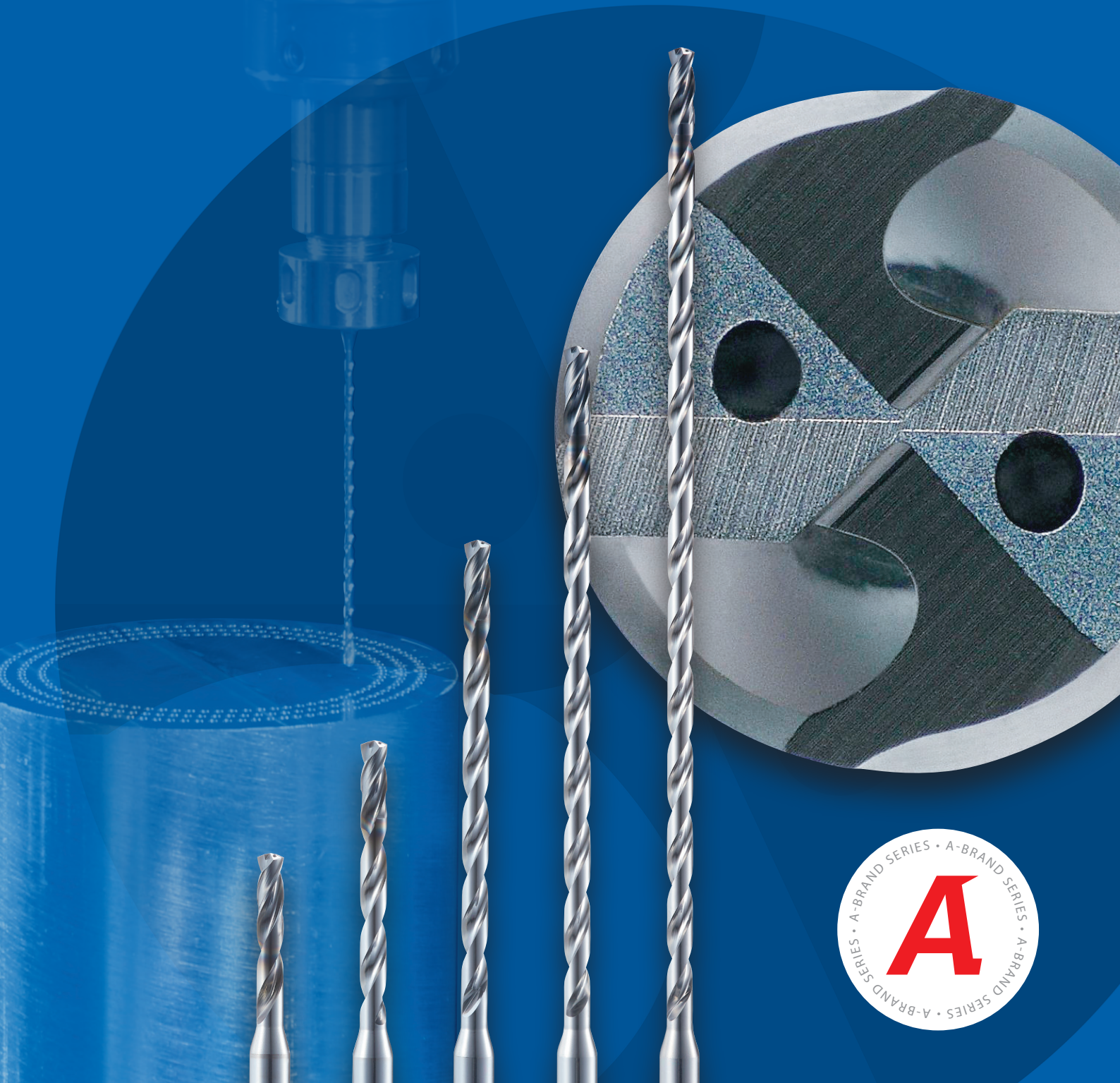




Small diameter carbide drills with oil holes

ADO-MICRO

Volume 3



KEY FEATURES: ADO-MICRO



1 Double margin

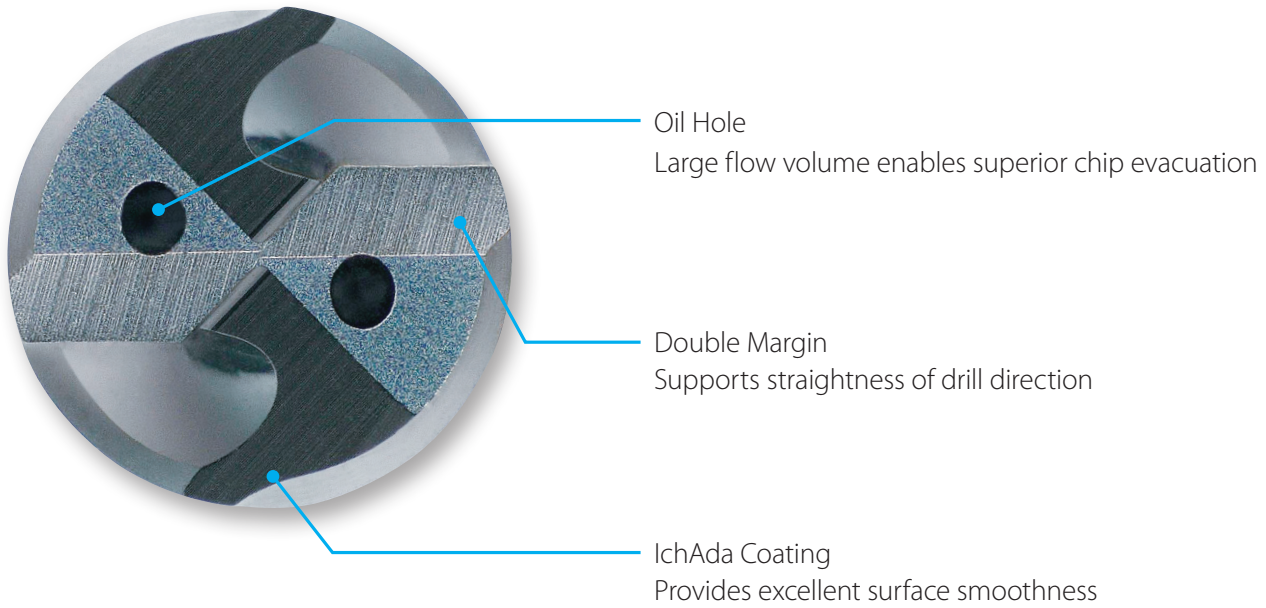
2 Coolant through

3 IchAda coating
Excellent surface smoothness

4 Large size range
2D/5D: Ø0,7~ Ø2
12D/20D/30D: Ø1~ Ø2
71 items total



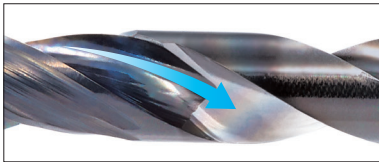
"STABLE" AND "HIGH EFFICIENCY" SMALL DIAMETER DEEP-HOLE DRILLING



Features that enable outstanding chip evacuation performance

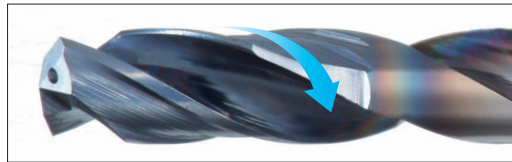
Flute structure

Stable performance even in difficult small diameter deep-hole applications



Extended Flute

Chips are discharged from the tip of the flute to the extended flute with enhanced evacuation capability



