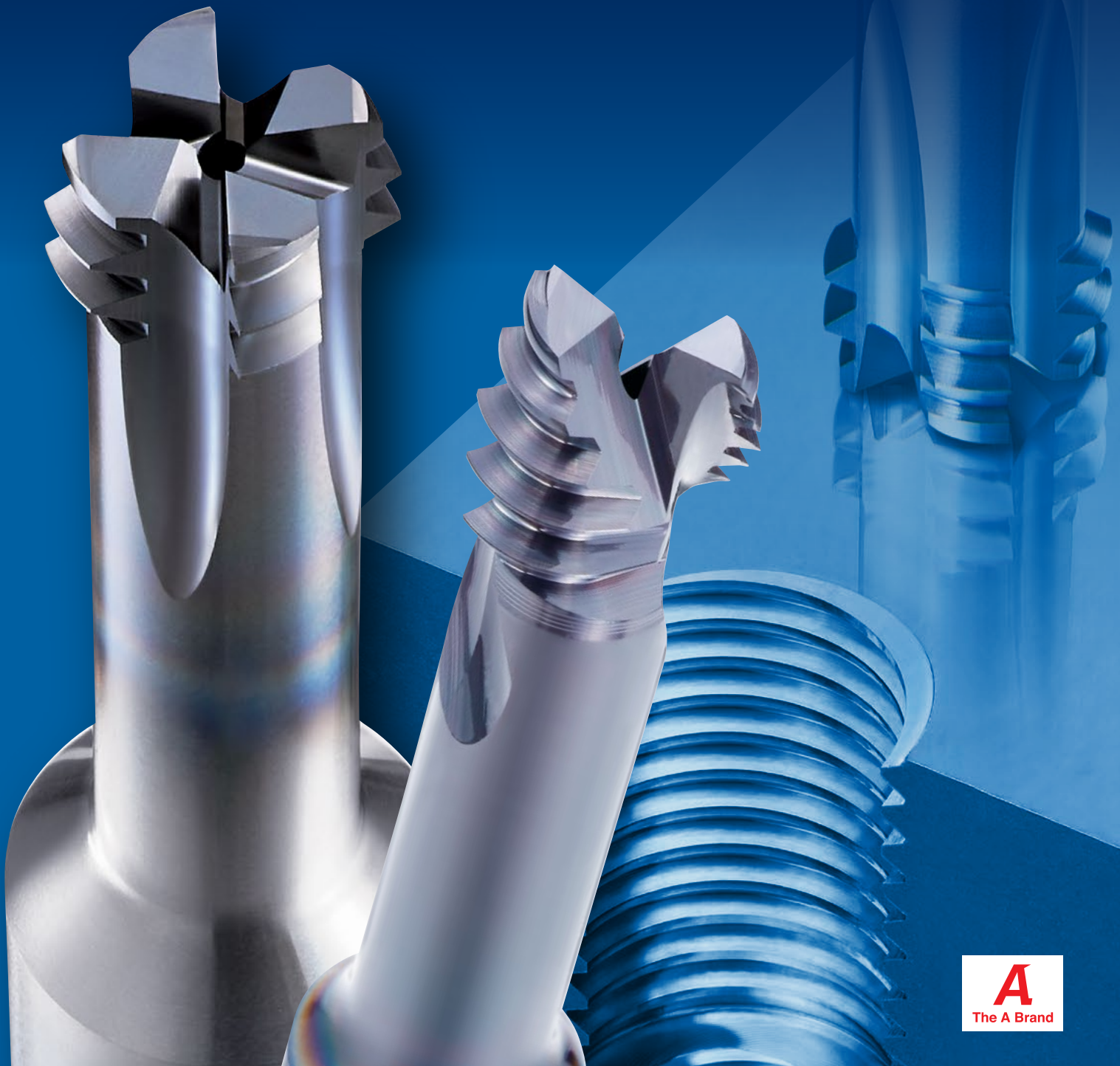


Vol 3

Advanced Performance End-Cutting Thread Mills for a Variety of Materials

A Brand[®] AT-2

AT-2 • AT-2 R-SPEC



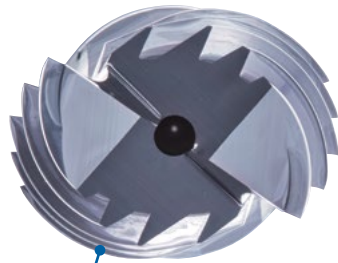
A Brand® AT-2 R-SPEC

Features & Benefits

Coolant Hole

To evacuate chips smoothly.

