NACHI

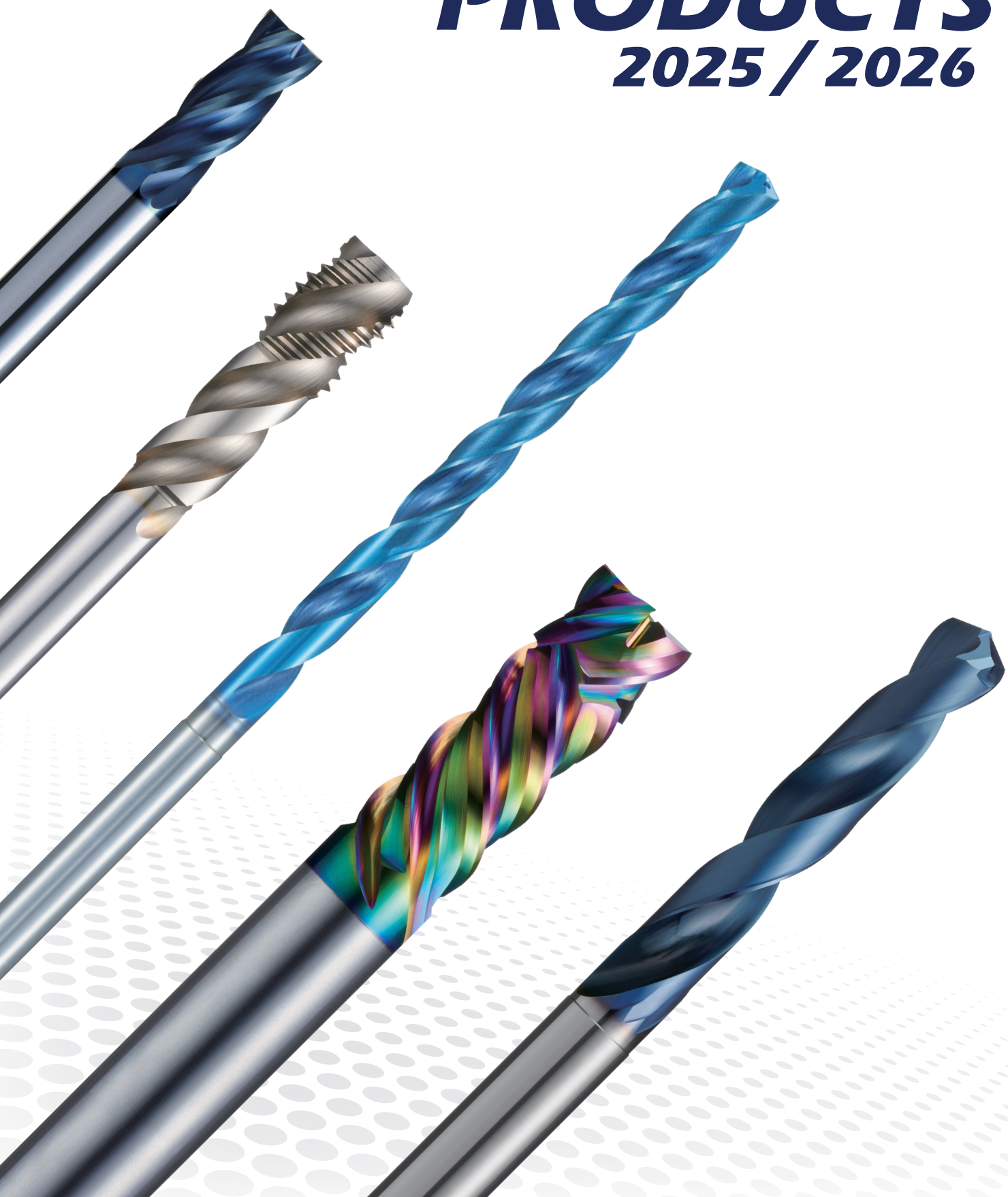
CUTTING TOOLS

DRILLS END MILLS TAPS

NEW

PRODUCTS

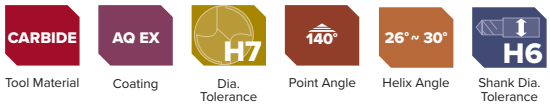
2025 / 2026



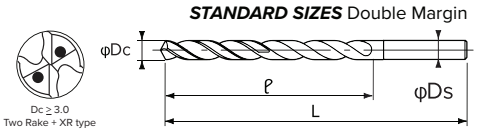
AQUA DRILL EX
OIL HOLE SERIES

Carbide 10D Fractional Series

SERIES SPECIFICATIONS



Tool Material | Coating | Dia. Tolerance | Point Angle | Helix Angle | Shank Dia. Tolerance



AQDEXOH10D
AQUA DRILL EX OIL HOLE 10D

LIST 9613 - Fractional Series

Unit: mm

Feeds and Speeds on page 75

EDP#	Size (Dc)	Decimal	W/F/L	Flute Length (ℓ)	OAL (L)	Shank Dia. (Ds)
1591660	3.175	0.1250	1/8	46	96	4
1591677	3.572	0.1406	9/64	52	102	4
1591683	3.969	0.1563	5/32	52	102	4
1591690	4.366	0.1719	11/64	59	109	5
1591705	4.763	0.1875	3/16	65	115	5
1591711	5.159	0.2031	13/64	72	122	6
1591728	5.408	0.2129	#3	72	122	6
1591734	5.556	0.2187	7/32	78	128	6
1591740	5.953	0.2344	15/64	78	128	6
1591757	6.350	0.2500	1/4	85	135	7
1591763	6.747	0.2656	17/64	91	141	7
1591770	7.144	0.2813	9/32	98	148	8
1591786	7.541	0.2969	19/64	104	154	8
1591792	7.938	0.3125	5/16	104	154	8
1591808	8.334	0.3281	21/64	111	161	9
1591814	8.731	0.3437	11/32	117	167	9
1591820	9.128	0.3594	23/64	124	174	10
1591837	9.525	0.3750	3/8	130	180	10
1591843	9.922	0.3906	25/64	130	180	10
1591850	10.716	0.4219	27/64	143	203	11
1591866	11.113	0.4375	7/16	150	210	12
1591872	11.509	0.4531	29/64	156	216	12

BURRLESS SERIES

IMPROVE EFFICIENCY THROUGH BURR ELIMINATION

- Evaluates the burr generation mechanism to eliminate the burr.
- Exclusive lineup of drills, taps, and end mills in multiple coating options to help eliminate the entire deburring process.

THE CUTTING EDGE

BURRLESS DRILLS

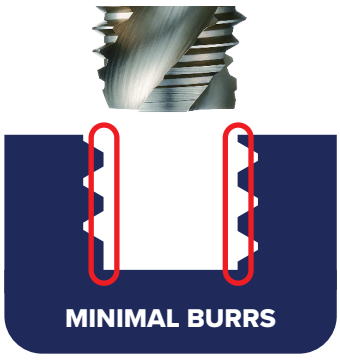
Aqua Revo
DLC-Revo

Eliminates the burr and drill cap on exit of a through hole.

BURRLESS TAPS

SG Spiral Taps

Zero burrs on the minor diameter of the thread profile.

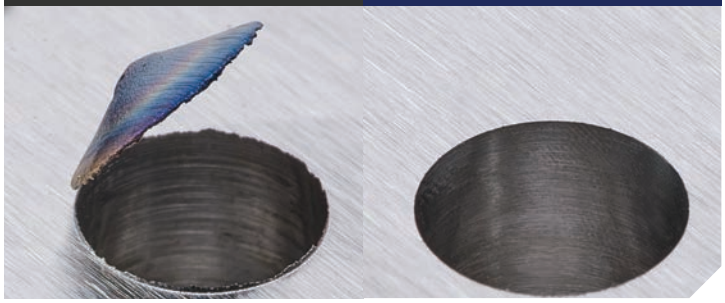


BURRLESS MILLS

Aqua Revo
DLC-Revo

Suppresses burrs on the top & bottom of the part when profile milling.

MULTIPURPOSE DRILL	BURRLESS DRILL



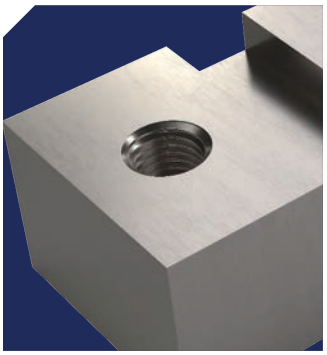
Size:
φ10

Work Material:
S50C

Cutting Speed:
287 SFM

Feed Speed:
43.7 IPM

Cutting Fluid:
Water-soluble



MULTIPURPOSE TAP	BURRLESS TAP

Size:
M12x1.75

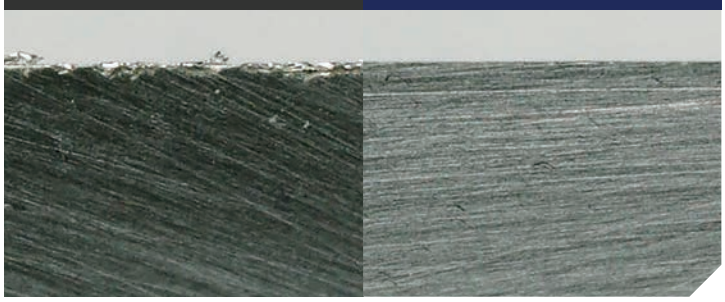
Work Material:
S50C

Cutting Speed:
98 SFM

Prepared Diameter:
φ10.2

Cutting Fluid:
Water-soluble

MULTIPURPOSE END MILL	BURRLESS END MILL



Size:
φ10

Work Material:
SUS304

Cutting Speed:
262 SFM

Feed Speed:
9.8 IPM

Depth of Cut:
ap20mm ae0.05mm

Cutting Fluid:
Water-soluble

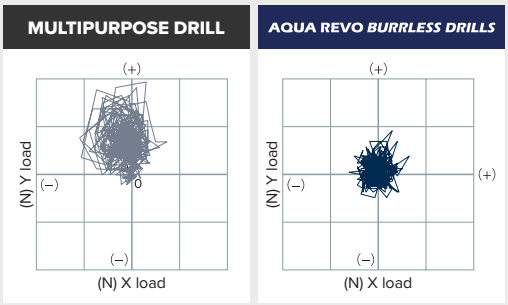
AQUA REVO DRILLS BURRLESS

Engineered to deliver a burr-free finish using REVOlutionary design techniques.

C-POINT

The C-Point angle improves location and size accuracy.

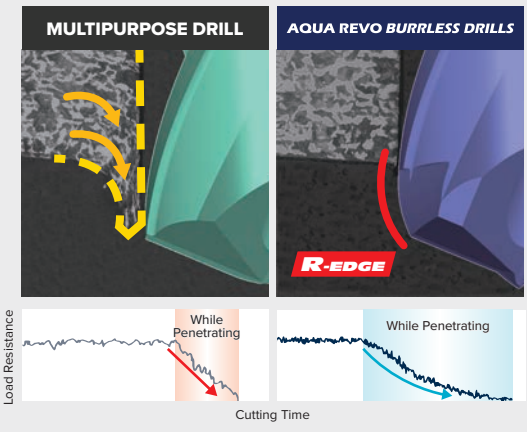
Helps prevent tool-walking during the drilling process by maintaining its position.

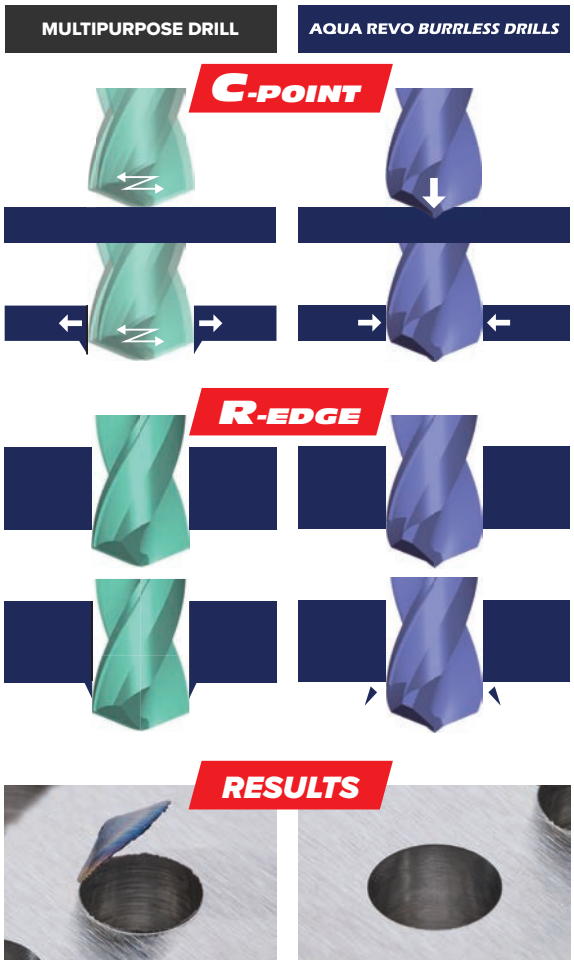


R-EDGE

The radius-edge changes the vertical cutting force of a traditional drill into a side/radial force similar to that of an end mill.

This eliminates the burr from being pushed down, and is instead, trimmed off in a radial direction during drill exit.

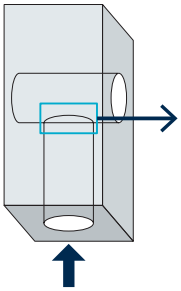


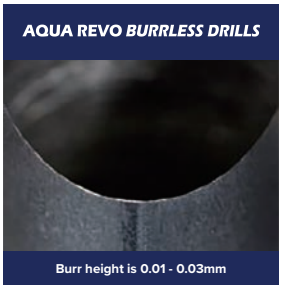


PERFORMANCE

Exceptional performance on flat surfaces, and cross-hole applications, eliminating the need for post-operation deburring processes.

BURR HEIGHT (SAME DIAMETER CROSS HOLE)





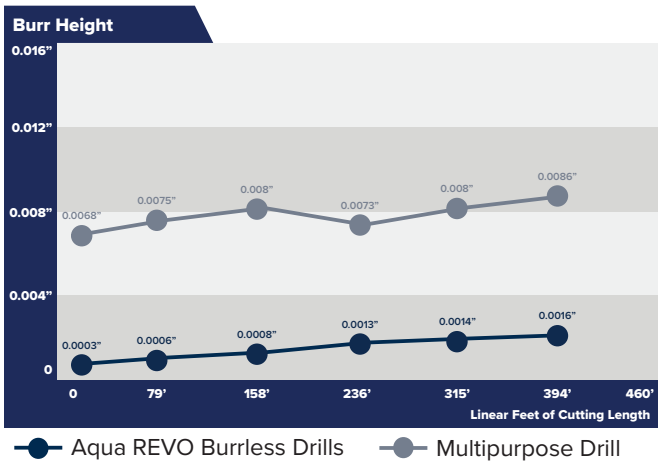
Size: φ6
Cutting Speed: 287 SFM
Depth of Hole: 12mm Through
Work Material: S50C
Feed Speed: 0.0094 IPR
Cutting Fluid: Water-soluble

DRILL CAP

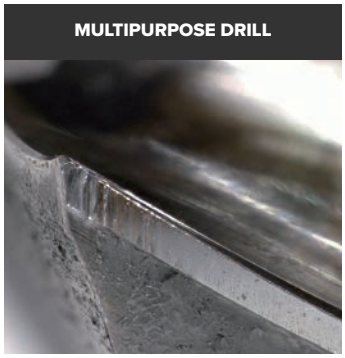
Size: φ6
Cutting Speed: 287 SFM
Depth of Hole: 13mm Through
Work Material: S50C
Feed Speed: 0.0094 IPR
Cutting Fluid: Water-soluble

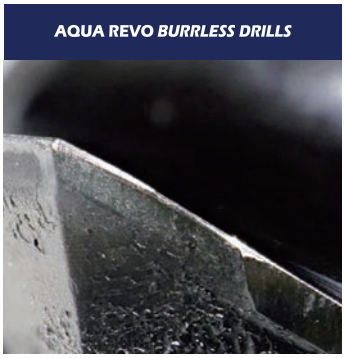
TOOL LIFE

Achieves a smaller burr even near the end of tool life. After 394 linear feet of use, Nachi Burrless Drills maintained a 0.0016” maximum burr height, compared to the 0.0068” starting burr height of a multipurpose drill.



TOOL WEAR AFTER 394 FT OF USE





Size: φ6
Feed Speed: 0.0094 IPR
Machine: Vertical M/C(BT40)
Work Material: S50C
Depth of Hole: 24mm Through
Cutting Speed: 287 SFM
Cutting Fluid: Water-soluble

APPLICABLE WORK MATERIAL

STRUCTURAL STEEL	LOW-CARBON STEEL	HIGH-CARBON STEEL	ALLOY STEEL, HEAT TREATED STEEL	MOLD STEEL, PRE-HARDENED STEEL	HARDENED STEEL	STAINLESS STEEL	CAST IRON	ALUMINUM ALLOY, COPPER ALLOY	HIGH TEMP ALLOY, TITANIUM ALLOY
●	●	●	●	○	-	○	○	-	-

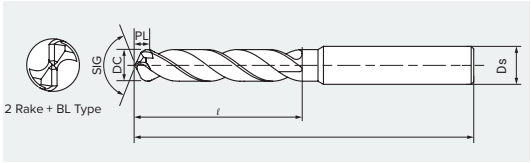
● Excellent ○ Good - Not Recommended

Carbide | REVO D | 30° | 135°
Tool Material | Coating | Helix Angle | Point Angle

h7 | h6 | 4DC | 2.0-16.0
Dia. Tolerance | Shank Dia. Tolerance | Machining Hole Depth | Diameter Range

AQRVDBL4D
AQUA REVO DRILLS BURRLESS

FOR THROUGH HOLES 4D



LIST 9896 - Metric Series

Unit: mm

EDP#	Size (DC)	Decimal	Flute Length (ℓ)	OAL (L)	Shank Dia. (DS)	Point Length (PL)	Protrusion Length
0798103	2.0	0.0787	15.0	49.0	3.0	0.9	1.2
0798110	2.1	0.0827	18.0	49.0	3.0	0.9	1.3
0798126	2.2	0.0866	18.0	49.0	3.0	1.0	1.3
0798132	2.3	0.0906	18.0	49.0	3.0	1.0	1.4
0798149	2.4	0.0945	18.0	49.0	3.0	1.1	1.4
0798155	2.5	0.0984	18.0	49.0	3.0	1.1	1.5
0798161	2.6	0.1024	20.0	49.0	3.0	1.2	1.6
0798178	2.7	0.1063	20.0	49.0	3.0	1.2	1.6
0798184	2.8	0.1102	20.0	49.0	3.0	1.3	1.7
0798190	2.9	0.1142	20.0	49.0	3.0	1.3	1.7
0798206	3.0	0.1181	20.0	49.0	3.0	1.4	1.8
0798212	3.1	0.1220	25.0	60.0	4.0	1.4	1.9
0798229	3.2	0.1260	25.0	60.0	4.0	1.4	1.9
0798235	3.3	0.1299	25.0	60.0	4.0	1.5	2.0
0798241	3.4	0.1339	25.0	60.0	4.0	1.5	2.0
0798258	3.5	0.1378	25.0	60.0	4.0	1.6	2.1
0798264	3.6	0.1417	28.0	60.0	4.0	1.6	2.2
0798270	3.7	0.1457	28.0	60.0	4.0	1.7	2.2
0798287	3.8	0.1496	28.0	60.0	4.0	1.7	2.3
0798293	3.9	0.1535	28.0	60.0	4.0	1.8	2.3
0798309	4.0	0.1575	28.0	60.0	4.0	1.8	2.4
0798315	4.1	0.1614	32.0	77.0	5.0	1.8	2.5
0798321	4.2	0.1654	32.0	77.0	5.0	1.9	2.5
0798338	4.3	0.1693	32.0	77.0	5.0	1.9	2.6
0798344	4.4	0.1732	32.0	77.0	5.0	2.0	2.6
0798350	4.5	0.1772	32.0	77.0	5.0	2.0	2.7
0798367	4.6	0.1811	39.0	77.0	5.0	2.1	2.8
0798373	4.7	0.1850	39.0	77.0	5.0	2.1	2.8
0798380	4.8	0.1890	39.0	77.0	5.0	2.2	2.9
0798396	4.9	0.1929	39.0	77.0	5.0	2.2	2.9
0798401	5.0	0.1969	39.0	77.0	5.0	2.3	3.0
0798418	5.1	0.2008	40.0	82.0	6.0	2.3	3.1
0798424	5.2	0.2047	40.0	82.0	6.0	2.3	3.1
0798430	5.3	0.2087	40.0	82.0	6.0	2.4	3.2
0798447	5.4	0.2126	40.0	82.0	6.0	2.4	3.2
0798453	5.5	0.2165	40.0	82.0	6.0	2.5	3.3
0798460	5.6	0.2205	42.0	82.0	6.0	2.5	3.4
0798476	5.7	0.2244	42.0	82.0	6.0	2.6	3.4
0798482	5.8	0.2283	42.0	82.0	6.0	2.6	3.5
0798499	5.9	0.2323	42.0	82.0	6.0	2.7	3.5
0798504	6.0	0.2362	42.0	82.0	6.0	2.7	3.6
0798510	6.1	0.2402	43.0	84.0	7.0	2.7	3.7
0798527	6.2	0.2441	43.0	84.0	7.0	2.8	3.7
0798533	6.3	0.2480	43.0	84.0	7.0	2.8	3.8
0798540	6.4	0.2520	43.0	84.0	7.0	2.9	3.8
0798556	6.5	0.2559	43.0	84.0	7.0	2.9	3.9
0798562	6.6	0.2598	44.0	84.0	7.0	3.0	4.0
0798579	6.7	0.2638	44.0	84.0	7.0	3.0	4.0
0798585	6.8	0.2677	44.0	84.0	7.0	3.1	4.1
0798591	6.9	0.2717	44.0	84.0	7.0	3.1	4.1
0798607	7.0	0.2756	44.0	84.0	7.0	3.2	4.2
0798613	7.1	0.2795	46.0	91.0	8.0	3.2	4.3
0798620	7.2	0.2835	46.0	91.0	8.0	3.2	4.3
0798636	7.3	0.2874	46.0	91.0	8.0	3.3	4.4
0798642	7.4	0.2913	46.0	91.0	8.0	3.3	4.4
0798659	7.5	0.2953	46.0	91.0	8.0	3.4	4.5
0798665	7.6	0.2992	47.0	91.0	8.0	3.4	4.6
0798671	7.7	0.3031	47.0	91.0	8.0	3.5	4.6
0798688	7.8	0.3071	47.0	91.0	8.0	3.5	4.7
0798694	7.9	0.3110	47.0	91.0	8.0	3.6	4.7

EDP#	Size (DC)	Decimal	Flute Length (ℓ)	OAL (L)	Shank Dia. (DS)	Point Length (PL)	Protrusion Length
0798700	8.0	0.3150	47.0	91.0	8.0	3.6	4.8
0798716	8.1	0.3189	55.0	99.0	9.0	3.6	4.9
0798722	8.2	0.3228	55.0	99.0	9.0	3.7	4.9
0798739	8.3	0.3268	55.0	99.0	9.0	3.7	5.0
0798745	8.4	0.3307	55.0	99.0	9.0	3.8	5.0
0798751	8.5	0.3346	55.0	99.0	9.0	3.8	5.1
0798768	8.6	0.3386	57.0	99.0	9.0	3.9	5.2
0798774	8.7	0.3425	57.0	99.0	9.0	3.9	5.2
0798780	8.8	0.3465	57.0	99.0	9.0	4.0	5.3
0798797	8.9	0.3504	57.0	99.0	9.0	4.0	5.3
0798802	9.0	0.3543	57.0	99.0	9.0	4.1	5.4
0798819	9.1	0.3583	60.0	107.0	10.0	4.1	5.5
0798825	9.2	0.3622	60.0	107.0	10.0	4.1	5.5
0798831	9.3	0.3661	60.0	107.0	10.0	4.2	5.6
0798848	9.4	0.3701	60.0	107.0	10.0	4.2	5.6
0798854	9.5	0.3740	60.0	107.0	10.0	4.3	5.7
0798860	9.6	0.3780	62.0	107.0	10.0	4.3	5.8
0798877	9.7	0.3819	62.0	107.0	10.0	4.4	5.8
0798883	9.8	0.3858	62.0	107.0	10.0	4.4	5.9
0798890	9.9	0.3898	62.0	107.0	10.0	4.5	5.9
0798905	10.0	0.3937	62.0	107.0	10.0	4.5	6.0
0798911	10.1	0.3976	68.0	116.0	11.0	4.5	6.1
0798928	10.2	0.4016	68.0	116.0	11.0	4.6	6.1
0798934	10.3	0.4055	68.0	116.0	11.0	4.6	6.2
0798940	10.4	0.4094	68.0	116.0	11.0	4.7	6.2
0798957	10.5	0.4134	68.0	116.0	11.0	4.7	6.3
0798963	10.6	0.4173	70.0	116.0	11.0	4.8	6.4
0798970	10.7	0.4213	70.0	116.0	11.0	4.8	6.4
0798986	10.8	0.4252	70.0	116.0	11.0	4.9	6.5
0798992	10.9	0.4291	70.0	116.0	11.0	4.9	6.5
0799007	11.0	0.4331	70.0	116.0	11.0	5.0	6.6
0799013	11.1	0.4370	73.0	123.0	12.0	5.0	6.7
0799020	11.2	0.4409	73.0	123.0	12.0	5.0	6.7
0799036	11.3	0.4449	73.0	123.0	12.0	5.1	6.8
0799042	11.4	0.4488	73.0	123.0	12.0	5.1	6.8
0799059	11.5	0.4528	73.0	123.0	12.0	5.2	6.9
0799065	11.6	0.4567	76.0	123.0	12.0	5.2	7.0
0799071	11.7	0.4606	76.0	123.0	12.0	5.3	7.0
0799088	11.8	0.4646	76.0	123.0	12.0	5.3	7.1
0799094	11.9	0.4685	76.0	123.0	12.0	5.4	7.1
0799100	12.0	0.4724	76.0	123.0	12.0	5.4	7.2
0799116	12.1	0.4764	79.0	138.0	13.0	5.4	7.3
0799122	12.2	0.4803	79.0	138.0	13.0	5.5	7.3
0799139	12.3	0.4843	79.0	138.0	13.0	5.5	7.4
0799145	12.4	0.4882	79.0	138.0	13.0	5.6	7.4
0799151	12.5	0.4921	79.0	138.0	13.0	5.6	7.5
0799168	12.6	0.4961	81.0	138.0	13.0	5.7	7.6
0799174	12.7	0.5000	81.0	138.0	13.0	5.7	7.6
0799180	12.8	0.5039	81.0	138.0	13.0	5.8	7.7
0799197	12.9	0.5079	81.0	138.0	13.0	5.8	7.7
0799202	13.0	0.5118	81.0	138.0	13.0	5.9	7.8
0799219	13.1	0.5157	87.0	148.0	14.0	5.9	7.9
0799225	13.2	0.5197	87.0	148.0	14.0	5.9	7.9
0799231	13.3	0.5236	87.0	148.0	14.0	6.0	8.0
0799248	13.4	0.5276	87.0	148.0	14.0	6.0	8.0
0799254	13.5	0.5315	87.0	148.0	14.0	6.1	8.1
0799260	13.6	0.5354	90.0	148.0	14.0	6.1	8.2
0799277	13.7	0.5394	90.0	148.0	14.0	6.2	8.2
0799283	13.8	0.5433	90.0	148.0	14.0	6.2	8.3
0799290	13.9	0.5472	90.0	148.0	14.0	6.3	8.3

EDP#	Size (DC)	Decimal	Flute Length (ℓ)	OAL (L)	Shank Dia. (DS)	Point Length (PL)	Protrusion Length
0799305	14.0	0.5512	90.0	148.0	14.0	6.3	8.4
0799311	14.1	0.5551	92.0	154.0	15.0	6.3	8.5
0799328	14.2	0.5591	92.0	154.0	15.0	6.4	8.5
0799334	14.3	0.5630	92.0	154.0	15.0	6.4	8.6
0799340	14.4	0.5669	92.0	154.0	15.0	6.5	8.6
0799357	14.5	0.5709	92.0	154.0	15.0	6.5	8.7
0799363	14.6	0.5748	94.0	154.0	15.0	6.6	8.8
0799370	14.7	0.5787	94.0	154.0	15.0	6.6	8.8
0799386	14.8	0.5827	94.0	154.0	15.0	6.7	8.9
0799392	14.9	0.5866	94.0	154.0	15.0	6.7	8.9

EDP#	Size (DC)	Decimal	Flute Length (ℓ)	OAL (L)	Shank Dia. (DS)	Point Length (PL)	Protrusion Length
0799408	15.0	0.5906	94.0	154.0	15.0	6.8	9.0
0799414	15.1	0.5945	97.0	162.0	16.0	6.8	9.1
0799420	15.2	0.5984	97.0	162.0	16.0	6.8	9.1
0799437	15.3	0.6024	97.0	162.0	16.0	6.9	9.2
0799443	15.4	0.6063	97.0	162.0	16.0	6.9	9.2
0799450	15.5	0.6102	97.0	162.0	16.0	7.0	9.3
0799466	15.6	0.6142	99.0	162.0	16.0	7.0	9.4
0799472	15.7	0.6181	99.0	162.0	16.0	7.1	9.4
0799489	15.8	0.6220	99.0	162.0	16.0	7.1	9.5
0799495	15.9	0.6260	99.0	162.0	16.0	7.2	9.5
0799500	16.0	0.6299	99.0	162.0	16.0	7.2	9.6

LIST 9897 - Fractional Series

Unit: inch / mm

EDP#	Size (DC)	Decimal	Flute Length (ℓ)	OAL (L)	Shank Dia. (DS)	Point Length (PL)	Protrusion Length
1584403	3/32	0.0937	18.0	49.0	3.0	1.1	1.4
1584730	7/64	0.1094	20.0	49.0	3.0	1.3	1.7
1584410	1/8	0.1250	25.0	60.0	4.0	1.4	1.9
1584426	9/64	0.1406	28.0	60.0	4.0	1.6	2.1
1584432	5/32	0.1562	28.0	60.0	4.0	1.8	2.4
1584747	#21	0.1590	32.0	77.0	6.0	1.8	2.4
1584753	#20	0.1610	32.0	77.0	6.0	1.8	2.5
1584760	11/64	0.1719	32.0	77.0	6.0	2.0	2.6
1584776	3/16	0.1875	39.0	77.0	6.0	2.1	2.9
1584782	#7	0.2010	40.0	82.0	6.0	2.3	3.1
1584799	13/64	0.2031	40.0	82.0	6.0	2.3	3.1
1584804	#3	0.2130	40.0	82.0	6.0	2.4	3.2
1584833	7/32	0.2187	42.0	82.0	6.0	2.5	3.3
1584810	#2	0.2210	42.0	82.0	6.0	2.5	3.4
1584827	15/64	0.2344	42.0	82.0	6.0	2.7	3.6
1584449	1/4	0.2500	43.0	84.0	8.0	2.9	3.8
1584455	F	0.2570	44.0	84.0	8.0	2.9	3.9
1584461	17/64	0.2656	44.0	84.0	8.0	3.0	4.0
1584478	I	0.2720	44.0	84.0	8.0	3.1	4.1
1584484	J	0.2770	46.0	91.0	8.0	3.2	4.2
1584490	9/32	0.2812	46.0	91.0	8.0	3.2	4.3
1584506	19/64	0.2969	47.0	91.0	8.0	3.4	4.5
1584512	5/16	0.3125	47.0	91.0	8.0	3.6	4.8
1584529	P	0.3230	55.0	99.0	10.0	3.7	4.9

EDP#	Size (DC)	Decimal	Flute Length (ℓ)	OAL (L)	Shank Dia. (DS)	Point Length (PL)	Protrusion Length
1584535	21/64	0.3281	55.0	99.0	10.0	3.8	5.0
1584541	Q	0.3320	55.0	99.0	10.0	3.8	5.1
1584558	11/32	0.3437	57.0	99.0	10.0	3.9	5.2
1584564	23/64	0.3594	60.0	107.0	10.0	4.1	5.5
1584570	U	0.3680	60.0	107.0	10.0	4.2	5.6
1584587	3/8	0.3750	62.0	107.0	10.0	4.3	5.7
1584593	25/64	0.3906	62.0	107.0	10.0	4.5	6.0
1584609	13/32	0.4062	68.0	116.0	12.0	4.6	6.2
1584615	27/64	0.4219	70.0	116.0	12.0	4.8	6.4
1584621	7/16	0.4375	73.0	123.0	12.0	5.0	6.7
1584840	29/64	0.4531	76.0	123.0	12.0	5.2	6.9
1584856	15/32	0.4687	76.0	123.0	12.0	5.4	7.1
1584638	31/64	0.4844	79.0	138.0	14.0	5.5	7.4
1584644	1/2	0.5000	81.0	138.0	14.0	5.7	7.6
1584650	33/64	0.5156	87.0	148.0	14.0	5.9	7.9
1584667	17/32	0.5312	87.0	148.0	14.0	6.1	8.1
1584673	35/64	0.5469	90.0	148.0	14.0	6.3	8.3
1584680	9/16	0.5625	92.0	154.0	16.0	6.4	8.6
1584696	37/64	0.5781	94.0	154.0	16.0	6.6	8.8
1584701	19/32	0.5937	97.0	162.0	16.0	6.8	9.0
1584718	39/64	0.6094	97.0	162.0	16.0	7.0	9.3
1584724	5/8	0.6250	99.0	162.0	16.0	7.1	9.5

Standard Cutting Conditions

LIST 9896 AQRVDBL4D - Metric Series
LIST 9897 AQRVDBL4D - Fractional Series

Work Material		Structural Steel		Carbon Steel, Cast Iron		Alloy Steel, Heat Treated Steel		Mold Steel, Pre-Hardened Steel		Ductile Cast Iron		300 Series, 400 Series, PH Stainless	
		~200HB		~200HB		20~30HRC		30~40HRC					
Cutting Speed (SFM)		225 - 235		160 - 170		160 - 170		95 - 105		160 - 170			
Drill Dia.		RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
2.0 mm	0.07874”	11,200	0.0016	8,000	0.0024	8,000	0.0024	4,900	0.0016	8,000	0.0031		
3.0 mm	0.11811”	7,400	0.0023	5,300	0.0036	5,300	0.0036	3,200	0.0023	5,300	0.0048		
5.0 mm	0.19685”	4,500	0.0039	3,200	0.0059	3,200	0.0059	1,900	0.0039	3,200	0.0079		
6.0 mm	0.23622”	3,700	0.0048	2,700	0.0094	2,700	0.0094	1,600	0.0052	2,700	0.0094	Contact Nachi cutting tool engineers for 300 Series, 400 Series, and PH Stainless.	
8.0 mm	0.31496”	2,800	0.0063	2,000	0.0123	2,000	0.0123	1,200	0.0070	2,000	0.0123		
10.0 mm	0.3937”	2,200	0.0079	1,600	0.0157	1,600	0.0157	1,000	0.0086	1,600	0.0118		
12.0 mm	0.47244”	1,900	0.0094	1,300	0.0189	1,300	0.0189	800	0.0105	1,300	0.0143		
14.0 mm	0.55118”	1,600	0.0111	1,100	0.0165	1,100	0.0165	700	0.0112	1,100	0.0165		
16.0 mm	0.62992”	1,400	0.0127	1,000	0.0126	1,000	0.0126	600	0.0125	1,000	0.0189		

Cutting conditions:

1. AQRVDBL is for through hole drilling usage. Drill should exit the hole at least 0.6DC.
2. Burrless drill will not perform on an inclined entry or exit. In that case, we recommend a flat-bottom drill.
3. In low rigidity applications, when chatter occurs, reduce the rotation and feed rate.
4. Wet conditions are for drilling with water soluble cutting fluid.
5. In non-water soluble cutting fluid, reduce the rotation and feed rate by 20%.
6. Drilling Aluminum Alloy, Hardened Stainless Steel, and Hardened Steel is not recommended.
7. Sparks, excessive heat, or hot chips increase the risk of fire. If this happens, please take fire prevention measures.
8. If struggling with chip control in certain materials, peck drilling may be required.
9. Retract plane should be set at the top of the hole when peck drilling.
10. Peck drilling increments should be 0.5-1.0xDC. Small diameter should be 0.2-0.5xDC.
11. Please ensure tool runout is held below 0.02mm. For small diameters, runout should be held below 0.01mm.

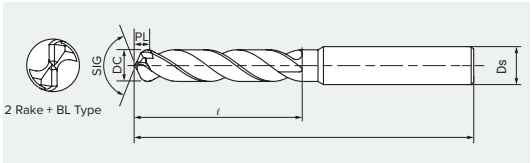
DLC-REVO DRILLS BURRLESS

Carbide | DLC REVO | 38° | 135°
Tool Material | Coating | Helix Angle | Point Angle

h7 | h6 | 4DC | 2.0-16.0
Dia. Tolerance | Shank Dia. Tolerance | Machining Hole Depth | Diameter Range

DLCRVDBL4D
DLC-REVO DRILLS BURRLESS

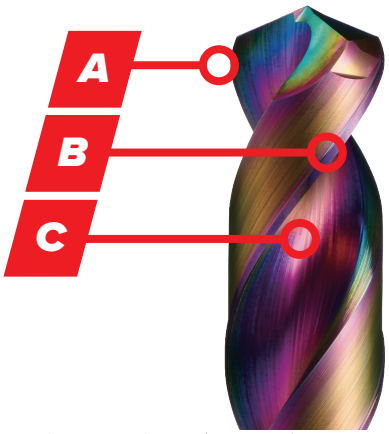
FOR THROUGH HOLES 4D



(A) Enhanced Rake Angle: Optimized R-edge rake angle effectively removes burrs on non-ferrous metals.

(B) Optimized Helix Angle: High helix design sharpens the cutting edge and eliminates burrs.

(C) Wider Flute Width: Expansive flute width prevents chip packing and minimizes cutting edge wear.



LIST 9910 - Metric Series

Unit: mm

EDP#	Size (DC)	Decimal	Flute Length (ℓ)	OAL (L)	Shank Dia. DS)	Point Length (PL)	Protrusion Length
0800592	2.0	0.0787	15.0	49.0	3.0	0.9	1.2
0800608	2.1	0.0827	18.0	49.0	3.0	0.9	1.3
0800614	2.2	0.0866	18.0	49.0	3.0	1.0	1.3
0800620	2.3	0.0906	18.0	49.0	3.0	1.0	1.4
0800637	2.4	0.0945	18.0	49.0	3.0	1.1	1.4
0800643	2.5	0.0984	18.0	49.0	3.0	1.1	1.5
0800650	2.6	0.1024	20.0	49.0	3.0	1.2	1.6
0800666	2.7	0.1063	20.0	49.0	3.0	1.2	1.6
0800672	2.8	0.1102	20.0	49.0	3.0	1.3	1.7
0800689	2.9	0.1142	20.0	49.0	3.0	1.3	1.7
0800695	3.0	0.1181	20.0	49.0	3.0	1.4	1.8
0800700	3.1	0.1220	25.0	60.0	4.0	1.4	1.9
0800717	3.2	0.1260	25.0	60.0	4.0	1.4	1.9
0800723	3.3	0.1299	25.0	60.0	4.0	1.5	2.0
0800730	3.4	0.1339	25.0	60.0	4.0	1.5	2.0
0800746	3.5	0.1378	25.0	60.0	4.0	1.6	2.1
0800752	3.6	0.1417	28.0	60.0	4.0	1.6	2.2
0800769	3.7	0.1457	28.0	60.0	4.0	1.7	2.2
0800775	3.8	0.1496	28.0	60.0	4.0	1.7	2.3
0800781	3.9	0.1535	28.0	60.0	4.0	1.8	2.3
0800798	4.0	0.1575	28.0	60.0	4.0	1.8	2.4
0800803	4.1	0.1614	32.0	77.0	5.0	1.8	2.5
0800810	4.2	0.1654	32.0	77.0	5.0	1.9	2.5
0800826	4.3	0.1693	32.0	77.0	5.0	1.9	2.6
0800832	4.4	0.1732	32.0	77.0	5.0	2.0	2.6
0800849	4.5	0.1772	32.0	77.0	5.0	2.0	2.7
0800855	4.6	0.1811	39.0	77.0	5.0	2.1	2.8
0800861	4.7	0.1850	39.0	77.0	5.0	2.1	2.8
0800878	4.8	0.1890	39.0	77.0	5.0	2.2	2.9
0800884	4.9	0.1929	39.0	77.0	5.0	2.2	2.9
0800890	5.0	0.1969	39.0	77.0	5.0	2.3	3.0
0800906	5.1	0.2008	40.0	82.0	6.0	2.3	3.1
0800912	5.2	0.2047	40.0	82.0	6.0	2.3	3.1
0800929	5.3	0.2087	40.0	82.0	6.0	2.4	3.2

EDP#	Size (DC)	Decimal	Flute Length (ℓ)	OAL (L)	Shank Dia. DS)	Point Length (PL)	Protrusion Length
0800935	5.4	0.2126	40.0	82.0	6.0	2.4	3.2
0800941	5.5	0.2165	40.0	82.0	6.0	2.5	3.3
0800958	5.6	0.2205	42.0	82.0	6.0	2.5	3.4
0800964	5.7	0.2244	42.0	82.0	6.0	2.6	3.4
0800970	5.8	0.2283	42.0	82.0	6.0	2.6	3.5
0800987	5.9	0.2323	42.0	82.0	6.0	2.7	3.5
0800993	6.0	0.2362	42.0	82.0	6.0	2.7	3.6
0801008	6.1	0.2402	43.0	84.0	7.0	2.7	3.7
0801014	6.2	0.2441	43.0	84.0	7.0	2.8	3.7
0801020	6.3	0.2480	43.0	84.0	7.0	2.8	3.8
0801037	6.4	0.2520	43.0	84.0	7.0	2.9	3.8
0801043	6.5	0.2559	43.0	84.0	7.0	2.9	3.9
0801050	6.6	0.2598	44.0	84.0	7.0	6.0	4.0
0801066	6.7	0.2638	44.0	84.0	7.0	3.0	4.0
0801072	6.8	0.2677	44.0	84.0	7.0	3.1	4.1
0801089	6.9	0.2717	44.0	84.0	7.0	3.1	4.1
0801095	7.0	0.2756	44.0	84.0	7.0	3.2	4.2
0801100	7.1	0.2795	46.0	91.0	8.0	3.2	4.3
0801117	7.2	0.2835	46.0	91.0	8.0	3.2	4.3
0801123	7.3	0.2874	46.0	91.0	8.0	3.3	4.4
0801130	7.4	0.2913	46.0	91.0	8.0	3.3	4.4
0801146	7.5	0.2953	46.0	91.0	8.0	3.4	4.5
0801152	7.6	0.2992	47.0	91.0	8.0	3.4	4.6
0801169	7.7	0.3031	47.0	91.0	8.0	3.5	4.6
0801175	7.8	0.3071	47.0	91.0	8.0	3.5	4.7
0801181	7.9	0.3110	47.0	91.0	8.0	3.6	4.7
0801198	8.0	0.3150	47.0	91.0	8.0	3.6	4.8
0801203	8.1	0.3189	55.0	99.0	9.0	3.6	4.9
0801210	8.2	0.3228	55.0	99.0	9.0	3.7	4.9
0801226	8.3	0.3268	55.0	99.0	9.0	3.7	5.0
0801232	8.4	0.3307	55.0	99.0	9.0	3.8	5.0
0801249	8.5	0.3346	55.0	99.0	9.0	3.8	5.1
0801255	8.6	0.3386	57.0	99.0	9.0	3.9	5.2
0801261	8.7	0.3425	57.0	99.0	9.0	3.9	5.2

EDP#	Size (DC)	Decimal	Flute Length (ℓ)	OAL (L)	Shank Dia. DS)	Point Length (PL)	Protrusion Length
0801278	8.8	0.3465	57.0	99.0	9.0	4.0	5.3
0801284	8.9	0.3504	57.0	99.0	9.0	4.0	5.3
0801290	9.0	0.3543	57.0	99.0	9.0	4.1	5.4
0801306	9.1	0.3583	60.0	107.0	10.0	4.1	5.5
0801312	9.2	0.3622	60.0	107.0	10.0	4.1	5.5
0801329	9.3	0.3661	60.0	107.0	10.0	4.2	5.6
0801335	9.4	0.3701	60.0	107.0	10.0	4.2	5.6
0801341	9.5	0.3740	60.0	107.0	10.0	4.3	5.7
0801358	9.6	0.3780	62.0	107.0	10.0	4.3	5.8
0801364	9.7	0.3819	62.0	107.0	10.0	4.4	5.8
0801370	9.8	0.3858	62.0	107.0	10.0	4.4	5.9
0801387	9.9	0.3898	62.0	107.0	10.0	4.5	5.9
0801393	10.0	0.3937	62.0	107.0	10.0	4.5	6.0
0801409	10.1	0.3976	68.0	116.0	11.0	4.5	6.1
0801415	10.2	0.4016	68.0	116.0	11.0	4.6	6.1
0801421	10.3	0.4055	68.0	116.0	11.0	4.6	6.2
0801438	10.4	0.4094	68.0	116.0	11.0	4.7	6.2
0801444	10.5	0.4134	68.0	116.0	11.0	4.7	6.3
0801450	10.6	0.4173	70.0	116.0	11.0	4.8	6.4
0801467	10.7	0.4213	70.0	116.0	11.0	4.8	6.4
0801473	10.8	0.4252	70.0	116.0	11.0	4.9	6.5
0801480	10.9	0.4291	70.0	116.0	11.0	4.9	6.5
0801496	11.0	0.4331	70.0	116.0	11.0	5.0	6.6
0801501	11.1	0.4370	73.0	123.0	12.0	5.0	6.7
0801518	11.2	0.4409	73.0	123.0	12.0	5.0	6.7
0801524	11.3	0.4449	73.0	123.0	12.0	5.1	6.8
0801530	11.4	0.4488	73.0	123.0	12.0	5.1	6.8
0801547	11.5	0.4528	73.0	123.0	12.0	5.2	6.9
0801553	11.6	0.4567	76.0	123.0	12.0	5.2	7.0
0801560	11.7	0.4606	76.0	123.0	12.0	5.3	7.0
0801576	11.8	0.4646	76.0	123.0	12.0	5.3	7.1
0801582	11.9	0.4685	76.0	123.0	12.0	5.4	7.1
0801599	12.0	0.4724	76.0	123.0	12.0	5.4	7.2
0801604	12.1	0.4764	79.0	138.0	13.0	5.4	7.3
0801610	12.2	0.4803	79.0	138.0	13.0	5.5	7.3
0801627	12.3	0.4843	79.0	138.0	13.0	5.5	7.4

EDP#	Size (DC)	Decimal	Flute Length (ℓ)	OAL (L)	Shank Dia. DS)	Point Length (PL)	Protrusion Length
0801633	12.4	0.4882	79.0	138.0	13.0	5.6	7.4
0801640	12.5	0.4921	79.0	138.0	13.0	5.6	7.5
0801656	12.6	0.4961	81.0	138.0	13.0	5.7	7.6
0801662	12.7	0.5000	81.0	138.0	13.0	5.7	7.6
0801679	12.8	0.5039	81.0	138.0	13.0	5.8	7.7
0801685	12.9	0.5079	81.0	138.0	13.0	5.8	7.7
0801691	13.0	0.5118	81.0	138.0	13.0	5.9	7.8
0801707	13.1	0.5157	87.0	148.0	14.0	5.9	7.9
0801713	13.2	0.5197	87.0	148.0	14.0	5.9	7.9
0801720	13.3	0.5236	87.0	148.0	14.0	6.0	8.0
0801736	13.4	0.5276	87.0	148.0	14.0	6.0	8.0
0801742	13.5	0.5315	87.0	148.0	14.0	6.1	8.1
0801759	13.6	0.5354	90.0	148.0	14.0	6.1	8.2
0801765	13.7	0.5394	90.0	148.0	14.0	6.2	8.2
0801771	13.8	0.5433	90.0	148.0	14.0	6.2	8.3
0801788	13.9	0.5472	90.0	148.0	14.0	6.3	8.3
0801794	14.0	0.5512	90.0	148.0	14.0	6.3	8.4
0801800	14.1	0.5551	92.0	154.0	15.0	6.3	8.5
0801816	14.2	0.5591	92.0	154.0	15.0	6.4	8.5
0801822	14.3	0.5630	92.0	154.0	15.0	6.4	8.6
0801839	14.4	0.5669	92.0	154.0	15.0	6.5	8.6
0801845	14.5	0.5709	92.0	154.0	15.0	6.5	8.7
0801851	14.6	0.5748	94.0	154.0	15.0	6.6	8.8
0801868	14.7	0.5787	94.0	154.0	15.0	6.6	8.8
0801874	14.8	0.5827	94.0	154.0	15.0	6.7	8.9
0801880	14.9	0.5866	94.0	154.0	15.0	6.7	8.9
0801897	15.0	0.5906	94.0	154.0	15.0	6.8	9.0
0801902	15.1	0.5945	97.0	162.0	16.0	6.8	9.1
0801919	15.2	0.5984	97.0	162.0	16.0	6.8	9.1
0801925	15.3	0.6024	97.0	162.0	16.0	6.9	9.2
0801931	15.4	0.6063	97.0	162.0	16.0	6.9	9.2
0801948	15.5	0.6102	97.0	162.0	16.0	7.0	9.3
0801954	15.6	0.6142	99.0	162.0	16.0	7.0	9.4
0801960	15.7	0.6181	99.0	162.0	16.0	7.1	9.4
0801977	15.8	0.6220	99.0	162.0	16.0	7.1	9.5
0801983	15.9	0.6260	99.0	162.0	16.0	7.2	9.5
0801990	16.0	0.6299	99.0	162.0	16.0	7.2	9.6

Standard Cutting Conditions

LIST 9910 DLCRVDBL4D - Metric Series

Work Material		Aluminum		Aluminum Alloy (Si, Mg-Si)		Aluminum Alloy (Mg, Zn-Mg)		Aluminum Casting		Copper Alloy		Magnesium Alloy		Thermoplastic Resin	
		A1070		A430, A6061		A5052, A7075		AC, ADC		C1100		AZ91		PA, PVC	
Cutting Speed (SFM)		330		330		410		330		330		330		330	
Drill Dia. (mm)		RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
2.0	0.0787	15,900	0.0018	15,900	0.0031	20,000	0.0031	15,900	0.0035	15,900	0.0016	15,900	0.0031	15,900	0.0024
3.0	0.1181	10,600	0.0027	10,600	0.0047	13,300	0.0047	10,600	0.0053	10,600	0.0024	10,600	0.0047	10,600	0.0035
5.0	0.1969	6,400	0.0044	6,400	0.0078	8,000	0.0079	6,400	0.0088	6,400	0.0039	6,400	0.0078	6,400	0.0058
6.0	0.2362	5,300	0.0053	5,300	0.0094	6,600	0.0095	5,300	0.0106	5,300	0.0048	5,300	0.0094	5,300	0.0071
8.0	0.3150	4,000	0.0071	4,000	0.0125	5,000	0.0126	4,000	0.0141	4,000	0.0063	4,000	0.0125	4,000	0.0094
10.0	0.3937	3,200	0.0089	3,200	0.0156	4,000	0.0157	3,200	0.0176	3,200	0.0079	3,200	0.0156	3,200	0.0117
12.0	0.4724	2,650	0.0107	2,650	0.0189	3,300	0.0191	2,650	0.0212	2,650	0.0095	2,650	0.0189	2,650	0.0141
14.0	0.5512	2,300	0.0123	2,300	0.0217	2,850	0.0221	2,300	0.0245	2,300	0.0110	2,300	0.0217	2,300	0.0163
16.0	0.6299	2,000	0.0142	2,000	0.0250	2,500	0.0252	2,000	0.0281	2,000	0.0126	2,000	0.0250	2,000	0.0187

Cutting conditions:

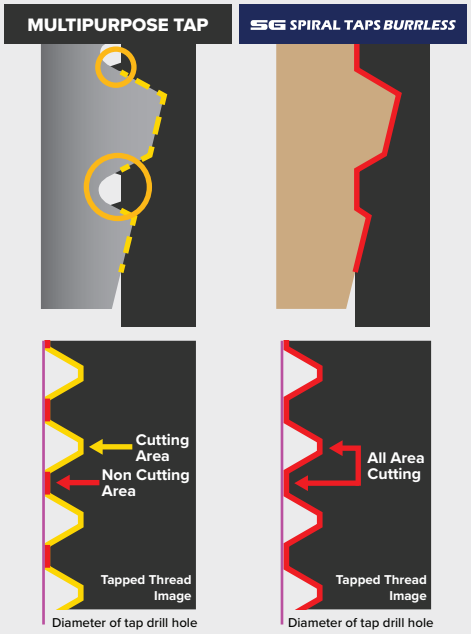
1. DLCRVDBL is for through hole drilling usage. Drill should exit the hole at least 0.6×DC.
2. Burrless drill will not perform in if the entrance or exit of hole is on an inclined surface. In that case, we recommend a flat drill.
3. Adjust cutting condition according to the situation, such as rigidity of machine, work clamp, and shape of workpiece.
4. Wet conditions are for drilling with water soluble cutting fluid.
5. A work material and cutting condition to chip removal may be worse. In that case, please step feed.
6. Retraction of the step feed is to be returned to the top of the hole.
7. Step feed is recommended to 0.5~1.0×DC. Small diameter less than 3mm is to 0.2 ~0.5×DC.
8. Please use the fixture to control the amplitude of the drill bit below 0.02mm, for small diameter, high-speed cutting control amplitude of the drill bit 0.01mm or less.
9. Magnesium alloys may catch fire, so be sure to use a special cutting fluid and manage chips.

SG SPIRAL TAPS BURRLESS

Engineered to deliver a burr-free finish.

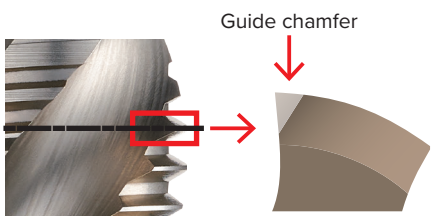
S-EDGE

The S-Edge is designed to leave no gap between the tap's thread root area and the pre-drilled hole to achieve a burr-free finish.

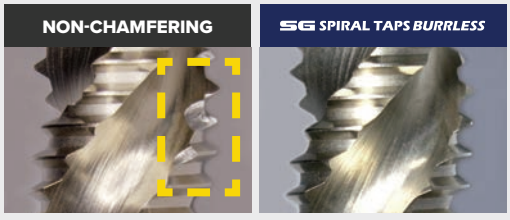


G-CHAMFER

The chamfered rake face releases the chips from the cutting edge, preventing chip jamming.

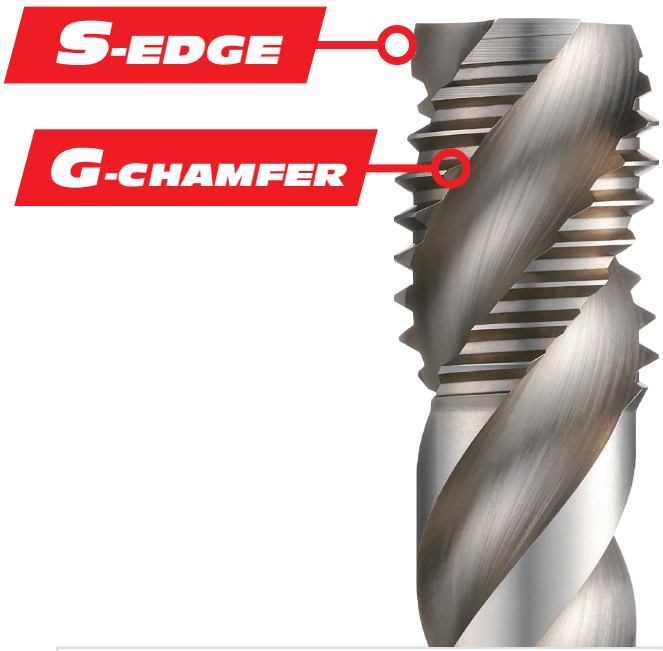


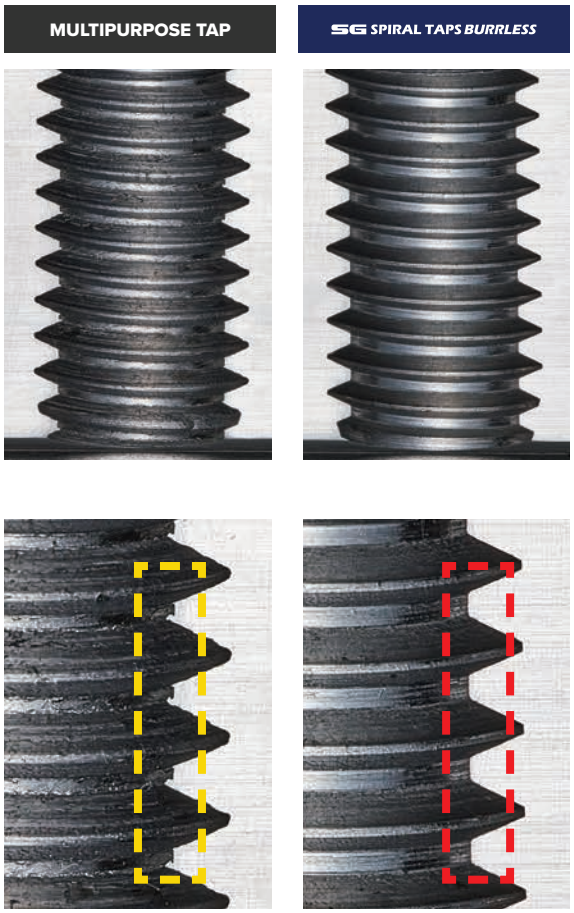
Chamfering the acute angles on the thread edge to prevent chipping



Chipping

No damage





Detailed view with burrs along threads

Detailed view of burr-free finish

PERFORMANCE

Achieve a burr-free finish on the minor diameter of internal thread profiles.

Size:
M6x1

Work Material:
S50C

Cutting Speed:
98 SFM

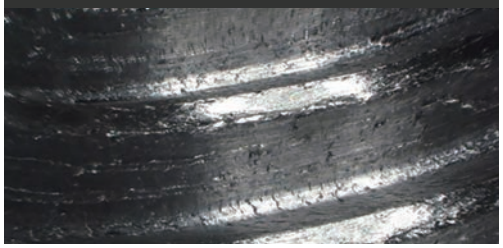
Diamter of Hole:
φ5.0

Effective Thread Length:
2D

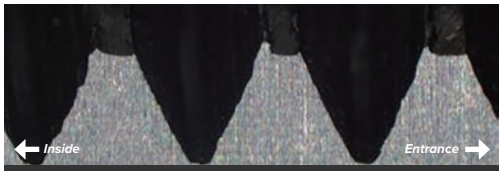
Cutting Fluid:
Water-soluble

Machine:
Vertical M/C (BT30)

MULTIPURPOSE DRILL



SG SPIRAL TAPS *BURRLESS*

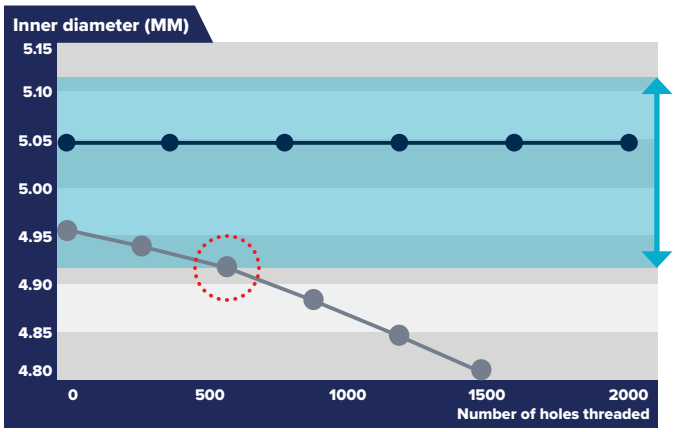


Burr height can be between 0.03 - 0.10mm

Zero burr

TOOL LIFE

Stabilized minor diameter accuracy and reduced chipping ensures a burr-free finish, even after extended use. This graph shows small chipping on the Burrless Tap at 1800 holes, compared to 1500 holes for the multipurpose tap.



SG Spiral Taps Burrless

Multipurpose Tap

Passing range of 6H

Large burrs occurred on minor diameter of thread caused by the internal diameter tolerance being out of tolerance.

MULTIPURPOSE DRILL

AQUA REVO *BURRLESS DRILLS*

Size:
M6x1

Cutting Speed:
98 SFM

Diameter of hole:
φ5

Work Material:
S50C

Effective Thread Length:
2D

Cutting Fluid:
Water-soluble

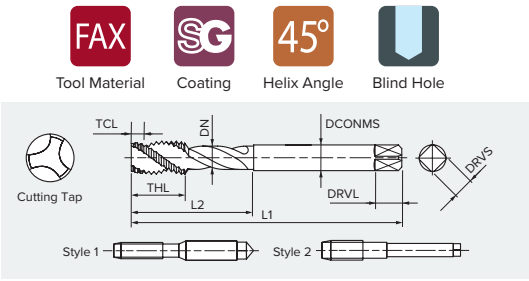
APPLICABLE WORK MATERIAL

	STRUCTURAL STEEL	LOW CARBON STEEL	MEDIUM CARBON STEEL	HIGH CARBON STEEL	ALLOY STEEL	STAINLESS STEEL	DUCTILE CAST IRON	ALUMINUM ALLOY	COPPER ALLOY
Blind Hole	○	○	●	●	○	○	○	○	○
Through Hole	○	○	●	●	○	○	○	○	○

● Excellent ○ Good

SGSPBL
SG SPIRAL TAPS *BURRLESS*

FOR BLIND HOLES



LIST 7966

Unit: mm

EDP#	Thread Size	Thread Limit	TCL(P)	No. of Flutes	OAL (L1)	Length of Thread (THL)	Under Neck Length (L2)	Shank Dia. (DCONMS)	Style
0799575	M3×0.5	D3 (P2)	2.5P	3F	46.0	3.5	18.0	4.0	1
0799581	M4×0.7	D4 (P3)	2.5P	3F	52.0	4.9	20.0	5.0	1
0799598	M5×0.8	D4 (P3)	2.5P	3F	60.0	5.6	22.0	5.5	1
0799603	M6×1	D5 (P3)	2.5P	3F	62.0	7.0	24.0	6.0	1
0799610	M6×0.75	D4 (P2)	2.5P	3F	62.0	7.0	24.0	6.0	1
0799626	M8×1.25	D5 (P3)	2.5P	3F	70.0	8.8	29.8	6.2	2
0799632	M8×1	D5 (P3)	2.5P	3F	70.0	8.8	29.8	6.2	2
0799649	M10×1.5	D6 (P3)	2.5P	3F	75.0	10.5	31.4	7.0	2
0799655	M10×1.25	D5 (P3)	2.5P	3F	75.0	10.5	31.4	7.0	2
0799661	M10×1	D5 (P3)	2.5P	3F	75.0	10.5	31.4	7.0	2
0799678	M12×1.75	D6 (P4)	2.5P	3F	82.0	12.3	36.2	8.5	2
0799684	M12×1.5	D5 (P3)	2.5P	3F	82.0	12.3	36.2	8.5	2
0799690	M12×1.25	D5 (P3)	2.5P	3F	82.0	12.3	36.2	8.5	2

Recommended Drill Diameter

Unit: mm

Thread Size	SG SPIRAL TAPS BURRLESS		JIS 6H	
	Drill Dia.	Intended Internal thread dia.	Min internal thread dia.	Max internal thread dia.
M3x0.5	2.5	2.55	2.459	2.599
M4x0.7	3.3	3.35	3.242	3.422
M5x0.8	4.2	4.25	4.134	4.334
M6x1	5.0	5.05	4.917	5.153
M6x0.75	5.25	5.30	5.188	5.378
M8x1.25	6.8	6.85	6.647	6.912
M8x1	7.0	7.05	6.917	7.153
M10x1.5	8.5	8.60	8.376	8.676
M10x1.25	8.8	8.85	8.647	8.912
M10x1	9.0	9.05	8.917	9.153
M12x1.75	10.2	10.30	10.106	10.441
M12x1.5	10.5	10.60	10.376	10.676
M12x1.25	10.8	10.85	10.647	10.912

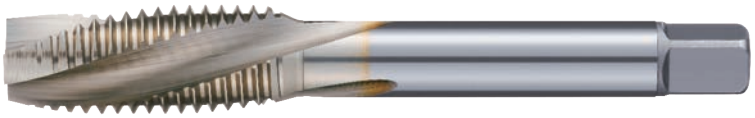
Shank Square end size

Unit: mm

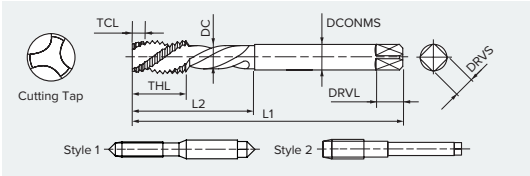
Shank Dia.	Square end	
DCONMS	DRVS	DRVL
4.0	3.2	6
5.0	4,0	7
5.5	4.5	7
6.0	4.5	7
6.2	5.0	8
7.0	5.5	8
8.5	6.5	9

SGSPBLL
SG SPIRAL TAPS *BURRLESS*

FOR THROUGH HOLES **LEFT HAND HELIX**



FAX Tool Material | SG Coating | Left Hand Helix 21° Helix Angle | Through Hole



LIST 7968

Unit: mm

EDP#	Thread Size	Thread Limit	TCL(P)	No. of Flutes	OAL (L1)	Length of Thread (THL)	Under Neck Length (L2)	Shank Dia. (DCONMS)	Style
0799793	M3×0.5	D3 (P3)	5P	3F	46.0	11.0	18.0	4.0	1
0799809	M4×0.7	D4 (P3)	5P	3F	52.0	13.0	21.0	5.0	1
0799815	M5×0.8	D4 (P3)	5P	3F	60.0	16.0	25.0	5.5	1
0799821	M6×1	D5 (P3)	5P	3F	62.0	19.0	30.0	6.0	1
0799838	M6×0.75	D4 (P3)	5P	3F	62.0	19.0	30.0	6.0	1
0799844	M8×1.25	D5 (P3)	5P	3F	70.0	22.0	-	6.2	2
0799850	M8×1	D5 (P3)	5P	3F	70.0	22.0	-	6.2	2
0799867	M10×1.5	D6 (P4)	5P	3F	75.0	24.0	-	7.0	2
0799873	M10×1.25	D5 (P3)	5P	3F	75.0	24.0	-	7.0	2
0799880	M10×1	D5 (P3)	5P	3F	75.0	24.0	-	7.0	2
0799896	M12×1.75	D6 (P4)	5P	3F	82.0	29.0	-	8.5	2
0799901	M12×1.5	D5 (P4)	5P	3F	82.0	29.0	-	8.5	2
0799918	M12×1.25	D5 (P4)	5P	3F	82.0	29.0	-	8.5	2

Standard Cutting Conditions

LIST 7966 SGSPBL - SG Spiral Taps Burrless
LIST 7968 SGSBLL - SG Spiral Taps Burrless Left Hand Helix

Work Material	Structural Steel	Low Carbon Steel	Medium Carbon Steel	High Carbon Steel	Alloy Steel		Stainless Steel	Ductile Cast Iron	Aluminum Alloy
	~200HB	~200HB	~200HB	~200HB	~200HB	20~30HRC			
SGSPBL	80~100	80~100	80~100	80~100	80~100	25~45	10~20	80~100	90~110
SGSPBLL	90~110	90~110	90~110	90~110	90~110	45~65	15~30	80~100	90~110
Cutting Fluids	High pressure non-water soluble / Water soluble								Water soluble

Cutting conditions:

- These are general cutting conditions, and may be altered by your conditions.
- These conditions are for thread depth of 2xDC.
- Recommend non water soluble cutting fluid for Stainless Steel.

L7966 & L7968 Notes:

- This tap cuts the internal diameter of the internal thread relative to the pilot hole diameter.
- Please use the recommended drill diameter for pilot hole drilling.
- Please note that if the pilot hole diameter is larger than the finished internal diameter of the internal thread, burrless performance will not be achieved.

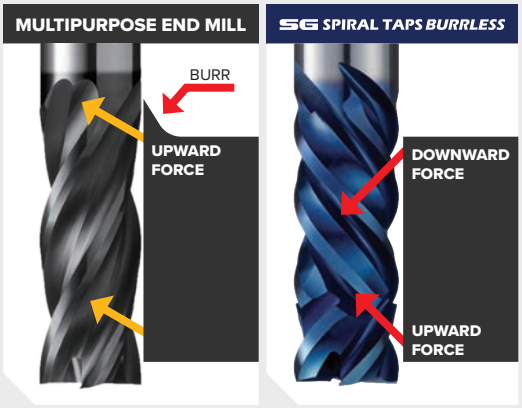
⚠ **WARNING:** Cancer risk from exposure to cobalt.
See www.P65Warnings.ca.gov.

AQUA REVO *MILLS BURRLESS*

Eliminates burrs with side-surface machining.

W-HELICAL

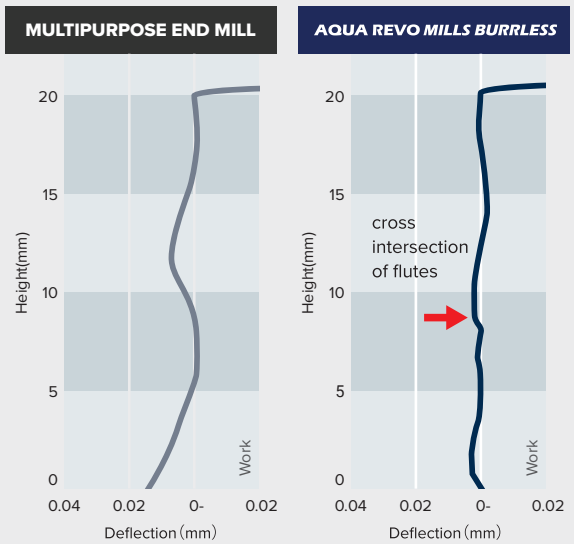
The double helix design incorporates cutting balance while eliminating burrs on the top and bottom surfaces of the workpiece.



The left-hand helix cuts the burr on the upper surface, while the right-hand helix eliminates burrs along the bottom surface.

C-CHAMFER

Connecting Chamfer reduces steps at the cross intersection of flutes.



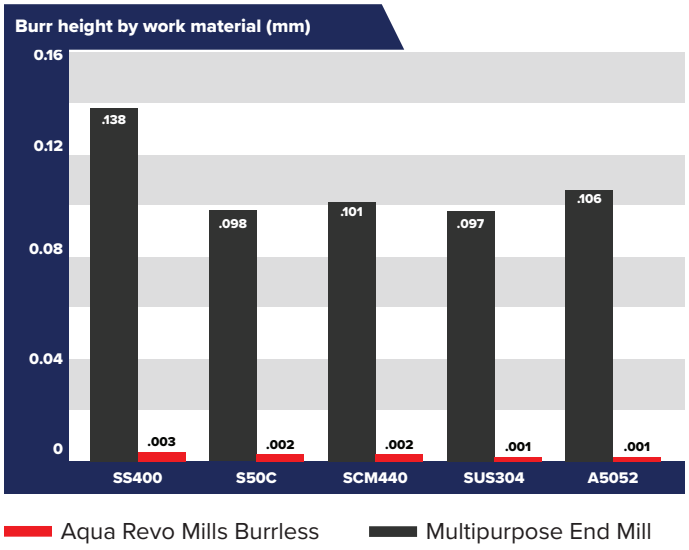
Size:	Cutting Method:	Feed Speed:	Machine:
φ10	Side milling	13.8 IPM	Vertical M/C
Work Material:	**Cutting Speed:**	**Depth of Cut:**	**Cutting Fluid:**
SUS304	262 SFM	ap20mm ae0.3mm	Water-soluble

Double helix design is engineered to eliminate burrs.

Patent pending

PERFORMANCE

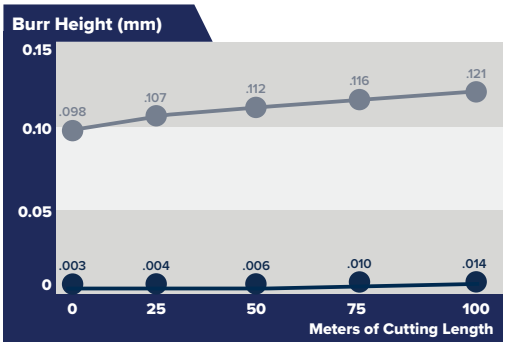
Achieves strong performance on a wide range of materials, including stainless steel and aluminum.

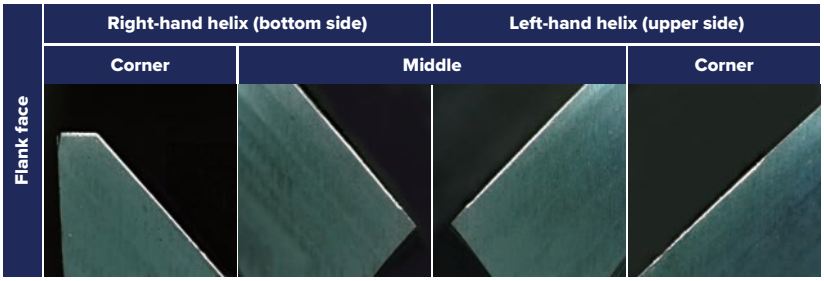


Work Material	Diameter (mm)	Cutting Speed (SFM)	Feed Speed (IPM)	Depth of Cut (mm)	Cutting Method	Cutting Fluid
SS400	φ10	394	33.1	ap20 (2.0DC) ae0.05 (0.005DC)	Side milling, down cut	Water-soluble
S50C	φ10	394	33.1	ap20 (2.0DC) ae0.05 (0.005DC)	Side milling, down cut	Water-soluble
SCM440	φ10	328	26.8	ap20 (2.0DC) ae0.05 (0.005DC)	Side milling, down cut	Water-soluble
SUS304	φ10	262	9.8	ap20 (2.0DC) ae0.05 (0.005DC)	Side milling, down cut	Water-soluble
A5052	φ10	328	35.8	ap20 (2.0DC) ae0.05 (0.005DC)	Side milling, down cut	Water-soluble

TOOL LIFE

This graph shows the burr height after 100 meters of cutting length.





Diameter: φ10
Cutting Speed: 394 SFM
Feed Speed: 33.1 IPM
Cutting Fluid: Water-soluble
Work Material: S50C
Depth of Cut: ap20mm, ae 0.05
Cutting Method: Side milling, down cut
Machine: Vertical M/C

APPLICABLE WORK MATERIAL

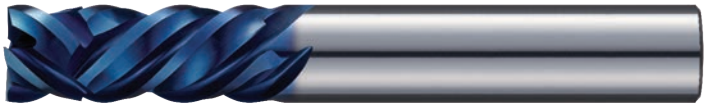
STRUCTURAL STEEL	CARBON STEEL	ALLOY STEEL	HEAD TREATED STEEL	MOLD STEEL	HARDENED STEEL			STAINLESS STEEL	TITANIUM ALLOY, HEAT RESISTANT ALLOY	CAST IRON	ALUMINUM ALLOY	COPPER ALLOY
					40-50 HRC	55-60 HRC	60-66 HRC					
●	●	●	●	●	●	○	-	●	○	●	○	○

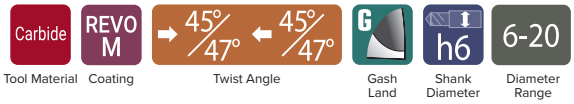
These are conditions under which performance can be demonstrated. Please see page 16.
Not recommended for slotting or plunging applications.

● Excellent ○ Good

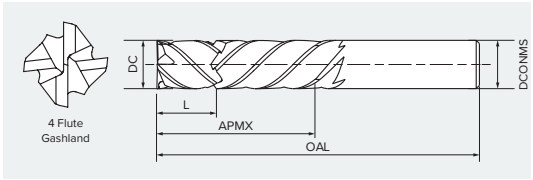
RVMBL4G-2.5D
AQUA REVO MILLS BURRLESS

GASH LAND | 2.5D G TYPE | 4 FLUTES





Tool Material | Coating | Twist Angle | Gash Land | Shank Diameter | Diameter Range



LIST 9722J

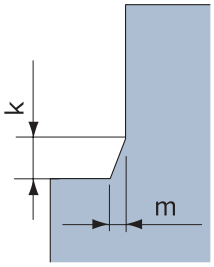
Unit: mm

EDP#	Cutting Diameter (DC)	Length of Cut (APMX)	Flute Intersection (L)	Overall Length (OAL)	Shank (DCONMS)
0799517	6.0	15	4.5	50	6
0799523	8.0	20	6.0	60	8
0799530	10.0	25	7.5	70	10
0799546	12.0	30	9.0	75	12
0799552	16.0	40	12.0	90	16
0799569	20.0	50	15.0	100	20

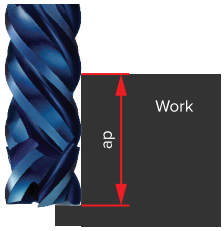
GUIDELINES OF REMAINING CORNER OF G TYPE (GASHLAND)

Unit: mm

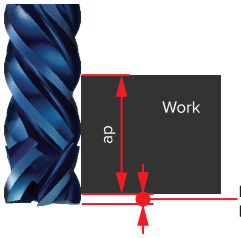
DC	k	m
6.0	0.2	0.03
10.0	0.3	0.04
20.0	0.4	0.05



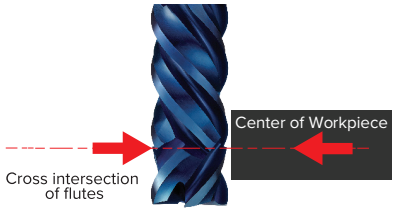
CUTTING DEPTH AP PARAMETER TABLE



Pattern 1



Pattern 2



Pattern 3

Dia.	Range of ap (mm)	Protrusion Length (mm)	Range of ap (mm)	Range of ap (mm)
	Min / Max		Min / Max	Min / Max
6.0	4.8 ~ 15.0	0.5	4.3 ~ 14.5	2.0 ~ 8.0
8.0	6.4 ~ 20.0	1	5.9 ~ 19.5	2.0 ~ 11.0
10.0	8.0 ~ 25.0	1	7.0 ~ 24.0	2.0 ~ 13.0
12.0	9.6 ~ 30.0	1	8.6 ~ 29.0	2.0 ~ 16.0
16.0	12.8 ~ 40.0	1	11.8 ~ 39.0	3.0 ~ 22.0
20.0	16.0 ~ 50.0	1	15.0 ~ 49.0	3.0 ~ 28.0

DC TOLERANCE

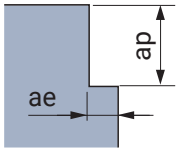
Unit: mm

DC		Tolerance
Above	Up to	
	12.0	0 - 0.02
12.0		0 - 0.03

Standard Cutting Conditions

LIST 9722J RVMBL4G-2.5D Aqua REVO Mills Burrless four flutes 2.5D G type

- Not recommended for slotting or plunging applications.
- If burrs from roughing remain, try slightly increasing the finishing depth to remove them.



Roughing

Work Material		Structural Steel, Carbon Steel, Cast Iron		Alloy Steel, Heat Treated Steel		Heat Treated Steel, Hardened Steel		Hardened Steel		Hardened Steel		Stainless Steel		Nickel Alloy, Titanium Alloy		Aluminum Alloy	
		150~250HB		25~35HRC		35~45HRC		45~55HRC		55~60HRC							
Cutting Speed (SFM)		290 - 400		290 - 330		195 - 265		225 - 250		225 - 250		225 - 265		125 - 200		325 - 335	
Diameter (mm)		RPM	Feed (IPT)	RPM	Feed (IPT)	RPM	Feed (IPT)	RPM	Feed (IPT)	RPM	Feed (IPT)	RPM	Feed (IPT)	RPM	Feed (IPT)	RPM	Feed (IPT)
6.0		6,370	0.0023	5,300	0.0020	4,240	0.0015	4,000	0.0013	4,000	0.0002	4,240	0.0008	3,180	0.0007	5,300	0.0024
8.0		4,800	0.0031	3,980	0.0027	3,180	0.0020	2,980	0.0018	2,980	0.0002	3,180	0.0011	2,390	0.0010	3,980	0.0032
10.0		3,820	0.0031	3,180	0.0030	2,550	0.0025	2,390	0.0019	2,390	0.0002	2,550	0.0014	1,910	0.0012	3,180	0.0040
12.0		3,180	0.0035	2,650	0.0031	2,120	0.0026	1,990	0.0019	1,990	0.0002	2,120	0.0016	1,320	0.0013	2,650	0.0048
16.0		1,790	0.0044	1,790	0.0033	1,190	0.0033	1,390	0.0025	1,390	0.0003	1,590	0.0019	800	0.0015	1,980	0.0065
20.0		1,430	0.0041	1,430	0.0032	960	0.0033	1,110	0.0025	1,110	0.0003	1,110	0.0020	630	0.0017	1,590	0.0080
Depth of Cut	ap	2.5 DC															
	ae	0.2 DC (MAX 1.0mm)						Up to φ6 0.03DC Over φ16 0.01DC		0.01DC		0.2DC (MAX 1.0mm)		0.02DC		0.1DC	

Finishing

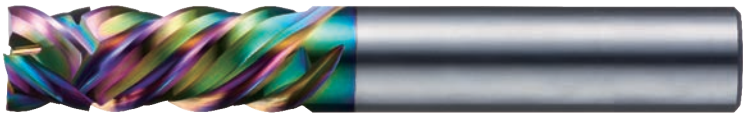
Cutting Speed (SFM)		290 - 400		290 - 330		195 - 265		225 - 250		225 - 250		225 - 265		125 - 200		325 - 335	
Diameter (mm)		RPM	Feed (IPT)	RPM	Feed (IPT)	RPM	Feed (IPT)	RPM	Feed (IPT)	RPM	Feed (IPT)	RPM	Feed (IPT)	RPM	Feed (IPT)	RPM	Feed (IPT)
6.0		6,370	0.0016	5,300	0.0014	4,240	0.0012	4,000	0.0012	4,000	0.0002	4,240	0.0006	3,180	0.0005	5,300	0.0017
8.0		4,800	0.0022	3,980	0.0019	3,180	0.0016	2,980	0.0016	2,980	0.0002	3,180	0.0008	2,390	0.0006	3,980	0.0023
10.0		3,820	0.0022	3,180	0.0021	2,550	0.0020	2,390	0.0017	2,390	0.0002	2,550	0.0010	1,910	0.0008	3,180	0.0028
12.0		3,180	0.0025	2,650	0.0022	2,120	0.0021	1,990	0.0017	1,990	0.0002	2,120	0.0012	1,320	0.0008	2,650	0.0034
16.0		1,790	0.0031	1,790	0.0023	1,190	0.0026	1,390	0.0023	1,390	0.0003	1,590	0.0013	800	0.0010	1,980	0.0045
20.0		1,430	0.0029	1,430	0.0023	960	0.0027	1,110	0.0023	1,110	0.0003	1,110	0.0014	630	0.0011	1,590	0.0056
Depth of Cut	ap	2.5DC															
	ae	0.005DC (MAX 0.05mm)															

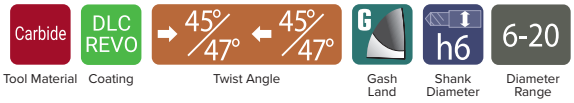
Cutting conditions:

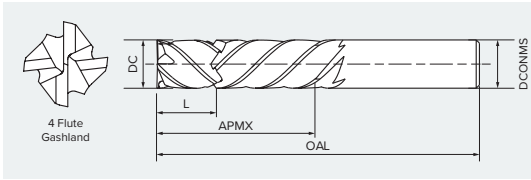
1. Use highly rigid machining center and holder.
2. Use an air blow for dry process.
3. When processing hardened steel (45 to 55HRC), use an air blow for dry process.
4. Use in wet condition in case of Stainless Steel, Nickel Alloy, Titanium Alloy.
5. When chattering occurs, reduce the rotation and feed rate, or reduce the depth of cut.

DLCRVMBL4G-2.5D
DLC-REVO MILLS BURRLESS

GASH LAND | **2.5D G TYPE** | **4 FLUTES**



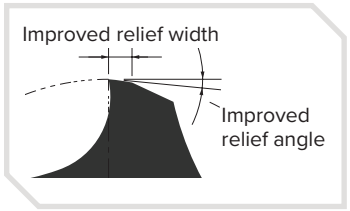




(A) Optimized Form Relief: Features a narrow relief width and shallow relief angle to enhance the cutting edge in Non-Ferrous metals while providing a burr-free finish.

Improved Vibration Control: The precise relief design minimizes vibrations during machining.

New DLC-REVO coating: Newly developed DLC-REVO coating helps to reduce welding.

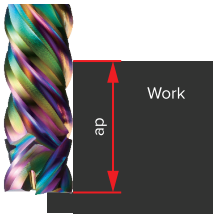


LIST 9728

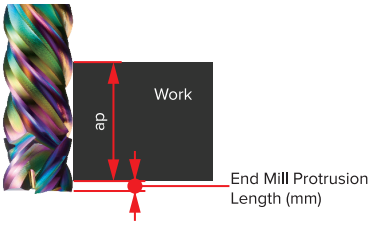
Unit: mm

EDP#	Cutting Diameter (DC)	Length of Cut (APMX)	Flute Intersection (L)	Overall Length (OAL)	Shank (DCONMS)
0802004	6.0	15.0	4.5	50.0	6.0
0802010	8.0	20.0	6.0	60.0	8.0
0802027	10.0	25.0	7.5	70.0	10.0
0802033	12.0	30.0	9.0	75.0	12.0
0802040	16.0	40.0	12.0	90.0	16.0
0802056	20.0	50.0	15.0	100.0	20.0

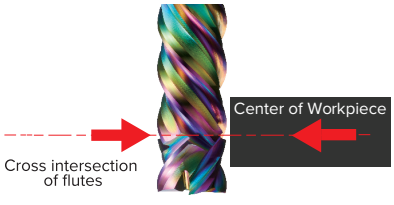
CUTTING DEPTH AP PARAMETER TABLE



Pattern 1



Pattern 2



Pattern 3

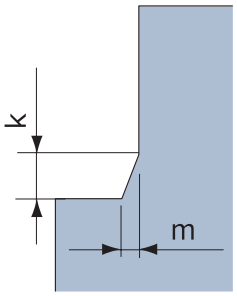
Dia.	Range of ap (mm)	Protrusion Length (mm)	Range of ap (mm)	Range of ap (mm)
	Min / Max		Min / Max	Min / Max
6.0	4.8 ~ 15.0	0.5	4.3 ~ 14.5	2.0 ~ 8.0
8.0	6.4 ~ 20.0	1	5.9 ~ 19.5	2.0 ~ 11.0
10.0	8.0 ~ 25.0	1	7.0 ~ 24.0	2.0 ~ 13.0
12.0	9.6 ~ 30.0	1	8.6 ~ 29.0	2.0 ~ 16.0
16.0	12.8 ~ 40.0	1	11.8 ~ 39.0	3.0 ~ 22.0
20.0	16.0 ~ 50.0	1	15.0 ~ 49.0	3.0 ~ 28.0

GUIDELINES

Guidelines of remaining corner of G type (Gashland)

Unit: mm

DC	k	m
6.0	0.2	0.03
10.0	0.3	0.04
20.0	0.4	0.05



DC TOLERANCE

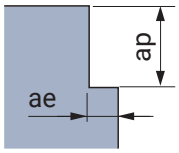
Unit: mm

DC		Tolerance
Above	Up to	
	12.0	0 - 0.02
12.0		0 - 0.03

Standard Cutting Conditions

LIST 9728 DLCRVMBL4G-2.5D DLC-REVO Mills Burrless four flutes 2.5D G type

- Not recommended for slotting or plunging applications.
- If burrs generated from roughing are not removed, slightly increase the finishing depth.