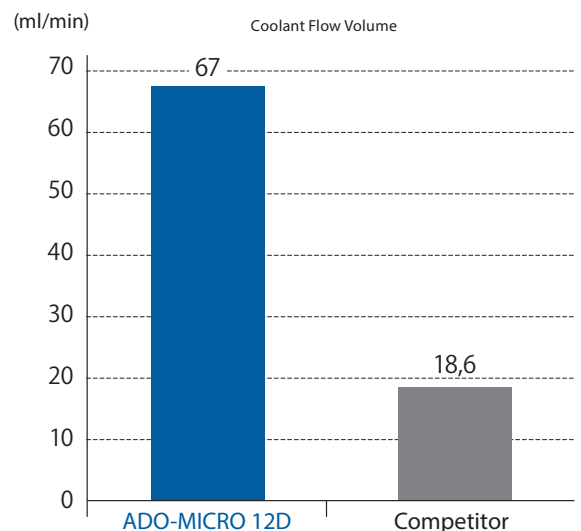
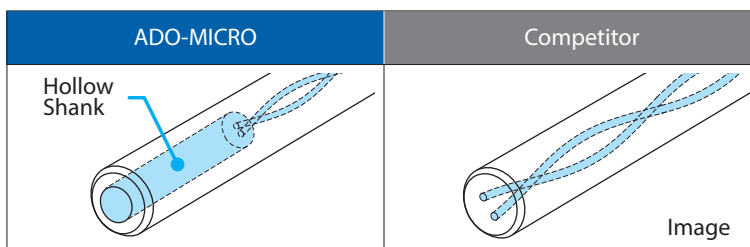
Removed End of Margin

Capability to smoothly discharge "micro sludges" that can be easily accumulated around the outer periphery of the tool, which is a key cause of abrupt tool breakage.

Oil Holes

Greater coolant flow volume achieved by the hollow shank design to enable smooth chip evacuation

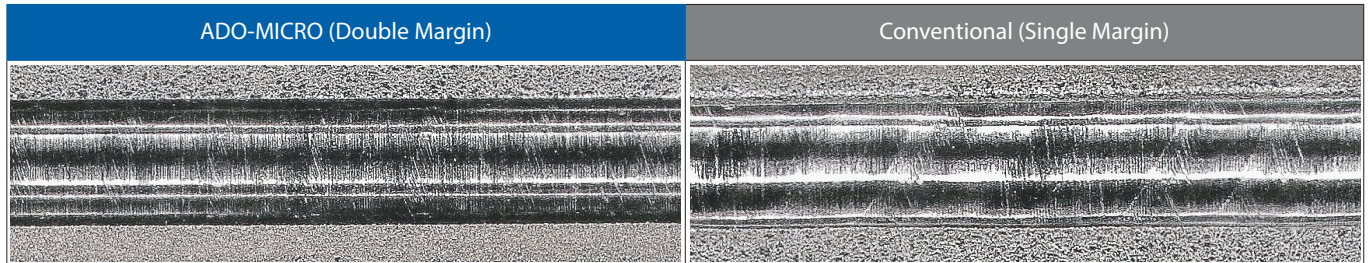
Tool	ADO-MICRO 12D Ø 1,5	Competitor Ø 1,5
Hollow Shank	Hollow	Solid
Coolant	Water Soluble (Internal)	
Coolant pressure	1,5 Mpa	
Time of Lubricant supply	60 sec.	



Stable Performance

Stable performance even in deep-hole applications

The double margin enhances the straightness stability of drill to enable stable drilling performance > Also reduces the rifle marks on the inner surface of hole



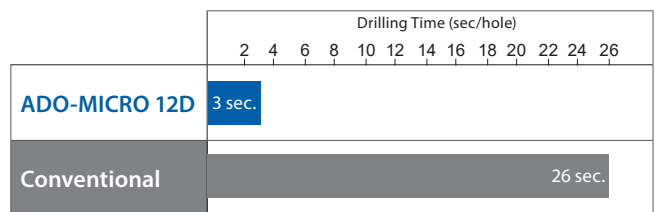
Tool: ADO-MICRO 20D Ø 2 Work Material: SUS304 Depth of Hole: 40mm

High Efficiency

Approximately 9 times the drilling efficiency by non-step drilling

Non-step drilling is possible even for deep holes, enabling high efficiency processing