*Over Ø4.6



End Cutting Edge

Helical drilling & threading can be done simultaneously.

Left-Hand Cut

Results in long tool life by climb milling.

*Counterclockwise Spindle Rotation

2-Flute

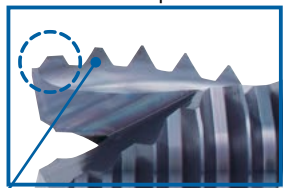
For wide chip room.

DLC-IGUSS Coating

To prevent welding on the cutting edge and achieve more tool life.

Unique Cutting Edge Shape

To prevent deflection of tool. *PAT. in Japan



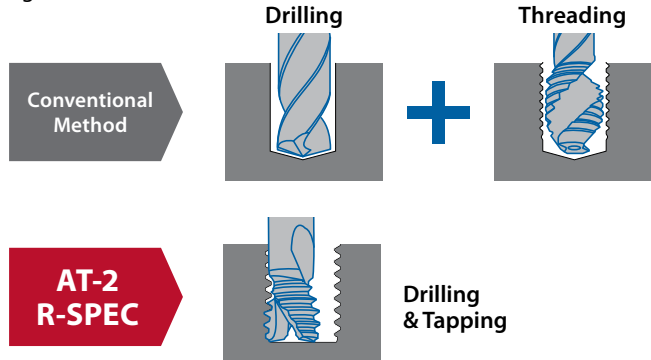
Roughing Teeth

To realize high efficiency by cutting load distribution.

Cycle Time Reduction

2 Processes with 1 Tool

Achieves drilling and threading by continuous helical cutting with a single tool.



Hole Position Accuracy

Countermeasure Against Misalignment in Cast

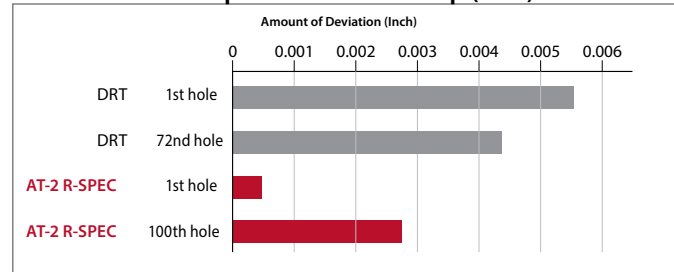
Rough position settings and inclined nature of cast holes can cause position shifting in following processes.



Issues in Cast Hole

1. Rough Hole Position
2. Draft Angle

Hole Position Comparison vs Drill & Tap (DRT)



Tool: M8x1.25 Depth: 0.7087" Material: Casting Aluminum

Machining Test Shifter 0.02756" from the pilot hole Ø0.1693"

DRT: SFM = 328, IPR = 0.0492

AT-2 R-SPEC: AFM = 722, IPR = 0.0472

Air Blow Option

Can Also Be Available with Air Blow

Q. There are cases that oil cannot be used in machining electrical parts.

A. It is recommended to use coolant, but it can also be used with air blow due to the fragmentation of chips and the welding resistance effect of the DLC coat (pre-holes are necessary).



Cycle Time Reduction Against Drill & Tap

ADC12 Aluminum Alloy

Tool	AT-2 R-SPEC	ADO-3D	A-SFT
Size	M6 x 1.0	5.0mm	M6 x 1.0
Material	ADC12 Aluminum Alloy		
Speed	525 SFM	230 SFM	62 SFM
Feed	0.0138 IPT	0.0067 IPR	Tapping
Depth	12mm Threading Depth		
Coolant	Water Soluble		
Machine	BT40 Horizontal		
Total Holes	13 Hole Cycle		
Cycle Time	62.5s	93.3s	



71m/min 0.17 mm/rev
(4,520 min-1 768 mm/min)



18.8 m/min
(1,000 min-1)

93.3s

Including 1 ATC

**30.8s
Reduction**



160 m/min 0.35 mm/t
(11,072 min-1 1,808 mm/min)

62.5s

Cycle Time Reduction Against Tap

6061 Aluminum Alloy

Tool	AT-2 R-SPEC	A-SFT
Size	M6 x 1.0	
Material	6061 Aluminum Alloy	
Speed	720 SFM	89 SFM
Feed	0.0090 IPT	Tapping
Depth	12 mm Threading Depth	
Coolant	Water Soluble	
Machine	HSK50 Vertical	
Cycle Time	2.27s	3.83s



27.2 m/min
(2,000 min-1)

3.83s

**1.56s
Reduction**



220 m/min 0.228 mm/t
(13,840 min-1 1,621 mm/min)

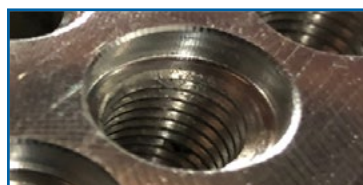
2.27s

Threading in Aluminum with Air Blow

Aluminum Alloy (AlMg50.5)

AT-2 R-SPEC can be used with air blow if there is a pre-hole.