Roughing

Work Material		Aluminum		Aluminum Alloy (Si, Mg-Si)		Aluminum Alloy (Mg, Zn-Mg)		Aluminum Casting		Copper Alloy		Magnesium Alloy		Thermoplastic Resin	
		A1070		A430, A6061		A5052, A7075		AC, ADC		C1100		AZ91		PA, PVC	
Cutting Speed (SFM)		1280 - 1320		990		990		865 - 890		390 - 400		990		330	
Diameter		RPM	Feed (IPT)	RPM	Feed (IPT)	RPM	Feed (IPT)	RPM	Feed (IPT)	RPM	Feed (IPT)	RPM	Feed (IPT)	RPM	Feed (IPT)
6mm	0.2362	21,000	0.0023	16,000	0.0024	16,000	0.0024	14,000	0.0025	6,400	0.0018	16,000	0.0024	5,310	0.0027
8mm	0.3150	16,000	0.0031	12,000	0.0031	12,000	0.0031	10,700	0.0032	4,800	0.0024	12,000	0.0031	3,980	0.0036
10mm	0.3937	12,700	0.0039	9,600	0.0039	9,600	0.0039	8,600	0.0040	3,820	0.0030	9,600	0.0039	3,180	0.0045
12mm	0.4724	10,600	0.0043	8,000	0.0043	8,000	0.0043	7,200	0.0043	3,180	0.0033	8,000	0.0043	2,650	0.0050
16mm	0.6299	7,800	0.0050	6,000	0.0050	6,000	0.0050	5,400	0.0050	2,390	0.0039	6,000	0.0050	1,990	0.0057
20mm	0.7874	6,200	0.0056	4,800	0.0055	4,800	0.0055	4,300	0.0056	1,910	0.0044	4,800	0.0055	1,590	0.0064
Depth of Cut	ap	2.5 DC													
	ae	0.1 DC													

Finishing

Cutting Speed (SFM)		1280 - 1320		990		990		865 - 890		390 - 400		990		330	
Diameter		RPM	Feed (IPT)	RPM	Feed (IPT)	RPM	Feed (IPT)	RPM	Feed (IPT)	RPM	Feed (IPT)	RPM	Feed (IPT)	RPM	Feed (IPT)
6mm	0.2362	21,000	0.0017	16,000	0.0017	16,000	0.0017	14,000	0.0017	6,400	0.0013	16,000	0.0017	5,310	0.0019
8mm	0.3150	16,000	0.0022	12,000	0.0023	12,000	0.0023	10,700	0.0023	4,800	0.0017	12,000	0.0023	3,980	0.0025
10mm	0.3937	12,700	0.0028	9,600	0.0028	9,600	0.0028	8,600	0.0028	3,820	0.0021	9,600	0.0028	3,180	0.0032
12mm	0.4724	10,600	0.0030	8,000	0.0030	8,000	0.0030	7,200	0.0030	3,180	0.0023	8,000	0.0030	2,650	0.0035
16mm	0.6299	7,800	0.0035	6,000	0.0035	6,000	0.0035	5,400	0.0035	2,390	0.0028	6,000	0.0035	1,990	0.0040
20mm	0.7874	6,210	0.0039	4,800	0.0039	4,800	0.0039	4,300	0.0039	1,910	0.0031	4,800	0.0039	1,590	0.0045
Depth of Cut	ap	2.5DC													
	ae	0.01DC (MAX 0.1mm)													

Cutting conditions:

1. Not recommeded for slotting or plunging
2. Remove this point and sync consecutive numbers
3. If the burrs from the roughing cycle cannot be removed with standard finishing conditions, please increase finishing width of cut.
4. Use highly rigid machining center and holder.
5. Use an air blow for dry process.
6. When chattering occurs, reduce the rotation and feed rate, or reduce the depth of cut.
7. Magnesium alloys may catch fire, so be sure to use a special cutting fluid and manage chips.

AQUA REVO MILL
MICRO SERIES

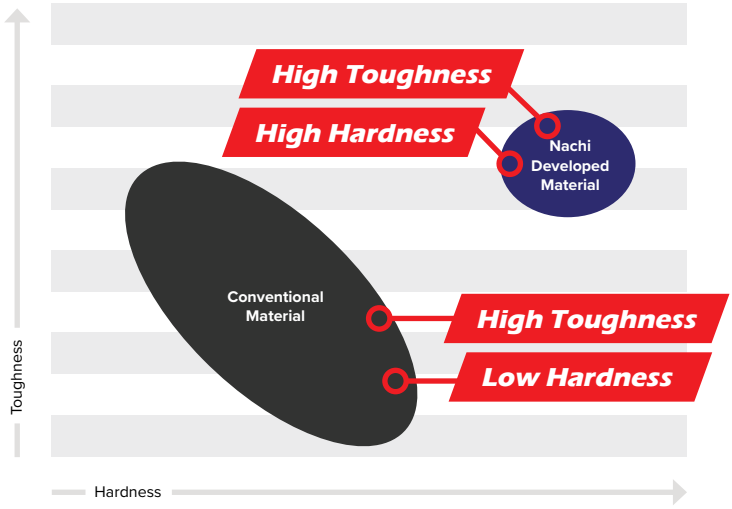
The Aqua REVO Mill Micro series delivers increased performance and durability, even in precision parts that require high detail and part quality

HIGHLIGHTS

- New Carbide Material
- New High-Performance Design
- REVO-M Coating For Increased Heat and Wear Resistance

MATERIAL

- Nachi developed carbide material is optimized for both hardness and toughness
- Improved alloy composition and grain size
- Excellent thermal shock resistance and strong wet processing



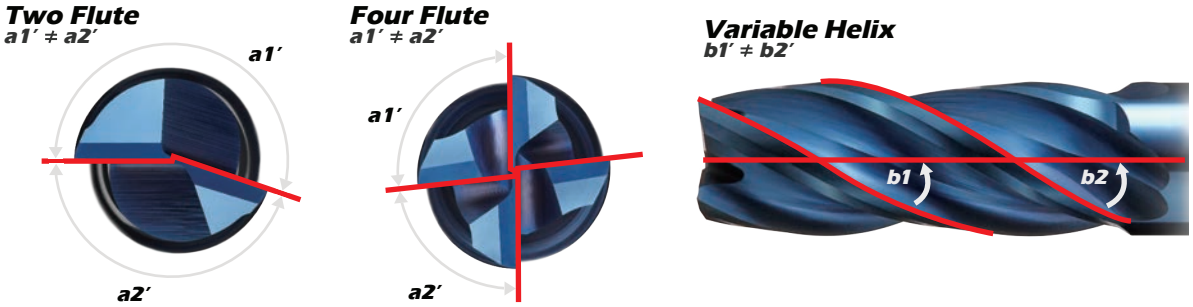
APPLICABLE WORK MATERIAL

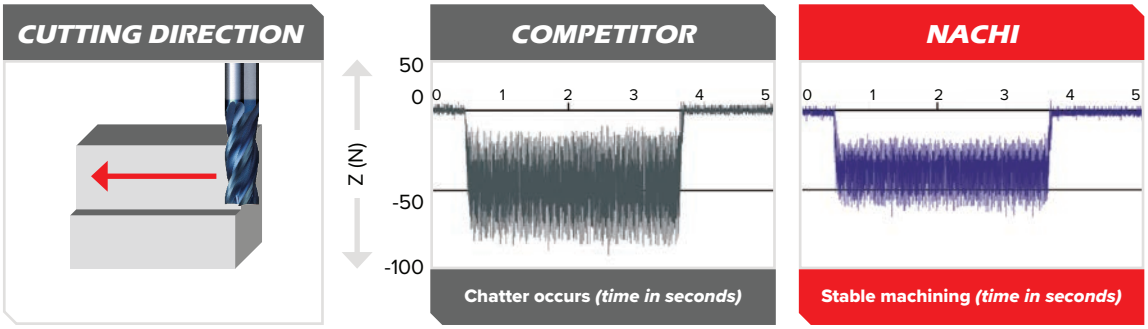
STRUCTURAL STEEL CARBON STEEL	ALLOY STEEL, HEAT TREATED STEEL 25-35 HRC	MOLD STEEL, HARDENED STEEL 35-45 HRC	STAINLESS STEEL	CAST IRON	ALUMINUM ALLOY, COPPER ALLOY	HIGH TEMP ALLOY, TITANIUM ALLOY	HARDENED STEEL 45-65 HRC
●	●	○	●	●	○	○	●

● Excellent ○ Good – Okay

CUTTING GEOMETRY

- Variable Pitch and Variable Helix Design to suppress chatter
- Extreme stability and high efficient machining





End Mill:
2.5D, 4-Flute, Gash land

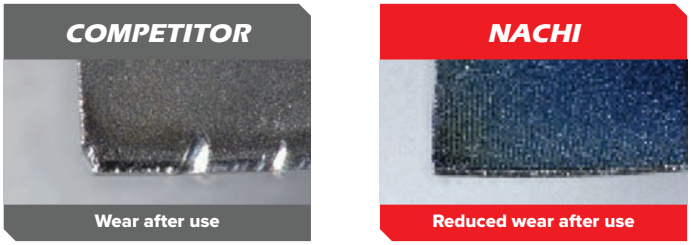
Work Material:
SUS 304

Cutting Fluid:
Water-soluble

Machine:
Vertical M/C

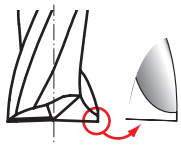
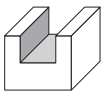
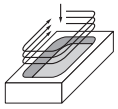
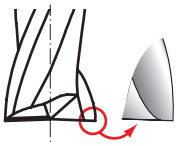
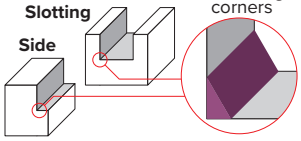
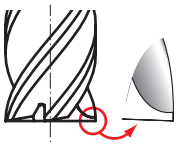
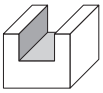
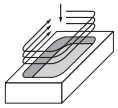
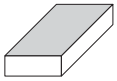
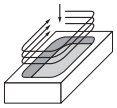
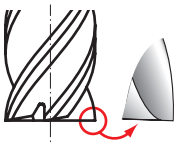
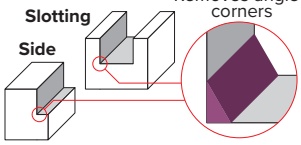
COATING

- New AlCrXN film provides high heat resistance (1,100 C) and excellent thermal shock resistance
- Wear resistance (HV3000) by optimized film formation conditions
- Super smooth surface treatment suppresses damage caused by chip adhesion, increasing overall wear resistance



RECOMMENDED MACHINING METHODS

Excellent Good

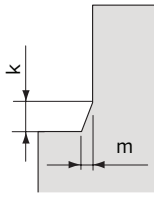
	Cutting Edge Shape	Length of Cut 1.5D	2.5D	4D
2-Flute	**G Type** *(Gash land)*			
		**Side** **Finishing** 	**Slotting** **Finishing** Roughing 	**Pocket Milling** **Finishing Roughing** 
	S Type *(Sharp Corner)*			
			**Finishing Corners** Slotting Side Removes angled corners 	
4-Flute	**G Type** *(Gash land)*			
		**Side** **Finishing**  **Slotting** **Finishing Roughing** 	**Pocket Milling** **Finishing Roughing**  **Facing** **Finishing** 	**Side** **Finishing Roughing**  **Pocket Milling** **Finishing Roughing** 
	S Type *(Sharp Corner)*			
			**Finishing Corners** Slotting Side Removes angled corners 	

Gash land

Guideline of remaining corner of Gash land type

Unit: mm

DC	k	m
1	0.05	0.005
3	0.1	0.015
6	0.2	0.03
10	0.3	0.04
20	0.4	0.05



DC Tolerance

Unit: mm

DC		Tolerance
Above	Up to	
	3	0 ~ -0.015
3	12	0 ~ -0.02
12		0 ~ -0.03

CUSTOMER
SUCCESS CASE

THE CHALLENGE

A customer machining sintered iron components on a vertical BT30 machine faced limited tool life using a competitor's carbide end mill.

At 308 SFM and 0.0012 IPR in slotting applications, their existing tooling only produced **300 finished parts** per tool before needing to be replaced. This short tool life caused machine downtime, raised tooling costs, and reduced overall productivity of the operator.

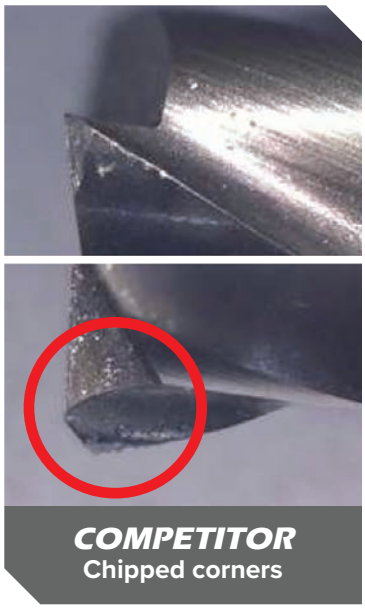
THE SOLUTION

By switching to a Nachi Aqua REVO Mill Micro Series with REVO-M coating, they were able to significantly extend tool performance without changing machining conditions or setup.

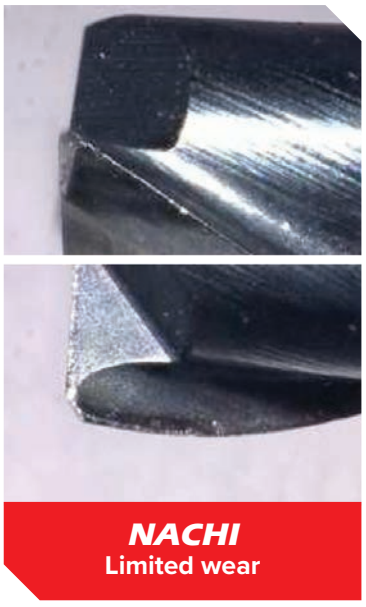
The tool life doubled to **600 finished parts** per tool, reducing tooling costs, while limiting machine downtime, and boosting operator productivity.

THE RESULT

	COMPETITOR	NACHI
MATERIAL:	Sintered Iron	
MACHINE:	Vertical M/C (BT30)	
TOOL SIZE:	1.5 2FL	1.5 2FL
SPEED:	308 SFM	
FEED:	0.0012 IPR	
CUT TYPE:	Slotting	
CUT DEPTH:	0.0093" by 4 pass	
PC'S PER TOOL:	300	600



COMPETITOR
Chipped corners

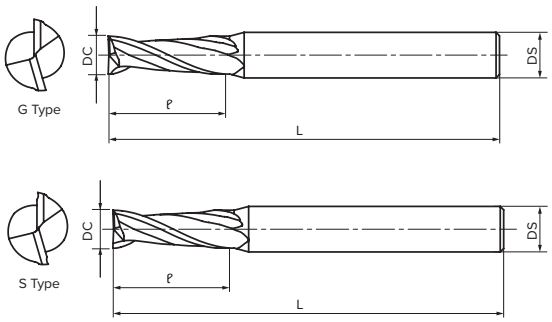


NACHI
Limited wear

AQUA REVO MILL MICRO SERIES

SERIES SPECIFICATIONS

Tool Material | Coating | Helix Angle | Shank Dia. Tolerance



RVM2G-1.5D

GASH LAND **1.5D** 2 Flute

L9760 - Metric Series

Unit: mm

EDP#	Size (DC)	Flute Length (ℓ)	OAL (L)	Shank Size (Ds)
1592157	1.0	1.5	40.0	4.0
1592163	1.5	2.3	40.0	4.0
1592170	2.0	3.0	40.0	4.0
1592186	2.5	3.8	40.0	4.0

LIST 9761 - Fractional Series

Unit: inch & mm

EDP#	Size (DC)	Flute Length (ℓ)	OAL (L)	Shank Size (Ds)
1592192	3/64	1.8	40.0	4.0
1592208	1/16	2.4	40.0	4.0
1592214	5/64	3.0	40.0	4.0
1592220	3/32	3.6	40.0	4.0

RVM2G-2.5D

GASH LAND **2.5D** 2 Flute

L9762 - Metric Series

Unit: mm

EDP#	Size (DC)	Flute Length (ℓ)	OAL (L)	Shank Size (Ds)
1592237	1.0	2.5	40.0	4.0
1592243	1.5	3.8	40.0	4.0
1592250	2.0	5.0	40.0	4.0
1592266	2.5	6.3	40.0	4.0

LIST 9763 - Fractional Series

Unit: inch & mm

EDP#	Size (DC)	Flute Length (ℓ)	OAL (L)	Shank Size (Ds)
1592272	3/64	3.0	40.0	4.0
1592289	1/16	4.0	40.0	4.0
1592295	5/64	5.0	40.0	4.0
1592300	3/32	6.0	40.0	4.0

RVM2S-2.5D

SHARP CORNER **2.5D** 2 Flute

L9764 - Metric Series

Unit: mm

EDP#	Size (DC)	Flute Length (ℓ)	OAL (L)	Shank Size (Ds)
1592317	1.0	2.5	40.0	4.0
1592323	1.5	3.8	40.0	4.0
1592330	2.0	5.0	40.0	4.0
1592346	2.5	6.3	40.0	4.0

LIST 9765 - Fractional Series

Unit: inch & mm

EDP#	Size (DC)	Flute Length (ℓ)	OAL (L)	Shank Size (Ds)
1592352	3/64	3.0	40.0	4.0
1592369	1/16	4.0	40.0	4.0
1592375	5/64	5.0	40.0	4.0
1592381	3/32	6.0	40.0	4.0

P	Steel	M	Stainless	K	Cast Iron	N	Aluminum	S	High Temp Alloys	H	Hardened Steel

L9760 / L9761 1.5D 2 Flute Side Milling Parameters

Work Material	Structural Steel, Carbon Steel / Cast Iron		Alloy Steel, Heat Treated Steel		Heat Treated Steel, Hardened Steel		Hardened Steel		Hardened Steel	Stainless Steel		Aluminum Alloy, Copper Alloy		Nickel Alloy, Titanium Alloy	
	150~250HB		25~35HRC		35~45HRC		45~55HRC		55~60HRC						
Size:	RPM	Feed (IPT)	RPM	Feed (IPT)	RPM	Feed (IPT)	RPM	Feed (IPT)		RPM	Feed (IPT)	RPM	Feed (IPT)	RPM	Feed (IPT)
1.0 mm	38,200	0.00056	31,850	0.00053	25,500	0.00037	19,000	0.00021	RVM4G-1.5D Please use series L9768 / L9769 (Four Flute, 1.5D G Type Gashland)	17,500	0.00018	31,700	0.00040	12,750	0.00009
3/64"	32,100	0.00067	26,750	0.00063	21,350	0.00044	15,900	0.00025		14,700	0.00021	26,600	0.00048	10,600	0.00011
1.5 mm	25,500	0.00083	21,200	0.00079	17,000	0.00056	13,250	0.00032		12,900	0.00034	21,100	0.00061	9,500	0.00016
1/16"	24,100	0.00089	20,000	0.00083	16,000	0.00059	12,500	0.00034		12,200	0.00035	19,900	0.00064	9,000	0.00016
5/64"	19,300	0.00110	16,000	0.00104	12,800	0.00074	10,400	0.00044		10,750	0.00049	15,950	0.00080	8,000	0.00022
2.0 mm	19,100	0.00110	15,900	0.00105	12,700	0.00074	10,400	0.00044		11,150	0.00049	15,850	0.00081	7,960	0.00022
3/32"	16,100	0.00133	13,350	0.00125	10,700	0.00088	8,750	0.00052		8,950	0.00059	13,300	0.00096	6,700	0.00026
2.5 mm	15,300	0.00138	12,750	0.00131	10,200	0.00093	8,300	0.00055		8,550	0.00062	12,650	0.00101	6,350	0.00028
(a_p)	1.5 x Tool Ø		1.5 x Tool Ø		1.5 x Tool Ø		1.5 x Tool Ø			1.5 x Tool Ø		1.5 x Tool Ø		1.5 x Tool Ø	
(a_e)	0.2 x Tool Ø		0.2 x Tool Ø		0.2 x Tool Ø		0.02 x Tool Ø			0.2 x Tool Ø		0.1 x Tool Ø		0.02 x Tool Ø	

L9760 / L9761 1.5D 2 Flute Slotting Parameters

1.0 mm	31,850	0.00033	25,500	0.00025	20,700	0.00024	7,500	0.00014	Not Recommended	12,740	0.00009	19,000	0.00016	6,370	0.00006
3/64"	26,700	0.00039	21,350	0.00030	17,350	0.00028	6,300	0.00017		10,670	0.00011	15,900	0.00019	5,350	0.00007
1.5 mm	21,200	0.00049	16,950	0.00038	13,750	0.00036	5,450	0.00022		9,540	0.00015	12,600	0.00023	4,800	0.00009
1/16"	20,000	0.00052	16,000	0.00041	13,000	0.00038	5,200	0.00024		9,000	0.00016	11,900	0.00025	4,500	0.00010
5/64"	16,000	0.00065	12,800	0.00051	10,350	0.00047	4,500	0.00031		8,000	0.00021	9,500	0.00031	4,000	0.00013
2.0 mm	15,900	0.00066	12,730	0.00051	10,350	0.00048	4,500	0.00031		7,960	0.00021	9,500	0.00031	3,980	0.00013
3/32"	13,350	0.00078	10,650	0.00061	8,700	0.00057	3,750	0.00037		6,700	0.00025	7,950	0.00037	3,300	0.00016
2.5 mm	12,700	0.00082	10,200	0.00064	8,250	0.00060	3,550	0.00039		6,350	0.00026	7,600	0.00039	3,150	0.00017
(a_p)	1 x Tool Ø		1 x Tool Ø		1 x Tool Ø		0.2 x Tool Ø			0.5 x Tool Ø		1 x Tool Ø		0.2 x Tool Ø	

L9762 / L9763 / L9764 / L9765 2.5D 2 Flute Side Milling Parameters

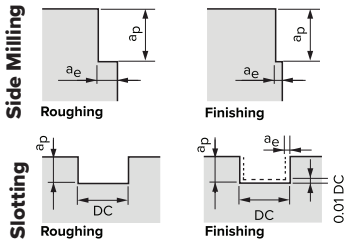
1.0 mm	38,200	0.00039	31,850	0.00033	25,500	0.00025	17,500	0.00015	RVM4G-2.5D Please use series L9772 / L9773 (Four Flute, 2.5D G Type Gashland)	17,500	0.00008	31,700	0.00040	12,750	0.00008
3/64"	32,100	0.00046	26,750	0.00040	21,350	0.00030	14,650	0.00017		14,700	0.00009	26,600	0.00048	10,600	0.00009
1.5 mm	25,500	0.00058	21,200	0.00050	17,000	0.00037	12,150	0.00023		12,900	0.00017	21,100	0.00061	9,500	0.00013
1/16"	24,100	0.00061	20,000	0.00053	16,000	0.00039	11,500	0.00024		12,200	0.00018	19,900	0.00064	9,000	0.00014
5/64"	19,300	0.00076	16,000	0.00066	12,800	0.00049	9,550	0.00031		10,750	0.00027	15,950	0.00080	8,000	0.00020
2.0 mm	19,100	0.00077	15,900	0.00067	12,700	0.00050	9,550	0.00031		11,150	0.00026	15,850	0.00081	7,960	0.00020
3/32"	16,100	0.00092	13,350	0.00080	10,700	0.00059	8,000	0.00037		8,950	0.00033	13,300	0.00096	6,700	0.00024
2.5 mm	15,300	0.00096	12,750	0.00083	10,200	0.00062	7,600	0.00039		8,550	0.00035	12,650	0.00101	6,350	0.00025
Roughing (a_p)	2 x Tool Ø		2 x Tool Ø		2 x Tool Ø		2 x Tool Ø			2 x Tool Ø		2 x Tool Ø		2 x Tool Ø	
Roughing (a_e)	0.1 x Tool Ø		0.1 x Tool Ø		0.1 x Tool Ø		0.02 x Tool Ø			0.1 x Tool Ø		0.1 x Tool Ø		0.02 x Tool Ø	
Finishing (a_p)	2 x Tool Ø		2 x Tool Ø		2 x Tool Ø		2 x Tool Ø			2 x Tool Ø		2 x Tool Ø		2 x Tool Ø	
Finishing (a_e)	0.05 x Tool Ø		0.05 x Tool Ø		0.05 x Tool Ø		0.01 x Tool Ø			0.05 x Tool Ø		0.1 x Tool Ø		0.01 x Tool Ø	

L9762 / L9763 / L9764 / L9765 2.5D 2 Flute Slotting Parameters

1.0 mm	31,850	0.00033	25,500	0.00025	20,700	0.00024	7,500	0.00014	Not Recommended	12,740	0.00009	19,000	0.00016	6,370	0.00006
3/64"	26,700	0.00039	21,350	0.00030	17,350	0.00028	6,300	0.00017		10,670	0.00011	15,900	0.00019	5,350	0.00007
1.5 mm	21,200	0.00049	16,950	0.00038	13,750	0.00036	5,450	0.00023		9,540	0.00015	12,600	0.00023	4,800	0.00009
1/16"	20,000	0.00052	16,000	0.00041	13,000	0.00038	5,200	0.00024		9,000	0.00016	11,900	0.00025	4,500	0.00010
5/64"	16,000	0.00065	12,800	0.00051	10,350	0.00048	4,500	0.00031		8,000	0.00021	9,500	0.00031	4,000	0.00013
2.0 mm	15,900	0.00066	12,730	0.00051	10,350	0.00048	4,500	0.00031		7,960	0.00021	9,500	0.00031	3,980	0.00013
3/32"	13,350	0.00078	10,650	0.00061	8,700	0.00057	3,750	0.00037		6,700	0.00025	7,950	0.00037	3,300	0.00016
2.5 mm	12,700	0.00082	10,200	0.00064	8,250	0.00060	3,550	0.00039		6,350	0.00026	7,600	0.00039	3,150	0.00017
Roughing (a_p)	1 x Tool Ø		1 x Tool Ø		1 x Tool Ø		0.2 x Tool Ø			0.5 x Tool Ø		1 x Tool Ø		0.2 x Tool Ø	
Finishing (a_p)	1.5 x Tool Ø		1.5 x Tool Ø		1.5 x Tool Ø		1.5 x Tool Ø			1.5 x Tool Ø		1.5 x Tool Ø		1.5 x Tool Ø	
Finishing (a_e)	0.02 x Tool Ø		0.02 x Tool Ø		0.02 x Tool Ø		0.02 x Tool Ø			0.02 x Tool Ø		0.02 x Tool Ø		0.02 x Tool Ø	

Standard Cutting Conditions

1. Use highly rigid machining center and holder.
2. For dry machining, use air blow only.
3. When processing hardened steel (45 to 55 HRC), use an air blow for dry process.
4. 2-Flute is not recommended for processing hardened steel (55 to 60 HRC).
5. For 55 to 60 HRC, use RVM4G-1.5D (Four Flutes G type Gash land).
6. Use in wet condition in case of Stainless, Nickel Alloy, Titanium Alloy.
7. When chattering occurs, reduce the rotation and feed rate, or reduce the depth of cut.



AQUA REVO MILL MICRO SERIES

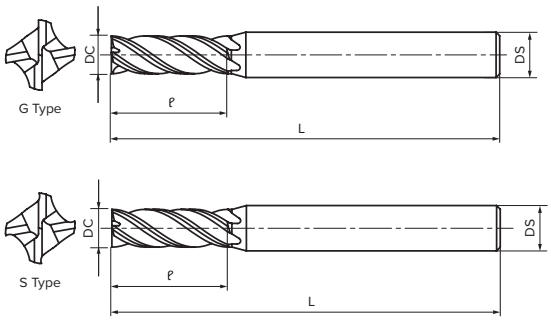
SERIES SPECIFICATIONS

CARBIDE — Tool Material

REVO M — Coating

30° / 35° — Helix Angle

H6 — Shank Dia. Tolerance



RVM4G-1.5D

GASH LAND | 1.5D | 4 Flute

L9768 - Metric Series

Unit: mm

EDP#	Size (DC)	Flute Length (ℓ)	OAL (L)	Shank Size (Ds)
1592398	1.0	1.5	40.0	4.0
1592403	1.5	2.3	40.0	4.0
1592410	2.0	3.0	40.0	4.0
1592426	2.5	3.8	40.0	4.0

LIST 9769 - Fractional Series

Unit: inch & mm

EDP#	Size (DC)	Flute Length (ℓ)	OAL (L)	Shank Size (Ds)
1592432	3/64	1.8	40.0	4.0
1592449	1/16	2.4	40.0	4.0
1592455	5/64	3.0	40.0	4.0
1592461	3/32	3.6	40.0	4.0

RVM4G-2.5D

GASH LAND | 2.5D | 4 Flute

L9770 - Metric Series

Unit: mm

EDP#	Size (DC)	Flute Length (ℓ)	OAL (L)	Shank Size (Ds)
1592478	1.0	2.5	40.0	4.0
1592484	1.5	3.8	40.0	4.0
1592490	2.0	5.0	40.0	4.0
1592506	2.5	6.3	40.0	4.0

LIST 9771 - Fractional Series

Unit: inch & mm

EDP#	Size (DC)	Flute Length (ℓ)	OAL (L)	Shank Size (Ds)
1592512	3/64	3.0	40.0	4.0
1592529	1/16	4.0	40.0	4.0
1592535	5/64	5.0	40.0	4.0
1592541	3/32	6.0	40.0	4.0

RVM4G-2.5D

SHARP CORNER | 2.5D | 4 Flute

L9772 - Metric Series

Unit: mm

EDP#	Size (DC)	Flute Length (ℓ)	OAL (L)	Shank Size (Ds)
1592558	1.0	2.5	40.0	4.0
1592564	1.5	3.8	40.0	4.0
1592570	2.0	5.0	40.0	4.0
1592587	2.5	6.3	40.0	4.0

LIST 9773 - Fractional Series

Unit: inch & mm

EDP#	Size (DC)	Flute Length (ℓ)	OAL (L)	Shank Size (Ds)
1592593	3/64	3.0	40.0	4.0
1592609	1/16	4.0	40.0	4.0
1592615	5/64	5.0	40.0	4.0
1592621	3/32	6.0	40.0	4.0

P	Steel	M	Stainless	K	Cast Iron	N	Aluminum	S	High Temp Alloys	H	Hardened Steel

L9768 / L9769 — 1.5D — 4 Flute — Side Milling Parameters

Work Material	Structural Steel, Carbon Steel / Cast Iron		Alloy Steel, Heat Treated Steel		Heat Treated Steel, Hardened Steel		Hardened Steel		Hardened Steel		Stainless Steel		Aluminum Alloy, Copper Alloy		Nickel Alloy, Titanium Alloy	
	150~250HB		25~35HRC		35~45HRC		45~55HRC		55~60HRC							
Size:	RPM	Feed (IPT)	RPM	Feed (IPT)	RPM	Feed (IPT)	RPM	Feed (IPT)	RPM	Feed (IPT)	RPM	Feed (IPT)	RPM	Feed (IPT)	RPM	Feed (IPT)
1.0 mm	38,200	0.00056	31,850	0.00049	25,500	0.00042	19,000	0.00026	17,500	0.00003	20,000	0.00022	31,700	0.00040	12,750	0.00009
3/64"	32,100	0.00067	26,750	0.00059	21,350	0.00051	15,900	0.00031	14,650	0.00003	16,800	0.00026	26,600	0.00048	10,600	0.00011
1.5 mm	25,500	0.00083	21,200	0.00074	17,000	0.00064	13,250	0.00041	12,200	0.00004	14,100	0.00033	21,100	0.00061	9,500	0.00016
1/16"	24,100	0.00089	20,000	0.00079	16,000	0.00068	12,500	0.00043	11,500	0.00004	13,300	0.00035	19,900	0.00064	9,000	0.00016
5/64"	19,300	0.00110	16,000	0.00098	12,800	0.00085	10,400	0.00057	9,550	0.00005	11,250	0.00044	15,950	0.00080	8,000	0.00022
2.0 mm	19,100	0.00110	15,900	0.00099	12,700	0.00085	10,400	0.00057	9,550	0.00005	11,150	0.00044	15,850	0.00081	7,960	0.00022
3/32"	16,100	0.00133	13,350	0.00118	10,700	0.00101	8,750	0.00067	8,000	0.00006	9,400	0.00052	13,300	0.00096	6,700	0.00026
2.5 mm	15,300	0.00138	12,750	0.00124	10,200	0.00106	8,300	0.00071	7,600	0.00006	8,900	0.00055	12,650	0.00101	6,350	0.00028
(a_p)	1.5 x Tool Ø		1.5 x Tool Ø		1.5 x Tool Ø		1.5 x Tool Ø		1.5 x Tool Ø		1.5 x Tool Ø		1.5 x Tool Ø		1.5 x Tool Ø	
(a_e)	0.2 x Tool Ø		0.2 x Tool Ø		0.2 x Tool Ø		0.03 x Tool Ø		0.01 x Tool Ø		0.2 x Tool Ø		0.1 x Tool Ø		0.02 x Tool Ø	

L9768 / L9769 — 1.5D — 4 Flute — Slotting Parameters

1.0 mm	31,850	0.00033	25,500	0.00025	20,700	0.00024	7,500	0.00014			12,740	0.00009	25,500	0.00015	6,370	0.00005
3/64"	26,700	0.00039	21,350	0.00030	17,350	0.00028	6,300	0.00017			10,670	0.00011	21,250	0.00019	5,350	0.00006
1.5 mm	21,200	0.00049	16,950	0.00038	13,750	0.00036	5,450	0.00022			9,540	0.00015	16,850	0.00023	4,800	0.00008
1/16"	20,000	0.00052	16,000	0.00041	13,000	0.00038	5,200	0.00024			9,000	0.00016	15,950	0.00025	4,500	0.00009
5/64"	16,000	0.00065	12,800	0.00051	10,350	0.00047	4,500	0.00031	Not Recommended		8,000	0.00021	12,750	0.00031	4,000	0.00012
2.0 mm	15,900	0.00066	12,730	0.00051	10,350	0.00048	4,500	0.00031			7,960	0.00021	12,700	0.00031	3,980	0.00012
3/32"	13,350	0.00078	10,650	0.00061	8,700	0.00057	3,750	0.00037			6,700	0.00026	10,650	0.00037	3,300	0.00015
2.5 mm	12,700	0.00082	10,200	0.00064	8,250	0.00060	3,550	0.00039			6,350	0.00028	10,150	0.00039	3,150	0.00016
(a_p)	1 x Tool Ø		1 x Tool Ø		1 x Tool Ø		0.2 x Tool Ø				0.5 x Tool Ø		1 x Tool Ø		0.2 x Tool Ø	

L9770 / L9771 / L9772 / L9773 — 2.5D — 4 Flute — Side Milling Parameters

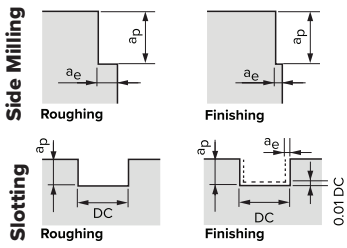
1.0 mm	38,200	0.00038	31,850	0.00033	25,500	0.00025	17,500	0.00019	17,500	0.00003	17,500	0.00005	31,700	0.00040	12,750	0.00008
3/64"	32,100	0.00045	26,750	0.00039	21,350	0.00030	14,650	0.00023	14,650	0.00004	14,700	0.00006	26,600	0.00048	10,600	0.00010
1.5 mm	25,500	0.00057	21,200	0.00050	17,000	0.00038	12,200	0.00029	12,200	0.00005	12,900	0.00008	21,100	0.00060	9,500	0.00012
1/16"	24,100	0.00060	20,000	0.00052	16,000	0.00040	11,500	0.00030	11,500	0.00005	12,200	0.00008	19,900	0.00064	9,000	0.00013
5/64"	19,300	0.00075	16,000	0.00065	12,800	0.00050	9,550	0.00038	9,550	0.00006	10,750	0.00010	15,950	0.00079	8,000	0.00016
2.0 mm	19,100	0.00077	15,900	0.00066	12,700	0.00050	9,550	0.00038	9,550	0.00006	11,150	0.00010	15,850	0.00080	7,960	0.00016
3/32"	16,100	0.00090	13,350	0.00079	10,700	0.00060	8,000	0.00045	8,000	0.00007	8,950	0.00012	13,300	0.00095	6,700	0.00019
2.5 mm	15,300	0.00095	12,750	0.00083	10,200	0.00063	7,600	0.00048	7,600	0.00008	8,550	0.00013	12,650	0.00100	6,350	0.00020
Roughing (a_p)	2 x Tool Ø		2 x Tool Ø		2 x Tool Ø		2 x Tool Ø		1.5 x Tool Ø		2 x Tool Ø		1.5 x Tool Ø		2 x Tool Ø	
Roughing (a_e)	0.2 x Tool Ø		0.2 x Tool Ø		0.2 x Tool Ø		0.03 x Tool Ø		0.01 x Tool Ø		0.2 x Tool Ø		0.1 x Tool Ø		0.02 x Tool Ø	
Finishing (a_p)	2 x Tool Ø		2 x Tool Ø		2 x Tool Ø		2 x Tool Ø		Not Recommended		2 x Tool Ø		1.5 x Tool Ø		2 x Tool Ø	
Finishing (a_e)	0.05 x Tool Ø		0.05 x Tool Ø		0.05 x Tool Ø		0.01 x Tool Ø				0.05 x Tool Ø		0.1 x Tool Ø		0.01 x Tool Ø	

L9770 / L9771 / L9772 / L9773 — 2.5D — 4 Flute — Slotting Parameters

1.0 mm	31,850	0.00033	25,500	0.00025	20,700	0.00024	7,500	0.00014			12,740	0.00009	25,500	0.00015	6,370	0.00005
3/64"	26,700	0.00039	21,350	0.00030	17,350	0.00028	6,300	0.00017			10,670	0.00011	21,350	0.00018	5,350	0.00006
1.5 mm	21,200	0.00050	16,950	0.00038	13,750	0.00036	5,450	0.00022			9,540	0.00014	16,950	0.00023	4,800	0.00008
1/16"	20,000	0.00052	16,000	0.00040	13,000	0.00038	5,200	0.00023			9,000	0.00015	16,000	0.00024	4,500	0.00008
5/64"	16,000	0.00065	12,800	0.00050	10,350	0.00047	4,500	0.00029	Not Recommended		8,000	0.00018	12,800	0.00031	4,000	0.00011
2.0 mm	15,900	0.00066	12,730	0.00050	10,350	0.00048	4,500	0.00029			7,960	0.00019	12,730	0.00031	3,980	0.00012
3/32"	13,350	0.00079	10,650	0.00060	8,700	0.00057	3,750	0.00034			6,700	0.00022	10,650	0.00037	3,300	0.00014
2.5 mm	12,700	0.00083	10,200	0.00063	8,250	0.00060	3,550	0.00036			6,350	0.00023	10,200	0.00039	3,150	0.00015
Roughing (a_p)	1 x Tool Ø		1 x Tool Ø		1 x Tool Ø		0.2 x Tool Ø				0.5 x Tool Ø		1 x Tool Ø		0.2 x Tool Ø	
Finishing (a_p)	1.5 x Tool Ø		1.5 x Tool Ø		1.5 x Tool Ø		1.5 x Tool Ø				1.5 x Tool Ø		1.5 x Tool Ø		1.5 x Tool Ø	
Finishing (a_e)	0.02 x Tool Ø		0.02 x Tool Ø		0.02 x Tool Ø		0.02 x Tool Ø				0.02 x Tool Ø		0.02 x Tool Ø		0.02 x Tool Ø	

Standard Cutting Conditions

1. Use highly rigid machining center and holder.
2. For dry machining, use air blow only.
3. When processing hardened steel (45 to 60 HRC), use an air blow for dry process.
4. Use in wet condition in case of Stainless, Nickel Alloy, Titanium Alloy.
5. When chattering occurs, reduce the rotation and feed rate, or reduce the depth of cut.

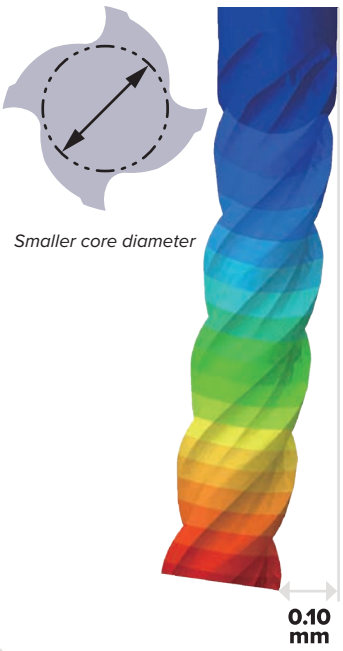


AQUA REVO MILL 4F4D
MICRO SERIES

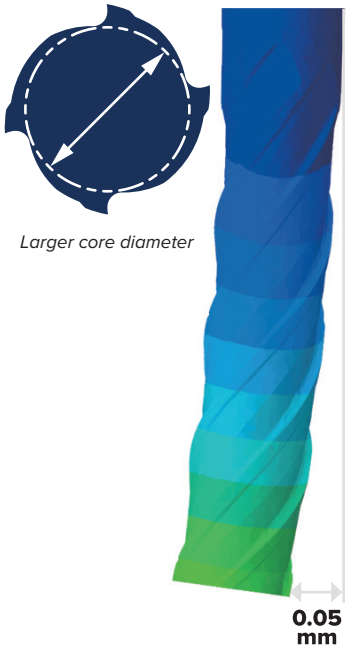
FLUTE DESIGN

Shallow flute depth increases the core diameter, enhancing rigidity and strength while reducing deflection.

COMPETITOR



NACHI

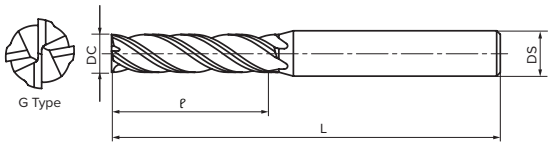


MATERIAL & COATING

- Nachi developed carbide material is optimized for both hardness and toughness.
- Excellent thermal shock resistance and strong wet processing.

SERIES SPECIFICATIONS

CARBIDE — Tool Material
REVO M — Coating
36.5°/39° — Helix Angle
H6 — Shank Dia. Tolerance



RVM4G-4D

GASH LAND **4D** 4 Flute

L9776 - Metric Series

Unit: mm

EDP#	Size (DC)	Flute Length (ℓ)	OAL (L)	Shank Size (Ds)
1592638	1.0	4.0	40.0	4.0
1592644	1.5	6.0	40.0	4.0
1592650	2.0	8.0	40.0	4.0
1592667	2.5	10.0	40.0	4.0

LIST 9777 - Fractional Series

Unit: inch & mm

EDP#	Size (DC)	Flute Length (ℓ)	OAL (L)	Shank Size (Ds)
1592673	3/64	4.8	40.0	4.0
1592680	1/16	6.4	40.0	4.0
1592696	5/64	8.0	40.0	4.0
1592701	3/32	9.6	40.0	4.0

P Steel | M Stainless | K Cast Iron | N Aluminum | S High Temp Alloys | H Hardened Steel

L9776 / L9777 4D 4 Flute Side Milling Parameters

Work Material		Structural Steel, Carbon Steel / Cast Iron		Alloy Steel, Heat Treated Steel		Heat Treated Steel, Hardened Steel		Hardened Steel		Hardened Steel		Stainless Steel		Aluminum Alloy, Copper Alloy		Nickel Alloy, Titanium Alloy	
		150~250HB		25~35HRC		35~45HRC		45~55HRC		55~60HRC							
Size:		RPM	Feed (IPT)	RPM	Feed (IPT)	RPM	Feed (IPT)	RPM	Feed (IPT)	RPM	Feed (IPT)	RPM	Feed (IPT)	RPM	Feed (IPT)	RPM	Feed (IPT)
1.0 mm		25,500	0.00015	22,300	0.00008	19,100	0.00004	12,730	0.00009	12,730	0.00003	19,100	0.00006	31,700	0.00040	12,700	0.00005
3/64"		21,450	0.00018	18,750	0.00009	16,050	0.00005	10,700	0.00010	10,700	0.00003	16,050	0.00007	26,650	0.00048	10,650	0.00006
1.5 mm		19,100	0.00023	16,800	0.00012	14,850	0.00006	9,050	0.00014	9,050	0.00005	14,850	0.00010	21,150	0.00060	8,500	0.00007
1/16"		18,050	0.00025	15,850	0.00013	14,050	0.00006	8,550	0.00014	8,550	0.00005	14,050	0.00010	20,000	0.00064	8,000	0.00007
5/64"		16,050	0.00031	14,400	0.00016	12,800	0.00008	7,200	0.00019	7,200	0.00007	12,800	0.00014	16,000	0.00080	6,400	0.00009
2.0 mm		15,900	0.00031	14,300	0.00016	12,730	0.00008	7,160	0.00019	7,160	0.00007	12,730	0.00014	15,900	0.00080	6,370	0.00009
3/32"		13,350	0.00037	12,000	0.00019	10,700	0.00009	6,000	0.00023	6,000	0.00008	10,700	0.00017	13,300	0.00096	5,350	0.00011
2.5 mm		12,700	0.00039	11,500	0.00020	10,200	0.00010	5,750	0.00024	5,750	0.00009	10,200	0.00017	12,700	0.00101	5,050	0.00012
Roughing	(a_p)	4 x Tool Ø		4 x Tool Ø		4 x Tool Ø		4 x Tool Ø		4 x Tool Ø		4 x Tool Ø		4 x Tool Ø		4 x Tool Ø	
	(a_e)	0.1 x Tool Ø		0.1 x Tool Ø		0.1 x Tool Ø		0.02 x Tool Ø		0.02 x Tool Ø		0.1 x Tool Ø		0.1 x Tool Ø		Not Recommended	
Finishing	(a_p)	4 x Tool Ø		4 x Tool Ø		4 x Tool Ø		4 x Tool Ø		4 x Tool Ø		4 x Tool Ø		4 x Tool Ø		4 x Tool Ø	
	(a_e)	0.03 x Tool Ø		0.03 x Tool Ø		0.03 x Tool Ø		0.01 x Tool Ø		0.01 x Tool Ø		0.02 x Tool Ø		0.05 x Tool Ø		0.01 x Tool Ø	

Standard Cutting Conditions

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2. For dry machining, use air blow only.
3. When processing hardened steel (45 to 60 HRC), use an air blow for dry process.
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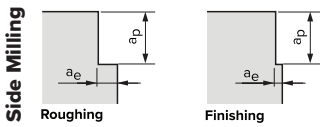

WARNING: Cancer risk from exposure to cobalt. See www.P65Warnings.ca.gov.

NACHI

CUTTING TOOLS

DRILLS END MILLS TAPS

Contributing to Progress in the World of Product Manufacturing

NACHI Cutting Tools

NACHI-FUJIKOSHI CORP. is a pioneer of precision cutting tools in Japan and one of the leading manufacturers of tools worldwide. No manufacturer of cutting tools anywhere in the world, exercises greater control over the quality of its products than NACHI. NACHI quality starts with the material itself because the High Speed Steel, premium Cobalt High Speed Steel, Powder High Speed Steel, and Cermet we use comes from our own mills. The technology of the coating, such as Mixed Component multi-layer coating and Diamond coating (thin film diamond) has been developed specifically for our cutting tools.

Cutting tools are basic products for the machine industries. Successful performance of machine tools cannot be expected without precise cutting tools and high quality. NACHI pursues the highest quality 100% of the time. NACHI is the first Japanese cutting tool manufacturer to be awarded the prestigious honor of the Deming Award for Quality.

NACHI AMERICA'S CUTTING TOOL DIVISION produces drills, endmills and taps designed to meet and exceed the exacting requirements of the industry's highest-precision machine tools. NACHI has long been a leader not only in tool design but in coatings that add durability and extend cutting life. Our tools are built to perform with precision and provide our customers with efficient, cost-effective solutions.

Ph: 888-340-8665
Fax: 888-383-8665
ml-nai.toolsengineer@nachi.com
NachiAmerica.com

For additional Cutting Tool Options visit our parent company site:
Nachi-Fujikoshi.co.jp

North America Headquarters - Greenwood, Indiana

We have a history of ninety years as a world-famous integrated manufacturer, with the renowned brand "NACHI". With the continuous production system, from high class special steels to finished products, our well-coordinated techniques stand high in public estimation.

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Sales Office & Warehouse, Cerritos, California

Sales Office & Warehouse, Queretaro, Mexico

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Greenwood Facilities Technical Center & Regrind Services

Nachi America has a testing center devoted to R&D of new and existing product, as well as providing test cuts for customer applications. As your cutting tool provider, Nachi America is dedicated to providing the best data and solution to your manufacturing process. Nachi America's facility in Greenwood, IN has the capacity to regrind tools. Contact your local sales representative for more information or contact a tools engineer through Technical Support.

Common Formulas

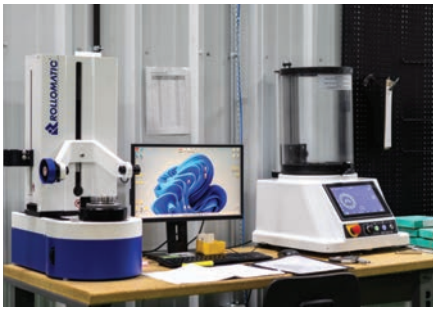
SFM = RPM x Diameter x 0.2618
RPM = (SFM x 3.82) / Diameter
Inch Per Minute = IPR x RPM
Inch Per Minute = IPT x # of Flutes x RPM
Inch Per Revolution = IPM / RPM
Inch Per Tooth = IPM / (RPM x # of Flutes)
Cutting % = IPR / Diameter * 100
Material Removal Rate = WOC x DOC x IPM
Mill Tapping Feedrate = 1/TPI x RPM

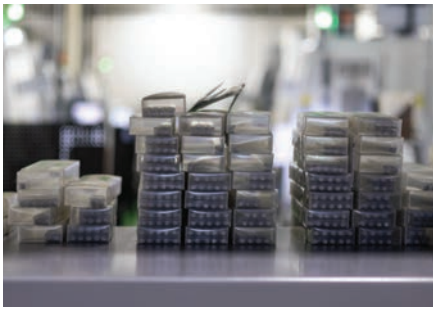
Technical Assistance

ml-nai.toolsengineer@nachi.com
(888) 340-8665
(317) 530-1003
www.nachiamerica.com/cutting-tools/

Regrind Facilities:

Regrinds are available on most of the NACHI line of cutting tools.





Scan here for a quick link to our Online Speeds & Feeds Calculator

Other Divisions of NACHI America

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Email: ml.nai.bearings@nachi.com
www.nachiamerica.com/Machine-Tools

Material and Heat Treatment

Clean Steel

Material and heat treatment are major factors in determining the performances of the **High-Speed Steel** tool. To provide high quality HSS tools, NACHI-FUJIKOSHI has a steel mill to manufacture the HSS steels conforming to individual requirements for our in-house use as well as for outside sales.

Electric arc furnace

Clean Heat Treatment

In the field of heat treatment, we are producing and marketing vacuum heat treatment furnaces, which are highly evaluated among users both in Japan and abroad. Further, through technical tie-ups with Sumitomo Electric Industries Co., Ltd., we use cemented carbide materials best suited to individual requirements.

Vacuum carbonizing furnace, vacuum degreasing washer, coating equipment and coating process

High-Speed Tool

Main high-speed tools and their applications

Classification	Steel Type Symbol			Chemical Component						Application
	JIS	AISI	NACHI	C	Mo	W	Cr	V	Co	
High-Speed Steel	SKH10	T 15	HS55T	1.5		12	4	5	5	Basic steel type, cutting tool
	SKH51	M 2	SKH51	0.85	5	6	4	2		Drill, broach, others in general
	—	M33	HM33	0.9	9.5	1.5	4	1.2	8	Drill, gear cutting tool, others in general
	—	M34	HM34	0.9	8	2	4	2	8	Cutting tool, others in general
	SKH55	M35	HS53M	1.05	5.5	6	4	2.5	5	Cutting tool, others in general
	SKH57	—	HS93R	1.25	3.5	10	4	3.5	10	Tool material
	SKH59	M42	HS96H	1.1	9.5	1.5	4	1.2	8	End milling cutter and others
			HS97R	1.1	5.5	7.5	4	1.8	9	End milling cutter, tap
Powdered High-Speed Steel			FAX18	1.1	9.5	1.5	4	1.2	8	Saws and others
			FAX31	1.3	5.5	6	4	3		General
			FAX38	1.3	5	6	4	3	8	Gear cutting tool, tap, others in general
			FAX55	1.6		12	4	5	5	Gear cutting tool, broach, others in general
			FAX90	2.6	3.5	10	4	8.5	10	General (high alloy material)
Alloy Tool Steel	SKS 7		SKS 7	1.15		2.2	0.3			Hack saw, etc.
	SKD11		SKD11	1.5	1		12	0.4		Molding tools including dies and molds
	SKD61		SKD61	0.4	1.3		5	1	Sil	

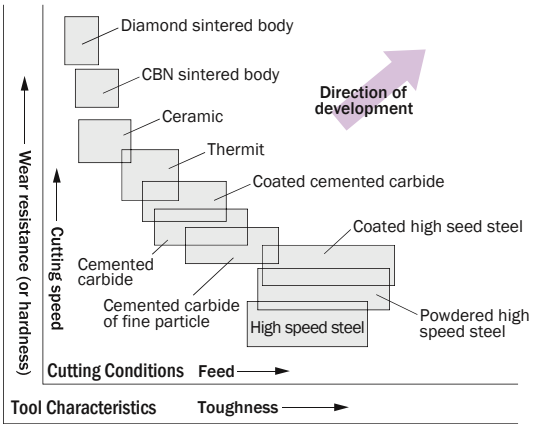
Effects of major alloy components

W : Hard double carbide is formed to ensure improved wear resistance
Mo : Fine carbide and improved toughness to ensure improved wear resistance
Cr : Tissue stabilization factor (upgraded solubility)
V : Extended and improved wear resistance of secondary carbon
C : Enhanced carbon formation factor and hardening properties
Co : Best suited to heavy-duty cutting due to improved heat resistance

Material and Heat Treatment

Characteristics of Various Tool Materials

It is important that tool materials are characterized by excellent resistance to chipping or breakage. Selection is made from among various types of tool materials in conformity to the workpiece and machining method. NACHI's integrated production system, covering the entire range from materials to tool, produces tool materials meeting each of your requirements.



Type	Symbol	(Example)	Production Method	Features
Carbon Tool Steel	SK ☐	SK 3	Tool steel where carbon is put into iron to enable hardening.	Less expensive, but low hardness at a high temperature.
Alloy Tool Steel	SKS ☐ SKD ☐	SKS 7 SKD 11	Tool steel with its wear resistance improved by alloy steel such as iron, Cr and W.	
High Speed Steel	SKH ☐	SKH 51 SKH 55	Tool steel with wear resistance and toughness improved by hard carbide created by mixing W, Mo, Cr and V with iron.	The steel type with much Co content is called cobalt high speed tool characterized by excellent heat resistance.
Powdered High Speed Steel	NACHI symbol FAX ☐	FAX 38 FAX 55	Fine powder of the high speed steel sintered by the powder metallurgy. This method can also be used to manufacture the type of steep containing such components as V and Co.	The tissue is minute, uniform and tough. Further, excellent wear resistance is provided by such components.
Cemented Carbide	K ☐ P ☐	K 10 P 20	The major component is W. It is manufactured by sintering the TiC, TaC and Co (bonding agent) according to powder metallurgy method.	Very hard at a high temperature and excellent in wear resistance, but chips easily.
Ultrafine Grain Cemented Carbine	Z ☐	Z 20	Cemented carbide characterized in that the particle diameter of carbide such as W, Ti and Ta does not exceed 1 micron.	The toughness is higher than that of cemented carbide, but wear resistance is lower.
Thermit	NACHI symbol NAX ☐	NAX T NAX LL	The main components are carbide such as Ti and Ta, nitride and carbonitride. They are sintered with Ni and Co (binder) by powder metallurgy to produce Thermit.	Excellent in resistance to wear, heat and deposition, but susceptible to chipping. Used for high-speed cutting.
Ceramic			A sintered body (porcelain). Available in two types; alumina type mainly consisting of Al2O3 and silicon type mainly consisting of Si2N4.	Excellent wear resistance but poor toughness.
CBN Sintered Body	NACHI symbol BM ☐ BC ☐	BM 10 BC 30B	Manufactured by sintering the powder of CBN, the hardest second only to diamond, at a high temperature under super high pressure. Excellent hardness even at a high temperature.	Reaction with metal occurs very rarely. Characterized by excellent stability at a high temperature.
Diamond Sintered Body	NACHI symbol DM ☐	DM 10 DM 10F	A polycrystalline body formed by sintering powdered diamond at a high temperature under super high pressure. Characterized by excellent hardness.	Chemically stable to the workpiece made of material other than iron.

Hardness of High-Hardness Material

GUIDE TO MARK (TOOL SPECIFICATION)

	Mark	Explanation
Coating	G	G (TiN) Coating
	SG	SG (TiCN multi layer) Coating
	AG	AG (TiAlN multi layer) Coating
	AQ EX	AQ (ALCRN Base, multi layer) Coating
	AQ Mill	AQ Mill (AlTiN Base, nano layer) Coating
	GS	GS (TiAlN multi layer) Coating
	DLC	DLC Coating
	DIA	Diamond Coating
	REVO D	REVO D Coating
Tool Materials	HSS	High Speed Steels
	HSS Co	Cobalt High Speed Steels ⚠
	FMX	Fine Melting HSS ⚠
	FAX	High Grade Powder HSS ⚠
	PREMIUM	Vanadium HSS
	HSSE-V	Vanadium HSS
	HSSE	Cobalt/Vanadium HSS ⚠
	Carbide	Tungsten Carbide ⚠
Helix Angle	24°~30°	Helix Angle

⚠ WARNING: This product can expose you to chemicals including cobalt, which is known to the State of California to cause cancer. For more information go to www.P65Warnings.ca.gov

	Mark	Explanation
Flutes of Drills	HELIX N	Normal Helix Flutes
	HELIX H	High Helix Flutes
	HELIX L	Low Helix Flutes
	Variable V	Variable Helix Flutes
Drill Dimension	118°	Point Angle of Drills
		Drill Length is from Center Point
		Drill Length is from Corner Point
	OIL HOLE	Oil-hole Drills
	3FLUTE	Three Flutes Drills
Lip Relief of Drills	Conical	Shape of Lip Relief is Conical
	2RAKE	Shape of Lip Relief is Two Rake
	3RAKE	Shape of Lip Relief is Three Rake
Thinning of Drills	S-type	S-type Thinning
	N-type	Notch Thinning
	X-type	X-type Thinning
	X-type	
	XH-type	XH-type Thinning
	2RAKE+X	2Rake Relief & X-type Thinning
	2RAKE+XR	2Rake Relief & XR-type Thinning
	2RAKE+3F	3 Flutes Drills & 3F-type Thinning

GUIDE TO MARK (TOOL SPECIFICATION)

	Mark	Explanation
Tolerance of Drills Dia.	js6	Tolerance of Drills Diameter is js6 *Drill diameter tolerances shown on page 154*
	h7	Tolerance of Drills Diameter is h7 *Drill diameter tolerances shown on page 154*
	h8	Tolerance of Drills Diameter is h8 *Drill diameter tolerances shown on page 154*
Tolerance of Shank Dia.	h7	Tolerance of Shank Diameter
Flutes of End Mills	Sharp Corner	Sharp Corner Type End Mills
		2 Flutes Square End Mills (Center Cut)
		3 Flutes Square End Mills (Center Cut)
		4 Flutes Square End Mills (Center Cut)
		4 Flutes Square (Center Cut)
		5 Flutes Square End Mills (Center Cut)
		6 Flutes Square End Mills (Center Cut)
		6 Flutes Square (Center Cut)
		8 Flutes Square (Center Cut)
		4 Flutes Square End Mills (with Center Hole)
		5 Flutes Square End Mills (with Center Hole)
		6 Flutes Square End Mills (with Center Hole)
		Multiple Flutes (over 8) Square End mills (with Center Hole)
		2 Flutes Radius End Mills (Center Cut)

	Mark	Explanation
Flutes of End Mills		4 Flutes Radius End mills (Center Cut)
		2 Flutes Ball Nose End mills (Center Cut)
		3 Flutes Ball Nose End mills (Center Cut)
		4 Flutes Ball Nose End mills (Center Cut)
		5 Flutes Ball Nose End mills (Center Cut)
		6 Flutes Ball Nose End mills (Center Cut)
Type of Taps		Cutting Taps
		Forming Taps
Flutes of Taps	TAPS FLUTE ST	Straight Flutes Taps
	TAPS FLUTE SP	Spiral Pointed Taps
	TAPS FLUTE NH	Normal Helix Flutes Taps
	TAPS FLUTE HH	High Helix Flutes Taps
	TAPS FLUTE L	Low Helix Flutes Taps
Chamfer of Taps	MB CHAMFER	Chamfer Length is 2.5P to 3P
	P CHAMFER	Chamfer Length is 4P to 5P (for through hole)
	B CHAMFER	Chamfer Length is 1.5P (for blind hole)
	T CHAMFER	Chamfer Length is 7P to 10 P (for through hole)
	2.5P CHAMFER	Chamfer Length is 2.5P
	TAPER PIPE	Cutting Taps for Taper Pipe
	STRAIGHT PIPE	Cutting Taps for Straight Pipe

NACHI

WHERE **INNOVATION** AND **QUALITY** MEET

VISUAL INDEX

DRILLS
ENDMILLS
TAPS

Specs/Sizes
Speeds/Feeds

AQUA REVO DRILL STUB

List 9860 Metric Sizes
List 9861 Fractional Sizes

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AQUA REVO DRILL REGULAR

List 9862 Metric Sizes
List 9863 Fractional Sizes

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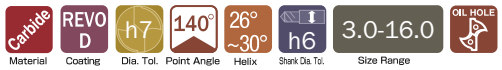
AQUA REVO DRILL OIL HOLE 3D

DIN Standard



List 9872 Metric Sizes
List 9873 Fractional Sizes

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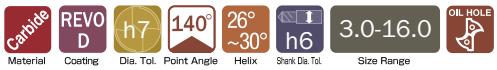
AQUA REVO DRILL OIL HOLE 3D

JIS Standard



List 9864 Metric Sizes

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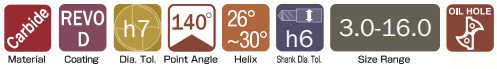
AQUA REVO DRILL OIL HOLE 5D

DIN Standard



List 9874 Metric Sizes
List 9875 Fractional Sizes

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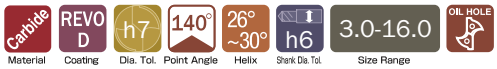
AQUA REVO DRILL OIL HOLE 5D

JIS Standard



List 9866 Metric Sizes

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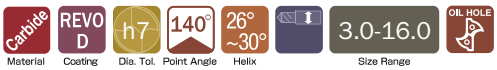
AQUA REVO DRILL OIL HOLE 8D



List 98**68** Metric Sizes
List 98**69** Fractional Sizes

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Specs/Sizes
Speeds/Feeds

AQUA DRILL EX OIL HOLE 10D

Carbide | AQ EX | 24°~30° | h7 | 140° | h6 | OIL HOLE

LIST 9612 Metric sizes

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AQUA DRILL EX OIL HOLE 15D

Carbide | AQ EX | 24°~30° | h7 | 140° | h6 | OIL HOLE

LIST 9614 Metric sizes
LIST 9615 Fractional sizes

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AQUA DRILL EX OIL HOLE 20D

Carbide | AQ EX | 24°~30° | h7 | 140° | h6 | OIL HOLE

LIST 9616 Metric sizes
LIST 9617 Fractional sizes

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AQUA DRILL EX OIL HOLE 25D

Carbide | AQ EX | 24°~30° | h7 | 140° | h6 | OIL HOLE

LIST 9618 Metric sizes
LIST 9619 Fractional sizes

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AQUA DRILL EX OIL HOLE 30D

Carbide | AQ EX | 24°~30° | h7 | 140° | h6 | OIL HOLE

LIST 9620 Metric sizes
LIST 9621 Fractional sizes

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AQUA DRILL EX OIL HOLE 40D

Carbide | AQ EX | 24°~30° | h7 | 140° | h6 | OIL HOLE

LIST 9626 Metric sizes
LIST 9627 Fractional sizes

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Specs/Sizes
Speeds/Feeds

AQUA DRILL EX OIL HOLE PILOT

Carbide | AQ EX | 24° ~30° | h7 | 150° | h6 | OIL HOLE

Pilot Drill for
L9612, L9614, L9616, L9618, L9620, L9628

List 9622 Metric Sizes
List 9623 Fractional Sizes

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AQUA DRILL EX OIL HOLE 3 FLUTE 3D

Carbide | AQ EX | 24° ~30° | js6 | 140° | h6 | OIL HOLE

List 9826

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AQUA DRILL EX OIL HOLE 3 FLUTE 5D

Carbide | AQ EX | 24° ~30° | js6 | 140° | h6 | OIL HOLE

List 9820

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P 84

AQUA REVO DRILL MICRO 5D

Carbide | REVO D | SEE FOOTNOTE AFTER TABLE | 120° | 135° | 30° | h6 | 0.50-1.99

List 9878 Metric sizes

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AQUA REVO DRILL MICRO 10D

Carbide | REVO D | SEE FOOTNOTE AFTER TABLE | 120° | 135° | 30° | h6 | 0.50-1.99

List 9880 Metric sizes

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AQUA DRILL MICRO

Carbide | AQ | HELIX N | 140° | 2RAKE+X

List 9544 Metric Sizes

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Specs/Sizes
Speeds/Feeds

AQUA DRILL EX OIL HOLE MICRO 3D

Carbide | AQ EX | h7 | 135° | 24°~30° | h6 | OIL HOLE

Material | Coating | Dia. Tol | Point Angle | Helix | Shank Dia. Tol

List 9604 Metric sizes

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AQUA DRILL EX OIL HOLE MICRO 5D

Carbide | AQ EX | h7 | 135° | 24°~30° | h6 | OIL HOLE

Material | Coating | Dia. Tol | Point Angle | Helix | Shank Dia. Tol

List 9606 Metric sizes

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DLC DRILL MICRO

Carbide | DLC | h7 | HELIX H | 120° | 2RAKE

List 9524 Metric Sizes

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DLC DRILL REGULAR

Carbide | DLC | h7 | HELIX H | 118° | 2RAKE

List 9520 Metric Sizes

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AQUA DRILL EX FLAT STUB LENGTH

Specs/Sizes Speeds/Feeds

Carbide AQ EX 20° h7 180° h6

List 9610 Metric Sizes
List 9611 Fractional Sizes

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AQUA DRILL EX FLAT RADIUS

Carbide AQ EX 20° h7 180° h6

List 9830 Metric Sizes
List 9831 Fractional Sizes

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AQUA DRILL EX FLAT REGULAR

Carbide AQ EX 20° h7 180° h6

List 9818 Metric Sizes
List 9819 Fractional Sizes

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AQUA DRILL EX FLAT LONG SHANK

Carbide AQ EX 20° h7 180° h6

List 9816 Metric Sizes
List 9817 Fractional Sizes

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AQUA DRILL EX FLAT OIL HOLE 3D

Carbide AQ EX 24°~30° h7 180° h6 OIL HOLE

List 9812 Metric Sizes
List 9813 Fractional Sizes

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AQUA DRILL EX FLAT OIL HOLE 5D

Carbide AQ EX 24°~30° h7 180° h6 OIL HOLE

List 9814 Metric Sizes
List 9815 Fractional Sizes

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AQUA DRILL EX FLAT SUPER STUB

Carbide AQ EX 20° h7 180° h6

List 9628 ***Japan Stock Item**

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AQUA DRILL EX STARTING DRILL

Specs/Sizes Speeds/Feeds

Carbide AQ EX 25° h7

List 9624

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Specs/Sizes
Speeds/Feeds

AG STARTING DRILL

HSS Co | AG | 25° | h7

List 6502

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AG STARTING DRILL EXTENDED LENGTH

HSS Co | AG | 25° | h7

List 6504

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SG-ESS DRILL MICRO

FAX | SG | h7 | HELIX N | 118° | h7

List 7572P Metric Sizes

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SG-ESS DRILL STUB LENGTH

FAX | SG | h7 | | HELIX N | 118° | 135° >1.9 | 3RAKE

List 7572P Metric Sizes
List 7573P Fractional, Wire, Letter Sizes

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SG-ESR DRILL

FAX | SG | h7 | | HELIX N | 135° | 2RAKE+X

List 7574P Metric Sizes
List 7575P Fractional, Wire, Letter Sizes

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*Replacing AG-SUS Drill L6594P, 6595P and SG-ES Drill L7570P, L7571P

SG DRILL OIL HOLE

FAX | SG | h8 | | HELIX N | 135° | 2RAKE+X | OIL HOLE

List 7596P Metric Sizes
List 7591P Fractional Sizes

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AG POWER LONG DRILL

List 6540P Metric Sizes
List 6541P Fractional Sizes

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DLC DRILL

List 544 Metric Sizes

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STRAIGHT SHANK DRILLS

STRAIGHT SHANK DRILL SCREW MACHINE LENGTH

List 561 General Purpose
Letter, Fractional & Wire Gauge Sizes

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List 561P General Purpose
Fractional & Wire Gauge Sizes

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List 563 Aircraft NAS907-C
Letter, Fractional & Wire Gauge Sizes

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List 6563 Aircraft NAS907-C
Letter, Fractional & Wire Gauge Sizes

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STRAIGHT SHANK DRILL JOBBER LENGTH

Specs/Sizes
Speeds/Feeds

HSS | h8 | HELIX N | 118° | S-type >1/2 | Conical

List 501A — General Purpose
Letter, Fractional & Wire Gauge Sizes

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HSS | h8 | HELIX N | 108° | 118° | S-type >0.55 >13.0 | Conical

List 500 — Metric Sizes

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HSS | h8 | HELIX N | 118° | S-type >1/2 | Conical

List 501 — General Purpose
Letter, Fractional & Wire Gauge Sizes

P 131
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HSS Co | h8 | HELIX N | 135° | X-type >5/64 | Conical

List 6501 — Aircraft NAS907-J
Letter, Fractional & Wire Gauge Sizes

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STRAIGHT SHANK DRILL COBALT

HSS Co | h8 | HELIX H | 135° | X-type >1.5 | Conical

List 6520 — Metric Sizes

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STRAIGHT SHANK DRILL G STANDARD

HSS | G | h8 | HELIX N | 118° | X-type >3 | Conical

List 520P — Metric Sizes

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STRAIGHT SHANK DRILL JOBBER LENGTH

HSS | G | h8 | HELIX N | 118° | S-type >1/2 | Conical

List 501P — General Purpose
Fractional & Wire Gauge Sizes

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HSS | G | h8 | HELIX H | 135° | XH-type

List 517P — Parabolic
Fractional & Wire Gauge Sizes

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STRAIGHT SHANK DRILL TAPER LENGTH

Specs/Sizes
Speeds/Feeds

HSS | h8 | N | 118° | S-type >1/2 | Conical

List 531 — General Purpose, Fractional Sizes

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HSS Co | h8 | N | 135° | X-type

List 6531 — General Purpose, Fractional Sizes

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HSS | G | h8 | H | 135° | XH-type

List 545P — Parabolic Style, Fractional Sizes

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STRAIGHT SHANK DRILL EXTRA LENGTH

HSS | h8 | N | 118° | S-type

List 551 — Fractional Sizes

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HSS Co | h8 | H | 118° | XH-type

List 6551 — Parabolic Tang Drive, Fractional Sizes

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STRAIGHT SHANK DRILL OIL HOLE

HSS Co | h8 | N | 118° | S-type | OIL HOLE

List 581 — Fractional Sizes

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TAPER SHANK DRILLS

Specs/Sizes
Speeds/Feeds

TAPER SHANK DRILL REGULAR LENGTH

HSS h8 HELIX N 118° S-type >1/2 Conical

List 601 Fractional Sizes

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TAPER SHANK DRILL EXTRA LENGTH

HSS h8 HELIX N 118° S-type >1/2 Conical

List 651 Fractional Sizes

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TAPER SHANK DRILL OIL HOLE

HSS Co h8 HELIX N 118° N-type OIL HOLE

List 683 Fractional Sizes

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SPECIALTY DRILLS

Specs/Sizes
Speeds/Feeds

SILVER AND DEMING DRILL

HSS h8 HELIX N 118° S-type >23/32 Conical

List 575 Fractional Sizes

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DRILL SET JOBBER LENGTH

List 599 Letter, Fractional & Wire Gauge Sizes

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TECHNICAL REFERENCE / DRILLS

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HSS DRILLS

HIGH PERFORMANCE END MILLS

Specs/Sizes
Speeds/Feeds

AQUA V MILL FOUR FLUTE

Carbide | AQ Mill | h6 | Variable V

List 9701 Fractional Sizes
List 9702 Metric Sizes

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AQUA V MILL FOUR FLUTE CORNER RADIUS

Carbide | AQ Mill | h6 | Variable V

List 9703 Fractional Sizes
List 9704 Metric Sizes

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AQUA V MILL FIVE FLUTE

Carbide | AQ Mill | h6 | Variable V

List 9705 Fractional Sizes
List 9706 Metric Sizes

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AQUA V MILL FIVE FLUTE CORNER RADIUS

Carbide | AQ Mill | h6 | Variable V

List 9707 Fractional Sizes
List 9708 Metric Sizes

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AQUA V MILL FIVE FLUTE BALL NOSE

Carbide | AQ Mill | h6 | Variable V

List 9709 Fractional Sizes
List 9710 Metric Sizes

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AQUA V MILL FIVE FLUTE NECK RELIEF

Carbide | AQ Mill | h6 | Variable V

List 9727 Fractional Sizes

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AQUA MILL HARD

Carbide | AQ Mill | h6 | HELIX H | > 1/2, >12

List 9711 Fractional Sizes
List 9712 Metric Sizes

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AQUA MILL HARD CORNER RADIUS

Carbide | AQ Mill | h6 | HELIX H | > 1/2, 4,6,8

List 9713 Fractional Sizes
List 9714 Metric Sizes

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Specs/Sizes
Speeds/Feeds

AQUA MILL HARD BALL NOSE

Carbide | AQ Mill | h6 | HELIX L

List 9715 Fractional Sizes
List 9716 Metric Sizes

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AQUA HARD MILL CORNER RADIUS NECK RELIEF

Carbide | AQ Mill | h6 | Variable V | >1/2, >12

List 9729 Fractional Sizes
List 9730 Metric Sizes

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ALH MILL

Carbide | h6 | HELIX H

List 9717 Fractional Sizes
List 9718 Metric Sizes

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ALH MILL CORNER RADIUS

Carbide | h6 | HELIX H

List 9719 Fractional Sizes
List 9720 Metric Sizes

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ALH MILL BALL NOSE

Carbide | h6 | HELIX H

List 9721 Fractional Sizes
List 9722 Metric Sizes

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ALH MILL NECK RELIEF

Carbide | h6 | HELIX H

List 9723 Fractional Sizes

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ALH MILL BALL NOSE NECK RELIEF

Carbide | h6 | HELIX H

List 9725 Fractional Sizes

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Specs/Sizes
Speeds/Feeds

DLC MILL

HSS Co | DLC | HELIX H

List 6231HD — Fractional Sizes

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AG-MILL ROUGHING

HSS Co | AG | HELIX N

List 6485 — Fractional Sizes

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AG-MILL HEAVY

HSS Co | AG | HELIX H

List 6403 — Fractional Sizes

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ROUGHING AND FINISHING (HEAVY DUTY) END MILL

HSS Co | HELIX N

List 6367 — Fractional Sizes

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HSS Co | SG | HELIX N

List 6367X — Fractional Sizes

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ROUGHING (HOG) END MILL

HSS Co | HELIX N

List 6303 — Fractional Sizes

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HSS Co | SG | HELIX N

List 6303X — Fractional Sizes

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HSS Co | HELIX N

List 6307 — Fractional Sizes

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HSS END MILLS

Specs/Sizes
Speeds/Feeds

TWO FLUTE END MILL SINGLE END

HSS Co · HELIX N

List 6231 Fractional Sizes

HSS Co · SG · HELIX N

List 6231X Fractional Sizes

TWO FLUTE END MILL LONG SINGLE END

HSS Co · HELIX N

List 6233 Fractional Sizes

TWO FLUTE END MILL SINGLE END

HSS Co · HELIX N

List 6230 Metric Sizes

FOUR FLUTE END MILL SINGLE END

HSS Co · HELIX N

List 6210 Metric Sizes

MULTI FLUTE END MILL REGULAR SINGLE END, CENTER CUTTING

HSS Co · HELIX N

List 6211M Fractional Sizes

HSS Co · SG · HELIX N

List 6211X Fractional Sizes

MULTI FLUTE END MILL LONG SINGLE END, CENTER CUTTING

HSS Co · HELIX N

List 6213 Fractional Sizes

TECHNICAL REFERENCE / END MILLS

HIGH PERFORMANCE TAPS

Specs/Sizes
Speeds/Feeds

SGSP-DIN TAP SPIRAL FLUTED

FAX · SG · 45° · TAPS FLUTE NH · MB CHAMFER

List 6800 Metric Sizes
List 6801 Machine Screw and Fractional Sizes

P 222-223
P 222

SGPO-DIN TAP SPIRAL POINTED

FAX · SG · TAPS FLUTE SP · P CHAMFER

List 6802 Metric Sizes
List 6803 Fractional and Machine Screw Sizes

P 224-225
P 224

SG LO TAP SPIRAL FLUTED

HSSE · SG · TAPS FLUTE L · MB CHAMFER

List 6958 Metric Sizes
List 6959 Fractional and Machine Screw Sizes

P 226-227
P 226

DLC TAFLET TAP THREAD FORMING

HSSE-V · DLC · B CHAMFER

List 6956 Metric Sizes
List 6955 Fractional Sizes
List 6957 Machine Screw Sizes

P 228-229
P 228

VIPER TAFLET

VIPER TAFLET FOR STEEL

HSSE-V · P CHAMFER · B CHAMFER

List 996 Metric Sizes

P 230
P 231

HSSE-V · P CHAMFER · B CHAMFER

List 995 Fractional Sizes
List 995 Machine Screw Sizes

P 231-232
P 231-232

VTP TAPS

VTP TAP SPIRAL FLUTED

HSSE-V · TAPS FLUTE NH · MB CHAMFER

List 980 Metric Sizes
List 981 Fractional Sizes
List 983 Machine Screw Sizes

P 233
P 235
P 234
P 235

VTP TAP SPIRAL POINTED

HSSE-V · TAPS FLUTE SP · P CHAMFER

List 982 Metric Sizes
List 971 Fractional Sizes
List 973 Machine Screw Sizes

P 233
P 235
P 235
P 235

STANDARD TAPS

Specs/Sizes
Speeds/Feeds

STANDARD HAND TAP

HSS · TAPS FLUTE ST · T CHAMFER · P CHAMFER · B CHAMFER

List 911 Fractional Sizes

P 236
P 244

HSS · TAPS FLUTE ST · T CHAMFER · P CHAMFER · B CHAMFER

List 913 Machine Screw Size

P 237
P 244

STANDARD TAP SPIRAL POINTED

HSS · TAPS FLUTE SP · P CHAMFER

List 921 Fractional Sizes

P 238
P 244

STANDARD HAND TAP FOR CAST IRON

HSS · TAPS FLUTE ST · P CHAMFER · B CHAMFER

List 969 Fractional Sizes

P 238
P 244

STANDARD TAP SPIRAL POINTED

HSS · TAPS FLUTE SP · P CHAMFER

List 923 Machine Screw Sizes

P 239
P 244

STANDARD HAND TAP

HSS · TAPS FLUTE ST · T CHAMFER · P CHAMFER · B CHAMFER

List 910 Metric Sizes

P 240
P 244

STANDARD TAP SPIRAL POINTED

HSS · TAPS FLUTE SP · P CHAMFER

List 920 Metric Sizes

P 240
P 244

TAPER PIPE TAPS

Specs/Sizes
Speeds/Feeds

TAPER PIPE TAP STRAIGHT FLUTED

HSS | TAPS FLUTE ST | TAPER PIPE

List 941 (NPT)
List No. 941D (NPTF)

P 241
P 244

TAPER PIPE TAP INTERRUPTED

HSS | TAPS FLUTE ST | TAPER PIPE

List No. 943 (NPT)
List No. 943D (NPTF)

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P 244

TAPER PIPE TAP SPIRAL FLUTED

HSSE-V | TAPS FLUTE L | TAPER PIPE

List 947 (NPT)
List No. 947D (NPTF)

P 242
P 244

STRAIGHT PIPE TAP STRAIGHT FLUTED

HSS | TAPS FLUTE ST | STRAIGHT PIPE

List No. 945 (NPS)
List No. 945D (NPSF)

P 242
P 244

TAPER PIPE TAP SHORT PROJECTION

HSS | TAPS FLUTE ST | TAPER PIPE

List 959 (NPT)
List No. 959D (NPTF)

P 243
P 244

TAPER PIPE TAP 6” EXTENSION

HSS | TAPS FLUTE ST | TAPER PIPE

List 957 (NPT)

P 243
P 244

TECHNICAL REFERENCE / TAPS

P 244-256

DRILLS

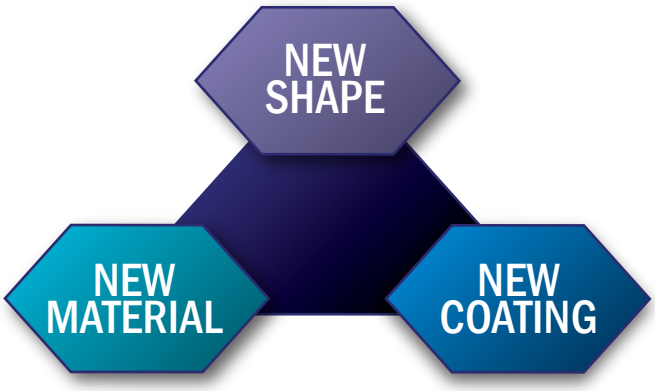
REVOlutionizing the World of Product Manufacturing

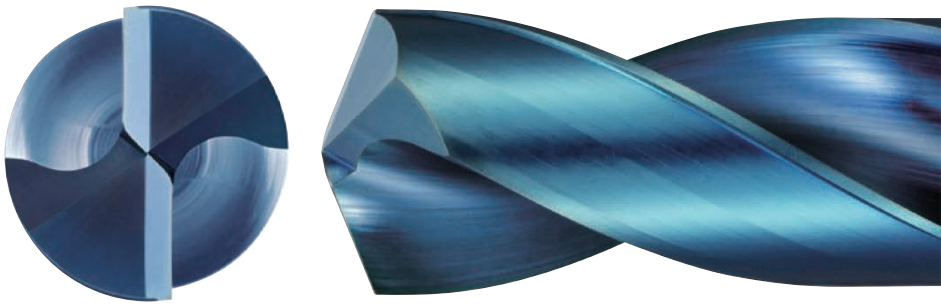
AQUA REVO DRILLS

LIST 9860, 9861 / LIST 9862, 9863

AQUA REVO Drills Stub/Regular

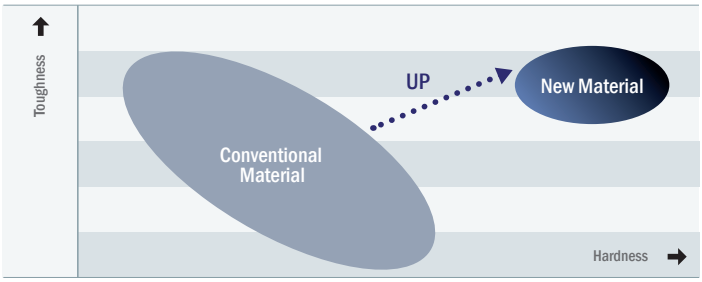
All New Material, Design and Coating Dramatically improves all functions of drilling





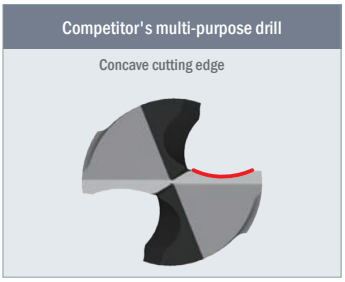
NEW MATERIAL

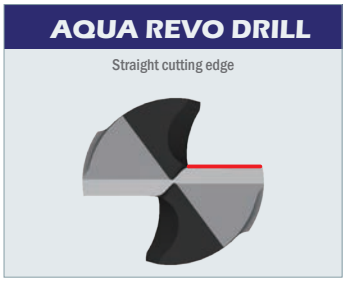
- Development of a carbide material adds both hardness and toughness
- Improves wear resistance and chipping resistance



NEW SHAPE

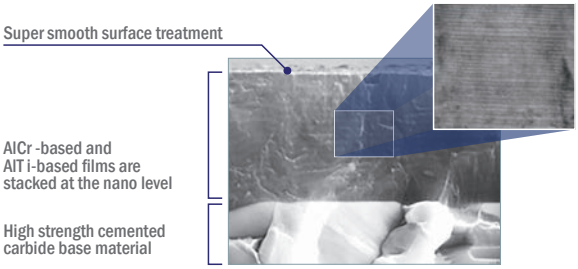
- New straight cutting edge breaks up cutting stress
- Improved strength against corner chipping





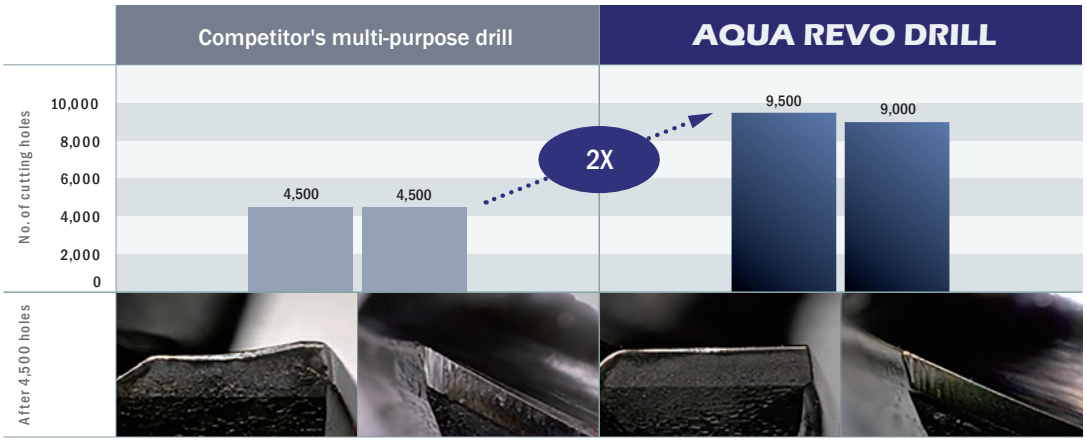
NEW COATING

- Newly developed REVO-D coating suitable for drilling multiple materials
- High oxidation resistance and wear resistance
- Low friction and smooth chip evacuation from super smooth surface treatment



LONG TOOL LIFE

Durability and stability to exceed other drills



φ 6.0
Diameter

S50C
Work Material

100m/min
Cutting speed

0.19mm/rev
Feed Rate

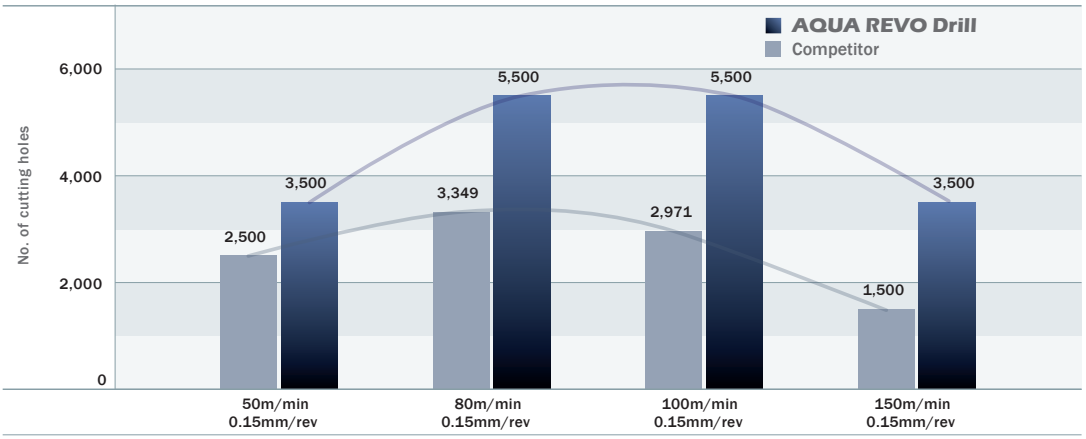
30m m (5Dc)
Depth of Cutting

Machine: Vertical M/C

Cutting Fluid: Water-soluble

HIGH EFFICIENCY

High performance even with increased speed and feed, extending tool life and shortening processing time



φ 6.0
Diameter

S50C
Work Material

30m m (5Dc)
Depth of Cutting

Machine: Vertical M/C

Cutting Fluid: Water-soluble

MULTI-PURPOSE

Able to cut high hardness materials and difficult-to-cut materials,
while maintaining high quality processing and increasing efficiency

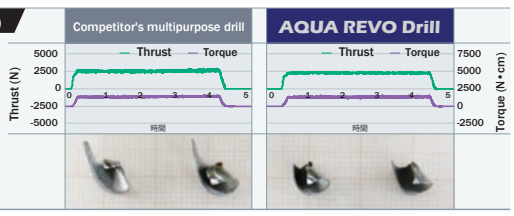
φ 6.0
Diameter
Machine: Vertical M/C
Cutting Fluid: Water-soluble

S50C (180HB)

Cutting speed
100m/min

Feed Rate
0.34mm/rev

Depth of Cutting
30mm

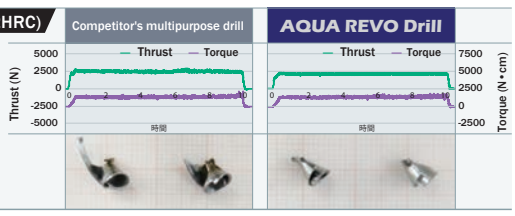


SCM440H (32HRC)

Cutting speed
45m/min

Feed Rate
0.29mm/rev

Depth of Cutting
30mm

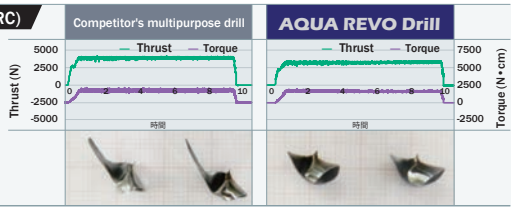


SKD61 (53HRC)

Cutting speed
30m/min

Feed Rate
0.27mm/rev

Depth of Cutting
18mm

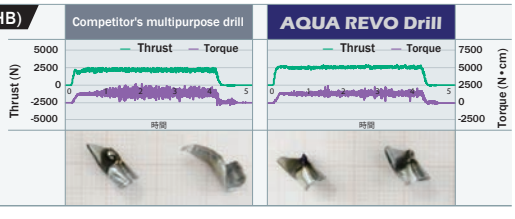


SS400 (124HB)

Cutting speed
100m/min

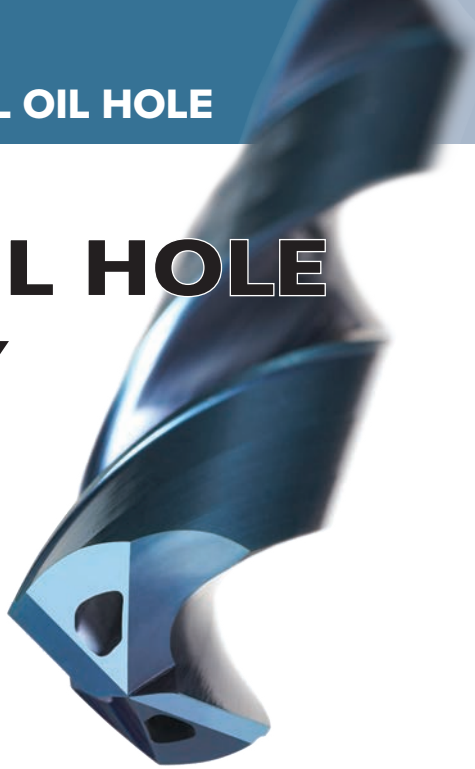
Feed Rate
0.34mm/rev

Depth of Cutting
30mm



REVOlutionizing the World of Product Manufacturing

AQUA REVO DRILLS OIL HOLE



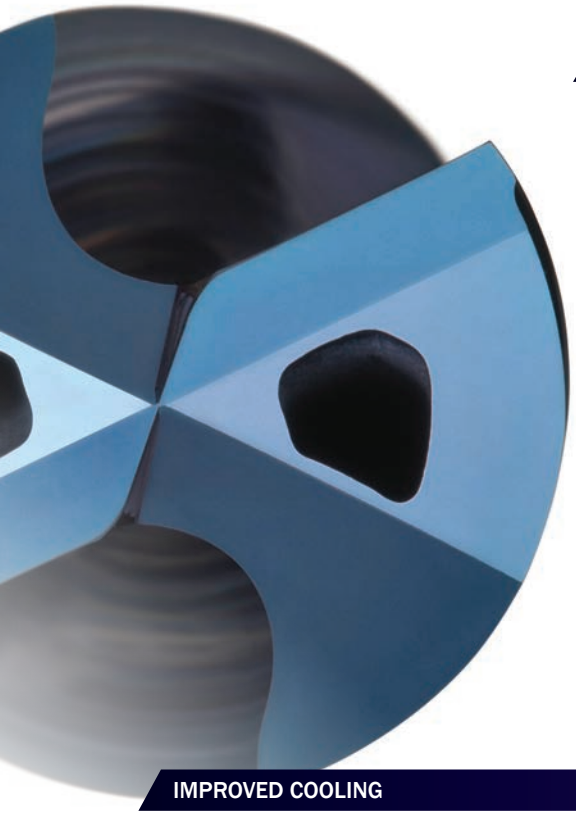
LIST 9864, 9866, 9868, 9869, 9872, 9873, 9874, 9875

AQUA REVO Drills Oil Hole 3D, 5D, 8D

All New Oil Hole Concept in our REVO Material, Design and Coating
The use of Fluid Analysis Greatly Improves Cooling and Lubrication

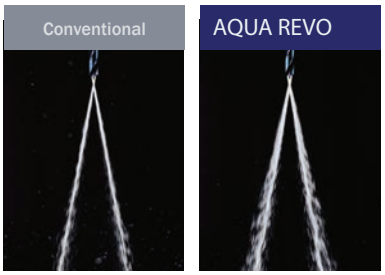
New Oil Hole Design

REVO Power Cooler

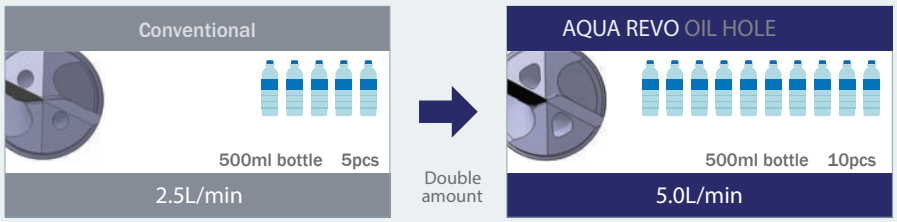


OVERWHELMING FLOW RATE

Cross-sectional area and coolant amount of the oil hole are more than twice that of conventional.