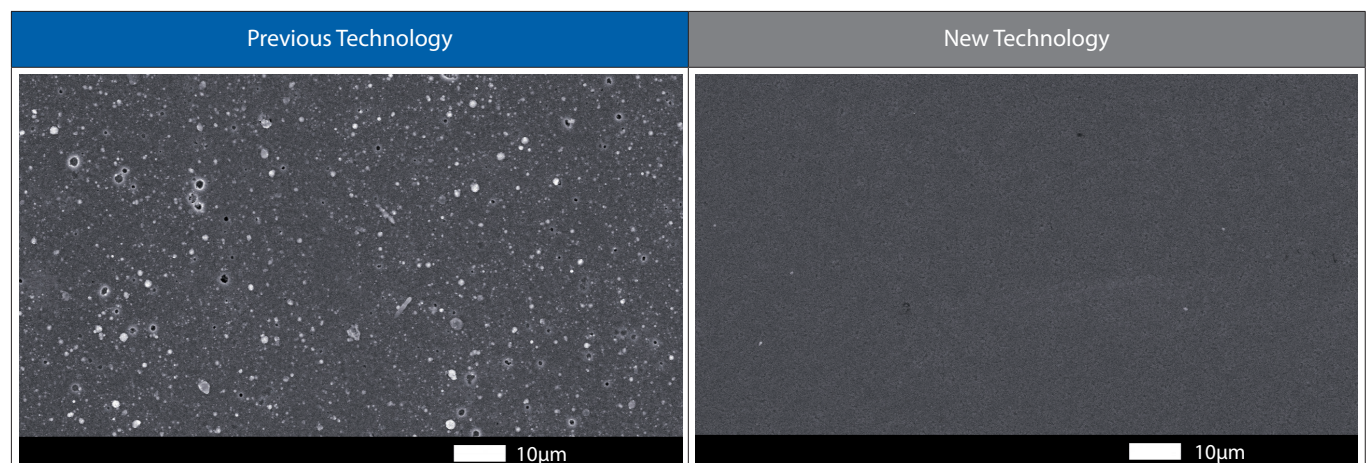
Tool	ADO-MICRO 12D Ø 15	Conventional
Work Material	SUS304	
Machining	Non-step drilling	Step drilling (0,5mm step)
Cutting Speed	50m/min (10.610min ⁻¹)	28m/min (5.940min ⁻¹)
Feed	318mm (0,03mm/rev)	89mm (0,015mm/rev)
Depth of Hole	12mm (Blind) with pilot hole	
Coolant	Water-Soluble (Internal)	Water-Soluble (External)
Machine	Vertical machining center (HSK-A40)	



Coating

IchAda coating with excellent surface smoothness

The excellent smoothness in conjunction with high abrasion resistance and heat resistance enable small diameter tools to achieve long tool life

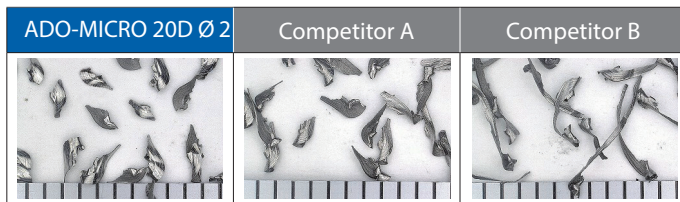
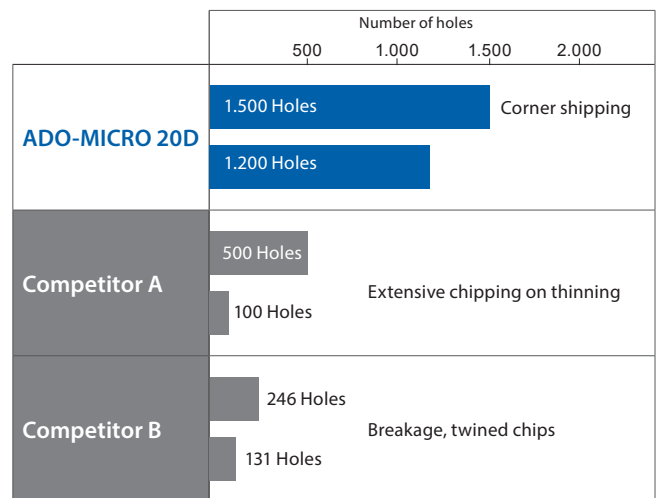


IchAda is a registered trademark of OSG Corporation.