	Case 1	Case 2
Thread size	M6 x 1	M8 x 1.25
Thread length	0.3150"	0.5118"
Drill depth	0.1969"	0.2638"
Machine	HSK 63 vertical MC (HERMLE)	
Coolant	Air Blow	
Work material	Aluminum Alloy (AlMg50.5)	
Cutting speed	722 SFM	
Feed rate	0.0049 IPT	
Cutting time	3.0 s	6.7 s



AT-2 R-SPEC after 100 Holes

List 16642 - A Brand® AT-2 R-SPEC List 16647 - A Brand® AT-2 R-SPEC

Work Material		Cutting Speed SFM	Feed Rate (in/t)
Low Carbon Steel	~C0.25%	-	-
Medium Carbon Steel	C0.25%~0.45%	-	-
High Carbon Steel	C0.45%~	-	-
Alloy Steel	4140, 4340, 8620	-	-
Hardened Steel	25-45 HRC	-	-
	45-50 HRC	-	-
	50-65 HRC	-	-
Stainless Steel	300-Series, 400-Series	-	-
Tool Steel	D2, H13, A6	-	-
Cast Steel	-	-	-
Cast Iron	-	-	-
Ductile Cast Iron	-	-	-
Copper	-	330 - 985	0.0118 - 0.0197
Brass	B21, B36	-	-
Brass Casting	B62	-	-
Bronze	B124, B103, B159	-	-
Aluminum	6061, 7075, 2014	330 - 985	0.0118 - 0.0197
Aluminum Alloy Casting	-	330 - 985	0.0118 - 0.0157
Magnesium Alloy Casting	-	330 - 985	0.0118 - 0.0197
Zinc Alloy Casting	-	-	-
Titanium Alloy*	Ti-6Al-4V	-	-
Nickel Alloy*	Inconel	-	-
Thermosetting Plastic	-	-	-
Thermo Plastic	-	-	-

1. This cutting condition table shows the standard values. When machining, it is recommended to use the program created by the NC program creation tool "ThreadPro".
2. Please select "Continuous" as the path type of ThreadPro.
3. Please use water soluble coolant unless there is pre-hole made by casting or drilling.
4. When machining magnesium please refer to the coolant oil manufacturer's specification for recommended oil. Please also properly dispose of the cutting chips to prevent fire hazards.
5. Please adjust the cutting conditions depending on the rigidity of the machine, tool holder, and workpiece clamping.
6. Tool vibration should be kept at a minimum level to ensure highest thread accuracy.
7. Select a higher feed rate for larger diameter tooling and a lower feed rate for smaller diameters.
8. The tool is left-hand cutting - program the spindle for counterclockwise rotation.

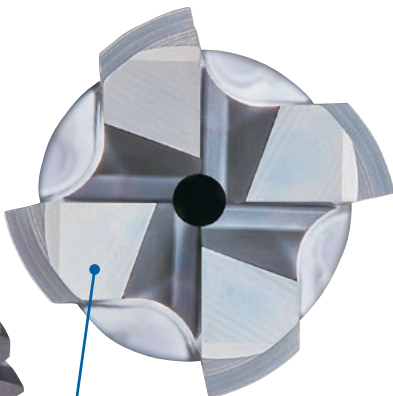
Note

Bottom shape of finished hole is as depicted in the right picture. Please make sure that it is acceptable based on the cutting instruction in advance.



A Brand AT-2

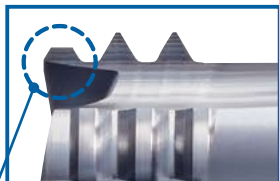
Features & Benefits



Unique Cutting Edge Shape
controls tool deflection.

Left-Hand Cut
results in long tool life by climb milling.

DUROREY Coating
for high-hardness steel.