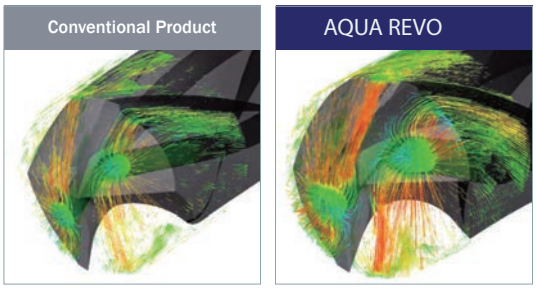


Amount per 1 minute
Drill: φ8.0 Equipment: 1.5MPa
Rotation: 4,800min $^{-1}$



IMPROVED COOLING

Increased flow rate and flow velocity around corners and thinning

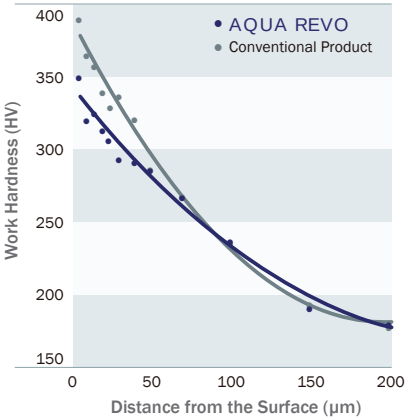


SUPPRESSES WORK HARDENING

Tool life and accuracy will improve after drilling process

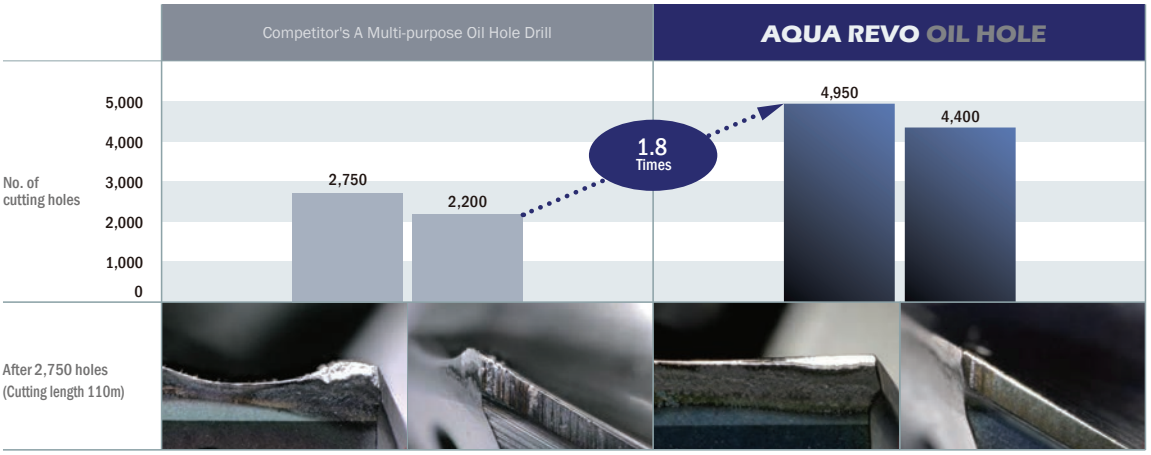
During the drilling process the work material can harden. Because of Nachi's new oil hole design, users can see a decrease in work hardening, prolonging tool life.

Work Material: SUS304



EXCELLENT TOOL LIFE & WEAR SUPPRESSION

Durability and stability surpasses other drills



Diameter: φ8.0

Work Material: S50C(180HB)

Cutting Speed: 120m/min

Feed Amount: 0.254mm/rev

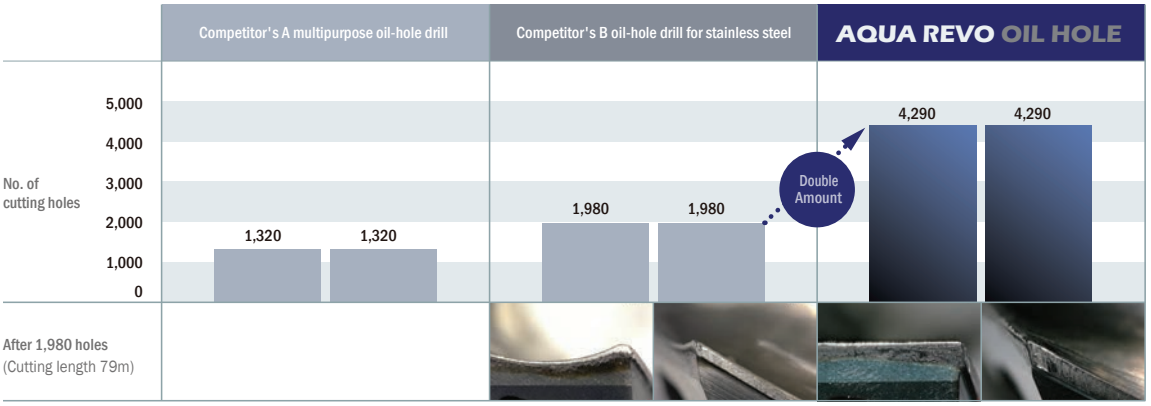
Depth of Hole: 40mm(5Dc)

Machine: Vertical M/C

Cutting Fluid: Water-soluble

INCREDIBLE TOOL LIFE EVEN IN STAINLESS STEEL

Although it is a multi-purpose drill, even compared to drills for Stainless steel, Nachi achieved more than twice as many holes



Diameter: φ8.0

Work Material: SUS304

Cutting Speed: 80m/min

Feed Amount: 0.20mm/rev

Depth of Hole: 40mm(5Dc)

Machine: Vertical M/C

Cutting Fluid: Water-soluble

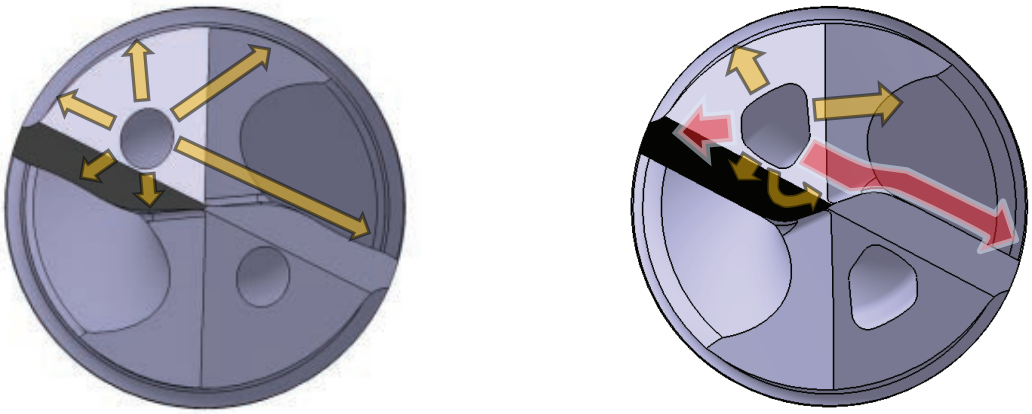
Compatible with a wide range of materials from Structural steel to Stainless steel and Hardened steel

SELECTION BY WORKING MATERIAL

	Structural Steel	Carbon Steel	Alloy Steel Heat-treated Steel	Mold Steel Hardened Steel	Hardened Steel			Stainless Steel			Titanium Alloy	Nickel Based Alloy	Cast Iron	Aluminum Alloy
	SS400	S45C S50C	SCM SCr	30～40 HRC	40～50 HRC	50～57 HRC	58～65 HRC	SUS304 SUS316	SUS420	SUS630	Ti-6Al-4V		FC FCD	AC ADC
AQUA REVO Oil Hole 3D, 5D, 8D	◎	◎	◎	◎	◎	○	–	◎	◎	◎	○	○	◎	○

◎: Excellent ○: Good –: Not recommended

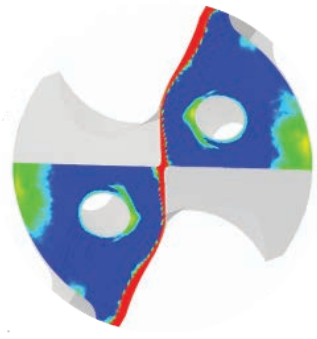
UNIQUE REVO POWER COOLER DESIGN



The REVO Power Cooler's unique design directs coolant to the cutting edge. This results in longer tool life by keeping the drill cooler when drilling.

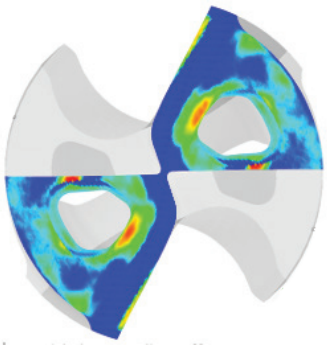
REVO POWER COOLER VS. CONVENTIONAL DESIGN

Conventional



Area with low cooling effect

AQUA REVO POWER COOLER

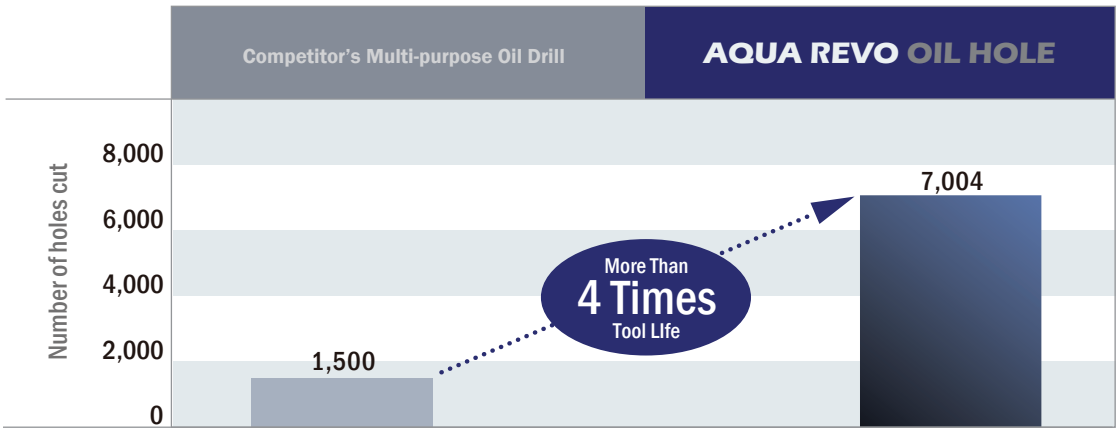


Area with high cooling effect

During a thermal analysis, Nachi's REVO Power Cooler proved to keep the cutting edge cooler than conventional oil hole drills.

SUCCESS CASE #1 - TOOL LIFE

L9874 REVO POWER COOLER 5XD - 316L



Application
Diameter: φ9.7
Work Material: 316L SS
Cutting Speed: 130 SFM
Feed Rate: 0.0027 IPR
Depth of Hole: 30.2 mm
Machine: Vertical M/C
Cutting Fluid: Water-soluble

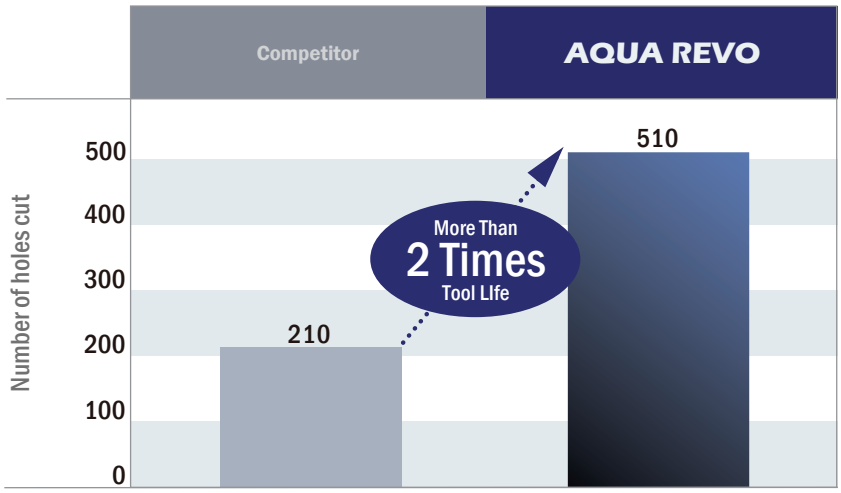
AQUA REVO Wear Results After 7004 Holes

Face | Cutting Edge 1 | Cutting Edge 2

AQUA REVO was able to increase tool life more than 400%

SUCCESS CASE #2 - TOOL LIFE & PART CYCLE TIME

L9872 REVO POWER COOLER 3XD - MONEL K500



Application
Diameter: φ8.5mm
Work Material: Monel K500
Depth of Hole: 12.6mm
Machine: Vertical M/C
Cutting Fluid: Water-soluble

Competitor Parameters	Nachi Parameters
Cutting Speed: 50 SFM	Cutting Speed: 50 SFM
Feed Amount: 0.0024 IPR	Feed Amount: 0.0043 IPR

Chip Formation

AQUA REVO was able to more than double tool life and reduce part cycle time by one minute

AQUA REVO DRILL MICRO

AQRVDM 5D/10D

Product Info Video

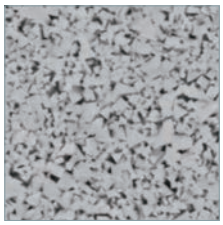
CARBIDE DRILLS

REVOLUTIONIZING THE WORLD OF MANUFACTURING

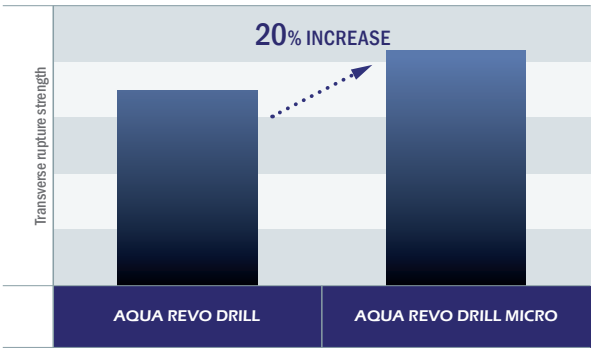
- New lineup of small diameter sizes for the AquaREVO Drill series
- Achieves "long tool life that is hard to break" and "stable cutting with little dispersion" required for small-diameter drills

MATERIAL

Newly developed carbide material for micro drill that is hard to break. Both hardness and toughness are improved by using ultra-fine particles carbide and original component design.



Microstructure
Material with ultra-fine particle type for micro drill

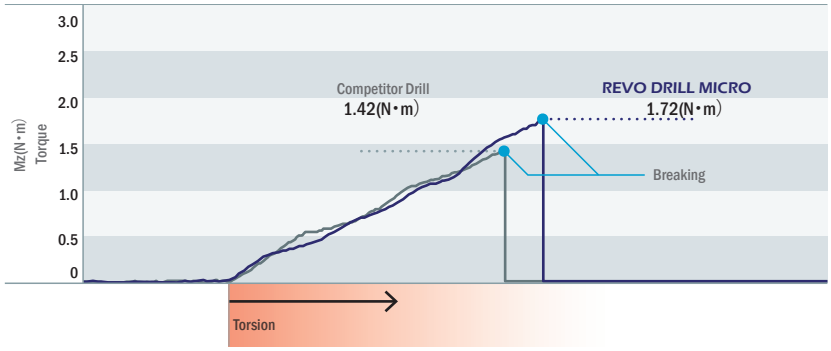


GEOMETRY

Achieves a drill that is hard to break with a flute shape that emphasizes rigidity and chip evacuation.

AquaREVO Drills Micro has 1.2 times the breaking torque of competitor's drill.

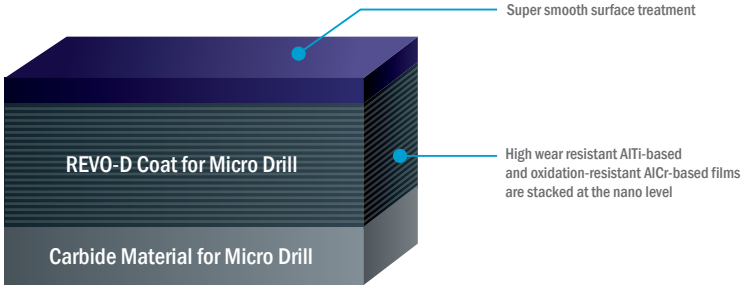
The breaking torsion torque



SHAPE

Stable tool life with accurate film thickness control - even with small diameter drills.

Super smooth surface treatment reduces resistance during cutting and improves smooth chip evacuation.

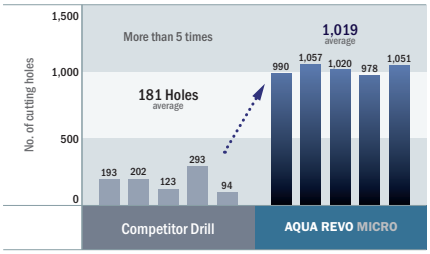


Cross-sectional structure of coating film for micro drill

LONG TOOL LIFE

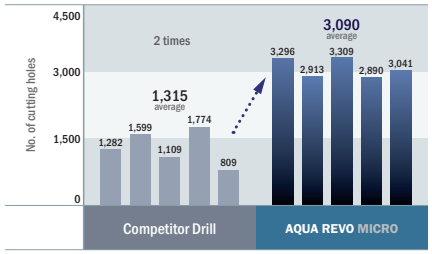
Hard to break even when drilling small diameter holes

S50C



ϕ0.5 Diameter
S50C (180HB) Work Material
40m/min Cutting Speed
0.03mm/rev Feed Rate
5mm (10DC) Depth of Cutting: Blind hole
0.1mm (0.2DC) Step feed
Cutting Fluid: Water-soluble
M/C Machine: Vertical M/C

SUS304

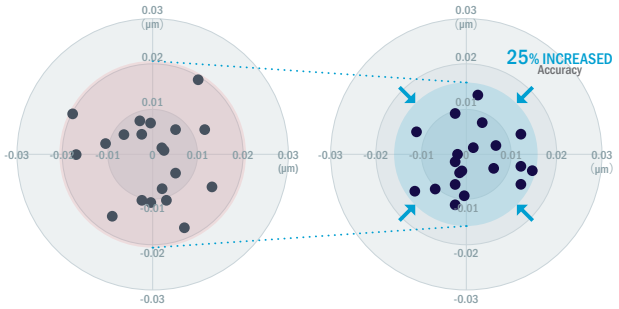


0.5 Diameter
SUS304 Work Material
9m/min Cutting Speed
0.02mm/rev Feed Rate
5mm (10DC) Depth of Cutting: Blind hole
0.1mm (0.2DC) Step feed
Cutting Fluid: Water-soluble
M/C Machine: Vertical M/C

HIGH-PRECISION

Exceptional Hole Position Accuracy

AquaREVO Drill Micro is designed with optimized centripetal properties and tool rigidity to achieve hole position accuracy within 15 µm.

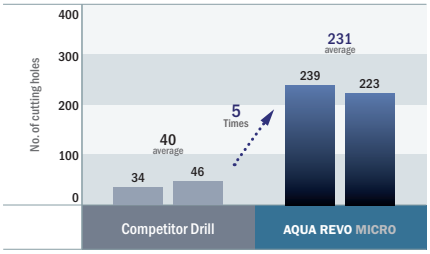


0.5 Diameter
SUS304 Work Material
9m/min Cutting Speed
0.02mm/rev Feed Rate
5mm (10DC) Depth of Cutting: Blind hole
0.1mm (0.2DC) Step feed
Cutting Fluid: Water-soluble
M/C Machine: Vertical M/C

MULTI-PURPOSE

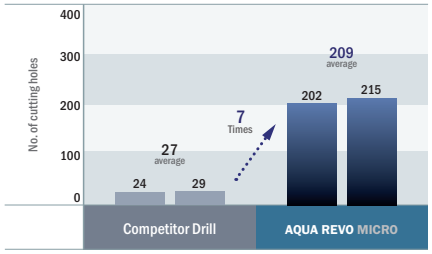
Compatible with a wide range of work materials

SCM440H (32HRC)

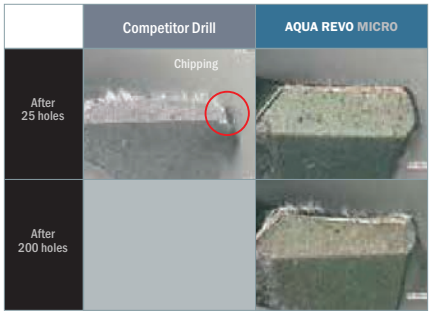


0.5 Diameter
SCM440H (32HRC) Work Material
30m/min Cutting Speed
0.02mm/rev Feed Rate
5mm (10DC) Depth of Cutting: Blind hole
0.1mm (0.2DC) Step feed
Cutting Fluid: Water-soluble
M/C Machine: Vertical M/C

SKD61 (53HRC)



ϕ0.5 Diameter
SKD61 (53HRC) Work Material
20m/min Cutting Speed
0.02mm/rev Feed Rate
5mm (10DC) Depth of Cutting: Blind hole
0.1mm (0.2DC) Step feed
Cutting Fluid: Water-soluble
M/C Machine: Vertical M/C



Applicable work Materials

Work Material	Structural Steel	Carbon Steel	Alloy Steel Heat treated Steel	Mold Steel Pre-Hardened Steel	Hardened Steel		Cast Iron	Stainless Steel			Aluminum Alloy
	SS400	S45C S50C	SCM SCr	30～40HRC	40～50HRC	50～55HRC	FC FCD	SUS304 SUS316	SUS420	SUS630	AC ADC
AQRVDM	◎	◎	◎	◎	◎	○	○	◎	◎	◎	○

◎: Excellent ○: Good

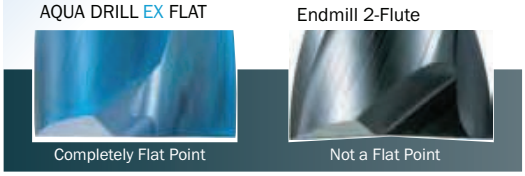
AQUA DRILL EX FLAT

- One Drill does it all – Eliminates the need to use a "center drill" or "end mill" on inclined or curved surfaces
- True 180° flat cutting edges creates minimal exit burr in Tubing & Thin Plates
- Double Margin for stable and precision Drilling

ELIMINATE END MILL DISH ANGLE

180° TRUE FLAT FACE

One cut to produce accurate counter bore surface



DURABLE AND STABLE DESIGN

AQUA DRILL EX OH FLAT

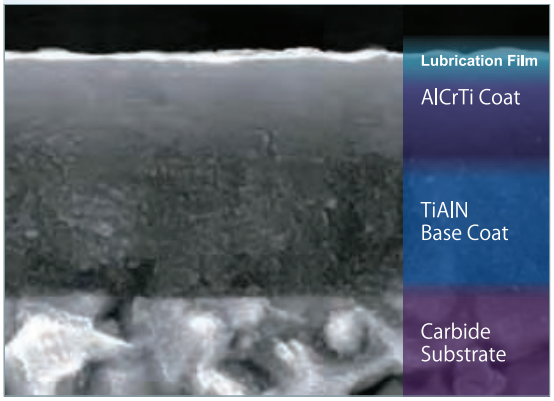
Features on 3D & 5D:

1) Double Margin
2) Corner Chamfer
3) Added Stability & Tool Life

IMPROVED HEAT & WEAR RESISTANCE

AQUA EX COATING

TiAlN + AlCrTi Nano Layer Coating



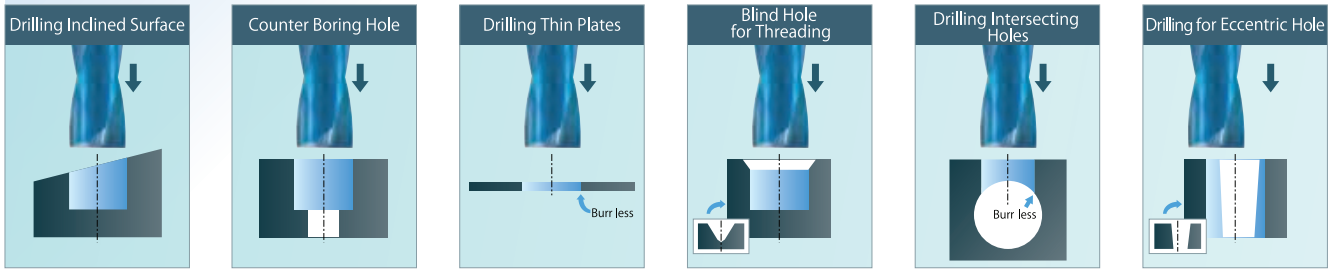
AQUA DRILL EX FLAT

Unique and Versatile High Performance Carbide Drill

One Step Drilling with Minimal Burr

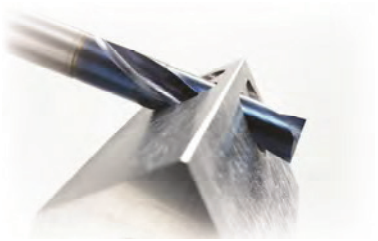
Eliminate the need for "Center Drill" & "End mill"

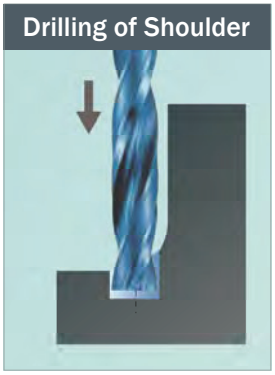
● Not recommended for milling

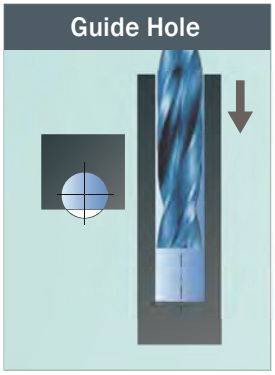


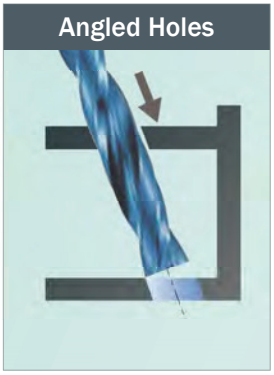
SS400 Wear after 105m (4100")

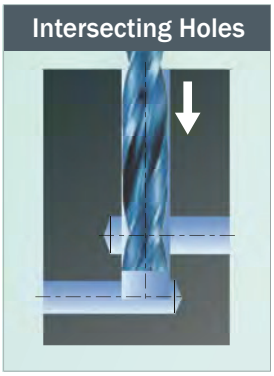
List No.	Diameter Metric	Diameter Fractional
L9610 L9611	0.2 - 20.0	1/8 - 3/4
L9628	2.0 - 20.0	
L9818 L9819	3.0 - 20.0	1/8 - 3/4
L9816 L9817	3.0 - 20.0	1/8 - 3/4
L9812 L9813	1.0 - 16.0	1/8 - 3/4
L9814 L9815	1.0 - 16.0	1/8 - 5/8
L9830 L9831	3.0 - 12.0	1/8 - 3/4











Applicable Work Materials

Work Material	Structural Steels	Carbon Steels	Pre-Hardened Steels Alloy Steels	Hardened Steels Mold Steels	Hardened Steels		Stainless Steels		Titanium Alloys Nickel Alloys	Cast Irons	Aluminum Alloys	Copper Alloys
	SS400	S45C	SCM/NAK	30~40HRC	40~50HRC	50~60HRC	SUS304/SUS316	SUS420		FC/FCD	AC/ADC	CU
AQDEXZ AQDEXZR AQDEXZLS	○	○	○	○	●			○		○	●	●
AQDEXZOH3D AQDEXZOH5D	○	○	○	○	●		●	○	●	○	○	○

○: Great ●: Good

Designed for consistent high performance drilling in stainless steels to high temperature alloys.

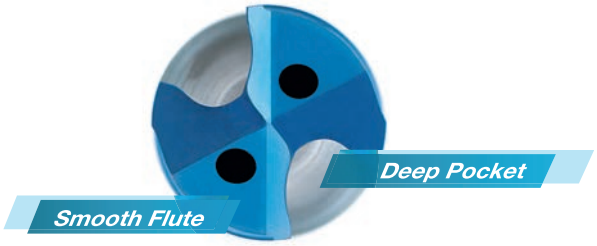
AQUA EX SERIES

AQUA DRILL EX CARBIDE DRILL SERIES

AQDEXOH10D, 15D, 20D, 25D, 30D, 40D, PLT

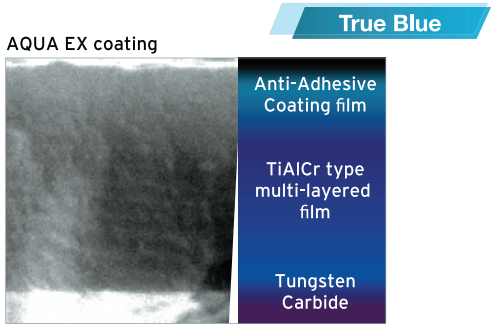
Features of Aqua EX Drill Series Fluting

- Unique J-shape flute design helps to generate easy chip break up.
- Smooth flute polishing facilitates fluid chip evactuation.
- Deep pockets ensure minimal chip packing.



Features of Aqua EX Drill Series Coating

- Aqua EX coating is designed for superior performance in both dry and wet conditions.
- EX = Exotic materials, extreme conditions.
- Engineering to withstand heavy wear and maintain consistent performance.

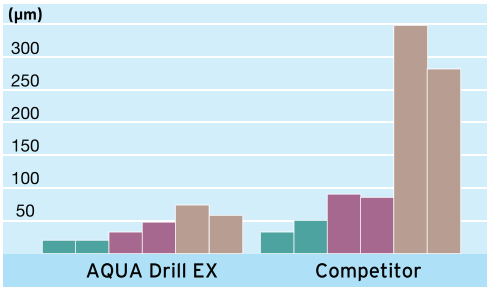


Long Tool Life

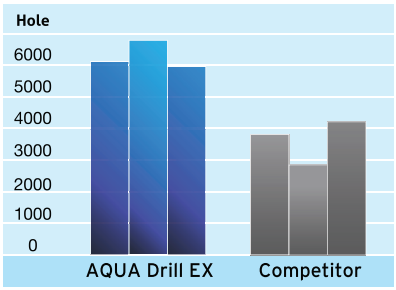
Cutting resistance is low

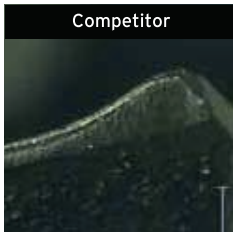
Flowing curve

Durability comparison



Durability comparison
(Service Life)



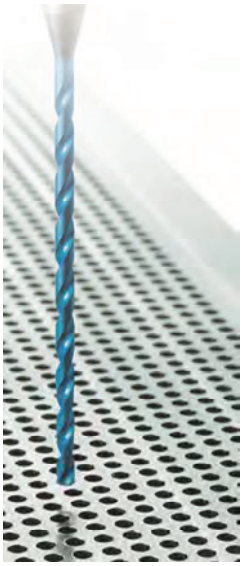


Cutting Conditions		
Tool	:	AQDEXR6.0 (L9602)
Speed	:	100m/min (RPM=5300)
Feed	:	0.18mm/rev (960mm/min)
Feed	:	0.007 IPR / 21.0 IPM
Work Material	:	C50 (Carbon Steel)
Cutting Fluid	:	Water Soluble

Fine Chips with AQUA DRILL EX

Features

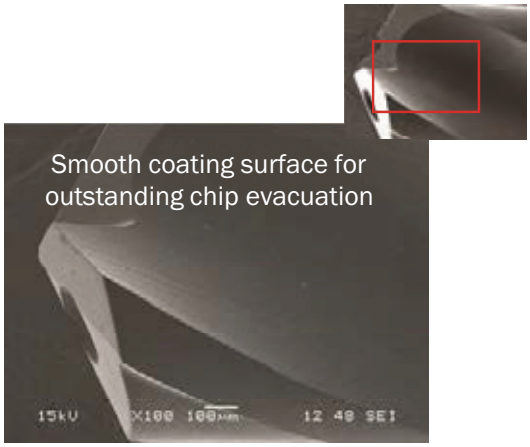
- Oil-Hole Drills for high efficiency drilling of small diameter deep holes
- Stable drilling of small diameter holes with new cutting edge geometry and large oil holes for efficient chip evacuation
- Suitable for wide work materials like Carbon Steels, Alloy Steels and Stainless Steels
- Multi-layered Aqua Ex Coating (TiALN+TiAlCr) plus anti-adhesive coating film for added lubrication



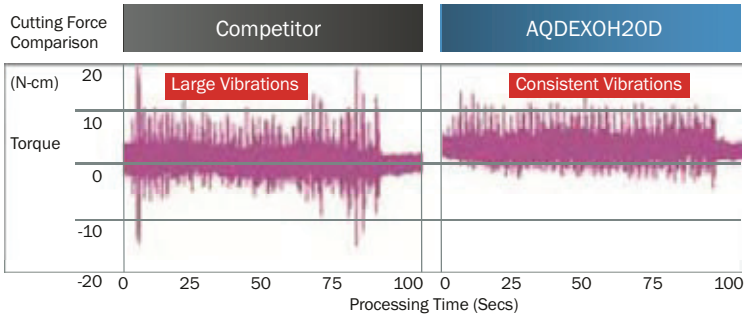
Performance

- New Oil Hole Design delivers coolant directly to the cutting edges
- New Cutting-Edge geometry breaks chips effectively
- Extremely smooth Aqua EX coating evacuates chips smoothly

Smooth Drill Flute Surface



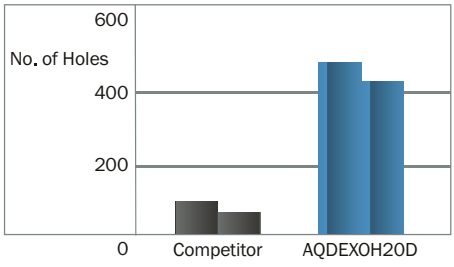
Stable Drilling of Deep Holes

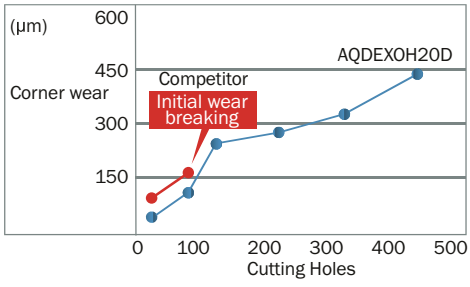


Cutting Condition

Tool Ø	Ø1.8	Coolant Type	Water Soluble - Coolant Thru
Cutting Speed	150 SFM (45m/min)	Hole Depth	38.1 mm (1.5") (20D) Blind Hole
Feed	0.003 IPR (310mm/min)	Step Feed Interva	0.17" (0.45 mm) / 0.25D
Work Material	Carbon Steel (S50C)	Guide Hole	AQDEXOHPLT01815 for 1.8 mm Hole

Long Tool Life





Cutting Condition

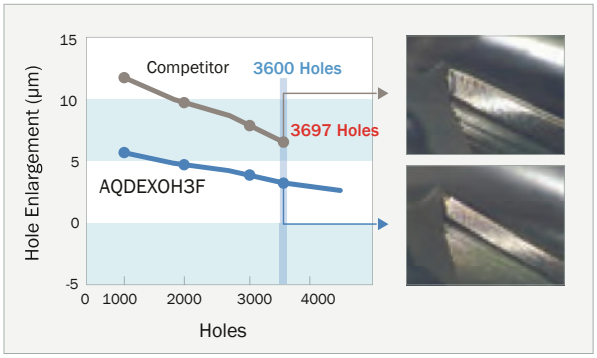
Tool Ø	Ø2.0
Cutting Speed	150 SFM (45m/min)
Feed/Speed	0.003 IPR (310mm/min)
Hole Depth	38.1 mm (1.5") (20D) Blind Hole
Step Feed Interva	0.17" (0.45 mm) / 0.25D
Coolant Type	Water Soluble - Coolant Thru
Guide Hole	AQDEXOHPLT02015 for 2.0 mm Hole

Features

- High Precision drilling as deep as 5xD of drill.
- High accuracy achieved at high feed rate with optimized cutting edge form and superior drilling balance of 3-flutes.
- Multi-layered Aqua EX Coating (TiAlN + TiAlCr)
- Anti-adhesive coating film for added lubrication

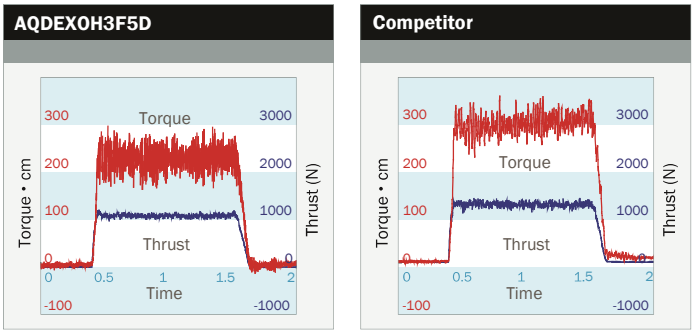
Performance

Hole Enlargement

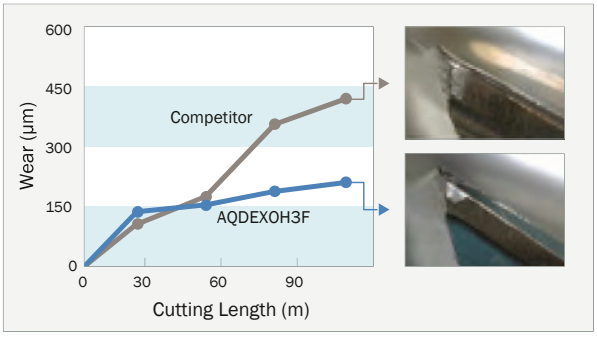


Comparison of Cutting Force

Cutting force is small, and controls amount of oversize.



SS400 Wear After 105m (4100")



Cutting Condition

Tools Ø	Ø6	400 Stainless (SS400)	Work Material
Speed	328 SFM (100m/min)	Water Soluble	Type of Coolant
Feed	50 IPM 1280mm/min (0.24mm/rev)	30mm - 1.2" (5D)	Depth/Blind Hole

Cutting Condition

Tools Ø	Ø6	Carbon Steel (S50C)	Work Material
Speed	400 SFM (120m/min)	Water Soluble	Type of Coolant
Feed	59 IPM 1500mm/min (0.24mm/rev)	30mm - 1.2" (5D)	Depth/Blind Hole

SUS304 Wear After 60m (2360")

Cutting Condition

Tools Ø	Ø6	304 Stainless (SUS304)	Work Material
Speed	164 SFM (50m/min)	Water Soluble	Type of Coolant
Feed	18 IPM 480mm/min (0.18mm/rev)	30mm - 1.2" (5D)	Depth/Blind Hole

Applicable Work Materials

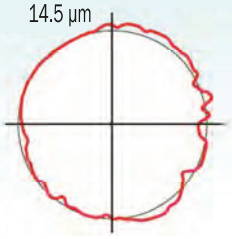
Structural Steels	Carbon Steels	Pre-Hardened Steels Alloy Steels	Hardened Steels Mold Steels	Hardened Steels		Stainless Steels		Titanium Alloys Nickel Alloys	Cast Irons	Aluminum Alloys	Copper Alloys
SS400	S45C/S50C	SCR/NAK	30～40HRC	40～50HRC	50～65HRC	SUS304/SUS316	SUS420		FCD/FC	AC/ADC	Cu
○	○	○	○	○	X	●	●	X	●	●	●

○ Great ● Good X Not Suitable

Performance

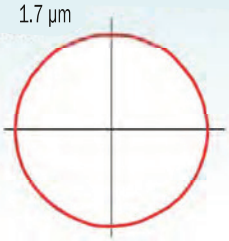
2-Flute Drill

Cutting Speed	150 SFM (45m/min)
Feed Speed	0.010 IPR - 12 IPM (300mm/min)
Roundness	14.5 µm



AQDEXOH3F

Cutting Speed	170 SFM (50m/min)
Feed Speed	0.017 IPR - 22 IPM (570mm/min)
Roundness	1.7 µm



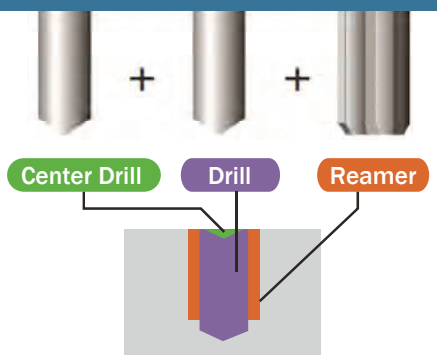
Cutting Condition

Tool Diameter	Ø 12 mm
Hole Depth/Blind Hole	36 mm (1.4")
Work Material	SUS304
Cutting Fluid	Water Soluble

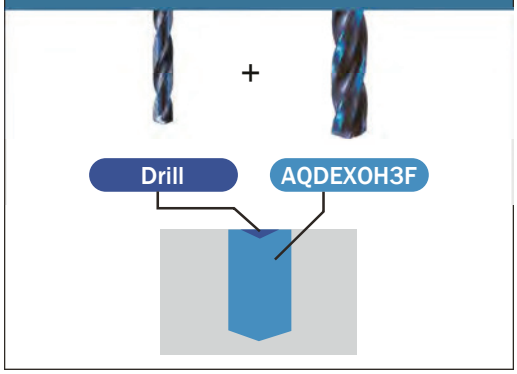
Superior Hole Finish

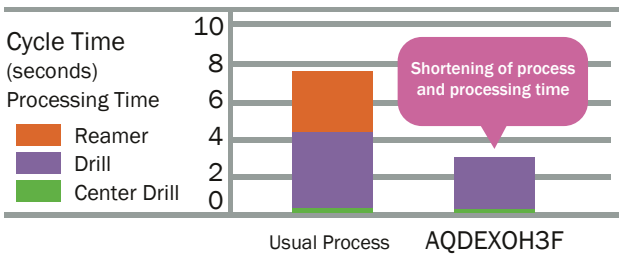
Streamline Process & Reduce Cycle Time

Usual Process



AQDEX OH3F





Cutting Condition

Diameter of Hole	Ø12 H7
Hole Depth	20 mm
Work Material	Carbon Steel

Features

- Utilizes a high accuracy shape of lip relief (3 rake, 2 rake + x-thinning)
- Made from premium powder metal with Composite Multi-Layer SG Coating (TiCN)
- End mill style shanks for highly precise and accurate drilling

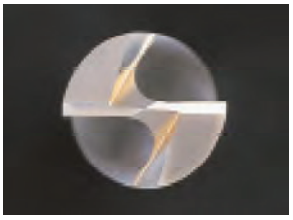
Work Materials

- Structural Steels
- Alloy Steels
- Cast Irons
- Carbon Steels
- Stainless Steels
- Aluminum Alloys

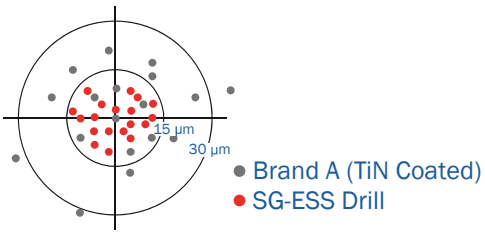
Performance

- Streamline the process and reduce machining time dramatically.
- Eliminate the center drill operation with our SG-ESS drills (Stub length)
- Stable positioning within 0.0006" (15µm)
- Faster feed & speed rates than regular HSS-Co drills
- Better cost performance than carbide drills

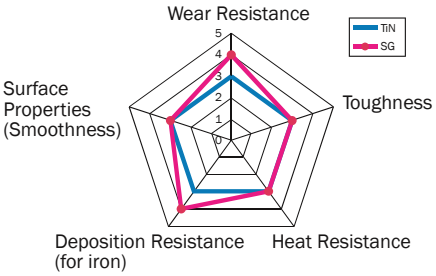
SG-ESS Drills (Stub Length)
Self Centering Point:



Positioning

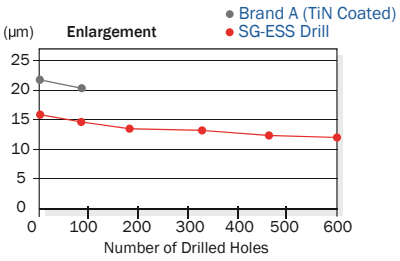


Characteristics of SG Coating



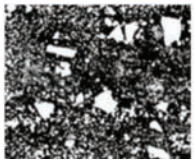
Composite multi-layer film coating method characterized by improved wear resistance as compared to TiN.

Performance and Cutting Data of SG Drill Series

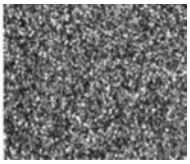


Benefits of Powdered Metal HSS

- Fine grain structure that distributes the heat more evenly
- Increased wear resistance
- Can be pushed harder than conventional HSS tools



Conventional HSS



Powdered Metal HSS

Cutting Condition

Drill Dia	9.0mm.
Hole Depth	32mm
Cutting Speed	20m/min. (65.6 SFM)
Feed	142mm/min (5.6 IPM)
Work Piece Material	Alloy steel (300HB)
Machine	Vertical machining center

Features

- Premium PM-Cobalt Substrate with composite SG Coating (Tin+Ticn)
- Equals Solid Carbide Drill in performance due to tough PM Cobalt Substrate

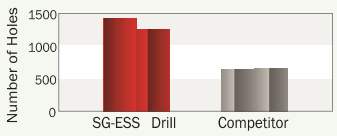
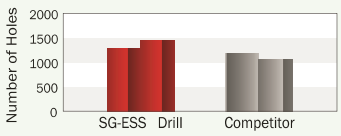
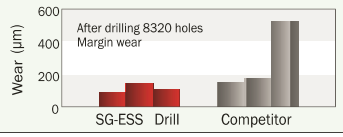
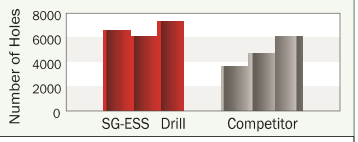
Work Materials

- Structural Steels
- Alloy Steels
- Cast Irons
- Carbon Steels
- Stainless Steels
- Aluminum Alloys

Performance

- 30 - 40% more tool life than conventional HSS/HSCO micro drills.
- Self centering point design with excellent positional accuracy.
- Precision ground end mill style shank for accurate and precision drilling.

Drilling Performance of SG-ESS Micro Drill

Diameter	Carbon Steel	304 Stainless Steel
0.5 mm		
	SFM (RPM) 80 (15,500) **Feed** 0.0006 ipr / 9.3 ipm **Hole Depth** 1.5mm (Blind Hole) **Cutting Fluid** Water solube	**SFM (RPM)** 26 (5000) **Feed** 0.0004 ipr / 2.0 ipm **Hole Depth** 1.5mm (Blind Hole) 0.25mm-peck depth **Cutting Fluid** Water Solube
0.99 mm		
	SFM (RPM) 80 (8,000) **Feed** 0.0015 ipr / 12 ipm **Hole Depth** 1.5mm (Blind Hole) **Cutting Fluid** Water Solube	**SFM (RPM)** 30 (3,200) **Feed** 0.001 ipr / 2.5 ipm **Hole Depth** 3mm (Blind Hole) 0.5mm-peck depth **Cutting Fluid** Water Solube

Applicable Work Materials

Drill Name	Structural Steels	Carbon Steels	Alloy Steels Pre-hardened Steels	Hardened Steels Mold Steels	Hardened Steels		Stainless Steels		Titanium Alloys Nickel Alloys	Cast Irons	Aluminum Alloys	Copper Alloys
	SS400	S45C/S50C	SCR/NAK	30~40HRC	40~50HRC	50~65HRC	304SS/316SS	400-Series		FCD/FC	AC/ADC	Cu
SGESS Drill	○	○	○	○	X	X	○	○	●	○	○	○

○: Great ●: Good X: Not Suitable

Features

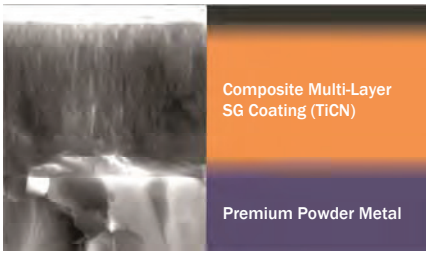
- 4-Facet self-centering point
- Designed & Engineered for drilling Stainless Steel & Hi-Temp Alloys
- Made from Premium powdered metal cobalt substrate
- Composite Multi-layer SG Coating (Tin+TiCN)
- Precision ground end mill style shank for accurate and precision drilling.

Work Materials

- Hi-temp Alloys
- Stainless Steels
- Alloy Steels
- Aluminum Alloys
- Carbon Steels
- Cast Irons
- Structural Steels
- Brass & Bronze

Performance

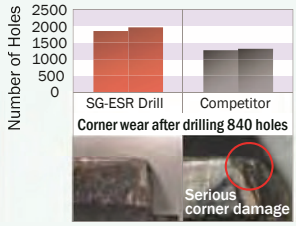
- Equals Solid Carbide drill in performance in Stainless, Inconel & Titanium.
- 30 ~ 40% Cheaper than Carbide Drills
- Self-centering point eliminates need for center drill operations.



SG Coating (Tin+TiCN)

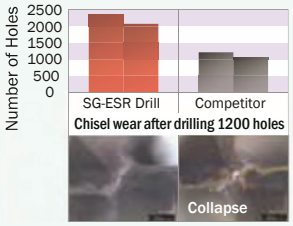
Well Suited for Drilling:

Tool Life in Carbon Steel



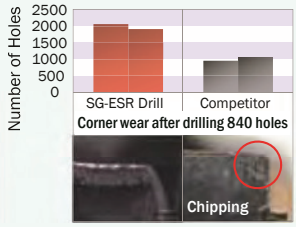
Cutting Condition	
Drill Diameter	6mm
SFM (RPM)	130 (2100)
Feed	0.008 ipr / 16.5 ipm
Work Material	Carbon Steel
Hole Depth	19mm (Through Hole)
Cutting Fluid	Water soluble

Tool Life in Alloy Steel



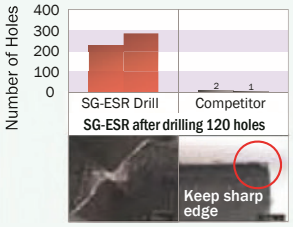
Cutting Condition	
Drill Diameter	2mm
SFM (RPM)	90 (4,400)
Feed	0.004 ipr / 15.7 ipm
Work Material	Alloy Steel (32 HRC)
Hole Depth	6mm (Blind Hole)
Cutting Fluid	Water Soluble

Tool Life in 400-Series Stainless



Cutting Condition	
Drill Diameter	6mm
SFM (RPM)	130 (2100)
Feed	0.007 ipr / 15.7 ipm
Work Material	400-Series Stainless
Hole Depth	19mm (Through Hole)
Cutting Fluid	Water soluble

Tool Life in 304 Stainless Steel



Cutting Condition	
Drill Diameter	12mm
SFM (RPM)	40 (320)
Feed	0.010 ipr / 3.1 ipm
Work Material	304 Stainless Steel
Hole Depth	28mm (Through Hole)
Cutting Fluid	Water soluble

Applicable Work Materials

Drill Name	Structural Steels	Carbon Steels	Alloy Steels Pre-hardened Steels	Hardened Steels Mold Steels	Hardened Steels		Stainless Steels		Titanium Alloys Nickel Alloys	Cast Irons	Aluminum Alloys	Copper Alloys
	SS400	S45C/S50C	SCR/NAK	30~40HRC	40~50HRC	50~65HRC	304SS/316SS	400-Series		FCD/FC	AC/ADC	Cu
SGESR Drill	○	○	○	●	X	X	○	○	●	○	○	○

○: Great ●: Good X: Not Suitable

Features

New Style Parabolic Drills

- Flute geometry and coating enables non pecking deep hole drilling up to 20XD.
- AG Coating (TiAlN) and HSS-Co material increases tool life.

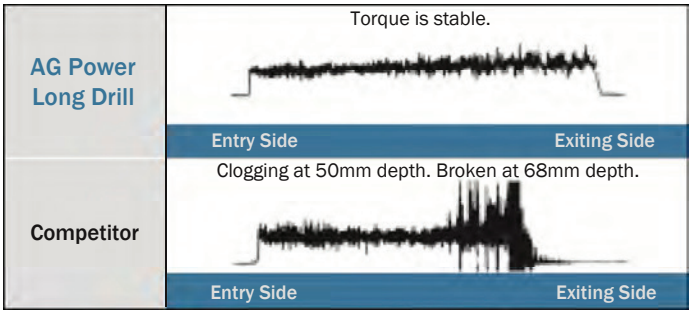
Work Materials

- Carbon Steels
- Mold Steels
- Cast Irons
- Alloy Steels
- Hardened Steels (under 40HRC)

Performance

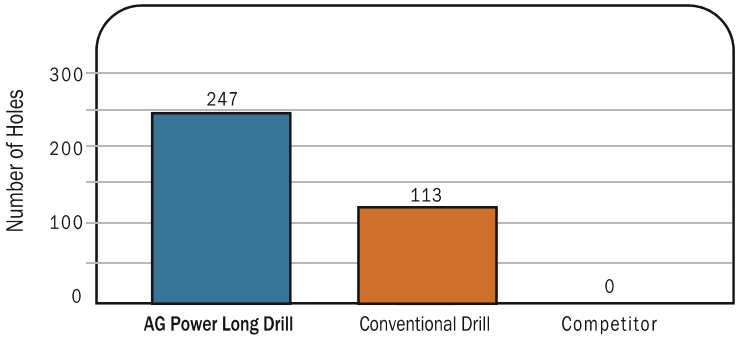
AG Power Long Drill vs. Standard Drill

Stable Torque



Cutting Condition	
Drill Dia.	6 mm (0.236in)
Material	1050 (217HB) S50C
Hole Depth	102 mm (4.01in : 17D) through
Speed	1590 rpm (98 SFM)
Feed	0.1mm/rev (6.26 IPM)
Pecking	non
Coolant	Emulsion

Long Tool Life



Features

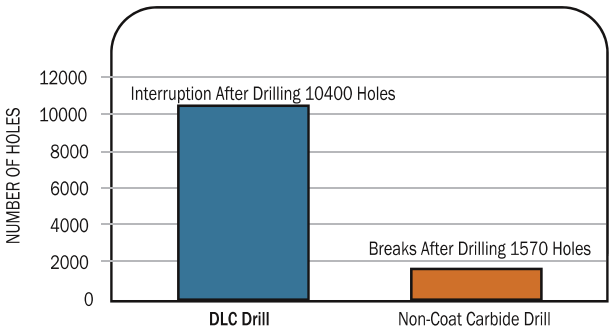
- Utilizes high accuracy shape of lip relief (2 rake thinning)
- Utilizes flute geometry resulting in excellent chip control and dry milling with no edge build-up
- End mill style shanks for highly precise and accurate drilling

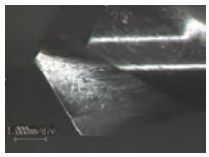
Work Materials

- Aluminums
- Aluminum Alloy Casting
- Copper Alloys
- Aluminum Alloys
- Aluminum Alloy Die-Casting

Performance

Wet Drilling By DLC Drill



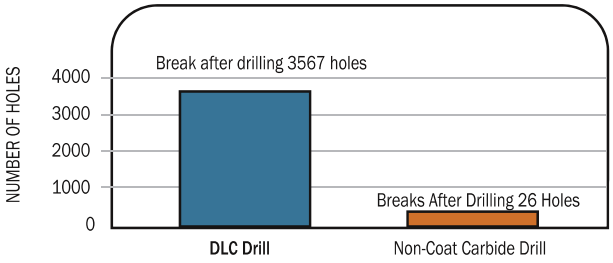


Small wear after drilling 10400 holes

Cutting Condition

Drill Dia.	5.5 mm (0.2165 in)
Material	AlMg2.5 (A5052)
Hole Depth	27.5 mm (1.06 in) blind
Speed	100m/min (328 SFM)
Feed	0.08mm/rev (18.26 IPM)
Coolant	Emulsion

Dry Drilling By DLC Drill



Cutting Condition

Drill Dia.	5.5 mm (0.2165 in)
Material	ADC12
Hole Depth	16.5 mm (0.65 in) blind
Speed	100m/min (328 SFM)
Feed	0.08mm/rev (18.26 IPM)
Coolant	Dry

Reading Your Drill Chips

When drilling, your chips will tell you a story. It is a common thought that running a drill at a slower feed or speed is “safer”, but that is not always the case. Sometimes, it can even be worse than running the drill too fast.

0.5% Dc

2.0% Dc

1.0% Dc

3.0% Dc

Chip shape will tell you a lot. The ideal shape for a chip can be described as “6’s and 9’s”. This means that the chip is short, like the tail of a 6, but curls up. Above there is an example of chips from some carbon steel. These pictures show that a slow speed did not help with tool life, but actually created improper chips that led to a decrease in tool life and poor quality hole. To the right, there is an example of how too slow a feed can cause the chisel of the drill to walk, creating an imperfect hole.

1.0% Dc

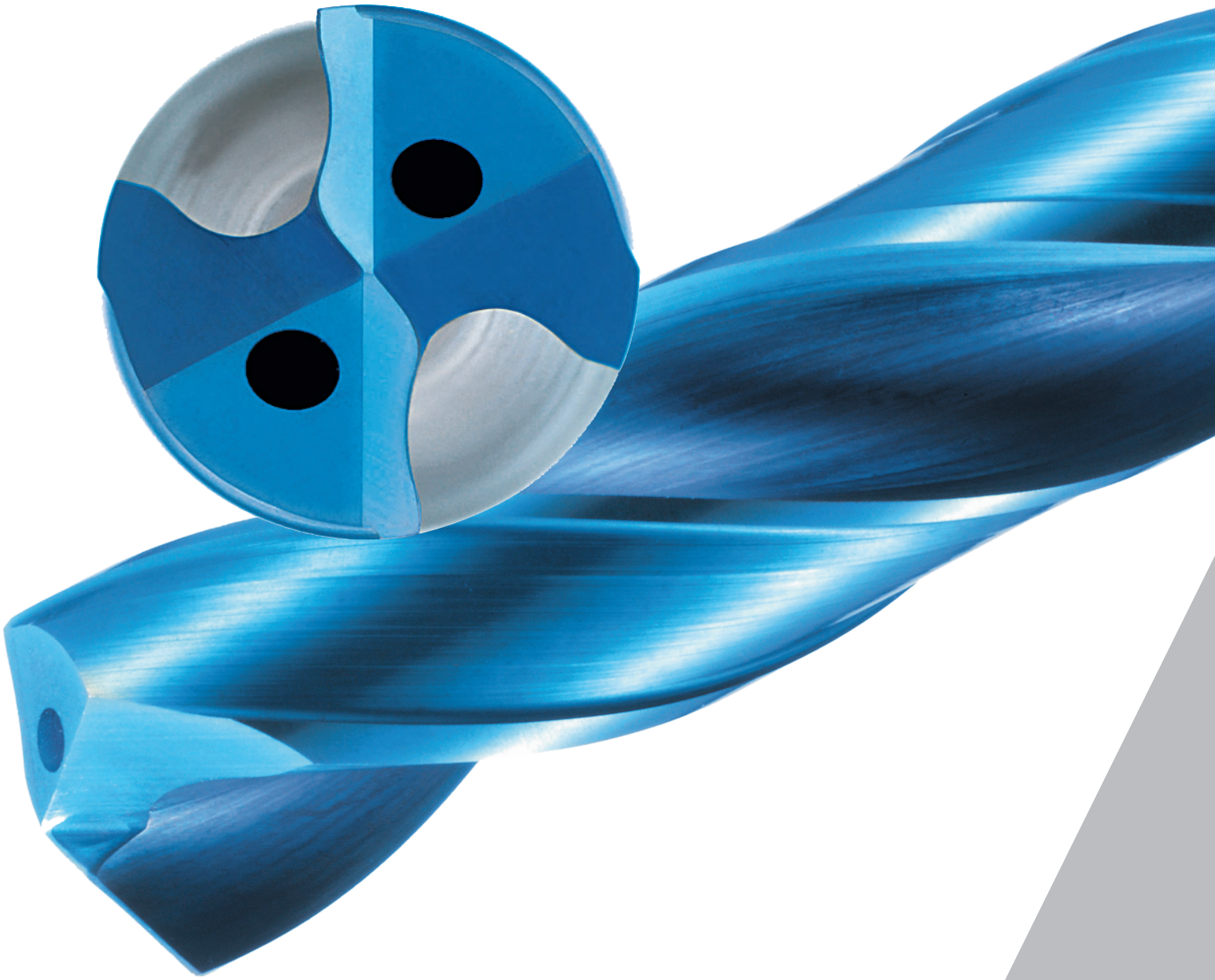
2.0% Dc

3.0% Dc

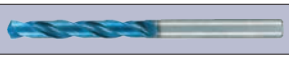
NEW!
Micro sizes now available in 25D, 30D and 40D

AQUA DRILL EX CARBIDE DRILL SERIES

Deep Hole 10D, 15D, 20D, 25D, 30D, 40D
Aqua EX Oil Hole Pilot



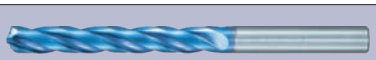
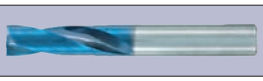
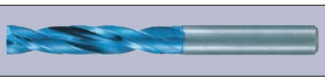
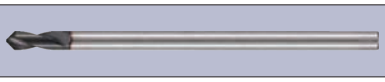
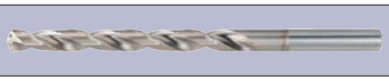
HIGH PERFORMANCE DRILLS

List No.	Drill Name		Material	Coating	Stock Size		Product Page
Aqua REVO Drill							
9860 9861		**Stub Length**	Carbide	REVO-D	Metric Fractional	2.0 to 16.0 1/8 to 5/8	p. 58-59
9862 9863		**Jobber Length**			Metric Fractional	2.0 to 16.0 1/8 to 5/8	p. 60-61
Aqua REVO Drill Oil Hole							
9864		**JIS - 3D**	Carbide	REVO-D	Metric	3.0 to 16.0	p. 64-65
9866		**JIS - 5D**			Metric	3.0 to 16.0	p. 68-69
9872 9873		**DIN - 3D**			Metric Fractional	3.0 to 16.0 1/8 to 5/8	p. 62-63
9874 9875		**DIN - 5D**			Metric Fractional	3.0 to 16.0 1/8 to 5/8	p. 66-67
9868 9869		**8D**			Metric Fractional	3.0 to 16.0 1/8 to 5/8	p. 70-71
Aqua Drill EX Oil Hole							
9604		**3D**	Carbide	Aqua EX	Metric	1.0 to 2.9	p. 93
9606		**5D**			Metric	1.0 to 2.9	p. 93
9612		**10D**			Metric	1.0 to 12.0	p. 72
9614 9615		**15XD**			Metric Fractional	1.0 to 12.0 1/8 to 9/16	p. 73
9616 9617		**20XD**			Metric Fractional	1.0 to 10.0 1/8 to 25/64	p. 74
9618 9619		**25XD**			Metric Fractional	1.0 to 8.0 1/8 to 3/8	p. 76
9620 9621		**30XD**			Metric Fractional	1.0 to 8.0 1/8 to 5/16	p. 77
9626 9627		**40XD**			Metric Fractional	1.0 to 7.0 1/8 to 5/16	p. 79
9622 9623		**Pilot**			Metric Fractional	1.015 to 12.03 1/8 to 9/16	p. 81-82
Aqua Drill Micro							
9544		**10D**	Carbide	Aqua	Metric	0.2 to 1.99	p. 90-91
Aqua REVO Drill Micro							
9878		**5D**	Carbide	REVO-D	Metric	0.5 to 1.99	p. 86-87
9880		**10D**			Metric	0.5 to 1.99	p. 88-89
DLC Drill							
9524 9520		**5D**	Carbide	DLC	Metric	0.5 to 12	p. 94

● : Great ○ : Good Δ : OK – : Not Recommended

List No.	Cutting Condition Page	Workpiece Material																
		Carbon Steel		Alloy Steel	Mold Steel	Hardened Steel			Stainless Steel		PH Stainless	Titanium Alloys	Nickel Alloys	Cast Iron		Aluminum		Copper Alloys
		Low Carbon	High Carbon	20 ~ 30	30 ~ 40	HRc 40 ~ 50	HRc 50 ~ 55	HRc 55 ~ 65	Austenitic 300 Series	Martensitic 400 Series				Soft <200HB	Hard >200HB	6061 7075	Casting	
9860	p. 59	●	●	●	●	●	○	–	Δ	○	○	○	○	●	●	○	○	○
9862 9863	p. 61	●	●	●	●	●	○	–	Δ	○	○	○	○	●	●	○	○	○
9864	p. 65	●	●	●	●	●	○	–	●	●	●	○	○	●	●	○	○	○
9866	p. 69	●	●	●	●	●	○	–	●	●	●	○	○	●	●	○	○	○
9872 9873	p. 63	●	●	●	●	●	○	–	●	●	●	○	○	●	●	○	○	○
9874 9875	p. 67	●	●	●	●	●	○	–	●	●	●	○	○	●	●	○	○	○
9868 9869	p. 71	●	●	●	●	●	○	–	●	●	●	○	○	●	●	○	○	○
9604	p. 93	●	●	●	●	–	–	–	●	●	●	●	●	○	○	○	○	○
9606	p. 93	●	●	●	●	–	–	–	●	●	●	●	●	○	○	○	○	○
9612	p. 75	●	●	●	●	○	–	–	●	●	●	○	○	●	●	○	○	○
9614 9615	p. 75	●	●	●	●	○	–	–	●	●	●	○	○	●	●	○	○	○
9616 9617	p. 75	●	●	●	●	○	–	–	●	●	●	○	○	●	●	○	○	○
9618 9619	p. 78	●	●	●	●	○	–	–	●	●	●	○	○	●	●	○	○	○
9620 9621	p. 78	●	●	●	●	○	–	–	●	●	●	○	○	●	●	○	○	○
9626 9627	p. 80	●	●	●	●	○	–	–	●	●	●	○	○	●	●	○	○	○
9622 9623	p. 82	●	●	●	●	○	–	–	●	●	●	○	○	●	●	○	○	○
9544	p. 92	●	●	●	●	●	–	–	●	●	●	○	○	○	○	○	○	○
9878	p. 87	●	●	●	●	●	○	–	●	●	●	○	○	○	○	○	○	○
9880	p. 89	●	●	●	●	●	○	–	●	●	●	○	○	○	○	○	○	○
9524 9520	p. 95	-	-	-	-	-	-	–	-	-	-	-	-	-	-	●	●	●

HIGH PERFORMANCE DRILLS

List No.	Drill Name		Material	Coating	Stock Size			Product Page
Aqua Drill EX Oil Hole 3 Flute								
9826		**3D**	Carbide	Aqua EX	Metric		3.0 to 16.0	p. 83
9820		**5D**			Metric		3.0 to 16.0	p. 84
Aqua Drill EX Flat								
9628		**Super Stub Length**	Carbide	Aqua EX	Metric Fractional		2.0 to 20.0	p. 107
9610 9611		**Stub Length**			Metric Fractional		0.2 to 20.0 1/8 to 3/4	p. 96-97
9830 9831		**Corner Radius**			Metric Fractional		3.0 to 12.0 1/8 to 3/4	p. 98
9818 9819		**Jobber Length**			Metric Fractional		3.0 to 20.0 1/8 to 3/4	p. 100
9816 9817		**Long Shank**			Metric Fractional		3.0 to 20.0 1/8 to 3/4	p. 101
Aqua Drill EX Flat Oil Hole								
9812 9813		**3D**	Carbide	Aqua EX	Metric Fractional		1.0 to 16.0 1/8 to 3/4	p. 103-104
9814 9815		**5D**			Metric Fractional		1.0 to 16.0 1/8 to 5/8	p. 105-106
Aqua Drill EX Starter								
9624		**Starter**	Carbide	Aqua EX	Metric		3.0 to 20.0	p. 109
AG Drill								
6502		**Starter**	HSS-Co	AG	Metric		3.0 to 20.0	p. 110
6504		**Starter Ext. Length**			Metric		3.0 to 20.0	p. 110
6540P		**Parabolic Long Drill**			Ser. 1	Metric Fractional	1.0 to 13.0 1/8 to 3/8	p. 121
					Ser. 2	Metric Fractional	1.0 to 10.0 1/8 to 3/8	
6541P					Ser. 3	Metric Fractional	3.0 to 10.0 1/8 to 5/16	
SG Drill								
7572P 7573P		**Stub Length**	PM-HSS	SG	Metric Fractional Letter Wire		0.5 to 20.0 3/64 to 3/4 B to Z #1 to #76	p. 111-116
7574P 7575P		**Jobber Length**			Metric Fractional Letter Wire		2.0 to 32.0 3/32 to 3/4 B to Z #1 to #45	p. 117-118
7596P 7591P		**Oil Hole**			Metric Fractional		3.0 to 12.0 1/8 to 3/4	p. 120

● : Great ○ : Good Δ : OK – : Not Recommended

List No.	Cutting Condition Page	Workpiece Material																
		Carbon Steel		Alloy Steel	Mold Steel	Hardened Steel			Stainless Steel		PH Stainless	Titanium Alloys	Nickel Alloys	Cast Iron		Aluminum		Copper Alloys
		Low Carbon	High Carbon			HRc			Austenitic 300 Series	Martensitic 400 Series				Soft <200HB	Hard >200HB	6061 7075	Cast	
				20 ~ 30	30 ~ 40	40 ~ 50	50 ~ 55	55 ~ 65										
Aqua Drill EX Oil Hole 3 Flute																		
9826	p. 84	●	●	●	●	●	–	–	●	●	●	–	○	●	●	–	○	–
9820	p. 84	●	●	●	●	●	–	–	●	●	●	–	○	●	●	–	○	–
Aqua Drill EX Flat																		
9628	p. 82	●	●	●	●	○	–	–	●	●	○	○	○	●	●	○	○	○
9610 9611	p. 99	●	●	●	●	○	–	–	●	●	○	○	○	●	●	○	○	○
9830 9831	p. 99	●	●	●	●	○	–	–	○	●	○	○	○	●	●	○	○	○
9818 9819	p. 102	●	●	●	●	○	–	–	○	●	○	–	○	●	●	○	○	○
9816 9817	p. 102	●	●	●	●	○	–	–	○	●	○	–	○	●	●	○	○	○
Aqua Drill EX Flat Oil Hole																		
9812 9813	p. 104	●	●	●	●	○	–	–	●	●	●	–	○	●	●	●	●	●
9814 9815	p. 106	●	●	●	●	○	–	–	●	●	●	–	○	●	●	●	●	●
Aqua Drill EX Starter																		
9624	p. 109	●	●	●	●	○	–	–	●	●	●	○	○	●	●	○	○	○
AG Drill																		
6502	p. 109	●	●	●	●	–	–	–	○	○	○	○	○	○	○	○	○	○
6504	p. 109	●	●	●	●	–	–	– –	○	○	○	○	○	○	○	○	○	○
6540P 6541P	p. 122	●	●	●	●	–	–	–	–	–	–	–	–	●	●	–	–	–
SG Drill																		
7572P 7573P	p. 116	●	●	●	●	–	–	–	●	●	●	●	○	●	●	○	○	○
7574P 7575P	p. 119	●	●	●	○	–	–	–	●	●	●	○	–	●	●	○	○	○
7596P 7591P	p. 120	●	●	●	●	–	–	–	○	○	○	○	○	○	○	○	○	○

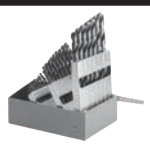
STRAIGHT SHANK DRILLS

List No.	Drill Name		Material	Coating	Stock Size		Product Page
Screw Machine Length							
561		**Bright**	HSS	Bright	Fractional Wire Letter	3/64 to 2 #1 to #60 A to Z	p. 125
561P		**TiN Coated**		TiN	Fractional Wire	1/16 to 1/2 #1 to #52	p. 126
563		**Aircraft NAS 907-C**		Black Oxide	Fractional Wire Letter	3/64 to 1/2 #1 to #52 A to Z	p. 127
6563		**Aircraft NAS 907-C**	HSCO		Fractional Wire Letter	3/64 to 1/2 #1 to #52 A to Z	p. 128
Jobber Length							
501A		**Bright**	HSS	Bright	Fractional Wire Letter	1/64 to 11/16 #1 to #80 A to Z	p. 129
500		**Standard**		Black Oxide	Metric	0.2 to 17.5	p. 130
501		**Standard**			Fractional Wire Letter	3/64 to 11/16 #1 to #60 A to Z	p. 131
6501		**Aircraft NAS 907-J**	HSCO		Fractional Wire Letter	1/64 to 1/2 #1 to #80 A to Z	p. 132
6520		**Cobalt**			Metric	0.5 to 13.0	p. 133
520P		**TiN Coated**	HSS	TiN	Metric	0.5 to 13.0	p. 134
501P		**TiN Coated**			Fractional Wire	1/16 to 1/2 #1 to #52	p. 135
517P		**Parabolic - TiN Coated**			Fractional Wire	1/16 to 1/2 #1 to #52	p. 136

● : Great ○ : Good Δ : OK – : Not Recommended

List No.	Cutting Condition Page	Workpiece Material																
		Carbon Steel		Alloy Steel	Mold Steel	Hardened Steel			Stainless Steel		PH Stainless	Titanium Alloys	Nickel Alloys	Cast Iron		Aluminum		Copper Alloys
						HRc												
		Low Carbon	High Carbon	20 ~ 30	30 ~ 40	40 ~ 50	50 ~ 55	55 ~ 65	Austenitic 300 Series	Martensitic 400 Series				Soft <200HB	Hard >200HB	6061 7075	Cast	
Screw Machine Length																		
561	p. 148	○	○	○	–	–	–	–	–	–	–	–	–	Δ	–	Δ	Δ	Δ
561P	p. 148	●	●	●	Δ	–	–	–	Δ	Δ	Δ	Δ	Δ	○	Δ	Δ	Δ	Δ
563	p. 148	○	○	○	–	–	–	–	–	–	–	–	–	Δ	Δ	Δ	Δ	Δ
6563	p. 148	●	●	●	Δ	–	–	–	Δ	○	Δ	○	Δ	Δ	Δ	Δ	Δ	Δ
Jobber Length																		
501A	p. 148	○	○	○	–	–	–	–	–	–	–	–	–	Δ	–	Δ	Δ	Δ
500	p. 148	○	○	○	–	–	–	–	–	–	–	–	–	Δ	Δ	Δ	Δ	Δ
501	p. 148	○	○	○	–	–	–	–	–	–	–	–	–	Δ	Δ	Δ	Δ	Δ
501	p. 148	●	●	●	Δ	–	–	–	Δ	○	Δ	○	Δ	Δ	Δ	Δ	Δ	Δ
6520	p. 148	●	●	●	Δ	–	–	–	Δ	○	Δ	○	Δ	Δ	Δ	Δ	Δ	Δ
520P	p. 148	●	●	●	Δ	–	–	–	Δ	Δ	Δ	Δ	Δ	○	Δ	Δ	Δ	Δ
501P	p. 148	●	●	●	Δ	–	–	–	Δ	Δ	Δ	Δ	Δ	○	Δ	Δ	Δ	Δ
517P	p. 149	●	●	●	Δ	–	–	–	Δ	Δ	Δ	Δ	Δ	○	Δ	Δ	Δ	Δ

STRAIGHT SHANK DRILLS

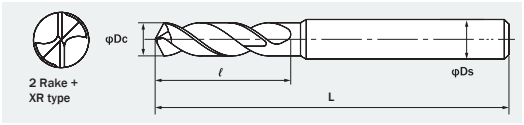
List No.	Drill Name		Material	Coating	Stock Size		Product Page
Taper Length Drill							
531		**Standard**	HSS	Black Oxide	Fractional	1/64 to 1/2	p. 137
6531		**Cobalt**	HSCO		Fractional	1/16 to 3/4	p. 138
545P		**Parabolic - TiN Coated**	HSS	TiN	Fractional	1/16 to 1/2	p. 139
Extra Length Drill							
551		**12" OAL**	HSS	Bright	Fractional	1/8 to 1	p. 140
551		**18" OAL**			Fractional	1/8 to 1	p. 140
6551		**10" OAL**	HSCO	Black Oxide	Fractional	3/16 to 1/2	p. 141
Oil Hole Drill							
581		**Standard**	HSCO	Bright	Fractional	3/8 to 1-1/2	p. 142
Taper Shank Drill							
601		**Regular**	HSS	Black Oxide	Fractional	9/32 to 3-1/2	p. 143
651		**Extra Length - 18"**		Bright	Fractional	1/4 to 2	p. 144
651		**Extra Length - 24"**			Fractional	5/16 to 2-1/2	p. 144
683		**Oil Hole**	HSCO		Fractional	3/8 to 1-1/2	p. 145
Silver and Deming Drills							
575		**1/2" Reduced Shank**	HSS	Bright	Fractional	1/2 to 1-1/2	p. 146
HSS and HSCO Drill Sets							
599		**Drill Sets**	HSS, HSCO	Black Oxide, Bright	See Catalog Page For Size Information		p. 147

● : Great ○ : Good Δ : OK – : Not Recommended

List No.	Cutting Condition Page	Workpiece Material																	
		Carbon Steel		Alloy Steel	Mold Steel	Hardened Steel			Stainless Steel		PH Stainless	Titanium Alloys	Nickel Alloys	Cast Iron		Aluminum		Copper Alloys
						HRc												
		Low Carbon	High Carbon	20 ~ 30	30 ~ 40	40 ~ 50	50 ~ 55	55 ~ 65	Austenitic 300 Series	Martensitic 400 Series				Soft <200HB	Hard >200HB	6061 7075	Cast	
531	p. 148	○	○	○	–	–	–	–	–	–	–	–	–	Δ	Δ	Δ	Δ	Δ
6531	p. 148	●	●	●	○	–	–	–	Δ	○	Δ	○	Δ	Δ	Δ	Δ	Δ	Δ
545P	p. 149	●	●	●	○	–	–	–	Δ	Δ	Δ	Δ	Δ	○	Δ	Δ	Δ	Δ
551	p. 149	○	○	○	–	–	–	–	–	–	–	–	–	Δ	–	Δ	Δ	Δ
551	p. 149	○	○	○	–	–	–	–	–	–	–	–	–	Δ	–	Δ	Δ	Δ
6551	p. 149	●	●	●	Δ	–	–	–	Δ	○	Δ	○	Δ	Δ	Δ	Δ	Δ	Δ
581	p. 150	●	●	●	●	–	–	–	Δ	○	○	○	Δ	Δ	Δ	Δ	Δ	Δ
601	p. 150	●	●	●	○	○	–	–	●	●	●	–	○	●	●	●	●	●
651	p. 150	●	●	●	○	○	–	–	●	●	●	○	○	●	●	○	○	○
651	p. 150	●	●	●	○	–	–	–	○	○	○	○	○	○	○	○	○	○
683	p. 150	●	●	●	●	–	–	–	–	–	–	–	–	●	●	–	–	–
575	p. 150	●	●	●	–	–	–	–	–	–	–	–	–	○	–	○	○	○
599	–	○	○	○	–	–	–	–	–	–	–	–	–	Δ	Δ	Δ	Δ	Δ

AQUA REVO Drill Stub

Carbide (Material) | REVO D (Coating) | h7 (Dia. Tolerance) | 135° (Point Angle) | 30° (Helix) | h6 (Shank Dia. Tol.) | 2.0-16.0 (Size Range)



LIST 9860 Metric Sizes
LIST 9861 Wire, Fractional & Letter Sizes

Unit: mm

EDP#	Size	Decimal Equiv.	Wire, Fractional, Letter	Flute Length	Overall Length	Shank Diameter
	Dc			l	L	Ds
0769955	2.000	0.0787		9	45	3
0769978	2.100	0.0827		11		
0769990	2.200	0.0866				
0770010	2.300	0.0906				
1547745	2.381	0.0938	3/32			
0770033	2.400	0.0945				
0770056	2.500	0.0984				
0770079	2.600	0.1024		14		
0770091	2.700	0.1063				
1547751	2.778	0.1094	7/64			
0770113	2.800	0.1102				
0770136	2.900	0.1142				
0770159	3.000	0.1181				
0770171	3.100	0.1220		20	55	4
1547768	3.175	0.1250	1/8			
0770194	3.200	0.1260				
0770216	3.300	0.1299				
0770239	3.400	0.1339				
0770251	3.500	0.1378				
1547774	3.572	0.1406	9/64	22		
0770274	3.600	0.1417				
0770297	3.700	0.1457				
0770319	3.800	0.1496				
0770331	3.900	0.1535				
1547780	3.969	0.1563	5/32			
0770354	4.000	0.1575				
1548094	4.039	0.1590	#21	24	62	6
1548100	4.089	0.1610	#20			
0773783	4.100	0.1614				
0773790	4.200	0.1654				
0773805	4.300	0.1693				
1547797	4.366	0.1719	11/64			
0773811	4.400	0.1732				
0773828	4.500	0.1772				
0773834	4.600	0.1811		26		
0773840	4.700	0.1850				
1547802	4.762	0.1875	3/16			
0773857	4.800	0.1890				
0773863	4.900	0.1929				
0773870	5.000	0.1969				
0770572	5.100	0.2008			66	
1548116	5.105	0.2010	#7			
1547819	5.159	0.2031	13/64			
0770595	5.200	0.2047				
0770617	5.300	0.2087				
0770630	5.400	0.2126				
1548122	5.410	0.2130	#3			
0770652	5.500	0.2165				
1547825	5.556	0.2187	7/32	28		
0770675	5.600	0.2205				
1548139	5.613	0.2210	#2			
0770698	5.700	0.2244				
0770710	5.800	0.2283				
0770732	5.900	0.2323				
1547831	5.953	0.2344	15/64			
0770755	6.000	0.2362				

EDP#	Size	Decimal Equiv.	Wire, Fractional, Letter	Flute Length	Overall Length	Shank Diameter
	Dc			l	L	Ds
0773886	6.100	0.2402		32	74	8
0773892	6.200	0.2441				
0773908	6.300	0.2480				
1547848	6.350	0.2500	1/4			
0773914	6.400	0.2520				
0773920	6.500	0.2559				
1548145	6.528	0.2570	F	35		
0773937	6.600	0.2598				
0773943	6.700	0.2638				
1547854	6.747	0.2656	17/64			
0773950	6.800	0.2677				
0773966	6.900	0.2717				
1548151	6.909	0.2720	I			
0773972	7.000	0.2756			79	
1548168	7.036	0.2770	J			
0770864	7.100	0.2795				
1547860	7.144	0.2813	9/32			
0770870	7.200	0.2835				
0770887	7.300	0.2874				
0770893	7.400	0.2913				
0770909	7.500	0.2953				
1547877	7.541	0.2969	19/64	38		
0770915	7.600	0.2992				
0770921	7.700	0.3031				
0770938	7.800	0.3071				
0770944	7.900	0.3110				
1547883	7.937	0.3125	5/16			
0770950	8.000	0.3150				
0773989	8.100	0.3189			83	10
0773995	8.200	0.3228				
1548174	8.204	0.3230	P			
0774000	8.300	0.3268				
1547890	8.334	0.3281	21/64			
0774016	8.400	0.3307				
1548180	8.433	0.3320	Q			
0774022	8.5 00	0.3346				
0774039	8.600	0.3386		40		
0774045	8.700	0.3425				
1547905	8.731	0.3437	11/32			
0774051	8.800	0.3465				
0774068	8.900	0.3504				
0774074	9.000	0.3543			89	
0771069	9.100	0.3583				
1547911	9.128	0.3594	23/64			
0771075	9.200	0.3622				
0771081	9.300	0.3661				
1548197	9.347	0.3680	U			
0771098	9.400	0.3701				
0771103	9.500	0.3740				
1547928	9.525	0.3750	3/8	43		
0771110	9.600	0.3780				
0771126	9.700	0.3819				
0771132	9.800	0.3858				
0771149	9.900	0.3898				
1547934	9.922	0.3906	25/64			
0771155	10.000	0.3937				

EDP#	Size	Decimal Equiv.	Wire, Fractional, Letter	Flute Length	Overall Length	Shank Diameter
	Dc			l	L	Ds
0774080	10.100	0.3976		43	95	12
0774097	10.200	0.4016				
0774102	10.300	0.4055				
1547940	10.319	0.4063	13/32			
0774119	10.400	0.4094				
0774125	10.500	0.4134				
0774131	10.600	0.4173		47	102	
0774148	10.700	0.4213				
1547957	10.716	0.4219	27/64			
0774154	10.800	0.4252				
0774160	10.900	0.4291				
0774177	11.000	0.4331				
0771264	11.100	0.4370				
1547963	11.112	0.4375	7/16			
0771270	11.200	0.4409				
0771287	11.300	0.4449				
0771293	11.400	0.4488				
0771309	11.500	0.4528				
1547970	11.509	0.4531	29/64	50		
0771315	11.600	0.4567				
0771321	11.700	0.4606				
0771338	11.800	0.4646				
0771344	11.900	0.4685				
1547986	11.906	0.4687	15/32			
0771350	12.000	0.4724				
0774183	12.100	0.4764				14
0774190	12.200	0.4803				
0774205	12.300	0.4843				
1547992	12.303	0.4844	31/64			
0774211	12.400	0.4882				
0774228	12.500	0.4921				
0774234	12.600	0.4961		52		
0774240	12.700	0.5000				
1548007	12.700	0.5000	1/2			
0774257	12.800	0.5039				
0774263	12.900	0.5079				
0774270	13.000	0.5118				

EDP#	Size	Decimal Equiv.	Wire, Fractional, Letter	Flute Length	Overall Length	Shank Diameter
	Dc			l	L	Ds
1548013	13.097	0.5156	33/64	53	107	14
0771460	13.100	0.5157				
0771476	13.200	0.5197				
0771482	13.300	0.5236				
0771499	13.400	0.5276				
1548020	13.494	0.5313	17/32			
0771504	13.500	0.5315				
0771510	13.600	0.5354		55	110	16
0771527	13.700	0.5394				
0771533	13.800	0.5433				
1548036	13.891	0.5469	35/64			
0771540	13.900	0.5472				
0771556	14.000	0.5512				
0774286	14.100	0.5551				
0774292	14.200	0.5591				
1548042	14.287	0.5625	9/16			
0774308	14.300	0.5630				
0774314	14.400	0.5669				
0774320	14.500	0.5709				
0774337	14.600	0.5748		56	114	
1548059	14.684	0.5781	37/64			
0774343	14.700	0.5787				
0774350	14.800	0.5827				
0774366	14.900	0.5866				
0774372	15.000	0.5906				
1548065	15.081	0.5937	19/32			
0771665	15.100	0.5945				
0771671	15.200	0.5984				
0771688	15.300	0.6024				
0771694	15.400	0.6063				
1548071	15.478	0.6094	39/64			
0771700	15.500	0.6102				
0771716	15.600	0.6142		58		
0771722	15.700	0.6181				
0771739	15.800	0.6220				
1548088	15.875	0.6250	5/8			
0771745	15.900	0.6260				
0771751	16.000	0.6299				

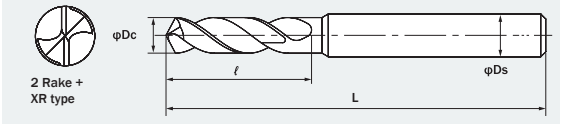
LIST 9860, 9861 Standard Wet Cutting Conditions

Work Material		Structural Steel Carbon Steel Cast Iron		Alloy Steel Heat Treated Steel (20 - 30 HRC)		Mold Steel Hardened Steel (30 - 40 HRC)		Hardened Steel (40 - 50 HRC)		Ductile Cast Iron		Stainless Steel (300 Series)		Nickel Alloys Titanium Alloys PH Stainless		Aluminum Alloy	
Speed (SFM)		320 - 330 SFM		255 - 265 SFM		140 - 150 SFM		100 - 105 SFM		245 - 255 SFM		100 - 110 SFM		65-75 SFM		340 - 360 SFM	
Drill Diameter		RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
Metric	Fractional																
2		16000	0.0023	12700	0.0023	7200	0.0017	4800	0.0014	11900	0.0023	5000	0.0009	4120	0.0010	16750	0.0022
3		10600	0.0035	8500	0.0033	4800	0.0030	3200	0.0023	7950	0.0038	3400	0.0016	2750	0.0017	11200	0.0033
	1/8	10000	0.0038	7950	0.0035	4450	0.0031	2900	0.0025	7500	0.0040	3200	0.0017	2600	0.0017	10500	0.0035
	3/16	6700	0.0056	5300	0.0053	2950	0.0047	1950	0.0037	5000	0.0060	2130	0.0026	1730	0.0026	7000	0.0053
5		6400	0.0059	5050	0.0055	2800	0.0051	1850	0.0040	4750	0.0063	2030	0.0027	1650	0.0028	6700	0.0055
	1/4	5000	0.0075	4000	0.0068	2200	0.0064	1450	0.0051	3750	0.0080	1600	0.0034	1300	0.0035	5300	0.0070
	5/16	4050	0.0094	3200	0.0075	1800	0.0078	1200	0.0064	3000	0.0100	1280	0.0043	1040	0.0044	4250	0.0086
8		4000	0.0095	3150	0.0076	1750	0.0079	1150	0.0065	2950	0.0101	1270	0.0043	1030	0.0044	4200	0.0088
	3/8	3350	0.0113	2650	0.0090	1500	0.0089	1000	0.0071	2500	0.0113	1070	0.0048	870	0.0046	3500	0.0105
10		3200	0.0118	2500	0.0094	1400	0.0094	950	0.0074	2400	0.0119	1020	0.0050	830	0.0048	3350	0.0110
12		2650	0.0132	2100	0.0109	1200	0.0102	800	0.0084	2000	0.0134	850	0.0060	690	0.0058	2800	0.0123
	1/2	2500	0.0140	2000	0.0115	1100	0.0107	750	0.0088	1900	0.0141	800	0.0063	650	0.0061	2600	0.0130
16		2000	0.0157	1600	0.0145	900	0.0127	600	0.0098	1500	0.0157	640	0.0067	510	0.0074	2100	0.0157

1) Adjust cutting condition according to the rigidity of machine or work clamp state.
2) When rigidity is low and chattering occurs, reduce the rotation and feed rate.
3) Wet conditions are for drilling with water soluble cutting fluid.
4) In non-water soluble cutting fluid, reduce the rotation and feed rate by 20%.
5) Drilling in stainless steel will require pecking. Recommended peck depth is 0.1 x Dc.
6) Use air blow for cooling and chip evacuation when drilling dry.
7) Use the tables values for drilling depth under 3 x Dc.
8) Where chip jamming is a problem, add pecking.
9) Retract plane for peck drilling should be set to the top of the hole.
10) Recommended peck depth is 0.2 - 1.0 x Dc.

