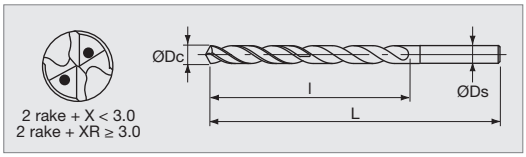
AQDEXOH10D

AQUA Drills EX Oil-Hole Long 10D

VHM | AQ EX | h7 | 140° | 24° ~30° | h6



LIST9612			Unit: mm
Dc	l	L	Ds
1.0	13	61	3
1.1	14	63	3
1.2	16	63	3
1.3	17	63	3
1.4	18	63	3
1.5	20	63	3
1.6	21	70	3
1.7	22	70	3
1.8	23	70	3
1.9	25	70	3
2.0	26	70	3
2.1	27	80	3
2.2	29	80	3
2.3	30	80	3
2.4	31	80	3
2.5	33	80	3
2.6	34	89	3
2.7	35	89	3
2.8	36	89	3
2.9	38	89	3
3.0	39	89	3
3.1	46	96	4
3.2	46	96	4
3.3	46	96	4
3.4	46	96	4
3.5	46	96	4
3.6	52	102	4
3.7	52	102	4
3.8	52	102	4
3.9	52	102	4

LIST9612			Unit: mm
Dc	l	L	Ds
4.0	52	102	4
4.1	59	109	5
4.2	59	109	5
4.3	59	109	5
4.4	59	109	5
4.5	59	109	5
4.6	65	115	5
4.7	65	115	5
4.8	65	115	5
4.9	65	115	5
5.0	65	115	5
5.1	72	122	6
5.2	72	122	6
5.3	72	122	6
5.4	72	122	6
5.5	72	122	6
5.6	78	128	6
5.7	78	128	6
5.8	78	128	6
5.9	78	128	6
6.0	78	128	6
6.1	85	135	7
6.2	85	135	7
6.3	85	135	7
6.4	85	135	7
6.5	85	135	7
6.6	91	141	7
6.7	91	141	7
6.8	91	141	7
6.9	91	141	7

LIST9612			Unit: mm
Dc	l	L	Ds
7.0	91	141	7
7.1	98	148	8
7.2	98	148	8
7.3	98	148	8
7.4	98	148	8
7.5	98	148	8
7.6	104	154	8
7.7	104	154	8
7.8	104	154	8
7.9	104	154	8
8.0	104	154	8
8.1	111	161	9
8.2	111	161	9
8.3	111	161	9
8.4	111	161	9
8.5	111	161	9
8.6	117	167	9
8.7	117	167	9
8.8	117	167	9
8.9	117	167	9
9.0	117	167	9
9.1	124	174	10
9.2	124	174	10
9.3	124	174	10
9.4	124	174	10
9.5	124	174	10
9.6	130	180	10
9.7	130	180	10
9.8	130	180	10
9.9	130	180	10

LIST9612			Unit: mm
Dc	l	L	Ds
10.0	130	180	10
10.1	137	197	11
10.2	137	197	11
10.3	137	197	11
10.4	137	197	11
10.5	137	197	11
10.6	143	203	11
10.7	143	203	11
10.8	143	203	11
10.9	143	203	11
11.0	143	203	11
11.1	150	210	12
11.2	150	210	12
11.3	150	210	12
11.4	150	210	12
11.5	150	210	12
11.6	156	216	12
11.7	156	216	12
11.8	156	216	12
11.9	156	216	12
12.0	156	216	12

Standard drilling condition

Wet Condition

AQDEXOH 10D 15D 20D

Work material	SS400 S50C FC250 Structural steels Carbon steels ~200 HB		SCM440 NAK HPM Alloy steels 20~30 HRC		SKD61 NAK HPM Mold steels Hardened Steels 30~40HRC		Hardened steels		FCD400 Ductile cast iron		SUS304 SUS316 Stainless steel		Nickel Alloys Titanium Alloys 30~40 HRC	
mm	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min
1.0	14300	310	12700	250	11150	170	6350	65	11150		7950	80	3150	30
1.5	9550	310	8500	250	7400	170	4250	65	7400		5300	80	2100	30
2.0	7150	310	6350	250	5550	170	3200	65	5550		4000	80	1600	30
2.5	7000	470	6350	360	5700	280	3200	95	5700		3800	140	1650	50
2.9	6050	470	5500	360	4950	280	2750	95	4950		3300	140	1400	50
3.0	11500	1140	7600	570	6700	500			6700	600	6700	440		
4.0	8600	1140	5700	570	5000	500			5000	600	5000	440		
5.0	7600	1260	5100	640	4500	560			4500	670	4500	490		
6.0	6400	1260	4200	640	3700	560			3700	670	3700	490		
7.0	5500	1260	3600	640	3200	560			3200	670	3200	490		
8.0	4800	1260	3200	640	2800	560			2800	670	2800	490		
9.0	4200	1190	2800	610	2500	540			2500	650	2500	470		
10.0	3800	1100	2500	590	2200	510			2200	620	2200	450		
11.0	3500	1030	2300	560	2000	490			2000	600	2000	420		
12.0	3200	960	2100	540	1900	470			1900	580	1900	400		