Long tool life achieved by stable drilling

Benefit of unique flute geometry

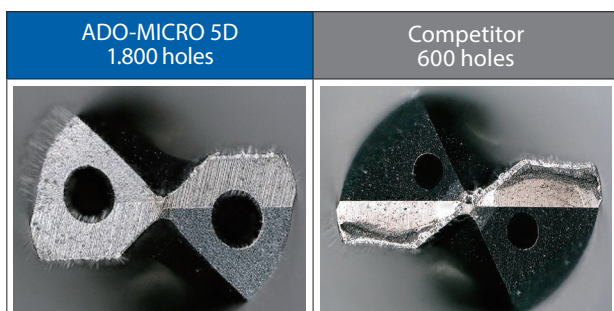
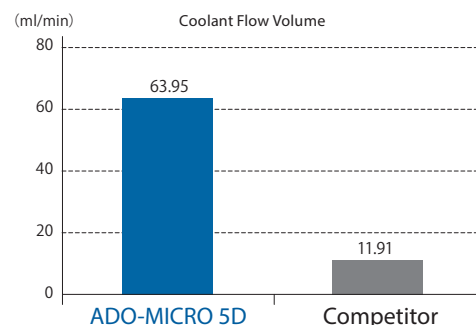
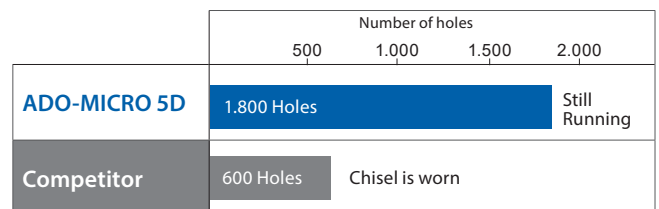
Tool	ADO-MICRO 20D Ø 2
Work Material	SCM440
Cutting Speed	50m/min (7.960min ⁻¹)
Feed	557mm/min (0,07mm/rev)
Depth of Hole	38mm (Blind) with pilot hole
Coolant	Water-Soluble (Internal)
Coolant Pressure	3Mpa
Machine	Vertical machining center (HSK-A40)



Large coolant flow volume to enable stable drilling

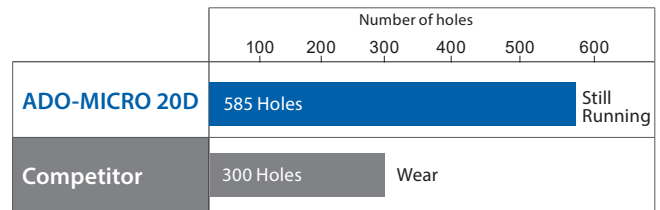
Benefit of enlarged oil holes

Tool	ADO-MICRO 5D Ø 0,7
Work Material	SUS304
Cutting Speed	30m/min (13.640min ⁻¹)
Feed	136mm/min (0,01mm/rev)
Depth of Hole	3,5mm (Blind)
Coolant	Water-Soluble (Internal)
Coolant Pressure	5Mpa
Machine	Vertical machining center (HSK-A63)



Efficiency improvement in the machining of titanium alloy bolts

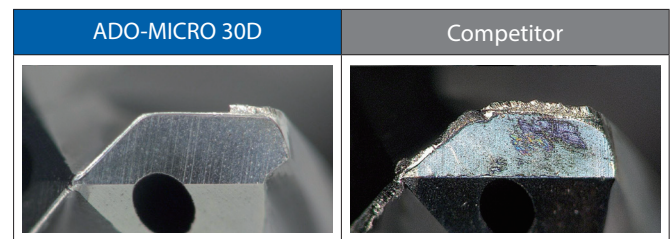
Tool	ADO-MICRO 20D Ø 1,2	Competitor Ø 1,2
Work Material	Ti-Al-4V	
Machining	Non-step drilling	Step drilling (0,12mm step)
Cutting Speed	35m/min (9.300min ⁻¹)	10m/min (2.600min ⁻¹)
Feed	167mm/min (0,02mm/rev)	30mm/min (0,01mm/rev)
	Approx. 5 times	
Depth of Hole	15mm (Blind) with pilot hole	
Coolant	Water-Soluble (Internal)	
Coolant Pressure	2Mpa	
Machine	Vertical machining center (BT30)	



Excellent durability achieved by combining "automatic lathe + oil-based coolant"

Tool	ADO-MICRO 30D Ø 1,6
Work Material	SUS440C
Cutting Speed	20m/min (4.000min ⁻¹)
Feed	120mm/min (0,03mm/rev)
Depth of Hole	45mm (Blind) with pilot hole
Coolant	Oil-based coolant (Internal)
Coolant Pressure	7Mpa
Machine	CNC Automatic lathe