AQUA REVO Drill Regular

Carbide (Material) | REVO D (Coating) | h7 (Dia. Tolerance) | 135° (Point Angle) | 30° (Helix) | h6 (Shank Dia. Tol.) | 2.0-16.0 (Size Range)



LIST 9862 Metric Sizes
LIST 9863 Wire, Fractional & Letter Sizes

Unit: mm

EDP#	Size	Decimal Equiv.	Wire, Fractional, Letter	Flute Length	Overall Length	Shank Diameter
	Dc			l	L	Ds
0771768	2.000	0.0787		15	49	3
0771780	2.100	0.0827		18		
0771802	2.200	0.0866				
0771825	2.300	0.0906				
1548202	2.381	0.0938	3/32			
0771848	2.400	0.0945				
0771860	2.500	0.0984				
0771883	2.600	0.1024		20		
0771905	2.700	0.1063				
1548219	2.778	0.1094	7/64			
0771928	2.800	0.1102				
0771940	2.900	0.1142				
0771963	3.000	0.1181				
0771986	3.100	0.1220		25	60	4
1548225	3.175	0.1250	1/8			
0772007	3.200	0.1260				
0772020	3.300	0.1299				
0772042	3.400	0.1339				
0772065	3.500	0.1378				
1548231	3.572	0.1406	9/64	28		
0772088	3.600	0.1417				
0772100	3.700	0.1457				
0772122	3.800	0.1496				
0772145	3.900	0.1535				
1548248	3.969	0.1563	5/32			
0772168	4.000	0.1575				
1548552	4.039	0.1590	#21	32	77	6
1548569	4.089	0.1610	#20			
0774389	4.100	0.1614				
0774395	4.200	0.1654				
0774400	4.300	0.1693				
1548254	4.366	0.1719	11/64			
0774417	4.400	0.1732				
0774423	4.500	0.1772				
0774430	4.600	0.1811		39		
0774446	4.700	0.1850				
1548260	4.762	0.1875	3/16			
0774452	4.800	0.1890				
0774469	4.900	0.1929				
0774475	5.000	0.1969				
0772386	5.100	0.2008		40	82	
1548575	5.105	0.2010	#7			
1548277	5.159	0.2031	13/64			
0772408	5.200	0.2047				
0772420	5.300	0.2087				
0772443	5.400	0.2126				
1548581	5.410	0.2130	#3			
0772466	5.500	0.2165				
1548283	5.556	0.2187	7/32	42		
0772489	5.600	0.2205				
1548598	5.613	0.2210	#2			
0772500	5.700	0.2244				
0772523	5.800	0.2283				
0772546	5.900	0.2323				
1548290	5.953	0.2344	15/64			
0772569	6.000	0.2362				

EDP#	Size	Decimal Equiv.	Wire, Fractional, Letter	Flute Length	Overall Length	Shank Diameter
	Dc			l	L	Ds
0774481	6.100	0.2402		43	84	8
0774498	6.200	0.2441				
0774503	6.300	0.2480				
1548305	6.350	0.2500	1/4			
0774510	6.400	0.2520				
0774526	6.500	0.2559				
1548603	6.528	0.2570	F	44		
0774532	6.600	0.2598				
0774549	6.700	0.2638				
1548311	6.747	0.2656	17/64			
0774555	6.800	0.2677				
0774561	6.900	0.2717				
1548610	6.909	0.2720	I			
0774578	7.000	0.2756				
1548626	7.036	0.2770	J	46	91	
0772678	7.100	0.2795				
1548328	7.144	0.2813	9/32			
0772684	7.200	0.2835				
0772690	7.300	0.2874				
0772706	7.400	0.2913				
0772712	7.500	0.2953				
1548334	7.541	0.2969	19/64	47		
0772729	7.600	0.2992				
0772735	7.700	0.3031				
0772741	7.800	0.3071				
0772758	7.900	0.3110				
1548340	7.937	0.3125	5/16			
0772764	8.000	0.3150				
0774584	8.100	0.3189		55	99	10
0774590	8.200	0.3228				
1548632	8.204	0.3230	P			
0774606	8.300	0.3268				
1548357	8.334	0.3281	21/64			
0774612	8.400	0.3307				
1548649	8.433	0.3320	Q			
0774629	8.500	0.3346				
0774635	8.600	0.3386		57		
0774641	8.700	0.3425				
1548363	8.731	0.3437	11/32			
0774658	8.800	0.3465				
0774664	8.900	0.3504				
0774670	9.000	0.3543				
0772873	9.100	0.3583		60	107	
1548370	9.128	0.3594	23/64			
0772880	9.200	0.3622				
0772896	9.300	0.3661				
1548655	9.347	0.3680	U			
0772901	9.400	0.3701				
0772918	9.500	0.3740				
1548386	9.525	0.3750	3/8	62		
0772924	9.600	0.3780				
0772930	9.700	0.3819				
0772947	9.800	0.3858				
0772953	9.900	0.3898				
1548392	9.922	0.3906	25/64			
0772960	10.000	0.3937				

EDP#	Size	Decimal Equiv.	Wire, Fractional, Letter	Flute Length	Overall Length	Shank Diameter
	Dc			l	L	Ds
0774687	10.100	0.3976		68	116	12
0774693	10.200	0.4016				
0774709	10.300	0.4055				
1548408	10.319	0.4063	13/32			
0774715	10.400	0.4094				
0774721	10.500	0.4134				
0774738	10.600	0.4173		70		
0774744	10.700	0.4213				
1548414	10.716	0.4219	27/64			
0774750	10.800	0.4252				
0774767	10.900	0.4291				
0774773	11.000	0.4331				
0773078	11.100	0.4370		73	123	
1548420	11.112	0.4375	7/16			
0773084	11.200	0.4409				
0773090	11.300	0.4449				
0773106	11.400	0.4488				
0773112	11.500	0.4528				
1548437	11.509	0.4531	29/64			
0773129	11.600	0.4567		76		
0773135	11.700	0.4606				
0773141	11.800	0.4646				
0773158	11.900	0.4685				
1548443	11.906	0.4687	15/32			
0773164	12.000	0.4724				
0774780	12.100	0.4764		79	138	14
0774796	12.200	0.4803				
0774801	12.300	0.4843				
1548450	12.303	0.4844	31/64			
0774818	12.400	0.4882				
0774824	12.500	0.4921				
0774830	12.600	0.4961		81		
0774847	12.700	0.5000				
1548466	12.700	0.5000	1/2			
0774853	12.800	0.5039				
0774860	12.900	0.5079				
0774876	13.000	0.5118				

EDP#	Size	Decimal Equiv.	Wire, Fractional, Letter	Flute Length	Overall Length	Shank Diameter
	Dc			l	L	Ds
1548472	13.097	0.5156	33/64	81	148	14
0773273	13.100	0.5157		87		
0773280	13.200	0.5197				
0773296	13.300	0.5236				
0773301	13.400	0.5276				
1548489	13.494	0.5313	17/32			
0773318	13.500	0.5315				
0773324	13.600	0.5354		90		
0773330	13.700	0.5394				
0773347	13.800	0.5433				
1548495	13.891	0.5469	35/64			
0773353	13.900	0.5472				
0773360	14.000	0.5512				
0774882	14.100	0.5551		92	154	16
0774899	14.200	0.5591				
1548500	14.287	0.5625	9/16			
0774904	14.300	0.5630				
0774910	14.400	0.5669				
0774927	14.500	0.5709				
0774933	14.600	0.5748		94		
1548517	14.684	0.5781	37/64			
0774940	14.700	0.5787				
0774956	14.800	0.5827				
0774962	14.900	0.5866				
0774979	15.000	0.5906				
1548523	15.081	0.5937	19/32	97	162	
0773479	15.100	0.5945				
0773485	15.200	0.5984				
0773491	15.300	0.6024				
0773507	15.400	0.6063				
1548530	15.478	0.6094	39/64			
0773513	15.500	0.6102				
0773520	15.600	0.6142		99		
0773536	15.700	0.6181				
0773542	15.800	0.6220				
1548546	15.875	0.6250	5/8			
0773559	15.900	0.6260				
0773565	16.000	0.6299				

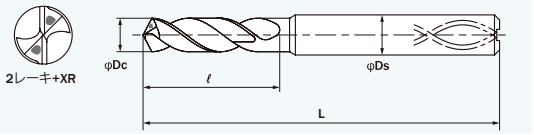
LIST 9862, 9863 Standard Cutting Conditions

Work Material		Structural Steel Carbon Steel Cast Iron		Alloy Steel Heat Treated Steel (20 - 30 HRC)		Mold Steel Hardened Steel (30 - 40 HRC)		Hardened Steel (40 - 50 HRC)		Ductile Cast Iron		Stainless Steel (300 Series)		Nickel Alloys Titanium Alloys PH Stainless		Aluminum Alloy	
Speed (SFM)		320 - 330 SFM		255 - 265 SFM		140 - 150 SFM		100 - 105 SFM		245 - 255 SFM		100 - 110 SFM		65-75 SFM		340 - 360 SFM	
Drill Diameter		RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
Metric	Fractional																
2		16000	0.0023	12700	0.0023	7200	0.0017	4800	0.0014	11900	0.0023	5000	0.0009	4120	0.0010	16750	0.0022
3		10600	0.0035	8500	0.0033	4800	0.0030	3200	0.0023	7950	0.0038	3400	0.0016	2750	0.0017	11200	0.0033
	1/8	10000	0.0038	7950	0.0035	4450	0.0031	2900	0.0025	7500	0.0040	3200	0.0017	2600	0.0017	10500	0.0035
	3/16	6700	0.0056	5300	0.0053	2950	0.0047	1950	0.0037	5000	0.0060	2130	0.0026	1730	0.0026	7000	0.0053
5		6400	0.0059	5050	0.0055	2800	0.0051	1850	0.0040	4750	0.0063	2030	0.0027	1650	0.0028	6700	0.0055
	1/4	5000	0.0075	4000	0.0068	2200	0.0064	1450	0.0051	3750	0.0080	1600	0.0034	1300	0.0035	5300	0.0070
	5/16	4050	0.0094	3200	0.0075	1800	0.0078	1200	0.0064	3000	0.0100	1280	0.0043	1040	0.0044	4250	0.0086
8		4000	0.0095	3150	0.0076	1750	0.0079	1150	0.0065	2950	0.0101	1270	0.0043	1030	0.0044	4200	0.0088
	3/8	3350	0.0113	2650	0.0090	1500	0.0089	1000	0.0071	2500	0.0113	1070	0.0048	870	0.0046	3500	0.0105
10		3200	0.0118	2500	0.0094	1400	0.0094	950	0.0074	2400	0.0119	1020	0.0050	830	0.0048	3350	0.0110
12		2650	0.0132	2100	0.0109	1200	0.0102	800	0.0084	2000	0.0134	850	0.0060	690	0.0058	2800	0.0123
	1/2	2500	0.0140	2000	0.0115	1100	0.0107	750	0.0088	1900	0.0141	800	0.0063	650	0.0061	2600	0.0130
16		2000	0.0157	1600	0.0145	900	0.0127	600	0.0098	1500	0.0157	640	0.0067	510	0.0074	2100	0.0157

1) Adjust cutting condition according to the rigidity of machine or work clamp state.
2) When rigidity is low and chattering occurs, reduce the rotation and feed rate.
3) Wet conditions are for drilling with water soluble cutting fluid.
4) In non-water soluble cutting fluid, reduce the rotation and feed rate by 20%.
5) Drilling in stainless steel will require pecking. Recommended peck interval is 0.1 x Dc.
6) Use air blow for cooling and chip evacuation when drilling dry.
7) Use the tables values for drilling depth under 3 x Dc.
8) Where chip jamming is a problem, add pecking.
9) Retract plane for peck drilling should be set to the top of the hole.
10) Recommended peck depth is 0.2 - 1.0 x Dc.

AQUA REVO Drill Oil Hole 3D

Carbide (Material) | REVO D (Coating) | h7 (Dia. Tolerance) | 140° (Point Angle) | 26° ~30° (Helix) | h6 (Shank Dia. Tol.) | 3.0-16.0 (Size Range)



LIST 9872 Metric Sizes
LIST 9873 Wire, Fractional & Letter Sizes

DIN Standard

Unit: mm

CARBIDE DRILLS

EDP#	Size	Decimal Equiv.	Wire, Fractional, Letter	Flute Length	Overall Length	Shank Diameter
	Dc			l	L	Ds
0777800	3.000	0.1181		20	62	6
0777817	3.100	0.1220				
1561530	3.175	0.1250	1/8			
0777823	3.200	0.1260				
0777830	3.300	0.1299				
0777846	3.400	0.1339				
0777852	3.500	0.1378				
1561547	3.572	0.1406	9/64			
0777869	3.600	0.1417				
0777875	3.700	0.1457				
0777881	3.800	0.1496		24	66	
0777898	3.900	0.1535				
1561553	3.969	0.1563	5/32			
0777903	4.000	0.1575				
1561560	4.039	0.1590	#21			
1561977	4.089	0.1610	#20			
0777910	4.100	0.1614				
0777926	4.200	0.1654				
0777932	4.300	0.1693				
1561576	4.366	0.1719	11/64			
0777949	4.400	0.1732				
0777955	4.500	0.1772				
0777961	4.600	0.1811				
0777978	4.700	0.1850				
1561582	4.762	0.1875	3/16	28		
0777984	4.800	0.1890				
0777990	4.900	0.1929				
0778005	5.000	0.1969				
0778011	5.100	0.2008				
1561599	5.105	0.2010	#7			
1561983	5.159	0.2031	13/64			
0778028	5.200	0.2047				
0778034	5.300	0.2087				
0778040	5.400	0.2126				
1561604	5.410	0.2130	#3			
0778057	5.500	0.2165				
1561610	5.556	0.2187	7/32			
0778063	5.600	0.2205				
1561627	5.613	0.2210	#2			
0778070	5.700	0.2244				
0778086	5.800	0.2283				
0778092	5.900	0.2323				
1561633	5.953	0.2344	15/64			
0778108	6.000	0.2362				
0778114	6.100	0.2402		34	79	8
0778120	6.200	0.2441				
0778137	6.300	0.2480				
1561640	6.350	0.2500	1/4			
0778143	6.400	0.2520				
0778150	6.500	0.2559				
1561656	6.528	0.2570	F			
0778166	6.600	0.2598				

EDP#	Size	Decimal Equiv.	Wire, Fractional, Letter	Flute Length	Overall Length	Shank Diameter
	Dc			l	L	Ds
0778172	6.700	0.2638		34	79	8
1561662	6.747	0.2656	17/64			
0778189	6.800	0.2677				
0778195	6.900	0.2717				
1561679	6.909	0.2720	I			
0778200	7.000	0.2756				
1561685	7.036	0.2770	J	41		
0778217	7.100	0.2795				
1561691	7.144	0.2813	9/32			
0778223	7.200	0.2835				
0778230	7.300	0.2874				
0778246	7.400	0.2913				
0778252	7.500	0.2953				
1561707	7.541	0.2969	19/64			
0778269	7.600	0.2992				
0778275	7.700	0.3031				
0778281	7.800	0.3071				
0778298	7.900	0.3110				
1561713	7.937	0.3125	5/16			
0778303	8.000	0.3150				
0778310	8.100	0.3189		47	89	10
0778326	8.200	0.3228				
1561720	8.204	0.3230	P			
0778332	8.300	0.3268				
1561736	8.334	0.3281	21/64			
0778349	8.400	0.3307				
1561742	8.433	0.3320	Q			
0778355	8.500	0.3346				
0778361	8.600	0.3386				
0778378	8.700	0.3425				
1561759	8.731	0.3437	11/32			
0778384	8.800	0.3465				
0778390	8.900	0.3504				
0778406	9.000	0.3543				
0778412	9.100	0.3583				
1561765	9.128	0.3594	23/64			
0778429	9.200	0.3622				
0778435	9.300	0.3661				
1561771	9.347	0.3680	U			
0778441	9.400	0.3701				
0778458	9.500	0.3740				
1561788	9.525	0.3750	3/8			
0778464	9.600	0.3780				
0778470	9.700	0.3819				
0778487	9.800	0.3858				
0778493	9.900	0.3898				
1561794	9.922	0.3906	25/64			
0778509	10.000	0.3937				
0778515	10.100	0.3976		55	102	12
0778521	10.200	0.4016				
0778538	10.300	0.4055				
1561800	10.319	0.4063	13/32			

EDP#	Size	Decimal Equiv.	Wire, Fractional, Letter	Flute Length	Overall Length	Shank Diame-ter
	Dc			l	L	Ds
0778544	10.400	0.4094				
0778550	10.500	0.4134				
0778567	10.600	0.4173				
0778573	10.700	0.4213				
1561816	10.716	0.4219	27/64			
0778580	10.800	0.4252				
0778596	10.900	0.4291				
0778601	11.000	0.4331				
0778618	11.100	0.4370				
1561822	11.112	0.4375	7/16			
0778624	11.200	0.4409		55	102	12
0778630	11.300	0.4449				
0778647	11.400	0.4488				
0778653	11.500	0.4528				
1561839	11.509	0.4531	29/64			
0778660	11.600	0.4567				
0778676	11.700	0.4606				
0778682	11.800	0.4646				
0778699	11.900	0.4685				
1561845	11.906	0.4687	15/32			
0778704	12.000	0.4724				
0778710	12.100	0.4764				
0778727	12.200	0.4803				
0778733	12.300	0.4843				
1561851	12.303	0.4844	31/64			
0778740	12.400	0.4882				
0778756	12.500	0.4921				
0778762	12.600	0.4961				
0778779	12.700	0.5000		60	107	14
1561868	12.700	0.5000	1/2			
0778785	12.800	0.5039				
0778791	12.900	0.5079				
0778807	13.000	0.5118				
1561874	13.097	0.5156	33/64			
0778813	13.100	0.5157				
0778820	13.200	0.5197				

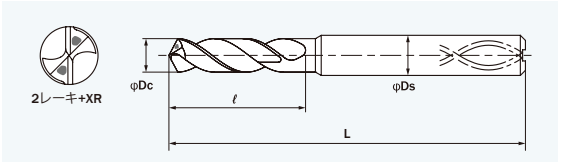
EDP#	Size	Decimal Equiv.	Wire, Fractional, Letter	Flute Length	Overall Length	Shank Diame-ter
	Dc			l	L	Ds
0778836	13.300	0.5236				
0778842	13.400	0.5276				
1561880	13.494	0.5313	17/32			
0778859	13.500	0.5315				
0778865	13.600	0.5354		60	107	14
0778871	13.700	0.5394				
0778888	13.800	0.5433				
1561897	13.891	0.5469	35/64			
0778894	13.900	0.5472				
0778900	14.000	0.5512				
0778916	14.100	0.5551				
0778922	14.200	0.5591				
1561902	14.287	0.5625	9/16			
0778939	14.300	0.5630				
0778945	14.400	0.5669				
0778951	14.500	0.5709				
0778968	14.600	0.5748				
1561919	14.684	0.5781	37/64			
0778974	14.700	0.5787				
0778980	14.800	0.5827				
0778997	14.900	0.5866				
0779001	15.000	0.5906				
1561925	15.081	0.5937	19/32	65	115	16
0779018	15.100	0.5945				
0779024	15.200	0.5984				
0779030	15.300	0.6024				
0779047	15.400	0.6063				
1561931	15.478	0.6094	39/64			
0779053	15.500	0.6102				
0779060	15.600	0.6142				
0779076	15.700	0.6181				
0779082	15.800	0.6220				
1561948	15.875	0.6250	5/8			
0779099	15.900	0.6260				
0779104	16.000	0.6299				

LIST 9872, 9873 Standard Cutting Conditions

Work Material		Structural Steel Carbon Steel Cast Iron		Alloy Steel Heat Treated Steel (20 - 30 HRC)		Mold Steel Hardened Steel (30 - 40 HRC)		Hardened Steel (40 - 50 HRC)		Ductile Cast Iron		Stainless Steel		PH Stainless		Titanium Alloys		Nickel Alloys Inconel		Aluminum Alloy	
Speed (SFM)		380 - 400 SFM		310 - 330 SFM		240 - 260 SFM		120 - 140 SFM		320 - 340 SFM		240 - 260 SFM		140 - 160 SFM		115 - 135 SFM		115 - 135 SFM		440 - 460 SFM	
Drill Diameter		RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
Metric	Fractional																				
3		12700	0.0038	10600	0.0038	8250	0.0035	4200	0.0024	10600	0.0035	8000	0.0031	4850	0.0030	4000	0.0030	4000	0.0018	14550	0.0041
	1/8	12000	0.0040	10000	0.0040	7800	0.0037	4000	0.0026	9950	0.0037	7650	0.0033	4600	0.0032	3700	0.0032	3700	0.0019	13750	0.0044
	3/16	7950	0.0060	6650	0.0060	5200	0.0056	2650	0.0038	6650	0.0056	5100	0.0050	3000	0.0047	2450	0.0047	2450	0.0028	9200	0.0066
5		7600	0.0063	6300	0.0063	4950	0.0058	2500	0.0040	6300	0.0059	4850	0.0052	2900	0.0049	2300	0.0049	2300	0.0029	8700	0.0069
	1/4	6000	0.0080	5000	0.0080	3900	0.0071	2000	0.0048	5000	0.0076	3800	0.0066	2300	0.0064	1850	0.0064	1850	0.0038	6700	0.0088
	5/16	4750	0.0099	4000	0.0099	3150	0.0088	1600	0.0059	4000	0.0086	3050	0.0078	1850	0.0076	1500	0.0076	1500	0.0046	5500	0.0109
8		4700	0.0101	3950	0.0101	3100	0.0087	1550	0.0060	3950	0.0087	3000	0.0079	1800	0.0077	1450	0.0077	1450	0.0047	5450	0.0110
	3/8	4000	0.0120	3350	0.0120	2600	0.0098	1350	0.0065	3300	0.0093	2550	0.0089	1550	0.0087	1250	0.0087	1250	0.0056	4600	0.0131
10		3800	0.0126	3200	0.0126	2450	0.0101	1250	0.0070	3200	0.0097	2400	0.0093	1450	0.0091	1150	0.0091	1150	0.0057	4400	0.0138
12		3200	0.0132	2700	0.0132	2050	0.0104	1050	0.0082	2650	0.0098	200	0.0105	1200	0.0103	1000	0.0102	1000	0.0067	3650	0.0151
	1/2	3000	0.0140	2500	0.0140	1950	0.0107	1000	0.0083	2500	0.0104	1900	0.0111	1150	0.0108	950	0.0107	950	0.0072	3450	0.0160
16		2400	0.0157	2000	0.0157	1550	0.0118	800	0.0103	2000	0.0122	1500	0.0125	900	0.0122	750	0.0121	750	0.0074	2750	0.0189

1) Adjust cutting condition according to the rigidity of machine or work clamp state.
2) When rigidity is low and chattering occurs, reduce the rotation and feed rate.
3) Wet conditions are for drilling with water soluble cutting fluid.
4) In non-water soluble cutting fluid, reduce the rotation and feed rate by 20%.
5) Use high pressure internal coolant
6) In applications where chip jamming is a problem, use peck drilling.
7) Retract plane for peck drilling should be set to the top of the hole.
8) Recommended peck depth is 0.2 - 1.0 x Dc.

AQUA REVO Drill Oil Hole 3D



LIST 9864 Metric Sizes

JIS Standard

Unit: mm

EDP #	Size mm	Decimal Equivalent	Flute Length	Overall Length	Shank Diameter
		Dc	ℓ	L	Ds
0775180	3.0	0.1181	19	68	3
0775196	3.1	0.1220	21	72	4
0775201	3.2	0.1260			
0775218	3.3	0.1299			
0775224	3.4	0.1339			
0775230	3.5	0.1378			
0775247	3.6	0.1417	23		
0775253	3.7	0.1457			
0775260	3.8	0.1496			
0775276	3.9	0.1535			
0775282	4.0	0.1575			
0775299	4.1	0.1614	26	80	5
0775304	4.2	0.1654			
0775310	4.3	0.1693			
0775327	4.4	0.1732			
0775333	4.5	0.1772			
0775340	4.6	0.1811	29		
0775356	4.7	0.1850			
0775362	4.8	0.1890			
0775379	4.9	0.1929			
0775385	5.0	0.1969			
0775391	5.1	0.2008		82	6
0775407	5.2	0.2047			
0775413	5.3	0.2087			
0775420	5.4	0.2126			
0775436	5.5	0.2165			
0775442	5.6	0.2205	32		
0775459	5.7	0.2244			
0775465	5.8	0.2283			
0775471	5.9	0.2323			
0775488	6.0	0.2362			
0775494	6.1	0.2402	34	88	7
0775500	6.2	0.2441			
0775516	6.3	0.2480			
0775522	6.4	0.2520			
0775539	6.5	0.2559			
0775545	6.6	0.2598	37		
0775551	6.7	0.2638			
0775568	6.8	0.2677			
0775574	6.9	0.2717			
0775580	7.0	0.2756			

EDP #	Size mm	Decimal Equivalent	Flute Length	Overall Length	Shank Diameter
		Dc	ℓ	L	Ds
0775597	7.1	0.2795	39	94	8
0775602	7.2	0.2835			
0775619	7.3	0.2874			
0775625	7.4	0.2913			
0775631	7.5	0.2953			
0775648	7.6	0.2992	42		
0775654	7.7	0.3031			
0775660	7.8	0.3071			
0775677	7.9	0.3110			
0775683	8.0	0.3150			
0775690	8.1	0.3189	44	100	9
0775705	8.2	0.3228			
0775711	8.3	0.3268			
0775728	8.4	0.3307			
0775734	8.5	0.3346			
0775740	8.6	0.3386	47		
0775757	8.7	0.3425			
0775763	8.8	0.3465			
0775770	8.9	0.3504			
0775786	9.0	0.3543			
0775792	9.1	0.3583	49	106	10
0775808	9.2	0.3622			
0775814	9.3	0.3661			
0775820	9.4	0.3701			
0775837	9.5	0.3740			
0775843	9.6	0.3780	52		
0775850	9.7	0.3819			
0775866	9.8	0.3858			
0775872	9.9	0.3898			
0775889	10.0	0.3937			
0775895	10.1	0.3976	54	116	11
0775900	10.2	0.4016			
0775917	10.3	0.4055			
0775923	10.4	0.4094			
0775930	10.5	0.4134			
0775946	10.6	0.4173	57		
0775952	10.7	0.4213			
0775969	10.8	0.4252			
0775975	10.9	0.4291			
0775981	11.0	0.4331			

EDP #	Size mm	Decimal Equivalent	Flute Length	Overall Length	Shank Diameter
		Dc	ℓ	L	Ds
0775998	11.1	0.4370	60	122	12
0776002	11.2	0.4409			
0776019	11.3	0.4449			
0776025	11.4	0.4488			
0776031	11.5	0.4528			
0776048	11.6	0.4567	63		
0776054	11.7	0.4606			
0776060	11.8	0.4646			
0776077	11.9	0.4685			
0776083	12.0	0.4724			
0776090	12.1	0.4764	65	128	13
0776105	12.2	0.4803			
0776111	12.3	0.4843			
0776128	12.4	0.4882			
0776134	12.5	0.4921			
0776140	12.6	0.4961	68		
0776157	12.7	0.5000			
0776163	12.8	0.5039			
0776170	12.9	0.5079			
0776186	13.0	0.5118			
0776192	13.1	0.5157	70	134	14
0776208	13.2	0.5197			
0776214	13.3	0.5236			
0776220	13.4	0.5276			
0776237	13.5	0.5315			

EDP #	Size mm	Decimal Equivalent	Flute Length	Overall Length	Shank Diameter
		Dc	ℓ	L	Ds
0776243	13.6	0.5354	73	134	14
0776250	13.7	0.5394			
0776266	13.8	0.5433			
0776272	13.9	0.5472			
0776289	14.0	0.5512			
0776295	14.1	0.5551	75	140	15
0776300	14.2	0.5591			
0776317	14.3	0.5630			
0776323	14.4	0.5669			
0776330	14.5	0.5709			
0776346	14.6	0.5748	78		
0776352	14.7	0.5787			
0776369	14.8	0.5827			
0776375	14.9	0.5866			
0776381	15.0	0.5906			
0776398	15.1	0.5945	80	146	16
0776403	15.2	0.5984			
0776410	15.3	0.6024			
0776426	15.4	0.6063			
0776432	15.5	0.6102			
0776449	15.6	0.6142	83		
0776455	15.7	0.6181			
0776461	15.8	0.6220			
0776478	15.9	0.6260			
0776484	16.0	0.6299			

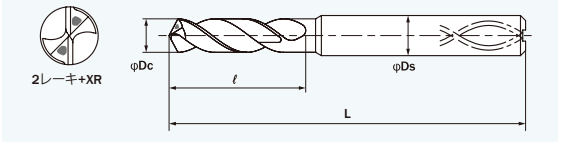
LIST 9864 Standard Cutting Conditions

Work Material	Structural Steel Carbon Steel Cast Iron		Alloy Steel Heat Treated Steel (20 - 30 HRC)		Mold Steel Hardened Steel (30 - 40 HRC)		Hardened Steel (40 - 50 HRC)		Ductile Cast Iron		Stainless Steel		PH Stainless		Titanium Alloys		Nickel Alloys Inconel		Aluminum Alloy	
Speed (SFM)	380 - 400 SFM		310 - 330 SFM		240 - 260 SFM		120 - 140 SFM		320 - 340 SFM		240 - 260 SFM		140 - 160 SFM		115 - 135 SFM		115 - 135 SFM		440 - 460 SFM	
Drill Diameter Metric Fractional	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
3	12700	0.0038	10600	0.0038	8250	0.0035	4200	0.0024	10600	0.0035	8000	0.0031	4850	0.0030	4000	0.0030	4000	0.0018	14550	0.0041
5	7600	0.0063	6300	0.0063	4950	0.0058	2500	0.0040	6300	0.0059	4850	0.0052	2900	0.0049	2300	0.0049	2300	0.0029	8700	0.0069
8	4700	0.0101	3950	0.0101	3100	0.0087	1550	0.0060	3950	0.0087	3000	0.0079	1800	0.0077	1450	0.0077	1450	0.0047	5450	0.0110
10	3800	0.0126	3200	0.0126	2450	0.0101	1250	0.0070	3200	0.0097	2400	0.0093	1450	0.0091	1150	0.0091	1150	0.0057	4400	0.0138
12	3200	0.0132	2700	0.0132	2050	0.0104	1050	0.0082	2650	0.0098	200	0.0105	1200	0.0103	1000	0.0102	1000	0.0067	3650	0.0151
16	2400	0.0157	2000	0.0157	1550	0.0118	800	0.0103	2000	0.0122	1500	0.0125	900	0.0122	750	0.0121	750	0.0074	2750	0.0189

1) Adjust cutting condition according to the rigidity of machine or work clamp state.
2) When rigidity is low and chattering occurs, reduce the rotation and feed rate.
3) Wet conditions are for drilling with water soluble cutting fluid.
4) In non-water soluble cutting fluid, reduce the rotation and feed rate by 20%.
5) Use high pressure internal coolant
6) In applications where chip jamming is a problem, use peck drilling.
7) Retract plane for peck drilling should be set to the top of the hole.
8) Recommended peck depth is 0.2 - 1.0 x Dc.

AQUA REVO Drill Oil Hole 5D

Carbide Material | REVO D Coating | h7 Dia. Tolerance | 140° Point Angle | 26° ~30° Helix | h6 Shank Dia. Tol. | 3.0-16.0 Size Range



LIST 9874 Metric Sizes
LIST 9875 Wire, Fractional & Letter Sizes

DIN Standard

Unit: mm

EDP#	Size	Decimal Equiv.	Wire, Fractional, Letter	Flute Length	Overall Length	Shank Diameter
	Dc			l	L	Ds
0779110	3.000	0.1181		28	66	6
0779127	3.100	0.1220				
1561990	3.175	0.1250	1/8			
0779133	3.200	0.1260				
0779140	3.300	0.1299				
0779156	3.400	0.1339				
0779162	3.500	0.1378				
1562004	3.572	0.1406	9/64			
0779179	3.600	0.1417				
0779185	3.700	0.1457				
0779191	3.800	0.1496		36	74	
0779207	3.900	0.1535				
1562010	3.969	0.1563	5/32			
0779213	4.000	0.1575				
1562027	4.039	0.1590	#21			
1561954	4.089	0.1610	#20			
0779220	4.100	0.1614				
0779236	4.200	0.1654				
0779242	4.300	0.1693				
1562033	4.366	0.1719	11/64			
0779259	4.400	0.1732				
0779265	4.500	0.1772				
0779271	4.600	0.1811				
0779288	4.700	0.1850				
1562040	4.762	0.1875	3/16	44	82	
0779294	4.800	0.1890				
0779300	4.900	0.1929				
0779316	5.000	0.1969				
0779322	5.100	0.2008				
1562056	5.105	0.2010	#7			
1561960	5.159	0.2031	13/64			
0779339	5.200	0.2047				
0779345	5.300	0.2087				
0779351	5.400	0.2126				
1562062	5.410	0.2130	#3			
0779368	5.500	0.2165				
1562079	5.556	0.2187	7/32			
0779374	5.600	0.2205				
1562085	5.613	0.2210	#2			
0779380	5.700	0.2244				
0779397	5.800	0.2283				
0779402	5.900	0.2323				
1562091	5.953	0.2344	15/64			
0779419	6.000	0.2362				
0779425	6.100	0.2402		53	91	8
0779431	6.200	0.2441				
0779448	6.300	0.2480				
1562107	6.350	0.2500	1/4			
0779454	6.400	0.2520				
0779460	6.500	0.2559				
1562113	6.528	0.2570	F			
0779477	6.600	0.2598				

EDP#	Size	Decimal Equiv.	Wire, Fractional, Letter	Flute Length	Overall Length	Shank Diameter
	Dc			l	L	Ds
0779483	6.700	0.2638		53	91	8
1562120	6.747	0.2656	17/64			
0779490	6.800	0.2677				
0779505	6.900	0.2717				
1562136	6.909	0.2720	I			
0779511	7.000	0.2756				
1562142	7.036	0.2770	J			
0779528	7.100	0.2795				
1562159	7.144	0.2813	9/32			
0779534	7.200	0.2835				
0779540	7.300	0.2874				
0779557	7.400	0.2913				
0779563	7.500	0.2953				
1562165	7.541	0.2969	19/64			
0779570	7.600	0.2992				
0779586	7.700	0.3031				
0779592	7.800	0.3071				
0779608	7.900	0.3110				
1562171	7.937	0.3125	5/16			
0779614	8.000	0.3150				
0779620	8.100	0.3189		61	103	10
0779637	8.200	0.3228				
1562188	8.204	0.3230	P			
0779643	8.300	0.3268				
1562194	8.334	0.3281	21/64			
0779650	8.400	0.3307				
1562200	8.433	0.3320	Q			
0779666	8.500	0.3346				
0779672	8.600	0.3386				
0779689	8.700	0.3425				
1562216	8.731	0.3437	11/32			
0779695	8.800	0.3465				
0779700	8.900	0.3504				
0779717	9.000	0.3543				
0779723	9.100	0.3583				
1562222	9.128	0.3594	23/64			
0779730	9.200	0.3622				
0779746	9.300	0.3661				
1562239	9.347	0.3680	U			
0779752	9.400	0.3701				
0779769	9.500	0.3740				
1562245	9.525	0.3750	3/8			
0779775	9.600	0.3780				
0779781	9.700	0.3819				
0779798	9.800	0.3858				
0779803	9.900	0.3898				
1562251	9.922	0.3906	25/64			
0779810	10.000	0.3937				
0779826	10.100	0.3976		71	118	12
0779832	10.200	0.4016				
0779849	10.300	0.4055				
1562268	10.319	0.4063	13/32			

EDP#	Size	Decimal Equiv.	Wire, Fractional, Letter	Flute Length	Overall Length	Shank Diameter
	Dc			l	L	Ds
0779855	10.400	0.4094		71	118	12
0779861	10.500	0.4134				
0779878	10.600	0.4173				
0779884	10.700	0.4213				
1562274	10.716	0.4219	27/64			
0779890	10.800	0.4252				
0779906	10.900	0.4291				
0779912	11.000	0.4331				
0779929	11.100	0.4370				
1562280	11.112	0.4375	7/16			
0779935	11.200	0.4409				
0779941	11.300	0.4449				
0779958	11.400	0.4488				
0779964	11.500	0.4528				
1562297	11.509	0.4531	29/64			
0779970	11.600	0.4567				
0779987	11.700	0.4606				
0779993	11.800	0.4646				
0780007	11.900	0.4685				
1562302	11.906	0.4687	15/32			
0780013	12.000	0.4724				
0780020	12.100	0.4764		77	124	14
0780036	12.200	0.4803				
0780042	12.300	0.4843				
1562319	12.303	0.4844	31/64			
0780059	12.400	0.4882				
0780065	12.500	0.4921				
0780071	12.600	0.4961				
0780088	12.700	0.5000				
1562325	12.700	0.5000	1/2			
0780094	12.800	0.5039				
0780100	12.900	0.5079				
0780116	13.000	0.5118				
1562331	13.097	0.5156	33/64			
0780122	13.100	0.5157				
0780139	13.200	0.5197				

EDP#	Size	Decimal Equiv.	Wire, Fractional, Letter	Flute Length	Overall Length	Shank Diameter
	Dc			l	L	Ds
0780145	13.300	0.5236		77	124	14
0780151	13.400	0.5276				
1562348	13.494	0.5313	17/32			
0780168	13.500	0.5315				
0780174	13.600	0.5354				
0780180	13.700	0.5394				
0780197	13.800	0.5433				
1562354	13.891	0.5469	35/64			
0780202	13.900	0.5472				
0780219	14.000	0.5512				
0780225	14.100	0.5551		83	133	16
0780231	14.200	0.5591				
1562360	14.287	0.5625	9/16			
0780248	14.300	0.5630				
0780254	14.400	0.5669				
0780260	14.500	0.5709				
0780277	14.600	0.5748				
1562377	14.684	0.5781	37/64			
0780283	14.700	0.5787				
0780290	14.800	0.5827				
0780305	14.900	0.5866				
0780311	15.000	0.5906				
1562383	15.081	0.5937	19/32			
0780328	15.100	0.5945				
0780334	15.200	0.5984				
0780340	15.300	0.6024				
0780357	15.400	0.6063				
1562390	15.478	0.6094	39/64			
0780363	15.500	0.6102				
0780370	15.600	0.6142				
0780386	15.700	0.6181				
0780392	15.800	0.6220				
1562405	15.875	0.6250	5/8			
0780408	15.900	0.6260				
0780414	16.000	0.6299				

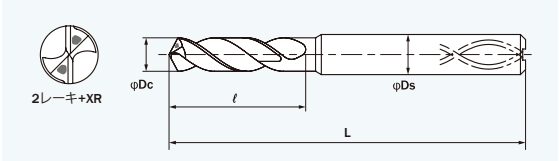
LIST 9874, 9875 Standard Cutting Conditions

Work Material		Structural Steel Carbon Steel Cast Iron		Alloy Steel Heat Treated Steel (20 - 30 HRC)		Mold Steel Hardened Steel (30 - 40 HRC)		Hardened Steel (40 - 50 HRC)		Ductile Cast Iron		Stainless Steel		PH Stainless		Titanium Alloys		Nickel Alloys Inconel		Aluminum Alloy	
Speed (SFM)		380 - 400 SFM		310 - 330 SFM		240 - 260 SFM		120 - 140 SFM		320 - 340 SFM		240 - 260 SFM		140 - 160 SFM		115 - 135 SFM		115 - 135 SFM		440 - 460 SFM	
Drill Diameter		RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
Metric	Fractional																				
3		12700	0.0038	10600	0.0038	8250	0.0035	4200	0.0024	10600	0.0035	8000	0.0031	4850	0.0030	4000	0.0030	4000	0.0018	14550	0.0041
	1/8	12000	0.0040	10000	0.0040	7800	0.0037	4000	0.0026	9950	0.0037	7650	0.0033	4600	0.0032	3700	0.0032	3700	0.0019	13750	0.0044
	3/16	7950	0.0060	6650	0.0060	5200	0.0056	2650	0.0038	6650	0.0056	5100	0.0050	3000	0.0047	2450	0.0047	2450	0.0028	9200	0.0066
5		7600	0.0063	6300	0.0063	4950	0.0058	2500	0.0040	6300	0.0059	4850	0.0052	2900	0.0049	2300	0.0049	2300	0.0029	8700	0.0069
	1/4	6000	0.0080	5000	0.0080	3900	0.0071	2000	0.0048	5000	0.0076	3800	0.0066	2300	0.0064	1850	0.0064	1850	0.0038	6700	0.0088
	5/16	4750	0.0099	4000	0.0099	3150	0.0088	1600	0.0059	4000	0.0086	3050	0.0078	1850	0.0076	1500	0.0076	1500	0.0046	5500	0.0109
8		4700	0.0101	3950	0.0101	3100	0.0087	1550	0.0060	3950	0.0087	3000	0.0079	1800	0.0077	1450	0.0077	1450	0.0047	5450	0.0110
	3/8	4000	0.0120	3350	0.0120	2600	0.0098	1350	0.0065	3300	0.0093	2550	0.0089	1550	0.0087	1250	0.0087	1250	0.0056	4600	0.0131
10		3800	0.0126	3200	0.0126	2450	0.0101	1250	0.0070	3200	0.0097	2400	0.0093	1450	0.0091	1150	0.0091	1150	0.0057	4400	0.0138
12		3200	0.0132	2700	0.0132	2050	0.0104	1050	0.0082	2650	0.0098	200	0.0105	1200	0.0103	1000	0.0102	1000	0.0067	3650	0.0151
	1/2	3000	0.0140	2500	0.0140	1950	0.0107	1000	0.0083	2500	0.0104	1900	0.0111	1150	0.0108	950	0.0107	950	0.0072	3450	0.0160
16		2400	0.0157	2000	0.0157	1550	0.0118	800	0.0103	2000	0.0122	1500	0.0125	900	0.0122	750	0.0121	750	0.0074	2750	0.0189

1) Adjust cutting condition according to the rigidity of machine or work clamp state.
2) When rigidity is low and chattering occurs, reduce the rotation and feed rate.
3) Wet conditions are for drilling with water soluble cutting fluid.
4) In non-water soluble cutting fluid, reduce the rotation and feed rate by 20%.
5) Use high pressure internal coolant
6) In applications where chip jamming is a problem, use peck drilling.
7) Retract plane for peck drilling should be set to the top of the hole.
8) Recommended peck depth is 0.2 - 1.0 x Dc.

AQUA REVO Drill Oil Hole 5D

Carbide Material | REVO D Coating | h7 Dia. Tolerance | 140° Point Angle | 26° ~30° Helix | h6 Shank Dia. Tol. | 3.0-16.0 Size Range



LIST 9866 Metric Sizes

JIS Standard

EDP #	Size mm	Decimal Equivalent	Flute Length	Overall Length	Shank Diameter
		Dc	ℓ	L	Ds
0776490	3.0	0.1181	29	78	3
0776506	3.1	0.1220	33	86	4
0776512	3.2	0.1260			
0776529	3.3	0.1299			
0776535	3.4	0.1339			
0776541	3.5	0.1378			
0776558	3.6	0.1417	37		
0776564	3.7	0.1457			
0776570	3.8	0.1496			
0776587	3.9	0.1535			
0776593	4.0	0.1575			
0776609	4.1	0.1614	41	98	5
0776615	4.2	0.1654			
0776621	4.3	0.1693			
0776638	4.4	0.1732			
0776644	4.5	0.1772			
0776650	4.6	0.1811	46		
0776667	4.7	0.1850			
0776673	4.8	0.1890			
0776680	4.9	0.1929			
0776696	5.0	0.1969			
0776701	5.1	0.2008		100	6
0776718	5.2	0.2047			
0776724	5.3	0.2087			
0776730	5.4	0.2126			
0776747	5.5	0.2165			
0776753	5.6	0.2205	50		
0776760	5.7	0.2244			
0776776	5.8	0.2283			
0776782	5.9	0.2323			
0776799	6.0	0.2362			
0776804	6.1	0.2402	54	109	7
0776810	6.2	0.2441			
0776827	6.3	0.2480			
0776833	6.4	0.2520			
0776840	6.5	0.2559			
0776856	6.6	0.2598	58		
0776862	6.7	0.2638			
0776879	6.8	0.2677			
0776885	6.9	0.2717			
0776891	7.0	0.2756			

EDP #	Size mm	Decimal Equivalent	Flute Length	Overall Length	Shank Diameter
		Dc	ℓ	L	Ds
0776907	7.1	0.2795	62	118	8
0776913	7.2	0.2835			
0776920	7.3	0.2874			
0776936	7.4	0.2913			
0776942	7.5	0.2953			
0776959	7.6	0.2992	66		
0776965	7.7	0.3031			
0776971	7.8	0.3071			
0776988	7.9	0.3110			
0776994	8.0	0.3150			
0777009	8.1	0.3189	70	127	9
0777015	8.2	0.3228			
0777021	8.3	0.3268			
0777038	8.4	0.3307			
0777044	8.5	0.3346			
0777050	8.6	0.3386	74		
0777067	8.7	0.3425			
0777073	8.8	0.3465			
0777080	8.9	0.3504			
0777096	9.0	0.3543			
0777101	9.1	0.3583	78	136	10
0777118	9.2	0.3622			
0777124	9.3	0.3661			
0777130	9.4	0.3701			
0777147	9.5	0.3740			
0777153	9.6	0.3780	82		
0777160	9.7	0.3819			
0777176	9.8	0.3858			
0777182	9.9	0.3898			
0777199	10.0	0.3937			
0777204	10.1	0.3976	87	149	11
0777210	10.2	0.4016			
0777227	10.3	0.4055			
0777233	10.4	0.4094			
0777240	10.5	0.4134			
0777256	10.6	0.4173	91		
0777262	10.7	0.4213			
0777279	10.8	0.4252			
0777285	10.9	0.4291			
0777291	11.0	0.4331			

EDP #	Size mm	Decimal Equivalent	Flute Length	Overall Length	Shank Diameter
		Dc	ℓ	L	Ds
0777307	11.1	0.4370	95	158	12
0777313	11.2	0.4409			
0777320	11.3	0.4449			
0777336	11.4	0.4488			
0777342	11.5	0.4528			
0777359	11.6	0.4567	99		
0777365	11.7	0.4606			
0777371	11.8	0.4646			
0777388	11.9	0.4685			
0777394	12.0	0.4724			
0777400	12.1	0.4764	103	167	13
0777416	12.2	0.4803			
0777422	12.3	0.4843			
0777439	12.4	0.4882			
0777445	12.5	0.4921			
0777451	12.6	0.4961	107		
0777468	12.7	0.5000			
0777474	12.8	0.5039			
0777480	12.9	0.5079			
0777497	13.0	0.5118			
0777502	13.1	0.5157	111	176	14
0777519	13.2	0.5197			
0777525	13.3	0.5236			
0777531	13.4	0.5276			
0777548	13.5	0.5315			

EDP #	Size mm	Decimal Equivalent	Flute Length	Overall Length	Shank Diameter
		Dc	ℓ	L	Ds
0777554	13.6	0.5354	115	176	14
0777560	13.7	0.5394			
0777577	13.8	0.5433			
0777583	13.9	0.5472			
0777590	14.0	0.5512			
0777605	14.1	0.5551	119	185	15
0777611	14.2	0.5591			
0777628	14.3	0.5630			
0777634	14.4	0.5669			
0777640	14.5	0.5709			
0777657	14.6	0.5748	124		
0777663	14.7	0.5787			
0777670	14.8	0.5827			
0777686	14.9	0.5866			
0777692	15.0	0.5906			
0777708	15.1	0.5945	128	194	16
0777714	15.2	0.5984			
0777720	15.3	0.6024			
0777737	15.4	0.6063			
0777743	15.5	0.6102			
0777750	15.6	0.6142	132		
0777766	15.7	0.6181			
0777772	15.8	0.6220			
0777789	15.9	0.6260			
0777795	16.0	0.6299			

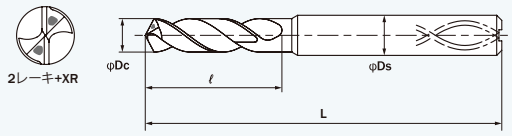
LIST 9866 Standard Cutting Conditions

Work Material	Structural Steel Carbon Steel Cast Iron		Alloy Steel Heat Treated Steel (20 - 30 HRC)		Mold Steel Hardened Steel (30 - 40 HRC)		Hardened Steel (40 - 50 HRC)		Ductile Cast Iron		Stainless Steel		PH Stainless		Titanium Alloys		Nickel Alloys Inconel		Aluminum Alloy	
Speed (SFM)	380 - 400 SFM		310 - 330 SFM		240 - 260 SFM		120 - 140 SFM		320 - 340 SFM		240 - 260 SFM		140 - 160 SFM		115 - 135 SFM		115 - 135 SFM		440 - 460 SFM	
Drill Diameter Metric	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
3	12700	0.0038	10600	0.0038	8250	0.0035	4200	0.0024	10600	0.0035	8000	0.0031	4850	0.0030	4000	0.0030	4000	0.0018	14550	0.0041
5	7600	0.0063	6300	0.0063	4950	0.0058	2500	0.0040	6300	0.0059	4850	0.0052	2900	0.0049	2300	0.0049	2300	0.0029	8700	0.0069
8	4700	0.0101	3950	0.0101	3100	0.0087	1550	0.0060	3950	0.0087	3000	0.0079	1800	0.0077	1450	0.0077	1450	0.0047	5450	0.0110
10	3800	0.0126	3200	0.0126	2450	0.0101	1250	0.0070	3200	0.0097	2400	0.0093	1450	0.0091	1150	0.0091	1150	0.0057	4400	0.0138
12	3200	0.0132	2700	0.0132	2050	0.0104	1050	0.0082	2650	0.0098	200	0.0105	1200	0.0103	1000	0.0102	1000	0.0067	3650	0.0151
16	2400	0.0157	2000	0.0157	1550	0.0118	800	0.0103	2000	0.0122	1500	0.0125	900	0.0122	750	0.0121	750	0.0074	2750	0.0189

1) Adjust cutting condition according to the rigidity of machine or work clamp state.
2) When rigidity is low and chattering occurs, reduce the rotation and feed rate.
3) Wet conditions are for drilling with water soluble cutting fluid.
4) In non-water soluble cutting fluid, reduce the rotation and feed rate by 20%.
5) Use high pressure internal coolant
6) In applications where chip jamming is a problem, use peck drilling.
7) Retract plane for peck drilling should be set to the top of the hole.
8) Recommended peck depth is 0.2 - 1.0 x Dc.

AQUA REVO Drill Oil Hole 8D

Carbide Material | REVO D Coating | h7 Dia. Tolerance | 140° Point Angle | 26° ~30° Helix | h6 Shank Dia. Tol. | 3.0-16.0 Size Range



LIST 9868 Metric Sizes
LIST 9869 Wire, Fractional & Letter Sizes

Unit: mm

EDP#	Size	Decimal Equiv.	Wire, Fractional, Letter	Flute Length	Overall Length	Shank Diameter
	Dc			l	L	Ds
0780632	3.000	0.1181		34	81	3
0780649	3.100	0.1220		39	92	4
1571126	3.175	0.1250	1/8			
0780655	3.200	0.1260				
0780661	3.300	0.1299				
0780678	3.400	0.1339				
0780684	3.500	0.1378				
1571132	3.572	0.1406	9/64	45		
0780690	3.600	0.1417				
0780706	3.700	0.1457				
0780712	3.800	0.1496				
0780729	3.900	0.1535				
1571149	3.969	0.1563	5/32			
0780735	4.000	0.1575				
1571155	4.039	0.1590	#21	50	105	5
1571161	4.089	0.1610	#20			
0780741	4.100	0.1614				
0780758	4.200	0.1654				
0780764	4.300	0.1693				
1571178	4.366	0.1719	11/64			
0780770	4.400	0.1732				
0780787	4.500	0.1772				
0780793	4.600	0.1811		56		
0780809	4.700	0.1850				
1571184	4.762	0.1875	3/16			
0780815	4.800	0.1890				
0780821	4.900	0.1929				
1569932	5.000	0.1969				6
0780844	5.100	0.2008		62	118	
1571190	5.105	0.2010	#7			
1571206	5.159	0.2031	13/64			
0780850	5.200	0.2047				
0780867	5.300	0.2087				
0780873	5.400	0.2126				
1571212	5.410	0.2130	#3			
0780880	5.500	0.2165				
1571229	5.556	0.2187	7/32	68		
0780896	5.600	0.2205				
1571235	5.613	0.2210	#2			
0780901	5.700	0.2244				
0780918	5.800	0.2283				
0780924	5.900	0.2323				
1571241	5.953	0.2344	15/64			
0780930	6.000	0.2362				
1569949	6.100	0.2402		73	130	8
1569955	6.200	0.2441				
1569961	6.300	0.2480				
1571258	6.350	0.2500	1/4			
1569978	6.400	0.2520				
1569984	6.500	0.2559				
1571264	6.528	0.2570	F	79		
1569990	6.600	0.2598				
1570004	6.700	0.2638				

EDP#	Size	Decimal Equiv.	Wire, Fractional, Letter	Flute Length	Overall Length	Shank Diameter
	Dc			l	L	Ds
1571270	6.747	0.2656	17/64	79	130	8
1570010	6.800	0.2677				
1570027	6.900	0.2717				
1571287	6.909	0.2720	I			
1570033	7.000	0.2756				
1571293	7.036	0.2770	J	84	142	
0781049	7.100	0.2795				
1571309	7.144	0.2813	9/32			
0781055	7.200	0.2835				
0781061	7.300	0.2874				
0781078	7.400	0.2913				
0781084	7.500	0.2953				
1571315	7.541	0.2969	19/64	90		
0781090	7.600	0.2992				
0781106	7.700	0.3031				
0781112	7.800	0.3071				
0781129	7.900	0.3110				
1571321	7.937	0.3125	5/16			
0781135	8.000	0.3150				
1570040	8.100	0.3189		95	154	10
1570056	8.200	0.3228				
1571338	8.204	0.3230	P			
1570062	8.300	0.3268				
1571344	8.334	0.3281	21/64			
1570079	8.400	0.3307				
1571350	8.433	0.3320	Q			
1570085	8.500	0.3346				
1570091	8.600	0.3386		101		
1570107	8.700	0.3425				
1571367	8.731	0.3437	11/32			
1570113	8.800	0.3465				
1570120	8.900	0.3504				
1570136	9.000	0.3543				
0781244	9.100	0.3583		106	166	
1571373	9.128	0.3594	23/64			
0781250	9.200	0.3622				
0781267	9.300	0.3661				
1571380	9.347	0.3680	U			
0781273	9.400	0.3701				
0781280	9.500	0.3740				
1571396	9.525	0.3750	3/8	112		
0781296	9.600	0.3780				
0781301	9.700	0.3819				
0781318	9.800	0.3858				
0781324	9.900	0.3898				
1571401	9.922	0.3906	25/64			
0781330	10.000	0.3937				
1570142	10.100	0.3976		118	182	12
1570159	10.200	0.4016				
1570165	10.300	0.4055				
1571418	10.319	0.4063	13/32			
1570171	10.400	0.4094				
1570188	10.500	0.4134				

EDP#	Size	Decimal Equiv.	Wire, Fractional, Letter	Flute Length	Overall Length	Shank Diameter
	Dc			l	L	Ds
1570194	10.600	0.4173		124	182	12
1570200	10.700	0.4213				
1571424	10.716	0.4219	27/64			
1570216	10.800	0.4252				
1570222	10.900	0.4291				
1570239	11.000	0.4331				
0781440	11.100	0.4370		129	194	
1571430	11.112	0.4375	7/16			
0781456	11.200	0.4409				
0781462	11.300	0.4449				
0781479	11.400	0.4488				
0781485	11.500	0.4528				
1571447	11.509	0.4531	29/64	135		
0781491	11.600	0.4567				
0781507	11.700	0.4606				
0781513	11.800	0.4646				
0781520	11.900	0.4685				
1571453	11.906	0.4687	15/32			
0781536	12.000	0.4724				
1570245	12.100	0.4764		140	206	14
1570251	12.200	0.4803				
1570268	12.300	0.4843				
1571460	12.303	0.4844	31/64			
1570274	12.400	0.4882				
1570280	12.500	0.4921				
1570297	12.600	0.4961		146		
1570302	12.700	0.5000	1/2			
1570319	12.800	0.5039				
1570325	12.900	0.5079				
1570331	13.000	0.5118				
0781645	13.100	0.5157	33/64	151	218	
0781651	13.200	0.5197				
0781668	13.300	0.5236				

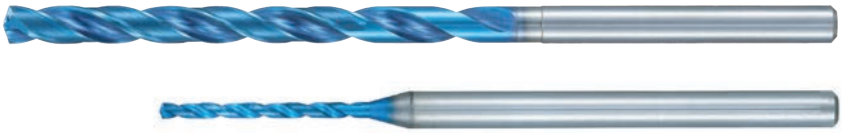
EDP#	Size	Decimal Equiv.	Wire, Fractional, Letter	Flute Length	Overall Length	Shank Diameter
	Dc			l	L	Ds
0781674	13.400	0.5276		151	218	14
1571476	13.494	0.5313	17/32			
0781680	13.500	0.5315				
0781697	13.600	0.5354		157		
0781702	13.700	0.5394				
0781719	13.800	0.5433				
1571482	13.891	0.5469	35/64			
0781725	13.900	0.5472				
0781731	14.000	0.5512				
1570348	14.100	0.5551		163	230	16
1570354	14.200	0.5591				
1571499	14.287	0.5625	9/16			
1570360	14.300	0.5630				
1570377	14.400	0.5669				
1570383	14.500	0.5709				
1570390	14.600	0.5748		169		
1571504	14.684	0.5781	37/64			
1570405	14.700	0.5787				
1570411	14.800	0.5827				
1570428	14.900	0.5866				
1570434	15.000	0.5906				
1571510	15.081	0.5937	19/32	174	242	
0781840	15.100	0.5945				
0781857	15.200	0.5984				
0781863	15.300	0.6024				
0781870	15.400	0.6063				
1571527	15.478	0.6094	39/64			
0781886	15.500	0.6102				
0781892	15.600	0.6142		180		
0781908	15.700	0.6181				
0781914	15.800	0.6220				
1571533	15.875	0.6250	5/8			
0781920	15.900	0.6260				
0781937	16.000	0.6299				

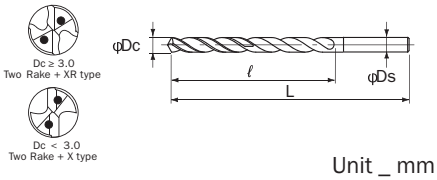
LIST 9868, 9869 Standard Cutting Conditions

Work Material		Structural Steel Carbon Steel Cast Iron		Alloy Steel Heat Treated Steel (20 - 30 HRC)		Mold Steel Hardened Steel (30 - 40 HRC)		Hardened Steel (40 - 50 HRC)		Ductile Cast Iron		Stainless Steel		PH Stainless		Titanium Alloys		Nickel Alloys Inconel		Aluminum Alloy	
Speed (SFM)		380 - 400 SFM		310 - 330 SFM		240 - 260 SFM		120 - 140 SFM		320 - 340 SFM		240 - 260 SFM		140 - 160 SFM		115 - 135 SFM		115 - 135 SFM		440 - 460 SFM	
Drill Diameter		RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
Metric	Fractional																				
3		12700	0.0038	10600	0.0038	8250	0.0035	4200	0.0024	10600	0.0035	8000	0.0031	4850	0.0030	4000	0.0030	4000	0.0018	14550	0.0041
	1/8	12000	0.0040	10000	0.0040	7800	0.0037	4000	0.0026	9950	0.0037	7650	0.0033	4600	0.0032	3700	0.0032	3700	0.0019	13750	0.0044
	3/16	7950	0.0060	6650	0.0060	5200	0.0056	2650	0.0038	6650	0.0056	5100	0.0050	3000	0.0047	2450	0.0047	2450	0.0028	9200	0.0066
5		7600	0.0063	6300	0.0063	4950	0.0058	2500	0.0040	6300	0.0059	4850	0.0052	2900	0.0049	2300	0.0049	2300	0.0029	8700	0.0069
	1/4	6000	0.0080	5000	0.0080	3900	0.0071	2000	0.0048	5000	0.0076	3800	0.0066	2300	0.0064	1850	0.0064	1850	0.0038	6700	0.0088
	5/16	4750	0.0099	4000	0.0099	3150	0.0088	1600	0.0059	4000	0.0086	3050	0.0078	1850	0.0076	1500	0.0076	1500	0.0046	5500	0.0109
8		4700	0.0101	3950	0.0101	3100	0.0087	1550	0.0060	3950	0.0087	3000	0.0079	1800	0.0077	1450	0.0077	1450	0.0047	5450	0.0110
	3/8	4000	0.0120	3350	0.0120	2600	0.0098	1350	0.0065	3300	0.0093	2550	0.0089	1550	0.0087	1250	0.0087	1250	0.0056	4600	0.0131
10		3800	0.0126	3200	0.0126	2450	0.0101	1250	0.0070	3200	0.0097	2400	0.0093	1450	0.0091	1150	0.0091	1150	0.0057	4400	0.0138
12		3200	0.0132	2700	0.0132	2050	0.0104	1050	0.0082	2650	0.0098	200	0.0105	1200	0.0103	1000	0.0102	1000	0.0067	3650	0.0151
	1/2	3000	0.0140	2500	0.0140	1950	0.0107	1000	0.0083	2500	0.0104	1900	0.0111	1150	0.0108	950	0.0107	950	0.0072	3450	0.0160
16		2400	0.0157	2000	0.0157	1550	0.0118	800	0.0103	2000	0.0122	1500	0.0125	900	0.0122	750	0.0121	750	0.0074	2750	0.0189

1) Adjust cutting condition according to the rigidity of machine or work clamp state.
2) When rigidity is low and chattering occurs, reduce the rotation and feed rate.
3) Wet conditions are for drilling with water soluble cutting fluid.
4) In non-water soluble cutting fluid, reduce the rotation and feed rate by 20%.
5) Use high pressure internal coolant
6) In applications where chip jamming is a problem, use peck drilling.
7) Retract plane for peck drilling should be set to the top of the hole.
8) Recommended peck depth is 0.2 - 1.0 x Dc.

Aqua Drill EX Oil Hole 10D





Carbide Material | AQ EX Coating | h7 Dia. Tol. | 140° Point Angle | 26°~30° Helix | h6 Shank Dia. Tol.

LIST 9612 Metric sizes

Unit _ mm

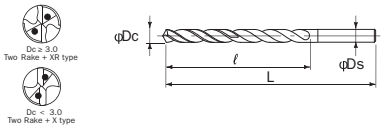
EDP#	Size	Decimal Equiv.	Flute Length	Overall Length	Shank Diameter
	Dc		ℓ	L	Ds
0733673	1.000	0.0394	13	61	3
0733680	1.100	0.0433	14	63	
0733696	1.200	0.0472	16		
0733701	1.300	0.0512	17		
0733718	1.400	0.0551	18		
0733724	1.500	0.0591	20		
0733730	1.600	0.0630	21	70	
0733747	1.700	0.0669	22		
0733753	1.800	0.0709	23		
0733760	1.900	0.0748	25		
0733776	2.000	0.0787	26		
0733782	2.100	0.0827	27	80	
0733799	2.200	0.0866	29		
0733804	2.300	0.0906	30		
0733810	2.400	0.0945	31		
0733827	2.500	0.0984	33		
0733833	2.600	0.1024	34	89	
0733840	2.700	0.1063	35		
0733856	2.800	0.1102	36		
0733862	2.900	0.1142	38		
0726519	3.000	0.1181	39		
0729788	3.100	0.1220	46	96	4
0729794	3.200	0.1260			
0729800	3.300	0.1299			
0729816	3.400	0.1339			
0726525	3.500	0.1378			
0729822	3.600	0.1417	52	102	
0729839	3.700	0.1457			
0729845	3.800	0.1496			
0729851	3.900	0.1535			
0726531	4.000	0.1575			
0729868	4.100	0.1614	59	109	5
0729874	4.200	0.1654			
0729880	4.300	0.1693			
0729897	4.400	0.1732			
0726548	4.500	0.1772			
0729902	4.600	0.1811	65	115	
0729919	4.700	0.1850			
0729925	4.800	0.1890			
0729931	4.900	0.1929			
0726554	5.000	0.1969			
0729948	5.100	0.2008	72	122	6
0729954	5.200	0.2047			
0729960	5.300	0.2087			
0729977	5.400	0.2126			
0726560	5.500	0.2165			
0729983	5.600	0.2205	78	128	
0729990	5.700	0.2244			
0730003	5.800	0.2283			
0730010	5.900	0.2323			
0726577	6.000	0.2362			
0730026	6.100	0.2402	85	135	7
0730032	6.200	0.2441			
0730049	6.300	0.2480			
0730055	6.400	0.2520			
0726583	6.500	0.2559			

EDP#	Size	Decimal Equiv.	Flute Length	Overall Length	Shank Diameter
	Dc		ℓ	L	Ds
0730061	6.600	0.2598	91	141	7
0730078	6.700	0.2638			
0730084	6.800	0.2677			
0730090	6.900	0.2717			
0726590	7.000	0.2756			
0730106	7.100	0.2795	98	148	8
0730112	7.200	0.2835			
0730129	7.300	0.2874			
0730135	7.400	0.2913			
0726605	7.500	0.2953			
0730141	7.600	0.2992	104	154	
0730158	7.700	0.3031			
0730164	7.800	0.3071			
0730170	7.900	0.3110			
0726611	8.000	0.3150			
0730187	8.100	0.3189	111	161	9
0730193	8.200	0.3228			
0730209	8.300	0.3268			
0730215	8.400	0.3307			
0726628	8.500	0.3346			
0730221	8.600	0.3386	117	167	
0730238	8.700	0.3425			
0730244	8.800	0.3465			
0730250	8.900	0.3504			
0726634	9.000	0.3543			
0730267	9.100	0.3583	124	174	10
0730273	9.200	0.3622			
0730280	9.300	0.3661			
0730296	9.400	0.3701			
0726640	9.500	0.3740			
0730301	9.600	0.3780	130	180	
0730318	9.700	0.3819			
0730324	9.800	0.3858			
0730330	9.900	0.3898			
0726657	10.000	0.3937			
0730347	10.100	0.3976	137	197	11
0730353	10.200	0.4016			
0730360	10.300	0.4055			
0730376	10.400	0.4094			
0726663	10.500	0.4134			
0730382	10.600	0.4173	143	203	
0730399	10.700	0.4213			
0730404	10.800	0.4252			
0730410	10.900	0.4291			
0726670	11.000	0.4331			
0730427	11.100	0.4370	150	210	12
0730433	11.200	0.4409			
0730440	11.300	0.4449			
0730456	11.400	0.4488			
0726686	11.500	0.4528			
0730462	11.600	0.4567	156	216	
0730479	11.700	0.4606			
0730485	11.800	0.4646			
0730491	11.900	0.4685			
0726692	12.000	0.4724			

1 per tube

⚠ WARNING: Cancer - www.P65Warnings.ca.gov

Aqua Drill EX Oil Hole 15D



LIST 9614 Metric sizes

LIST 9615 Fractional sizes

Unit _ mm

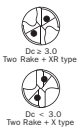
EDP#	Size	Decimal Equiv.	Wire, Fractional, Letter	Flute Length	Overall Length	Shank Diameter
	Dc			ℓ	L	Ds
0733879	1.000	0.0394		18	66	3
0733885	1.100	0.0433		20	71	
0733891	1.200	0.0472		22		
0733907	1.300	0.0512		23		
0733913	1.400	0.0551		25		
0733920	1.500	0.0591		27		
0733936	1.600	0.0630		29	80	
0733942	1.700	0.0669		31		
0733959	1.800	0.0709		32		
0733965	1.900	0.0748		34		
0733971	2.000	0.0787		36		
0733988	2.100	0.0827		38	93	
0733994	2.200	0.0866		40		
0734009	2.300	0.0906		41		
0734015	2.400	0.0945		43		
0734021	2.500	0.0984		45		
0734038	2.600	0.1024		47	104	
0734044	2.700	0.1063		49		
0734050	2.800	0.1102		50		
0734067	2.900	0.1142		52		
0726708	3.000	0.1181		54		
0730507	3.100	0.1220		63	113	4
1519137	3.175	0.1250	1/8			
0730513	3.200	0.1260				
0730520	3.300	0.1299				
0730536	3.400	0.1339				
0726714	3.500	0.1378				
1519143	3.572	0.1406	9/64	72	122	
0730542	3.600	0.1417				
0730559	3.700	0.1457				
0730565	3.800	0.1496				
0730571	3.900	0.1535				
1519150	3.969	0.1562	5/32			
0726720	4.000	0.1575				
0730588	4.100	0.1614		81	131	5
0730594	4.200	0.1654				
0730600	4.300	0.1693				
1519166	4.366	0.1719	11/64			
0730616	4.400	0.1732				
0726737	4.500	0.1772				
0730622	4.600	0.1811		90	140	
0730639	4.700	0.1850				
1519172	4.763	0.1875	3/16			
0730645	4.800	0.1890				
0730651	4.900	0.1929				
0726743	5.000	0.1969				
0730668	5.100	0.2008		99	149	6
1519189	5.159	0.2031	13/64			
0730674	5.200	0.2047				
0730680	5.300	0.2087				
0730697	5.400	0.2126				
1519195	5.408	0.2129	#3			
0726750	5.500	0.2165				
1519200	5.556	0.2187	7/32	108	158	
0730702	5.600	0.2205				
0730719	5.700	0.2244				
0730725	5.800	0.2283				
0730731	5.900	0.2323				
1519217	5.953	0.2344	15/64			
0726766	6.000	0.2362				
0730748	6.100	0.2402		117	167	7
0730754	6.200	0.2441				
0730760	6.300	0.2480				
1519223	6.350	0.2500	1/4			
0730777	6.400	0.2520				
0726772	6.500	0.2559				
0730783	6.600	0.2598		126	176	
0730790	6.700	0.2638				
1591413	6.747	0.2656	17/64			

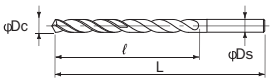
EDP#	Size	Decimal Equiv.	Wire, Fractional, Letter	Flute Length	Overall Length	Shank Diameter
	Dc			ℓ	L	Ds
0730805	6.800	0.2677		126	176	7
0730811	6.900	0.2717				
0726789	7.000	0.2756				
0730828	7.100	0.2795		135	185	8
1519230	7.144	0.2812	9/32			
0730834	7.200	0.2835				
0730840	7.300	0.2874				
0730857	7.400	0.2913				
0726795	7.500	0.2953				
1591420	7.541	0.2969	19/64	144	194	
0730863	7.600	0.2992				
0730870	7.700	0.3031				
0730886	7.800	0.3071				
0730892	7.900	0.3110				
1519246	7.938	0.3125	5/16			
0726800	8.000	0.3150				
0730908	8.100	0.3189		153	203	9
0730914	8.200	0.3228				
0730920	8.300	0.3268				
1591436	8.334	0.3281	21/64			
0730937	8.400	0.3307				
0726817	8.500	0.3346				
0730943	8.600	0.3386		162	212	
0730950	8.700	0.3425				
1519252	8.731	0.3437	11/32			
0730966	8.800	0.3465				
0730972	8.900	0.3504				
0726823	9.000	0.3543				
0730989	9.100	0.3583		171	221	10
1519269	9.128	0.3594	23/64			
0730995	9.200	0.3622				
0731000	9.300	0.3661				
0731016	9.400	0.3701				
0726830	9.500	0.3740				
1519275	9.525	0.3750	3/8	180	230	
0731022	9.600	0.3780				
0731039	9.700	0.3819				
0731045	9.800	0.3858				
0731051	9.900	0.3898				
1519281	9.922	0.3906	25/64			
0726846	10.000	0.3937				
0731068	10.100	0.3976		189	249	11
0731074	10.200	0.4016				
0731080	10.300	0.4055				
0731097	10.400	0.4094				
0726852	10.500	0.4134				
0731102	10.600	0.4173		198	258	
0731119	10.700	0.4213				
1591442	10.716	0.4219	27/64			
0731125	10.800	0.4252				
0731131	10.900	0.4291				
0726869	11.000	0.4331				
0731148	11.100	0.4370		207	267	12
1591459	11.113	0.4375	7/16			
0731154	11.200	0.4409				
0731160	11.300	0.4449				
0731177	11.400	0.4488				
0726875	11.500	0.4528				
1591465	11.509	0.4531	29/64	216	276	
0731183	11.600	0.4567				
0731190	11.700	0.4606				
0731205	11.800	0.4646				
0731211	11.900	0.4685				
0726881	12.000	0.4724				
1519298	12.700	0.5000	1/2	234	294	13
1519303	13.494	0.5312	17/32	243	303	14

1 per tube

⚠ WARNING: Cancer - www.P65Warnings.ca.gov

Aqua Drill EX Oil Hole 20D





LIST 9616 Metric sizes
LIST 9617 Fractional sizes

EDP#	Size	Decimal Equiv.	Wire, Fractional, Letter	Flute Length	Overall Length	Shank Diameter
	Dc			ℓ	L	Ds
0734073	1.000	0.0394		23	71	3
0734080	1.100	0.0433		25	78	
0734096	1.200	0.0472		28		
0734101	1.300	0.0512		30		
0734118	1.400	0.0551		32		
0734124	1.500	0.0591		35		
0734130	1.600	0.0630		37	90	
0734147	1.700	0.0669		39		
0734153	1.800	0.0709		41		
0734160	1.900	0.0748		44		
0734176	2.000	0.0787		46		
0734182	2.100	0.0827		48	105	
0734199	2.200	0.0866		51		
0734204	2.300	0.0906		53		
0734210	2.400	0.0945		55		
0734227	2.500	0.0984		58		
0734233	2.600	0.1024		60	119	
0734240	2.700	0.1063		62		
0734256	2.800	0.1102		64		
0734262	2.900	0.1142		67		
0726898	3.000	0.1181		69		
0731228	3.100	0.1220		81	131	4
1519310	3.175	0.1250	1/8			
0731234	3.200	0.1260				
0731240	3.300	0.1299				
0731257	3.400	0.1339				
0726903	3.500	0.1378				
1519326	3.572	0.1406	9/64	92	142	
0731263	3.600	0.1417				
0731270	3.700	0.1457				
0731286	3.800	0.1496				
0731292	3.900	0.1535				
1519332	3.969	0.1562	5/32			
0726910	4.000	0.1575				
0731308	4.100	0.1614		104	154	5
0731314	4.200	0.1654				
0731320	4.300	0.1693				
1519349	4.366	0.1719	11/64			
0731337	4.400	0.1732				
0726926	4.500	0.1772				
0731343	4.600	0.1811		115	165	
0731350	4.700	0.1850				
1519355	4.763	0.1875	3/16			
0731366	4.800	0.1890				
0731372	4.900	0.1929				
0726932	5.000	0.1969				
0731389	5.100	0.2008		127	177	6
1591889	5.159	0.2031	13/64			
0731395	5.200	0.2047				
0731400	5.300	0.2087				
0731417	5.400	0.2126				
1519361	5.408	0.2129	#3			
0726949	5.500	0.2165				
1519378	5.556	0.2187	7/32	138	188	
0731423	5.600	0.2205				

EDP#	Size	Decimal Equiv.	Wire, Fractional, Letter	Flute Length	Overall Length	Shank Diameter
	Dc			ℓ	L	Ds
0731430	5.700	0.2244		138	188	6
0731446	5.800	0.2283				
0731452	5.900	0.2323				
1591895	5.953	0.2344	15/64			
0726955	6.000	0.2362				
0731469	6.100	0.2402		150	200	7
0731475	6.200	0.2441				
0731481	6.300	0.2480				
1519384	6.350	0.2500	1/4			
0731498	6.400	0.2520				
0726961	6.500	0.2559				
0731503	6.600	0.2598		161	211	
0731510	6.700	0.2638				
1519390	6.747	0.2656	17/64			
0731526	6.800	0.2677				
0731532	6.900	0.2717				
0726978	7.000	0.2756				
0731549	7.100	0.2795		173	223	8
1591900	7.144	0.2812	9/32			
0731555	7.200	0.2835				
0731561	7.300	0.2874				
0731578	7.400	0.2913				
0726984	7.500	0.2953				
1519406	7.541	0.2969	19/64	184	234	
0731584	7.600	0.2992				
0731590	7.700	0.3031				
0731606	7.800	0.3071				
0731612	7.900	0.3110				
1519412	7.938	0.3125	5/16			
0726990	8.000	0.3150				
0731629	8.100	0.3189		196	246	9
0731635	8.200	0.3228				
0731641	8.300	0.3268				
1519429	8.334	0.3281	21/64			
0731658	8.400	0.3307				
0727005	8.500	0.3346				
0731664	8.600	0.3386		207	257	
0731670	8.700	0.3425				
1519435	8.731	0.3437	11/32			
0731687	8.800	0.3465				
0731693	8.900	0.3504				
0727011	9.000	0.3543				
0731709	9.100	0.3583		219	269	10
1591917	9.128	0.3594	23/64			
0731715	9.200	0.3622				
0731721	9.300	0.3661				
0731738	9.400	0.3701				
0727028	9.500	0.3740				
1519441	9.525	0.3750	3/8	230	280	
0731744	9.600	0.3780				
0731750	9.700	0.3819				
0731767	9.800	0.3858				
0731773	9.900	0.3898				
1519458	9.922	0.3906	25/64			
0727034	10.000	0.3937				

1 per tube

⚠ WARNING: Cancer - www.P65Warnings.ca.gov

Drilling Conditions - Wet

LIST 9612, 9614, 9615, 9616, 9617

Work Material	Structural Steel Carbon Steel		Alloy Steel Heat Treated Steel (20 - 30 HRC)		Mold Steel Hardened Steel (30 - 40 HRC)		Ductile Cast Iron		Stainless Steel (300 Series)		Nickel Alloys PH Stainless		Aluminum Alloy	
Speed (SFM)	145-180 SFM		130-165 SFM		115-150 SFM		115-150 SFM		80-100 SFM		70-90 SFM			
Drill Diameter Metric	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
1.0	15500	0.0009	14000	0.0008	12100	0.0008	12100	0.0011	7750	0.0005	6800	0.0004	Contact Engineering	
1.5	10350	0.0013	9400	0.0012	8100	0.0012	8100	0.0016	5200	0.0007	4500	0.0006		
2.0	7800	0.0020	7000	0.0016	6050	0.0016	6050	0.0021	3900	0.0009	3400	0.0008		
2.5	6200	0.0030	5600	0.0020	4850	0.0020	4850	0.0027	3100	0.0015	2700	0.0013		
Speed (SFM)	320-350 SFM		230-250 SFM		200-230 SFM		200-230 SFM		120-150 SFM		100 - 120 SFM		340 - 360 SFM	
3.0	10350	0.0038	7400	0.0030	6500	0.0030	6500	0.0033	3900	0.0021	3200	0.0014	11300	0.0030
4.0	7800	0.0050	5600	0.0040	4850	0.0040	4850	0.0044	2900	0.0028	2400	0.0019	8500	0.0039
5.0	6200	0.0063	4500	0.0050	3900	0.0050	3900	0.0055	2300	0.0035	1950	0.0024	6800	0.0049
6.0	5200	0.0076	3700	0.0060	3200	0.0060	3200	0.0066	1950	0.0043	1600	0.0028	5700	0.0059
7.0	4400	0.0088	3200	0.0070	2800	0.0070	2800	0.0077	1650	0.0050	1400	0.0033	4850	0.0069
8.0	3900	0.0101	2800	0.0080	2400	0.0080	2400	0.0088	1450	0.0057	1200	0.0038	4250	0.0079
9.0	3450	0.0113	2500	0.0090	2150	0.0090	2150	0.0099	1300	0.0064	1100	0.0043	3800	0.0089
10.0	3100	0.0122	2200	0.0090	1900	0.0090	1900	0.0110	1150	0.0071	970	0.0047	3400	0.0098
11.0	2800	0.0134	2000	0.0100	1800	0.0100	1800	0.0121	1050	0.0078	880	0.0052	3100	0.0108
12.0	2600	0.0142	1850	0.0100	1600	0.0100	1600	0.0132	970	0.0085	810	0.0057	2800	0.0118

Cutting Condition Table Recommendations

1) Adjust cutting condition according to the rigidity of machine or work clamp state.
2) The table values are for drilling with water-soluble cutting fluid.
3) Reduce RPM and feed rate by 30% for non-water soluble coolant.
4) Straight shot drilling is possible. However, when experiencing poor chip evacuation please add a peck or review drilling parameters.
5) When pecking, set retract slightly below hole entrance.
6) Peck increment starting size should be 0.5-1XD.
7) Recommended pilot hole depth is 1.5-2XD.
8) Recommend the AQDEXOHPLT for pilot hole drilling.

Drilling Conditions - MQL

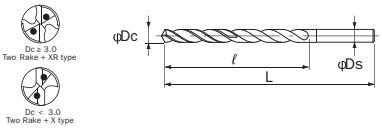
LIST 9612, 9614, 9615, 9616, 9617

Work Material	Structural Steel Carbon Steel		Alloy Steel Heat Treated Steel (20 - 30 HRC)		Mold Steel Hardened Steel (30 - 40 HRC)		Ductile Cast Iron	
Drill Diameter Metric	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
3.0	7600	0.0038	7600	0.0030	5700	0.0030	5700	0.0033
4.0	5700	0.0050	5000	0.0040	4300	0.0040	4300	0.0044
5.0	5100	0.0063	4450	0.0050	3800	0.0050	3800	0.0055
6.0	4200	0.0076	3700	0.0060	3200	0.0060	3200	0.0066
7.0	3600	0.0088	3200	0.0070	2700	0.0070	2700	0.0077
8.0	3200	0.0101	2800	0.0080	2400	0.0080	2400	0.0088
9.0	2800	0.0113	2500	0.0090	2100	0.0090	2100	0.0099
10.0	2550	0.0122	2200	0.0090	1900	0.0090	1900	0.0110
11.0	2300	0.0134	2000	0.0100	1700	0.0100	1700	0.0121
12.0	2100	0.0142	1900	0.0100	1600	0.0100	1600	0.0132

Cutting Condition Table Recommendations

1) Adjust cutting condition according to the rigidity of machine or work clamp state.
2) The table values are for MQL drilling.
3) Straight shot drilling is possible. However, when experiencing poor chip evacuation please add a peck or review drilling parameters.
4) When pecking, set retract slightly below hole entrance.
5) Peck increment starting size should be 0.5-1XD.
6) Recommended pilot hole depth is 1.5-2XD.
7) Recommend the AQDEXOHPLT for pilot hole drilling.
8) MQL not recommended for stainless and nickel applications. Please use wet drilling conditions.