AQDEXOH 25D 30D

Work material	SS400 S50C FC250 Structural steels Carbon steels ~200 HB		SCM440 NAK HPM Alloy steels 20~30 HRC		SKD61 NAK HPM Mold steels Hardened Steels 30~40HRC		FCD400 Ductile cast iron		SUS304 SUS316 Stainless steel	
mm	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min
3.0	11500	1030	7600	530	6700	460	6700	560	6700	400
4.0	8600	1030	5700	530	5000	460	5000	560	5000	400
5.0	7600	1150	5100	590	4500	510	4500	620	4500	450
6.0	6400	1150	4200	590	3700	510	3700	620	3700	450
7.0	5500	1150	3600	590	3200	510	3200	620	3200	450
8.0	4800	1150	3200	590	2800	510	2800	620	2800	450
9.0	4200	1070	2800	560	2500	490	2500	600	2500	420
10.0	3800	1000	2500	540	2200	470	2200	580	2200	400

Warnings on using the drilling condition tables

1. Adjust drilling condition according to the rigidity of machine or work clamp state.
2. The table values condition are for drilling with water-soluble cutting fluid.
3. Reduce RPM and feed speeds by 30% for non-water-soluble cutting fluid.
4. Ues the internal lubricating oil hole.
5. Non-step drilling is possible. However, a work material and drilling condition to chip removal may be worse.
   In that case, add step feed or review the drilling condition.
   For holes deeper than 20D in stainless steels, recommend in step feed.
6. In step feed, return to the entrance hole.
7. Step feed interval is about 0.5~1×D.
8. Recommend pre-drilling of guide holes. Depth is 2~3×D.
9. Recommend the AQDEXOHPLT for guide drilling.
   Recommend the diameter that is 0.03mm larger than the deep hole drill.

MQL Condition

AQDEXOH 10D 15D 20D

Work material	SS400 S50C FC250 Structural steels Carbon steels ~200 HB		SCM440 NAK HPM Alloy steels Pre-Hardened steels 20~30 HRC		SKD61 NAK HPM Mold steels Hardened Steels 30~40HRC		FCD400 Ductile cast iron	
mm	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min
3.0	7600	750	6700	500	5700	430	5700	520
4.0	5700	750	5000	500	4300	430	4300	520
5.0	5100	840	4450	560	3800	480	3800	570
6.0	4200	840	3700	560	3200	480	3200	570
7.0	3600	840	3200	560	2700	480	2700	570
8.0	3200	840	2800	560	2400	480	2400	570
9.0	2800	790	2500	540	2100	460	2100	550
10.0	2550	740	2200	510	1900	440	1900	540
11.0	2300	690	2000	490	1700	420	1700	520
12.0	2100	640	1900	470	1600	400	1600	500

AQDEXOH 25D 30D

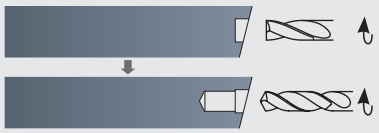
Work material	SS400 S50C FC250 Structural steels Carbon steels ~200 HB		SCM440 NAK HPM Alloy steels Pre-Hardened steels 20~30 HRC		SKD61 NAK HPM Mold steels Hardened Steels 30~40HRC		FCD400 Ductile cast iron	
mm	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min
3.0	7700	690	6700	460	5700	400	5700	480
4.0	5700	690	5000	460	4300	400	4300	480
5.0	5100	750	4450	510	3800	440	3800	540
6.0	4200	750	3700	510	3200	440	3200	540
7.0	3600	750	3200	510	2700	440	2700	540
8.0	3200	750	2800	510	2400	440	2400	540
9.0	2800	730	2500	490	2100	420	2100	520
10.0	2550	690	2200	470	1900	400	1900	500