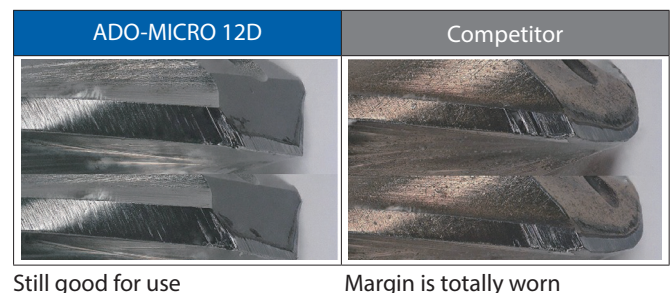
Wear condition of cutting edge after drilling 1.200 holes



Cutting edge condition in special steel drilling application

Tool	ADO-MICRO 12D Ø 1,5
Work Material	SUJ2
Cutting Speed	45m/min (9.550min ⁻¹)
Feed	430mm/min (0,045mm/rev)
Depth of Hole	9mm (Blind) with pilot hole
Coolant	Water-Soluble (Internal)
Coolant Pressure	1,5Mpa
Machine	Vertical machining center (HSK-A40)

Cutting edge wear condition after drilling 900 holes



Still good for use

Margin is totally worn

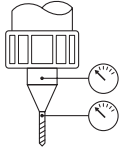
CUTTING CONDITIONS

Drilling | Solid | Cutting conditions

ADO-MICRO 2D/5D

Vc	Mild Steel - Low Carbon Steel SS400 - S10C ~150HB ~500 N/mm ²		Carbon Steel S35C - S50C ~210HB ~710 N/mm ²		Alloy Steel SCM - SCr - sncm 710 ~900 N/mm ²		Alloy Steel SCM - SCr - sncm 710 ~900 N/mm ²		Austenitic Stainless Steel SUS303 - SUS304 SUS316 - SUS316L		Special Alloy Steel SUJ2 - SUS440	
	S (min ⁻¹)	F (mm/rev.)	S (min ⁻¹)	F (mm/rev.)	S (min ⁻¹)	F (mm/rev.)	S (min ⁻¹)	F (mm/rev.)	S (min ⁻¹)	F (mm/rev.)	S (min ⁻¹)	F (mm/rev.)
20~40~60m/min			20~40~60m/min		20~40~60m/min		20~30~40m/min		20~30~70m/min		25~35~45m/min	
0,7	18.200	0,007 ~ 0,021	18.200	0,007 ~ 0,021	18.200	0,014 ~ 0,028	13.600	0,014 ~ 0,028	13.600	0,007 ~ 0,021	15.900	0,007 ~ 0,021
1	12.700	0,01 ~ 0,03	12.700	0,01 ~ 0,03	12.700	0,02 ~ 0,04	9.500	0,02 ~ 0,04	9.500	0,01 ~ 0,03	11.100	0,01 ~ 0,03
1,5	8.500	0,015 ~ 0,045	8.500	0,015 ~ 0,045	8.500	0,03 ~ 0,06	6.400	0,03 ~ 0,06	6.400	0,015 ~ 0,045	7.400	0,015 ~ 0,045
2	6.400	0,02 ~ 0,06	6.400	0,02 ~ 0,06	6.400	0,04 ~ 0,08	4.800	0,04 ~ 0,08	4.800	0,02 ~ 0,06	5.600	0,02 ~ 0,06