Aqua Drill EX Oil Hole 25D



LIST 9618 Metric sizes
LIST 9619 Fractional sizes

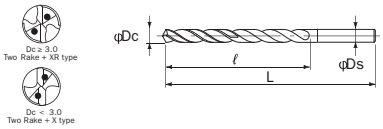
EDP#	Size	Decimal Equiv.	Wire, Fractional, Letter	Flute Length	Overall Length	Shank Dia.
	Dc			ℓ	L	Ds
1574446	1.000	0.0394		28	76	3
1574452	1.100	0.0433		31	86	
1574469	1.200	0.0472		34		
1574475	1.300	0.0512		36		
1574481	1.400	0.0551		39		
1574498	1.500	0.0591		42		
1574503	1.600	0.0630		45	100	
1574510	1.700	0.0669		48		
1574526	1.800	0.0709		50		
1574532	1.900	0.0748		53		
1574549	2.000	0.0787		56		
1574555	2.100	0.0827		59	115	
1574584	2.200	0.0866		62		
1574590	2.300	0.0906		64		
1574606	2.400	0.0945		67		
1574612	2.500	0.0984		70		
1574629	2.600	0.1024		73	126	
1574635	2.700	0.1063		76		
1574641	2.800	0.1102		78		
1574561	2.900	0.1142		81		
0727040	3.000	0.1181		84	134	
0731780	3.100	0.1220		98	148	4
1519464	3.175	0.1250	1/8			
0731796	3.200	0.1260				
0731801	3.300	0.1299				
0731818	3.400	0.1339				
0727057	3.500	0.1378				
1591471	3.572	0.1406	9/64	112	162	
0731824	3.600	0.1417				
0731830	3.700	0.1457				
0731847	3.800	0.1496				
0731853	3.900	0.1535				
1519470	3.969	0.1562	5/32			
0727063	4.000	0.1575				
0731860	4.100	0.1614		126	176	5
0731876	4.200	0.1654				
0731882	4.300	0.1693				
1591488	4.366	0.1719	11/64			
0731899	4.400	0.1732				
0727070	4.500	0.1772				
0731904	4.600	0.1811		140	190	
0731910	4.700	0.1850				
1519487	4.763	0.1875	3/16			
0731927	4.800	0.1890				
0731933	4.900	0.1929				
0727086	5.000	0.1969				
0731940	5.100	0.2008		154	204	6

1 per tube

⚠ WARNING: Cancer - www.P65Warnings.ca.gov

EDP#	Size	Decimal Equiv.	Wire, Fractional, Letter	Flute Length	Overall Length	Shank Dia.
	Dc			ℓ	L	Ds
1591494	5.159	0.2031	13/64	154	204	6
0731956	5.200	0.2047				
0731962	5.300	0.2087				
0731979	5.400	0.2126				
1519493	5.408	0.2129	#3			
0727092	5.500	0.2165				
1591500	5.556	0.2187	7/32	168	218	
0731985	5.600	0.2205				
0731991	5.700	0.2244				
0732006	5.800	0.2283				
0732012	5.900	0.2323				
1591516	5.953	0.2344	15/64			
0727108	6.000	0.2362				
0732029	6.100	0.2402		182	232	7
0732035	6.200	0.2441				
0732041	6.300	0.2480				
1519509	6.350	0.2500	1/4			
0732058	6.400	0.2520				
0727114	6.500	0.2559				
0732064	6.600	0.2598		196	246	
0732070	6.700	0.2638				
1591522	6.747	0.2656	17/64			
0732087	6.800	0.2677				
0732093	6.900	0.2717				
0727120	7.000	0.2756				
0732109	7.100	0.2795		210	260	8
1591539	7.144	0.2812	9/32			
0732115	7.200	0.2835				
0732121	7.300	0.2874				
0732138	7.400	0.2913				
0727137	7.500	0.2953				
1591545	7.541	0.2969	19/64	224	274	
0732144	7.600	0.2992				
0732150	7.700	0.3031				
0732167	7.800	0.3071				
0732173	7.900	0.3110				
1519515	7.938	0.3125	5/16			
0727143	8.000	0.3150				
1591551	8.334	0.3281	21/64	238	288	9
0767863	8.500	0.3346		239.5	289.5	
1591568	8.731	0.3437	11/32	252	302	
0767734	9.000	0.3543		253.6	303.6	
1591574	9.128	0.3594	23/64	266	302	10
0767580	9.500	0.3740		267.7	317.7	
1519521	9.525	0.3750	3/8	280	330	
0767597	9.600	0.3780		281.7	331.7	
1591580	9.922	0.3906	25/64	280	330	
0767631	10.000	0.3937		281.8	331.8	

Aqua Drill EX Oil Hole 30D



LIST 9620 Metric sizes
LIST 9621 Fractional sizes

EDP#	Size	Decimal Equiv.	Wire, Fractional, Letter	Flute Length	Overall Length	Shank Dia.
	Dc			ℓ	L	Ds
1574578	1.000	0.0394		33	78	3
1574658	1.100	0.0433		36	93	
1574664	1.200	0.0472		40		
1574670	1.300	0.0512		43		
1574687	1.400	0.0551		46		
1574693	1.500	0.0591		50		
1574709	1.600	0.0630		53	110	
1574715	1.700	0.0669		56		
1574721	1.800	0.0709		59		
1574738	1.900	0.0748		63		
1574744	2.000	0.0787		66		
1574750	2.100	0.0827		69	127	
1574767	2.200	0.0866		73		
1574773	2.300	0.0906		76		
1574780	2.400	0.0945		79		
1574796	2.500	0.0984		83		
1574801	2.600	0.1024		86	141	
1574818	2.700	0.1063		89		
1574824	2.800	0.1102		92		
1574830	2.900	0.1142		96		
0727150	3.000	0.1181		99	149	
0732180	3.100	0.1220		116	166	4
1519538	3.175	0.1250	1/8			
0732196	3.200	0.1260				
0732201	3.300	0.1299				
0732218	3.400	0.1339				
0727166	3.500	0.1378				
1591923	3.572	0.1406	9/64	132	182	
0732224	3.600	0.1417				
0732230	3.700	0.1457				
0732247	3.800	0.1496				
0732253	3.900	0.1535				
1519544	3.969	0.1562	5/32			
0727172	4.000	0.1575				
0732260	4.100	0.1614		149	199	5
0732276	4.200	0.1654				
0732282	4.300	0.1693				
1591930	4.366	0.1719	11/64			
0732299	4.400	0.1732				
0727189	4.500	0.1772				
0732304	4.600	0.1811		165	215	
0732310	4.700	0.1850				
1519550	4.763	0.1875	3/16			
0732327	4.800	0.1890				
0732333	4.900	0.1929				
0727195	5.000	0.1969				

1 per tube

⚠ WARNING: Cancer - www.P65Warnings.ca.gov

EDP#	Size	Decimal Equiv.	Wire, Fractional, Letter	Flute Length	Overall Length	Shank Dia.
	Dc			ℓ	L	Ds
0732340	5.100	0.2008		182	232	6
1591946	5.159	0.2031	13/64			
0732356	5.200	0.2047				
0732362	5.300	0.2087				
0732379	5.400	0.2126				
1591952	5.410	0.2130	#3			
0727200	5.500	0.2165				
1591969	5.556	0.2187	7/32	198	248	
0732385	5.600	0.2205				
0732391	5.700	0.2244				
0732407	5.800	0.2283				
0732413	5.900	0.2323				
1591975	5.953	0.2344	15/64			
0727217	6.000	0.2362				
0732420	6.100	0.2402		215	265	7
0732436	6.200	0.2441				
0732442	6.300	0.2480				
1519567	6.350	0.2500	1/4			
0732459	6.400	0.2520				
0727223	6.500	0.2559				
0732465	6.600	0.2598		231	281	
0732471	6.700	0.2638				
1591981	6.747	0.2656	17/64			
0732488	6.800	0.2677				
0732494	6.900	0.2717				
0727230	7.000	0.2756				
0732500	7.100	0.2795		248	298	8
1591998	7.144	0.2812	9/32			
0732516	7.200	0.2835				
0732522	7.300	0.2874				
0732539	7.400	0.2913				
0727246	7.500	0.2953				
1592002	7.541	0.2969	19/64	264	314	
0732545	7.600	0.2992				
0732551	7.700	0.3031				
0732568	7.800	0.3071				
0732574	7.900	0.3110				
1592019	7.938	0.3125	5/16			
0727252	8.000	0.3150				
1592025	8.334	0.3281	21/64	281	331	9
0767814	8.500	0.3346		282.5	332.5	
1592031	8.731	0.3437	11/32	297	347	
0767866	9.000	0.3543		298.6	348.6	
1592048	9.128	0.3594	23/64	314	364	10
0767917	9.500	0.3740		315.7	365.7	
1592054	9.525	0.3750	3/8	330	380	
0767923	9.600	0.3780		331.7	381.7	
1592060	9.922	0.3906	25/64	330	380	
0767969	10	0.3937		331.8	381.8	

Drilling Conditions - Wet

LIST 9618, 9619, 9620, 9621

Work Material	Structural Steel Carbon Steel		Alloy Steel Heat Treated Steel (20 - 30 HRC)		Mold Steel Hardened Steel (30 - 40 HRC)		Ductile Cast Iron		Stainless Steel (300 Series)		Nickel Alloys PH Stainless		Aluminum Alloy	
Speed (SFM)	145-180 SFM		130-165 SFM		115-150 SFM		115-150 SFM		80-100 SFM		70-90 SFM			
Drill Diameter Metric	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
1.0	15500	0.0008	14000	0.0007	12100	0.0007	12100	0.0010	7750	0.0004	6800	0.0004	Contact Engineering	
1.5	10350	0.0012	9400	0.0011	8100	0.0011	8100	0.0015	5200	0.0006	4500	0.0006		
2.0	7800	0.0018	7000	0.0014	6050	0.0014	6050	0.0020	3900	0.0008	3400	0.0008		
2.5	6200	0.0028	5600	0.0017	4850	0.0017	4850	0.0026	3100	0.0014	2700	0.0012		
Speed (SFM)	320-350 SFM		230-250 SFM		200-230 SFM		200-230 SFM		120-150 SFM		100 - 120 SFM		340 - 360 SFM	
3.0	10350	0.0036	7400	0.0030	6500	0.0028	6500	0.0032	3900	0.0019	3200	0.0013	11300	0.0028
4.0	7800	0.0048	5600	0.0040	4850	0.0039	4850	0.0043	2900	0.0026	2400	0.0018	8500	0.0038
5.0	6200	0.0060	4500	0.0050	3900	0.0043	3900	0.0054	2300	0.0034	1950	0.0023	6800	0.0047
6.0	5200	0.0072	3700	0.0060	3200	0.0054	3200	0.0065	1950	0.0042	1600	0.0027	5700	0.0057
7.0	4400	0.0085	3200	0.0060	2800	0.0065	2800	0.0076	1650	0.0049	1400	0.0032	4850	0.0067
8.0	3900	0.0097	2800	0.0070	2400	0.0074	2400	0.0087	1450	0.0055	1200	0.0037	4250	0.0077

Cutting Condition Table Recommendations

1) Adjust cutting condition according to the rigidity of machine or work clamp state.
2) The table values are for drilling with water-soluble cutting fluid.
3) Reduce RPM and feed rate by 30% for non-water soluble coolant.
4) Straight shot drilling is possible. However, when experiencing poor chip evacuation please add a peck or review drilling parameters.
5) When pecking, set retract slightly below hole entrance.
6) Peck increment starting size should be 0.5-1XD.
7) Recommended pilot hole depth is 1.5-2XD.
8) Recommend the AQDEXOHPLT for pilot hole drilling.

Drilling Conditions - MQL

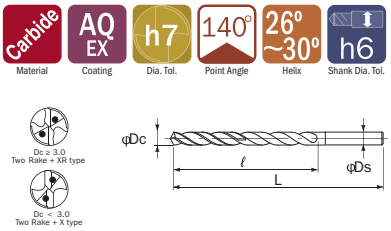
LIST 9618, 9619, 9620, 9621

Work Material	Structural Steel Carbon Steel		Alloy Steel Heat Treated Steel (20 - 30 HRC)		Mold Steel Hardened Steel (30 - 40 HRC)		Ductile Cast Iron	
Drill Diameter Metric	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
3.0	7600	0.0032	7600	0.0028	5700	0.0026	5700	0.0030
4.0	5700	0.0044	5000	0.0038	4300	0.0037	4300	0.0040
5.0	5100	0.0056	4450	0.0046	3800	0.0041	3800	0.0050
6.0	4200	0.0068	3700	0.0052	3200	0.0052	3200	0.0061
7.0	3600	0.0081	3200	0.0057	2700	0.0063	2700	0.0072
8.0	3200	0.0093	2800	0.0067	2400	0.0071	2400	0.0083

Cutting Condition Table Recommendations

1) Adjust cutting condition according to the rigidity of machine or work clamp state.
2) The table values are for MQL drilling.
3) Straight shot drilling is possible. However, when experiencing poor chip evacuation please add a peck or review drilling parameters.
4) When pecking, set retract slightly below hole entrance.
5) Peck increment starting size should be 0.5-1XD.
6) Recommended pilot hole depth is 1.5-2XD.
7) Recommend the AQDEXOHPLT for pilot hole drilling.
8) MQL not recommended for stainless and nickel applications. Please use wet drilling conditions.

Aqua Drill EX Oil Hole 40D



LIST 9626 Metric sizes
LIST 9627 Fractional sizes

• U.S Stock Item n Special Order

EDP#	Size	Decimal Equiv.	Wire, Fractional, Letter	Flute Length	Overall Length	Shank Diameter	Stock
	Dc			ℓ	L	Ds	
1575058	1.000	0.0394		43	88		•
1575064	1.100	0.0433		47			•
1575070	1.200	0.0472		52			•
1575087	1.300	0.0512		56	108		•
1575093	1.400	0.0551		60			•
1575109	1.500	0.0591		65			•
1575115	1.600	0.0630		69			•
1575121	1.700	0.0669		73			•
1575138	1.800	0.0709		77	130		•
1575144	1.900	0.0748		82			•
1575150	2.000	0.0787		86		3	•
1575167	2.100	0.0827		90			•
1575173	2.200	0.0866		95			•
1575180	2.300	0.0906		99	152		•
1575196	2.400	0.0945		103			•
1575201	2.500	0.0984		108			•
1575218	2.600	0.1024		112			•
1575224	2.700	0.1063		116			•
1575230	2.800	0.1102		120	170		•
1575247	2.900	0.1142		125			•
1519573	3.000	0.1181		129	179		•
	3.100	0.1220					n
1519618	3.175	0.1250	1/8				•
	3.200	0.1260					n
	3.300	0.1299		151	201		n
	3.400	0.1339					n
1592077	3.500	0.1378					•
1519580	3.572	0.1406	9/64				•
	3.600	0.1417					n
	3.700	0.1457					n
	3.800	0.1496		172	222	4	n
	3.900	0.1535					n
1519624	3.969	0.1562	5/32				•
1519596	4.000	0.1575					•
	4.100	0.1614					n
	4.200	0.1654					n
	4.300	0.1693		194	244	5	n
1591597	4.366	0.1719	11/64				•
	4.400	0.1732					n

EDP#	Size	Decimal Equiv.	Wire, Fractional, Letter	Flute Length	Overall Length	Shank Diameter	Stock
	Dc			ℓ	L	Ds	
1592083	4.500	0.1772		194	244		•
	4.600	0.1811					n
	4.700	0.1850					n
1519630	4.763	0.1875	3/16	215	265	5	•
	4.800	0.1890					n
	4.900	0.1929					n
1592090	5.000	0.1969					•
	5.100	0.2008					n
1591602	5.159	0.2031	13/64				•
	5.200	0.2047					n
	5.300	0.2087		237	287		n
	5.400	0.2126					n
1591619	5.408	0.2129	#3				•
1519601	5.500	0.2165				6	•
1591625	5.556	0.2187	7/32				•
	5.600	0.2205					n
	5.700	0.2244					n
	5.800	0.2283		258	308		n
	5.900	0.2323					n
1591631	5.953	0.2344	15/64				•
1592111	6.000	0.2362					•
	6.100	0.2402					n
	6.200	0.2441					n
	6.300	0.2480		280	330		n
1519647	6.350	0.2500	1/4				•
	6.400	0.2520					n
1592128	6.500	0.2559				7	•
	6.600	0.2598					n
	6.700	0.2638					n
1591648	6.747	0.2656	17/64	301	351		•
	6.800	0.2677					n
	6.900	0.2717					n
1592134	7.000	0.2756					•
	7.100	0.2795					n
1591654	7.144	0.2812	9/32				•
	7.200	0.2835					n
	7.300	0.2874		323	373	8	n
	7.400	0.2913					n
1592140	7.500	0.2953					•
1519653	7.938	0.3125	5/16	344	394		•

1 per tube

⚠ WARNING: Cancer - www.P65Warnings.ca.gov

Drilling Conditions - Wet

LIST 9626, 9627

Work Material	Structural Steel Carbon Steel		Alloy Steel Heat Treated Steel (20 - 30 HRC)		Mold Steel Hardened Steel (30 - 40 HRC)		Ductile Cast Iron		Stainless Steel (300 Series)		Nickel Alloys PH Stainless		Aluminum Alloy	
Speed (SFM)	145-180 SFM		130-165 SFM		115-150 SFM		115-150 SFM		80-100 SFM		70-90 SFM			
Drill Diameter Metric	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
1.0	15500	0.0006	14000	0.0006	12100	0.0006	12100	0.0008	7750	0.0004	6800	0.0004	Contact Engineering	
1.5	10350	0.0009	9400	0.0008	8100	0.0008	8100	0.0012	5200	0.0006	4500	0.0006		
2.0	7800	0.0015	7000	0.0011	6050	0.0011	6050	0.0016	3900	0.0008	3400	0.0008		
2.5	6200	0.0024	5600	0.0014	4850	0.0014	4850	0.0022	3100	0.0012	2700	0.0011		
Speed (SFM)	320-350 SFM		230-250 SFM		200-230 SFM		200-230 SFM		120-150 SFM		100 - 120 SFM		340 - 360 SFM	
3.0	10350	0.0030	7400	0.0024	6500	0.0024	6500	0.0026	3900	0.0017	3200	0.0012	11300	0.0026
4.0	7800	0.0040	5600	0.0031	4850	0.0031	4850	0.0035	2900	0.0023	2400	0.0017	8500	0.0036
5.0	6200	0.0050	4500	0.0040	3900	0.0040	3900	0.0045	2300	0.0030	1950	0.0022	6800	0.0045
6.0	5200	0.0060	3700	0.0048	3200	0.0048	3200	0.0054	1950	0.0035	1600	0.0026	5700	0.0055
7.0	4400	0.0070	3200	0.0051	2800	0.0051	2800	0.0064	1650	0.0045	1400	0.0031	4850	0.0064
8.0	3900	0.0078	2800	0.0056	2400	0.0056	2400	0.0074	1450	0.0050	1200	0.0036	4250	0.0074

Cutting Condition Table Recommendations

1) Adjust cutting condition according to the rigidity of machine or work clamp state.
2) The table values are for drilling with water-soluble cutting fluid.
3) Reduce RPM and feed rate by 30% for non-water soluble coolant.
4) Straight shot drilling is possible. However, when experiencing poor chip evacuation please add a peck or review drilling parameters.
5) When pecking, set retract slightly below hole entrance.
6) Peck increment starting size should be 0.5-1XD.
7) Recommended pilot hole depth is 1.5-2XD.
8) Recommend the AQDEXOHPLT for pilot hole drilling.

Drilling Conditions - MQL

LIST 9626, 9627

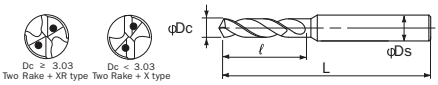
Work Material	Structural Steel Carbon Steel		Alloy Steel Heat Treated Steel (20 - 30 HRC)		Mold Steel Hardened Steel (30 - 40 HRC)		Ductile Cast Iron	
Drill Diameter Metric	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
3.0	7600	0.0030	7600	0.0024	5700	0.0024	5700	0.0026
4.0	5700	0.0040	5000	0.0031	4300	0.0031	4300	0.0035
5.0	5100	0.0050	4450	0.0040	3800	0.0040	3800	0.0045
6.0	4200	0.0060	3700	0.0048	3200	0.0048	3200	0.0054
7.0	3600	0.0070	3200	0.0051	2700	0.0051	2700	0.0064
8.0	3200	0.0078	2800	0.0056	2400	0.0056	2400	0.0074

Cutting Condition Table Recommendations

1) Adjust cutting condition according to the rigidity of machine or work clamp state.
2) The table values are for MQL drilling.
3) Straight shot drilling is possible. However, when experiencing poor chip evacuation please add a peck or review drilling parameters.
4) When pecking, set retract slightly below hole entrance.
5) Peck increment starting size should be 0.5-1XD.
6) Recommended pilot hole depth is 1.5-2XD.
7) Recommend the AQDEXOHPLT for pilot hole drilling.
8) MQL not recommended for stainless and nickel applications. Please use wet drilling conditions.

Aqua Drill EX Oil Hole Pilot

Carbide Material | AQ EX Coating | h7 Dia. Tol. | 150° Point Angle | 26°~30° Helix | h6 Shank Dia. Tol.



LIST 9622 Metric sizes
LIST 9623 Fractional sizes

EDP#	Size	Decimal Equiv.	For Ø	Flute Length	Overall Length	Shank Diameter
	Dc			ℓ	L	Ds
0734279	1.015	0.0400		3.3	54	3
0734285	1.115	0.0439		3.6	56	
0734291	1.215	0.0478		3.9		
0734307	1.315	0.0518		4.2		
0734313	1.415	0.0557		4.6		
0734320	1.515	0.0596		4.9		
0734336	1.615	0.0636		5.2	60	
0734342	1.715	0.0675		5.5		
0734359	1.815	0.0715		5.8		
0734365	1.915	0.0754		6.2		
0734371	2.015	0.0793		9		
0734388	2.115	0.0833		11	63	
0734394	2.215	0.0872				
0734400	2.315	0.0911				
0734416	2.415	0.0951		12		
0734422	2.515	0.0990				
0734439	2.615	0.1030			68	
0734445	2.715	0.1069		14		
0734451	2.815	0.1108				
0734468	2.915	0.1148				
0727624	3.030	0.1193				
0732952	3.130	0.1232		15	72	4
1519660	3.205	0.1262	1/8			
0732969	3.230	0.1272				
0732975	3.330	0.1311				
0732981	3.430	0.1350		16		
0727630	3.530	0.1390				
1519676	3.601	0.1418	9/64			
0732998	3.630	0.1429				
0733002	3.730	0.1469		18		
0733019	3.830	0.1508				
0733025	3.930	0.1547				
1519682	3.998	0.1574	5/32			
0727647	4.030	0.1587				
0733031	4.130	0.1626		19	80	5
0733048	4.230	0.1665				
0733054	4.330	0.1705				
1519699	4.395	0.1730	11/64			
0733060	4.430	0.1744		21		
0727653	4.530	0.1783				
0733077	4.630	0.1823				
0733083	4.730	0.1862		22		
1519704	4.792	0.1887	3/16			
0733090	4.830	0.1902				
0733105	4.930	0.1941				
0727660	5.030	0.1980		23		
0733111	5.130	0.2020		24	82	6

EDP#	Size	Decimal Equiv.	For Ø	Flute Length	Overall Length	Shank Diameter
	Dc			ℓ	L	Ds
1519710	5.189	0.2043	13/64	24	82	6
0733128	5.230	0.2059				
0733134	5.330	0.2098				
0733140	5.430	0.2138		25		
1519727	5.440	0.2142	#3			
0727676	5.530	0.2177				
1519733	5.586	0.2199	7/32			
0733157	5.630	0.2217				
0733163	5.730	0.2256		27		
0733170	5.830	0.2295				
0733186	5.930	0.2335				
1519740	5.983	0.2356	15/64			
0727682	6.030	0.2374				
0733192	6.130	0.2413		28	88	7
0733208	6.230	0.2453				
0733214	6.330	0.2492				
1519756	6.380	0.2512	1/4			
0733220	6.430	0.2531		30		
0727699	6.530	0.2571				
0733237	6.630	0.2610				
0733243	6.730	0.2650		31		
1519762	6.777	0.2668	17/64			
0733250	6.830	0.2689				
0733266	6.930	0.2728				
0727704	7.030	0.2768		32		
0733272	7.130	0.2807		33	94	8
1519779	7.173	0.2824	9/32			
0733289	7.230	0.2846				
0733295	7.330	0.2886				
0733300	7.430	0.2925		34		
0727710	7.530	0.2965				
1519785	7.571	0.2981	19/64			
0733317	7.630	0.3004				
0733323	7.730	0.3043		36		
0733330	7.830	0.3083				
0733346	7.930	0.3122				
1519791	7.967	0.3137	5/16			
0727727	8.030	0.3161				
0733352	8.130	0.3201		37	100	9
0733369	8.230	0.3240				
0733375	8.330	0.3280				
1519807	8.364	0.3293	21/64			
0733381	8.430	0.3319		39		
0727733	8.530	0.3358				
0733398	8.630	0.3398				
0733403	8.730	0.3437		40		
1519813	8.761	0.3449	11/32			

Aqua Drill EX Oil Hole Pilot

LIST 9622 Metric sizes

LIST 9623 Fractional sizes

EDP#	Size	Decimal Equiv.	For Ø	Flute Length	Overall Length	Shank Diameter
	Dc			ℓ	L	Ds
0733410	8.830	0.3476		40	100	9
0733426	8.930	0.3516				
0727740	9.030	0.3555		41		
0733432	9.130	0.3594		42	106	10
1519820	9.158	0.3606	23/64			
0733449	9.230	0.3634				
0733455	9.330	0.3673				
0733461	9.430	0.3713		43		
0727756	9.530	0.3752				
1519836	9.555	0.3762	3/8			
0733478	9.630	0.3791				
0733484	9.730	0.3831		45		
0733490	9.830	0.3870				
0733506	9.930	0.3909				
1519842	9.951	0.3918	25/64			
0727762	10.030	0.3949				
0733512	10.130	0.3988		46	116	11
0733529	10.230	0.4028				
0733535	10.330	0.4067				
0733541	10.430	0.4106		48		
0727779	10.530	0.4146				

EDP#	Size	Decimal Equiv.	For Ø	Flute Length	Overall Length	Shank Diameter
	Dc			ℓ	L	Ds
0733558	10.630	0.4185		48	116	11
0733564	10.730	0.4224		49		
1545117	10.745	0.4230	27/64			
0733570	10.830	0.4264				
0733587	10.930	0.4303				
0727785	11.030	0.4343				
0733593	11.130	0.4382		50	122	12
1545123	11.142	0.4387	7/16			
0733609	11.230	0.4421		51		
0733615	11.330	0.4461				
0733621	11.430	0.4500		52		
0727791	11.530	0.4539				
1545130	11.549	0.4547	29/64			
0733638	11.630	0.4579				
0733644	11.730	0.4618		54		
0733650	11.830	0.4657				
0733667	11.930	0.4697				
0727807	12.030	0.4736				
1519859	12.730	0.5012	1/2	57	127	13
1519865	13.524	0.5324	17/32	62	132	14
1545146	14.318	0.5637	9/16	65	140	15

1 per tube

⚠ WARNING: Cancer - www.P65Warnings.ca.gov

Drilling Conditions - Wet

LIST 9622, 9623

Work Material	Structural Steel Carbon Steel		Alloy Steel Heat Treated Steel (20 - 30 HRC)		Mold Steel Hardened Steel (30 - 40 HRC)		Ductile Cast Iron		Stainless Steel (300 Series)		Nickel Alloys PH Stainless		Aluminum Alloy	
Speed (SFM)	145-180 SFM		130-165 SFM		115-150 SFM		115-150 SFM		80-100 SFM		70-90 SFM		280-300 SFM	
Drill Diameter Metric	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
1.015	15500	0.0011	14000	0.0010	12100	0.0008	12100	0.0014	7750	0.0005	6800	0.0004	27200	0.0010
1.515	10350	0.0016	9400	0.0015	8100	0.0012	8100	0.0018	5200	0.0007	4500	0.0006	18100	0.0015
2.015	7800	0.0025	7000	0.0020	6050	0.0016	6050	0.0024	3900	0.0010	3400	0.0008	13600	0.0020
2.515	6200	0.0032	5600	0.0025	4850	0.0020	4850	0.0030	3100	0.0015	2700	0.0013	10900	0.0025
Speed (SFM)	320-350 SFM		230-250 SFM		200-230 SFM		200-230 SFM		120-150 SFM		100 - 120 SFM		340 - 360 SFM	
3.03	10350	0.0040	7400	0.0035	6500	0.0030	6500	0.0038	3900	0.0026	3200	0.0020	11300	0.0034
4.03	7800	0.0055	5600	0.0045	4850	0.0040	4850	0.0048	2900	0.0032	2400	0.0025	8500	0.0046
5.03	6200	0.0065	4500	0.0055	3900	0.0050	3900	0.0059	2300	0.0039	1950	0.0030	6800	0.0057
6.03	5200	0.0078	3700	0.0065	3200	0.0060	3200	0.0070	1950	0.0047	1600	0.0033	5700	0.0068
7.03	4400	0.0090	3200	0.0075	2800	0.0070	2800	0.0081	1650	0.0055	1400	0.0038	4850	0.0080
8.03	3900	0.0105	2800	0.0085	2400	0.0080	2400	0.0092	1450	0.0062	1200	0.0042	4250	0.0091
9.03	3450	0.0115	2500	0.0095	2150	0.0090	2150	0.0102	1300	0.0068	1100	0.0048	3800	0.0103
10.03	3100	0.0125	2200	0.0100	1900	0.0090	1900	0.0115	1150	0.0075	970	0.0052	3400	0.0114
11.03	2800	0.0135	2000	0.0105	1800	0.0102	1800	0.0012	1050	0.0083	880	0.0057	3100	0.0126
12.03	2600	0.0145	1850	0.0107	1600	0.0105	1600	0.0135	970	0.0090	810	0.0063	2800	0.0137

Cutting Condition Table Recommendations

1) Adjust cutting condition according to the rigidity of machine or work clamp state.
2) The table values are for drilling with water-soluble cutting fluid.
3) Reduce RPM and feed rate by 20% for non-water soluble coolant.
4) Use internal coolant.

Drilling Conditions - MQL

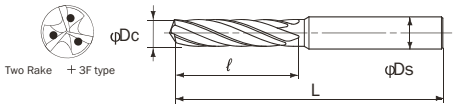
LIST 9622, 9623

Work Material	Structural Steel Carbon Steel		Alloy Steel Heat Treated Steel (20 - 30 HRC)		Mold Steel Hardened Steel (30 - 40 HRC)		Ductile Cast Iron	
Drill Diameter Metric	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
3.03	7600	0.0040	7600	0.0035	5700	0.0030	5700	0.0038
4.03	5700	0.0055	5000	0.0045	4300	0.0040	4300	0.0048
5.03	5100	0.0065	4450	0.0055	3800	0.0050	3800	0.0059
6.03	4200	0.0078	3700	0.0065	3200	0.0060	3200	0.0070
7.03	3600	0.0090	3200	0.0075	2700	0.0070	2700	0.0081
8.03	3200	0.0105	2800	0.0085	2400	0.0080	2400	0.0092
9.03	2800	0.0115	2500	0.0095	2100	0.0090	2100	0.0102
10.03	2550	0.0125	2200	0.0100	1900	0.0090	1900	0.0115
11.03	2300	0.0135	2000	0.0105	1700	0.0102	1700	0.0012
12.03	2100	0.0145	1900	0.0107	1600	0.0105	1600	0.0135

Cutting Condition Table Recommendations

1) Adjust cutting condition according to the rigidity of machine or work clamp state.
2) The table values are for MQL drilling.
3) Straight shot drilling is possible. However, when experiencing poor chip evacuation please add a peck or review drilling parameters.
4) MQL not recommended for stainless and nickel applications. Please use wet drilling conditions.

Aqua Drill EX Oil Hole 3 Flute 3D



LIST 9826

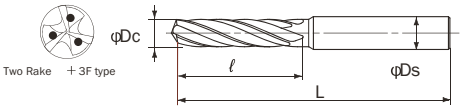
U.S. stock item

EDP #	Size	Decimal Equivalent	Flute Length	Overall Length	Shank Dia.	Stock
	Dc		ℓ	L	Ds	
0723876	3.0	0.1181	17	68	3	●
0728483	3.1	0.1220	20	72	4	●
0728490	3.2	0.1260				●
0728505	3.3	0.1299				●
0723882	3.4	0.1339				●
0723899	3.5	0.1378				●
0728511	3.6	0.1417	22			●
0728528	3.7	0.1457				●
0728534	3.8	0.1496				●
0728540	3.9	0.1535				●
0723904	4.0	0.1575				●
0728557	4.1	0.1614	25	80	5	●
0728563	4.2	0.1654				●
0723910	4.3	0.1693				●
0729736	4.4	0.1732				●
0723927	4.5	0.1772				●
0728570	4.6	0.1811	27			●
0728586	4.7	0.1850				●
0728592	4.8	0.1890				●
0728608	4.9	0.1929				●
0723933	5.0	0.1969				●
0723940	5.1	0.2008		82	6	●
0728614	5.2	0.2047				●
0728620	5.3	0.2087				●
0728637	5.4	0.2126				●
0723956	5.5	0.2165				●
0728643	5.6	0.2205	30			●
0728650	5.7	0.2244				●
0728666	5.8	0.2283				●
0728672	5.9	0.2323				●
0723962	6.0	0.2362				●
0728689	6.1	0.2402	32	88	7	●
0728695	6.2	0.2441				●
0728700	6.3	0.2480				●
0728717	6.4	0.2520				●
0723979	6.5	0.2559				●
0728723	6.6	0.2598	35			●
0728730	6.7	0.2638				●
0723985	6.8	0.2677				●
0723991	6.9	0.2717				●
0724006	7.0	0.2756				●
0729742	7.1	0.2795	37	94	8	●
0729759	7.2	0.2835				●
0729765	7.3	0.2874				●
0729771	7.4	0.2913				●
0724012	7.5	0.2953				●
0728746	7.6	0.2992	40			●
0728752	7.7	0.3031				●
0728769	7.8	0.3071				●
0728775	7.9	0.3110				●
0724029	8.0	0.3150				●

EDP #	Size	Decimal Equivalent	Flute Length	Overall Length	Shank Dia.	Stock
	Dc		ℓ	L	Ds	
0728781	8.1	0.3189	42	100	9	●
0728798	8.2	0.3228				●
0728803	8.3	0.3268				●
0728810	8.4	0.3307				●
0724035	8.5	0.3346				●
0724041	8.6	0.3386	45			●
0728826	8.7	0.3425				●
0728832	8.8	0.3465				●
0728849	8.9	0.3504				●
0724058	9.0	0.3543				●
0728855	9.1	0.3583	47	106	10	●
0728861	9.2	0.3622				●
0728878	9.3	0.3661				●
0728884	9.4	0.3701				●
0724064	9.5	0.3740				●
0728890	9.6	0.3780	50			●
0728906	9.7	0.3819				●
0728912	9.8	0.3858				●
0728929	9.9	0.3898				●
0724070	10.0	0.3937				●
0728935	10.1	0.3976	52	116	11	●
0728941	10.2	0.4016				●
0724087	10.3	0.4055				●
0728958	10.4	0.4094				●
0724093	10.5	0.4134				●
0728964	10.6	0.4173	55			●
0728970	10.7	0.4213				●
0728987	10.8	0.4252				●
0728993	10.9	0.4291				●
0724109	11.0	0.4331				●
0729008	11.1	0.4370	57	122	12	●
0729014	11.2	0.4409				●
0729020	11.3	0.4449				●
0729037	11.4	0.4488				●
0724115	11.5	0.4528				●
0729043	11.6	0.4567	60			●
0729050	11.7	0.4606				●
0729066	11.8	0.4646				●
0729072	11.9	0.4685				●
0724121	12.0	0.4724				●
0724138	12.1	0.4764	62	128	13	●
0724144	12.5	0.4921				●
0724150	13.0	0.5118	65			●
0724167	13.5	0.5315	67	134	14	●
0724173	14.0	0.5512	70			●
0724180	14.1	0.5551	72	140	15	●
0724196	14.5	0.5709				●
0724201	15.0	0.5906	75			●
0724218	15.5	0.6102	77	146	16	●
0724224	15.6	0.6142	80			●
0724230	16.0	0.6299				●

⚠ WARNING: Cancer - www.P65Warnings.ca.gov

Aqua Drill EX Oil Hole 3 Flute 5D



LIST 9820

EDP #	Size	Decimal Equivalent	Flute Length	Overall Length	Shank Dia.	Stock
	Dc		ℓ	L	Ds	
0724247	3.0	0.1181	28	78	3	•
0729089	3.1	0.1220	32	86	4	•
0729095	3.2	0.1260				•
0729100	3.3	0.1299				•
0724253	3.4	0.1339				•
0724260	3.5	0.1378				•
0729117	3.6	0.1417	36			•
0729123	3.7	0.1457				•
0729130	3.8	0.1496				•
0729146	3.9	0.1535				•
0724276	4.0	0.1575				•
0729152	4.1	0.1614	40	89	5	•
0729169	4.2	0.1654				•
0724282	4.3	0.1693				•
0729175	4.4	0.1732				•
0724299	4.5	0.1772				•
0729181	4.6	0.1811	44			•
0729198	4.7	0.1850				•
0729203	4.8	0.1890				•
0729210	4.9	0.1929				•
0724304	5.0	0.1969				•
0724310	5.1	0.2008		100	6	•
0729226	5.2	0.2047				•
0729232	5.3	0.2087				•
0729249	5.4	0.2126				•
0724327	5.5	0.2165				•
0729255	5.6	0.2205	48			•
0729261	5.7	0.2244				•
0729278	5.8	0.2283				•
0729284	5.9	0.2323				•
0724333	6.0	0.2362				•
0729290	6.1	0.2402	52	109	7	•
0729306	6.2	0.2441				•
0729312	6.3	0.2480				•
0729329	6.4	0.2520				•
0724340	6.5	0.2559				•
0729335	6.6	0.2598	56			•
0729341	6.7	0.2638				•
0724356	6.8	0.2677				•
0724362	6.9	0.2717				•
0724379	7.0	0.2756				•
0729358	7.1	0.2795	60	118	8	•
0729364	7.2	0.2835				•
0729370	7.3	0.2874				•
0729387	7.4	0.2913				•
0724385	7.5	0.2953				•
0729393	7.6	0.2992	64			•
0729409	7.7	0.3031				•
0729415	7.8	0.3071				•
0729421	7.9	0.3110				•
0724391	8.0	0.3150				•

U.S. stock item

EDP #	Size	Decimal Equivalent	Flute Length	Overall Length	Shank Dia.	Stock
	Dc		ℓ	L	Ds	
0729438	8.1	0.3189	68	127	9	•
0729444	8.2	0.3228				•
0729450	8.3	0.3268				•
0729467	8.4	0.3307				•
0724407	8.5	0.3346				•
0724413	8.6	0.3386				•
0729473	8.7	0.3425	72			•
0729480	8.8	0.3465				•
0729496	8.9	0.3504				•
0724420	9.0	0.3543				•
0729501	9.1	0.3583	76	136	10	•
0729518	9.2	0.3622				•
0729524	9.3	0.3661				•
0729530	9.4	0.3701				•
0724436	9.5	0.3740				•
0729547	9.6	0.3780	80			•
0729553	9.7	0.3819				•
0729560	9.8	0.3858				•
0729576	9.9	0.3898				•
0724442	10.0	0.3937				•
0729582	10.1	0.3976	84	149	11	•
0729599	10.2	0.4016				•
0724459	10.3	0.4055				•
0729604	10.4	0.4094				•
0724465	10.5	0.4134				•
0729610	10.6	0.4173	88			•
0729627	10.7	0.4213				•
0729633	10.8	0.4252				•
0729640	10.9	0.4291				•
0724471	11.0	0.4331				•
0729656	11.1	0.4370	92	158	12	•
0729662	11.2	0.4409				•
0729679	11.3	0.4449				•
0729685	11.4	0.4488				•
0724488	11.5	0.4528				•
0729691	11.6	0.4567	96			•
0729707	11.7	0.4606				•
0729713	11.8	0.4646				•
0729720	11.9	0.4685				•
0724494	12.0	0.4724				•
0724500	12.1	0.4764	100	167	13	•
0724516	12.5	0.4921				•
0724522	13.0	0.5118	104			•
0724539	13.5	0.5315	108	176	14	•
0724545	14.0	0.5512	112			•
0724551	14.1	0.5551	116	185	15	•
0724568	14.5	0.5709				•
0724574	15.0	0.5906	120			•
0724580	15.5	0.6102	124	194	16	•
0724597	15.6	0.6142	128			•
0724602	16.0	0.6299				•

Standard Drilling Conditions

LIST 9826, 9820

Work Material			Cast Irons/Carbon Steel		Alloy Steels/Pre-Hardened (20-30 HRC)		Mold Steels/Hardened (30-40 HRC)		Hardened Steels (40-50 HRC)		Cast Irons		Stainless Steel (300-Series)		Cast Aluminum	
Speed (SFM)			325-330 SFM		260-265 SFM		225-230 SFM		170-175 SFM		260-265 SFM		160-165 SFM		260-450 SFM	
Drilling Diameter																
Metric	Decimal		RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
3	0.118		10,700	0.005	8,500	0.005	7,450	0.004	5,600	0.004	8,500	0.005	5,300	0.004	14,800	0.007
4	0.157		8,000	0.006	6,400	0.006	5,600	0.005	4,200	0.005	6,400	0.006	4,000	0.006	11,200	0.009
6	0.236		5,300	0.010	4,250	0.009	3,750	0.008	2,800	0.006	4,250	0.009	2,650	0.008	7,400	0.010
8	0.315		4,000	0.013	3,200	0.013	2,800	0.011	2,100	0.010	3,200	0.013	2,000	0.011	5,600	0.013
10	0.394		3,200	0.016	2,550	0.016	2,250	0.014	1,700	0.0125	2,550	0.016	1,600	0.014	4,500	0.016
12	0.472		2,650	0.019	2,100	0.019	1,850	0.017	1,400	0.015	2,100	0.019	1,350	0.016	3,700	0.019
14	0.551		2,250	0.020	1,800	0.020	1,600	0.016	1,200	0.014	1,800	0.019	1,150	0.016	3,200	0.022
16	0.630		2,000	0.022	1,600	0.022	1,400	0.019	1,050	0.016	1,600	0.022	1,000	0.019	2,200	0.032

Drill Dia. (mm/inches)

Note:
1) Adjust drilling conditions according to the rigidity of machine or work clamp state.
2) Use the table values as starting parameters. Adjust per your machine & set up as required.
3) Above table values are for drilling water soluble cutting fluid. For non-water soluble cutting fluid reduce the RPM and feed rates by 20%
4) Use Internal Coolant. If drilling more than 3xD or 5xD use peck drill cycle (G83).
5) Peck Depth interval = 1xD

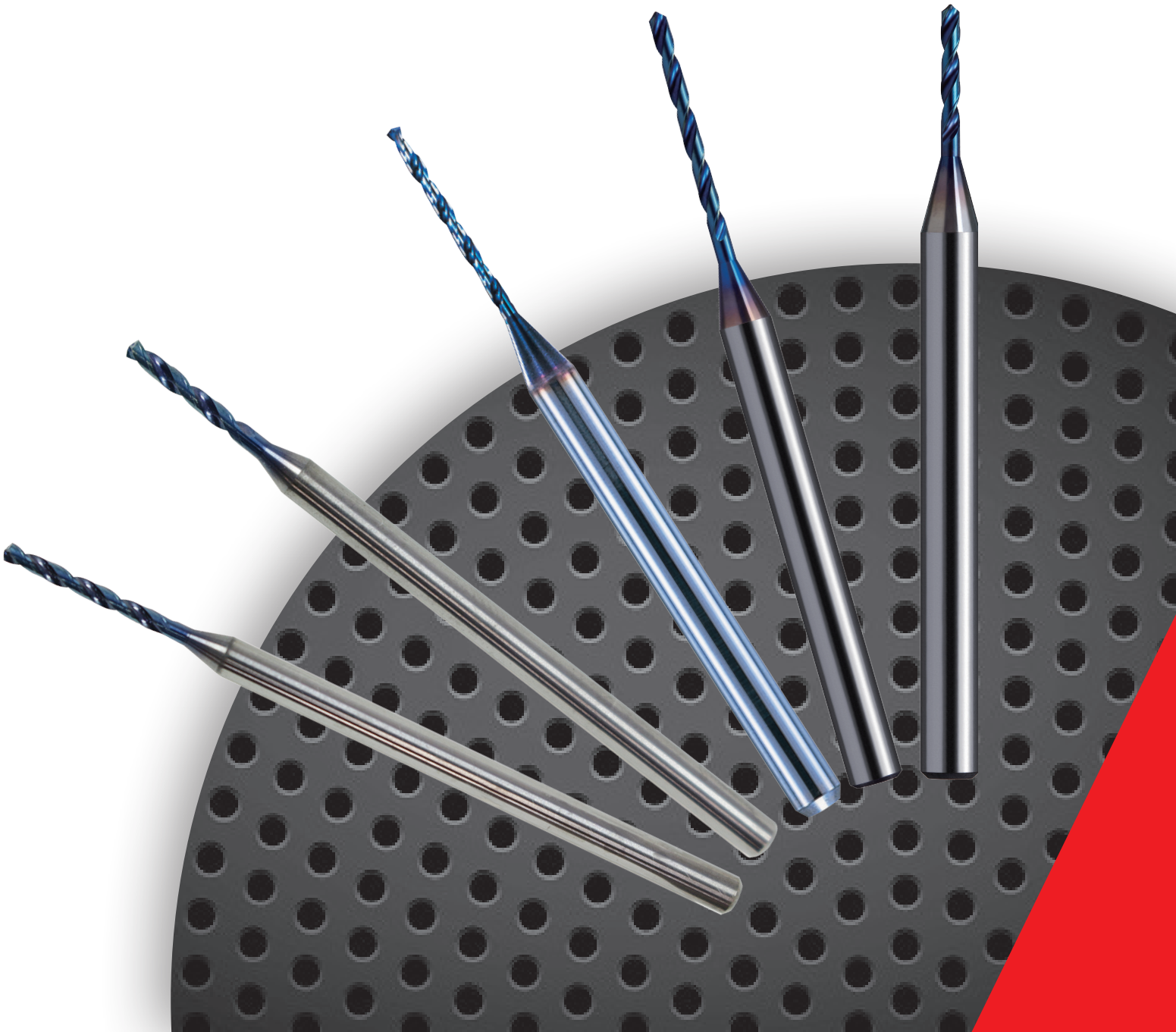
Formulas: $RPM = \frac{SFM \times 3.82}{\text{Drill Dia.}}$

Feed rate(in/min): RPM x IPR

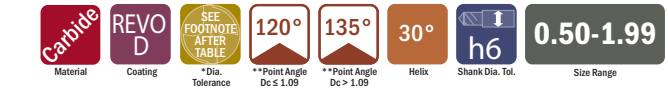
NACHI

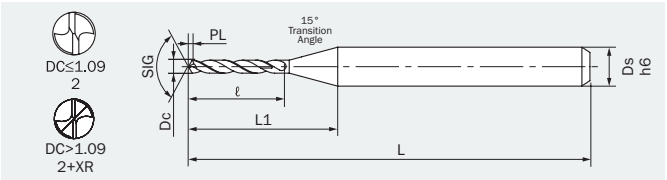
High Performance Micro Drills

New Aqua REVO Micro Drill in 5D and 10D Lengths



Aqua REVO Drill Micro 5D





LIST 9878 Metric sizes

Unit: mm

EDP #	Size mm	Decimal Equivalent	Flute Length	Neck Length	Overall Length	Shank Diameter
		Dc	ℓ	L1	L	Ds
0786515	0.50	0.0197	3.5	8.7	38	3
0786521	0.51	0.0201	3.8	8.9		
0786538	0.52	0.0205				
0786544	0.53	0.0209				
0786550	0.54	0.0213				
0786567	0.55	0.0217				
0786573	0.56	0.0220	4.2	9.2		
0786580	0.57	0.0224				
0786596	0.58	0.0228				
0786601	0.59	0.0232				
0786618	0.60	0.0236				
0786624	0.61	0.0240	4.5	9.4		
0786630	0.62	0.0244				
0786647	0.63	0.0248				
0786653	0.64	0.0252				
0786660	0.65	0.0256				
0786676	0.66	0.0260	4.9	9.7		
0786682	0.67	0.0264				
0786699	0.68	0.0268				
0786704	0.69	0.0272				
0786710	0.70	0.0276				
0786727	0.71	0.0280	5.2	9.9		
0786733	0.72	0.0283				
0786740	0.73	0.0287				
0786756	0.74	0.0291				
0786762	0.75	0.0295				
0786779	0.76	0.0299	5.6	10.2		
0786785	0.77	0.0303				
0786791	0.78	0.0307				
0786807	0.79	0.0311				
0786813	0.80	0.0315				
0786820	0.81	0.0319	5.9	10.4		
0786836	0.82	0.0323				
0786842	0.83	0.0327				
0786859	0.84	0.0331				
0786865	0.85	0.0335				
0786871	0.86	0.0339	6.3	10.7		
0786888	0.87	0.0343				
0786894	0.88	0.0346				
0786900	0.89	0.0350				
0786916	0.90	0.0354				

EDP #	Size mm	Decimal Equivalent	Flute Length	Neck Length	Overall Length	Shank Diameter
		Dc	ℓ	L1	L	Ds
0786922	0.91	0.0358	6.6	10.9	38	3
0786939	0.92	0.0362				
0786945	0.93	0.0366				
0786951	0.94	0.0370				
0786968	0.95	0.0374				
0786974	0.96	0.0378	7.0	11.3		
0786980	0.97	0.0382				
0786997	0.98	0.0386				
0787001	0.99	0.0390				
0787018	1.00	0.0394		11.7		
0787024	1.01	0.0398	7.4	12		
0787030	1.02	0.0402				
0787047	1.03	0.0406				
0787053	1.04	0.0409				
0787060	1.05	0.0413				
0787076	1.06	0.0417	7.7	12.3		
0787082	1.07	0.0421				
0787099	1.08	0.0425				
0787104	1.09	0.0429				
0787110	1.10	0.0433		12.2		
0787127	1.11	0.0437	8.1	12.6		
0787133	1.12	0.0441				
0787140	1.13	0.0445				
0787156	1.14	0.0449				
0787162	1.15	0.0453				
0787179	1.16	0.0457	8.4	12.8		
0787185	1.17	0.0461				
0787191	1.18	0.0465				
0787207	1.19	0.0469				
0787213	1.20	0.0472				
0787220	1.21	0.0476	8.8	13.1		
0787236	1.22	0.0480				
0787242	1.23	0.0484				
0787259	1.24	0.0488				
0787265	1.25	0.0492				
0787271	1.26	0.0496	9.1	13.3		
0787288	1.27	0.0500				
0787294	1.28	0.0504				
0787300	1.29	0.0508				
0787316	1.30	0.0512				

LIST 9878 Metric sizes

EDP #	Size mm	Decimal Equivalent	Flute Length	Neck Length	Overall Length	Shank Diameter
		Dc	ℓ	L1	L	Ds
0787322	1.31	0.0516	9.5	13.6	38	3
0787339	1.32	0.0520				
0787345	1.33	0.0524				
0787351	1.34	0.0528				
0787368	1.35	0.0531				
0787374	1.36	0.0535	9.8	13.8		
0787380	1.37	0.0539				
0787397	1.38	0.0543				
0787402	1.39	0.0547				
0787419	1.40	0.0551				
0787425	1.41	0.0555	10.2	14.1		
0787431	1.42	0.0559				
0787448	1.43	0.0563				
0787454	1.44	0.0567				
0787460	1.45	0.0571				
0787477	1.46	0.0575	10.5	14.3		
0787483	1.47	0.0579				
0787490	1.48	0.0583				
0787505	1.49	0.0587				
0787511	1.50	0.0591				
0787528	1.51	0.0594	10.9	14.6		
0787534	1.52	0.0598				
0787540	1.53	0.0602				
0787557	1.54	0.0606				
0787563	1.55	0.0610				
0787570	1.56	0.0614	11.3	14.9		
0787586	1.57	0.0618				
0787592	1.58	0.0622				
0787608	1.59	0.0626				
0787614	1.60	0.0630				
0787620	1.61	0.0634	11.6	15.1	45	
0787637	1.62	0.0638				
0787643	1.63	0.0642				
0787650	1.64	0.0646				
0787666	1.65	0.0650				
0787672	1.66	0.0654	12.0	15.4	45	3
0787689	1.67	0.0657				
0787695	1.68	0.0661				
0787700	1.69	0.0665				
0787717	1.70	0.0669				
0787723	1.71	0.0673	12.3	15.6		
0787730	1.72	0.0677				
0787746	1.73	0.0681				
0787752	1.74	0.0685				
0787769	1.75	0.0689				
0787775	1.76	0.0693	12.7	15.9		
0787781	1.77	0.0697				
0787798	1.78	0.0701				
0787803	1.79	0.0705				
0787810	1.80	0.0709				
0787826	1.81	0.0713	13.0	16.1		
0787832	1.82	0.0717				
0787849	1.83	0.0720				
0787855	1.84	0.0724				
0787861	1.85	0.0728				
0787878	1.86	0.0732	13.3	16.4		
0787884	1.87	0.0736				
0787890	1.88	0.0740				
0787906	1.89	0.0744				
0787912	1.90	0.0748				
0787929	1.91	0.0752	13.7	16.7		
0787935	1.92	0.0756				
0787941	1.93	0.0760				
0787958	1.94	0.0764				
0787964	1.95	0.0768				
0787970	1.96	0.0772	14.0	16.9		
0787987	1.97	0.0776				
0787993	1.98	0.0780				
0788008	1.99	0.0783				

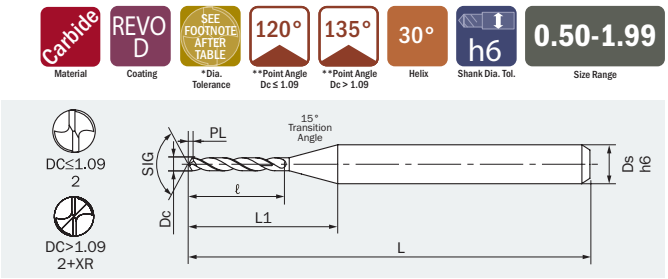
*Tolerance of diameter is 0 to -0.009mm.
**Point angle is 120° for diameters 0.50 to 1.09mm or less and 135° for diameters over 1.09 to 1.99mm.

LIST 9878 Standard Wet Cutting Conditions

Work Material	Carbon Steel, Cast Iron (200 HB)		Alloy Steel (20 - 30 HRC)		Mold Steel (30 - 40 HRC)		Hardened Steel (40 - 55 HRC)		Ductile Cast Iron		Stainless Steel		PH Stainless		Aluminum Alloy	
Drill Diam. mm	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
0.5	25500	0.0012	19100	0.0008	15900	0.0008	12750	0.0008	12600	0.0008	5600	0.0007	5600	0.0007	30000	0.0012
1	15000	0.0024	9900	0.0016	8500	0.0016	7500	0.0016	9900	0.0016	4200	0.0011	4200	0.0009	25000	0.0024
1.1	15000	0.0026	9900	0.0017	8500	0.0017	7500	0.0017	9900	0.0017	4100	0.0012	4100	0.0010	25000	0.0026
1.6	11940	0.0038	7900	0.0025	7000	0.0025	6000	0.0025	7900	0.0025	4000	0.0013	3200	0.0012	20000	0.0038
1.9	10050	0.0045	6700	0.0030	5900	0.0030	5030	0.0030	6700	0.0030	3350	0.0015	2700	0.0015	16760	0.0045

1. Adjust cutting condition according to the rigidity of the machine and work holding
2. If the machine you are using has rotation limitations, reduce the rotation and feed rate by the same ratio.
3. Wet condition refers to drilling with water soluble content.
4. In non-water coluble coolant, reduce the rotation and feed rate by 20%.
5. Please use pecking regardless of the hole depth.
6. Retract plane for pecking should return to the top of the hole.
7. Recommended peck increment is 0.2-0.5 x Dc.
8. Direct flood coolant along the work piece and not directly at the drill.

Aqua REVO Drill Micro 10D



LIST 9880 Metric sizes

Unit: mm

EDP #	Size mm	Decimal Equivalent	Flute Length	Neck Length	Overall Length	Shank Diameter
		Dc	ℓ	L1	L	Ds
0788014	0.50	0.0197	6.0	11.2	38	3
0788020	0.51	0.0201	6.6	11.7		
0788037	0.52	0.0205				
0788043	0.53	0.0209				
0788050	0.54	0.0213				
0788066	0.55	0.0217				
0788072	0.56	0.0220	7.2	12.2		
0788089	0.57	0.0224				
0788095	0.58	0.0228				
0788100	0.59	0.0232				
0788117	0.60	0.0236				
0788123	0.61	0.0240	7.8	12.7		
0788130	0.62	0.0244				
0788146	0.63	0.0248				
0788152	0.64	0.0252				
0788169	0.65	0.0256				
0788175	0.66	0.0260	8.4	13.2		
0788181	0.67	0.0264				
0788198	0.68	0.0268				
0788203	0.69	0.0272				
0788210	0.70	0.0276				
0788226	0.71	0.0280	9.0	13.7		
0788232	0.72	0.0283				
0788249	0.73	0.0287				
0788255	0.74	0.0291				
0788261	0.75	0.0295				
0788278	0.76	0.0299	9.6	14.2		
0788284	0.77	0.0303				
0788290	0.78	0.0307				
0788306	0.79	0.0311				
0788312	0.80	0.0315				
0788329	0.81	0.0319	10.2	14.7	45	
0788335	0.82	0.0323				
0788341	0.83	0.0327				
0788358	0.84	0.0331				
0788364	0.85	0.0335				
0788370	0.86	0.0339	10.8	15.2		
0788387	0.87	0.0343				
0788393	0.88	0.0346				
0788409	0.89	0.0350				
0788415	0.90	0.0354				
0788421	0.91	0.0358	11.4	15.7	45	3
0788438	0.92	0.0362				
0788444	0.93	0.0366				
0788450	0.94	0.0370				
0788467	0.95	0.0374				
0788473	0.96	0.0378	12.0	16.3		
0788480	0.97	0.0382				
0788496	0.98	0.0386				
0788501	0.99	0.0390				
0788518	1.00	0.0394		16.7		
0788524	1.01	0.0398	12.6	17.2		
0788530	1.02	0.0402				
0788547	1.03	0.0406				
0788553	1.04	0.0409				
0788560	1.05	0.0413				
0788576	1.06	0.0417	13.2	17.8		
0788582	1.07	0.0421				
0788599	1.08	0.0425				
0788604	1.09	0.0429				
0788610	1.10	0.0433		17.7		
0788627	1.11	0.0437	13.8	18.3		
0788633	1.12	0.0441				
0788640	1.13	0.0445				
0788656	1.14	0.0449				
0788662	1.15	0.0453				
0788679	1.16	0.0457	14.4	18.8		
0788685	1.17	0.0461				
0788691	1.18	0.0465				
0788707	1.19	0.0469				
0788713	1.20	0.0472				
0788720	1.21	0.0476	15.0	19.3		
0788736	1.22	0.0480				
0788742	1.23	0.0484				
0788759	1.24	0.0488				
0788765	1.25	0.0492				
0788771	1.26	0.0496	15.6	19.8		
0788788	1.27	0.0500				
0788794	1.28	0.0504				
0788800	1.29	0.0508				
0788816	1.30	0.0512				

LIST 9880 Metric sizes

EDP #	Size mm	Decimal Equivalent	Flute Length	Neck Length	Overall Length	Shank Diameter
		Dc	ℓ	L1	L	Ds
0788822	1.31	0.0516	16.2	20.3	45	3
0788839	1.32	0.0520				
0788845	1.33	0.0524				
0788851	1.34	0.0528				
0788868	1.35	0.0531				
0788874	1.36	0.0535	16.8	20.8		
0788880	1.37	0.0539				
0788897	1.38	0.0543				
0788902	1.39	0.0547				
0788919	1.40	0.0551				
0788925	1.41	0.0555	17.4	21.3		
0788931	1.42	0.0559				
0788948	1.43	0.0563				
0788954	1.44	0.0567				
0788960	1.45	0.0571				
0788977	1.46	0.0575	18.0	21.8		
0788983	1.47	0.0579				
0788990	1.48	0.0583				
0789004	1.49	0.0587				
0789010	1.50	0.0591				
0789027	1.51	0.0594	18.6	22.3	50	
0789033	1.52	0.0598				
0789040	1.53	0.0602				
0789056	1.54	0.0606				
0789062	1.55	0.0610				
0789079	1.56	0.0614	19.2	22.8		
0789085	1.57	0.0618				
0789091	1.58	0.0622				
0789107	1.59	0.0626				
0789113	1.60	0.0630				
0789120	1.61	0.0634	19.8	23.3		
0789136	1.62	0.0638				
0789142	1.63	0.0642				
0789159	1.64	0.0646				
0789165	1.65	0.0650				

EDP #	Size mm	Decimal Equivalent	Flute Length	Neck Length	Overall Length	Shank Diameter
		Dc	ℓ	L1	L	Ds
0789171	1.66	0.0654	20.4	23.8	50	3
0789188	1.67	0.0657				
0789194	1.68	0.0661				
0789200	1.69	0.0665				
0789216	1.70	0.0669				
0789222	1.71	0.0673	21.0	24.3		
0789239	1.72	0.0677				
0789245	1.73	0.0681				
0789251	1.74	0.0685				
0789268	1.75	0.0689				
0789274	1.76	0.0693	21.6	24.8		
0789280	1.77	0.0697				
0789297	1.78	0.0701				
0789302	1.79	0.0705				
0789319	1.80	0.0709				
0789325	1.81	0.0713	22.2	25.3		
0789331	1.82	0.0717				
0789348	1.83	0.0720				
0789354	1.84	0.0724				
0789360	1.85	0.0728				
0789377	1.86	0.0732	22.8	25.9		
0789383	1.87	0.0736				
0789390	1.88	0.0740				
0789405	1.89	0.0744				
0789411	1.90	0.0748				
0789428	1.91	0.0752	23.4	26.4		
0789434	1.92	0.0756				
0789440	1.93	0.0760				
0789457	1.94	0.0764				
0789463	1.95	0.0768				
0789470	1.96	0.0772	23.9	26.8		
0789486	1.97	0.0776				
0789492	1.98	0.0780				
0789508	1.99	0.0783				

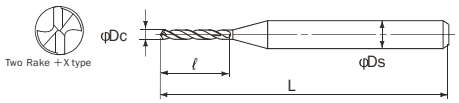
*Tolerance of diameter is 0 to -0.009mm.
**Point angle is 120° for diameters 0.50 to 1.09mm or less and 135° for diameters over 1.09 to 1.99mm.

LIST 9880 Standard Wet Cutting Conditions

Work Material	Carbon Steel, Cast Iron (200 HB)		Alloy Steel (20 - 30 HRC)		Mold Steel (30 - 40 HRC)		Hardened Steel (40 - 55 HRC)		Ductile Cast Iron		Stainless Steel		PH Stainless		Aluminum Alloy	
Drill Diam. mm	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
0.5	25500	0.0012	19100	0.0008	15900	0.0008	12750	0.0008	12600	0.0008	5600	0.0007	5600	0.0007	30000	0.0012
1	15000	0.0024	9900	0.0016	8500	0.0016	7500	0.0016	9900	0.0016	4200	0.0011	4200	0.0009	25000	0.0024
1.1	15000	0.0026	9900	0.0017	8500	0.0017	7500	0.0017	9900	0.0017	4100	0.0012	4100	0.0010	25000	0.0026
1.6	11940	0.0038	7900	0.0025	7000	0.0025	6000	0.0025	7900	0.0025	4000	0.0013	3200	0.0012	20000	0.0038
1.9	10050	0.0045	6700	0.0030	5900	0.0030	5030	0.0030	6700	0.0030	3350	0.0015	2700	0.0015	16760	0.0045

1. Adjust cutting condition according to the rigidity of the machine and work holding
2. If the machine you are using has rotation limitations, reduce the rotation and feed rate by the same ratio.
3. Wet condition refers to drilling with water soluble content.
4. In non-water coluble coolant, reduce the rotation and feed rate by 20%.
5. Please use pecking regardless of the hole depth.
6. Retract plane for pecking should return to the top of the hole.
7. Recommended peck increment is 0.2-0.5 x Dc.
8. Direct flood coolant along the work piece and not directly at the drill.

Aqua Drill Micro Solid Carbide



LIST 9544 Metric Range 0.20 to 1.99

EDP#	Size	Decimal Equiv.	Flute Length	Overall Length	Shank Diameter
	Dc		ℓ	L	Ds
0634002	0.20	0.0079	2.5	38	3
0634019	0.21	0.0083			
0634025	0.22	0.0087			
0634031	0.23	0.0091			
0634048	0.24	0.0094			
0634054	0.25	0.0098			
0634060	0.26	0.0102			
0634077	0.27	0.0106			
0634083	0.28	0.0110			
0634090	0.29	0.0114			
0634105	0.30	0.0118	3		
0634111	0.31	0.0122			
0634128	0.32	0.0126			
0634134	0.33	0.0130			
0634140	0.34	0.0134			
0634157	0.35	0.0138	4		
0634163	0.36	0.0142			
0634170	0.37	0.0146			
0634186	0.38	0.0150			
0634192	0.39	0.0154			
0634208	0.40	0.0157	5		
0634214	0.41	0.0161			
0634220	0.42	0.0165			
0634237	0.43	0.0169			
0634243	0.44	0.0173			
0634250	0.45	0.0177			
0634266	0.46	0.0181			
0634272	0.47	0.0185			
0634289	0.48	0.0189			
0634295	0.49	0.0193			
0634300	0.50	0.0197	6		
0634317	0.51	0.0201			
0634323	0.52	0.0205			
0634330	0.53	0.0209			
0634346	0.54	0.0213			
0634352	0.55	0.0217			
0634369	0.56	0.0220			
0634375	0.57	0.0224			
0634381	0.58	0.0228			
0634398	0.59	0.0232			
0634403	0.60	0.0236	7		
0634410	0.61	0.0240			

EDP#	Size	Decimal Equiv.	Flute Length	Overall Length	Shank Diameter
	Dc		ℓ	L	Ds
0634426	0.62	0.0244	7	38	3
0634432	0.63	0.0248			
0634449	0.64	0.0252			
0634455	0.65	0.0256			
0634461	0.66	0.0260			
0634478	0.67	0.0264			
0634484	0.68	0.0268			
0634490	0.69	0.0272			
0634506	0.70	0.0276	9		
0634512	0.71	0.0280			
0634529	0.72	0.0283			
0634535	0.73	0.0287			
0634541	0.74	0.0291			
0634558	0.75	0.0295			
0634564	0.76	0.0299			
0634570	0.77	0.0303			
0634587	0.78	0.0307			
0634593	0.79	0.0311			
0634609	0.80	0.0315	10		
0634615	0.81	0.0319			
0634621	0.82	0.0323			
0634638	0.83	0.0327			
0634644	0.84	0.0331			
0634650	0.85	0.0335			
0634667	0.86	0.0339			
0634673	0.87	0.0343			
0634680	0.88	0.0346			
0634696	0.89	0.0350			
0634701	0.90	0.0354	11		
0634718	0.91	0.0358			
0634724	0.92	0.0362			
0634730	0.93	0.0366			
0634747	0.94	0.0370			
0634753	0.95	0.0374			
0634760	0.96	0.0378			
0634776	0.97	0.0382			
0634782	0.98	0.0386			
0634799	0.99	0.0390			
0634804	1.00	0.0394	12		
0634810	1.01	0.0398			
0634827	1.02	0.0402			
0634833	1.03	0.0406			

EDP#	Size	Decimal Equiv.	Flute Length	Overall Length	Shank Diameter
	Dc		ℓ	L	Ds
0634840	1.04	0.0409	12	38	3
0634856	1.05	0.0413			
0634862	1.06	0.0417			
0634879	1.07	0.0421			
0634885	1.08	0.0425			
0634891	1.09	0.0429			
0634907	1.10	0.0433	14	47	
0634913	1.11	0.0437			
0634920	1.12	0.0441			
0634936	1.13	0.0445			
0634942	1.14	0.0449			
0634959	1.15	0.0453			
0634965	1.16	0.0457			
0634971	1.17	0.0461			
0634988	1.18	0.0465			
0634994	1.19	0.0469			
0635009	1.20	0.0472	15		
0635015	1.21	0.0476			
0635021	1.22	0.0480			
0635038	1.23	0.0484			
0635044	1.24	0.0488			
0635050	1.25	0.0492			
0635067	1.26	0.0496			
0635073	1.27	0.0500			
0635080	1.28	0.0504			
0635096	1.29	0.0508			
0635101	1.30	0.0512			
0635118	1.31	0.0516			
0635124	1.32	0.0520			
0635130	1.33	0.0524			
0635147	1.34	0.0528			
0635153	1.35	0.0531			
0635160	1.36	0.0535			
0635176	1.37	0.0539			
0635182	1.38	0.0543			
0635199	1.39	0.0547			
0635204	1.40	0.0551			
0635210	1.41	0.0555			
0635227	1.42	0.0559			
0635233	1.43	0.0563			
0635240	1.44	0.0567			
0635256	1.45	0.0571			
0635262	1.46	0.0575			
0635279	1.47	0.0579			
0635285	1.48	0.0583			
0635291	1.49	0.0587			
0635307	1.50	0.0591			
0635313	1.51	0.0594			
0635320	1.52	0.0598			

*Tolerance of diameter is 0 to -0.009mm.

EDP#	Size	Decimal Equiv.	Flute Length	Overall Length	Shank Diameter
	Dc		ℓ	L	Ds
0635336	1.53	0.0602	15	47	3
0635342	1.54	0.0606			
0635359	1.55	0.0610			
0635365	1.56	0.0614			
0635371	1.57	0.0618			
0635388	1.58	0.0622			
0635394	1.59	0.0626			
0635400	1.60	0.0630			
0635416	1.61	0.0634			
0635422	1.62	0.0638			
0635439	1.63	0.0642			
0635445	1.64	0.0646			
0635451	1.65	0.0650			
0635468	1.66	0.0654			
0635474	1.67	0.0657			
0635480	1.68	0.0661			
0635497	1.69	0.0665			
0635502	1.70	0.0669			
0635519	1.71	0.0673			
0635525	1.72	0.0677			
0635531	1.73	0.0681			
0635548	1.74	0.0685			
0635554	1.75	0.0689			
0635560	1.76	0.0693			
0635577	1.77	0.0697			
0635583	1.78	0.0701			
0635590	1.79	0.0705			
0635605	1.80	0.0709			
0635611	1.81	0.0713			
0635628	1.82	0.0717			
0635634	1.83	0.0720			
0635640	1.84	0.0724			
0635657	1.85	0.0728			
0635663	1.86	0.0732			
0635670	1.87	0.0736			
0635686	1.88	0.0740			
0635692	1.89	0.0744			
0635708	1.90	0.0748			
0635714	1.91	0.0752			
0635720	1.92	0.0756			
0635737	1.93	0.0760			
0635743	1.94	0.0764			
0635750	1.95	0.0768			
0635766	1.96	0.0772			
0635772	1.97	0.0776			
0635789	1.98	0.0780			
0635795	1.99	0.0783			

1 per tube

⚠ WARNING: Cancer - www.P65Warnings.ca.gov

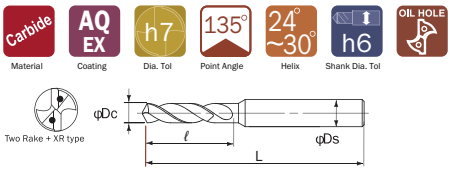
Standard Cutting Conditions

LIST 9544 AQMD

Work Material	"Carbon Steel, Cast Iron (200 HB)"			"Alloy Steel (20 - 30 HRC)"			"Mold Steel (30 - 40 HRC)"			"Hardened Steel (40 - 50 HRC)"			"Hardened Steel (50 - 55 HRC)"			Ductile Cast Iron			Stainless Steels		
Drill Diameter (mm)	RPM	Feed (IPR)	Peck Increment (mm)	RPM	Feed (IPR)	Peck Increment (mm)	RPM	Feed (IPR)	Peck Increment (mm)	RPM	Feed (IPR)	Peck Increment (mm)	RPM	Feed (IPR)	Peck Increment (mm)	RPM	Feed (IPR)	Peck Increment (mm)	RPM	Feed (IPR)	Peck Increment (mm)
0.2	31800	0.0001	0.1D	26500	0.0001	0.1D	21200	0.0001	0.1D	12700	0.0001	0.1D	10600	0.0001	0.1D	31800	0.0001	0.1D	10600	0.0001	0.1D
0.3	31800	0.0001		26500	0.0001		21200	0.0001		12700	0.0001		10600	0.0001		31800	0.0001		10600	0.0001	
0.4	31800	0.0002		25900	0.0002		19900	0.0002		12700	0.0002		9900	0.0002		31800	0.0002		9500	0.0002	
0.5	31800	0.0002		25900	0.0002		19100	0.0002		12700	0.0002		9200	0.0002		31800	0.0002		9500	0.0002	
1	23900	0.0006	0.2D	15900	0.0006	0.2D	12700	0.0006	0.2D	8000	0.0005		5600	0.0004		19100	0.0006	0.2D	5600	0.0006	
1.5	21200	0.0011		13800	0.0011		9500	0.0011		6400	0.0009		4200	0.0006		17000	0.0011		4200	0.0012	
1.99	19200	0.0019		12800	0.0020		8000	0.0020		5600	0.0015		3600	0.0008		16000	0.0014		3600	0.0015	

Cutting Condition Table Recommendations

1) Adjust cutting condition according to the rigidity of the machine and work holding.
2) If the machine you are using has rotation limitations, reduce the rotation and feed rate by the same ratio.
3) Wet condition refers to drilling with water soluble coolant.
4) In non-water soluble coolant, reduce the rotation and feed rate by 20%.
5) Please use pecking regardless of the hole depth.
6) Retract plane for pecking should return to the top of the hole.
7) Drill runout should be 0.005mm or less.
8) Direct flood coolant along the work piece and not directly at the drill.



Aqua Drill EX Oil Hole Micro 3D

LIST 9604 Metric sizes

EDP#	Size	Decimal Equiv.	Flute Length	Overall Length	Shank Diameter
	Dc		ℓ	L	Ds
0754470	1.0	0.0394	6	54	3
0754492	1.1	0.0433	7	55	
0754514	1.2	0.0472	8		
0754537	1.3	0.0512	8		
0754550	1.4	0.0551	9		
0754572	1.5	0.0591	10		
0754595	1.6	0.0630	11	58	
0754617	1.7	0.0669			
0754630	1.8	0.0709	12		
0754652	1.9	0.0748			
0754675	2.0	0.0787			
0754698	2.1	0.0827	13	63	
0754710	2.2	0.0866			
0754732	2.3	0.0906			
0754755	2.4	0.0945	14		
0754778	2.5	0.0984	15		
0754790	2.6	0.1024	16	68	
0754812	2.7	0.1063	17.5		
0754835	2.8	0.1102			
0754858	2.9	0.1142			

1 per tube

⚠ WARNING: Cancer - www.P65Warnings.ca.gov

Aqua Drill EX Oil Hole Micro 5D

LIST 9606 Metric sizes

EDP#	Size	Decimal Equiv.	Flute Length	Overall Length	Shank Diameter
	Dc		ℓ	L	Ds
0737203	1.0	0.0394	8	56	3
0737210	1.1	0.0433	9	58	
0737226	1.2	0.0472	10		
0737232	1.3	0.0512	11		
0737249	1.4	0.0551	12		
0737255	1.5	0.0591	13		
0737261	1.6	0.0630	14	62	
0737278	1.7	0.0669			
0737284	1.8	0.0709	15		
0737290	1.9	0.0748			
0737306	2.0	0.0787	16		
0737312	2.1	0.0827	17	68	
0737329	2.2	0.0866	18		
0737335	2.3	0.0906	18		
0737341	2.4	0.0945	19		
0737358	2.5	0.0984	20		
0737364	2.6	0.1024	21	78	
0737370	2.7	0.1063	22		
0737387	2.8	0.1102			
0737393	2.9	0.1142	23		

1 per tube

⚠ WARNING: Cancer - www.P65Warnings.ca.gov

Drilling Conditions - Wet

LIST 9604, 9606

Work Material	Structural Steel Carbon Steel		Alloy Steel Heat Treated Steel (20 - 30 HRC)		Mold Steel Hardened Steel (30 - 40 HRC)		Hardened Steels (40 - 50 HRC)		Ductile Cast Iron		Stainless Steel (300 Series)		Nickel Alloys PH Stainless		Aluminum Alloy	
Speed (SFM)	160-200 SFM		140-180 SFM		130-165 SFM		95-115 SFM		130-165 SFM		90-115 SFM		30-50 SFM		255 - 310 SFM	
Drill Diameter Metric	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
1.0	15500	0.0009	13600	0.0008	12600	0.0006	9700	0.0005	12600	0.0008	9700	0.0005	3900	0.0004	24250	0.0005
1.5	10350	0.0013	9100	0.0012	8400	0.0009	6450	0.0007	8400	0.0012	6450	0.0007	2600	0.0006	16200	0.0008
2.0	7750	0.0017	6800	0.0016	6300	0.0012	4850	0.0009	6300	0.0016	4850	0.0010	1950	0.0008	12100	0.0012
2.5	6200	0.0024	5450	0.0021	5050	0.0013	3900	0.0012	5050	0.0021	3900	0.0015	1550	0.0012	9700	0.0022

Cutting Condition Table Recommendations
1) Adjust cutting condition according to the rigidity of machine or work clamp state.
2) The table values are for drilling with water-soluble cutting fluid.
3) Reduce RPM and feed rate by 30% for non-water soluble coolant.

DLC Drill

L9524 DLC Micro Range 0.5 to 1.9
L9520 DLC Regular Range 2.0 to 12.0

EDP#	Size	Decimal Equiv.	Flute Length	Overall Length	Shank Diameter
	Dc		ℓ	L	Ds
0626747	0.500	0.0197	6	44	3
0626753	0.600	0.0236	7		
0626760	0.700	0.0276	9		
0626776	0.800	0.0315	10		
0626782	0.900	0.0354	11		
0626799	1.000	0.0394	12	47	
0626804	1.100	0.0433	14		
0626810	1.200	0.0472	15		
0626827	1.300	0.0512			
0626833	1.400	0.0551			
0626840	1.500	0.0591			
0626856	1.600	0.0630			
0626862	1.700	0.0669			
0626879	1.800	0.0709			
0626885	1.900	0.0748			
0626346	2.000	0.0787			
0626352	2.100	0.0827			
0626369	2.200	0.0866	16	48	
0626375	2.300	0.0906			
0626381	2.400	0.0945	17	49	
0626398	2.500	0.0984			
0626403	2.600	0.1024			
0626410	2.700	0.1063	19	51	
0626426	2.800	0.1102			
0626432	2.900	0.1142			
0626449	3.000	0.1181			
0626455	3.100	0.1220	21	53	4
0626461	3.200	0.1260			
0626478	3.300	0.1299			
0626484	3.400	0.1339	24	56	
0626490	3.500	0.1378			
0626506	3.600	0.1417			
0626512	3.700	0.1457			
0626529	3.800	0.1496	27	59	
0626535	3.900	0.1535			
0626541	4.000	0.1575			
0626558	4.100	0.1614		71	6
0626564	4.200	0.1654			
0626570	4.300	0.1693	31	75	
0626587	4.400	0.1732			
0626593	4.500	0.1772			
0626609	4.600	0.1811			
0626615	4.700	0.1850			
0626621	4.800	0.1890	33	77	
0626638	4.900	0.1929			
0626644	5.000	0.1969	38	82	
0626650	5.100	0.2008			
0626667	5.200	0.2047			
0626673	5.300	0.2087			
0626680	5.400	0.2126			
0626696	5.500	0.2165			
0626701	5.600	0.2205	41	85	
0626718	5.700	0.2244			
0626724	5.800	0.2283			
0626730	5.900	0.2323			
0625734	6.000	0.2362			
0625740	6.100	0.2402			8
0625757	6.200	0.2441			
0625763	6.300	0.2480			
0625770	6.400	0.2520			
0625786	6.500	0.2559			

*** JAPAN STOCK ITEM: Please allow 2-3 weeks delivery**

EDP#	Size	Decimal Equiv.	Flute Length	Overall Length	Shank Diameter
	Dc		ℓ	L	Ds
0625792	6.600	0.2598	43	87	8
0625808	6.700	0.2638			
0625814	6.800	0.2677			
0625820	6.900	0.2717			
0625837	7.000	0.2756			
0625843	7.100	0.2795	45	89	
0625850	7.200	0.2835			
0625866	7.300	0.2874			
0625872	7.400	0.2913			
0625889	7.500	0.2953			
0625895	7.600	0.2992	48	92	
0625900	7.700	0.3031			
0625917	7.800	0.3071			
0625923	7.900	0.3110			
0625930	8.000	0.3150			
0625946	8.100	0.3189	53	103	10
0625952	8.200	0.3228			
0625969	8.300	0.3268			
0625975	8.400	0.3307			
0625981	8.500	0.3346			
0625998	8.600	0.3386	55	105	
0626002	8.700	0.3425			
0626019	8.800	0.3465			
0626025	8.900	0.3504			
0626031	9.000	0.3543			
0626048	9.100	0.3583	58	108	
0626054	9.200	0.3622			
0626060	9.300	0.3661			
0626077	9.400	0.3701			
0626083	9.500	0.3740			
0626090	9.600	0.3780	60	110	
0626105	9.700	0.3819			
0626111	9.800	0.3858			
0626128	9.900	0.3898			
0626134	10.000	0.3937			
0626140	10.100	0.3976	66	123	12
0626157	10.200	0.4016			
0626163	10.300	0.4055			
0626170	10.400	0.4094			
0626186	10.500	0.4134			
0626192	10.600	0.4173	68	125	
0626208	10.700	0.4213			
0626214	10.800	0.4252			
0626220	10.900	0.4291			
0626237	11.000	0.4331			
0626243	11.100	0.4370	71	128	
0626250	11.200	0.4409			
0626266	11.300	0.4449			
0626272	11.400	0.4488			
0626289	11.500	0.452 8			
0626295	11.600	0.4567	73	130	
0626300	11.700	0.4606			
0626317	11.800	0.4646			
0626323	11.900	0.4685			
0626330	12.000	0.4724			

1 per tube

⚠ WARNING: Cancer - www.P65Warnings.ca.gov

Standard Drilling Condition

L9524, L9520

Drilling in Wet & Semi Dry (Mist Coolant) Condition

Workpiece Material / Speed (SFM) / Drill Diameter		Aluminum 1017		Aluminum Alloys						Aluminum Alloy Casting		Copper Alloys	
				4032, 6061		5052		7075					
		315 - 820 SFM		330 - 500 SFM		500 - 650 SFM		500 - 650 SFM		430 - 590 SFM		260 - 330 SFM	
Metric mm	Decimal	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
0.5	0.0197	60,000	0.0002	58,000	0.0002	60,000	0.0002	60,000	0.0003	60,000	0.0003	38,000	0.0003
1	0.0394	50,000	0.0006	38,000	0.0006	50,000	0.0006	50,000	0.0007	48,000	0.0007	25,000	0.0007
2	0.0787	40,000	0.0014	24,000	0.0014	32,000	0.0015	32,000	0.0016	29,000	0.0016	16,000	0.0016
3	0.1181	26,500	0.0021	16,000	0.0021	21,000	0.0022	21,000	0.0024	19,000	0.0025	10,500	0.0024
5	0.1969	16,000	0.003	9,600	0.004	12,700	0.004	12,700	0.004	11,500	0.004	6,400	0.004
8	0.3150	10,000	0.006	6,000	0.006	8,000	0.006	8,000	0.006	7,200	0.007	4,000	0.006
10	0.3937	8,000	0.007	4,800	0.007	6,400	0.007	6,400	0.008	5,700	0.008	3,200	0.008
12	0.4724	6,600	0.008	4,000	0.008	5,300	0.009	5,300	0.010	4,800	0.010	2,650	0.010

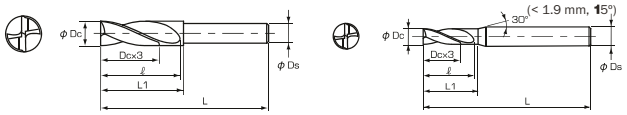
Drilling in Dry Condition

Workpiece Material / Speed (SFM) / Drill Diameter		Aluminum 1017		Aluminum Alloys						Aluminum Alloy Casting		Copper Alloys	
				4032, 6061		5052		7075					
		--		210 - 260 SFM		280 - 330 SFM		330 - 390 SFM		280 - 330 SFM		164 - 196 SFM	
Metric mm	Decimal	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
0.5	0.0197	Not Used		30,000	0.0002	38,000	0.0002	45,000	0.0002	38,000	0.0002	22,000	0.0002
1	0.0394			20,000	0.0004	25,000	0.0004	30,000	0.0005	25,000	0.0005	15,000	0.0005
2	0.0787			12,500	0.0010	16,000	0.0010	19,000	0.0012	16,000	0.0012	9,500	0.0012
3	0.1181			8,500	0.0015	10,600	0.0016	12,700	0.0018	10,600	0.0018	6,400	0.0017
5	0.1969			5,100	0.0025	6,400	0.0026	7,600	0.003	6,400	0.003	3,800	0.003
8	0.3150			3,200	0.004	4,000	0.004	4,800	0.005	4,000	0.005	2,400	0.005
10	0.3937			2,550	0.005	3,200	0.005	3,800	0.006	3,200	0.006	1,900	0.006
12	0.4724			2,100	0.006	2,650	0.006	3,200	0.007	2,650	0.007	1,600	0.007

1) DLC Drills are used in Nonferrous Metals such as Aluminum or Copper Alloys.
2) Adjust drilling condition when unusual vibration or different sound occurs.
3) When using low speed machines, use the maximum speed and adjust the feed rate.