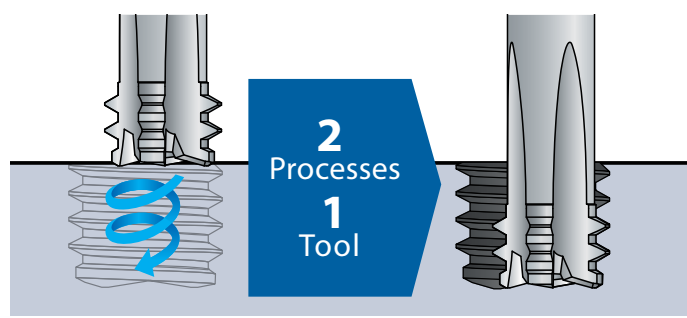
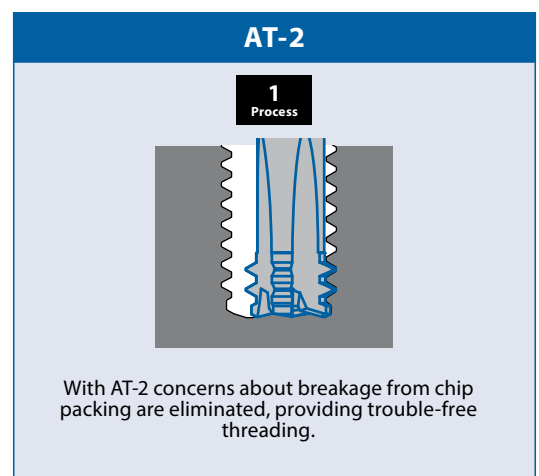
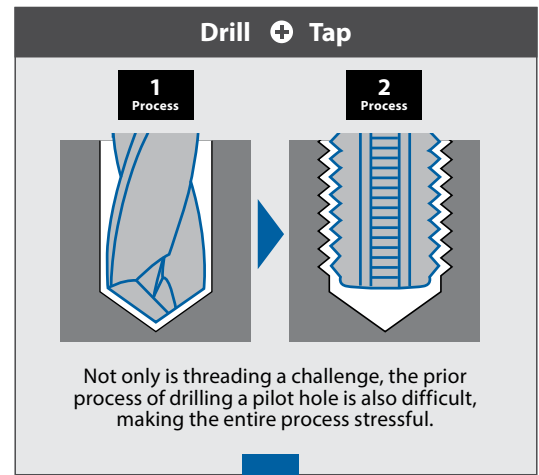
Roughing Teeth
added to distribute the load.

2 Processes with 1 Tool

Helical Drilling & Threading Done Simultaneously!

Helical drilling and threading are performed simultaneously, which reduces the risk of potential machining problems in the processing of high hardness steels.

The risk of sudden tool breakage is minimized as the chips are broken into small, manageable pieces and evacuated smoothly. Since no pilot hole is required, AT-2 integrates two processes while avoiding part scrap.



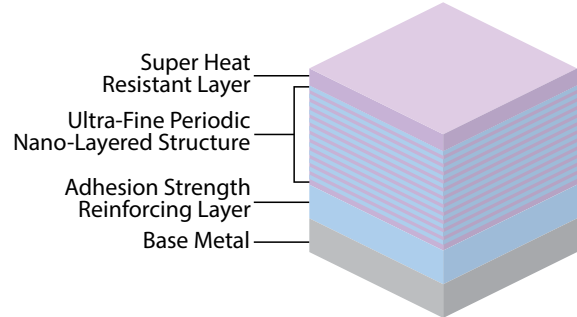
DUROREY Coating (PAT. P)

Superior Heat Resistance and Toughness

OSG's newly developed DUROREY coating, with its unique coating structure, provides superior heat resistance and toughness for high-hardness steel milling. DUROREY coating also suppresses chipping and achieves longer tool life.



Coating Structure



Coating Color	Coating Structure	Hardness (GPa)	Oxidation Temperature (°C)	Heat Resistance	Adhesion Strength	Surface Roughness	Wear Resistance	Welding Resistance	Toughness
Black Gray	Ultra-Fine Periodic Nano-Layered	41	1,300	⊙	○	Fair	⊙	○	○

DUROREY is a registered trademark of OSG Corporation.