Vc	Cast Iron FC250 ~350N/mm ²		Ductile Cast Iron FCD450 - FCD600 400 ~600 N/mm ²		Aluminium Alloy AC4C - ADC		Aluminium A5052 - A7075		Titanium Alloy		Heat Resistant Alloy Inconel 718	
	S (min ⁻¹)	F (mm/rev.)	S (min ⁻¹)	F (mm/rev.)	S (min ⁻¹)	F (mm/rev.)	S (min ⁻¹)	F (mm/rev.)	S (min ⁻¹)	F (mm/rev.)	S (min ⁻¹)	F (mm/rev.)
20~50~60m/min			30~40~50m/min		30~50~70m/min		20~40~60m/min		40~50~60m/min		5~10~15m/min	
0,7	22.700	0,014 ~ 0,028	18.200	0,014 ~ 0,028	22.700	0,014 ~ 0,042	18.200	0,007 ~ 0,021	22.700	0,011 ~ 0,018	4.500	0,004 ~ 0,014
1	15.900	0,02 ~ 0,04	12.700	0,02 ~ 0,04	15.900	0,02 ~ 0,06	12.700	0,01 ~ 0,03	15.900	0,015 ~ 0,025	3.200	0,005 ~ 0,02
1,5	10.600	0,03 ~ 0,06	8.500	0,03 ~ 0,06	10.600	0,03 ~ 0,09	8.500	0,015 ~ 0,045	10.600	0,023 ~ 0,038	2.100	0,008 ~ 0,03
2	8.000	0,04 ~ 0,08	6.400	0,04 ~ 0,08	8.000	0,04 ~ 0,12	6.400	0,02 ~ 0,06	8.000	0,03 ~ 0,05	1.600	0,01 ~ 0,04

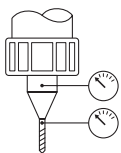


1. This cutting condition chart is based on the usage of **water-soluble coolant and internal oil supply**.
2. Please use quality water-soluble coolant with a dilution factor of approximately 20 times.
3. Please use a precision filter (approximation of 3µm to 5µm) to prevent the oil holes from clogging.
4. Although the recommended coolant pressure is 3 MPa or more, please adjust accordingly if the level of flow volume is unsatisfactory due to the type and concentration of cutting oil used.
5. For accurate mounting, acceptable deflection of the body cylindrical part at the shank end should be **less than 0.002µm**, as shown in the illustrated figure.
6. For work material with poor chip evacuation characteristic, please perform step drilling as required.
7. Please always use the appropriate cutting fluid recommended by the cutting fluid manufacturer in the machining of magnesium alloys. Be cautious with the cutting chips as they are highly flammable and may pose a serious fire risk if not properly handled.

ADO-MICRO 12D/15D/20D/25D/30D

Vc	Mild Steel - Low Carbon Steel SS400 - S10C ~150HB ~500 N/mm ²		Carbon Steel S35C - S50C ~210HB ~710 N/mm ²		Alloy Steel SCM - SCr - sncm 710 ~900 N/mm ²		Alloy Steel SCM - SCr - sncm 710 ~900 N/mm ²		Austenitic Stainless Steel SUS303 - SUS304 SUS316 - SUS316L		Special Alloy Steel SUJ2 - SUS440	
	S (min ⁻¹)	F (mm/rev.)	S (min ⁻¹)	F (mm/rev.)	S (min ⁻¹)	F (mm/rev.)	S (min ⁻¹)	F (mm/rev.)	S (min ⁻¹)	F (mm/rev.)	S (min ⁻¹)	F (mm/rev.)
20~40~60m/min			20~40~60m/min		20~40~60m/min		20~30~40m/min		20~30~70m/min		25~35~45m/min	
1	12.700	0,01 ~ 0,03	12.700	0,01 ~ 0,03	12.700	0,02 ~ 0,04	9.500	0,02 ~ 0,04	9.500	0,01 ~ 0,03	11.100	0,01 ~ 0,03
1,5	8.500	0,015 ~ 0,045	8.500	0,015 ~ 0,045	8.500	0,03 ~ 0,06	6.400	0,03 ~ 0,06	6.400	0,015 ~ 0,045	7.400	0,015 ~ 0,045
2	6.400	0,02 ~ 0,06	6.400	0,02 ~ 0,06	6.400	0,04 ~ 0,08	4.800	0,04 ~ 0,08	4.800	0,02 ~ 0,06	5.600	0,02 ~ 0,06