Warnings on using the drilling condition tables
1. Adjust drilling condition according to the rigidity of machine or work clamp state.
2. The table values condition are for drilling with water-soluble cutting fluid.
3. Non-step drilling is possible. However, a work material and drilling condition to chip removal may be worse.
   In that case, add step feed or review the drilling condition.
   For holes deeper than 20D in stainless steels, recommend in step feed.
4. In step feed, return to the entrance hole.
5. Step feed interval is about 0.5~1×D.
6. Recommend pre-drilling of guide holes. Depth is 2~3×D.
7. Recommend the AQDEXOHPLT for guide drilling.
   Recommend the diameter that is 0.03mm larger than the deep hole drill.

Recommended usage for Deep hole drill

Guide hole drilling (AQDEXOHPLT)

For angled surface



We recommend pre-drilling of guide holes. Depth is 2 to 3D.
We recommend the AQDEXOHPLT for guide hole drilling. Select one with a diameter 0.03 mm larger than the deep hole drill when using AQDEXOHPLT. If the part is canted or misshapened, use the AQDEXZ to make a flat surface before use.

Deep hole drilling (Insert it in a guide hole)

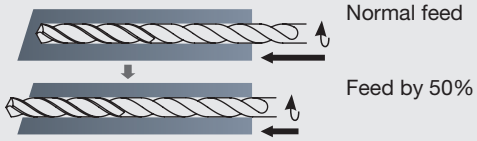
Penetrate into the guide hole at low speed until 2 to 3 mm from the bottom of the guide hole.
(About, Rotation 500min^{-1}, Feed 1000 mm/min)

Deep hole drilling

Start drilling at normal speed and feed

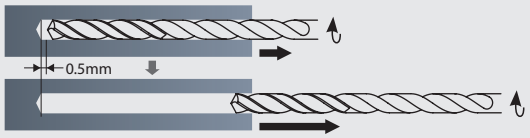
Deep hole drilling (Completion)

Penetration on angled surface



For through holes, drill at normal feed until penetration.
Before penetrating through, lower the feed. To prevent drill from breaking.

Deep hole drilling (Back)



After drilling is completed and once the bit has passed through the bottom of the drill hole, decrease speed and pull the drill back through the hole.
(About, Rotation 500min^{-1}, Feed 2000 mm/min)

High-Efficient Deep Hole Drill

AQUA Drills EX Oil Hole Long

AQDEXOH

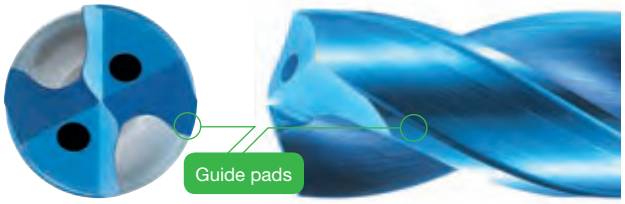
AQDEX AQDEXR AQDEXOH10D AQDEXOH15D AQDEXOH20D AQDEXOH25D AQDEXOH30D

- 30D Non step drilling possible
- High efficient & long tool life in both Wet & MQL
- Low cutting force point geometry provides long tool life on stainless steel deep hole drilling

Improved sharpness and stability

Point geometry which reduces the cutting force and improves the chip evacuation

Double margin supports the guide and realizes stable deep drilling



Guide pad located on the vertical direction against the cutting edge lead the drill stable

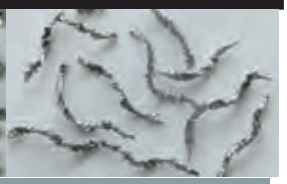
Stable deep hole drilling in stainless steels

Divided in small chips

Chip comparison

L9616 20D **AQDEXOH20D**

Competitor

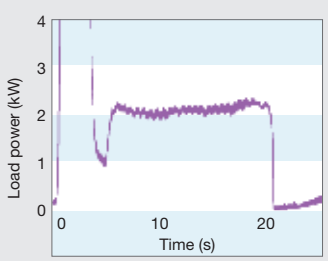


Cutting Condition			
Tool:	5.0 mm 20D type	**Cutting fluid:**	Water soluble (internal coolant)
Cutting speed:	75 m/min	**Cutting depth:**	100 mm blind hole
Feed:	450 mm/min (0.1 mm/rev)	**Guide hole:**	5.03 mm, 10 mm depth
Work material:	1.4301 (SUS304)		