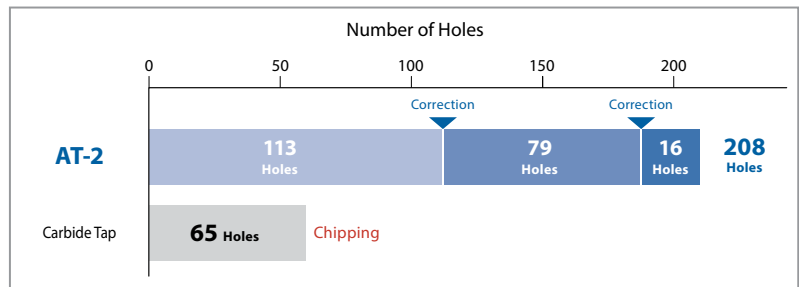
○ good ⊙ best

Long Tool Life with Exceptional Thread Quality

D2 Tool Steel (60 HRC)

AT-2 demonstrates long and stable tool life with higher thread quality compared to cutting taps.

Tool	AT-2	Carbide Tap
Size	Ø6.2 x 16 P1.25	M8x1.25
Material	D2 Tool Steel (60 HRC)	
Speed	150 SFM (2,310 RPM)	6.6 SFM (80 RPM)
Feed	3.26 IPM (0.0016 IPT)	3.937 IPM
Drill Size	None	Ø 6.8 x 23.5 (blind)
Thread Size	M8 x 1.25	
Thread Length	16mm (2D)	
Coolant	Air blow	Oil
Machine	HMC (BT40)	VMC (BT40)

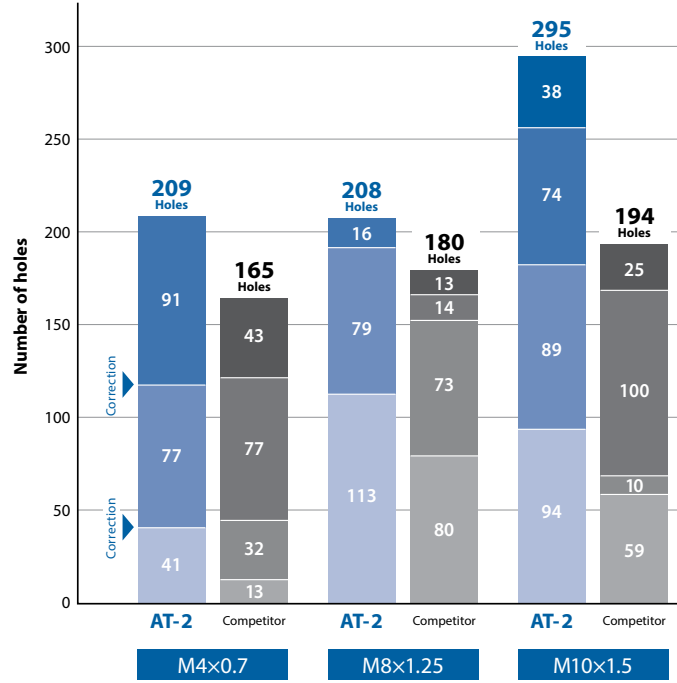


Outstanding Durability with Air-Blow

D2 Tool Steel (60 HRC)

AT-2 demonstrates outstanding durability by cutting with air-blow.

Size	Ø 3.1 x 8 P0.7	Ø 6.2 x 16 P1.25	Ø 7.5 x 20 P1.5
Material	D2 Tool Steel (60 HRC)		
Speed	150 SFM (4,620 RPM)	150 SFM (2,310 RPM)	115 SFM (1,485 RPM)
Feed	1.81 IPM (0.0004 IPT)	3.27 IPM (0.0016 IPT)	2.20 IPM (0.0015 IPT)
Thread Size	M4 x 0.7	M8 x 1.25	M10 x 1.5
Thread Length	7mm (1.75D)	14.8mm (1.85D)	18.5mm (1.85D)
Coolant	Air-Blow		
Machine	HMC (BT40)	VMC (HSK63)	