Aqua Drill EX Flat Stub

Carbide Material | AQ EX Coating | 20° Helix | h7 Dia.Tol | 180° Point Angle | h6 Shank Dia.Tolerance



L9610 Metric Size
L9611 Fractional Size

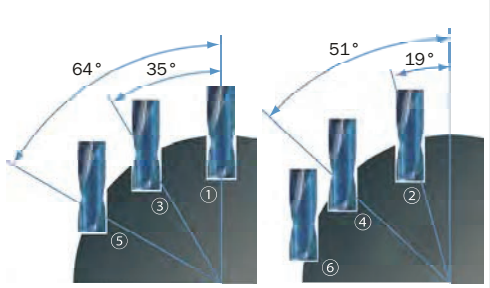
List #	EDP #	Size	Decimal Equivalent	Flute Length	Overall Length	L1	Shank Dia.	Stock
		Dc		ℓ	L	L1	Ds	
L9610	0751974	0.2	0.0079	0.66	47	0.98	3	•
L9610	0751968	0.3	0.0118	0.99		1.36		•
L9610	0751951	0.4	0.0157	1.32		1.65		•
L9610	0737198	0.5	0.0197	1.65		2.03		•
L9610	0737181	0.6	0.0236	1.98		2.32		•
L9610	0737175	0.7	0.0276	2.31		2.71		•
L9610	0737169	0.8	0.0315	2.64		2.99		•
L9610	0737152	0.9	0.0354	2.97		3.28		•
L9610	0715148	1.0	0.0394	3.3		3.6		•
L9610	0715154	1.1	0.0433	3.5		3.9		•
L9610	0715160	1.2	0.0472	3.9		4.2		•
L9610	0715177	1.3	0.0512	4.2		4.5		•
L9610	0715183	1.4	0.0551	4.6		4.9		•
L9610	0715190	1.5	0.0591	4.9		5.2		•
L9610	0715205	1.6	0.0630	5.2		5.5		•
L9610	0715211	1.7	0.0669	5.5		5.8		•
L9610	0715228	1.8	0.0709	5.8		6.1		•
L9610	0715234	1.9	0.0748	6.2		6.5		•
L9610	0711354	2.0	0.0787	9	50	9.8	4	•
L9610	0713180	2.1	0.0827	11		11.4		•
L9610	0711360	2.2	0.0866			11.4		•
L9610	0713197	2.3	0.0906			11.5		•
L9610	0713202	2.4	0.0945	12		12.6		•
L9610	0711377	2.5	0.0984			12.7		•
L9610	0713219	2.6	0.1024			12.8		•
L9610	0713225	2.7	0.1063	14		14.9		•
L9610	0713231	2.8	0.1102			15.0		•
L9610	0713248	2.9	0.1142			15.0		•
L9610	0709920	3.0	0.1181			14.4	6	•
L9610	0713254	3.1	0.1220	15		15.5		•
L9611	1455595	1/8	0.1250			18		•
L9610	0713260	3.2	0.1260			15.6		•
L9610	0710839	3.3	0.1299			15.7		•
L9610	0713277	3.4	0.1339	16		16.2		•
L9610	0709936	3.5	0.1378			16.3		•
L9610	0713283	3.6	0.1417			16.4		•
L9610	0713290	3.7	0.1457	18		18.0		•
L9610	0713305	3.8	0.1496			18.1		•
L9610	0713311	3.9	0.1535			18.2		•
L9611	1455600	5/32	0.1563			20		•
L9610	0709942	4.0	0.1575			18.3		•
L9610	0713328	4.1	0.1614	19	60	20.4		•
L9610	0710845	4.2	0.1654			20.4		•
L9610	0713334	4.3	0.1693			20.5		•
L9610	0713340	4.4	0.1732	21		22.6		•
L9610	0709959	4.5	0.1772			22.7		•
L9610	0713357	4.6	0.1811			22.8		•
L9610	0713363	4.7	0.1850	22		22.9		•
L9611	1455617	3/16	0.1875			24		•
L9610	0713370	4.8	0.1890			23.0		•
L9610	0713386	4.9	0.1929			23.0		•
L9610	0709965	5.0	0.1969	23		23.1		•
L9610	0713392	5.1	0.2008	24		26.2		•
L9610	0713408	5.2	0.2047			26.3		•
L9610	0711390	5.3	0.2087			26.4		•
L9610	0713414	5.4	0.2126	25		27.5		•
L9610	0709971	5.5	0.2165			27.6		•
L9611	1455623	7/32	0.2188			28		•
L9610	0713420	5.6	0.2205			27.7		•
L9610	0713437	5.7	0.2244	27		29.7		•
L9610	0713443	5.8	0.2283			29.8		•
L9610	0713450	5.9	0.2323			29.9		•
L9610	0709988	6.0	0.2362			30		•

List #	EDP #	Size	Decimal Equivalent	Flute Length	Overall Length	L1	Shank Dia.	Stock
		Dc		ℓ	L	L1	Ds	
L9610	0713466	6.1	0.2402	28	70	31	6	•
L9610	0713472	6.2	0.2441					•
L9610	0713489	6.3	0.2480					•
L9611	1455630	1/4	0.2500	30		33		•
L9610	0713495	6.4	0.2520					•
L9610	0709994	6.5	0.2559					•
L9610	0713500	6.6	0.2598					•
L9610	0713517	6.7	0.2638	31				•
L9610	0710851	6.8	0.2677					•
L9610	0713523	6.9	0.2717					•
L9610	0710008	7.0	0.2756	32				•
L9610	0713530	7.1	0.2795	33		36		•
L9611	1455646	9/32	0.2812					•
L9610	0713546	7.2	0.2835					•
L9610	0713552	7.3	0.2874					•
L9610	0713569	7.4	0.2913	34				•
L9610	0710014	7.5	0.2953					•
L9610	0713575	7.6	0.2992					•
L9610	0713581	7.7	0.3031	36		39		•
L9610	0713598	7.8	0.3071					•
L9610	0713603	7.9	0.3110					•
L9611	1455652	5/16	0.3125					•
L9610	0710020	8.0	0.3150				8	•
L9610	0713610	8.1	0.3189	37	80	40		•
L9610	0713626	8.2	0.3228					•
L9610	0713632	8.3	0.3268					•
L9611	1455669	21/64	0.3281	39		42		•
L9610	0713649	8.4	0.3307					•
L9610	0710037	8.5	0.3346					•
L9610	0713655	8.6	0.3386					•
L9610	0713661	8.7	0.3425	40				•
L9610	0711405	8.8	0.3465					•
L9610	0713678	8.9	0.3504					•
L9610	0710043	9.0	0.3543	41				•
L9610	0713684	9.1	0.3583	42		45		•
L9611	1455675	23/64	0.3594					•
L9610	0713690	9.2	0.3622	43				•
L9610	0713706	9.3	0.3661					•
L9610	0713712	9.4	0.3701					•
L9610	0710050	9.5	0.3740					•
L9611	1455681	3/8	0.3750					•
L9610	0713729	9.6	0.3780					•
L9610	0713735	9.7	0.3819	45		48		•
L9610	0713741	9.8	0.3858					•
L9610	0713758	9.9	0.3898					•
L9610	0710066	10.0	0.3937				10	•
L9610	0713764	10.1	0.3976	46	90	49		•
L9610	0713770	10.2	0.4016					•
L9610	0710868	10.3	0.4055					•
L9611	1455698	13/32	0.4063	48		51		•
L9610	0713787	10.4	0.4094					•
L9610	0710072	10.5	0.4134					•
L9610	0713793	10.6	0.4173					•
L9610	0713809	10.7	0.4213	49				•
L9610	0711411	10.8	0.4252					•
L9610	0713815	10.9	0.4291			54		•
L9610	0710089	11.0	0.4331	50				•
L9610	0713821	11.1	0.4370	51				•
L9611	1455703	7/16	0.4375					•
L9610	0713838	11.2	0.4409					•
L9610	0713844	11.3	0.4449					•
L9610	0713850	11.4	0.4488	52				•
L9610	0710095	11.5	0.4528					•

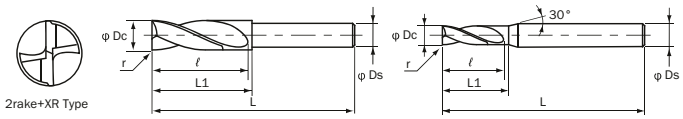
L9610 Metric Size
L9611 Fractional Size

List #	EDP #	Size	Decimal Equivalent	Flute Length	Overall Length	L1	Shank Dia.	Stock
		Dc		ℓ	L	L1	Ds	
L9611	1455710	29/64	0.4531	52	90	54	10	•
L9610	0713867	11.6	0.4567					•
L9610	0713873	11.7	0.4606	54		57		•
L9610	0713880	11.8	0.4646					•
L9610	0713896	11.9	0.4685					•
L9611	1455726	15/32	0.4688					•
L9610	0710100	12.0	0.4724				12	•
L9610	0724619	12.1	0.4764		100			•
L9610	0724625	12.2	0.4803					•
L9610	0724631	12.3	0.4843					•
L9610	0724648	12.4	0.4882					•
L9610	0710117	12.5	0.4921	57		60		•
L9610	0724654	12.6	0.4961					•
L9610	0724660	12.7	0.5000					•
L9611	1455732	1/2	0.5000	58				•
L9610	0724677	12.8	0.5039	57				•
L9610	0724683	12.9	0.5079					•
L9610	0710123	13.0	0.5118	59		63		•
L9610	0724690	13.1	0.5157					•
L9610	0724705	13.2	0.5197					•
L9610	0724711	13.3	0.5236					•
L9610	0724728	13.4	0.5276					•
L9610	0710130	13.5	0.5315	61				•
L9610	0724734	13.6	0.5354					•
L9610	0724740	13.7	0.5394					•
L9610	0724757	13.8	0.5433					•
L9610	0724763	13.9	0.5472					•
L9610	0710146	14.0	0.5512	63		66		•
L9610	0724770	14.1	0.5551					•
L9610	0724786	14.2	0.5591					•

List #	EDP #	Size	Decimal Equivalent	Flute Length	Overall Length	L1	Shank Dia.	Stock
		Dc		ℓ	L	L1	Ds	
L9611	1455749	9/16	0.5625	64	105	67	12	•
L9610	0724792	14.3	0.5630	63	100	66		•
L9610	0724808	14.4	0.5669					•
L9610	0710152	14.5	0.5709	66	105	69		•
L9610	0724814	14.6	0.5748					•
L9610	0724820	14.7	0.5787					•
L9610	0724837	14.8	0.5827					•
L9610	0724843	14.9	0.5866					•
L9610	0710169	15.0	0.5906	68				•
L9610	0724850	15.1	0.5945					•
L9610	0724866	15.2	0.5984					•
L9610	0724872	15.3	0.6024					•
L9610	0724889	15.4	0.6063					•
L9610	0710175	15.5	0.6102	70	115	72		•
L9610	0724895	15.6	0.6142					•
L9610	0724900	15.7	0.6181					•
L9610	0724917	15.8	0.6220					•
L9611	1455755	5/8	0.6250	72		75		•
L9610	0724923	15.9	0.6260	70		72	16	•
L9610	0710181	16.0	0.6299	72		75		•
L9610	0710198	16.5	0.6496	75		78		•
L9610	0710203	17.0	0.6693	77	125	79		•
L9611	1455761	11/16	0.6875	79		81		•
L9610	0710210	17.5	0.6890	79		81		•
L9610	0710226	18.0	0.7087	81		84		•
L9610	0710232	18.5	0.7283	84	135	87		•
L9610	0710249	19.0	0.7480	86		87		•
L9611	1455778	3/4	0.7500	87		90		•
L9610	0710255	19.5	0.7677	88	145	91		•
L9610	0710261	20.0	0.7874	90		93	20	•



Aqua Drill EX Flat Radius



L9830 Metric Size
L9831 Fractional Size

CARBIDE DRILLS

List No.	EDP NO.	Size	Decimal Equivalent	Radius	FL	OAL	L1	Shank Dia.	Stock
		Dc		r	ℓ	L	L1	Ds	
9830	0732580	3.0	0.1181	0.3	14	50	16	6	•
9830	1490158	3.1	0.1220		15		17		•
9831	1489960	1/8	0.1250						•
9830	1490164	3.2	0.1260						•
9830	0732597	3.3	0.1299						•
9830	1490170	3.4	0.1339		16		18		•
9830	0732602	3.5	0.1378						•
9830	1490187	3.6	0.1417						•
9830	1490193	3.7	0.1457		18		20		•
9830	1490209	3.8	0.1496						•
9830	1490215	3.9	0.1535						•
9831	1489977	5/32	0.1563						•
9830	0732619	4.0	0.1575						•
9830	1490221	4.1	0.1614		19		21		•
9830	0732625	4.2	0.1654						•
9830	1490238	4.3	0.1693						•
9830	1490244	4.4	0.1732		21		23		•
9830	0732631	4.5	0.1772						•
9830	1490250	4.6	0.1811						•
9830	1490267	4.7	0.1850		22		24		•
9831	1489983	3/16	0.1875						•
9830	1490273	4.8	0.1890						•
9830	1490280	4.9	0.1929						•
9830	0732648	5.0	0.1969		23	60	25		•
9830	1490296	5.1	0.2008		24		26		•
9830	1490301	5.2	0.2047						•
9830	0732654	5.3	0.2087						•
9830	1490318	5.4	0.2126		25		27	6	•
9830	0732660	5.5	0.2165						•
9831	1489990	7/32	0.2188						•
9830	1490324	5.6	0.2205						•
9830	1490330	5.7	0.2244		27		29		•
9830	1490347	5.8	0.2283						•
9830	1490353	5.9	0.2323						•
9830	0732677	6.0	0.2362	0.4			30		•
9830	1490360	6.1	0.2402		28	70			•
9830	1490376	6.2	0.2441						•
9830	1490382	6.3	0.2480						•
9831	1490003	1/4	0.2500		30		31		•
9830	1490399	6.4	0.2520						•
9830	0732683	6.5	0.2559						•
9830	1490404	6.6	0.2598						•
9830	1490410	6.7	0.2638		31		33		•
9830	0732690	6.8	0.2677						•
9830	1490427	6.9	0.2717						•
9830	0732705	7.0	0.2756		32		36		•
9830	1490433	7.1	0.2795		33				•
9831	1490010	9/32	0.2812						•
9830	1490440	7.2	0.2835						•
9830	1490456	7.3	0.2874						•
9830	1490462	7.4	0.2913		34				•
9830	0732711	7.5	0.2953						•
9830	1490479	7.6	0.2992						•
9830	1490485	7.7	0.3031		36		39		•
9830	1490491	7.8	0.3071						•

List No.	EDP NO.	Size	Decimal Equivalent	Radius	FL	OAL	L1	Shank Dia.	Stock
		Dc		r	ℓ	L	L1	Ds	
9830	1490507	7.9	0.3110	0.4	36	70	39	6	•
9831	1490026	5/16	0.3125						•
9830	0732728	8.0	0.3150					8	•
9830	1490513	8.1	0.3189		37	80	40		•
9830	1490520	8.2	0.3228						•
9830	1490536	8.3	0.3268						•
9831	1490032	21/64	0.3281		39		42		•
9830	1490542	8.4	0.3307						•
9830	0732734	8.5	0.3346						•
9830	1490559	8.6	0.3386						•
9830	1490565	8.7	0.3425		40				•
9830	0732740	8.8	0.3465						•
9830	1490571	8.9	0.3504						•
9830	0732757	9.0	0.3543		41				•
9830	1490588	9.1	0.3583		42		44		•
9831	1490049	23/64	0.3594						•
9830	1490594	9.2	0.3622						•
9830	1490600	9.3	0.3661						•
9830	1490616	9.4	0.3701		43		45		•
9830	0732763	9.5	0.3740						•
9831	1490055	3/8	0.3750						•
9830	1490622	9.6	0.3780						•
9830	1490639	9.7	0.3819		45		48		•
9830	1490645	9.8	0.3858						•
9830	1490651	9.9	0.3898						•
9830	0732770	10.0	0.3937	0.5	46	90	49	10	•
9830	1490668	10.1	0.3976						•
9830	1490674	10.2	0.4016						•
9830	0732786	10.3	0.4055						•
9831	1490061	13/32	0.4063		48		51		•
9830	1490680	10.4	0.4094						•
9830	0732792	10.5	0.4134						•
9830	1490697	10.6	0.4173						•
9830	1490702	10.7	0.4213		49				•
9830	0732808	10.8	0.4252						•
9830	1490719	10.9	0.4291						•
9830	0732814	11.0	0.4331		50		54		•
9830	1490725	11.1	0.4370		51				•
9831	1490078	7/16	0.4375						•
9830	1490731	11.2	0.4409						•
9830	1490748	11.3	0.4449						•
9830	1490754	11.4	0.4488		52				•
9830	0732820	11.5	0.4528						•
9831	1490084	29/64	0.4531						•
9830	1490760	11.6	0.4567						•
9830	1490777	11.7	0.4606		54		57		•
9830	1490783	11.8	0.4646						•
9830	1490790	11.9	0.4685						•
9831	1490090	15/32	0.4688						•
9830	0732837	12.0	0.4724					12	•
9831	1490106	1/2	0.5000		58	100	60		•
9831	1490112	9/16	0.5625	0.6	64	105	67		•
9831	1490129	5/8	0.6250		72	115	75		•
9831	1490135	11/16	0.6875		79	125	81	16	•
9831	1490141	3/4	0.7500		87	135	90		•

Drilling Conditions - Wet

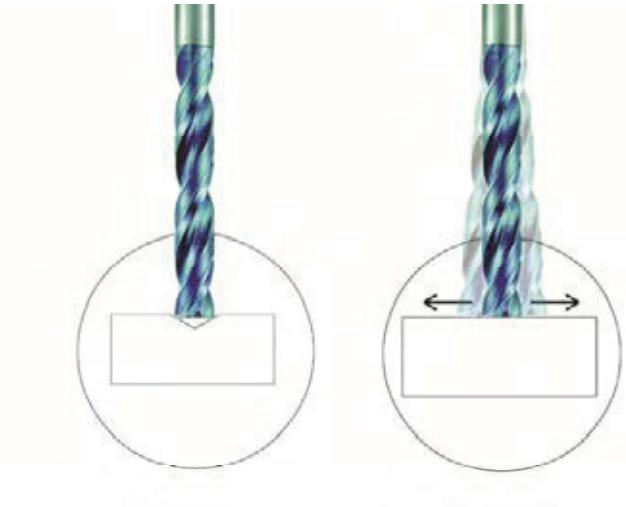
LIST 9610, 9611, 9830, 9831

Work Material	Structural Steel Carbon Steel Cast Iron		Alloy Steel Heat Treated Steel (20 - 30 HRC)		Mold Steel Hardened Steel (30 - 40 HRC)		Ductile Cast Iron		Stainless Steel (300 Series)		Nickel Alloys PH Stainless		Aluminum Alloy		Aluminum Casting	
Speed (SFM)	65 - 150 SFM		60 - 140 SFM		40 - 110 SFM		60 - 140 SFM		55 - 85 SFM		50 - 75 SFM		80 - 190 SFM		70 - 175 SFM	
Drill Diameter Metric	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
0.2	31000	0.00008	28650	0.00006	19100	0.00004	28650	0.00005	26300	0.00006	24000	0.00006	38200	0.00016	33500	0.00008
0.5	16200	0.0002	15200	0.00015	11400	0.0001	15200	0.00012	14300	0.00015	12400	0.00015	19100	0.00040	17100	0.00020
1.0	13600	0.0004	12600	0.0003	9700	0.0002	12600	0.0002	7300	0.0003	6300	0.0003	17450	0.0008	16000	0.0004
1.5	9100	0.0006	8400	0.0005	6500	0.0004	8400	0.0004	4850	0.0005	4200	0.0005	11650	0.0012	10700	0.0007
2.0	6800	0.0009	6300	0.0008	4850	0.0007	6300	0.0007	3650	0.0008	3150	0.0008	8750	0.0014	8000	0.0009
Speed (SFM)	235 - 255 SFM		210 - 230 SFM		110 - 130 SFM		210 - 230 SFM		80 - 100 SFM		75 - 85 SFM		340 - 360 SFM		300-320 SFM	
3.0	7950	0.0020	6900	0.0020	3700	0.0020	6900	0.0015	2600	0.0020	2450	0.0018	11000	0.0025	9700	0.0020
4.0	5950	0.0025	5150	0.0025	2800	0.0025	5150	0.0025	1950	0.0023	1850	0.0020	8400	0.0030	7300	0.0025
5.0	4800	0.0035	4150	0.0035	2200	0.0030	4150	0.0030	1550	0.0026	1450	0.0022	6700	0.0040	5900	0.0035
6.0	4000	0.0040	3450	0.0040	1800	0.0035	3450	0.0035	1300	0.0031	1200	0.0026	5600	0.0045	4900	0.0040
8.0	3000	0.0055	2600	0.0055	1400	0.0050	2600	0.0045	970	0.0038	920	0.0032	4200	0.0065	3700	0.0055
10.0	2400	0.0070	2050	0.0070	1100	0.0060	2050	0.0060	780	0.0047	730	0.0039	3400	0.0080	3000	0.0070
12.0	2000	0.0085	1700	0.0085	950	0.0070	1700	0.0070	650	0.0057	610	0.0048	2800	0.0095	2500	0.0080
16.0	1500	0.0110	1300	0.0110	700	0.0095	1300	0.0095	550	0.0063	460	0.0057	2100	0.0125	1850	0.0110
20.0	1200	0.0140	1050	0.0135	550	0.0120	1050	0.0115	480	0.0066	370	0.0063	1700	0.0155	1500	0.0135

Cutting Condition Table Recommendations

1) Adjust cutting condition according to the rigidity of machine or work clamp state.
2) The table values are for drilling with water-soluble cutting fluid.
3) Reduce RPM and feed rate by 20% for non-water soluble coolant.

Reduction % to above table values				
Degree of Angle	Reduction %		Reduction % (Multiplier)	
	RPM	Feed	RPM	Feed
0° - 5°	100%	100%	Table Value	Table Value
6° - 20°	50%	50%	(Table Value)x0.5	(Table Value)x0.5
21 - 35°	70%	40%	(Table Value)x0.3	(Table Value)x0.6
36° - 60°	70%	40%	(Table Value)x0.3	(Table Value)x0.6
61° and above	70%	30%	(Table Value)x0.3	(Table Value)x0.7

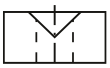


The longer a drill is, the higher the chance that it will walk. Flat bottom drills have a true 180* point. When entering on a flat surface, this amount of surface contact can cause the drill to walk. If this occurs, using a spot drill prior to the flat bottom drill will help to alleviate some of the surface contact to allow the drill to start properly.

Aqua Drill EX Flat Jobber Length

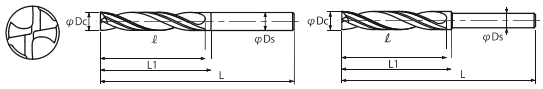
L9818 Metric Size
L9819 Fractional Size

- For entry on flat surfaces, Center Drill Hole is recommended



- Center Hole Diameter should be 0.5mm larger than Flat drill Diameter

Carbide Material | AQ EX Coating | 20° Helix | h7 Dia.Tol | 180° Point Angle | h6 Shank Dia. Tolerance



List #	EDP #	Size	Decimal Equivalent	Flute Length	Overall Length	L1	Shank Dia.	Stock
		Dc		ℓ	L	L1	Ds	
L9818	0720751	3.0	0.1181	19	60	20	6	•
L9818	0720768	3.1	0.1220	21		23		•
L9819	1489249	1/8	0.1250					•
L9818	0720774	3.2	0.1260					•
L9818	0720780	3.3	0.1299			24		•
L9818	0720797	3.4	0.1339	23				•
L9818	0720802	3.5	0.1378					•
L9818	0720819	3.6	0.1417			25		•
L9818	0720825	3.7	0.1457	25				•
L9818	0720831	3.8	0.1496					•
L9818	0720848	3.9	0.1535					•
L9819	1489255	5/32	0.1563					•
L9818	0720854	4.0	0.1575					•
L9818	0720860	4.1	0.1614	27	70	29		•
L9818	0720877	4.2	0.1654					•
L9818	0720883	4.3	0.1693			30		•
L9818	0720890	4.4	0.1732	29		32		•
L9818	0720905	4.5	0.1772					•
L9818	0720911	4.6	0.1811					•
L9818	0720928	4.7	0.1850	31		33		•
L9819	1489261	3/16	0.1875					•
L9818	0720934	4.8	0.1890					•
L9818	0720940	4.9	0.1929			32		•
L9818	0720957	5.0	0.1969	32				•
L9818	0720963	5.1	0.2008	34		36		•
L9818	0720970	5.2	0.2047					•
L9818	0720986	5.3	0.2087					•
L9818	0720992	5.4	0.2126	36		37		•
L9818	0721007	5.5	0.2165					•
L9819	1489278	7/32	0.2188			39		•
L9818	0721013	5.6	0.2205					•
L9818	0721020	5.7	0.2244	38				•
L9818	0721036	5.8	0.2283					•
L9818	0721042	5.9	0.2323					•
L9818	0721059	6.0	0.2362	40				•
L9818	0721065	6.1	0.2402			41		•
L9818	0721071	6.2	0.2441					•
L9818	0721088	6.3	0.2480					•
L9819	1489284	1/4	0.2500	42	85	43		•
L9818	0721094	6.4	0.2520		70			•
L9818	0721100	6.5	0.2559					•
L9818	0721116	6.6	0.2598					•
L9818	0721122	6.7	0.2638	44		45		•
L9818	0721139	6.8	0.2677					•
L9818	0721145	6.9	0.2717					•
L9818	0721151	7.0	0.2756	46	90	47		•
L9818	0721168	7.1	0.2795					•
L9819	1489290	9/32	0.2812					•
L9818	0721174	7.2	0.2835					•
L9818	0721180	7.3	0.2874	48		49		•
L9818	0721197	7.4	0.2913					•
L9818	0721202	7.5	0.2953					•
L9818	0721219	7.6	0.2992	51		52		•
L9818	0721225	7.7	0.3031					•
L9818	0721231	7.8	0.3071					•
L9818	0721248	7.9	0.3110					•
L9819	1489306	5/16	0.3125					•
L9818	0721254	8.0	0.3150	52	100	53	8	•
L9818	0721260	8.1	0.3189					•
L9818	0721277	8.2	0.3228					•
L9818	0721283	8.3	0.3268					•
L9819	1489312	21/64	0.3281	54		55		•
L9818	0721290	8.4	0.3307					•

List #	EDP #	Size	Decimal Equivalent	Flute Length	Overall Length	L1	Shank Dia.	Stock
		Dc		ℓ	L	L1	Ds	
L9818	0721305	8.5	0.3346	54	100	55	8	•
L9818	0721311	8.6	0.3386					•
L9818	0721328	8.7	0.3425	56		57		•
L9818	0721334	8.8	0.3465					•
L9818	0721340	8.9	0.3504					•
L9818	0721357	9.0	0.3543	58		59		•
L9818	0721363	9.1	0.3583	59		60		•
L9819	1489329	23/64	0.3594					•
L9818	0721370	9.2	0.3622					•
L9818	0721386	9.3	0.3661					•
L9818	0721392	9.4	0.3701	61		62		•
L9818	0721408	9.5	0.3740					•
L9819	1489335	3/8	0.3750					•
L9818	0721414	9.6	0.3780					•
L9818	0721420	9.7	0.3819	63		64		•
L9818	0721437	9.8	0.3858					•
L9818	0721443	9.9	0.3898					•
L9818	0721450	10.0	0.3937		110	65	10	•
L9818	0721466	10.1	0.3976	65		66		•
L9818	0721472	10.2	0.4016					•
L9818	0721489	10.3	0.4055			68		•
L9819	1489341	13/32	0.4063	67				•
L9818	0721495	10.4	0.4094					•
L9818	0721500	10.5	0.4134					•
L9818	0721517	10.6	0.4173			70		•
L9818	0721523	10.7	0.4213	69				•
L9818	0721530	10.8	0.4252					•
L9818	0721546	10.9	0.4291					•
L9818	0721552	11.0	0.4331	70	115	71	10	•
L9818	0721569	11.1	0.4370	71		72		•
L9819	1489358	7/16	0.4375					•
L9818	0721575	11.2	0.4409					•
L9818	0721581	11.3	0.4449					•
L9818	0721598	11.4	0.4488	73		74		•
L9818	0721603	11.5	0.4528					•
L9819	1489364	29/64	0.4531					•
L9818	0721610	11.6	0.4567					•
L9818	0721626	11.7	0.4606	76		77		•
L9818	0721632	11.8	0.4646					•
L9818	0721649	11.9	0.4685					•
L9819	1489370	15/32	0.4688					•
L9818	0721655	12.0	0.4724		125	78	12	•
L9818	0721661	12.5	0.4921	80		81		•
L9819	1489387	1/2	0.5000	81		83		•
L9818	0721678	13.0	0.5118	82	130	83		•
L9818	0721684	13.5	0.5315	86		87		•
L9818	0721690	14.0	0.5512	88	135	89		•
L9819	1489393	9/16	0.5625	90		91		•
L9818	0721706	14.5	0.5709	92		93		•
L9818	0721712	15.0	0.5906	95	145	96		•
L9818	0721729	15.5	0.6102	98		99		•
L9819	1489409	5/8	0.6250	101		102		•
L9818	0721735	16.0	0.6299	101	160	104	16	•
L9818	0721741	16.5	0.6496	105		106		•
L9818	0721758	17.0	0.6693	108	165	109		•
L9819	1489415	11/16	0.6875	111		112		•
L9818	0721764	17.5	0.6890	111		112		•
L9818	0721770	18.0	0.7087	113	175	114		•
L9818	0721787	18.5	0.7283	118		119		•
L9818	0721793	19.0	0.7480	120	185	121		•
L9819	1489421	3/4	0.7500	122		123		•
L9818	0721809	19.5	0.7677	124		125		•
L9818	0721815	20.0	0.7874	126	195	129	20	•

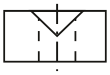
* Package Qty: 1 per Tube Size

Aqua Drill EX Flat Long Shank

L9816 Metric Size
L9817 Fractional Size

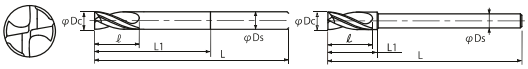
*Reach up to 10XD

For entry on flat surfaces, Center Drill Hole is recommended



Center Hole Diameter should be 0.5mm larger than Flat drill Diameter

Carbide Material | AQ EX Coating | 20° Helix | h7 Dia.Tol | 180° Point Angle | h6 Shank Dia. Tolerance



List #	EDP #	Size	Decimal Equivalent	Flute Length	Overall Length	L1	Shank Dia.	Stock
		Dc		ℓ	L	L1	Ds	
L9816	0717701	3.0	0.1181	14	100	30	6	•
L9816	0717718	3.1	0.1220	15		31		•
L9817	1489438	1/8	0.1250			32		•
L9816	0717724	3.2	0.1260			32		•
L9816	0717730	3.3	0.1299			33		•
L9816	0717747	3.4	0.1339	16		34		•
L9816	0717753	3.5	0.1378			35		•
L9816	0717760	3.6	0.1417			36		•
L9816	0717776	3.7	0.1457	18		37		•
L9816	0717782	3.8	0.1496			38		•
L9816	0717799	3.9	0.1535			39		•
L9817	1489444	5/32	0.1563			40		•
L9816	0717804	4.0	0.1575			40		•
L9816	0717810	4.1	0.1614	19		41		•
L9816	0717827	4.2	0.1654			42		•
L9816	0717833	4.3	0.1693			43		•
L9816	0717840	4.4	0.1732	21		44		•
L9816	0717856	4.5	0.1772			45		•
L9816	0717862	4.6	0.1811			46		•
L9816	0717879	4.7	0.1850	22		47		•
L9817	1489450	3/16	0.1875			48		•
L9816	0717885	4.8	0.1890			48		•
L9816	0717891	4.9	0.1929			49		•
L9816	0717907	5.0	0.1969	23	110	50		•
L9816	0717913	5.1	0.2008	24		51		•
L9816	0717920	5.2	0.2047			52		•
L9816	0717936	5.3	0.2087			53		•
L9816	0717942	5.4	0.2126	25		54		•
L9816	0717959	5.5	0.2165			55		•
L9817	1489467	7/32	0.2188			56		•
L9816	0717965	5.6	0.2205			56		•
L9816	0717971	5.7	0.2244	27		57		•
L9816	0717988	5.8	0.2283			58		•
L9816	0717994	5.9	0.2323			59		•
L9816	0718009	6.0	0.2362		120	60		•
L9816	0718015	6.1	0.2402	28		30		•
L9816	0718021	6.2	0.2441					•
L9816	0718038	6.3	0.2480					•
L9817	1489473	1/4	0.2500	30		32		•
L9816	0718044	6.4	0.2520					•
L9816	0718050	6.5	0.2559					•
L9816	0718067	6.6	0.2598					•
L9816	0718073	6.7	0.2638	31		33		•
L9816	0718080	6.8	0.2677					•
L9816	0718096	6.9	0.2717					•
L9816	0718101	7.0	0.2756	32		34		•
L9816	0718118	7.1	0.2795	33		35		•
L9817	1489480	9/32	0.2812					•
L9816	0718124	7.2	0.2835					•
L9816	0718130	7.3	0.2874					•
L9816	0718147	7.4	0.2913	34		36		•
L9816	0718153	7.5	0.2953					•
L9816	0718160	7.6	0.2992					•
L9816	0718176	7.7	0.3031	36		38		•
L9816	0718182	7.8	0.3071					•
L9816	0718199	7.9	0.3110					•
L9817	1489496	5/16	0.3125					•
L9816	0718204	8.0	0.3150		130	80	8	•
L9816	0718210	8.1	0.3189	37		39		•
L9816	0718227	8.2	0.3228					•
L9816	0718233	8.3	0.3268					•
L9817	1489501	21/64	0.3281	39		41		•
L9816	0718240	8.4	0.3307					•

List #	EDP #	Size	Decimal Equivalent	Flute Length	Overall Length	L1	Shank Dia.	Stock
		Dc		ℓ	L	L1	Ds	
L9816	0718256	8.5	0.3346	39	130	41	8	•
L9816	0718262	8.6	0.3386					•
L9816	0718279	8.7	0.3425	40		42		•
L9816	0718285	8.8	0.3465					•
L9816	0718291	8.9	0.3504					•
L9816	0718307	9.0	0.3543	41		43		•
L9816	0718313	9.1	0.3583	42		44		•
L9817	1489518	23/64	0.3594					•
L9816	0718320	9.2	0.3622					•
L9816	0718336	9.3	0.3661					•
L9816	0718342	9.4	0.3701	43		45		•
L9816	0718359	9.5	0.3740					•
L9817	1489524	3/8	0.3750					•
L9816	0718365	9.6	0.3780					•
L9816	0718371	9.7	0.3819	45		47		•
L9816	0718388	9.8	0.3858					•
L9816	0718394	9.9	0.3898					•
L9816	0718400	10.0	0.3937		150	100	10	•
L9816	0718416	10.1	0.3976	46		48		•
L9816	0718422	10.2	0.4016					•
L9816	0718439	10.3	0.4055					•
L9817	1489530	13/32	0.4063	48		50		•
L9816	0718445	10.4	0.4094					•
L9816	0718451	10.5	0.4134					•
L9816	0718468	10.6	0.4173					•
L9816	0718474	10.7	0.4213	49		51		•
L9816	0718480	10.8	0.4252					•
L9816	0718497	10.9	0.4291					•
L9816	0718502	11.0	0.4331	50		52		•
L9816	0718519	11.1	0.4370	51		53		•
L9817	1489547	7/16	0.4375					•
L9816	0718525	11.2	0.4409					•
L9816	0718531	11.3	0.4449					•
L9816	0718548	11.4	0.4488	52		54		•
L9816	0718554	11.5	0.4528					•
L9817	1489553	29/64	0.4531					•
L9816	0718560	11.6	0.4567					•
L9816	0718577	11.7	0.4606	54		56		•
L9816	0718583	11.8	0.4646					•
L9816	0718590	11.9	0.4685					•
L9817	1489560	15/32	0.4688					•
L9816	0718605	12.0	0.4724		170	120	12	•
L9816	0718611	12.5	0.4921	57		59		•
L9817	1489576	1/2	0.5000	58		60		•
L9816	0718628	13.0	0.5118	59	180	61		•
L9816	0718634	13.5	0.5315	61		63		•
L9816	0718640	14.0	0.5512	63	190	65		•
L9817	1489582	9/16	0.5625	64		66		•
L9816	0718657	14.5	0.5709	66		68		•
L9816	0718663	15.0	0.5906	67	200	69		•
L9816	0718670	15.5	0.6102	70		72		•
L9817	1489599	5/8	0.6250	72		74		•
L9816	0718686	16.0	0.6299	72	220	160	16	•
L9816	0718692	16.5	0.6496	75		77		•
L9816	0718708	17.0	0.6693	77		79		•
L9817	1489604	11/16	0.6875	79		81		•
L9816	0718714	17.5	0.6890	79		81		•
L9816	0718720	18.0	0.7087	81	240	83		•
L9816	0718737	18.5	0.7283	84		86		•
L9816	0718743	19.0	0.7480	86	250	88		•
L9817	1489610	3/4	0.7500	87		89		•
L9816	0718750	19.5	0.7677	88		90		•
L9816	0718766	20.0	0.7874	90		200	20	•

* Package Qty: 1 per Tube Size

⚠ WARNING: Cancer - www.P65Warnings.ca.gov

Standard Drilling Conditions

LIST 9818, 9819 - AQDEXZR

Work Material / Speed (SFM) / Drill Diameter		Cast Irons / Carbon Steels		Alloy Steels (20-30 HRC)		Mold Steels/ Hardened Steels (30-35 HRC)		Ductile Cast Irons		Aluminum Alloys		Aluminum Casting	
		325-328 SFM		290-295 SFM		220-225 SFM		290-295 SFM		515-525 SFM		260-400 SFM	
Metric mm	Decimal	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
3	0.118	10600	0.002	9500	0.002	7400	0.002	9500	0.002	17000	0.002	12700	0.002
4	0.157	7900	0.003	7100	0.002	5550	0.002	7100	0.002	12500	0.002	9500	0.003
5	0.197	6300	0.004	5700	0.003	4450	0.003	5700	0.003	10000	0.003	7600	0.004
6	0.236	5300	0.005	4750	0.004	3700	0.004	4750	0.004	8500	0.003	6400	0.005
8	0.315	3950	0.006	3550	0.005	2790	0.005	3550	0.005	6350	0.005	4780	0.006
10	0.394	3150	0.008	2860	0.006	2230	0.006	2860	0.006	5100	0.006	3800	0.008
12	0.472	2650	0.009	2390	0.007	1860	0.007	2390	0.007	4250	0.007	3180	0.009
16	0.630	1990	0.012	1790	0.009	1390	0.009	1790	0.009	3200	0.009	2390	0.013
20	0.787	1590	0.016	1430	0.012	1110	0.012	1430	0.012	2550	0.012	1910	0.016

LIST 9816, 9817 - AQDEXZLS

Work Material / Speed (SFM) / Drill Diameter		Cast Irons / Carbon Steels		Alloy Steels (20-30 HRC)		Mold Steels/ Hardened Steels (30-35 HRC)		Ductile Cast Irons		Aluminum Alloys		Aluminum Casting	
		325-328 SFM		290-295 SFM		220-225 SFM		290-295 SFM		515-525 SFM		260-400 SFM	
Metric mm	Decimal	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
3	0.118	10600	0.003	9500	0.002	7400	0.002	9500	0.002	17000	0.002	12700	0.002
4	0.157	7900	0.004	7100	0.003	5550	0.002	7100	0.003	12500	0.002	9500	0.003
5	0.197	6300	0.005	5700	0.004	4450	0.003	5700	0.004	10000	0.003	7600	0.004
6	0.236	5300	0.006	4750	0.005	3700	0.004	4750	0.005	8500	0.003	6400	0.005
8	0.315	3950	0.008	3550	0.006	2790	0.005	3550	0.006	6350	0.005	4780	0.006
10	0.394	3150	0.010	2860	0.008	2230	0.006	2860	0.008	5100	0.006	3800	0.008
12	0.472	2650	0.012	2390	0.009	1860	0.007	2390	0.009	4250	0.007	3180	0.009
16	0.630	1990	0.016	1790	0.013	1390	0.009	1790	0.013	3200	0.009	2390	0.013
20	0.787	1590	0.020	1430	0.016	1110	0.012	1430	0.016	2550	0.012	1910	0.016

Note : 1) Adjust drilling conditions according to the rigidity of machine or work clamp state.
2) Use the table values for drilling depths upto 2xD. Adjust cutting conditions per table based on "degree angle to be drilled."
3) Above table values are for drilling water soluble cutting fluid. For non-water soluble cutting fluid reduce the RPM and feed rates by 20%.
4) Not recommended for drilling in Stainless Steel. We recommend using List9814 AQUA EX Flat OH3Dor OH5D for Stainless Steel & Hi-temp alloys.
5) Center Drill or Guide hole required. (1: Use AG Starting drill or Aqua Ex Flat drill)

Formulas : $\text{RPM} = \frac{\text{SFM} \times 3.82}{\text{Drill dia.}}$ Feed Rate (in/min) : RPM×IPR

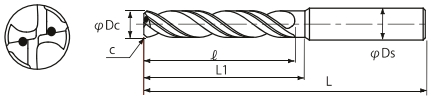
Drilling Conditions for Angled Surfaces					
Reduction % to above table values					
Degree Angle		Reduction %		Reduction % (Multiplier)	
		RPM	Feed	RPM	Feed
0°	5°	100%	100%	Table Value	Table Value
6°	20°	50%	50%	(Table Value)x0.5	(Table Value)x0.5
21°	35°	70%	40%	(Table Value)x0.3	(Table Value)x0.6
36°	60°	70%	40%	(Table Value)x0.3	(Table Value)x0.6
61°		70%	30%	(Table Value)x0.3	(Table Value)x0.7

Aqua Drill EX Flat Oil Hole 3D

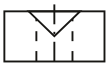
Carbide Material | AQ EX Coating | 24°-30° Helix | h7 Dia.Tol | 180° Point Angle | h6 Shank Dia.Tolerance

L9812 Metric Sizes
L9813 Fractional Size

Drill Dia (in mm)		Corner Chamfer
Above	Up to	C (mm)
	6.0	0.04
6.0	10.0	0.1
10.0		0.2



- For entry on flat surfaces, Center Drill Hole is recommended



- Center hole diameter should be 75% of flat drill diameter, or larger.

List #	EDP #	Size	Decimal Equivalent	Flute Length	Overall Length	L1	Shank Dia.	Stock
		Dc		ℓ	L	L1	Ds	
L9812	0760322	1.0	0.0394	4.3	55	4.6	3	•
L9812	0760339	1.1	0.0433	4.7	58	5		•
L9812	0760345	1.2	0.0472	5.2		5.5		•
L9812	0760351	1.3	0.0512	5.6		5.9		•
L9812	0760368	1.4	0.0551	6		6.3		•
L9812	0760374	1.5	0.0591	6.5		6.8		•
L9812	0760380	1.6	0.0630	6.9		7.2		•
L9812	0760397	1.7	0.0669	7.3		7.6		•
L9812	0760402	1.8	0.0709	7.7		8		•
L9812	0760419	1.9	0.0748	8.2		8.5		•
L9812	0760425	2.0	0.0787	8.6		8.9		•
L9812	0760431	2.1	0.0827	9	62	9.3		•
L9812	0760448	2.2	0.0866	9.5		9.8		•
L9812	0760454	2.3	0.0906	9.9		10.2		•
L9812	0760460	2.4	0.0945	10.3		10.6		•
L9812	0760477	2.5	0.0984	10.8		11.1		•
L9812	0760483	2.6	0.1024	11.2	68	11.5		•
L9812	0760490	2.7	0.1063	11.6		11.9		•
L9812	0760505	2.8	0.1102	12		12.3		•
L9812	0760511	2.9	0.1142	12.5		12.9		•
L9812	0718772	3.0	0.1181	14	68	15		•
L9812	0718789	3.1	0.1220	15	72	17	4	•
L9813	1489627	1/8	0.1250					•
L9812	0718795	3.2	0.1260					•
L9812	0718800	3.3	0.1299					•
L9812	0718817	3.4	0.1339	16		18		•
L9812	0718823	3.5	0.1378					•
L9812	0718830	3.6	0.1417			19		•
L9812	0718846	3.7	0.1457	18				•
L9812	0718852	3.8	0.1496					•
L9812	0718869	3.9	0.1535					•
L9813	1489633	5/32	0.1563					•
L9812	0718875	4.0	0.1575					•
L9812	0718881	4.1	0.1614	19	80	22	5	•
L9812	0718898	4.2	0.1654					•
L9812	0718903	4.3	0.1693					•
L9812	0718910	4.4	0.1732	21		23		•
L9812	0718926	4.5	0.1772					•
L9812	0718932	4.6	0.1811			24		•
L9812	0718949	4.7	0.1850	22				•
L9813	1489640	3/16	0.1875					•
L9812	0718955	4.8	0.1890					•
L9812	0718961	4.9	0.1929					•
L9812	0718978	5.0	0.1969	23				•
L9812	0718984	5.1	0.2008	24	82	26	6	•
L9812	0718990	5.2	0.2047					•
L9812	0719005	5.3	0.2087					•
L9812	0719011	5.4	0.2126	25		27		•
L9812	0719028	5.5	0.2165					•
L9813	1489656	7/32	0.2188					•
L9812	0719034	5.6	0.2205	27		28		•
L9812	0719040	5.7	0.2244					•
L9812	0719057	5.8	0.2283					•
L9812	0719063	5.9	0.2323					•

List #	EDP #	Size	Decimal Equivalent	Flute Length	Overall Length	L1	Shank Dia.	Stock
		Dc		ℓ	L	L1	Ds	
L9812	0719070	6.0	0.2362	27	82	28	6	•
L9812	0719086	6.1	0.2402	28	88	31	7	•
L9812	0719092	6.2	0.2441					•
L9812	0719108	6.3	0.2480					•
L9813	1489662	1/4	0.2500	30		32		•
L9812	0719114	6.4	0.2520					•
L9812	0719120	6.5	0.2559					•
L9812	0719137	6.6	0.2598			33		•
L9812	0719143	6.7	0.2638	31				•
L9812	0719150	6.8	0.2677					•
L9812	0719166	6.9	0.2717					•
L9812	0719172	7.0	0.2756	32				•
L9812	0719189	7.1	0.2795	33	94	35	8	•
L9813	1489679	9/32	0.2812					•
L9812	0719195	7.2	0.2835					•
L9812	0719200	7.3	0.2874					•
L9812	0719217	7.4	0.2913	34		36		•
L9812	0719223	7.5	0.2953					•
L9812	0719230	7.6	0.2992			37		•
L9812	0719246	7.7	0.3031	36				•
L9812	0719252	7.8	0.3071					•
L9812	0719269	7.9	0.3110					•
L9813	1489685	5/16	0.3125					•
L9812	0719275	8.0	0.3150					•
L9812	0719281	8.1	0.3189	37	100	40	9	•
L9812	0719298	8.2	0.3228					•
L9812	0719303	8.3	0.3268					•
L9813	1489691	21/64	0.3281	39		41		•
L9812	0719310	8.4	0.3307					•
L9812	0719326	8.5	0.3346					•
L9812	0719332	8.6	0.3386			42		•
L9812	0719349	8.7	0.3425	40				•
L9812	0719355	8.8	0.3465					•
L9812	0719361	8.9	0.3504					•
L9812	0719378	9.0	0.3543	41				•
L9812	0719384	9.1	0.3583	42	106	44	10	•
L9813	1489707	23/64	0.3594					•
L9812	0719390	9.2	0.3622					•
L9812	0719406	9.3	0.3661					•
L9812	0719412	9.4	0.3701	43		45		•
L9812	0719429	9.5	0.3740					•
L9813	1489713	3/8	0.3750					•
L9812	0719435	9.6	0.3780			46		•
L9812	0719441	9.7	0.3819	45				•
L9812	0719458	9.8	0.3858					•
L9812	0719464	9.9	0.3898					•
L9812	0719470	10.0	0.3937					•
L9812	0719487	10.1	0.3976	46	116	49	11	•
L9812	0719493	10.2	0.4016					•
L9812	0719509	10.3	0.4055					•
L9813	1489720	13/32	0.4063	48				•
L9812	0719515	10.4	0.4094					•
L9812	0719521	10.5	0.4134			50		•
L9812	0719538	10.6	0.4173			51		•

* Package Qty: 1 per Tube Size

L9812 Metric Size
L9813 Fractional Size

List #	EDP #	Size	Decimal Equivalent	Flute Length	Overall Length	L1	Shank Dia.	Stock
		Dc		ℓ	L	L1	Ds	
L9812	0719544	10.7	0.4213	49	116	51	11	•
L9812	0719550	10.8	0.4252					•
L9812	0719567	10.9	0.4291					•
L9812	0719573	11.0	0.4331	50				•
L9812	0719580	11.1	0.4370	51	122	53	12	•
L9813	1489736	7/16	0.4375					•
L9812	0719596	11.2	0.4409					•
L9812	0719601	11.3	0.4449	52		54		•
L9812	0719618	11.4	0.4488					•
L9812	0719624	11.5	0.4528					•
L9813	1489742	29/64	0.4531			55		•
L9812	0719630	11.6	0.4567					•
L9812	0719647	11.7	0.4606	54				•
L9812	0719653	11.8	0.4646					•
L9812	0719660	11.9	0.4685					•

* Package Qty: 1 per Tube Size

List #	EDP #	Size	Decimal Equivalent	Flute Length	Overall Length	L1	Shank Dia.	Stock
		Dc		ℓ	L	L1	Ds	
L9813	1489759	15/32	0.4688	54	122	55	12	•
L9812	0719676	12.0	0.4724					•
L9812	0719682	12.5	0.4921	57	128	59	13	•
L9813	1489765	1/2	0.5000	58	128	60		•
L9812	0719699	13.0	0.5118	59	128	60		•
L9812	0719704	13.5	0.5315	61	134	63	14	•
L9812	0719710	14.0	0.5512	63	134	64		•
L9813	1489771	9/16	0.5625	64	140	68	15	•
L9812	0719727	14.5	0.5709	66	140	68		•
L9812	0719733	15.0	0.5906	68	140	69		•
L9812	0719740	15.5	0.6102	70	146	72	16	•
L9813	1489788	5/8	0.6250	72	146	73		•
L9812	0719756	16.0	0.6299	72	146	73		•
L9813	1496964	11/16	0.6875	74	146	75	18	•
L9813	1496970	3/4	0.7500	76	152	77	20	•

⚠ WARNING: Cancer - www.P65Warnings.ca.gov

Drilling Conditions - Wet

LIST 9812, 9813

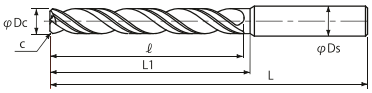
Work Material		Structural Steel Carbon Steel		Alloy Steel Heat Treated Steel (20 - 30 HRC)		Mold Steel Hardened Steel (30 - 40 HRC)		Hardened Steels (40 - 50 HRC)		Ductile Cast Iron		Stainless Steel (300 Series)		Nickel Alloys PH Stainless		Aluminum Alloy		Aluminum Casting	
Speed (SFM)		160-200 SFM		130 - 170 SFM		100 - 140 SFM		80 - 100 SFM		130-165 SFM		90-115 SFM		70 - 80 SFM		180 - 200 SFM		160 - 185 SFM	
Drill Diameter		RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
Metric	Dec. Inch																		
1.0	0.039	15500	0.0004	13600	0.0003	10700	0.0002	8700	0.0002	12600	0.0002	9700	0.0003	6800	0.0003	18300	0.0008	15500	0.0004
1.5	0.059	10350	0.0006	9100	0.0005	7100	0.0004	5800	0.0004	8400	0.0004	6450	0.0005	4500	0.0005	12300	0.0012	10350	0.0007
2.0	0.079	7750	0.0009	6800	0.0008	5350	0.0007	4350	0.0007	6300	0.0007	4850	0.0008	3400	0.0008	9200	0.0014	7750	0.0009
Speed (SFM)		320 - 370 SFM		250 - 310 SFM		225 - 245 SFM		145 - 165 SFM		250 - 310 SFM		115-145 SFM		80 - 100 SFM		380 - 420 SFM		320 - 360 SFM	
3.0	0.118	10000	0.0030	9700	0.0019	7600	0.0016	4600	0.0016	9700	0.0016	4200	0.0024	2750	0.0018	12200	0.0035	10500	0.0033
4.0	0.157	8250	0.0040	7500	0.0024	5700	0.0020	3800	0.0020	7500	0.0020	3150	0.0031	2050	0.0024	9200	0.0047	8000	0.0044
5.0	0.197	6600	0.0050	6000	0.0031	4550	0.0026	3000	0.0026	6000	0.0026	2550	0.0039	1650	0.0030	7400	0.0059	6400	0.0055
6.0	0.236	5500	0.0060	4850	0.0040	3800	0.0036	2500	0.0036	4850	0.0036	2100	0.0047	1400	0.0035	6200	0.0071	5350	0.0066
8.0	0.315	4300	0.0080	3650	0.0052	2850	0.0046	1900	0.0046	3650	0.0046	1600	0.0063	1050	0.0047	4600	0.0094	4000	0.0088
10.0	0.394	3400	0.0100	2900	0.0063	2300	0.0057	1500	0.0057	2900	0.0057	1300	0.0071	830	0.0051	3700	0.0118	3200	0.0110
12.0	0.472	2850	0.0120	2450	0.0070	1900	0.0065	1300	0.0065	2450	0.0065	1050	0.0085	690	0.0061	3100	0.0142	2700	0.0132
16.0	0.630	2150	0.0160	1850	0.0090	1450	0.0085	1000	0.0085	1850	0.0085	790	0.0113	520	0.0082	2300	0.0189	2000	0.0176

Cutting Condition Table Recommendations

1) Adjust cutting condition according to the rigidity of machine or work clamp state.
2) The table values are for drilling with water-soluble cutting fluid.
3) Reduce RPM and feed rate by 20% for non-water soluble coolant.
4) Use 9812 3xD for angled and irregular entries. See chart below.
5) Recommmended feeds and speeds are starting points only and may require adjustment based on specific material, condition of equipment, and coolant condition.

9812 Drilling Conditions for Angled Surfaces				
Reduction % to above table values				
Degree of Angle	Reduction %		Reduction % (Multiplier)	
	RPM	Feed	RPM	Feed
0° - 5°	100%	100%	Table Value	Table Value
6° - 20°	50%	50%	(Table Value)x0.5	(Table Value)x0.5
21 - 35°	70%	40%	(Table Value)x0.3	(Table Value)x0.6
36° - 60°	70%	40%	(Table Value)x0.3	(Table Value)x0.6
61° and above	70%	30%	(Table Value)x0.3	(Table Value)x0.7

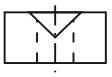
Aqua Drill EX Flat Oil Hole 5D



Drill Dia (in mm)		Corner Chamfer
Above	Up to	C (mm)
	6.0	0.04
6.0	10.0	0.1
10.0		0.2

L9814 Metric Sizes
L9815 Fractional Size

- For entry on flat surfaces, Center Drill Hole is recommended



- Center hole diameter should be 75% of flat drill diameter, or larger.

List #	EDP #	Size	Decimal Equivalent	Flute Length	Overall Length	L1	Shank Dia.	Stock
		Dc		ℓ	L	L1	Ds	
L9814	0760528	1.0	0.0394	6.3	57	6.6	3	•
L9814	0760534	1.1	0.0433	6.9	60	7.2		•
L9814	0760540	1.2	0.0472	7.6		7.9		•
L9814	0760557	1.3	0.0512	8.2		8.5		•
L9814	0760563	1.4	0.0551	8.8		9.1		•
L9814	0760570	1.5	0.0591	9.5		9.8		•
L9814	0760586	1.6	0.0630	10.1		10.4		•
L9814	0760592	1.7	0.0669	10.7		11		•
L9814	0760608	1.8	0.0709	11.3		11.6		•
L9814	0760614	1.9	0.0748	12		12.3		•
L9814	0760620	2.0	0.0787	12.6		12.9		•
L9814	0760637	2.1	0.0827	13.2	64	13.5		•
L9814	0760643	2.2	0.0866	13.9		14.2		•
L9814	0760650	2.3	0.0906	14.5		14.8		•
L9814	0760666	2.4	0.0945	15.1		15.4		•
L9814	0760672	2.5	0.0984	15.8		16.1		•
L9814	0760689	2.6	0.1024	16.4	74	16.7		•
L9814	0760695	2.7	0.1063	17		17.3		•
L9814	0760700	2.8	0.1102	17.6		17.9		•
L9814	0760717	2.9	0.1142	18.3		18.6		•
L9814	0719762	3.0	0.1181	20	74	21		•
L9814	0719779	3.1	0.1220	22	80	25	4	•
L9815	1489794	1/8	0.1250					•
L9814	0719785	3.2	0.1260					•
L9814	0719791	3.3	0.1299					•
L9814	0719807	3.4	0.1339	24				•
L9814	0719813	3.5	0.1378					•
L9814	0719820	3.6	0.1417					•
L9814	0719836	3.7	0.1457	26		27		•
L9814	0719842	3.8	0.1496					•
L9814	0719859	3.9	0.1535					•
L9815	1489800	5/32	0.1563					•
L9814	0719865	4.0	0.1575					•
L9814	0719871	4.1	0.1614	28	90	30	5	•
L9814	0719888	4.2	0.1654					•
L9814	0719894	4.3	0.1693					•
L9814	0719900	4.4	0.1732	29		31		•
L9814	0719916	4.5	0.1772					•
L9814	0719922	4.6	0.1811			34		•
L9814	0719939	4.7	0.1850	32				•
L9815	1489816	3/16	0.1875					•
L9814	0719945	4.8	0.1890					•
L9814	0719951	4.9	0.1929					•
L9814	0719968	5.0	0.1969	33				•
L9814	0719974	5.1	0.2008	35	94	38	6	•
L9814	0719980	5.2	0.2047					•
L9814	0719997	5.3	0.2087					•
L9814	0720000	5.4	0.2126	37		39		•
L9814	0720017	5.5	0.2165					•
L9815	1489822	7/32	0.2188			40		•
L9814	0720023	5.6	0.2205					•
L9814	0720030	5.7	0.2244	39				•
L9814	0720046	5.8	0.2283					•
L9814	0720052	5.9	0.2323					•

List #	EDP #	Size	Decimal Equivalent	Flute Length	Overall Length	L1	Shank Dia.	Stock
		Dc		ℓ	L	L1	Ds	
L9814	0720069	6.0	0.2362	39	94	40	6	•
L9814	0720075	6.1	0.2402	41	101	44	7	•
L9814	0720081	6.2	0.2441					•
L9814	0720098	6.3	0.2480					•
L9815	1489839	1/4	0.2500	43				•
L9814	0720103	6.4	0.2520					•
L9814	0720110	6.5	0.2559			45		•
L9814	0720126	6.6	0.2598			46		•
L9814	0720132	6.7	0.2638	45				•
L9814	0720149	6.8	0.2677					•
L9814	0720155	6.9	0.2717					•
L9814	0720161	7.0	0.2756	46				•
L9814	0720178	7.1	0.2795	48	110	51	8	•
L9815	1489845	9/32	0.2812					•
L9814	0720184	7.2	0.2835					•
L9814	0720190	7.3	0.2874					•
L9814	0720206	7.4	0.2913	50		52		•
L9814	0720212	7.5	0.2953					•
L9814	0720229	7.6	0.2992					•
L9814	0720235	7.7	0.3031	52		53		•
L9814	0720241	7.8	0.3071					•
L9814	0720258	7.9	0.3110					•
L9815	1489851	5/16	0.3125					•
L9814	0720264	8.0	0.3150					•
L9814	0720270	8.1	0.3189	54	117	57	9	•
L9814	0720287	8.2	0.3228					•
L9814	0720293	8.3	0.3268					•
L9815	1489868	21/64	0.3281	56				•
L9814	0720309	8.4	0.3307					•
L9814	0720315	8.5	0.3346			58		•
L9814	0720321	8.6	0.3386					•
L9814	0720338	8.7	0.3425	58		59		•
L9814	0720344	8.8	0.3465					•
L9814	0720350	8.9	0.3504					•
L9814	0720367	9.0	0.3543	59				•
L9814	0720373	9.1	0.3583	61	126	64	10	•
L9815	1489874	23/64	0.3594			65		•
L9814	0720380	9.2	0.3622					•
L9814	0720396	9.3	0.3661			64		•
L9814	0720401	9.4	0.3701	63				•
L9814	0720418	9.5	0.3740			65		•
L9815	1489880	3/8	0.3750					•
L9814	0720424	9.6	0.3780					•
L9814	0720430	9.7	0.3819	65		66		•
L9814	0720447	9.8	0.3858					•
L9814	0720453	9.9	0.3898					•
L9814	0720460	10.0	0.3937					•
L9814	0720476	10.1	0.3976	67	138	70	11	•
L9814	0720482	10.2	0.4016					•
L9814	0720499	10.3	0.4055					•
L9815	1489897	13/32	0.4063	69				•
L9814	0720504	10.4	0.4094					•
L9814	0720510	10.5	0.4134			71		•
L9814	0720527	10.6	0.4173					•

* Package Qty: 1 per Tube Size

L9814 Metric Size
L9815 Fractional Size

List #	EDP #	Size	Decimal Equivalent	Flute Length	Overall Length	L1	Shank Dia.	Stock
		Dc		ℓ	L	L1	Ds	
L9814	0720533	10.7	0.4213	72	138	73	11	•
L9814	0720540	10.8	0.4252					•
L9814	0720556	10.9	0.4291					•
L9814	0720562	11.0	0.4331	73				•
L9814	0720579	11.1	0.4370	74		77		•
L9815	1489902	7/16	0.4375					•
L9814	0720585	11.2	0.4409					•
L9814	0720591	11.3	0.4449					•
L9814	0720607	11.4	0.4488	76	146	78	12	•
L9814	0720613	11.5	0.4528					•
L9815	1489919	29/64	0.4531			79		•
L9814	0720620	11.6	0.4567					•
L9814	0720636	11.7	0.4606	78				•
L9814	0720642	11.8	0.4646					•

* Package Qty: 1 per Tube Size

List #	EDP #	Size	Decimal Equivalent	Flute Length	Overall Length	L1	Shank Dia.	Stock
		Dc		ℓ	L	L1	Ds	
L9814	0720659	11.9	0.4685	78	146	79	12	•
L9815	1489925	15/32	0.4688					•
L9814	0720665	12.0	0.4724					•
L9814	0720671	12.5	0.4921	82	153	84	13	•
L9815	1489931	1/2	0.5000	85		86		•
L9814	0720688	13.0	0.5118	86		86		•
L9814	0720694	13.5	0.5315	89	162	91	14	•
L9814	0720700	14.0	0.5512	91		92		•
L9815	1489948	9/16	0.5625	93	169	97	15	•
L9814	0720716	14.5	0.5709	95		97		•
L9814	0720722	15.0	0.5906	98		98		•
L9814	0720739	15.5	0.6102	102	178	104	16	•
L9815	1489954	5/8	0.6250	104		105		•
L9814	0720745	16.0	0.6299	104		105		•

⚠ WARNING: Cancer - www.P65Warnings.ca.gov

Drilling Conditions - Wet

LIST 9814, 9815

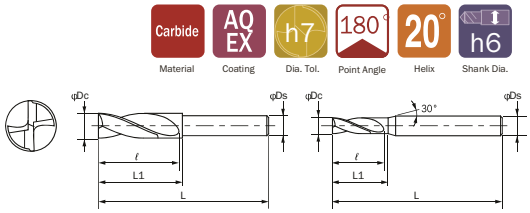
Work Material		Structural Steel Carbon Steel		Alloy Steel Heat Treated Steel (20 - 30 HRC)		Mold Steel Hardened Steel (30 - 40 HRC)		Hardened Steels (40 - 50 HRC)		Ductile Cast Iron		Stainless Steel (300 Series)		Nickel Alloys PH Stainless		Aluminum Alloy		Aluminum Casting	
Speed (SFM)		160-200 SFM		130 - 170 SFM		100 - 140 SFM		80 - 100 SFM		130-165 SFM		90-115 SFM		70 - 80 SFM		180 - 200 SFM		160 - 185 SFM	
Drill Diameter		RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
Metric	Dec. Inch																		
1.0	0.039	15500	0.0004	13600	0.0003	10700	0.0002	8700	0.0002	12600	0.0002	9700	0.0003	6800	0.0003	18300	0.0008	15500	0.0004
1.5	0.059	10350	0.0006	9100	0.0005	7100	0.0004	5800	0.0004	8400	0.0004	6450	0.0005	4500	0.0005	12300	0.0012	10350	0.0007
2.0	0.079	7750	0.0009	6800	0.0008	5350	0.0007	4350	0.0007	6300	0.0007	4850	0.0008	3400	0.0008	9200	0.0014	7750	0.0009
Speed (SFM)		320 - 370 SFM		250 - 310 SFM		225 - 245 SFM		145 - 165 SFM		250 - 310 SFM		115-145 SFM		80 - 100 SFM		380 - 420 SFM		320 - 360 SFM	
3.0	0.118	10000	0.0030	9700	0.0019	7600	0.0016	4600	0.0016	9700	0.0016	4200	0.0024	2750	0.0018	12200	0.0035	10500	0.0033
4.0	0.157	8250	0.0040	7500	0.0024	5700	0.0020	3800	0.0020	7500	0.0020	3150	0.0031	2050	0.0024	9200	0.0047	8000	0.0044
5.0	0.197	6600	0.0050	6000	0.0031	4550	0.0026	3000	0.0023	6000	0.0026	2550	0.0039	1650	0.0028	7400	0.0059	6400	0.0055
6.0	0.236	5500	0.0060	4850	0.0040	3800	0.0032	2500	0.0030	4850	0.0036	2100	0.0044	1400	0.0033	6200	0.0071	5350	0.0066
8.0	0.315	4300	0.0080	3650	0.0052	2850	0.0042	1900	0.0040	3650	0.0046	1600	0.0059	1050	0.0045	4600	0.0094	4000	0.0088
10.0	0.394	3400	0.0100	2900	0.0063	2300	0.0053	1500	0.0050	2900	0.0057	1300	0.0067	830	0.0049	3700	0.0118	3200	0.0110
12.0	0.472	2850	0.0120	2450	0.0070	1900	0.0061	1300	0.0059	2450	0.0065	1050	0.0083	690	0.0059	3100	0.0142	2700	0.0132
16.0	0.630	2150	0.0160	1850	0.0090	1450	0.0081	1000	0.0078	1850	0.0085	790	0.0110	520	0.0076	2300	0.0189	2000	0.0176

Cutting Condition Table Recommendations

1) Adjust cutting condition according to the rigidity of machine or work clamp state.
2) The table values are for drilling with water-soluble cutting fluid.
3) Reduce RPM and feed rate by 20% for non-water soluble coolant.
4) For best results, use 9812 3xD for angled and irregular entries.
5) Recommended feeds and speeds are starting points only and may require adjustment based on specific material, condition of equipment, and coolant condition.

Drilling Conditions for Angled Surfaces				
Reduction % to above table values				
Degree of Angle	Reduction %		Reduction % (Multiplier)	
	RPM	Feed	RPM	Feed
0° - 5°	100%	100%	Table Value	Table Value
6° - 20°	50%	50%	(Table Value)x0.5	(Table Value)x0.5
21 - 35°	70%	40%	(Table Value)x0.3	(Table Value)x0.6
36° - 60°	70%	40%	(Table Value)x0.3	(Table Value)x0.6
61° and above	70%	30%	(Table Value)x0.3	(Table Value)x0.7

Aqua Drill EX Flat Super Stub



L9628 Metric Sizes

*** JAPAN STOCK ITEM: Please allow 2-3 weeks delivery**

List #	EDP #	Size	Decimal Equivalent	Flute Length	Overall Length	L1	Shank Dia.	Stock
		Dc		ℓ	L	L1	Ds	
L9628	0765754	2.0	0.0787	7	50	7.8	4	•
L9628	0765760	2.1	0.0827	8		8.4		•
L9628	0765777	2.2	0.0866			8.4		•
L9628	0765783	2.3	0.0906			8.5		•
L9628	0765790	2.4	0.0945	9		9.6		•
L9628	0765805	2.5	0.0984			9.7		•
L9628	0765811	2.6	0.1024			9.8		•
L9628	0765828	2.7	0.1063	10		10.9		•
L9628	0765834	2.8	0.1102			11		•
L9628	0765840	2.9	0.1142	11		13		•
L9628	0765055	3.0	0.1181			11.4	6	•
L9628	0765061	3.1	0.1220	12		12.5		•
L9628	0765078	3.2	0.1260			12.6		•
L9628	0765084	3.3	0.1299			12.7		•
L9628	0765090	3.4	0.1339	13		13.2		•
L9628	0765106	3.5	0.1378			13.3		•
L9628	0765112	3.6	0.1417			13.4		•
L9628	0765129	3.7	0.1457	14		14		•
L9628	0765135	3.8	0.1496			14.1		•
L9628	0765141	3.9	0.1535			14.2		•
L9628	0765158	4.0	0.1575			14.3		•
L9628	0765164	4.1	0.1614	15	60	16.4		•
L9628	0765170	4.2	0.1654			16.4		•
L9628	0765187	4.3	0.1693			16.5		•
L9628	0765193	4.4	0.1732	16		17.6		•
L9628	0765209	4.5	0.1772			17.7		•
L9628	0765215	4.6	0.1811			17.8		•
L9628	0765221	4.7	0.1850	18		18.9		•
L9628	0765238	4.8	0.1890			19		•
L9628	0765244	4.9	0.1929			19		•
L9628	0765250	5.0	0.1969			19.1		•
L9628	0765267	5.1	0.2008	19		21.2		•
L9628	0765273	5.2	0.2047			21.3		•
L9628	0765280	5.3	0.2087			21.4		•
L9628	0765296	5.4	0.2126	20		22.5		•
L9628	0765301	5.5	0.2165			22.6		•
L9628	0765318	5.6	0.2205			22.7		•
L9628	0765324	5.7	0.2244	21		23.7		•
L9628	0765330	5.8	0.2283			23.8		•
L9628	0765347	5.9	0.2323			23.9		•
L9628	0765353	6.0	0.2362			24		•
L9628	0765360	6.1	0.2402	22	70	25		•
L9628	0765376	6.2	0.2441					•
L9628	0765382	6.3	0.2480					•
L9628	0765399	6.4	0.2520	23		26		•
L9628	0765404	6.5	0.2559					•
L9628	0765410	6.6	0.2598					•
L9628	0765427	6.7	0.2638	24				•
L9628	0765433	6.8	0.2677					•
L9628	0765440	6.9	0.2717					•
L9628	0765456	7.0	0.2756	26		29		•
L9628	0765462	7.1	0.2795					•
L9628	0765479	7.2	0.2835					•
L9628	0765485	7.3	0.2874					•
L9628	0765491	7.4	0.2913	27				•
L9628	0765507	7.5	0.2953					•
L9628	0765513	7.6	0.2992					•
L9628	0765520	7.7	0.3031	28		31		•
L9628	0765536	7.8	0.3071					•
L9628	0765542	7.9	0.3110					•
L9628	0765559	8.0	0.3150				8	•

List #	EDP #	Size	Decimal Equivalent	Flute Length	Overall Length	L1	Shank Dia.	Stock
		Dc		ℓ	L	L1	Ds	
L9628	0765565	8.1	0.3189	29	80	32	8	•
L9628	0765571	8.2	0.3228					•
L9628	0765588	8.3	0.3268					•
L9628	0765594	8.4	0.3307	30		33		•
L9628	0765600	8.5	0.3346					•
L9628	0765616	8.6	0.3386					•
L9628	0765622	8.7	0.3425	32		34		•
L9628	0765639	8.8	0.3465					•
L9628	0765645	8.9	0.3504					•
L9628	0765651	9.0	0.3543					•
L9628	0765668	9.1	0.3583	33		36		•
L9628	0765674	9.2	0.3622					•
L9628	0765680	9.3	0.3661					•
L9628	0764690	9.4	0.3701	34				•
L9628	0764706	9.5	0.3740					•
L9628	0764712	9.6	0.3780					•
L9628	0764729	9.7	0.3819	35		38		•
L9628	0764735	9.8	0.3858					•
L9628	0764741	9.9	0.3898					•
L9628	0764758	10.0	0.3937				10	•
L9628	0764764	10.1	0.3976	36	90	39		•
L9628	0764770	10.2	0.4016					•
L9628	0764787	10.3	0.4055					•
L9628	0764793	10.4	0.4094	37		40		•
L9628	0764809	10.5	0.4134					•
L9628	0764815	10.6	0.4173					•
L9628	0764821	10.7	0.4213	38				•
L9628	0764838	10.8	0.4252					•
L9628	0764844	10.9	0.4291					•
L9628	0764850	11.0	0.4331					•
L9628	0764867	11.1	0.4370	40		43		•
L9628	0764873	11.2	0.4409					•
L9628	0764880	11.3	0.4449					•
L9628	0764896	11.4	0.4488	41				•
L9628	0764901	11.5	0.4528					•
L9628	0764918	11.6	0.4567					•
L9628	0764924	11.7	0.4606	42		45		•
L9628	0764930	11.8	0.4646					•
L9628	0764947	11.9	0.4685					•
L9628	0764953	12.0	0.4724				12	•
L9628	0764960	12.1	0.4764	43	100	46		•
L9628	0764976	12.2	0.4803					•
L9628	0764982	12.3	0.4843					•
L9628	0764999	12.4	0.4882	44		47		•
L9628	0765003	12.5	0.4921					•
L9628	0765010	12.6	0.4961					•
L9628	0765026	12.7	0.5000	45				•
L9628	0765032	12.8	0.5039					•
L9628	0765049	12.9	0.5079					•
L9628	0764305	13.0	0.5118					•
L9628	0764311	13.1	0.5157	47		50		•
L9628	0764328	13.2	0.5197					•
L9628	0764334	13.3	0.5236					•
L9628	0764340	13.4	0.5276	48				•
L9628	0764357	13.5	0.5315					•
L9628	0764363	13.6	0.5354					•
L9628	0764370	13.7	0.5394	49		52		•
L9628	0764386	13.8	0.5433					•
L9628	0764392	13.9	0.5472					•
L9628	0764408	14.0	0.5512					•
L9628	0764414	14.1	0.5551	50	105	3	5	•

* Package Qty: 1 per Tube Size

L9628 Metric Size

*Japan Stock Item

List #	EDP #	Size	Decimal Equivalent	Flute Length	Overall Length	L1	Shank Dia.	Stock
		Dc		ℓ	L	L1	Ds	
L9628	0764420	14.2	0.5591	50	105	53	12	•
L9628	0764437	14.3	0.5630					•
L9628	0764443	14.4	0.5669	51		54		•
L9628	0764450	14.5	0.5709					•
L9628	0764466	14.6	0.5748					•
L9628	0764472	14.7	0.5787	52				•
L9628	0764489	14.8	0.5827					•
L9628	0764495	14.9	0.5866					•
L9628	0764500	15.0	0.5906					•
L9628	0764517	15.1	0.5945	54	115	57		•
L9628	0764523	15.2	0.5984					•
L9628	0764530	15.3	0.6024					•
L9628	0764546	15.4	0.6063	55				•
L9628	0764552	15.5	0.6102					•
L9628	0764569	15.6	0.6142	55	115	57	12	•
L9628	0764575	15.7	0.6181	56		59		•
L9628	0764581	15.8	0.6220					•
L9628	0764598	15.9	0.6260					•
L9628	0764603	16.0	0.6299					•
L9628	0764610	16.5	0.6496	58		61	16	•
L9628	0764626	17.0	0.6693	59	125	62		•
L9628	0764632	17.5	0.6890	61		63		•
L9628	0764649	18.0	0.7087	63		66		•
L9628	0764655	18.5	0.7283	65	135	68		•
L9628	0764661	19.0	0.7480	66		68		•
L9628	0764678	19.5	0.7677	68	145	71		•
L9628	0764684	20.0	0.7874	70		73	20	•

* Package Qty: 1 per Tube Size

⚠ WARNING: Cancer - www.P65Warnings.ca.gov

Drilling Conditions - Wet

LIST 9628

Work Material	Structural Steel Carbon Steel Cast Iron		Alloy Steel Heat Treated Steel (20 - 30 HRC)		Mold Steel Hardened Steel (30 - 40 HRC)		Ductile Cast Iron		Stainless Steel (300 Series)		Nickel Alloys PH Stainless		Aluminum Alloy		Aluminum Casting	
Speed (SFM)	235 - 255 SFM		210 - 230 SFM		110 - 130 SFM		210 - 230 SFM		80 - 100 SFM		75 - 85 SFM		340 - 360 SFM		300-320 SFM	
Drill Diameter Metric	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
2.0	11400	0.0012	10450	0.0011	5350	0.0010	10200	0.0010	3900	0.0011	3650	0.0011	16500	0.0017	14600	0.0012
3.0	7950	0.0020	6900	0.0020	3700	0.0020	6900	0.0015	2600	0.0020	2450	0.0018	11000	0.0025	9700	0.0020
4.0	5950	0.0025	5150	0.0025	2800	0.0025	5150	0.0025	1950	0.0023	1850	0.0020	8400	0.0030	7300	0.0025
5.0	4800	0.0035	4150	0.0035	2200	0.0030	4150	0.0030	1550	0.0026	1450	0.0022	6700	0.0040	5900	0.0035
6.0	4000	0.0040	3450	0.0040	1800	0.0035	3450	0.0035	1300	0.0031	1200	0.0026	5600	0.0045	4900	0.0040
8.0	3000	0.0055	2600	0.0055	1400	0.0050	2600	0.0045	970	0.0038	920	0.0032	4200	0.0065	3700	0.0055
10.0	2400	0.0070	2050	0.0070	1100	0.0060	2050	0.0060	780	0.0047	730	0.0039	3400	0.0080	3000	0.0070
12.0	2000	0.0085	1700	0.0085	950	0.0070	1700	0.0070	650	0.0057	610	0.0048	2800	0.0095	2500	0.0080
16.0	1500	0.0110	1300	0.0110	700	0.0095	1300	0.0095	550	0.0063	460	0.0057	2100	0.0125	1850	0.0110
20.0	1200	0.0140	1050	0.0135	550	0.0120	1050	0.0115	480	0.0066	370	0.0063	1700	0.0155	1500	0.0135

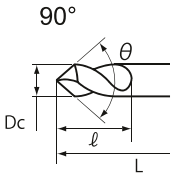
Cutting Condition Table Recommendations

1) Adjust cutting condition according to the rigidity of machine or work clamp state.
2) The table values are for drilling with water-soluble cutting fluid.
3) Reduce RPM and feed rate by 20% for non-water soluble coolant.

Drilling Conditions for Angled Surfaces				
Reduction % to above table values				
Degree of Angle	Reduction %		Reduction % (Multiplier)	
	RPM	Feed	RPM	Feed
0° - 5°	100%	100%	Table Value	Table Value
6° - 20°	50%	50%	(Table Value)x0.5	(Table Value)x0.5
21 - 35°	70%	40%	(Table Value)x0.3	(Table Value)x0.6
36° - 60°	70%	40%	(Table Value)x0.3	(Table Value)x0.6
61° and above	70%	30%	(Table Value)x0.3	(Table Value)x0.7

Aqua Drill EX Starting Drill

For use with Aqua Flat Drills (List 9819, 9817, 9815)



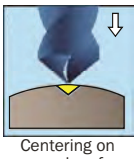
Carbide Material | AQ EX Coating | 25° Helix | h7 Shank Dia. Tol

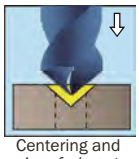
List 9624

Item Code	Size	Decimal Equivalent	Drill Point Angle	Flute Length	Overall Length	Shank Dia
EDP	Dc			ℓ	L	Ds
0727355	3.0	0.1181	90°	9	48	3.0
0727361	4.0	0.1575		12	52	4.0
0727378	5.0	0.1969		14	60	5.0
0727384	6.0	0.2362		15	66	6.0
0727390	8.0	0.3150		20	79	8.0
0727406	10.0	0.3937		25	89	10.0
0727412	12.0	0.4724		30	102	12.0
0727429	16.0	0.6299		35	115	16.0
0727435	20.0	0.7874		40	131	20.0

Package Qty: 1 per Tube Size

⚠ WARNING: Cancer - www.P65Warnings.ca.gov


Centering on a curved surface


Centering and chamfering at the same time


Chamfering


Cutting V-Groove


Chamfering edges


Chamfering large diameter holes

Standard Drilling Conditions

Centering

Work Material / Drill Diameter		Carbon Steels / Cast Irons <20 HRC		Alloy Steels 20 ~ 30 HRC		Mold Steels 30 ~ 40 HRC		Hardened Steel 40 ~ 50 HRC		Stainless Steel 300 /Series		Aluminum Alloy Copper Alloy	
Metric mm	Decimal	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)
3	0.118	7400	17.7	4800	11.4	2100	3.7	1900	2.8	2650	5.1	10600	43.3
4	0.157	5600	16.9	3600	10.2	1600	3.3	1450	2.6	2000	4.3	7950	41.3
5	0.197	4450	15.0	2850	9.4	1250	3.0	1150	2.4	1600	3.9	6350	37.4
6	0.236	3700	15.0	2400	9.4	1050	3.0	950	2.4	1300	3.9	5300	37.4
8	0.315	2800	15.0	1800	9.4	800	3.0	700	2.4	1000	3.9	4000	37.4
10	0.394	2200	13.0	1450	8.7	650	2.8	550	2.2	800	3.7	3200	31.5
12	0.472	1850	13.0	1200	8.7	530	2.8	480	2.2	650	3.7	2650	31.5
16	0.630	1400	11.4	900	7.5	400	2.6	350	2.0	500	3.5	2000	27.6
20	0.787	1100	10.2	720	6.7	320	2.6	280	2.0	400	3.1	1600	25.6

Note : 1) Adjust drilling conditions according to the rigidity of machine or work clamp state.
2) Above table values are for drilling water soluble cutting fluid. For non-water soluble cutting fluid reduce the RPM and feed rates by 20%
3) Apply sufficient cutting fluid to work area.
4) Use these cutting conditions for centering work.
5) Reduce RPM and feed rates by 20% for centering work on rolled steel or forged surfaces, curved or angled surfaces.
4) Use collet chucks or milling chucks.

Chamfering

Work Material / Drill Diameter		Carbon Steels / Cast Irons <20 HRC		Alloy Steels 20 ~ 30 HRC		Mold Steels/ Hardened Steels 30 ~ 40 HRC		Hardened Steel 40 ~ 50 HRC		Stainless Steel 300 /Series		Aluminum Alloy Copper Alloy	
Metric mm	Decimal	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)
3	0.118	7400	14.2	4800	9.1	2100	2.6	1900	2.0	2650	3.9	10600	35.0
4	0.157	5600	13.4	3600	8.3	1600	2.4	1450	1.8	2000	3.3	7950	33.1
5	0.197	4450	11.8	2850	7.5	1250	2.2	1150	1.6	1600	3.1	6350	29.9
6	0.236	3700	11.8	2400	7.5	1050	2.2	950	1.6	1300	3.1	5300	29.9
8	0.315	2800	11.8	1800	7.5	800	2.2	700	1.6	1000	3.1	4000	29.9
10	0.394	2200	10.2	1450	6.9	650	2.0	550	1.4	800	3.0	3200	25.2
12	0.472	1850	10.2	1200	6.9	530	2.0	480	1.4	650	3.0	2650	25.2
16	0.630	1400	9.1	900	5.9	400	1.8	350	1.2	500	2.8	2000	22.0
20	0.787	1100	8.3	720	5.3	320	1.8	280	1.2	400	2.4	1600	20.1

Note : 1) Adjust drilling conditions according to the rigidity of machine or work clamp state.
2) Above table values are for drilling water soluble cutting fluid. For non-water soluble cutting fluid reduce the RPM and feed rates by 20%
3) Apply sufficient cutting fluid to work area.
4) Use these cutting conditions for chamfering.
5) Reduce RPM and feed rates at the same ratio if chattering occurs, because the workpiece is not rigidly mounted to the machine.
4) Use collet chucks or milling chucks.