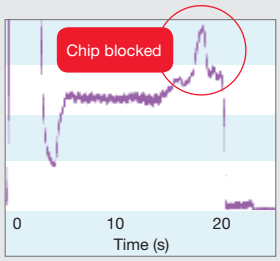
30D Non step drilling

No chip block

L9620 30D



Competitor

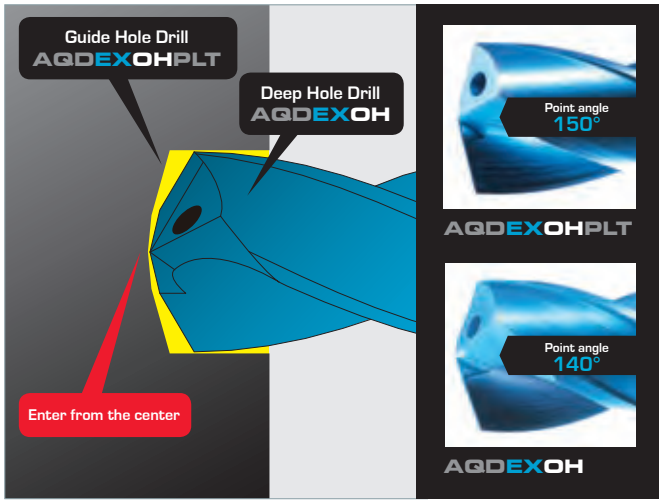


Cutting Condition			
Tool:	5.0 mm 30D type	**Cutting fluid:**	Water soluble (internal coolant)
Speed:	120 m/min	**Cutting depth:**	150 mm (30D)
Feed:	1150 mm/min	**Guide hole:**	5.03 mm, 10 mm depth
Work material:	C50 (180 HB)		

AQUA EX Oil-Hole Pilot

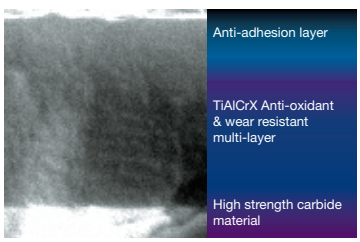
AQDEXOHPLT

Ideal guide hole drill for AQUA EX Oil-Hole long
Improved concentricity and realize stable deep hole drilling



AQUA EX Coating

Improved heat and wear resistance



Anti-oxidation test

After 1 hour in 1100°C

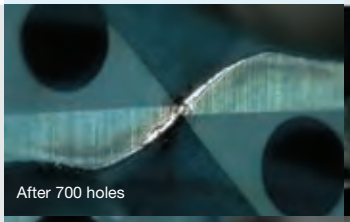
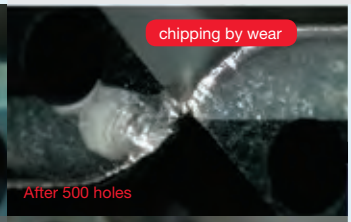
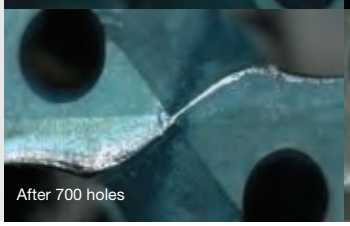
AQUA EX Coat 50% oxidized

Competitor (1200°C catalog condition) Complete oxidation

- Anti-adhesion layer and smoothed surface makes easy chip evacuation
- Al rich layer realize high anti-oxidant (1100°C)
- Multi-layered avoids crack propagation. Compressive stress moderates hardened film (3300HV) which increases the wear resistance.

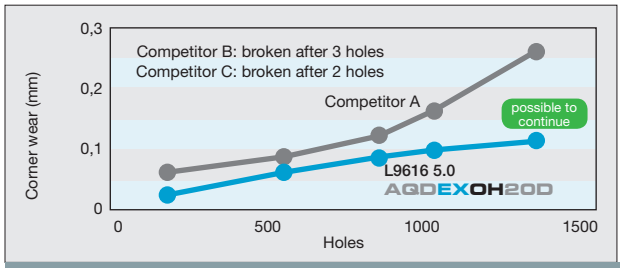
30D Non-step drilling on C50

High efficient & long tool life in both wet & MQL

	AQDEXOH30D	Competitor	Cutting conditions
Wet			**Tool:** 5.0 mm 30D type **Cutting fluid:** Water soluble (internal coolant) **Speed:** 120 m/min **Cutting depth:** 150 mm through hole **Feed:** 1150 mm/min (0.15 mm/rev) **Guide hole:** 5.03 mm, 10 mm depth **Work material:** C50
MQL			**Tool:** 5.0 mm 30D type **Cutting fluid:** MQL **Speed:** 80 m/min **Cutting depth:** 150 mm through hole **Feed:** 760 mm/min (0.15 mm/rev) **Guide hole:** 5.03 mm, 10 mm depth **Work material:** C50