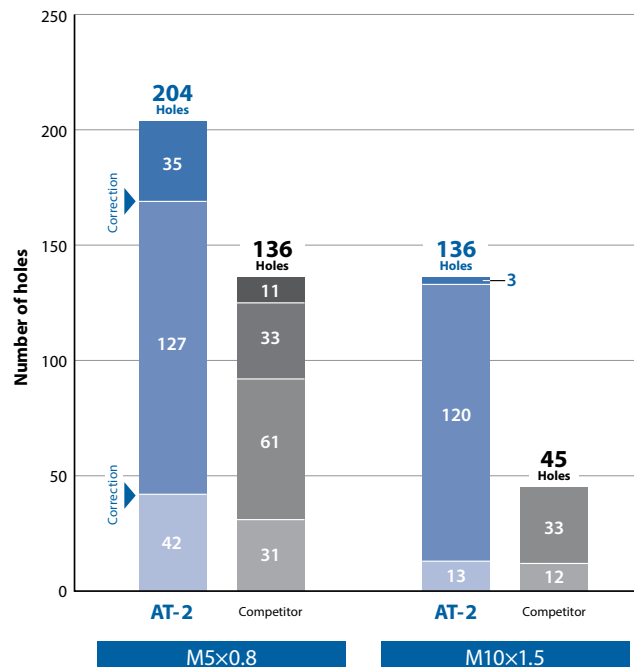


Stable Durability with Water-Soluble Coolant

D2 Tool Steel (60 HRC)

Unlike threading with a tap, which often involves the use of cutting oils, AT-2 can be used with water-soluble coolant, reducing setup time while machining.

Size	Ø 4 x 10 P0.8	Ø 7.5 x 20 P1.5
Material	D2 Tool Steel (60 HRC)	
Speed	150 SFM (3,581 RPM)	150 SFM (1,910 RPM)
Feed	2.60 IPM (0.0009 IPT)	2.87 IPM (0.0015 IPT)
Thread Size	M5 x 0.8	M10 x 1.5
Depth	9.2mm (1.85D)	18.5mm (1.85D)
Coolant	Water soluble	
Machine	HMC (BT40)	VMC (HSK63)

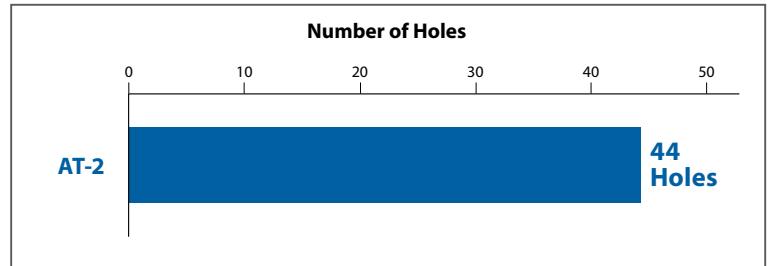


Remarkable Durability in 65 HRC Material

M2 High Speed Steel (65 HRC)

AT-2 demonstrates outstanding durability by cutting with air-blow.

Size	Ø 4 x 10 P0.8
Material	M2 High Speed Steel (65 HRC)
Speed	150 SFM (3581 RPM)
Feed	1.14 IPM (0.0004 IPT)
Thread Size	M5 x 0.8
Depth	8mm (2D)
Coolant	Air blow
Machine	HMC

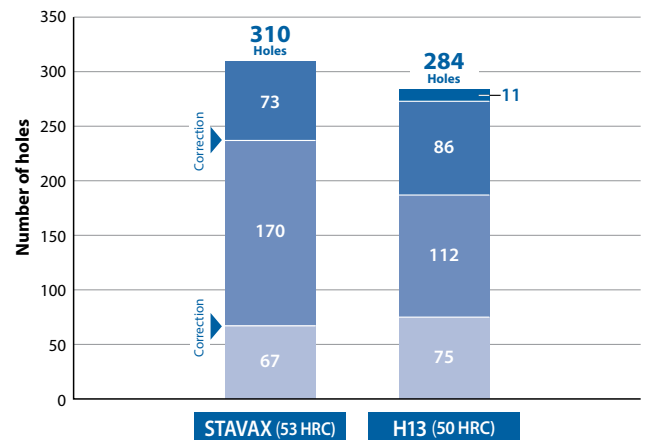


Excellent Durability in STAVAX

STAVAX (53 HRC) and H13 (50 HRC)

Even in difficult stainless steels AT-2 provides excellent tool life.

Size	Ø 7.5 x 20 P1.5	
Material	STAVAX (53 HRC)	H13 (50 HRC)
Speed	180 SFM (2,331 RPM)	
Feed	3.50 IPM (0.0015 IPT)	
Thread Size	M10 x 1.5	
Depth	18mm (1.8D)	
Coolant	Air Blow	
Machine	HMC (BT40)	