AG Starting Drill

For use with Aqua Flat Drills (List 9814, 9815, 9816, 9817, 9818, 9819)

HSS Co Material | AG Coating | 25° Helix | h7 Shank Dia. Tol

List 6502 Metric Sizes

90° Range 3.0 to 20.0
140° Range 3.0 to 20.0

Item Code	Size	Decimal Equivalent	Drill Point Angle	Flute Length	Overall Length	Shank Dia
EDP	Dc			ℓ	L	Ds
0710358	3.0	0.1181	90°	9	48	3.0
0710364	4.0	0.1575		12	52	4.0
0712613	5.0	0.1969		14	60	5.0
0710370	6.0	0.2362		15	66	6.0
0710387	8.0	0.3150		20	79	8.0
0710393	10.0	0.3937		25	89	10.0
0710409	12.0	0.4724		30	102	12.0
0710415	16.0	0.6299		35	115	16.0
0710421	20.0	0.7874		40	131	20.0
0710518	3.0	0.1181	140°	9	48	3.0
0710524	4.0	0.1575		12	52	4.0
0712636	5.0	0.1969		14	60	5.0
0710530	6.0	0.2362		15	66	6.0
0710547	8.0	0.3150		20	79	8.0
0710553	10.0	0.3937		25	89	10.0
0710560	12.0	0.4724		30	102	12.0
0710576	16.0	0.6299		35	115	16.0
0710582	20.0	0.7874		40	131	20.0

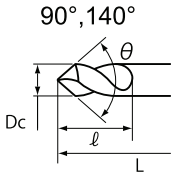
Package Qty: 1 per Tube Size

⚠ WARNING: Cancer - www.P65Warnings.ca.gov

AG Starting Drill Extended Length

For use with Aqua Flat Drills (List 9814, 9815, 9816, 9817, 9818, 9819)

HSS Co Material | AG Coating | 25° Helix | h7 Shank Dia. Tol



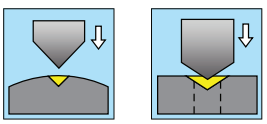
List 6504 Metric Sizes

90° Range 3.0 to 12.0
140° Range 3.0 to 12.0

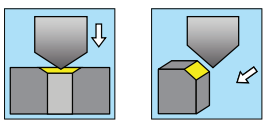
Item Code	Size	Decimal Equivalent	Drill Point Angle	Flute Length	Overall Length	Shank Dia
EDP	Dc			ℓ	L	Ds
0710656	3.0	0.1181	90°	9	75	3.0
0710662	4.0	0.1575		12	100	4.0
0712659	5.0	0.1969		14	100	5.0
0710679	6.0	0.2362		15	150	6.0
0710685	8.0	0.3150		20	150	8.0
0710691	10.0	0.3937		25	200	10.0
0710707	12.0	0.4724		30	200	12.0
0710771	3.0	0.1181	140°	9	75	3.0
0710788	4.0	0.1575		12	100	4.0
0712671	5.0	0.1969		14	100	5.0
0710794	6.0	0.2362		15	150	6.0
0710800	8.0	0.3150		20	150	8.0
0710816	10.0	0.3937		25	200	10.0
0710822	12.0	0.4724		30	200	12.0

⚠ WARNING: Cancer - www.P65Warnings.ca.gov

AREAS OF APPLICATION FOR AG STARTING



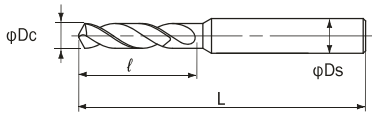
For Pre-Drilling of Drills that have inconsistent bite and drilling holes on curved or inclined surfaces



For Chamfering of Holes and Chamfering Edges

SG-ESS Drill Micro

High Performance (3xD)



SG-ESS Drill Stub Length

LIST 7572P Metric: Micro & Stub Length

LIST 7573P Fractional, Wire & Letter

Metric Range .50 to 20.0

*Replacing AG-SUS Drill Short L6596P

EDP No.	Size	Decimal	Wire/Fractional Equivalent	Flute Length	Overall Length	Shank Dia.
EDP	Dc			ℓ	L	Ds
0716602	0.50	0.0197		3	38	3
0716705	0.51	0.0201	#76			
0716711	0.52	0.0205				
0716728	0.53	0.0209				
0716734	0.54	0.0213				
0716619	0.55	0.0217				
0716740	0.56	0.0220				
0716757	0.57	0.0224				
0716763	0.58	0.0228				
0716770	0.59	0.0232				
0716625	0.60	0.0236		3.5		
0716786	0.61	0.0240	#73			
0716792	0.62	0.0244				
0716808	0.63	0.0248				
0716814	0.64	0.0252				
0716631	0.65	0.0256				
0716820	0.66	0.0260	#71			
0716837	0.67	0.0264				
0716843	0.68	0.0268				
0716850	0.69	0.0272				
0716648	0.70	0.0276		4.5		
0716866	0.71	0.0280	#70			
0716872	0.72	0.0283				
0716889	0.73	0.0287				
0716895	0.74	0.0291				
0716654	0.75	0.0295				
0716900	0.76	0.0299				
0716917	0.77	0.0303				
0716923	0.78	0.0307	#68			
0716930	0.79	0.0311				
0716660	0.80	0.0315		5		
0716946	0.81	0.0319				
0716952	0.82	0.0323	#67			
0716969	0.83	0.0327				
0716975	0.84	0.0331	#66			
0716677	0.85	0.0335				
0716981	0.86	0.0339				
0716998	0.87	0.0343				
0717002	0.88	0.0346				
0717019	0.89	0.0350	#65			
0716683	0.90	0.0354		5.5		
0717025	0.91	0.0358				
0717031	0.92	0.0362				
0717048	0.93	0.0366				
0717054	0.94	0.0370	#63			
0716690	0.95	0.0374				
0717060	0.96	0.0378				
0717077	0.97	0.0382				
0717083	0.98	0.0386				
0717090	0.99	0.0390	#61			

EDP No.	Size	Decimal	Wire/Fractional Equivalent	Flute Length	Overall Length	Shank Dia.
EDP	Dc			ℓ	L	Ds
0573780	1.00	0.0394		6	38	3
0693862	1.01	0.0398				
0693879	1.02	0.0402	#60			
0693885	1.03	0.0406				
0693891	1.04	0.0409	#59			
0575347	1.05	0.0413				
0693907	1.06	0.0417				
0693913	1.07	0.0421	#58	7	39	
0693920	1.08	0.0425				
0693936	1.09	0.0429	#57			
0573797	1.10	0.0433				
0693942	1.11	0.0437				
0693959	1.12	0.0441				
0693965	1.13	0.0445				
0693971	1.14	0.0449				
0575353	1.15	0.0453				
0693988	1.16	0.0457				
0693994	1.17	0.0461				
0694009	1.18	0.0465	#56			
0694015	1.19	0.0469	3/64	8	40	
0573802	1.20	0.0472				
0694021	1.21	0.0476				
0694038	1.22	0.0480				
0694044	1.23	0.0484				
0694050	1.24	0.0488				
0575360	1.25	0.0492				
0694067	1.26	0.0496				
0694073	1.27	0.0500				
0694080	1.28	0.0504				
0694096	1.29	0.0508				
0573819	1.30	0.0512				
0694101	1.31	0.0516				
0694118	1.32	0.0520	#55	9	41	
0694124	1.33	0.0524				
0694130	1.34	0.0528				
0575376	1.35	0.0531				
0694147	1.36	0.0535				
0694153	1.37	0.0539				
0694160	1.38	0.0543				
0694176	1.39	0.0547				
0573825	1.40	0.0551				
0694182	1.41	0.0555				
0694199	1.42	0.0559				
0694204	1.43	0.0563				
0694210	1.44	0.0567				
0575382	1.45	0.0571				
0694227	1.46	0.0575				
0694233	1.47	0.0579				
0694240	1.48	0.0583				
0694256	1.49	0.0587				

SG-ESS Drill Stub Length

L7572P Metric
L7573P Fractional, Wire & Letter

*Replacing AG-SUS Drill Short L6596P

EDP No.	Size	Decimal	Wire/Fractional Equivalent	Flute Length	Overall Length	Shank Dia.
EDP	Dc			ℓ	L	Ds
0573831	1.50	0.0591		9	41	
0694262	1.51	0.0594	#53			
0694279	1.52	0.0598				
0694285	1.53	0.0602				
0694291	1.54	0.0606				
0575399	1.55	0.0610				
0694307	1.56	0.0614				
0694313	1.57	0.0618				
0694320	1.58	0.0622				
0694336	1.59	0.0626	1/16			
0573848	1.60	0.0630		10	42	
0694342	1.61	0.0634	#52			
0694359	1.62	0.0638				
0694365	1.63	0.0642				
0694371	1.64	0.0646				
0575404	1.65	0.0650				
0694388	1.66	0.0654				
0694394	1.67	0.0657				
0694400	1.68	0.0661				
0694416	1.69	0.0665				
0573854	1.70	0.0669				
0694422	1.71	0.0673				
0694439	1.72	0.0677				
0694445	1.73	0.0681				
0694451	1.74	0.0685				
0575410	1.75	0.0689				
0694468	1.76	0.0693				
0694474	1.77	0.0697				
0694480	1.78	0.0701	#50			
0694497	1.79	0.0705				
0573860	1.80	0.0709		11	43	3
0694502	1.81	0.0713				
0694519	1.82	0.0717				
0694525	1.83	0.0720	#49			
0694531	1.84	0.0724				
0575427	1.85	0.0728				
0694548	1.86	0.0732				
0694554	1.87	0.0736				
0694560	1.88	0.0740				
0694577	1.89	0.0744				
0573877	1.90	0.0748				
0694583	1.91	0.0752				
0694590	1.92	0.0756				
0694605	1.93	0.0760	#48			
0694611	1.94	0.0764				
0575433	1.95	0.0768				
0694628	1.96	0.0772				
0694634	1.97	0.0776				
0694640	1.98	0.0780	5/64			
0694657	1.99	0.0783	#47	12	44	
0572514	2.00	0.0787				
0694663	2.01	0.0791				
0694670	2.02	0.0795				
0694686	2.03	0.0799				
0694692	2.04	0.0803				
0575440	2.05	0.0807				
0694708	2.06	0.0811	#46			
0694714	2.07	0.0815				
0694720	2.08	0.0819				
1363043	2.08	0.0820	#45	3/4	2	1/8
0694737	2.09	0.0823		12	44	3

• USA Stock Size

EDP No.	Size	Decimal	Wire/Fractional Equivalent	Flute Length	Overall Length	Shank Dia.
EDP	Dc			ℓ	L	Ds
0572520	2.10	0.0827				
0694743	2.11	0.0831		12	44	
0694750	2.12	0.0835				
0694766	2.13	0.0839				
0694772	2.14	0.0843				3
0575456	2.15	0.0846		13	45	
0694789	2.16	0.0850				
0694795	2.17	0.0854				
0694800	2.18	0.0858				
1363050	2.18	0.0860	#44	3/4	2	1/8
0694817	2.19	0.0862				
0572537	2.20	0.0866				
0694823	2.21	0.0870				
0694830	2.22	0.0874		13	45	3
0694846	2.23	0.0878				
0694852	2.24	0.0882				
0575462	2.25	0.0886				
0694869	2.26	0.0890				
1363066	2.26	0.0890	#43	3/4	2	1/8
0694875	2.27	0.0894				
0694881	2.28	0.0898				
0694898	2.29	0.0902				
0572543	2.30	0.0906				
0694903	2.31	0.0909		13	45	3
0694910	2.32	0.0913				
0694926	2.33	0.0917				
0694932	2.34	0.0921				
0575479	2.35	0.0925				
0694949	2.36	0.0929				
0694955	2.37	0.0933		14	46	
1363072	2.37	0.0935	#42	3/4	2	1/8
0694961	2.38	0.0937		14	46	3
1245365	2.38	0.0938	3/32	1/2	1-3/4	1/8
0694978	2.39	0.0941				
0572550	2.40	0.0945				
0694984	2.41	0.0949		14	46	3
0694990	2.42	0.0953				
0695005	2.43	0.0957				
1363089	2.44	0.0960	#41	13/16	2-1/16	1/8
0695011	2.44	0.0961				
0575485	2.45	0.0965				
0695028	2.46	0.0969		14	46	3
0695034	2.47	0.0972				
0695040	2.48	0.0976				
0695057	2.49	0.0980				
1280931	2.49	0.0980	#40	13/16	2-1/16	1/8
0572566	2.50	0.0984				
0695063	2.51	0.0988		14	46	3
0695070	2.52	0.0992				
1363095	2.53	0.0995	#39	13/16	2-1/4	1/8
0695086	2.53	0.0996				
0695092	2.54	0.1000				
0575491	2.55	0.1004		14	46	3
0695108	2.56	0.1008				
0695114	2.57	0.1012				
1363100	2.58	0.1015	#38	13/16	2-1/4	1/8
0695120	2.58	0.1016				
0695137	2.59	0.1020				
0572572	2.60	0.1024		14	46	3
0695143	2.61	0.1028				
0695150	2.62	0.1031				

0.01mm size Diameter Tolerance : 0～−.009mm

SG-ESS Drill Stub Length

L7572P Metric
L7573P Fractional, Wire & Letter

EDP No.	Size	Decimal	Wire/Fractional Equivalent	Flute Length	Overall Length	Shank Dia.
EDP	Dc			ℓ	L	Ds
0695166	2.63	0.1035		14	46	3
0695172	2.64	0.1039				
1363117	2.64	0.1040	#37	13/16	2-1/4	1/8
0575507	2.65	0.1043		14	46	3
0695189	2.66	0.1047		16	48	
0695195	2.67	0.1051				
0695200	2.68	0.1055				
0695217	2.69	0.1059				
0572589	2.70	0.1063				
1245823	2.71	0.1065	#36	13/16	2-1/4	1/8
0695223	2.71	0.1067		16	48	3
0695230	2.72	0.1071				
0695246	2.73	0.1075				
0695252	2.74	0.1079				
0575513	2.75	0.1083				
0695269	2.76	0.1087				
0695275	2.77	0.1091				
0695281	2.78	0.1094				
1245371	2.78	0.1094	7/64	5/8	1-7/8	1/8
0695298	2.79	0.1098		16	48	3
0572595	2.80	0.1102				
0695303	2.81	0.1106				
0695310	2.82	0.1110				
1363130	2.82	0.1110	#34	7/8	2-5/16	1/8
0695326	2.83	0.1114		16	48	3
0695332	2.84	0.1118				
0575520	2.85	0.1122				
0695349	2.86	0.1126				
0695355	2.87	0.1130				
1363146	2.87	0.1130	#33	7/8	2-5/16	1/8
0695361	2.88	0.1134		16	48	3
0695378	2.89	0.1138				
0572600	2.90	0.1142				
0695384	2.91	0.1146				
0695390	2.92	0.1150				
0695406	2.93	0.1154				
0695412	2.94	0.1157				
0575536	2.95	0.1161				
0695429	2.96	0.1165				
0695435	2.97	0.1169				
0695441	2.98	0.1173				
0695458	2.99	0.1177				
0572617	3.00	0.1181				
0695464	3.01	0.1185		18	50	4
0695470	3.02	0.1189				
0695487	3.03	0.1193				
0695493	3.04	0.1197				
0575542	3.05	0.1201				
0695509	3.06	0.1205				
0695515	3.07	0.1209				
0695521	3.08	0.1213				
0695538	3.09	0.1217				
0572623	3.10	0.1220				
0695544	3.11	0.1224				
0695550	3.12	0.1228				
0695567	3.13	0.1232				
0695573	3.14	0.1236				
0575559	3.15	0.1240				
0695580	3.16	0.1244				
0695596	3.17	0.1248				
1245388	3.18	0.1250	1/8	3/4	2	1/8
0695601	3.18	0.1252		18	50	4
0695618	3.19	0.1256				
0572630	3.20	0.1260				
0695624	3.21	0.1264				
0695630	3.22	0.1268				
0695647	3.23	0.1272				
0695653	3.24	0.1276				
0575565	3.25	0.1280				
0695660	3.26	0.1283				
1289836	3.26	0.1285	#30	15/16	2-3/8	3/16
0695676	3.27	0.1287		18	50	4
0695682	3.28	0.1291				
0695699	3.29	0.1295				
0572646	3.30	0.1299				

• USA Stock Size

*Replacing AG-SUS Drill Short L6596P

EDP No.	Size	Decimal	Wire/Fractional Equivalent	Flute Length	Overall Length	Shank Dia.
EDP	Dc			ℓ	L	Ds
0695704	3.31	0.1303		18	50	4
0695710	3.32	0.1307				
0695727	3.33	0.1311				
0695733	3.34	0.1315				
0575571	3.35	0.1319				
0695740	3.36	0.1323		20	52	
0695756	3.37	0.1327				
0695762	3.38	0.1331				
0695779	3.39	0.1335				
0572652	3.40	0.1339				
0695785	3.41	0.1343				
0695791	3.42	0.1346				
0695807	3.43	0.1350				
0695813	3.44	0.1354				
0575588	3.45	0.1358				
0695820	3.46	0.1362				
1245817	3.46	0.1365	#29	15/16	2-3/8	3/16
0695836	3.47	0.1366		20	52	4
0695842	3.48	0.1370				
0695859	3.49	0.1374				
0572669	3.50	0.1378				
0695865	3.51	0.1382				
0695871	3.52	0.1386				
0695888	3.53	0.1390				
0695894	3.54	0.1394				
0575594	3.55	0.1398				
0695900	3.56	0.1402				
1363169	3.57	0.1405	#28	15/16	2-3/8	3/16
0695916	3.57	0.1406		20	52	4
1245394	3.57	0.1406	9/64	13/16	2-1/8	3/16
0695922	3.58	0.1409		20	52	4
0695939	3.59	0.1413				
0572675	3.60	0.1417				
0695945	3.61	0.1421				
0695951	3.62	0.1425				
0695968	3.63	0.1429				
0695974	3.64	0.1433				
0575600	3.65	0.1437				
1363175	3.66	0.1440	#27	1	2-7/16	3/16
0695980	3.66	0.1441		20	52	4
0695997	3.67	0.1445				
0696001	3.68	0.1449				
0696018	3.69	0.1453				
0572681	3.70	0.1457				
0696024	3.71	0.1461				
0696030	3.72	0.1465				
0696047	3.73	0.1469				
1363181	3.73	0.1470	#26	1	2-7/16	3/16
0696053	3.74	0.1472		20	52	4
0575616	3.75	0.1476				
0696060	3.76	0.1480		22	54	
0696076	3.77	0.1484				
0696082	3.78	0.1488				
0696099	3.79	0.1492				
1245800	3.80	0.1495	#25	1	2-7/16	3/16
0572698	3.80	0.1496		22	54	4
0696104	3.81	0.1500				
0696110	3.82	0.1504				
0696127	3.83	0.1508				
0696133	3.84	0.1512				
0575622	3.85	0.1516				
0696140	3.86	0.1520				
1363198	3.86	0.1520	#24	1	2-7/16	3/16
0696156	3.87	0.1524		22	54	4
0696162	3.88	0.1528				
0696179	3.89	0.1531				
0572703	3.90	0.1535				
0696185	3.91	0.1539				
1363203	3.91	0.1540	#23	1	2-7/16	3/16
0696191	3.92	0.1543		22	54	4
0696207	3.93	0.1547				
0696213	3.94	0.1551				
0575639	3.95	0.1555				
0696220	3.96	0.1559				

0.01mm size Diameter Tolerance : 0 ~-.009mm

SG-ESS Drill Stub Length

L7572P Metric
L7573P Fractional, Wire & Letter

*Replacing AG-SUS Drill Short L6596P

EDP No.	Size	Decimal	Wire/Fractional Equivalent	Flute Length	Overall Length	Shank Dia.
EDP	Dc			ℓ	L	Ds
0696236	3.97	0.1563		22	54	4
1245400	3.97	0.1563	5/32	13/16	2-1/8	3/16
0696242	3.98	0.1567		22	54	4
1363210	3.99	0.1570	#22	1-1/16	2-7/16	3/16
0696259	3.99	0.1571			54	4
0572710	4.00	0.1575				
0696265	4.01	0.1579		22		
0696271	4.02	0.1583			66	6
0696288	4.03	0.1587				
1245795	4.04	0.1590	#21	1-1/16	2-7/16	3/16
0696294	4.04	0.1591				
0575645	4.05	0.1594				
0696300	4.06	0.1598		22	66	6
0696316	4.07	0.1602				
0696322	4.08	0.1606				
0696339	4.09	0.1610				
1363226	4.09	0.1610	#20	1-1/16	2-7/16	3/16
0572726	4.10	0.1614				
0696345	4.11	0.1618				
0696351	4.12	0.1622				
0696368	4.13	0.1626				
0696374	4.14	0.1630				
0575651	4.15	0.1634		22	66	6
0696380	4.16	0.1638				
0696397	4.17	0.1642				
0696402	4.18	0.1646				
0696419	4.19	0.1650				
0572732	4.20	0.1654				
0696425	4.21	0.1657				
1363232	4.22	0.1660	#19	1-1/16	2-7/16	3/16
0696431	4.22	0.1661				
0696448	4.23	0.1665		22		
0696454	4.24	0.1669				
0575668	4.25	0.1673				
0696460	4.26	0.1677				
0696477	4.27	0.1681				
0696483	4.28	0.1685				
0696490	4.29	0.1689			68	6
0572749	4.30	0.1693				
0696505	4.31	0.1697		24		
0696511	4.32	0.1701				
0696528	4.33	0.1705				
0696534	4.34	0.1709				
0575674	4.35	0.1713				
0696540	4.36	0.1717				
1245416	4.37	0.1719	11/64	1	2-3/8	3/16
0696557	4.37	0.1720				
0696563	4.38	0.1724				
0696570	4.39	0.1728				
0572755	4.40	0.1732				
0696586	4.41	0.1736				
0696592	4.42	0.1740				
0696608	4.43	0.1744				
0696614	4.44	0.1748				
0575680	4.45	0.1752				
0696620	4.46	0.1756				
0696637	4.47	0.1760		24	68	6
0696643	4.48	0.1764				
0696650	4.49	0.1768				
0572761	4.50	0.1772				
0696666	4.51	0.1776				
0696672	4.52	0.1780				
0696689	4.53	0.1783				
0696695	4.54	0.1787				
0575697	4.55	0.1791				
0696700	4.56	0.1795				
0696717	4.57	0.1799				
1363278	4.57	0.1800	#15	1-1/8	2-9/16	3/16
0696723	4.58	0.1803				
0696730	4.59	0.1807				
0572778	4.60	0.1811		24	68	6
0696746	4.61	0.1815				
0696752	4.62	0.1819				
1363284	4.62	0.1820	#14	1-1/8	2-9/16	3/16

• USA Stock Size

EDP No.	Size	Decimal	Wire/Fractional Equivalent	Flute Length	Overall Length	Shank Dia.
EDP	Dc			ℓ	L	Ds
0696769	4.63	0.1823				
0696775	4.64	0.1827				
0575702	4.65	0.1831				
0696781	4.66	0.1835				
0696798	4.67	0.1839				
0696803	4.68	0.1843				
0696810	4.69	0.1846		24	68	6
0572784	4.70	0.1850				
0696826	4.71	0.1854				
0696832	4.72	0.1858				
0696849	4.73	0.1862				
0696855	4.74	0.1866				
0575719	4.75	0.1870				
0696861	4.76	0.1874		26	70	6
1245422	4.76	0.1875	3/16	1	2-3/8	3/16
0696878	4.77	0.1878				
0696884	4.78	0.1882				
0696890	4.79	0.1886				
0572790	4.80	0.1890				
0696906	4.81	0.1894				
0696912	4.82	0.1898				
0696929	4.83	0.1902				
0696935	4.84	0.1906		26	70	6
0575725	4.85	0.1909				
0696941	4.86	0.1913				
0696958	4.87	0.1917				
0696964	4.88	0.1921				
0696970	4.89	0.1925				
0572806	4.90	0.1929				
0696987	4.91	0.1933				
1363329	4.91	0.1935	#10	1-3/16	3	1/4
0696993	4.92	0.1937				
0697008	4.93	0.1941				
0697014	4.94	0.1945		26	70	6
0575731	4.95	0.1949				
0697020	4.96	0.1953				
0697037	4.97	0.1957				
1363335	4.98	0.1960	#9	1-3/16	3	1/4
0697043	4.98	0.1961				
0697050	4.99	0.1965				
0572812	5.00	0.1969				
0697066	5.01	0.1972		26	70	6
0697072	5.02	0.1976				
0697089	5.03	0.1980				
0697095	5.04	0.1984				
0575748	5.05	0.1988				
1280954	5.05	0.1990	#8	1-3/16	3	1/4
0697100	5.06	0.1992				
0697117	5.07	0.1996				
0697123	5.08	0.2000		26	70	6
0697130	5.09	0.2004				
0572829	5.10	0.2008				
1245789	5.11	0.2010	#7	1-3/16	3	1/4
0697146	5.11	0.2012				
0697152	5.12	0.2016				
0697169	5.13	0.2020		26	70	6
0697175	5.14	0.2024				
0575754	5.15	0.2028				
0697181	5.16	0.2031				
1245439	5.16	0.2031	13/64	1-1/8	2-7/8	1/4
0697198	5.17	0.2035		26	70	6
0697203	5.18	0.2039				
1280960	5.18	0.2040	#6	1-1/4	3-1/16	1/4
0697210	5.19	0.2043				
0572835	5.20	0.2047		26	70	6
0697226	5.21	0.2051				
0697232	5.22	0.2055				
1363341	5.22	0.2055	#5	1-1/4	3-1/16	1/4
0697249	5.23	0.2059				
0697255	5.24	0.2063				
0575760	5.25	0.2067		26	70	6
0697261	5.26	0.2071				
0697278	5.27	0.2075				
0697284	5.28	0.2079				

0.01mm size Diameter Tolerance : 0 ～-.009mm

SG-ESS Drill Stub Length

L7572P Metric
L7573P Fractional, Wire & Letter

*Replacing AG-SUS Drill Short L6596P

EDP No.	Size	Decimal	Wire, Fractional & Letter Equivalent	Flute Length	Overall Length	Shank Dia.
EDP	Dc			ℓ	L	Ds
0697290	5.29	0.2083		26	70	6
0572841	5.30	0.2087				
1363358	5.31	0.2090	#4	1-1/4	3-1/16	1/4
0697306	5.31	0.2091		28	72	6
0697312	5.32	0.2094				
0697329	5.33	0.2098				
0697335	5.34	0.2102				
0575777	5.35	0.2106				
0697341	5.36	0.2110				
0697358	5.37	0.2114				
0697364	5.38	0.2118				
0697370	5.39	0.2122				
0572858	5.40	0.2126				
0697387	5.41	0.2130				
1363364	5.41	0.2130	#3	1-1/4	3-1/16	1/4
0697393	5.42	0.2134		28	72	6
0697409	5.43	0.2138				
0697415	5.44	0.2142				
0575783	5.45	0.2146				
0697421	5.46	0.2150				
0697438	5.47	0.2154				
0697444	5.48	0.2157				
0697450	5.49	0.2161				
0572864	5.50	0.2165				
0697467	5.51	0.2169				
0697473	5.52	0.2173				
0697480	5.53	0.2177				
0697496	5.54	0.2181				
0575790	5.55	0.2185				
1245445	5.56	0.2188	7/32	1-1/8	2-7/8	1/4
0697501	5.56	0.2189		28	72	6
0697518	5.57	0.2193				
0697524	5.58	0.2197				
0697530	5.59	0.2201				
0572870	5.60	0.2205				
0697547	5.61	0.2209				
1363370	5.61	0.2210	#2	1-5/16	3-1/8	1/4
0697553	5.62	0.2213		28	72	6
0697560	5.63	0.2217				
0697576	5.64	0.2220				
0575805	5.65	0.2224				
0697582	5.66	0.2228				
0697599	5.67	0.2232				
0697604	5.68	0.2236				
0697610	5.69	0.2240				
0572887	5.70	0.2244				
0697627	5.71	0.2248				
0697633	5.72	0.2252				
0697640	5.73	0.2256				
0697656	5.74	0.2260				
0575811	5.75	0.2264				
0697662	5.76	0.2268				
0697679	5.77	0.2272				
0697685	5.78	0.2276				
0697691	5.79	0.2280				
1363387	5.79	0.2280	#1	1-5/16	3-1/8	1/4
0572893	5.80	0.2283		28	72	6
0697707	5.81	0.2287				
0697713	5.82	0.2291				
0697720	5.83	0.2295				
0697736	5.84	0.2299				
0575828	5.85	0.2303				
0697742	5.86	0.2307				
0697759	5.87	0.2311				
0697765	5.88	0.2315				
0697771	5.89	0.2319				
0572909	5.90	0.2323				
0697788	5.91	0.2327				
0697794	5.92	0.2331				
0697800	5.93	0.2335				
0697816	5.94	0.2339				
0575834	5.95	0.2343				
1245451	5.95	0.2344	15/64	1-1/4	3	1/4
0697822	5.96	0.2346		28	72	6
0697839	5.97	0.2350				
0697845	5.98	0.2354				
0697851	5.99	0.2358				
0572915	6.00	0.2362				
1363409	6.05	0.2380	B	1-3/8	3-3/16	1/4

• USA Stock Size

EDP No.	Size	Decimal	Wire/Letter Equivalent	Flute Length	Overall Length	Shank Dia.
EDP	Dc			ℓ	L	Ds
0572921	6.10	0.2402		31	75	8
1363415	6.15	0.2420	C	1-3/8	3-3/16	1/4
0572938	6.20	0.2441		31	75	8
1363421	6.25	0.2460	D	1-3/8	3-3/16	1/4
0572944	6.30	0.2480		31	75	8
1245468	6.35	0.2500	1/4	1-1/4	3	1/4
0572950	6.40	0.2520		31	75	8
0572967	6.50	0.2559		31	75	8
1245830	6.53	0.2570	F	1-7/16	3-1/4	3/8
0572973	6.60	0.2598		31	75	8
1363444	6.63	0.2610	G	1-7/16	3-1/4	3/8
0572980	6.70	0.2638		31	75	8
1245474	6.75	0.2656	17/64	1-3/8	3-3/16	3/8
0572996	6.80	0.2677		34	78	8
0573000	6.90	0.2717		34	78	8
1363450	6.91	0.2720	I	1-1/2	3-5/16	3/8
0573017	7.00	0.2756		34	78	8
1363467	7.04	0.2770	J	1-1/2	3-5/16	3/8
0573023	7.10	0.2795		34	78	8
1245480	7.14	0.2813	9/32	1-3/8	3-3/16	3/8
0573030	7.20	0.2835		34	78	8
0573046	7.30	0.2874		34	78	8
1363473	7.37	0.2900	L	1-9/16	3-3/8	3/8
0573052	7.40	0.2913		34	78	8
1363480	7.49	0.2950	M	1-9/16	3-3/8	3/8
0573069	7.50	0.2953		34	78	8
1245497	7.54	0.2969	19/64	1-3/8	3-3/16	3/8
0573075	7.60	0.2992		37	81	8
1363496	7.67	0.3020	N	1-5/8	3-7/16	3/8
0573081	7.70	0.3031		37	81	8
0573098	7.80	0.3071				
0573103	7.90	0.3110				
1245502	7.94	0.3125	5/16	1-1/2	3-3/8	3/8
0573110	8.00	0.3150		37	81	8
1363501	8.03	0.3160	O	1-11/16	3-1/2	3/8
0573126	8.10	0.3189		37	87	10
0573132	8.20	0.3228				
0573149	8.30	0.3268				
1245519	8.33	0.3281	21/64	1-1/2	3-3/8	3/8
0573155	8.40	0.3307		37	87	10
1363524	8.43	0.3320	Q	1-11/16	3-1/2	3/8
0573161	8.50	0.3346		37	87	10
0573178	8.60	0.3386		40	90	10
1363530	8.61	0.3390	R	1-11/16	3-1/2	3/8
0573184	8.70	0.3425		40	90	10
1245525	8.73	0.3438	11/32	1-5/8	3-1/2	3/8
0573190	8.80	0.3465		40	90	10
0573206	8.90	0.3504				
0573212	9.00	0.3543				
0573229	9.10	0.3583				
1245531	9.13	0.3594	23/64	1-5/8	3-1/2	3/8
0573235	9.20	0.3622		40	90	10
0573241	9.30	0.3661		40	90	10
1280977	9.35	0.3680	U	1-13/16	3-5/8	3/8
0573258	9.40	0.3701		40	90	10
0573264	9.50	0.3740		40	90	10
1245548	9.53	0.3750	3/8	1-5/8	3-1/2	3/8
1363560	9.58	0.3770	V	1-7/8	3-31/32	1/2
0573270	9.60	0.3780		43	93	10
0573287	9.70	0.3819				
0573293	9.80	0.3858				
0573309	9.90	0.3898				
1245554	9.92	0.3906	25/64	1-11/16	3-7/8	1/2
0573315	10.00	0.3937		43	93	10
1363582	10.08	0.3970	X	1-15/16	4-1/32	1/2
0573321	10.10	0.3976		43	93	10
0573338	10.20	0.4016		43	100	12
1363599	10.26	0.4040	Y	1-15/16	4-1/32	1/2
0573344	10.30	0.4055		43	100	12
1245560	10.32	0.4063	13/32	1-11/16	3-7/8	1/2
0573350	10.40	0.4094		43	100	12
1363604	10.49	0.4130	Z	2	4-3/32	1/2
0573367	10.50	0.4134		43	100	12
0573373	10.60	0.4173		43	100	12
0573380	10.70	0.4213		47	104	12
1245577	10.72	0.4219	27/64	1-7/8	4-1/8	1/2
0573396	10.80	0.4252		47	104	12
0573401	10.90	0.4291				
0573418	11.00	0.4331				

0.01mm size Diameter Tolerance : 0 ～-.009mm

SG-ESS Drill Stub Length

L7572P Metric
L7573P Fractional, Wire & Letter

EDP No.	Size	Decimal	Wire/Fractional Equivalent	Flute Length	Overall Length	Shank Dia.
EDP	Dc			ℓ	L	Ds
0573424	11.10	0.4370		47	104	12
1245583	11.11	0.4375	7/16	1-7/8	4-1/8	1/2
0573430	11.20	0.4409		47	104	12
0573447	11.30	0.4449				
0573453	11.40	0.4488				
0573460	11.50	0.4528				
1245590	11.51	0.4531	29/64	1-7/8	4-1/8	1/2
0573476	11.60	0.4567		47	104	12
0573482	11.70	0.4606				
0573499	11.80	0.4646				
0573504	11.90	0.4685		51	108	12
1245605	11.91	0.4688	15/32	2	4-1/4	1/2
0573510	12.00	0.4724		51	108	12
0573527	12.10	0.4764				
0573533	12.20	0.4803				
0573540	12.30	0.4843				
1245611	12.30	0.4844	31/64	2	4-1/4	1/2
0573556	12.40	0.4882		51	108	12
0573562	12.50	0.4921				
0573579	12.60	0.4961				
0573585	12.70	0.5000				
1245628	12.70	0.5000	1/2	2	4-1/4	1/2
0573591	12.80	0.5039		51	108	12
0573607	12.90	0.5079				

*Replacing AG-SUS Drill Short L6596P

EDP No.	Size	Decimal	Wire/Fractional Equivalent	Flute Length	Overall Length	Shank Dia.
EDP	Dc			ℓ	L	Ds
0573613	13.00	0.5118		51	108	12
1280851	13.49	0.5313	17/32	2-7/8	5-3/16	5/8
0573620	13.50	0.5315		72	132	16
0573636	14.00	0.5512		72	132	16
1280868	14.29	0.5625	9/16	3	5-3/8	1/2
0573642	14.50	0.5709		76	136	16
0573659	15.00	0.5906		76	142	20
1280874	15.08	0.5938	19/32	3	5-5/8	3/4
0573665	15.50	0.6102		80	146	20
1280880	15.88	0.6250	5/8	3-3/16	5-3/4	3/4
0573671	16.00	0.6299		80	146	20
0573688	16.50	0.6496		84	150	20
1280897	16.67	0.6563	21/32	3-3/8	5-15/16	3/4
0573694	17.00	0.6693		84	150	20
1280902	17.46	0.6875	11/16	3-7/16	6	3/4
0573700	17.50	0.6890		87	153	20
0573716	18.00	0.7087		87	153	20
1280919	18.26	0.7188	23/32	3-7/16	6	7/8
0573722	18.50	0.7283		90	156	20
0573739	19.00	0.7480		90	164	25
1280925	19.05	0.7500	3/4	3-9/16	6-1/2	7/8
0573745	19.50	0.7677		94	168	25
0573751	20.00	0.7874		94	168	25

1 per tube

⚠ WARNING: Cancer - www.P65Warnings.ca.gov

Standard Drilling Conditions

L7572, 7573

Work Material			Structural Steel Carbon Steel		Alloy Steel (20-30 HRC)		Die Steels Hardened Steels		Stainless Steel 300 Series		Nickel Alloys Titanium Alloys PH Stainless		Cast Iron		Aluminum Alloys Copper Alloy	
Speed (SFM)			80 - 90 SFM		65 - 85 SFM		35 - 45 SFM		20 - 30 SFM		10 -20 SFM		100 - 110 SFM		110 - 120 SFM	
Drill Diameter																
Frac-tional	Metric	Dec. Inch	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
	0.5		16000	0.0005	13000	0.0004	7750	0.0004	5250	0.0004	2500	0.0003	20000	0.0005	23000	0.0006
	0.75		10500	0.0008	8550	0.0007	5100	0.0006	3800	0.0006	2150	0.0005	13100	0.0008	15150	0.0009
Speed (SFM)			115 - 135 SFM		95 - 105 SFM		40 - 50 SFM		30 - 50 SFM		20 -30 SFM		115 - 135 SFM		120 - 140 SFM	
	1	0.0394	11200	0.0010	9200	0.0009	3900	0.0008	3600	0.0008	1950	0.0006	11200	0.0010	13100	0.0012
	2	0.0787	5600	0.0020	4600	0.0018	1950	0.0016	1450	0.0016	970	0.0012	5600	0.0020	6550	0.0024
3/32	2.381	0.0937	4700	0.0028	3900	0.0026	1450	0.0024	1200	0.0024	820	0.0018	4100	0.0035	4500	0.0036
	3	0.1181	3700	0.0037	3100	0.0035	1150	0.0031	940	0.0031	650	0.0022	3250	0.0045	3550	0.0048
1/8	3.175	0.1250	3500	0.0040	2900	0.0037	1100	0.0032	890	0.0032	610	0.0024	3050	0.0055	3350	0.0055
5/32	3.969	0.1563	2800	0.0050	2350	0.0047	850	0.0038	710	0.0038	490	0.0030	2450	0.0066	2700	0.0066
3/16	4.763	0.1875	2350	0.0060	1950	0.0056	720	0.0045	590	0.0045	410	0.0032	2050	0.0079	2250	0.0078
	5	0.1969	2250	0.0067	1850	0.0059	680	0.0047	560	0.0047	390	0.0033	1950	0.0083	2150	0.0081
1/4	6.35	0.2500	1750	0.0080	1450	0.0072	540	0.0057	440	0.0057	310	0.0042	1500	0.0101	1700	0.0101
5/16	7.938	0.3125	1400	0.0094	1150	0.0088	430	0.0072	350	0.0072	240	0.0053	1200	0.0121	1350	0.0114
	8	0.3150	1400	0.0094	1150	0.0088	430	0.0072	350	0.0072	240	0.0054	1200	0.0122	1350	0.0116
3/8	9.525	0.3750	1200	0.0103	970	0.0092	360	0.0082	300	0.0082	200	0.0064	1000	0.0132	1150	0.0125
	10	0.3937	1100	0.0108	920	0.0094	340	0.0087	280	0.0087	190	0.0067	1000	0.0135	1100	0.0131
	12	0.4724	930	0.0113	770	0.0109	280	0.0094	240	0.0094	160	0.0080	810	0.0144	890	0.0149
1/2	12.7	0.5000	880	0.0120	730	0.0110	270	0.0095	220	0.0095	150	0.0082	770	0.0151	840	0.0154
	16.0	0.6299	700	0.0145	580	0.0132	220	0.0107	170	0.0107	120	0.0094	610	0.0172	670	0.0174
	20.0	0.7874	560	0.0165	460	0.0142	170	0.0118	140	0.0118	100	0.0102	490	0.0202	530	0.0205
	25.0	0.9843	450	0.0187	370	0.0157	140	0.0128	110	0.0128	80	0.0123	390	0.0231	430	0.0229
	32.0	1.2598	350	0.0189	290	0.0157	110	0.0132	90	0.0132	60	0.0132	300	0.0222	330	0.0230

Cutting Condition Table Recommendations

1) Adjust drilling condition according to the rigidity of the machine or workholding.
2) The table values are for drilling with water-soluble cutting fluid in vertical and horizontal machines.
3) When drilling stainless or other tough to machine materials, use peck drilling.
4) When pecking, set retract to the hole entrance.
5) Peck increment should be 0.5xD - 1xD. For small diameters, use 0.2xD - 0.5xD.
6) Recommmended feeds and speeds are starting points only and may require adjustment based on specific material, condition of equipment, and coolant condition.

Formulas: $RPM = \frac{SFM \times 3.82}{\text{Drill Diam.}}$ Feed Rate (in/min) = RPM x IPR

SG-ESR Drill

L7574P Metric
L7575P Fractional, Wire & Letter

Metric Range 2.0 to 32.0
Fractional Range 3/32 to 3/4

EDP No.	Size	Decimal Equivalent	Wire / Fractional Equivalent	Flute Length	Overall Length	Shank Dia.
EDP	Dc			ℓ	L	Ds
0721821	2.00	0.0787		24	56	3
1464190	2.08	0.0820	#45	1-1/8	2-3/8	1/8
0721838	2.10	0.0827		24	56	3
1464206	2.18	0.0860	#44	1-1/8	2-3/8	1/8
0721844	2.20	0.0866		25	56	3
1464212	2.26	0.0890	#43	1-1/4	2-1/2	1/8
0721850	2.30	0.0906		25	56	3
1464229	2.37	0.0935	#42	1-1/4	2-1/2	1/8
1464739	2.38	0.0938	3/32	1-1/8	2-3/8	1/8
0721867	2.40	0.0945		30	61	3
1464235	2.44	0.0960	#41	1-3/8	2-5/8	1/8
1464241	2.49	0.0980	#40			
0721873	2.50	0.0984		30	61	3
1464258	2.53	0.0995	#39	1-3/8	2-13/16	1/8
1464264	2.58	0.1015	#38	1-7/16	2-7/8	1/8
0721880	2.60	0.1024		30	61	3
1464270	2.64	0.1040	#37	1-7/16	2-7/8	1/8
0721896	2.70	0.1063		33	64	3
1464287	2.71	0.1065	#36	1-7/16	2-7/8	1/8
1464745	2.78	0.1094	7/64	1-1/4	2-1/2	1/8
0721901	2.80	0.1102		33	64	3
1464293	2.82	0.1110	#34	1-1/2	2-15/16	1/8
1464309	2.87	0.1130	#33			
0721918	2.90	0.1142		33	64	3
0721924	3.00	0.1181				
0721930	3.10	0.1220		36	68	4
1464751	3.18	0.1250	1/8	1-3/8	2-5/8	1/8
0721947	3.20	0.1260		36	68	4
1464315	3.26	0.1285	#30	1-5/8	3-1/16	3/16
0721953	3.30	0.1299		36	68	4
0721960	3.40	0.1339		39	71	4
1464321	3.47	0.1365	#29	1-3/4	3-3/16	3/16
0721976	3.50	0.1378		39	71	4
1464338	3.57	0.1405	#28	1-3/4	3-3/16	3/16
1464768	3.57	0.1406	9/64	1-1/2	2-7/8	3/16
0721982	3.60	0.1417		39	71	4
1464344	3.66	0.1440	#27	1-7/8	3-5/16	3/16
0721999	3.70	0.1457		39	71	4
1464350	3.73	0.1470	#26	1-7/8	3-5/16	3/16
1464367	3.80	0.1495	#25			
0722003	3.80	0.1496		43	75	4
1464373	3.86	0.1520	#24	2	3-7/16	3/16
0722010	3.90	0.1535		43	75	4
1464380	3.91	0.1540	#23	2	3-7/16	3/16
1464774	3.97	0.1563	5/32	1-3/4	3-1/8	3/16
1464396	3.99	0.1570	#22	2	3-7/16	3/16
0722026	4.00	0.1575		43	75	4
1464401	4.04	0.1590	#21	2-1/8	3-9/16	3/16
1464418	4.09	0.1610	#20			
0722032	4.10	0.1614		43	85	6
0722049	4.20	0.1654				
1464424	4.22	0.1660	#19	2-1/8	3-9/16	3/16
0722055	4.30	0.1693		47	89	6
1464780	4.37	0.1719	11/64	1-7/8	3-1/4	3/16
0722061	4.40	0.1732		47	89	6
0722078	4.50	0.1772				
1464430	4.57	0.1800	#15	2-3/16	3-5/8	3/16
1464447	4.62	0.1820	#14	2-3/16	3-5/8	3/16
0722090	4.70	0.1850		47	89	6
1464797	4.76	0.1875	3/16	2	3-3/8	3/16
0722106	4.80	0.1890		52	94	6
0722112	4.90	0.1929				
1464453	4.91	0.1935	#10	2-7/16	4-1/4	1/4
1464460	4.98	0.1960	#9			
0722129	5.00	0.1969		52	94	6
1464476	5.05	0.1990	#8	2-7/16	4-1/4	1/4
0722135	5.10	0.2008		52	94	6
1464482	5.11	0.2010	#7	2-7/16	4-1/4	1/4
1464802	5.16	0.2031	13/64	2-1/16	3-7/8	1/4
1464499	5.18	0.2040	#6	2-7/16	4-1/4	1/4
0722141	5.20	0.2047		52	94	6
1464504	5.22	0.2055	#5	2-1/2	4-5/16	1/4
0722158	5.30	0.2087		52	94	6
1464510	5.31	0.2090	#4	2-1/2	4-5/16	1/4
0722164	5.40	0.2126		57	99	6
1464527	5.41	0.2130	#3	2-1/2	4-5/16	1/4
0722170	5.50	0.2165		57	99	6
1464819	5.56	0.2188	7/32	2-1/16	3-7/8	1/4
0722187	5.60	0.2205		57	99	6
1464533	5.61	0.2210	#2	2-5/8	4-7/16	1/4
0722193	5.70	0.2244		57	99	6
1464540	5.79	0.2280	#1	2-5/8	4-7/16	1/4
0722209	5.80	0.2283		57	99	6
0722215	5.90	0.2323				
1464825	5.95	0.2344	15/64	2-3/8	4-1/4	1/4
0722221	6.00	0.2362		57	99	6
1464556	6.05	0.2380	B	2-3/4	4-9/16	1/4
0722238	6.10	0.2402		63	107	8
1464562	6.15	0.2420	C	2-3/4	4-9/16	1/4
0722244	6.20	0.2441		63	107	8
1464579	6.25	0.2460	D	2-3/4	4-9/16	1/4
0722250	6.30	0.2480		63	107	8
1464831	6.35	0.2500	1/4	2-3/8	4-1/4	1/4
0722267	6.40	0.2520		63	107	8
0722273	6.50	0.2559				
1464585	6.53	0.2570	F	2-7/8	4-11/16	3/8
0722280	6.60	0.2598		63	107	8
1464591	6.63	0.2610	G	2-7/8	4-11/16	3/8
0722296	6.70	0.2638		63	107	8
1464848	6.75	0.2656	17/64	2-3/4	4-5/8	3/8
0722301	6.80	0.2677		69	113	8
0722318	6.90	0.2717				
1464607	6.91	0.2720	I	2-7/8	4-11/16	3/8
0722324	7.00	0.2756		69	113	8
1464613	7.04	0.2770	J	2-7/8	4-11/16	3/8
0722330	7.10	0.2795		69	113	8
1464854	7.15	0.2813	9/32	2-3/4	4-5/8	3/8
0722347	7.20	0.2835		69	113	8
0722353	7.30	0.2874				
1464620	7.37	0.2900	L	2-15/16	4-3/4	3/8
0722360	7.40	0.2913		69	113	8
1464636	7.49	0.2950	M	3-1/16	4-7/8	3/8
0722376	7.50	0.2953		69	113	8

• USA Stock Size

1 per tube

L7574P Metric
L7575P Fractional

Metric Range 2.0 to 32.0
Fractional Range 3/32 to 3/4

EDP No.	Size	Decimal Equivalent	Wire / Fractional Equivalent	Flute Length	Overall Length	Shank Dia.
EDP	Dc			ℓ	L	Ds
1464860	7.54	0.2969	19/64	2-7/8	4-3/4	3/8
0722382	7.60	0.2992		75	119	8
1464642	7.67	0.3020	N	3-1/16	4-7/8	3/8
0722399	7.70	0.3031		75	119	8
0722404	7.80	0.3071				
0722410	7.90	0.3110				
1464877	7.94	0.3125	5/16	2-7/8	4-3/4	3/8
0722427	8.00	0.3150		75	119	8
1464659	8.03	0.3160	O	3-3/16	5	3/8
0722433	8.10	0.3189		75	125	10
0722440	8.20	0.3228				
0722456	8.30	0.3268				
1464883	8.33	0.3281	21/64	2-7/8	4-3/4	3/8
0722462	8.40	0.3307		75	125	10
1464665	8.43	0.3320	Q	3-7/16	5-1/4	3/8
0722479	8.50	0.3346		75	125	10
0722485	8.60	0.3386		81	131	10
1464671	8.61	0.3390	R	3-7/16	5-1/4	3/8
0722491	8.70	0.3425		81	131	10
1464890	8.73	0.3438	11/32	3-1/4	5-1/8	3/8
0722507	8.80	0.3465		81	131	10
0722513	8.90	0.3504				
0722520	9.00	0.3543				
0722536	9.10	0.3583				
1464905	9.13	0.3594	23/64	3-1/4	5-1/8	3/8
0722542	9.20	0.3622		81	131	10
0722559	9.30	0.3661				
1464688	9.35	0.3680	U	3-5/8	5-7/16	3/8
0722565	9.40	0.3701		81	131	10
0722571	9.50	0.3740				
1464911	9.53	0.3750	3/8	3-1/4	5-1/8	3/8
1464694	9.58	0.3770	V	3-5/8	5-23/32	1/2
0722588	9.60	0.3780		87	137	10
0722594	9.70	0.3819				
0722600	9.80	0.3858				
0722616	9.90	0.3898				
1464928	9.92	0.3906	25/64	3-3/8	5-1/2	1/2
0722622	10.00	0.3937		87	137	10
1464700	10.08	0.3970	X	3-3/4	5-27/32	1/2
0722639	10.10	0.3976		87	144	12
0722645	10.20	0.4016				
1464716	10.26	0.4040	Y	3-7/8	5-31/32	1/2
0722651	10.30	0.4055		87	144	12
1464934	10.32	0.4063	13/32	3-3/8	5-1/2	1/2
0722668	10.40	0.4094		87	144	12
1464722	10.49	0.4130	Z	3-7/8	5-31/32	1/2
0722674	10.50	0.4134		87	144	12
0722680	10.60	0.4173				
0722697	10.70	0.4213		94	151	12
1464940	10.72	0.4219	27/64	3-3/4	5-7/8	1/2
0722702	10.80	0.4252		94	151	12
0722719	10.90	0.4291				
0722725	11.00	0.4331				
0722731	11.10	0.4370				
1464957	11.11	0.4375	7/16	3-3/4	5-7/8	1/2
0722748	11.20	0.4409		94	151	12
0722754	11.30	0.4449				
0722760	11.40	0.4488				
0722777	11.50	0.4528				
1464963	11.51	0.4531	29/64	3-3/4	5-7/8	1/2
0722783	11.60	0.4567		94	151	12
0722790	11.70	0.4606				
0722805	11.80	0.4646				

EDP No.	Size	Decimal Equivalent	Wire / Fractional Equivalent	Flute Length	Overall Length	Shank Dia.
EDP	Dc			ℓ	L	Ds
0722811	11.90	0.4685		101	158	12
1464970	11.91	0.4688	15/32	4	6-1/4	1/2
0722828	12.00	0.4724		101	158	12
0722834	12.10	0.4764				
0722840	12.20	0.4803				
0722857	12.30	0.4843				
1464986	12.30	0.4844	31/64	4	6-1/4	1/2
0722863	12.40	0.4882		101	158	12
0722870	12.50	0.4921				
0722886	12.60	0.4961				
0722892	12.70	0.5000				
1464992	12.70	0.5000	1/2	4	6-1/4	1/2
0722908	12.80	0.5039		101	158	12
0722914	12.90	0.5079				
0722920	13.00	0.5118				
1465007	13.50	0.5313	17/32	4-1/4	6-3/4	5/8
0722937	13.50	0.5315		108	168	16
0722943	14.00	0.5512				
1465013	14.29	0.5625	9/16	4-1/2	7	5/8
0722950	14.50	0.5709		114	173	16
1465020	14.68	0.5781	37/64	4-1/2	7	5/8
0722966	15.00	0.5906		114	180	20
1465036	15.08	0.5938	19/32	4-3/4	7-1/4	3/4
0722972	15.50	0.6102		120	185	20
1465042	15.88	0.6250	5/8	4-3/4	7-1/4	3/4
0722989	16.00	0.6299		120	185	20
0722995	16.50	0.6496		125	189	20
1465059	16.67	0.6563	21/32	5	7-1/2	3/4
0723000	17.00	0.6693		125	189	20
1465065	17.46	0.6875	11/16	5-1/8	7-5/8	3/4
0723016	17.50	0.6890		130	194	20
0723022	18.00	0.7087		135	206	20
1465071	18.26	0.7188	23/32	5-3/8	7-3/4	7/8
0723039	18.50	0.7283		140	210	20
0723045	19.00	0.7480		135	206	25
1465088	19.05	0.7500	3/4	5-1/2	7-7/8	7/8
0723051	19.50	0.7677		140	210	25
0723068	20.00	0.7874				
0723074	20.50	0.8071			214	
0723080	21.00	0.8268		145		
0723097	21.50	0.8465		150	218	
0723102	22.00	0.8661				
0723119	22.50	0.8858		155	223	
0723125	23.00	0.9055				
0723131	23.50	0.9252				
0723148	24.00	0.9449		160	237	32
0723154	24.50	0.9646				
0723160	25.00	0.9843		165	241	
0723177	25.50	1.0039				
0723183	26.00	1.0236				
0723190	26.50	1.0433				
0723205	27.00	1.0630		170	245	
0723211	27.50	1.0827				
0723228	28.00	1.1024				
0723234	28.50	1.1220		175	248	
0723240	29.00	1.1417				
0723257	29.50	1.1614				
0723263	30.00	1.1811				
0723270	30.50	1.2008		180	252	
0723286	31.00	1.2205				
0723292	31.50	1.2402				
0723308	32.00	1.2598		185		

• USA Stock Size

1 per tube

⚠ **WARNING:** Cancer - www.P65Warnings.ca.gov

Standard Drilling Conditions

LIST 7574, 7575

Work Material			Structural Steel Carbon Steel		Alloy Steel (20-30 HRC)		Die Steels Hardened Steels		Stainless Steel 300 Series		Nickel Alloys Titanium Alloys PH Stainless		Cast Iron		Aluminum Alloys Copper Alloy	
Speed (SFM)			110 - 130 SFM		85 - 105 SFM		35 - 45 SFM		20 - 30 SFM		10 -20 SFM		100 - 110 SFM		110 - 130 SFM	
Drill Diameter			RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
Fractional	Metric	Dec. Inch														
	2	0.0787	5600	0.0020	4600	0.0018	1950	0.0014	1450	0.0014	970	0.0011	5600	0.0020	6550	0.0024
3/32	2.381	0.0937	4700	0.0028	3900	0.0023	1450	0.0019	1200	0.0019	820	0.0014	4100	0.0035	4500	0.0033
	3	0.1181	3700	0.0037	3100	0.0031	1150	0.0022	940	0.0022	650	0.0019	3250	0.0045	3550	0.0044
1/8	3.175	0.1250	3500	0.0040	2900	0.0034	1100	0.0024	890	0.0024	610	0.0021	3050	0.0055	3350	0.0053
5/32	3.969	0.1563	2800	0.0050	2350	0.0042	850	0.0034	710	0.0034	490	0.0024	2450	0.0066	2700	0.0063
3/16	4.763	0.1875	2350	0.0054	1950	0.0049	720	0.0041	590	0.0041	410	0.0029	2050	0.0079	2250	0.0073
	5	0.1969	2250	0.0063	1850	0.0054	680	0.0044	560	0.0044	390	0.0030	1950	0.0083	2150	0.0074
1/4	6.35	0.2500	1750	0.0074	1450	0.0061	540	0.0053	440	0.0053	310	0.0039	1500	0.0101	1700	0.0084
5/16	7.938	0.3125	1400	0.0078	1150	0.0065	430	0.0072	350	0.0072	240	0.0044	1200	0.0121	1350	0.0104
	8	0.3150	1400	0.0079	1150	0.0066	430	0.0072	350	0.0072	240	0.0044	1200	0.0122	1350	0.0104
3/8	9.525	0.3750	1200	0.0082	970	0.0072	360	0.0078	300	0.0078	200	0.0052	1000	0.0132	1150	0.0112
	10	0.3937	1100	0.0084	920	0.0073	340	0.0084	280	0.0084	190	0.0054	1000	0.0135	1100	0.0114
	12	0.4724	930	0.0094	770	0.0084	280	0.0099	240	0.0099	160	0.0063	810	0.0144	890	0.0122
1/2	12.7	0.5000	880	0.0105	730	0.0090	270	0.0102	220	0.0102	150	0.0068	770	0.0151	840	0.0124
	16.0	0.6299	700	0.0124	580	0.0104	220	0.0107	170	0.0107	120	0.0081	610	0.0172	670	0.0154
	20.0	0.7874	560	0.0144	460	0.0123	170	0.0118	140	0.0118	100	0.0092	490	0.0202	530	0.0174
	25.0	0.9843	450	0.0149	370	0.0132	140	0.0128	110	0.0128	80	0.0105	390	0.0231	430	0.0194
	32.0	1.2598	350	0.0154	290	0.0144	110	0.0145	90	0.0145	60	0.0115	300	0.0222	330	0.0196

Cutting Condition Table Recommendations

1) Adjust drilling condition according to the rigidity of the machine or workholding.
2) The table values are for drilling with water-soluble cutting fluid in vertical and horizontal machines.
3) When drilling stainless or other tough to machine materials, use peck drilling.
4) When pecking, set retract to the hole entrance.
5) Peck increment should be 0.5xD - 1xD.
6) Recommended feeds and speeds are starting points only and may require adjustment based on specific material, condition of equipment, and coolant condition.

Formulas: $RPM = \frac{SFM \times 3.82}{\text{Drill Diam.}}$ Feed Rate (in/min) = RPM x IPR

SG Drill Oil Hole

L7596P Metric Range 5.0 to 20.0 mm
L7591P Fractional Range 15/64 to 3/4

EDP No.	Size	Decimal Equivalent	Fractional Equivalent	Flute Length	Overall Length
EDP	Dc			ℓ	L
1314751	5.0	0.1969		52	94
1314768	5.5	0.2165		57	99
1315065		0.2344	15/64	2-3/8	4-1/4
1314774	6.0	0.2362		57	99
1315071		0.2500	1/4	2-3/8	4-1/4
1314780	6.5	0.2559		63	107
1315088		0.2656	17/64	2-3/4	4-5/8
1314797	7.0	0.2756		69	113
1315094		0.2813	9/32	2-3/4	4-5/8
1314802	7.5	0.2953		69	113
1315100		0.2969	19/64	2-7/8	4-3/4
1315116		0.3125	5/16	2-7/8	4-3/4
1314819	8.0	0.3150		75	119
1315122		0.3281	21/64	2-7/8	4-3/4
1314825	8.5	0.3346		75	125
1315139		0.3438	11/32	3-1/4	5-1/8
1314831	9.0	0.3543		81	131
1315145		0.3594	23/64	3-1/4	5-1/8
1314848	9.5	0.3740		81	131
1315151		0.3750	3/8	3-1/4	5-1/8
1315168		0.3906	25/64	3-3/8	5-1/2
1314854	10.0	0.3937		87	137
1315174		0.4063	13/32	3-3/8	5-1/2
1314860	10.5	0.4134		87	144
1315180		0.4219	27/64	3-3/4	5-7/8
1314877	11.0	0.4331		94	151
1315197		0.4375	7/16	3-3/4	5-7/8
1314883	11.5	0.4528		94	151
1315202		0.4531	29/64	3-3/4	5-7/8

EDP No.	Size	Decimal Equivalent	Fractional Equivalent	Flute Length	Overall Length
EDP	Dc			ℓ	L
1315219		0.4688	15/32	4	6-1/4
1314890	12.0	0.4724		101	158
1315225		0.4844	31/64	4	6-1/4
1314905	12.5	0.4921		101	158
1315231		0.5000	1/2	4	6-1/4
1314911	13.0	0.5118		101	158
1315248		0.5313	17/32	4-1/4	6-3/4
1314928	13.5	0.5315		108	168
1314934	14.0	0.5512		108	168
1315254		0.5625	9/16	4-1/2	7
1314940	14.5	0.5709		114	173
1315260		0.5781	37/64	4-1/2	7
1314957	15.0	0.5906		114	180
1315277		0.5938	19/32	4-3/4	7-1/4
1314963	15.5	0.6102		120	185
1315283		0.6250	5/8	4-3/4	7-1/4
1314970	16.0	0.6299		120	185
1314986	16.5	0.6496		125	189
1315290		0.6563	21/32	5	7-1/2
1314992	17.0	0.6693		125	189
1315305		0.6875	11/16	5-1/8	7-5/8
1315007	17.5	0.6890		130	194
1315013	18.0	0.7087		130	194
1315311		0.7188	23/32	5-3/8	7-3/4
1315020	18.5	0.7283		135	198
1315036	19.0	0.7480		135	206
1315328		0.7500	3/4	5-1/2	7-7/8
1315042	19.5	0.7677		140	210
1315059	20.0	0.7874			

• USA Stock Size

⚠ **WARNING:** Cancer - www.P65Warnings.ca.gov

Standard Drilling Conditions

Workpiece Material / Speed (SFM) / Drill Diameter			Structural Steels Carbon Steels		Alloy Steels		Die Steels Hardened Steels (35-45HRc)		Stainless Steels		Cast Irons		Aluminum Alloys Copper Alloys Nonferrous Alloys	
			120 - 130 SFM		105 - 110 SFM		40 - 50 SFM		60 - 70 SFM		130 - 150 SFM		200 - 230 SFM	
Fractional	Metric mm	Decimal	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
—	5.000	0.1969	2,400	0.007	1,900	0.006	850	0.005	1,200	0.005	2,700	0.009	4,100	0.009
1/4	6.350	0.2500	1,900	0.008	1,500	0.008	650	0.006	1,000	0.006	2,100	0.011	3,300	0.011
5/16	7.938	0.3125	1,500	0.008	1,250	0.008	550	0.007	800	0.007	1,700	0.013	2,650	0.013
—	8.000	0.3150	1,500	0.009	1,200	0.009	550	0.009	750	0.008	1,700	0.014	2,600	0.014
3/8	9.525	0.3750	1,250	0.010	1,000	0.010	500	0.009	700	0.009	1,500	0.014	2,200	0.014
—	10.000	0.3937	1,200	0.011	950	0.011	450	0.010	650	0.010	1,400	0.016	2,000	0.016
—	12.000	0.4724	1,000	0.011	800	0.011	400	0.010	550	0.010	1,200	0.016	1,700	0.016
1/2	12.700	0.5000	950	0.013	750	0.013	350	0.012	500	0.013	1,100	0.019	1,600	0.019
—	16.000	0.6299	750	0.014	600	0.014	250	0.014	400	0.015	850	0.021	1,300	0.021
—	20.000	0.7874	600	0.015	450	0.015	200	0.014	300	0.015	650	0.022	1,000	0.021

1) The above values apply when coolant is used in vertical machine & horizontal machine. When drilling in stainless steel and hard to cut material using pecking.
2) Adjust drilling condition when unusual vibration or different sound occurs.
3) Recommended feeds & speeds are starting points only. Actual performance will be determined by specific material, the condition of equipment being used and coolant.

Formulas: $RPM = \frac{SFM \times 3.82}{Drill\ Diam.}$ Feed Rate (in/min) = RPM x IPR

AG Power Long Drill

L6540P	Metric Sizes	Series 1 Range 1.0 to 13.0	Series 2 Range 1.0 to 10.0	Series 3 Range 3.0 to 10.0
L6541P	Fractional Sizes	Series 1 Range 1/8 to 3/8	Series 2 Range 1/8 to 3/8	Series 3 Range 1/8 to 5/16

Series 1

EDP	Fractional Size	Size	Decimal Equivalent	Flute Length	Overall Length
0640796		1.0000	0.0394	33	56
0640801		1.1000	0.0433	37	60
0640818		1.2000	0.0472	41	65
0640824		1.3000	0.0512		
0640830		1.4000	0.0551	45	70
0640847		1.5000	0.0591		
0640853		1.6000	0.0630	50	76
0640860		1.7000	0.0669		
0640876		1.8000	0.0709	53	80
0640882		1.9000	0.0748		
0640899		2.0000	0.0787	56	85
0640904		2.1000	0.0827		
0640910		2.2000	0.0866	59	90
0640927		2.3000	0.0906		
0640933		2.4000	0.0945	62	95
0640940		2.5000	0.0984		
0640956		2.6000	0.1024		
0640962		2.7000	0.1063	66	100
0640979		2.8000	0.1102		
0640985		2.9000	0.1142		
0640991		3.0000	0.1181		
0641006		3.1000	0.1220	69	106
1372812	1/8	3.1750	0.1250		
0641012		3.2000	0.1260		
0641029		3.3000	0.1299		
0641035		3.4000	0.1339	73	112
0641041		3.5000	0.1378		
1372829	9/64	3.5720	0.1406		
0641058		3.6000	0.1417		
0641064		3.7000	0.1457		
0641070		3.8000	0.1496	78	119
0641087		3.9000	0.1535		
1372835	5/32	3.9690	0.1563		
0641093		4.0000	0.1575		
0641109		4.1000	0.1614		
0641115		4.2000	0.1654		
0641121		4.3000	0.1693	82	126
1372841	11/64	4.3660	0.1719		
0641138		4.4000	0.1732		
0641144		4.5000	0.1772		
0641150		4.6000	0.1811		
0641167		4.7000	0.1850		
1372858	3/16	4.7620	0.1875	87	132
0641173		4.8000	0.1890		
0641180		4.9000	0.1929		
0641196		5.0000	0.1969		
0641201		5.1000	0.2008		
1372864	13/64	5.1590	0.2031		
0641218		5.2000	0.2047		
0641224		5.3000	0.2087		
0641230		5.4000	0.2126	91	139
0641247		5.5000	0.2165		
1372870	7/32	5.5560	0.2187		
0641253		5.6000	0.2205		
0641260		5.7000	0.2244		
0641276		5.8000	0.2283		
0641282		5.9000	0.2323		
0641299		6.0000	0.2362		
1372887	1/4	6.3500	0.2500	97	148
0641304		6.5000	0.2559		
1372893	17/64	6.7470	0.2656	102	156
0641310		6.8000	0.2677		
0641327		7.0000	0.2756		
1372909	9/32	7.1440	0.2813	102	156
0641333		7.5000	0.2953		
1372915	19/64	7.5410	0.2969	109	165
1372921	5/16	7.9330	0.3125		
0641340		8.0000	0.3150		
1372938	21/64	8.3340	0.3281		
0641356		8.5000	0.3346		
1372944	11/32	8.7310	0.3437	115	175
0641362		9.0000	0.3543		
1372950	23/64	9.1280	0.3594		
0641379		9.5000	0.3740		
1372967	3/8	9.5250	0.3750	121	184
0641385		10.0000	0.3937		
0641391		10.5000	0.4134		
0641407		11.0000	0.4331	128	195
0641413		11.5000	0.4528		
0641420		12.0000	0.4724	134	205
0641436		12.5000	0.4921		
0641442		13.0000	0.5118		

Series 2

EDP	Fractional Size	Size	Decimal Equivalent	Flute Length	Overall Length
0641459		1.0000	0.0394	60	100
0641465		1.1000	0.0433		
0641471		1.2000	0.0472	65	105
0641488		1.3000	0.0512		
0641494		1.4000	0.0551	70	110
0641500		1.5000	0.0591		
0641516		1.6000	0.0630	75	115
0641522		1.7000	0.0669		
0641539		1.8000	0.0709	80	120
0641545		1.9000	0.0748		
0641551		2.0000	0.0787	85	125
0641568		2.1000	0.0827		
0641574		2.2000	0.0866	90	135
0641580		2.3000	0.0906		
0641597		2.4000	0.0945	95	140
0641602		2.5000	0.0984		
0641619		2.6000	0.1024		
0641625		2.7000	0.1063	100	150
0641631		2.8000	0.1102		
0641648		2.9000	0.1142		
0641654		3.0000	0.1181		
0641660		3.1000	0.1220	105	155
1372973	1/8	3.1750	0.1250		
0641677		3.2000	0.1260		
0641683		3.3000	0.1299		
0641690		3.4000	0.1339	115	165
0641705		3.5000	0.1378		
1372980	9/64	3.5720	0.1406		
0641711		3.6000	0.1417		
0641728		3.7000	0.1457		
0641734		3.8000	0.1496	120	175
0641740		3.9000	0.1535		
1372996	5/32	3.9690	0.1563		
0641757		4.0000	0.1575		
0641763		4.1000	0.1614		
0641770		4.2000	0.1654		
0641786		4.3000	0.1693	125	185
1373000	11/64	4.3660	0.1719		
0641792		4.4000	0.1732		
0641808		4.5000	0.1772		
0641814		4.6000	0.1811		
0641820		4.7000	0.1850	125	185
1373017	3/16	4.7620	0.1875	135	195
0641837		4.8000	0.1890		
0641843		4.9000	0.1929		
0641850		5.0000	0.1969		
0641866		5.1000	0.2008		
1373023	13/64	5.1590	0.2031		
0641872		5.2000	0.2047		
0641889		5.3000	0.2087		
0641895		5.4000	0.2126	140	205
0641900		5.5000	0.2165		
1373030	7/32	5.5600	0.2187		
0641917		5.6000	0.2205		
0641923		5.7000	0.2244		
0641930		5.8000	0.2283		
0641946		5.9000	0.2323		
0641952		6.0000	0.2362		
1373046	1/4	6.3500	0.2500	150	215
0641969		6.5000	0.2559		
1373052	17/64	6.7470	0.2656	155	225
0641975		6.8000	0.2677		
0641981		7.0000	0.2756		
1373069	9/32	7.1440	0.2813		
0641998		7.5000	0.2953		
1373075	19/64	7.5410	0.2969	165	240
1373081	5/16	7.9330	0.3125		
0642002		8.0000	0.3150		
1373098	21/64	8.3340	0.3281		
0642019		8.5000	0.3346		
1373103	11/32	8.7310	0.3437	175	250
0642025		9.0000	0.3543		
1373110	23/64	9.1280	0.3594		
0642031		9.5000	0.3740		
1373126	3/8	9.5250	0.3750	185	265
0642048		10.0000	0.3937		

Series 3

EDP	Fractional Size	Size	Decimal Equivalent	Flute Length	Overall Length
0642054		3.0000	0.1181	130	190
1373132	1/8	3.1750	0.1250	135	200
0642060		3.5000	0.1378	145	210
1373149	9/64	3.5720	0.1406		
1373155	5/32	3.9690	0.1563	150	220
0642077		4.0000	0.1575		
1373161	11/64	4.3660	0.1719	160	235
0642083		4.5000	0.1772		
1373178	3/16	4.7620	0.1875	170	245
0642090		5.0000	0.1969		
0642105		5.5000	0.2165	180	260
1373184	7/32	5.5600	0.2187		
0642111		6.0000	0.2362		
1373190	1/4	6.3500	0.2500	190	275
0642128		6.5000	0.2559		
0642134		7.0000	0.2756	200	290
0642140		7.5000	0.2953		
1373206	5/16	7.9330	0.3125	210	305
0642157		8.0000	0.3150		
0642163		8.5000	0.3346		
0642170		9.0000	0.3543	220	320
0642186		9.5000	0.3740		
0642192		10.0000	0.3937	235	340

1 per tube

*Metric Size is Japan item: Please allow 2-3 weeks delivery

⚠ WARNING: Cancer - www.P65Warnings.ca.gov

Standard Drilling Conditions

List No. 6540P, 6541P

Workpiece Material / Speed (SFM) / Drill Diameter			Structural Steels, Carbon Steels		Alloy Steels		Hardened Steels, (-40 HRc), Tool Steels		Stainless Steels 300-400 Series		Cast Irons	
			40 - 80 SFM		25 - 50 SFM		16 - 35 SFM		30 - 40 SFM		42 - 82 SFM	
Fractional	Metric mm	Decimal	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
—	1	0.0394	5,800	0.0007	3,300	0.0007	2,400	0.0005	2,900	0.0006	6,000	0.0008
—	2	0.0787	2,900	0.002	1,600	0.002	1,200	0.002	1,400	0.0015	3,000	0.002
—	3	0.1181	1,950	0.003	1,100	0.003	800	0.002	950	0.002	2,000	0.003
1/8	3.175	0.1250	1,800	0.003	1,000	0.003	750	0.002	900	0.002	1,800	0.003
3/16	4.763	0.1875	1,200	0.005	700	0.005	500	0.004	600	0.003	1,200	0.005
—	5	0.1969	1,100	0.005	650	0.005	480	0.004	550	0.004	1,200	0.006
—	6	0.2362	970	0.006	550	0.006	400	0.005	450	0.004	1,000	0.007
1/4	6.350	0.2500	900	0.006	500	0.006	350	0.005	450	0.004	950	0.008
9/32	7.144	0.2813	800	0.007	450	0.007	350	0.005	400	0.005	850	0.009
5/16	7.938	0.3125	700	0.008	400	0.008	300	0.006	350	0.006	800	0.010
—	8	0.3150	700	0.008	400	0.008	300	0.006	350	0.006	750	0.009
23/64	9	0.3594	650	0.009	350	0.009	250	0.007	300	0.007	700	0.010
—	10	0.3937	600	0.010	350	0.009	250	0.008	300	0.007	650	0.013
—	13	0.5118	550	0.009	300	0.009	200	0.008	250	0.008	600	0.011

1) Pilot Hole is required. It is recommended to use same diameter or up to 0.1mm larger than diamter of the long drill. The depth of cut of the pilot hole is 1 to 2 times diameter of the drill diameter.
2) Above drilling table is applied to Series 1 & 2. In case of series 3 & 4, reduce the RPM and feed to 80% of table values.
3) Use pecking when drilling in Stainless Steel & Hardened Steels.
4) Recommended feeds and speeds are starting points only. Actual performance will be determined by specific material, the condition of equipment being used and coolant.

Formulas: $RPM = \frac{SFM \times 3.82}{\text{Drill dia.}'}$ Feed Rate (in/min)= RPM x IPR

DLC Drill

L544 High Performance - DLC Coated

Range 1.0 to 13.0 (Unit) : mm

EDP	Size	Decimal Equivalent	Flute Length	Overall Length	Shank Dia
0642426	1.0000	0.0394	12	50	3
0642432	1.1000	0.0433	14		
0642449	1.2000	0.0472	16		
0642455	1.3000	0.0512			
0642461	1.4000	0.0551	18		
0642478	1.5000	0.0591			
0642484	1.6000	0.0630	20	56	
0642490	1.7000	0.0669			
0642506	1.8000	0.0709	22		
0642512	1.9000	0.0748			
0642529	2.0000	0.0787	24		
0642535	2.1000	0.0827			
0642541	2.2000	0.0866	25		
0642558	2.3000	0.0906			
0642564	2.4000	0.0945	30	64	
0642570	2.5000	0.0984			
0642587	2.6000	0.1024			
0642593	2.7000	0.1063	33		
0642609	2.8000	0.1102			
0642615	2.9000	0.1142			
0642621	3.0000	0.1181			
0642638	3.1000	0.1220	36	71	4
0642644	3.2000	0.1260			
0642650	3.3000	0.1299			
0642667	3.4000	0.1339	39		
0642673	3.5000	0.1378			
0642680	3.6000	0.1417			
0642696	3.7000	0.1457			
0642701	3.8000	0.1496	43	75	
0642718	3.9000	0.1535			
0642724	4.0000	0.1575			
0642730	4.1000	0.1614		89	6
0642747	4.2000	0.1654			
0642753	4.3000	0.1693	47		
0642760	4.4000	0.1732			
0642776	4.5000	0.1772			
0642782	4.6000	0.1811			
0642799	4.7000	0.1850			
0642804	4.8000	0.1890	52	94	
0642810	4.9000	0.1929			
0642827	5.0000	0.1969			
0642833	5.1000	0.2008			
0642840	5.2000	0.2047			
0642856	5.3000	0.2087			
0642862	5.4000	0.2126	57	99	
0642879	5.5000	0.2165			
0642885	5.6000	0.2205			
0642891	5.7000	0.2244			
0642907	5.8000	0.2283			
0642913	5.9000	0.2323			
0642920	6.0000	0.2362			
0642936	6.1000	0.2402	63	107	8
0642942	6.2000	0.2441			
0642959	6.3000	0.2480			
0642965	6.4000	0.2520			
0642971	6.5000	0.2559			
0642988	6.6000	0.2598			
0642994	6.7000	0.2638			
0643009	6.8000	0.2677	69	113	
0643015	6.9000	0.2717			
0643021	7.0000	0.2756			

1 per tube

*** JAPAN STOCK ITEM: Please allow 2-3 weeks delivery**

EDP	Size	Decimal Equivalent	Flute Length	Overall Length	Shank Dia
0643038	7.1000	0.2795	69	113	8
0643044	7.2000	0.2835			
0643050	7.3000	0.2874			
0643067	7.4000	0.2913			
0643073	7.5000	0.2953			
0643080	7.6000	0.2992	75	119	
0643096	7.7000	0.3031			
0643101	7.8000	0.3071			
0643118	7.9000	0.3110			
0643124	8.0000	0.3150			
0643130	8.1000	0.3189		125	10
0643147	8.2000	0.3228			
0643153	8.3000	0.3268			
0643160	8.4000	0.3307			
0643176	8.5000	0.3346			
0643182	8.6000	0.3386	81	131	
0643199	8.7000	0.3425			
0643204	8.8000	0.3465			
0643210	8.9000	0.3504			
0643227	9.0000	0.3543			
0643233	9.1000	0.3583			
0643240	9.2000	0.3622			
0643256	9.3000	0.3661			
0643262	9.4000	0.3701			
0643279	9.5000	0.3740			
0643285	9.6000	0.3780	87	137	
0643291	9.7000	0.3819			
0643307	9.8000	0.3858			
0643313	9.9000	0.3898			
0643320	10.0000	0.3937			
0643336	10.1000	0.3976		144	12
0643342	10.2000	0.4016			
0643359	10.3000	0.4055			
0643365	10.4000	0.4094			
0643371	10.5000	0.4134			
0643388	10.6000	0.4173			
0643394	10.7000	0.4213	94	151	
0643400	10.8000	0.4252			
0643416	10.9000	0.4291			
0643422	11.0000	0.4331			
0643439	11.1000	0.4370			
0643445	11.2000	0.4409			
0643451	11.3000	0.4449			
0643468	11.4000	0.4488			
0643474	11.5000	0.4528			
0643480	11.6000	0.4567			
0643497	11.7000	0.4606			
0643502	11.8000	0.4646			
0643519	11.9000	0.4685	101	158	
0643525	12.0000	0.4724			
0643531	12.1000	0.4764			
0643548	12.2000	0.4803			
0643554	12.3000	0.4843			
0643560	12.4000	0.4882			
0643577	12.5000	0.4921			
0643583	12.6000	0.4961			
0643590	12.7000	0.5000			
0643605	12.8000	0.5039			
0643611	12.9000	0.5079			
0643628	13.0000	0.5118			

Standard Drilling Condition

L544

Drilling in Wet Condition

Workpiece Material / Speed (SFM) / Drill Diameter		Aluminum 1017		Aluminum Alloys						Aluminum Alloy Casting		Copper Alloys	
				4032, 6061		5052		7075					
		330 - 390 SFM		210 - 260 SFM		280 - 330 SFM		210 - 260 SFM		210 - 260 SFM		150 - 200 SFM	
Metric mm	Decimal	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
1	0.0394	30,600	0.001	20,400	0.001	25,500	0.001	20,400	0.001	20,400	0.001	15,300	0.001
2	0.0787	19,100	0.002	12,700	0.002	15,900	0.002	12,700	0.002	12,700	0.002	9,600	0.002
3	0.1181	12,700	0.003	8,500	0.003	10,600	0.003	8,500	0.002	8,500	0.002	6,400	0.002
5	0.1969	7,600	0.005	5,100	0.005	6,400	0.005	5,100	0.004	5,100	0.004	3,800	0.004
8	0.3150	4,800	0.008	3,200	0.008	4,000	0.008	3,200	0.006	3,200	0.006	2,400	0.006
10	0.3937	3,800	0.010	2,500	0.010	3,200	0.010	2,500	0.008	2,500	0.008	1,900	0.008
12	0.4724	3,200	0.012	2,100	0.012	2,700	0.012	2,100	0.009	2,100	0.009	1,600	0.009
16	0.6299	2,400	0.013	1,600	0.013	2,000	0.013	1,600	0.010	1,600	0.010	1,200	0.010
20	0.7874	1,900	0.012	1,300	0.012	1,600	0.012	1,300	0.009	1,300	0.009	1,000	0.009

1) The table values are for drilling with water soulble cutting fluid.
2) DLC-HSS Drills are used in Nonferrous Metals such as Aluminum or Copper alloys.
3) Adjust drilling condition when unusual vibration or different sound occurs.
4) If drilling a deep hole over 3 times drill diameter, use pecking.

Screw Machine Length Bright

HSS | h8 | HELIX N | 118° | S-type >1/2 | Conical

L561 General Purpose

Fractional: Range 3/64" to 2"
Wire: Range #1 to #60
Letter Range: A to Z

DIAMETERS 0.50 (1/2") AND LARGER WILL BE DISCONTINUED ONCE STOCK IS DEPLETED

EDP	Size			Decimal Equivalent	Flute Length	Overall Length
	Fractional	Wire	Letter			
1061218		#60		0.0400	1/2	1 3/8
1061224		#59		0.0410		
1061230		#58		0.0420		
1061247		#57		0.0430		
1061253		#56		0.0465		
1265486	3/64			0.0469		
1061276		#55		0.0520	5/8	1 5/8
1061282		#54		0.0550		
1061299		#53		0.0595		
1265492	1/16			0.0625		
1061310		#52		0.0635	11/16	1 11/16
1061327		#51		0.0670		
1061333		#50		0.0700		
1061340		#49		0.0730		
1061356		#48		0.0760		
1265508	5/64			0.0781		
1061379		#47		0.0785	3/4	1 3/4
1061385		#46		0.0810		
1061391		#45		0.0820		
1061407		#44		0.0860		
1061413		#43		0.0890		
1061420		#42		0.0935		
1265514	3/32			0.0938		
1061442		#41		0.0960	13/16	1 13/16
1061459		#40		0.0980		
1061465		#39		0.0995		
1061471		#38		0.1015		
1061488		#37		0.1040		
1061494		#36		0.1065		
1265520	7/64			0.1094		
1061516		#35		0.1100	7/8	1 7/8
1061522		#34		0.1110		
1061539		#33		0.1130		
1061545		#32		0.1160		
1061551		#31		0.1200		
1265537	1/8			0.1250		
1061568		#30		0.1285	15/16	1 15/16
1061574		#29		0.1360		
1061580		#28		0.1405		
1265543	9/64			0.1406		
1061602		#27		0.1440	1	2 1/16
1061619		#26		0.1470		
1061625		#25		0.1495		
1061631		#24		0.1520		
1061648		#23		0.1540		
1265550	5/32			0.1563		
1061660		#22		0.1570	1 1/16	2 1/8
1061677		#21		0.1590		
1061683		#20		0.1610		
1061690		#19		0.1660		
1061705		#18		0.1695		
1265566	11/64			0.1719		
1061728		#17		0.1730	1 1/8	2 3/16
1061734		#16		0.1770		
1061740		#15		0.1800		
1061757		#14		0.1820		
1061763		#13		0.1850		
1265572	3/16			0.1875		
1061786		#12		0.1890	1 3/16	2 1/4

EDP	Size			Decimal Equivalent	Flute Length	Overall Length
	Fractional	Wire	Letter			
1004080		#11		0.1910	1 3/16	2 1/4
1061792		#10		0.1935		
1061808		#9		0.1960		
1061814		#8		0.1990		
1061820		#7		0.2010		
1265589	13/64			0.2031		
1061843		#6		0.2040	1 1/4	2 3/8
1061850		#5		0.2055		
1061866		#4		0.2090		
1061872		#3		0.2130		
1265595	7/32			0.2188		
1061895		#2		0.2210	1 5/16	2 7/16
1061900		#1		0.2285		
1061917			A	0.2340		
1265600	15/64			0.2344		
1061930			B	0.2380	1 3/8	2 1/2
1061946			C	0.2420		
1061952			D	0.2460		
1265617	1/4			0.2500		
1061975			E	0.2500		
1061981			F	0.2570	1 7/16	2 5/8
1061998			G	0.2610		
1265623	17/64			0.2656		
1062019			H	0.2660	1 1/2	2 11/16
1062025			I	0.2720		
1062031			J	0.2770		
1062048			K	0.2810		
1265630	9/32			0.2813		
1062060			L	0.2900	1 9/16	2 3/4
1062077			M	0.2950		
1265646	19/64			0.2969		
1062090			N	0.3020	1 5/8	2 13/16
1265652	5/16			0.3125		
1062111			O	0.3160	1 11/16	2 15/16
1062128			P	0.3230		
1265669	21/64			0.3281		
1062140			Q	0.3320		3
1062157			R	0.3390		
1265675	11/32			0.3438		
1062170			S	0.3480	1 3/4	3 1/16
1062186			T	0.3580		
1265681	23/64			0.3594		
1062208			U	0.3680	1 13/16	3 1/8
1265698	3/8			0.3750		
1062220			V	0.3770	1 7/8	3 1/4
1062237			W	0.3860		
1265703	25/64			0.3906		
1062250			X	0.3970	1 15/16	3 5/16
1062266			Y	0.4040		
1265710	13/32			0.4063		
1062289			Z	0.4130	2	3 3/8
1265726	27/64			0.4219		
1265732	7/16			0.4375	2 1/16	3 7/16

EDP	Size			Decimal Equivalent	Flute Length	Overall Length
	Fractional	Wire	Letter			
1265749	29/64			0.4531	2 1/8	3 9/16
1265755	15/32			0.4688		3 5/8
1265761	31/64			0.4844	2 3/16	3 11/16
1265778	1/2			0.5000	2 1/4	3 3/4
1265784	33/64			0.5156	2 3/8	3 7/8
1265790	17/32			0.5313		
1265806	35/64			0.5469	2 1/2	4
1265812	9/16			0.5625		
1265829	37/64			0.5781	2 5/8	4 1/8
1265835	19/32			0.5938		
1265841	39/64			0.6094	2 3/4	4 1/4
1265858	5/8			0.6250		
1265864	41/64			0.6406	2 7/8	4 1/2
1265870	21/32			0.6563		
1265887	43/64			0.6719		4 5/8
1265893	11/16			0.6875		
1265909	45/64			0.7031	3	4 3/4
1265915	23/32			0.7188		
1265921	47/64			0.7344	3 1/8	5
1265938	3/4			0.7500		
1265944	49/64			0.7656	3 1/4	5 1/8
1265950	25/32			0.7813		
1265967	51/64			0.7969	3 3/8	5 1/4
1265973	13/16			0.8125	3 1/2	5 3/8
1265980	53/64			0.8281		
1265996	27/32			0.8438		5 1/2
1266000	55/64			0.8594		
1266017	7/8			0.8750	3 5/8	5 5/8
1266023	57/64			0.8906		
1266030	29/32			0.9063	3 3/4	5 3/4
1266046	59/64			0.9219		
1266052	15/16			0.9375	3 7/8	5 7/8
1266069	61/64			0.9531		
1266075	31/32			0.9688	4	6
1266081	63/64			0.9844		
1266098	1			1.0000		6 1/4
1266103	1 1/16			1.0625		6 3/8
1266110	1 1/8			1.1250		
1266126	1 3/16			1.1875	4 1/4	6 5/8
1266132	1 1/4			1.2500	4 3/8	6 3/4
1266149	1 5/16			1.3125		7
1266155	1 3/8			1.3750	4 1/2	7 1/8
1266161	1 7/16			1.4375	4 3/4	7 3/8
1266178	1 1/2			1.5000	4 7/8	7 1/2
1266184	1 9/16			1.5625		7 3/4
1266190	1 5/8			1.6250		
1266206	1 11/16			1.6875	5 1/8	8
1266212	1 3/4			1.7500		
1266229	1 13/16			1.8125	5 3/8	8 1/4
1266235	1 7/8			1.8750		
1266241	1 15/16			1.9375	5 5/8	8 1/2
1266258	2			2.0000		

Fractional sizes: Sizes 3/64 to 5/16 in package of 10; 21/64 to 1/2 in package of 5
Wire gauge sizes: All sizes in package of 10
Letter sizes: A to N in package of 10; O to Z in package of 5

Screw Machine Length Tin Coated

HSS G h8 HELIX N 118° X-type Conical >5/64

L561P General Purpose

Fractional: Range 1/16" to 1/2"
Wire: Range #1 to #52

EDP	Size			Decimal Equivalent	Flute Length	Overall Length
	Fractional	Wire	Letter			
1087629	1/16			0.0625	5/8	1 5/8
1019049		#52		0.0635	11/16	1 11/16
1019112		#51		0.0670		
1019215		#50		0.0700		
1019324		#49		0.0730		
1019347		#48		0.0760		
1087635	5/64			0.0781		
1019410		#47		0.0785	3/4	1 3/4
1019433		#46		0.0810		
1019456		#45		0.0820		
1019520		#44		0.0860		
1019594		#43		0.0890		
1019651		#42		0.0935		
1087641	3/32			0.0938		
1019805		#41		0.0960	13/16	1 13/16
1019863		#40		0.0980		
1019892		#39		0.0995		
1020096		#38		0.1015		
1020124		#37		0.1040		
1020199		#36		0.1065		
1087658	7/64			0.1094		
1020371		#35		0.1100	7/8	1 7/8
1020416		#34		0.1110		
1020468		#33		0.1130		
1020480		#32		0.1160		
1020502		#31		0.1200		
1087664	1/8			0.1250		
1020548		#30		0.1285	15/16	1 15/16
1020560		#29		0.1360		
1020583		#28		0.1405		
1087670	9/64			0.1406		
1020611		#27		0.1440	1	2 1/16
1020634		#26		0.1470		
1020663		#25		0.1495		
1020708		#24		0.1520		
1020720		#23		0.1540		
1087687	5/32			0.1563	1 1/16	2 1/8
1020795		#22		0.1570		
1020846		#21		0.1590		
1020869		#20		0.1610		
1020898		#19		0.1660		

EDP	Size			Decimal Equivalent	Flute Length	Overall Length
	Fractional	Wire	Letter			
1020961		#18		0.1695	1 1/16	2 1/8
1087693	11/64			0.1719		
1021034		#17		0.1730	1 1/8	2 3/16
1021092		#16		0.1770		
1021200		#15		0.1800		
1021230		#14		0.1820		
1021252		#13		0.1850		
1087709	3/16			0.1875		
1021303		#12		0.1890	1 3/16	2 1/4
1021355		#11		0.1910		
1021493		#10		0.1935		
1021521		#9		0.1960		
1021567		#8		0.1990		
1021601		#7		0.2010		
1087715	13/64			0.2031		
1021653		#6		0.2040	1 1/4	2 3/8
1021676		#5		0.2055		
1021699		#4		0.2090		
1021710		#3		0.2130		
1087721	7/32			0.2188		
1021762		#2		0.2210	1 5/16	2 7/16
1021791		#1		0.2285		
1087738	15/64			0.2344		
1087744	1/4			0.2500	1 3/8	2 1/2
1087750	17/64			0.2656	1 7/16	2 5/8
1087767	9/32			0.2813	1 1/2	2 11/16
1087773	19/64			0.2969	1 9/16	2 3/4
1087780	5/16			0.3125	1 5/8	2 13/16
1087796	21/64			0.3281	1 11/16	2 15/16
1087801	11/32			0.3438		3
1087818	23/64			0.3594	1 3/4	3 1/16
1087824	3/8			0.3750	1 13/16	3 1/8
1087830	25/64			0.3906	1 7/8	3 1/4
1087847	13/32			0.4063	1 15/16	3 5/16
1087853	27/64			0.4219	2	3 3/8
1087860	7/16			0.4375	2 1/16	3 7/16
1087876	29/64			0.4531	2 1/8	3 9/16
1087882	15/32			0.4688		3 5/8
1087899	31/64			0.4844	2 3/16	3 11/16
1087904	1/2			0.5000	2 1/4	3 3/4

Fractional sizes: Sizes 3/64 to 5/16 in package of 10; 21/64 to 1/2 in package of 5
Wire gauge sizes: All sizes in package of 10

Screw Machine Length Aircraft

HSS | h8 | HELIX N | 135° | S-type | Conical

>5/64

L563 Aircraft NAS907-C - Black Oxide

Fractional: Bright Finish 3/64 to 7/64 Black Oxide 1/8 to 1/2
Wire: Bright Finish #32 to #52 Black Oxide #1 to #31
Letter: Range A to Z

EDP	Size			Decimal Equivalent	Flute Length	Overall Length
	Fractional	Wire	Letter			
1050626	3/64			0.0469	1/2	1 3/8
1050632	1/16			0.0625	5/8	1 5/8
1050649		#52		0.0635	11/16	1 11/16
1050655		#51		0.0670		
1050661		#50		0.0700		
1050678		#49		0.0730		
1050684		#48		0.0760		
1050690	5/64			0.0781		
1050706		#47		0.0785	3/4	1 3/4
1050712		#46		0.0810		
1050729		#45		0.0820		
1050735		#44		0.0860		
1050741		#43		0.0890		
1050758		#42		0.0935		
1050764	3/32			0.0938		
1050770		#41		0.0960	13/16	1 13/16
1050787		#40		0.0980		
1050793		#39		0.0995		
1050809		#38		0.1015		
1050815		#37		0.1040		
1050821		#36		0.1065		
1050838	7/64			0.1094		
1050844		#35		0.1100	7/8	1 7/8
1050850		#34		0.1110		
1050867		#33		0.1130		
1050873		#32		0.1160		
1050880		#31		0.1200		
1050896	1/8			0.1250		
1050901		#30		0.1285	15/16	1 15/16
1059812		#29		0.1360		
1050918		#28		0.1405		
1050924	9/64			0.1406		
1050930		#27		0.1440	1	2 1/16
1050947		#26		0.1470		
1050953		#25		0.1495		
1050960		#24		0.1520		
1050976		#23		0.1540		
1059829	5/32			0.1563	1 1/16	2 1/8
1050982		#22		0.1570		
1050999		#21		0.1590		
1059835		#20		0.1610		
1051003		#19		0.1660		
1051010		#18		0.1695		
1059841	11/64			0.1719		
1051026		#17		0.1730	1 1/8	2 3/16
1051032		#16		0.1770		
1051049		#15		0.1800		
1051055		#14		0.1820		
1051061		#13		0.1850		
1051078	3/16			0.1875		
1051084		#12		0.1890	1 3/16	2 1/4
1051090		#11		0.1910		
1051106		#10		0.1935		
1051112		#9		0.1960		

EDP	Size			Decimal Equivalent	Flute Length	Overall Length
	Fractional	Wire	Letter			
1051129		#8		0.1990	1 3/16	2 1/4
1051135		#7		0.2010		
1059858	13/64			0.2031		
1051141		#6		0.2040	1 1/4	2 3/8
1051158		#5		0.2055		
1051164		#4		0.2090		
1051170		#3		0.2130		
1051187	7/32			0.2188		
1051193		#2		0.2210	1 5/16	2 7/16
1051209		#1		0.2285		
1051215			A	0.2340		
1051221	15/64			0.2344		
1051238			B	0.2380	1 3/8	2 1/2
1051244			C	0.2420		
1051250			D	0.2460		
1051267	1/4			0.2500		
1051273			E	0.2500		
1051280			F	0.2570	1 7/16	2 5/8
1051296			G	0.2610		
1051301	17/64			0.2656		
1059864			H	0.2660	1 1/2	2 11/16
1051318			I	0.2720		
1051324			J	0.2770		
1051330			K	0.2810		
1051347	9/32			0.2813		
1051353			L	0.2900	1 9/16	2 3/4
1051360			M	0.2950		
1051376	19/64			0.2969		
1051382			N	0.3020	1 5/8	2 13/16
1051399	5/16			0.3125		
1051404			O	0.3160	1 11/16	2 15/16
1051410			P	0.3230		
1051427	21/64			0.3281		
1051433			Q	0.3320	1 11/16	3
1051440			R	0.3390		
1051456	11/32			0.3438		
1051462			S	0.3480	1 3/4	3 1/16
1051479			T	0.3580		
1051485	23/64			0.3594		
1051491			U	0.3680	1 13/16	3 1/8
1059870	3/8			0.3750		
1051507			V	0.3770	1 7/8	3 1/4
1051513			W	0.3860		
1051520	25/64			0.3906		
1051536			X	0.3970	1 15/16	3 5/16
1051542			Y	0.4040		
1051559	13/32			0.4063		
1051565			Z	0.4130	2	3 3/8
1051571	27/64			0.4219		
1051588	7/16			0.4375	2 1/16	3 7/16
1051594	29/64			0.4531	2 1/8	3 9/16
1051600	15/32			0.4688		3 5/8
1051616	31/64			0.4844	2 3/16	3 11/16
1051622	1/2			0.5000	2 1/4	3 3/4

Fractional sizes: Sizes 3/64 to 5/16 in package of 10; 21/64 to 1/2 in package of 5
Wire gauge sizes: All sizes in package of 10
Letter sizes: A to N in package of 10; O to Z in package of 5

Screw Machine Length Cobalt

HSS Co | h8 | HELIX N | 135° | X-type >5/64 >#53 | Conical

L6563 Aircraft NAS907-C - Cobalt

Fractional: Bright Finish 3/64 to 7/64 Black Oxide 1/8 to 1/2
Wire: Bright Finish #32 to #52 Black Oxide #1 to #31
Letter: Range A to Z