Wet drilling on stainless steel 304 (1.4301)

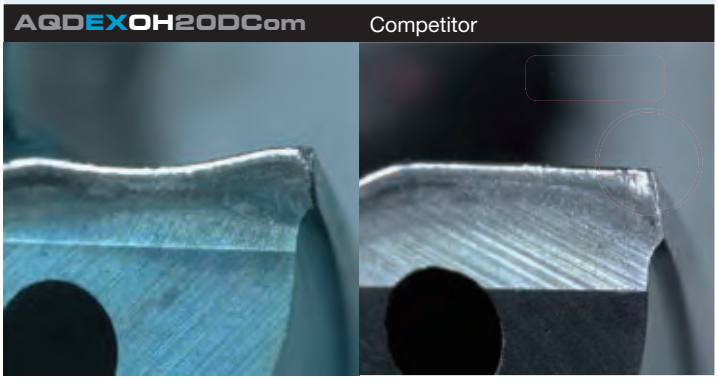
stable and long tool life even on stainless steel



Cutting Condition

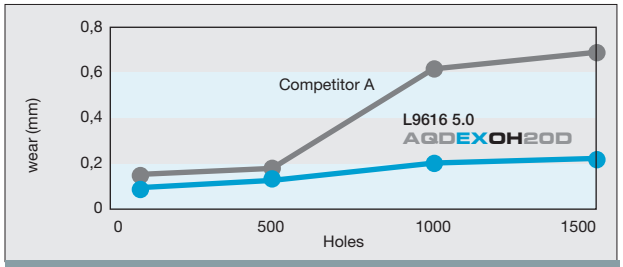
Tool:	5.0 mm 20D type	**Cutting fluid:**	Water soluble (internal coolant)
Speed:	75 m/min	**Cutting depth:**	100 mm through hole
Feed:	446 mm/min (0.1 mm/rev)	**Guide hole:**	5.03 mm, 10 mm depth
Work material:	1.4301 (SUS304)		

Comparison of wear after 1350 hole drilling



GG25(FC250) Cast Iron Wet drilling

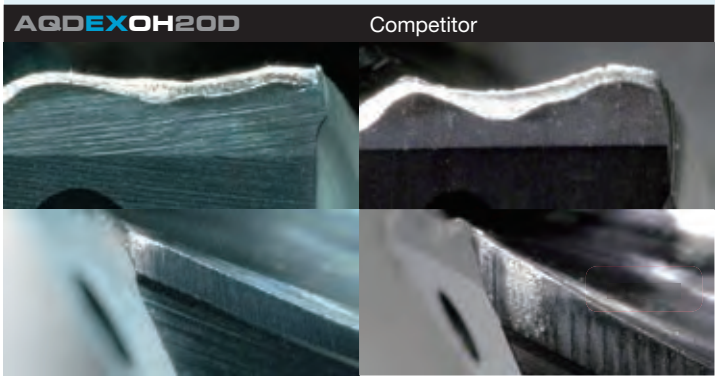
High wear resistance with long tool life



Cutting Condition

Tool:	5.0 mm 20D type	**Cutting fluid:**	Water soluble (internal coolant)
Speed:	100 m/min	**Cutting depth:**	100 mm blind hole
Feed:	955 mm/min (0.15 mm/rev)	**Guide hole:**	5.03 mm, 10 mm depth
Work material:	GG25 (FC250)		

Comparison of wear after 1500 hole drilling



Applicable working materials

Structural Steels	Carbon Steels	Pre-Hardened Steels Alloy Steels	Hardened Steels Mold Steels	Hardened Steels		Stainless Steels		Ti Alloys Ni Alloys	Cast Iron	Alumnium Alloys	Copper Alloys
ST37-2(SS400)	C45/C50	42CrMo4 SCR/NAK	30~40 HRC	40~50 HRC	50~65 HRC	1.4301/1.4401 SUS304/SUS316	1.4021/1.4028 SUS420		GG/GGG	Al/ADC	Cu
■	■	■	○			■	■		■		