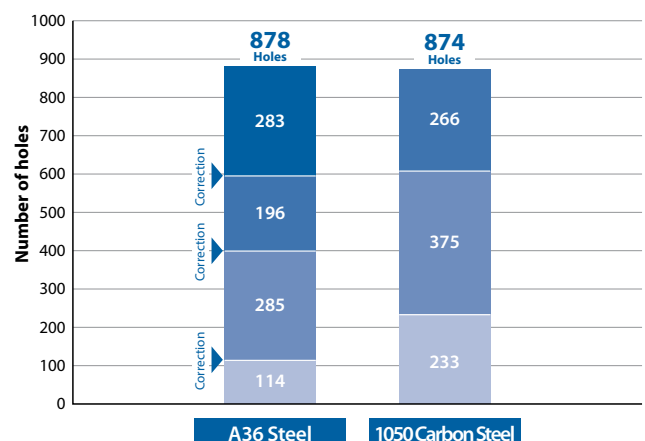


Stable Performance Even in General Steels

STAVAX (53 HRC) and H13 (50 HRC)

Since there is no cutting chip trouble, it is effective for avoiding the risk of tool breakage. Processing consolidation is also made possible.

Size	Ø 3.1 x 8 P0.7	
Material	A36 Steel	1050 Carbon Steel
Speed	150 SFM (3581 RPM)	150 SFM (1910 RPM)
Feed	2.60 IPM (0.0009 IPT)	2.87 IPM (0.0015 IPT)
Thread Size	M4 x 0.7	
Depth	7mm (1.75D)	
Coolant	Water soluble	
Machine	VMC	



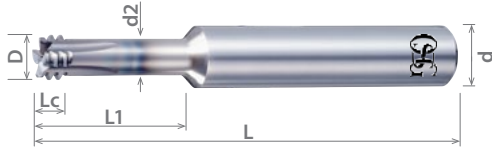
A Brand® AT-2

Advanced Performance End-Cutting Thread Mill for High-Hardness Steel

List 16640

AT-2, Coolant-Through*, Straight Flute, End Cut

NEW	SPEED FEED P11	CARBIDE	DUROREY	0°	LH	SHANK h6
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Units: mm

Size	Threads Per Inch	Cutter Diameter	Overall Length	Length of Cut	Neck Diameter	Neck Length	Shank Diameter	Coolant Through	No. of Flutes	EDP Number
		D	L	Lc	d2	L1	d			DUROREY
M3	0.50	2.40	50.00	1.50	1.82	7.25	6.00	-	4	8331200
M4	0.70	3.10	50.00	2.10	2.30	9.75	6.00	-	4	8331201
M5	0.80	4.00	50.00	2.40	3.10	12.00	6.00	-	4	8331202
M6	1.00	4.60	50.00	3.00	3.48	14.50	6.00	-	4	8331203
M8	1.25	6.20	70.00	3.75	4.81	19.13	10.00	-	4	8331204
M10	1.50	7.50	70.00	4.50	5.84	23.75	10.00	Yes	4	8331205
M12	1.75	9.00	80.00	5.25	7.07	28.38	10.00	Yes	4	8331206

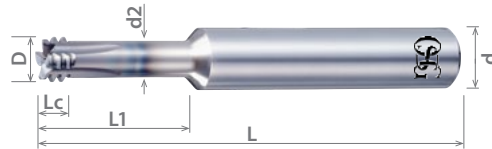
Packed: 1 pc.
Available DUROREY coating only.
For internal threads only.



List 16645

AT-2, Coolant-Through*, Straight Flute, End Cut

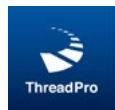
NEW	SPEED FEED P11	CARBIDE	DUROREY	0°	LH	SHANK h6
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Units: Inch

Size	Threads Per Inch	Cutter Diameter	Overall Length	Length of Cut	Neck Diameter	Neck Length	Shank Diameter	Coolant Through	No. of Flutes	EDP Number
		D	L	Lc	d2	L1	d			DUROREY
#8	32	0.122	2.000	0.0938	0.0866	0.4059	1/4	-	4	1664500011
#10	24	0.146	3.000	0.1250	0.0988	0.4843	1/4	-	4	1664500111
1/4	20	0.179	3.000	0.1500	0.1236	0.6252	1/4	-	4	1664500211
1/4	28	0.179	3.000	0.1071	0.1390	0.5894	1/4	-	4	1664500311
5/16	18	0.224	3.500	0.1667	0.1626	0.7642	3/8	-	4	1664500411
5/16	24	0.224	3.500	0.1250	0.1776	0.7295	3/8	-	4	1664500511
3/8	16	0.264	3.500	0.1875	0.1945	0.9063	3/8	-	4	1664500611
3/8	24	0.264	3.500	0.1250	0.2169	0.8543	3/8	-	4	1664500711
1/2	13	0.362	3.500	0.2308	0.2776	1.1921	3/8	Yes	4	1664500811
1/2	20	0.362	3.500	0.1500	0.3067	1.1252	3/8	Yes	4	1664500911

Packed: 1 pc.
Available DUROREY coating only.
For internal threads only.