Vc	Cast Iron FC250 ~350N/mm ²		Ductile Cast Iron FCD450 - FCD600 400 ~600 N/mm ²		Aluminium Alloy AC4C - ADC		Aluminium A5052 - A7075		Titanium Alloy		Heat Resistant Alloy Inconel 718	
	S (min ⁻¹)	F (mm/rev.)	S (min ⁻¹)	F (mm/rev.)	S (min ⁻¹)	F (mm/rev.)	S (min ⁻¹)	F (mm/rev.)	S (min ⁻¹)	F (mm/rev.)	S (min ⁻¹)	F (mm/rev.)
20~50~60m/min			30~40~50m/min		30~50~70m/min		20~40~60m/min		40~50~60m/min		5~10~15m/min	
1	15.900	0,02 ~ 0,04	12.700	0,02 ~ 0,04	15.900	0,02 ~ 0,06	12.700	0,01 ~ 0,03	15.900	0,015 ~ 0,025	3.200	0,005 ~ 0,02
1,5	10.600	0,03 ~ 0,06	8.500	0,03 ~ 0,06	10.600	0,03 ~ 0,09	8.500	0,015 ~ 0,045	10.600	0,023 ~ 0,038	2.100	0,008 ~ 0,03
2	8.000	0,04 ~ 0,08	6.400	0,04 ~ 0,08	8.000	0,04 ~ 0,12	6.400	0,02 ~ 0,06	8.000	0,03 ~ 0,05	1.600	0,01 ~ 0,04



1. This cutting condition chart is based on the usage of **water-soluble coolant and internal oil supply**.
2. Please use quality water-soluble coolant with a dilution factor of approximately 20 times.
3. Please use a precision filter (approximation of 3µm to 5µm) to prevent the oil holes from clogging.
4. Although the recommended coolant pressure is 3 MPa or more, please adjust accordingly if the level of flow volume is unsatisfactory due to the type and concentration of cutting oil used.
5. For accurate mounting, acceptable deflection of the body cylindrical part at the shank end should be **less than 0.002µm**, as shown in the illustrated figure.
6. For work material with poor chip evacuation characteristic, please perform step drilling as required.
7. From 12D type included, please use a 2D type drill to prepare a pilot hole prior to processing.
8. Please always use the appropriate cutting fluid recommended by the cutting fluid manufacturer in the machining of magnesium alloys. Be cautious with the cutting chips as they are highly flammable and may pose a serious fire risk if not properly handled.

Recommended drilling method for deep-holes

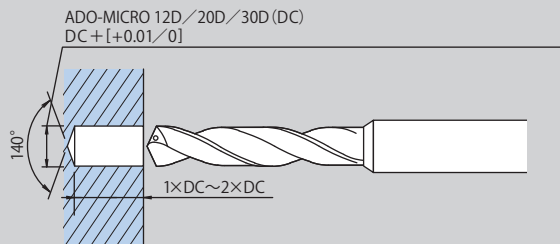
① ADO-MICRO 2D

Make a pilot hole with the ADO-MICRO 2D.

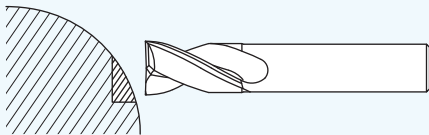
ADO-MICRO 12D/20D/30D

ADO-MICRO 2D (140°)

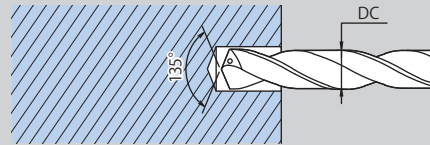
The ADO-MICRO 2D (140° point angle) is the recommended pilot hole drills of the ADO-MICRO 12D/20D/30D.



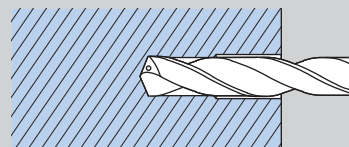
★ When working on a curved surface, use the FX-ZDS (end mill for counterboring) or the ADF (carbide flat drill) to counterbore a flat surface before drilling a pilot hole.



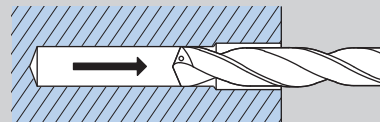
② Insert the long drill into a pilot hole with a low revolution of 500 to 1,000 min⁻¹ (n).



③ Increase the revolution to the designated speed and start drilling.



④ After drilling, move the drill away from the bottom of the hole; then reduce its speed to 500 to 1,000 min⁻¹ (n) while pulling it out of the hole.



※ Make sure to use internal coolant supply when drilling.

For drilling applications exceeding Ø2

Carbide Drill Series

AD•ADO



Carbide Drill Series for Stainless Steel and Titanium Alloy

ADO-SUS





shaping your dreams

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