For more information on thread mill applications, including ThreadPro software, visit: www.osgtool.com/ThreadPro.

List No.	Work Material																
	P					M			K	N		S		H			
	Carbon Steels			Alloy Steels	Die Steels	Stainless Steels			Cast Iron	Aluminum		Nickel Alloy	Titanium	Hardened Steels			
	Low	Med.	High			300	400	17-4 PH		6061 7075	Casting			6Al4V (30 HRC)	~35 HRC	35-45 HRC	45-50 HRC
16640	○	⊗	⊗	⊗	⊗	○	○	⊗	⊗	○	○	○	○	⊗	⊗	⊗	⊗
16645	○	⊗	⊗	⊗	⊗	○	○	⊗	⊗	○	○	○	○	⊗	⊗	⊗	⊗

○ good ⊗ best



List 16640 - A Brand® AT-2

List 16645 - A Brand® AT-2

Work Material		Cutting Speed SFM	Feed Rate (in/t)
Low Carbon Steel	~C0.25%	115 - 180	0.0004 - 0.0028
Medium Carbon Steel	C0.25%~0.45%	260 - 525	0.0004 - 0.0028
High Carbon Steel	C0.45%~	260 - 525	0.0004 - 0.0028
Alloy Steel	4140, 4340, 8620	200 - 400	0.0004 - 0.0028
Hardened Steel	25-45 HRC	115 - 250	0.0004 - 0.0028
	45-50 HRC	115 - 215	0.0004 - 0.0028
	50-65 HRC	115 - 180	0.0004 - 0.0028
Stainless Steel	300-Series, 400-Series	115 - 330	0.0004 - 0.0028
Tool Steel	D2, H13, A6	115 - 330	0.0004 - 0.0028
Cast Steel	-	115 - 330	0.0004 - 0.0028
Cast Iron	-	115 - 330	0.0004 - 0.0028
Ductile Cast Iron	-	115 - 330	0.0004 - 0.0028
Copper	-	115 - 330	0.0004 - 0.0028
Brass	B21, B36	115 - 330	0.0004 - 0.0028
Brass Casting	B62	115 - 330	0.0004 - 0.0028
Bronze	B124, B103, B159	115 - 330	0.0004 - 0.0028
Aluminum	6061, 7075, 2014	115 - 330	0.0004 - 0.0028
Aluminum Alloy Casting	-	115 - 330	0.0004 - 0.0028
Magnesium Alloy Casting	-	115 - 330	0.0004 - 0.0028
Zinc Alloy Casting	-	115 - 330	0.0004 - 0.0028
Titanium Alloy*	Ti-6Al-4V	115 - 180	0.0004 - 0.0028
Nickel Alloy*	Inconel	115 - 180	0.0004 - 0.0028
Thermosetting Plastic	-	115 - 330	0.0004 - 0.0028
Thermo Plastic	-	115 - 330	0.0004 - 0.0028

1. The indicated speeds and feeds are for air blow cooling.
 2. Please use water soluble coolant when machining aluminum materials.
 3. When machining magnesium please refer to the coolant oil manufacturer's specification for recommended oil. Please also properly dispose of the cutting chips to prevent fire hazards.
 4. Please adjust the cutting conditions depending on the rigidity of the machine, tool holder, and workpiece clamping.
 5. Tool vibration should be kept at a minimum level to ensure highest thread accuracy.
 6. Select a higher feed rate for larger diameter tooling and a lower feed rate for smaller diameters.
 7. The tool is left-hand cutting - program the spindle for counterclockwise rotation.
- *Titanium and Nickel alloy parameters are only to be used for tools with internal coolant running water soluble coolant.



shaping your dreams

 **Safe use of cutting tools**

- Use safety cover, safety glasses and safety shoes during operation.
- Do not touch cutting edges with bare hands.
- Do not touch cutting chips with bare hands. Chips will be hot after cutting.
- Stop cutting when the tool becomes dull.
- Stop cutting operation immediately if you hear any abnormal cutting sounds.
- Do not modify tools.
- Please use appropriate tools for the operation. Check dimensions to ensure proper selection.

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