EDP	Size			Decimal Equivalent	Flute Length	Overall Length
	Fractional	Wire	Letter			
1080704	3/64			0.0469	1/2	1 3/8
1080710	1/16			0.0625	5/8	1 5/8
1081259		#52		0.0635	11/16	1 11/16
1081265		#51		0.0670		
1081271		#50		0.0700		
1081288		#49		0.0730		
1081294		#48		0.0760		
1080727	5/64			0.0781	3/4	1 3/4
1081300		#47		0.0785		
1081316		#46		0.0810		
1081322		#45		0.0820		
1081339		#44		0.0860		
1081345		#43		0.0890		
1081351		#42		0.0935		
1080733	3/32			0.0938	13/16	1 13/16
1081368		#41		0.0960		
1081374		#40		0.0980		
1081380		#39		0.0995		
1081397		#38		0.1015		
1081402		#37		0.1040		
1081419		#36		0.1065		
1080740	7/64			0.1094	7/8	1 7/8
1081425		#35		0.1100		
1081431		#34		0.1110		
1081448		#33		0.1130		
1081454		#32		0.1160		
1081460		#31		0.1200		
1080756	1/8			0.1250	15/16	1 15/16
1081477		#30		0.1285		
1081483		#29		0.1360		
1081490		#28		0.1405		
1080762	9/64			0.1406	1	2 1/16
1081505		#27		0.1440		
1081511		#26		0.1470		
1081528		#25		0.1495		
1081534		#24		0.1520		
1081540		#23		0.1540		
1080779	5/32			0.1563	1	2 1/8
1081557		#22		0.1570	1 1/16	2 1/8
1081563		#21		0.1590		
1081570		#20		0.1610		
1081586		#19		0.1660		
1081592		#18		0.1695		
1080785	11/64			0.1719		
1081608		#17		0.1730	1 1/8	2 3/16
1081614		#16		0.1770		
1081620		#15		0.1800		
1081637		#14		0.1820		
1081643		#13		0.1850		
1080791	3/16			0.1875		
1081650		#12		0.1890	1 3/16	2 1/4
1081666		#11		0.1910		
1081672		#10		0.1935		
1081689		#9		0.1960		
1081695		#8		0.1990		
1081700		#7		0.2010		
1080807	13/64			0.2031		
1081717		#6		0.2040	1 1/4	2 3/8
1081723		#5		0.2055		
1081730		#4		0.2090		
1081746		#3		0.2130		
1080813	7/32			0.2188		
1081752		#2		0.2210	1 5/16	2 7/16
1081769		#1		0.2285		
1081001			A	0.2340		
1080820	15/64			0.2344		
1081018			B	0.2380	1 3/8	2 1/2
1081024			C	0.2420		
1146978			D	0.2460		
1080836	1/4			0.2500		
1081030			E	0.2500		
1081047			F	0.2570	1 7/16	2 5/8
1081053			G	0.2610		
1080842	17/64			0.2656		
1081060			H	0.2660	1 1/2	2 11/16
1081076			I	0.2720		
1081082			J	0.2770		
1081099			K	0.2810		
1080859	9/32			0.2813		
1081104			L	0.2900	1 9/16	2 3/4
1081110			M	0.2950		
1080865	19/64			0.2969		
1081127			N	0.3020	1 5/8	2 13/16
1080871	5/16			0.3125		
1081133			O	0.3160	1 11/16	2 15/16
1081140			P	0.3230		
1080888	21/64			0.3281		
1081156			Q	0.3320		3
1081162			R	0.3390		
1080894	11/32			0.3438		
1081179			S	0.3480	1 3/4	3 1/16
1081185			T	0.3580		
1080900	23/64			0.3594		
1081191			U	0.3680	1 13/16	3 1/8
1080916	3/8			0.3750		
1081207			V	0.3770	1 7/8	3 1/4
1081213			W	0.3860		
1080922	25/64			0.3906		
1081220			X	0.3970	1 15/16	3 5/16
1081236			Y	0.4040		
1080939	13/32			0.4063		
1081242			Z	0.4130	2	3 3/8
1080945	27/64			0.4219		
1080951	7/16			0.4375	2 1/16	3 7/16
1080968	29/64			0.4531	2 1/8	3 9/16
1080974	15/32			0.4688		3 5/8
1080980	31/64			0.4844	2 3/16	3 11/16
1080997	1/2			0.5000	2 1/4	3 3/4

Fractional sizes: Sizes 3/64 to 5/16 in package of 10; 21/64 to 1/2 in package of 5
Wire gauge sizes: All sizes in package of 10
Letter sizes: A to N in package of 10; O to Z in package of 5

Straight Shank Jobber Length Bright

L501A General Purpose

Fractional: Range 1/64” to 11/16”
Wire: Range #1 to #80
Letter: Range A to Z

EDP	Size			Decimal Equivalent	Flute Length	Overall Length
	Fractional	Wire	Letter			
0010870		#80		0.0135	1/8	3/4
0010886		#79		0.0145		
0010892	1/64			0.0156	3/16	7/8
0010908		#78		0.0160		
0010914		#77		0.0180		
0010920		#76		0.0200		
0010937		#75		0.0210	1/4	1
0010943		#74		0.0225		
0010950		#73		0.0240	5/16	1 1/8
0010966		#72		0.0250		
0010972		#71		0.0260	3/8	1 1/4
0010989		#70		0.0280		
0010995		#69		0.0292	1/2	1 3/8
0011000		#68		0.0310		
0011016	1/32			0.0313		
0011022		#67		0.0320		
0011039		#66		0.0330		
0011045		#65		0.0350	5/8	1 1/2
0011051		#64		0.0360		
0011068		#63		0.0370		
0011074		#62		0.0380		
0011080		#61		0.0390	11/16	1 5/8
0545092		#60		0.0400		
0545108		#59		0.0410		
0545114		#58		0.0420		
0545120		#57		0.0430	3/4	1 3/4
0545137		#56		0.0465		
0543593	3/64			0.0469		
0545143		#55		0.0520	7/8	1 7/8
0545150		#54		0.0550		
0545166		#53		0.0595		
0543609	1/16			0.0625		
0545172		#52		0.0635		
0545189		#51		0.0670	1	2
0545195		#50		0.0700		
0545200		#49		0.0730		
0545217		#48		0.0760		
0543615	5/64			0.0781		
0545223		#47		0.0785		
0545230		#46		0.0810	1 1/8	2 1/8
0545246		#45		0.0820		
0545252		#44		0.0860		
0545269		#43		0.0890	1 1/4	2 1/4
0545275		#42		0.0935		
0543621	3/32			0.0938		
0545281		#41		0.0960	1 3/8	2 3/8
0545298		#40		0.0980		
0545303		#39		0.0995		
0545310		#38		0.1015	1 7/16	2 1/2
0545326		#37		0.1040		
0545332		#36		0.1065	1 7/16	2 1/2
0543638	7/64			0.1094	1 1/2	2 5/8
0545349		#35		0.1100		
0545355		#34		0.1110		
0545361		#33		0.1130		
0545378		#32		0.1160	1 5/8	2 3/4
0545384		#31		0.1200		
0543644	1/8			0.1250		
0545390		#30		0.1285		
0545406		#29		0.1360	1 3/4	2 7/8
0545412		#28		0.1405		
0543650	9/64			0.1406		
0545429		#27		0.1440	1 7/8	3
0545435		#26		0.1470		
0545441		#25		0.1495		
0545458		#24		0.1520	2	3 1/8
0545464		#23		0.1540		
0543667	5/32			0.1563		
0545470		#22		0.1570		
0545487		#21		0.1590	2 1/8	3 1/4
0545493		#20		0.1610		
0545509		#19		0.1660		
0545515		#18		0.1695		
0543673	11/64			0.1719		
0545521		#17		0.1730	2 3/16	3 3/8
0545538		#16		0.1700		
0545544		#15		0.1800		
0545550		#14		0.1820		
0545567		#13		0.1850	2 5/16	3 1/2
0543680	3/16			0.1875		
0545573		#12		0.1890		
0545580		#11		0.1910		
0545596		#10		0.1935	2 7/16	3 5/8
0545601		#9		0.1960		
0545618		#8		0.1990		
0545624		#7		0.2010		
0543696	13/64			0.2031		
0545630		#6		0.2040	2 1/2	3 3/4
0545647		#5		0.2055		
0545653		#4		0.2090		
0545660		#3		0.2130		
0543701	7/32			0.2188		
0545676		#2		0.2210	2 5/8	3 7/8
0545682		#1		0.2280		
0545699			A	0.2340		
0543718	15/64			0.2344		
0545704			B	0.2380	2 3/4	4
0545710			C	0.2420		
0545727			D	0.2460		
0543724	1/4			0.2500		
0545733			E	0.2500	2 3/4	4
0545740			F	0.2570	2 7/8	4 1/8
0545756			G	0.2610		
0543730	17/64			0.2656		
0545762			H	0.2660		
0545779			I	0.2720		
0545785			J	0.2770		
0545791			K	0.2810	2 15/16	4 1/4
0543747	9/32			0.2813		
0545807			L	0.2900		
0545813			M	0.2950	3 1/16	4 3/8
0543753	19/64			0.2969		
0545820			N	0.3020		
0543760	5/16			0.3125	3 3/16	4 1/2
0545836			O	0.3160		
0545842			P	0.3230	3 5/16	4 5/8
0543776	21/64			0.3281		
0545859			Q	0.3320	3 7/16	4 3/4
0545865			R	0.3390		
0543782	11/32			0.3438		
0545871			S	0.3480	3 1/2	4 7/8
0545888			T	0.3580		
0543799	23/64			0.3594		
0545894			U	0.3680	3 5/8	5
0543804	3/8			0.3750		
0545900			V	0.3770		
0545916			W	0.3860	3 3/4	5 1/8
0543810	25/64			0.3906		
0545922			X	0.3970	3 7/8	5 1/4
0545939			Y	0.4040		
0543827	13/32			0.4063		
0545945			Z	0.4130		
0543833	27/64			0.4219	4 1/16	5 3/8
0543840	7/16			0.4375	4 3/16	5 1/2
0543856	29/64			0.4531	4 5/16	5 5/8
0543862	15/32			0.4688	4 3/8	5 3/4
0543879	31/64			0.4844	4 1/2	5 7/8
0543885	1/2			0.5000	4 13/16	6
1131784	33/64			0.5156		6 5/8
1131790	17/32			0.5313		
1131806	35/64			0.5469		
1131812	9/16			0.5625		
1131829	37/64			0.5781	5 3/16	7 1/8
1131835	19/32			0.5938		
1131841	39/64			0.6094		
1131858	5/8			0.6250		
1131864	41/64			0.6406		
1131870	21/32			0.6563		
1131887	43/64			0.6719	5 5/8	7 5/8
1131893	11/16			0.6875		

Fractional sizes: Sizes 1/64 to 5/16 in package of 10; 21/64 to 1/2 in package of 5; 33/64 to 11/16 in package of 2
Wire gauge sizes: All sizes in package of 10
Letter sizes: A to N in package of 10; O to Z in package of 5

Straight Shank Jobber Length

L500 General Purpose, Metric

Bright Finish 0.2 to 1.95 mm
Black Oxide 2.0 to 17.5 mm

(Unit) : mm

EDP	Size	Decimal Equivalent	Flute Length	Overall Length	EDP	Size	Decimal Equivalent	Flute Length	Overall Length	EDP	Size	Decimal Equivalent	Flute Length	Overall Length
0121256	0.2000	0.0079	3	19	0004333	2.8000	0.1102	39	67	0004917	7.5000	0.2953	78	111
0345266	0.2200	0.0087	3.5	20	0156256	2.8500	0.1122			0004930	7.6000	0.2992		
0062423	0.2500	0.0098			0004340	2.9000	0.1142	42	71	0004946	7.7000	0.3031	81	114
0345403	0.2800	0.0110			0159123	2.9500	0.1161			0141194	7.7500	0.3051		
0062417	0.3000	0.0118			0004356	3.0000	0.1181			0004952	7.8000	0.3071		
0345478	0.3200	0.0126	5.5	24	0004362	3.1000	0.1220			0004969	7.9000	0.3110		
0062400	0.3500	0.0138			0004385	3.2000	0.1260			0004981	8.0000	0.3150		
0345570	0.3800	0.0150			0159713	3.2500	0.1280			0004998	8.1000	0.3189	84	117
0062395	0.4000	0.0157			0004391	3.3000	0.1299	45	73	0005002	8.2000	0.3228		
0346474	0.4200	0.0165	7.5	27	0004407	3.4000	0.1339			0142957	8.2500	0.3248		
0062389	0.4500	0.0177			0118957	3.5000	0.1378			0005019	8.3000	0.3268		
0346560	0.4800	0.0189			0004436	3.6000	0.1417	48	76	0005031	8.4000	0.3307	87	121
0062372	0.5000	0.0197		30	0004442	3.7000	0.1457			0005048	8.5000	0.3346		
0062366	0.5500	0.0217	8.5		0159880	3.7500	0.1476			0005054	8.6000	0.3386		
0062350	0.6000	0.0236			0004459	3.8000	0.1496			0005060	8.7000	0.3425		
0062343	0.6500	0.0256	10	32	0004465	3.9000	0.1535	51	79	0143151	8.7500	0.3445	89	124
0062337	0.7000	0.0276			0004488	4.0000	0.1575	54	83	0005083	8.8000	0.3465		
0062320	0.7500	0.0295	11	34	0004494	4.1000	0.1614			0005090	8.9000	0.3504		
0062314	0.8000	0.0315			0004500	4.2000	0.1654			0005105	9.0000	0.3543		
0062308	0.8500	0.0335	13	36	0159931	4.2500	0.1673			0005111	9.1000	0.3583		
0062292	0.9000	0.0354			0004516	4.3000	0.1693			0005134	9.2000	0.3622	92	127
0062286	0.9500	0.0374	18	40	0004539	4.4000	0.1732	56	86	0143517	9.2500	0.3642		
0062270	1.0000	0.0394			0004545	4.5000	0.1772			0005140	9.3000	0.3661		
0128870	1.0500	0.0413	20	42	0004551	4.6000	0.1811			0005157	9.4000	0.3701		
0062263	1.1000	0.0433			0004568	4.7000	0.1850	59	89	0005163	9.5000	0.3740		
0129641	1.1500	0.0453			0160090	4.7500	0.1870			0005186	9.6000	0.3780	95	130
0062257	1.2000	0.0472			0004580	4.8000	0.1890			0005192	9.7000	0.3819		
0130298	1.2500	0.0492	22	45	0004597	4.9000	0.1929	62	92	0144244	9.7500	0.3839		
0062240	1.3000	0.0512			0004602	5.0000	0.1969			0005208	9.8000	0.3858		
0131271	1.3500	0.0531	23	48	0004619	5.1000	0.2008			0005214	9.9000	0.3898		
0062234	1.4000	0.0551			0004631	5.2000	0.2047	64	95	0005237	10.0000	0.3937		
0132473	1.4500	0.0571			0160347	5.2500	0.2067			0005250	10.2000	0.4016	98	133
0062228	1.5000	0.0591			0004648	5.3000	0.2087			0144410	10.2500	0.4035		
0133280	1.5500	0.0610	25	50	0004654	5.4000	0.2126			0005295	10.5000	0.4134	100	137
0062211	1.6000	0.0630			0004660	5.5000	0.2165			0144651	10.7500	0.4232	103	140
0134098	1.6500	0.0650			0004683	5.6000	0.2205	67	98	0005330	10.8000	0.4252		
0062205	1.7000	0.0669			0004690	5.7000	0.2244			0005352	11.0000	0.4331		
0135254	1.7500	0.0689	28	52	0160600	5.7500	0.2264			0005381	11.2000	0.4409	106	143
0062190	1.8000	0.0709			0004705	5.8000	0.2283			0145074	11.2500	0.4429		
0136870	1.8500	0.0728			0004711	5.9000	0.2323			0005410	11.5000	0.4528		
0062183	1.9000	0.0748			0004734	6.0000	0.2362	70	102	0145635	11.7500	0.4626	109	146
0138728	1.9500	0.0768	29	55	0004740	6.1000	0.2402			0005455	11.8000	0.4646		
0004230	2.0000	0.0787			0004757	6.2000	0.2441			0005484	12.0000	0.4724	111	149
0139856	2.0500	0.0807			0140640	6.2500	0.2461			0005506	12.2000	0.4803		
0004247	2.1000	0.0827			0004763	6.3000	0.2480			0147317	12.2500	0.4823		
0143632	2.1500	0.0846			0004786	6.4000	0.2520	73	105	0005541	12.5000	0.4921	114	152
0004253	2.2000	0.0866	33	58	0004792	6.5000	0.2559			0147804	12.7500	0.5020		
0144536	2.2500	0.0886			0004808	6.6000	0.2598			0005587	12.8000	0.5039		
0004260	2.3000	0.0906			0004814	6.7000	0.2638			0005609	13.0000	0.5118		
0146385	2.3500	0.0925			0140713	6.7500	0.2657			0005615	13.5000	0.5315	122	168
0004282	2.4000	0.0945	35	61	0004837	6.8000	0.2677			0005638	14.0000	0.5512		
0147810	2.4500	0.0965			0004843	6.9000	0.2717			0005644	14.5000	0.5709		
0004299	2.5000	0.0984			0004850	7.0000	0.2756			0005650	15.0000	0.5906	132	181
0149355	2.5500	0.1004	37	64	0004866	7.1000	0.2795	75	108	0005667	15.5000	0.6102		
0004304	2.6000	0.1024			0004889	7.2000	0.2835			0005673	16.0000	0.6299		
0151450	2.6500	0.1043			0140977	7.2500	0.2854			0005680	16.5000	0.6496		
0004310	2.7000	0.1063			0004895	7.3000	0.2874			0005701	17.0000	0.6693	143	194
0152995	2.7500	0.1083	39	67	0004900	7.4000	0.2913	78	111	0005718	17.5000	0.6890		

0.2 to 8.0 in package of 10; 8.1 to 13.0 in package of 5; 13.5 to 17.50 in package of 2

Straight Shank Jobber Length

L501 General Purpose, Fractional, Wire & Letter

Fractional: Bright Finish 3/64 to 7/64
Wire: Bright Finish #32 to #60
Letter: Range A to Z

Black Oxide 1/8 to 11/16
Black Oxide #1 to #31

EDP	Size			Decimal Equivalent	Flute Length	Overall Length
	Fractional	Wire	Letter			
0011097		#60		0.0400	11/16	1 5/8
0011102		#59		0.0410		
0011119		#58		0.0420		
0011125		#57		0.0430	3/4	1 3/4
0011131		#56		0.0465		
0011148	3/64			0.0469		
0011154		#55		0.0520	7/8	1 7/8
0011160		#54		0.0550		
0011177		#53		0.0595		
0011183	1/16			0.0625		
0011190		#52		0.0635		
0011205		#51		0.0670	1	2
0011211		#50		0.0700		
0011228		#49		0.0730		
0011234		#48		0.0760		
0011240	5/64			0.0781		
0011257		#47		0.0785		
0011263		#46		0.0810	1 1/8	2 1/8
0011270		#45		0.0820		
0011286		#44		0.0860		
0011292		#43		0.0890	1 1/4	2 1/4
0011308		#42		0.0935		
0011314	3/32			0.0938		
0011320		#41		0.0960	1 3/8	2 3/8
0590530		#40		0.0980		
0011343		#39		0.0995		
0011350		#38		0.1015	1 7/16	2 1/2
0011366		#37		0.1040		
0011372		#36		0.1065		
0011389	7/64			0.1094	1 1/2	2 5/8
0011395		#35		0.1100		
0011400		#34		0.1110		
0011417		#33		0.1130		
0011423		#32		0.1160	1 5/8	2 3/4
0011430		#31		0.1200		
0011446	1/8			0.1250		
0011452		#30		0.1285		
0011469		#29		0.1360	1 3/4	2 7/8
0011475		#28		0.1405		
0011481	9/64			0.1406		
0011498		#27		0.1440	1 7/8	3
0011503		#26		0.1470		
0011510		#25		0.1495		
0011526		#24		0.1520	2	3 1/8
0011532		#23		0.1540		
0011549	5/32			0.1563		
0011555		#22		0.1570	2 1/8	3 1/4
0011561		#21		0.1590		
0011578		#20		0.1610		
0011584		#19		0.1660		
0011590		#18		0.1695		
0011606	11/64			0.1719		
0011629		#17		0.1730	2 3/16	3 3/8
0011612		#16		0.1700		
0011635		#15		0.1800		
0011641		#14		0.1820		
0011658		#13		0.1850	2 5/16	3 1/2
0011664	3/16			0.1875		
0011670		#12		0.1890		
0011687		#11		0.1910		
0011693		#10		0.1935	2 7/16	3 5/8
0011709		#9		0.1960		
0011715		#8		0.1990		
0011721		#7		0.2010		
0011738	13/64			0.2031		
0011744		#6		0.2040	2 1/2	3 3/4
0011750		#5		0.2055		
0011767		#4		0.2090		
0011773		#3		0.2130		
0011780	7/32			0.2188		
0011796		#2		0.2210	2 5/8	3 7/8
0011801		#1		0.2280		
0553836			A	0.2340		
0011818	15/64			0.2344		
0553842			B	0.2380	2 3/4	4
0553859			C	0.2420		
0553865			D	0.2460		
0553871			E	0.2500		
0011824	1/4			0.2500		
0553888			F	0.2570	2 7/8	4 1/8
0553894			G	0.2610		
0011830	17/64			0.2656		
0553900			H	0.2660		
0553916			I	0.2720		
0553922			J	0.2770		
0553939			K	0.2810	2 15/16	4 1/4
0011847	9/32			0.2813	2 15/16	4 1/4
0553945			L	0.2900		
0553951			M	0.2950	3 1/16	4 3/8
0011853	19/64			0.2969		
0553968			N	0.3020		
0011860	5/16			0.3125	3 3/16	4 1/2
0553974			O	0.3160		
0553980			P	0.3230	3 5/16	4 5/8
0011876	21/64			0.3281		
0553997			Q	0.3320	3 7/16	4 3/4
0554001			R	0.3390		
0011882	11/32			0.3438		
0554018			S	0.3480	3 1/2	4 7/8
0554024			T	0.3580		
0011899	23/64			0.3594		
0554030			U	0.3680	3 5/8	5
0011904	3/8			0.3750		
0554047			V	0.3770		
0554053			W	0.3860	3 3/4	5 1/8
0011910	25/64			0.3906		
0554060			X	0.3970		
0554076			Y	0.4040	3 7/8	5 1/4
0011927	13/32			0.4063		
0554082			Z	0.4130		
0011933	27/64			0.4219	3 15/16	5 3/8
0011940	7/16			0.4375	4 1/16	5 1/2
0011956	29/64			0.4531	4 3/16	5 5/8
0011962	15/32			0.4688	4 5/16	5 3/4
0011979	31/64			0.4844	4 3/8	5 7/8
0011985	1/2			0.5000	4 1/2	6
1131669	33/64			0.5156	4 13/16	6 5/8
1131675	17/32			0.5313		
1131681	35/64			0.5469		
1131698	9/16			0.5625		
1131703	37/64			0.5781		
1131710	19/32			0.5938	5 3/16	7 1/8
1131726	39/64			0.6094		
1131732	5/8			0.6250		
1131749	41/64			0.6406		
1131755	21/32			0.6563		
1131761	43/64			0.6719	5 5/8	7 5/8
1131778	11/16			0.6875		

Fractional sizes: Sizes 1/64 to 5/16 in package of 10; 21/64 to 1/2 in package of 5; 33/64 to 11/16 in package of 2
Wire gauge sizes: All sizes in package of 10
Letter sizes: A to N in package of 10; O to Z in package of 5

Straight Shank Jobber Length Aircraft

HSS Co | h8 | HELIX N | 135° | X-type >5/64 | Conical

L6501 Aircraft NAS907-J, Fractional, Wire & Letter

Fractional: Bright Finish 1/64 to 7/64
Wire: Bright Finish #32 to #80
Letter: Range A to Z

Black Oxide 1/8 to 1/2
Black Oxide #1 to #31

EDP	Size			Decimal Equivalent	Flute Length	Overall Length
	Fractional	Wire	Letter			
1056762		#80		0.0135	1/8	3/4
1056779		#79		0.0145		
1056785	1/64			0.0156	3/16	7/8
1056791		#78		0.0160		
1056807		#77		0.0180		
1056813		#76		0.0200		
1056820		#75		0.0210	1/4	1
1056836		#74		0.0225		
1056842		#73		0.0240	5/16	1 1/8
1056865		#72		0.0250		
1056859		#71		0.0260	3/8	1 1/4
1056871		#70		0.0280		
1056888		#69		0.0292	1/2	1 3/8
1056894		#68		0.0310		
1056900	1/32			0.0313		
1056916		#67		0.0320		
1056922		#66		0.0330		
1056939		#65		0.0350	5/8	1 1/2
1056945		#64		0.0360		
1056951		#63		0.0370		
1056968		#62		0.0380		
1053889		#61		0.0390	11/16	1 5/8
1059950		#60		0.0400		
1059967		#59		0.0410		
1059973		#58		0.0420		
1059980		#57		0.0430	3/4	1 3/4
1059996		#56		0.0465		
1053895	3/64			0.0469		
1060000		#55		0.0520	7/8	1 7/8
1060016		#54		0.0550		
1060022		#53		0.0595		
1053900	1/16			0.0625		
1060039		#52		0.0635		
1060045		#51		0.0670	1	2
1060051		#50		0.0700		
1060068		#49		0.0730		
1060074		#48		0.0760		
1053923	5/64			0.0781		
1060080		#47		0.0785		
1060097		#46		0.0810	1 1/8	2 1/8
1060102		#45		0.0820		
1060119		#44		0.0860		
1060125		#43		0.0890	1 1/4	2 1/4
1060131		#42		0.0935		
1053946	3/32			0.0938		
1060148		#41		0.0960	1 3/8	2 3/8
1060154		#40		0.0980	1 3/8	2 3/8
1060160		#39		0.0995		
1060177		#38		0.1015	1 7/16	2 1/2
1060183		#37		0.1040		
1060190		#36		0.1065		
1053969	7/64			0.1094	1 1/2	2 5/8
1060205		#35		0.1100		
1060211		#34		0.1110		
1060228		#33		0.1130		
1060234		#32		0.1160	1 5/8	2 3/4
1060240		#31		0.1200		
1060257	1/8			0.1250		
1060263		#30		0.1285		
1060270		#29		0.1360	1 3/4	2 7/8
1060286		#28		0.1405		
1060292	9/64			0.1406		
1060308		#27		0.1440	1 7/8	3
1060314		#26		0.1470		
1060320		#25		0.1495		
1060337		#24		0.1520	2	3 1/8
1060343		#23		0.1540		
1060350	5/32			0.1563		
1060366		#22		0.1570		
1060372		#21		0.1590	2 1/8	3 1/4
1060389		#20		0.1610		
1060395		#19		0.1660		
1060400		#18		0.1695		
1060417	11/64			0.1719		
1060423		#17		0.1730	2 3/16	3 3/8
1060430		#16		0.1700		
1060446		#15		0.1800		
1060452		#14		0.1820		
1060469		#13		0.1850	2 5/16	3 1/2
1060475	3/16			0.1875		
1060481		#12		0.1890		
1060498		#11		0.1910		
1060503		#10		0.1935	2 7/16	3 5/8
1060510		#9		0.1960		
1060526		#8		0.1990		
1060532		#7		0.2010		
1060549	13/64			0.2031		
1060555		#6		0.2040	2 1/2	3 3/4
1060561		#5		0.2055		
1060578		#4		0.2090		
1060584		#3		0.2130		
1060590	7/32			0.2188		
1060606		#2		0.2210	2 5/8	3 7/8
1060612		#1		0.2280		
1054054			A	0.2340		
1060629	15/64			0.2344		
1054077			B	0.2380	2 3/4	4
1054083			C	0.2420		
1054090			D	0.2460		
1060635	1/4			0.2500		
1054111			E	0.2500		
1054128			F	0.2570	2 7/8	4 1/8
1054134			G	0.2610		
1060641	17/64			0.2656		
1054157			H	0.2660		
1054163			I	0.2720		
1054170			J	0.2770		
1054186			K	0.2810	2 15/16	4 1/4
1060658	9/32			0.2813		
1054208			L	0.2900		
1054214			M	0.2950	3 1/16	4 3/8
1060664	19/64			0.2969		
1054237			N	0.3020		
1060670	5/16			0.3125	3 3/16	4 1/2
1054250			O	0.3160		
1054266			P	0.3230	3 5/16	4 5/8
1060687	21/64			0.3281		
1054289			Q	0.3320	3 7/16	4 3/4
1054295			R	0.3390		
1060693	11/32			0.3438		
1054317			S	0.3480	3 1/2	4 7/8
1054323			T	0.3580		
1060709	23/64			0.3594		
1054346			U	0.3680	3 5/8	5
1060715	3/8			0.3750		
1054369			V	0.3770		
1054375			W	0.3860	3 3/4	5 1/8
1060721	25/64			0.3906		
1054398			X	0.3970		
1054403			Y	0.4040	3 7/8	5 1/4
1060738	13/32			0.4063		
1054426			Z	0.4130		
1060744	27/64			0.4219	3 15/16	5 3/8
1060750	7/16			0.4375	4 1/16	5 1/2
1060767	29/64			0.4531	4 3/16	5 5/8
1060773	15/32			0.4688	4 5/16	5 3/4
1060780	31/64			0.4844	4 3/8	5 7/8
1060796	1/2			0.5000	4 1/2	6

Fractional sizes: Sizes 1/64 to 5/16 in package of 10; 21/64 to 1/2 in package of 5; 33/64 to 11/16 in package of 2
Wire gauge sizes: All sizes in package of 10
Letter sizes: A to N in package of 10; O to Z in package of 5

Straight Shank Jobber Length Cobalt

L6520 General Purpose, Metric

Bright Finish 0.5 to 1.9 mm
Black Oxide 2.0 to 13.0 mm

(Unit) : mm

*** JAPAN STOCK ITEM: Please allow 2-3 weeks delivery**

EDP	Size	Decimal Equivalent	Flute Length	Overall Length
0084008	0.5000	0.0197	5	30
0084037	0.6000	0.0236	5.5	30
0084066	0.7000	0.0276	7.5	32
0084123	0.8000	0.0315	8	34
0084249	0.9000	0.0354	9	36
0046687	1.0000	0.0394	10	40
0046693	1.1000	0.0433	11	42
0046709	1.2000	0.0472	13	
0046715	1.3000	0.0512		45
0046721	1.4000	0.0551	14.5	48
0046738	1.5000	0.0591		
0046744	1.6000	0.0630	16	50
0046750	1.7000	0.0669		
0046767	1.8000	0.0709	17.5	52
0046773	1.9000	0.0748		
0046780	2.0000	0.0787	20	55
0046796	2.1000	0.0827		
0046801	2.2000	0.0866	23	58
0046818	2.3000	0.0906		
0046824	2.4000	0.0945	24.5	61
0046830	2.5000	0.0984		
0046847	2.6000	0.1024	26	64
0046853	2.7000	0.1063		
0046860	2.8000	0.1102	27	67
0046876	2.9000	0.1142	29.5	71
0046882	3.0000	0.1181		
0046899	3.1000	0.1220		
0046904	3.2000	0.1260		
0046910	3.3000	0.1299	31.5	73
0046927	3.4000	0.1339		
0046933	3.5000	0.1378		
0046940	3.6000	0.1417	33.5	76
0046956	3.7000	0.1457		
0046962	3.8000	0.1496		
0046979	3.9000	0.1535	36	79
0046985	4.0000	0.1575	38	83
0046991	4.1000	0.1614		
0047006	4.2000	0.1654		
0047012	4.3000	0.1693		
0047029	4.4000	0.1732	39	86
0047035	4.5000	0.1772		
0047041	4.6000	0.1811		
0047058	4.7000	0.1850	41	89
0047064	4.8000	0.1890		
0047070	4.9000	0.1929	43	92
0047087	5.0000	0.1969		
0047093	5.1000	0.2008		
0047109	5.2000	0.2047	45	95
0047115	5.3000	0.2087		
0047121	5.4000	0.2126		
0047138	5.5000	0.2165		
0047144	5.6000	0.2205	47	98
0047150	5.7000	0.2244		
0047167	5.8000	0.2283		
0047173	5.9000	0.2323		
0047180	6.0000	0.2362	49	102
0047196	6.1000	0.2402		
0047201	6.2000	0.2441		
0047218	6.3000	0.2480		
0047224	6.4000	0.2520	51	105
0047230	6.5000	0.2559		
0047247	6.6000	0.2598		
0047253	6.7000	0.2638		
0047260	6.8000	0.2677		
0047276	6.9000	0.2717		
0047282	7.0000	0.2756		
0047299	7.1000	0.2795	53	108
0047304	7.2000	0.2835		
0047310	7.3000	0.2874		
0047327	7.4000	0.2913	55	111
0047333	7.5000	0.2953		
0047340	7.6000	0.2992		
0047356	7.7000	0.3031	57	114
0047362	7.8000	0.3071		
0047379	7.9000	0.3110		
0047385	8.0000	0.3150		
0047391	8.1000	0.3189	59	117
0047407	8.2000	0.3228		
0047413	8.3000	0.3268		
0047420	8.4000	0.3307	61	121
0047436	8.5000	0.3346		
0047442	8.6000	0.3386		
0047459	8.7000	0.3425		
0047465	8.8000	0.3465	63	124
0047471	8.9000	0.3504	63	124
0047488	9.0000	0.3543		
0047494	9.1000	0.3583		
0047500	9.2000	0.3622	65	127
0047516	9.3000	0.3661		
0047522	9.4000	0.3701		
0047539	9.5000	0.3740		
0047545	9.6000	0.3780	67	130
0047551	9.7000	0.3819		
0047568	9.8000	0.3858		
0047574	9.9000	0.3898		
0047580	10.0000	0.3937		
0047597	10.1000	0.3976	69	133
0047602	10.2000	0.4016		
0047619	10.3000	0.4055		
0047625	10.4000	0.4094		
0047631	10.5000	0.4134	70	137
0047648	10.6000	0.4173		
0047654	10.7000	0.4213		
0047660	10.8000	0.4252	72	140
0047677	10.9000	0.4291		
0047683	11.0000	0.4331		
0047690	11.1000	0.4370		
0047705	11.2000	0.4409	75	143
0047711	11.3000	0.4449		
0047728	11.4000	0.4488		
0047734	11.5000	0.4528		
0047740	11.6000	0.4567	77	146
0047757	11.7000	0.4606		
0047763	11.8000	0.4646		
0047770	11.9000	0.4685		
0047786	12.0000	0.4724	78	149
0047792	12.1000	0.4764		
0047808	12.2000	0.4803		
0047814	12.3000	0.4843		
0047820	12.4000	0.4882	80	152
0047837	12.5000	0.4921		
0047843	12.6000	0.4961		
0047850	12.7000	0.5000		
0047866	12.8000	0.5039		
0047872	12.9000	0.5079		
0047889	13.0000	0.5118		

0.5 to 8.0 in package of 10; 8.1 to 13.0 in package of 5
*JAPAN STOCK ITEM : Please allow 2-3 weeks delivery

Straight Shank G Standard

L520P General Purpose, Tin Coated

Range 0.5 to 13.0 mm

(Unit) : mm

*** JAPAN STOCK ITEM: Please allow 2-3 weeks delivery**

EDP	Size	Decimal Equivalent	Flute Length	Overall Length
0579926	0.5000	0.0197	6	22
0579932	0.6000	0.0236	7	24
0579949	0.7000	0.0276	9	28
0579955	0.8000	0.0315	10	30
0579961	0.9000	0.0354	11	32
0156560	1.0000	0.0394	12	34
0156577	1.1000	0.0433	14	36
0156611	1.2000	0.0472	16	38
0156932	1.3000	0.0512		
0157086	1.4000	0.0551	18	40
0157269	1.5000	0.0591		
0157647	1.6000	0.0630	20	43
0157653	1.7000	0.0669		
0157660	1.8000	0.0709	22	46
0157894	1.9000	0.0748		
0157968	2.0000	0.0787	24	49
0158024	2.1000	0.0827		
0158030	2.2000	0.0866	27	53
0158133	2.3000	0.0906		
0158140	2.4000	0.0945	30	57
0158179	2.5000	0.0984		
0158419	2.6000	0.1024		
0158832	2.7000	0.1063	33	61
0158970	2.8000	0.1102		
0158987	2.9000	0.1142		
0159181	3.0000	0.1181		
0159261	3.1000	0.1220	36	65
0159312	3.2000	0.1260		
0159358	3.3000	0.1299		
0160520	3.4000	0.1339	39	70
0161446	3.5000	0.1378		
0161481	3.6000	0.1417		
0161503	3.7000	0.1457		
0161510	3.8000	0.1496	43	75
0161526	3.9000	0.1535		
0161549	4.0000	0.1575		
0161561	4.1000	0.1614		
0161693	4.2000	0.1654		
0161750	4.3000	0.1693	47	80
0161773	4.4000	0.1732		
0161780	4.5000	0.1772		
0161818	4.6000	0.1811		
0162260	4.7000	0.1850	47	80
0162304	4.8000	0.1890	52	86
0162465	4.9000	0.1929		
0162516	5.0000	0.1969		
0162539	5.1000	0.2008		
0162786	5.2000	0.2047		
0162952	5.3000	0.2087		
0163048	5.4000	0.2126	57	93
0163054	5.5000	0.2165		
0163490	5.6000	0.2205		
0163680	5.7000	0.2244		
0163730	5.8000	0.2283		
0164124	5.9000	0.2323		
0164153	6.0000	0.2362		
0164359	6.1000	0.2402	63	101
0164394	6.2000	0.2441		
0164480	6.3000	0.2480		
0164548	6.4000	0.2520		
0164554	6.5000	0.2559		
0164852	6.6000	0.2598		
0165303	6.7000	0.2638		
0165378	6.8000	0.2677	69	109
0165390	6.9000	0.2717		
0165429	7.0000	0.2756		
0165441	7.1000	0.2795		
0165470	7.2000	0.2835		
0165515	7.3000	0.2874		
0165630	7.4000	0.2913		
0165865	7.5000	0.2953		
0165980	7.6000	0.2992	75	117
0166047	7.7000	0.3031		
0166053	7.8000	0.3071		
0166425	7.9000	0.3110		
0166563	8.0000	0.3150		
0166700	8.1000	0.3189		
0166878	8.2000	0.3228		
0166964	8.3000	0.3268		
0167089	8.4000	0.3307		
0167152	8.5000	0.3346		
0167226	8.6000	0.3386	81	125
0167335	8.7000	0.3425		
0167341	8.8000	0.3465		
0168010	8.9000	0.3504	81	125
0168136	9.0000	0.3543		
0168348	9.1000	0.3583		
0168405	9.2000	0.3622		
0168537	9.3000	0.3661		
0168630	9.4000	0.3701		
0168938	9.5000	0.3740		
0171140	9.6000	0.3780	87	133
0172176	9.7000	0.3819		
0172307	9.8000	0.3858		
0172313	9.9000	0.3898		
0172359	10.0000	0.3937		
0172670	10.1000	0.3976		
0172766	10.2000	0.4016		
0172823	10.3000	0.4055		
0172898	10.4000	0.4094		
0172910	10.5000	0.4134		
0173005	10.6000	0.4173		
0173040	10.7000	0.4213	94	142
0173057	10.8000	0.4252		
0174592	10.9000	0.4291		
0176194	11.0000	0.4331		
0177607	11.1000	0.4370		
0178632	11.2000	0.4409		
0180009	11.3000	0.4449		
0180021	11.4000	0.4488		
0180160	11.5000	0.4528		
0180388	11.6000	0.4567		
0180400	11.7000	0.4606		
0181493	11.8000	0.4646	101	151
0181836	11.9000	0.4685		
0182300	12.0000	0.4724		
0182592	12.1000	0.4764		
0183050	12.2000	0.4803		
0183146	12.3000	0.4843		
0183249	12.4000	0.4882		
0184165	12.5000	0.4921		
0184537	12.6000	0.4961		
0184566	12.7000	0.5000		
0184572	12.8000	0.5039		
0184589	12.9000	0.5079		
0184595	13.0000	0.5118		

0.5 to 1.9 - 10 per package; 2.0 to 13.0 - 1 per package

*JAPAN STOCK ITEM : Please allow 2-3 weeks delivery

Straight Shank Jobber Length Tin Coated

L501P General Purpose

Fractional: Range 1/16" to 1/2"
Wire: Range #1 to #52

EDP	Size		Decimal Equivalent	Flute Length	Overall Length
	Fractional	Wire			
1047548	1/16		0.0625	7/8	1 7/8
1001039		#52	0.0635		
1001068		#51	0.0670	1	2
1001102		#50	0.0700		
1001125		#49	0.0730		
1001131		#48	0.0760		
1143985	5/64		0.0781		
1001154		#47	0.0785		
1001160		#46	0.0810	1 1/8	2 1/8
1001177		#45	0.0820		
1001190		#44	0.0860		
1001205		#43	0.0890	1 1/4	2 1/4
1001211		#42	0.0935		
1226503	3/32		0.0938		
1001234		#41	0.0960	1 3/8	2 3/8
1001240		#40	0.0980		
1001270		#39	0.0995		
1001308		#38	0.1015	1 7/16	2 1/2
1001337		#37	0.1040		
1001395		#36	0.1065		
1141626	7/64		0.1094	1 1/2	2 5/8
1001475		#35	0.1100		
1001481		#34	0.1110		
1001498		#33	0.1130		
1001503		#32	0.1160	1 5/8	2 3/4
1001510		#31	0.1200		
1144006	1/8		0.1250		
1001532		#30	0.1285		
1001549		#29	0.1360	1 3/4	2 7/8
1001584		#28	0.1405		
1143991	9/64		0.1406		
1001606		#27	0.1440	1 7/8	3
1001612		#26	0.1470		
1001635		#25	0.1495		
1001693		#24	0.1520	2	3 1/8
1001744		#23	0.1540		
1141598	5/32		0.1563		
1001933		#22	0.1570		
1001956		#21	0.1590	2 1/8	3 1/4
1002012		#20	0.1610		

EDP	Size		Decimal Equivalent	Flute Length	Overall Length
	Fractional	Wire			
1002167		#19	0.1660	2 1/8	3 1/4
1002173		#18	0.1695		
1226510	11/64		0.1719		
1002260		#17	0.1730	2 3/16	3 3/8
1002247		#16	0.1700		
1002310		#15	0.1800		
1002385		#14	0.1820		
1002420		#13	0.1850	2 5/16	3 1/2
1226526	3/16		0.1875		
1002734		#12	0.1890		
1002770		#11	0.1910		
1002814		#10	0.1935	2 7/16	3 5/8
1002837		#9	0.1960		
1002889		#8	0.1990		
1002952		#7	0.2010		
1174858	13/64		0.2031		
1002998		#6	0.2040	2 1/2	3 3/4
1003186		#5	0.2055		
1003192		#4	0.2090		
1003208		#3	0.2130		
1226532	7/32		0.2188		
1003237		#2	0.2210	2 5/8	3 7/8
1003300		#1	0.2280		
1141632	15/64		0.2344		
1226549	1/4		0.2500	2 3/4	4
1141603	17/64		0.2656	2 7/8	4 1/8
1144029	9/32		0.2813	2 15/16	4 1/4
1141610	19/64		0.2969	3 1/16	4 3/8
1141649	5/16		0.3125	3 3/16	4 1/2
1086513	21/64		0.3281	3 5/16	4 5/8
1086520	11/32		0.3438	3 7/16	4 3/4
1086536	23/64		0.3594	3 1/2	4 7/8
1086542	3/8		0.3750	3 5/8	5
1086559	25/64		0.3906	3 3/4	5 1/8
1086565	13/32		0.4063	3 7/8	5 1/4
1086571	27/64		0.4219	3 15/16	5 3/8
1086588	7/16		0.4375	4 1/16	5 1/2
1086594	29/64		0.4531	4 3/16	5 5/8
1086600	15/32		0.4688	4 5/16	5 3/4
1086616	31/64		0.4844	4 3/8	5 7/8
1086622	1/2		0.5000	4 1/2	6

Fractional sizes: Sizes 1/64 to 5/16 in package of 10; 21/64 to 1/2 in package of 5; 33/64 to 11/16 in package of 2
Wire gauge sizes: All sizes in package of 10

Straight Shank Jobber Length Parabolic

L517P Tin Coated

Fractional: Range 1/16" to 1/2"
Wire: Range #1 to #52

EDP	Size		Decimal Equivalent	Flute Length	Overall Length
	Fractional	Wire			
1019026	1/16		0.0625	7/8	1 7/8
1019055		#52	0.0635		
1019158		#51	0.0670	1	2
1019318		#50	0.0700		
1019330		#49	0.0730		
1019382		#48	0.0760		
1019399	5/64		0.0781		
1019427		#47	0.0785		
1019440		#46	0.0810	1 1/8	2 1/8
1019462		#45	0.0820		
1019559		#44	0.0860		
1019645		#43	0.0890	1 1/4	2 1/4
1019748		#42	0.0935		
1019783	3/32		0.0938		
1019840		#41	0.0960	1 3/8	2 3/8
1019870		#40	0.0980		
1020015		#39	0.0995		
1020118		#38	0.1015	1 7/16	2 1/2
1020153		#37	0.1040		
1020233		#36	0.1065		
1020279	7/64		0.1094	1 1/2	2 5/8
1020394		#35	0.1100		
1020451		#34	0.1110		
1020474		#33	0.1130		
1020497		#32	0.1160	1 5/8	2 3/4
1020519		#31	0.1200		
1020531	1/8		0.1250		
1020554		#30	0.1285		
1020577		#29	0.1360	1 3/4	2 7/8
1020590		#28	0.1405		
1020605	9/64		0.1406		
1020628		#27	0.1440	1 7/8	3
1020640		#26	0.1470		
1020686		#25	0.1495		
1020714		#24	0.1520	2	3 1/8
1020737		#23	0.1540		
1020750	5/32		0.1563		
1020817		#22	0.1570		
1020852		#21	0.1590	2 1/8	3 1/4
1020881		#20	0.1610		

EDP	Size		Decimal Equivalent	Flute Length	Overall Length
	Fractional	Wire			
1020932		#19	0.1660	2 1/8	3 1/4
1020990		#18	0.1695		
1021028	11/64		0.1719		
1021057		#17	0.1730	2 3/16	3 3/8
1021166		#16	0.1700		
1021217		#15	0.1800		
1021246		#14	0.1820		
1021275		#13	0.1850	2 5/16	3 1/2
1021281	3/16		0.1875		
1021310		#12	0.1890		
1021384		#11	0.1910		
1021515		#10	0.1935	2 7/16	3 5/8
1021544		#9	0.1960		
1021596		#8	0.1990		
1021630		#7	0.2010		
1021647	13/64		0.2031		
1021660		#6	0.2040	2 1/2	3 3/4
1021682		#5	0.2055		
1021704		#4	0.2090		
1021727		#3	0.2130		
1021733	7/32		0.2188		
1021779		#2	0.2210	2 5/8	3 7/8
1021820		#1	0.2280		
1021836	15/64		0.2344		
1021842	1/4		0.2500	2 3/4	4
1021871	17/64		0.2656	2 7/8	4 1/8
1021888	9/32		0.2813	2 15/16	4 1/4
1021894	19/64		0.2969	3 1/16	4 3/8
1021900	5/16		0.3125	3 3/16	4 1/2
1021922	21/64		0.3281	3 5/16	4 5/8
1021939	11/32		0.3438	3 7/16	4 3/4
1021951	23/64		0.3594	3 1/2	4 7/8
1021968	3/8		0.3750	3 5/8	5
1021974	25/64		0.3906	3 3/4	5 1/8
1021997	13/32		0.4063	3 7/8	5 1/4
1022001	27/64		0.4219	3 15/16	5 3/8
1022018	7/16		0.4375	4 1/16	5 1/2
1022024	29/64		0.4531	4 3/16	5 5/8
1022030	15/32		0.4688	4 5/16	5 3/4
1022047	31/64		0.4844	4 3/8	5 7/8
1022053	1/2		0.5000	4 1/2	6

Fractional sizes: Sizes 1/64 to 5/16 in package of 10;
21/64 to 1/2 in package of 5; 33/64 to 11/16 in package of 2
Wire gauge sizes: All sizes in package of 10

Straight Shank Taper Length

L531 General Purpose, Black Oxide

Range 1/64" to 1/2"

EDP	Size	Decimal Equivalent	Flute Length	Overall Length
1278436	1/64	0.0156	5/16	1 1/2
1266264	1/32	0.0313	3/4	2
1266270	3/64	0.0469	1 1/8	2 1/4
1266287	1/16	0.0625	1 3/4	3
1266293	5/64	0.0781	2	3 3/4
1266309	3/32	0.0938	2 1/4	4 1/4
1266315	7/64	0.1094	2 1/2	4 5/8
1266321	1/8	0.1250	2 3/4	5 1/8
1266338	9/64	0.1406	3	5 3/8
1266344	5/32	0.1563		
1266350	11/64	0.1719	3 3/8	5 3/4
1266367	3/16	0.1875		
1266373	13/64	0.2031	3 5/8	6
1266380	7/32	0.2188		
1266396	15/64	0.2344	3 3/4	6 1/8
1266401	1/4	0.2500		
1266418	17/64	0.2656	3 7/8	6 1/4
1266424	9/32	0.2813		
1266430	19/64	0.2969	4	6 3/8
1266447	5/16	0.3125		
1266453	21/64	0.3281	4 1/8	6 1/2
1266460	11/32	0.3438		
1266476	23/64	0.3594	4 1/4	6 3/4
1266482	3/8	0.3750		
1266499	25/64	0.3906	4 3/8	7
1266504	13/32	0.4063		
1266510	27/64	0.4219	4 5/8	7 1/4
1266527	7/16	0.4375		
1266533	29/64	0.4531	4 3/4	7 1/2
1266540	15/32	0.4688		
1266556	31/64	0.4844		7 3/4
1266562	1/2	0.5000		

Sizes 1/64 to 5/16 in package of 10;
21/64 to 1/2 in pckage of 5

Straight Shank Taper Length Cobalt

L6531 General Purpose

Range 1/16" to 3/4"

EDP	Size	Decimal Equivalent	Flute Length	Overall Length
1053917	1/16	0.0625	1 3/4	3
1053930	5/64	0.0781	2	3 3/4
1053952	3/32	0.0938	2 1/4	4 1/4
1053975	7/64	0.1094	2 1/2	4 5/8
1053981	1/8	0.1250	2 3/4	5 1/8
1053998	9/64	0.1406	3	5 3/8
1054002	5/32	0.1563		
1054019	11/64	0.1719	3 3/8	5 3/4
1054025	3/16	0.1875		
1054031	13/64	0.2031	3 5/8	6
1054048	7/32	0.2188		
1054060	15/64	0.2344	3 3/4	6 1/8
1054105	1/4	0.2500		
1054140	17/64	0.2656	3 7/8	6 1/4
1054192	9/32	0.2813		
1054220	19/64	0.2969	4	6 3/8
1054243	5/16	0.3125		
1054272	21/64	0.3281	4 1/8	6 1/2
1054300	11/32	0.3438		
1054330	23/64	0.3594	4 1/4	6 3/4
1054352	3/8	0.3750		
1054381	25/64	0.3906	4 3/8	7
1054410	13/32	0.4063		
1054432	27/64	0.4219	4 5/8	7 1/4
1054449	7/16	0.4375		
1054455	29/64	0.4531	4 3/4	7 1/2
1054461	15/32	0.4688		
1054478	31/64	0.4844		7 3/4
1054484	1/2	0.5000		
1058198	33/64	0.5156		8
1058261	17/32	0.5313		
1058312	35/64	0.5469	4 7/8	8 1/4
1058387	9/16	0.5625		
1058450	37/64	0.5781		8 3/4
1058524	19/32	0.5938		
1058582	39/64	0.6094		
1058656	5/8	0.6250		
1058713	41/64	0.6406	5 1/8	9
1058765	21/32	0.6563		
1058822	43/64	0.6719	5 3/8	9 1/4
1058874	11/16	0.6875		
1058925	45/64	0.7031	5 5/8	9 1/2
1058954	23/32	0.7188		
1058990	47/64	0.7344	5 7/8	9 3/4
1059027	3/4	0.7500		

Sizes 1/64 to 5/16 in package of 10; 21/64 to 1/2 in package of 5

⚠ **WARNING:** Cancer - www.P65Warnings.ca.gov

Straight Shank Taper Length Tin Coated

L545P Parabolic Style

Range: 1/16" to 1/2"

EDP	Size	Decimal Equivalent	Flute Length	Overall Length
1001016	1/16	0.0625	1 3/4	3
1001148	5/64	0.0781	2	3 3/4
1001228	3/32	0.0938	2 1/4	4 1/4
1001446	7/64	0.1094	2 1/2	4 5/8
1001526	1/8	0.1250	2 3/4	5 1/8
1001590	9/64	0.1406	3	5 3/8
1001899	5/32	0.1563		
1002218	11/64	0.1719	3 3/8	5 3/4
1002436	3/16	0.1875		
1002975	13/64	0.2031	3 5/8	6
1003214	7/32	0.2188		
1003403	15/64	0.2344	3 3/4	6 1/8
1003455	1/4	0.2500		
1003541	17/64	0.2656	3 7/8	6 1/4
1003609	9/32	0.2813		
1003615	19/64	0.2969	4	6 3/8
1003621	5/16	0.3125		
1003667	21/64	0.3281	4 1/8	6 1/2
1003673	11/32	0.3438		
1003885	23/64	0.3594	4 1/4	6 3/4
1003920	3/8	0.3750		
1003936	25/64	0.3906	4 3/8	7
1004038	13/32	0.4063		
1004130	27/64	0.4219	4 5/8	7 1/4
1004176	7/16	0.4375		
1004199	29/64	0.4531	4 3/4	7 1/2
1004256	15/32	0.4688		
1004285	31/64	0.4844		7 3/4
1004291	1/2	0.5000		

Sizes 1/64 to 5/16 in package of 10;
21/64 to 1/2 in package of 5

Straight Shank Extra Length

L551 General Purpose, Bright

Range 1/8" to 1"
Overall Length 12" and 18"

EDP	Size	Decimal Equivalent	Flute Length	Overall Length
1054490	1/8	0.1250	9	12
1054506	9/64	0.1406		
1054512	5/32	0.1563		
1054529	11/64	0.1719		
1054535	3/16	0.1875		
1054558	13/64	0.2031		
1054570	7/32	0.2188		
1054593	15/64	0.2344		
1054615	1/4	0.2500		
1054638	17/64	0.2656		
1054650	9/32	0.2813		
1054673	19/64	0.2969		
1054696	5/16	0.3125		
1054718	21/64	0.3281		
1054730	11/32	0.3438		
1054753	23/64	0.3594		
1054776	3/8	0.3750		
1054799	25/64	0.3906		
1054810	13/32	0.4063		
1054833	27/64	0.4219		
1054856	7/16	0.4375		
1054879	29/64	0.4531		
1054891	15/32	0.4688		
1054913	31/64	0.4844		
1054936	1/2	0.5000		
1058226	33/64	0.5156		
1058290	17/32	0.5313		
1058341	35/64	0.5469		
1058415	9/16	0.5625		
1058480	37/64	0.5781		
1058553	19/32	0.5938		
1058610	39/64	0.6094		
1058685	5/8	0.6250		
1058800	21/32	0.6563		
1058902	11/16	0.6875		
1058977	23/32	0.7188		
1059040	3/4	0.7500		
1059120	13/16	0.8125		
1059200	7/8	0.8750		

EDP	Size	Decimal Equivalent	Flute Length	Overall Length
1059280	15/16	0.9375	9	12
1059354	1	1.0000		
1054541	3/16	0.1875	14	18
1054564	13/64	0.2031		
1054587	7/32	0.2188		
1054609	15/64	0.2344		
1054621	1/4	0.2500		
1054644	17/64	0.2656		
1054667	9/32	0.2813		
1054680	19/64	0.2969		
1054701	5/16	0.3125		
1054724	21/64	0.3281		
1054747	11/32	0.3438		
1054760	23/64	0.3594		
1054782	3/8	0.3750		
1054804	25/64	0.3906		
1054827	13/32	0.4063		
1054840	27/64	0.4219		
1054862	7/16	0.4375		
1054885	29/64	0.4531		
1054907	15/32	0.4688		
1054920	31/64	0.4844		
1054942	1/2	0.5000		
1058210	33/64	0.5156		
1058284	17/32	0.5313		
1058335	35/64	0.5469		
1058409	9/16	0.5625		
1058473	37/64	0.5781		
1058547	19/32	0.5938		
1058604	39/64	0.6094		
1058679	5/8	0.6250		
1058788	21/32	0.6563		
1058897	11/16	0.6875		
1058960	23/32	0.7188		
1059033	3/4	0.7500		
1059113	13/16	0.8125		
1059194	7/8	0.8750		
1059274	15/16	0.9375		
1059348	1	1.0000		

1 per box

Straight Shank Extra Length Parabolic

L6551 Black Oxide

Range 3/16 to 1/2
Overall Length 10”

EDP	Size	Decimal Equivalent	Flute Length	Overall Length
1010087	3/16	0.1875	7	10
1010109	13/64	0.2031		
1010150	7/32	0.2188		
1010173	15/64	0.2344		
1010196	1/4	0.2500		
1005275	17/64	0.2656		
1005281	9/32	0.2813		
1005298	19/64	0.2969		
1005303	5/16	0.3125		
1005310	21/64	0.3281		
1005326	11/32	0.3438		
1005332	23/64	0.3594		
1005349	3/8	0.3750		
1010333	25/64	0.3906		
1010362	13/32	0.4063		
1010391	27/64	0.4219		
1005390	7/16	0.4375		
1005406	29/64	0.4531		
1010465	15/32	0.4688		
1005435	31/64	0.4844		
1008040	1/2	0.5000		

1 per box

⚠ **WARNING:** Cancer - www.P65Warnings.ca.gov

Straight Shank Oil Hole

L581 M35 Cobalt, Bright

Range 3/8 to 1 1/2

EDP	Size	Decimal Equivalent	Flute Length	Overall Length
1056974	3/8	0.3750	4 1/4	6 3/4
1056997	25/64	0.3906	4 3/8	7
1057018	13/32	0.4063		
1057030	27/64	0.4219	4 5/8	7 1/4
1061093	7/16	0.4375		
1057060	29/64	0.4531	4 7/8	7 1/2
1061109	15/32	0.4688		
1057099	31/64	0.4844	5	7 3/4
1057110	1/2	0.5000		
1057133	33/64	0.5156	5 1/4	8
1057156	17/32	0.5313		
1057179	35/64	0.5469	5 3/8	8 1/4
1057191	9/16	0.5625		
1057213	37/64	0.5781	5 5/8	8 1/2
1057236	19/32	0.5938		
1057259	39/64	0.6094	5 3/4	8 3/4
1057271	5/8	0.6250		
1146307	41/64	0.6406	5 7/8	9
1057316	21/32	0.6563		
1057339	43/64	0.6719	6	9 1/4
1057351	11/16	0.6875		
1057374	45/64	0.7031	6 3/16	9 1/2
1057397	23/32	0.7188		
1057419	47/64	0.7344	6 3/8	9 3/4
1061115	3/4	0.7500		
1057448	49/64	0.7656	6 1/2	9 7/8
1057460	25/32	0.7813		
1057483	51/64	0.7969	6 5/8	10

EDP	Size	Decimal Equivalent	Flute Length	Overall Length
1057505	13/16	0.8125	6 5/8	10
1057528	53/64	0.8281	6 3/4	10 1/4
1057540	27/32	0.8438		
1057563	55/64	0.8594	7	10 1/2
1061121	7/8	0.8750		
1057592	57/64	0.8906		10 5/8
1057614	29/32	0.9063		
1057637	59/64	0.9219		10 3/4
1057650	15/16	0.9375		
1057672	61/64	0.9531	7 1/8	10 7/8
1057695	31/32	0.9688		
1057717	63/64	0.9844	7 3/16	11
1057730	1	1.0000		
1057752	1 1/64	1.0156	7 5/16	11 1/8
1057769	1 1/32	1.0313		
1057775	1 3/64	1.0469	7 3/8	11 1/4
1057781	1 1/16	1.0625		
1057803	1 3/32	1.0938	7 5/8	11 1/2
1057810	1 1/8	1.1250	7 7/8	11 3/4
1057832	1 5/32	1.1563	8	11 7/8
1057849	1 3/16	1.1875	8 1/8	12
1057861	1 7/32	1.2188		12 1/8
1057878	1 1/4	1.2500	8 1/2	12 1/2
1057890	1 5/16	1.3125	9 1/4	14 1/4
1057912	1 3/8	1.3750	9 1/2	14 1/2
1057935	1 7/16	1.4375	9 5/8	14 3/4
1057958	1 1/2	1.5000	9 7/8	15

1 per box

Taper Shank Regular Length

HSS | h8 | HELIX N | 118° | S-type >1/2 | Conical

L601 General Purpose, Black Oxide

Range 9/32" to 3 1/2"

EDP	Size	Decimal Equivalent	Flute Length	Overall Length	Taper Shank
1267305	9/32	0.2813	3	6 1/4	1
1267328	19/64	0.2969	3 1/8	6 3/8	
1267357	5/16	0.3125			
1267363	21/64	0.3281	3 1/4	6 1/2	
1267370	11/32	0.3438			
1267386	23/64	0.3594	3 1/2	6 3/4	
1267392	3/8	0.3750			
1267408	25/64	0.3906	3 5/8	7	
1267414	13/32	0.4063			
1268221	27/64	0.4219	3 7/8	7 1/4	
1268238	7/16	0.4375			
1268250	29/64	0.4531	4 1/8	7 1/2	
1268296	15/32	0.4688			
1268318	31/64	0.4844	4 3/8	8 1/4	2
1268330	1/2	0.5000			
1268353	33/64	0.5156	4 5/8	8 1/2	
1268376	17/32	0.5313			
1268399	35/64	0.5469	4 7/8	8 3/4	
1268410	9/16	0.5625			
1268433	37/64	0.5781			
1268456	19/32	0.5938			
1268479	39/64	0.6094			
1268507	5/8	0.6250			
1268513	41/64	0.6406	5 1/8	9	
1268536	21/32	0.6563			
1268565	43/64	0.6719	5 3/8	9 1/4	
1268588	11/16	0.6875			
1268600	45/64	0.7031	5 5/8	9 1/2	
1268639	23/32	0.7188			
1268668	47/64	0.7344	5 7/8	9 3/4	
1268680	3/4	0.7500			
1268702	49/64	0.7656	6	9 7/8	
1268725	25/32	0.7813			
1268886	51/64	0.7969	6 1/8	10 3/4	3
1268892	13/16	0.8125			
1268908	53/64	0.8281			
1268914	27/32	0.8438			
1268920	55/64	0.8594			
1268943	7/8	0.8750			
1268972	57/64	0.8906			
1268995	29/32	0.9063			
1269022	59/64	0.9219			
1269051	15/16	0.9375			
1269080	61/64	0.9531	6 3/8	11	
1269097	31/32	0.9688	6 3/8	11	3
1269125	63/64	0.9844			
1269160	1	1.0000			
1269205	1 1/64	1.0156	6 1/2	11 1/8	
1269234	1 1/32	1.0313			
1269240	1 3/64	1.0469	6 5/8	11 1/4	
1269263	1 1/16	1.0625			
1269286	1 5/64	1.0781	6 7/8	12 1/2	4
1269314	1 3/32	1.0938			
1269337	1 7/64	1.1094	7 1/8	12 3/4	
1269366	1 1/8	1.1250			
1269400	1 9/64	1.1406	7 1/4	12 7/8	
1269430	1 5/32	1.1563			
1269469	1 11/64	1.1719	7 3/8	13	
1269498	1 3/16	1.1875			
1269526	1 13/64	1.2031	7 1/2	13 1/8	
1269664	1 7/32	1.2188			
1269709	1 15/64	1.2344	7 7/8	13 1/2	
1269773	1 1/4	1.2500			
1269830	1 17/64	1.2656	8 1/2	14 1/8	
1269899	1 9/32	1.2813			
1269910	1 19/64	1.2969	8 5/8	14 1/4	
1269927	1 5/16	1.3125			
1269933	1 21/64	1.3281	8 3/4	14 3/8	
1269940	1 11/32	1.3438			
1269956	1 23/64	1.3594	8 7/8	14 1/2	
1269962	1 3/8	1.3750			
1269979	1 25/64	1.3906	9	14 5/8	
1269985	1 13/32	1.4063			
1269991	1 27/64	1.4219	9 1/8	14 3/4	
1270005	1 7/16	1.4375			
1270011	1 29/64	1.4531	9 1/4	14 7/8	
1270028	1 15/32	1.4688			
1270034	1 31/64	1.4844	9 3/8	15	
1270040	1 1/2	1.5000			
1270057	1 33/64	1.5156		16 3/8	5
1270063	1 17/32	1.5313			
1270070	1 35/64	1.5469	9 5/8	16 5/8	
1270086	1 9/16	1.5625			
1270092	1 37/64	1.5781	9 7/8		
1270108	1 19/32	1.5938		16 7/8	
1270114	1 39/64	1.6094	10	17	
1270120	1 5/8	1.6250			
1270246	1 41/64	1.6406	10 1/8	17 1/8	
1270269	1 21/32	1.6563	10 1/8	17 1/8	5
1270275	1 43/64	1.6719			
1270281	1 11/16	1.6875			
1270298	1 45/64	1.7031			
1270303	1 23/32	1.7188			
1270332	1 47/64	1.7344			
1270361	1 3/4	1.7500			
1270390	1 25/32	1.7813			
1270429	1 13/16	1.8125			
1270458	1 27/32	1.8438			
1270487	1 7/8	1.8750	10 3/8	17 3/8	
1270515	1 29/32	1.9063			
1270630	1 15/16	1.9375			
1270660	1 31/32	1.9688			
1270699	2	2.0000			
1270727	2 1/32	2.0313			
1270762	2 1/16	2.0625			
1270785	2 3/32	2.0938	10 1/4		
1270807	2 1/8	2.1250			
1270836	2 5/32	2.1563			
1270859	2 3/16	2.1875			
1270865	2 7/32	2.2188	10 1/8		
1270871	2 1/4	2.2500			
1270888	2 5/16	2.3125			
1270894	2 3/8	2.3750			
1270900	2 7/16	2.4375	11 1/4	18 3/4	
1270916	2 1/2	2.5000			
1270922	2 9/16	2.5625	11 7/8	19 1/2	
1270939	2 5/8	2.6250			
1270945	2 11/16	2.6875	12 3/4	20 3/8	
1270951	2 3/4	2.7500			
1270968	2 13/16	2.8125	13 3/8	21 1/8	
1270974	2 7/8	2.8750			
1270980	2 15/16	2.9375	14	21 3/4	
1270997	3	3.0000			
1271001	3 1/16	3.0625	14 5/8	24 1/2	6
1271018	3 1/8	3.1250			
1271024	3 3/16	3.1875			
1271030	3 1/4	3.2500	15 1/2	25 1/2	
1271047	3 5/16	3.3125			
1271076	3 3/8	3.3750			
1271127	3 7/16	3.4375			
1271179	3 1/2	3.5000	16 3/8	26 1/2	

1 per box

Taper Shank Extra Length

L651 Bright

Range 1/4 to 2 1/2
Overall Length 18”

EDP	Size	Decimal Equivalent	Flute Length	Overall Length	Overall Length	Taper Shank
1057970	1/4	0.2500	14	18		1
1057987	17/64	0.2656	14			
1057993	9/32	0.2813	14			
1058008	19/64	0.2969	14			
1058014	5/16	0.3125	14			
1058020	5/16	0.3125	20		24	
1058037	21/64	0.3281	14	18		
1058043	11/32	0.3438	14			
1058050	23/64	0.3594	14			
1058066	3/8	0.3750	14			
1058072	3/8	0.3750	20		24	
1058089	25/64	0.3906	14	18		
1058095	13/32	0.4063	14			
1058100	27/64	0.4219	14			
1058117	7/16	0.4375	14			
1058123	7/16	0.4375	20		24	
1058130	29/64	0.4531	14	18		
1058146	15/32	0.4688	14			
1058152	31/64	0.4844	14			2
1058169	1/2	0.5000	14			
1058175	1/2	0.5000	20		24	
1058181	33/64	0.5156	14	18		
1061138	33/64	0.5156	20		24	
1058249	17/32	0.5313	14	18		
1058255	17/32	0.5313	20		24	
1061144	35/64	0.5469	14	18		
1058364	9/16	0.5625	14			
1058370	9/16	0.5625	20		24	
1058438	37/64	0.5781	14	18		
1058444	37/64	0.5781	20		24	
1058501	19/32	0.5938	14	18		
1058518	19/32	0.5938	20		24	
1058576	39/64	0.6094	14	18		
1058633	5/8	0.6250	14			
1058640	5/8	0.6250	20		24	
1058707	41/64	0.6406	14	18		
1058742	21/32	0.6563	14			
1058759	21/32	0.6563	20		24	
1058816	43/64	0.6719	14	18		
1058851	11/16	0.6875	14			
1058868	11/16	0.6875	20		24	
1058919	45/64	0.7031	14	18		
1058931	23/32	0.7188	14			
1058948	23/32	0.7188	20		24	
1058983	47/64	0.7344	14	18		
1059004	3/4	0.7500	14			
1059010	3/4	0.7500	20		24	
1059056	49/64	0.7656	14	18		
1059062	25/32	0.7813	14			
1059079	25/32	0.7813	20		24	
1059085	51/64	0.7969	13	18		3
1059091	13/16	0.8125	13			
1059107	13/16	0.8125	19		24	
1059136	53/64	0.8281	13	18		
1059142	27/32	0.8438	13			
1059159	27/32	0.8438	19		24	
1059165	55/64	0.8594	13	18		

EDP	Size	Decimal Equivalent	Flute Length	Overall Length	Overall Length	Taper Shank
1059171	7/8	0.8750	13	18		3
1059188	7/8	0.8750	19		24	
1059216	57/64	0.8906	13	18		
1059222	29/32	0.9063	13			
1059239	29/32	0.9063	19		24	
1059245	59/64	0.9219	13	18		
1059251	15/16	0.9375	13			
1059268	15/16	0.9375	19		24	
1059297	61/64	0.9531	13	18		
1059302	31/32	0.9688	13			
1059319	31/32	0.9688	19		24	
1059325	63/64	0.9844	13	18		
1061167	1	1.0000	13			
1059331	1	1.0000	19		24	
1059360	1 1/32	1.0313	13	18		
1059377	1 1/16	1.0625	13			
1059383	1 1/16	1.0625	19		24	
1059390	1 3/32	1.0938	12	18		4
1059405	1 1/8	1.1250	12			
1059411	1 1/8	1.1250	19		24	
1059428	1 5/32	1.1563	12	18		
1229743	1 5/32	1.1563	18		24	
1059434	1 3/16	1.1875	12	18		
1059440	1 3/16	1.1875	18		24	
1059457	1 7/32	1.2188	12	18		
1229750	1 7/32	1.2188	18		24	
1059463	1 1/4	1.2500	12	18		
1059470	1 1/4	1.2500	18		24	
1059486	1 9/32	1.2813	12	18		
1059492	1 5/16	1.3125	12			
1059508	1 5/16	1.3125	18		24	
1059514	1 11/32	1.3438	12	18		
1059520	1 3/8	1.3750	12			
1059537	1 3/8	1.3750	18		24	
1059543	1 13/32	1.4063	12	18		
1059550	1 7/16	1.4375	12			
1059566	1 7/16	1.4375	18		24	
1059572	1 15/32	1.4688	12	18		
1059589	1 1/2	1.5000	12			
1059595	1 1/2	1.5000	18		24	5
1059600	1 9/16	1.5625	10 1/2	18		
1059617	1 9/16	1.5625	17		24	
1059623	1 5/8	1.6250	10 1/2	18		
1059630	1 5/8	1.6250	17		24	
1059646	1 11/16	1.6875	10 1/2	18		
1059652	1 11/16	1.6875	17		24	
1059669	1 3/4	1.7500	10 1/2	18		
1059675	1 3/4	1.7500	17		24	
1059681	1 7/8	1.8750	10 1/2	18		
1059698	1 7/8	1.8750	17		24	
1059703	2	2.0000	10 1/2	18		
1061173	2	2.0000	17			
1059726	2 1/16	2.0625	17			
1059749	2 1/8	2.1250	17		24	
1059761	2 1/4	2.2500	17			
1159848	2 3/8	2.3750	17			
1059784	2 1/2	2.5000	17			

Taper Shank Oil Hole

L683 M35 Cobalt, Bright

Range 3/8 to 1 1/2

EDP	Size	Decimal Equivalent	Flute Length	Overall Length	Taper Shank
1056980	3/8	0.3750	4 1/4	8 1/8	2
1057001	25/64	0.3906	4 3/8	8 1/4	
1057024	13/32	0.4063			
1057047	27/64	0.4219	4 5/8	8 1/2	
1057053	7/16	0.4375			
1057076	29/64	0.4531	4 7/8	8 3/4	
1057082	15/32	0.4688			
1057104	31/64	0.4844	5	9 5/8	3
1057127	1/2	0.5000			
1057140	33/64	0.5156	5 1/8	9 3/4	
1057162	17/32	0.5313			
1057185	35/64	0.5469	5 1/4	9 7/8	
1057207	9/16	0.5625			
1057220	37/64	0.5781	5 1/2	10 1/8	
1057242	19/32	0.5938			
1057265	39/64	0.6094	5 5/8	10 1/4	
1057288	5/8	0.6250			
1057300	41/64	0.6406	5 3/4	10 3/8	
1057322	21/32	0.6563			
1057345	43/64	0.6719	5 7/8	10 1/2	
1057368	11/16	0.6875			
1057380	45/64	0.7031	6 1/8	10 3/4	
1057402	23/32	0.7188			
1057425	47/64	0.7344	6 1/4	10 7/8	
1057431	3/4	0.7500			

EDP	Size	Decimal Equivalent	Flute Length	Overall Length	Taper Shank
1057454	49/64	0.7656	6 3/8	11	3
1057477	25/32	0.7813			
1057490	51/64	0.7969	6 1/2	11 1/8	
1057511	13/16	0.8125			
1057534	53/64	0.8281	6 5/8	11 1/4	
1057557	27/32	0.8438			
1057570	55/64	0.8594	6 7/8	11 1/2	
1057586	7/8	0.8750			
1057608	57/64	0.8906			
1057620	29/32	0.9063			
1057643	59/64	0.9219			
1057666	15/16	0.9375			
1057689	61/64	0.9531	7	11 5/8	
1057700	31/32	0.9688			
1057723	63/64	0.9844	7 1/8	11 3/4	
1057746	1	1.0000			
1057798	1 1/16	1.0625	7 1/4	12 7/8	4
1057826	1 1/8	1.1250	7 3/4	13 3/8	
1057855	1 3/16	1.1875	8	13 5/8	
1057884	1 1/4	1.2500	8 1/4	13 7/8	
1057906	1 5/16	1.3125	9 1/8	14 3/4	
1057929	1 3/8	1.3750	9 3/8	15	
1057941	1 7/16	1.4375	9 1/2	15 1/8	
1057964	1 1/2	1.5000	9 3/4	15 3/8	

1 per box

⚠ **WARNING:** Cancer - www.P65Warnings.ca.gov

Coolant enters through the side of the Morse Taper shank

Silver and Deming

L575 High Speed Steel, Bright

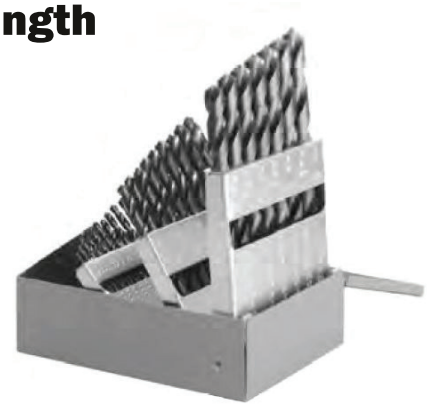
Shank Diameter 1/2" by 2 1/2" long
Range 1/2 to 1 1/2

EDP	Size	Decimal Equivalent	Flute Length	Overall Length
1023604	1/2	0.5000	3 1/8	6
1015599	33/64	0.5156		
1016600	17/32	0.5312		
1015604	35/64	0.5469		
1023839	9/16	0.5625		
1015640	37/64	0.5781		
1023925	19/32	0.5938		
1062352	39/64	0.6094		
1024062	5/8	0.6250		
1015656	41/64	0.6406		
1024194	21/32	0.6562		
1015685	43/64	0.6719		
1024319	11/16	0.6875		
1015765	45/64	0.7031		
1024550	23/32	0.7187		
1015771	47/64	0.7344		
1024909	3/4	0.7500		
1015788	49/64	0.7656	3	6
1025178	25/32	0.7812		
1015822	51/64	0.7969		
1025642	13/16	0.8125		
1015839	53/64	0.8281		
1026408	27/32	0.8438		
1015845	55/64	0.8594		
1027250	7/8	0.8750		

EDP	Size	Decimal Equivalent	Flute Length	Overall Length
1015851	57/64	0.8906	3	6
1027857	29/32	0.9062		
1015874	59/64	0.9219		
1028148	15/16	0.9375		
1015897	61/64	0.9531		
1028498	31/32	0.9687		
1015902	63/64	0.9844		
1028721	1	1.0000		
1015919	1 1/32	1.0312		
1029391	1 1/16	1.0625		
1015925	1 3/32	1.0938		
1029757	1 1/8	1.1250		
1015948	1 5/32	1.1562		
1030300	1 3/16	1.1875		
1015954	1 7/32	1.2188		
1030993	1 1/4	1.1250		
1005922	1 9/32	1.2812	2 3/4	6
1005939	1 5/16	1.3125		
1011054	1 11/32	1.3438		
1005951	1 3/8	1.3750		
1011140	1 13/32	1.4062		
1005968	1 7/16	1.4375		
1011163	1 15/32	1.4688		
1005974	1 1/2	1.5000		

1 per box

Drill Set Jobber Length



L599 Black Oxide

EDP	HIGH SPEED DRILL SETS	SET NO.
Fractional Sizes	**Fractional Sizes**	
3599013	1/16” To 1/4” By 64ths	S13
3599015	1/16” To 1/2” By 32nds	S15
3599021	1/16” To 3/8” By 64ths	S21
3599129	1/16” To 1/2” By 64ths	S29
Wire Gauge Sizes	**Wire Gauge Sizes**	
3599060	No.1 To No. 60	S60
3599020	No.61 To No. 80	S20
Letter Sizes	**Letter Sizes**	
3599026	A To Z	S26
Combination Sizes	**Combination Sizes**	
3599115	S29, S60, S26	S115
EDP	**COBALT DRILL SETS**	**SET NO.**
Fractional Sizes	**Fractional Sizes**	
3599029	1/16” To 1/2” By 64ths	C29

⚠ **WARNING:** Cancer - www.P65Warnings.ca.gov

Standard Drilling Conditions

Straight Shank

Screw Machine Length L561, L563
Jobber Length L500, L501, L501A, L599
Taper Length L531

Straight Shank Cobalt

Screw Machine Length L6563
Jobber Length L6501, L6520, L599
Taper Length L6531

Workpiece Material / Speed (SFM) / Drill Diameter			Carbon Steels		Alloy Steels Hardened Steels		Mold Steels Stainless Steels		Titanium Alloys[1] High Temperature[1] Alloys		Cast Irons		Aluminum Alloys Nonferrous Metals	
			50 - 65 SFM		40 - 52 SFM		30 - 40 SFM		10 - 20 SFM		55 - 72 SFM		83 - 115 SFM	
Fractional	Metric mm	Decimal	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
—	1	0.0394	4,800	0.0008	3,800	0.0007	2,900	0.0006	1,500	0.0003	5,300	0.0010	8,100	0.0007
1/16	1.588	0.0625	3,400	0.0013	2,700	0.0011	2,100	0.0009	1,000	0.0005	3,800	0.0015	5,800	0.0011
—	2	0.0787	2,900	0.0016	2,300	0.0013	1,700	0.0012	720	0.0006	3,200	0.0020	4,900	0.0014
—	3	0.1181	2,100	0.0028	1,700	0.0023	1,300	0.0021	480	0.0009	2,300	0.0034	3,600	0.0024
1/8	3.175	0.1250	2,000	0.0029	1,700	0.0023	1,200	0.0022	460	0.0010	2,200	0.0036	3,500	0.0025
—	5	0.1969	1,300	0.0042	1,000	0.0037	760	0.0033	290	0.0015	1,400	0.0053	2,200	0.0038
1/4	6.35	0.2500	1,100	0.0047	800	0.0044	610	0.0038	230	0.0020	1,120	0.0064	1,750	0.0044
—	8	0.3150	800	0.0059	640	0.0050	480	0.0044	180	0.0025	900	0.0074	1,400	0.0051
3/8	9.525	0.3750	680	0.0065	540	0.0055	400	0.0049	160	0.0030	740	0.0082	1,200	0.0054
—	10	0.3937	640	0.0068	510	0.0057	380	0.0050	150	0.0032	700	0.0084	1,100	0.0057
—	12	0.4724	530	0.0074	420	0.0064	320	0.0057	120	0.0040	580	0.0095	900	0.0066
1/2	12.7	0.5000	510	0.0076	400	0.0066	310	0.0057	120	0.0043	550	0.0099	860	0.0069
5/8	15.875	0.6250	410	0.0089	330	0.0076	250	0.0065	100	0.0050	450	0.0115	690	0.0086
—	16	0.6299	400	0.0091	320	0.0078	240	0.0067	90	0.0050	440	0.0116	680	0.0087

1) The cutting condition of Titanium Alloys and Nickel Alloys are for HSS-Co drills only.
2) The above values apply when coolant is used in a vertical machine. In a horizontal machine or deep hole, use pecking.
3) Adjust drilling condition when unusual vibration or different sound occurs.

Standard Drilling Conditions

Straight Shank TiN Coated

Screw Machine Length L561P
Jobber Length L501P, L520P

Workpiece Material / Speed (SFM) / Drill Diameter			Carbon Steels		Alloy Steels		Die Steels Hardened Steels Stainless Steels		Cast Irons		Aluminum Alloys Nonferrous Metals	
			60 - 85 SFM		47 - 65 SFM		36 - 48 SFM		66 - 90 SFM		100 - 140 SFM	
Fractional	Metric mm	Decimal	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
—	1	0.0394	5,800	0.0008	4,600	0.0007	3,500	0.0006	6,400	0.0010	9,800	0.0007
1/16	1.588	0.0625	4,100	0.0013	3,200	0.0011	2,500	0.0009	4,400	0.0015	7,000	0.0011
—	2	0.0787	3,500	0.0016	2,800	0.00 13	2,000	0.0012	3,800	0.0020	5,900	0.0014
—	3	0.1181	2,500	0.0028	2,000	0.00 23	1,500	0.0021	2,800	0.0034	4,300	0.0024
1/8	3.175	0.1250	2,400	0.0029	2,000	0.0023	1,400	0.0022	2,600	0.0036	4,200	0.0025
—	5	0.1969	1,600	0.0042	1,200	0.0037	910	0.0033	1,700	0.0053	2,600	0.0038
1/4	6.35	0.2500	1,300	0.0047	1,000	0.0044	730	0.0038	1,300	0.0064	2,100	0.0044
—	8	0.3150	1,000	0.0059	770	0.00 50	580	0.0044	1,100	0.0074	1,700	0.0051
3/8	9.525	0.3750	820	0.0065	650	0.00 55	480	0.0049	890	0.0082	1,400	0.0054
—	10	0.3937	770	0.0068	610	0.0057	460	0.0050	840	0.0084	1,300	0.0057
—	12	0.4724	640	0.0074	500	0.0064	380	0.0057	700	0.0095	1,100	0.0066
1/2	12.7	0.5000	610	0.0076	490	0.00 66	370	0.0057	670	0.0099	1,000	0.0069
5/8	15.875	0.6250	500	0.0089	400	0.00 76	300	0.0065	540	0.0115	830	0.0086
—	16	0.6299	480	0.0091	380	0.00 78	290	0.0067	530	0.0116	820	0.0087

1) The above values apply when coolant is used in a vertical machine. In a horizontal machine or deep hole, use pecking.
2) Adjust drilling condition when unusual vibration or different sound occurs.

Straight Shank Parabolic Style TiN Coated

Jobber Length L517P
Taper Length L545P

Workpiece Material / Speed (SFM) / Drill Diameter			Carbon Steels		Alloy Steels		Die Steels Hardened Steels Stainless Steels		Cast Irons	
			60 - 85 SFM		47 - 65 SFM		36 - 48 SFM		66 - 90 SFM	
Fractional	Metric mm	Decimal	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
—	1	0.0394	5,800	0.0011	4,600	0.0009	3,500	0.0008	6,400	0.0014
1/16	1.588	0.0625	4,100	0.0018	3,200	0.0014	2,500	0.0012	4,400	0.0021
—	2	0.0787	3,500	0.0023	2,800	0.0017	2,000	0.0015	3,800	0.0028
—	3	0.1181	2,500	0.0039	2,000	0.0030	1,500	0.0027	2,800	0.0048
1/8	3.175	0.1250	2,400	0.0041	2,000	0.0030	1,400	0.0029	2,600	0.0050
—	5	0.1969	1,600	0.0059	1,200	0.0048	910	0.0042	1,700	0.0075
1/4	6.35	0.2500	1,300	0.0066	1,000	0.0057	730	0.0049	1,300	0.0089
—	8	0.3150	1,000	0.0083	770	0.0066	580	0.0058	1,100	0.0104
3/8	9.525	0.3750	820	0.0091	650	0.0072	480	0.0063	890	0.0115
—	10	0.3937	770	0.0095	610	0.0074	460	0.0065	840	0.0118
—	12	0.4724	640	0.0104	500	0.0083	380	0.0074	700	0.0133
1/2	12.7	0.5000	610	0.0107	490	0.0086	370	0.0075	670	0.0139
5/8	15.875	0.6250	500	0.0124	400	0.0099	300	0.0085	540	0.0161
—	16	0.6299	480	0.0127	380	0.0101	290	0.0087	530	0.0163

1) The above values apply when coolant is used in a vertical machine. In a horizontal machine or deep hole, use pecking.
2) Adjust drilling condition when unusual vibration or different sound occurs.

Standard Drilling Conditions

Straight Shank Parabolic Style TiN Coated

Straight Shank Extra Length L551, L6551
Taper Shank Extra Length L651

Workpiece Material / Speed (SFM) / Drill Diameter		Carbon Steels		Alloy Steels Hardened Steels		Stainless Steels		Cast Irons		Brass Nonferrous Metals	
		44 - 55 SFM		32 - 40 SFM		32 - 40 SFM		52 - 65 SFM		48 - 60 SFM	
Fractional	Decimal	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
1/16	0.0625	2,700	0.0020	2,000	0.0010	2,000	0.0015	3,200	0.0015	3,000	0.0020
1/8	0.1250	1,600	0.0038	1,200	0.0018	1,200	0.0025	1,800	0.0025	1,700	0.0036
3/16	0.1875	1,200	0.0052	820	0.0025	820	0.0035	1,400	0.0035	1,300	0.0050
1/4	0.2500	850	0.0065	620	0.0030	620	0.0048	1,000	0.0048	1,000	0.0063
5/16	0.3125	680	0.0075	490	0.0035	490	0.0055	800	0.0055	740	0.0078
3/8	0.3750	570	0.0090	410	0.0040	410	0.0060	670	0.0060	620	0.0090
1/2	0.5000	430	0.0110	310	0.0052	310	0.0080	500	0.0080	460	0.0110
5/8	0.6250	340	0.0120	250	0.0060	250	0.0090	400	0.0090	370	0.0120
3/4	0.7500	290	0.0130	210	0.0070	210	0.0100	340	0.0100	310	0.0130
1	1.0000	220	0.0140	160	0.0080	160	0.0110	250	0.0110	230	0.0140

1) The above values apply when coolant is used in a vertical machine. In a horizontal machine or deep hole, use pecking.
2) Adjust drilling condition when unusual vibration or different sound occurs.

Standard Drilling Conditions
Straight Shank Oil Hole Cobalt L581

Workpiece Material / Speed (SFM) / Drill Diameter		Carbon Steels		Alloy Steels		Die Steels Hardened Steels Stainless Steels		Cast Irons		Aluminum Alloys Nonferrous Alloys	
		55 - 66 SFM		44 - 52 SFM		32 - 40 SFM		61 - 73 SFM		94 - 114 SFM	
Fractional	Decimal	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
1/16	0.0625	3,400	0.0016	2,700	0.0013	2,100	0.0011	3,800	0.0018	5,800	0.0013
1/8	0.1250	2,000	0.0035	1,700	0.0027	1,200	0.0027	2,200	0.0043	3,500	0.0030
1/4	0.2500	1,100	0.0056	800	0.0052	610	0.0046	1,120	0.0076	1,750	0.0053
3/8	0.3750	680	0.0078	540	0.0066	400	0.0058	740	0.0099	1,200	0.0065
1/2	0.5000	510	0.0091	400	0.0079	310	0.0069	550	0.0119	860	0.0082
5/8	0.6250	410	0.0106	330	0.0091	250	0.0079	450	0.0138	690	0.0103

1) The above values apply when coolant is used in a vertical machine. In a horizontal machine or deep hole, use pecking.
2) Adjust drilling condition when unusual vibration or different sound occurs.

Standard Drilling Conditions
Taper Shank Regular Shank / Core L601
Silver and Deming L575

Workpiece Material / Speed (SFM) / Drill Diameter		Carbon Steels		Alloy Steels		Die Steels Hardened Steels Stainless Steels		Cast Irons		Aluminum Alloys Nonferrous Alloys	
		55 - 65 SFM		50 - 60 SFM		35 - 45 SFM		65 - 80 SFM		100 - 110 SFM	
Fractional	Decimal	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
1/8	0.1250	2,000	0.003	1,900	0.003	1,400	0.002	2,500	0.004	3,400	0.003
3/16	0.1875	1,400	0.004	1,300	0.004	920	0.003	1,700	0.005	2,300	0.005
1/4	0.2500	1,000	0.004	920	0.005	690	0.004	1,300	0.007	1,700	0.006
5/16	0.3125	800	0.004	740	0.005	560	0.005	980	0.008	1,400	0.008
3/8	0.3750	670	0.007	620	0.006	460	0.005	820	0.008	1,200	0.008
7/16	0.4375	570	0.007	530	0.006	400	0.005	700	0.009	970	0.009
1/2	0.5000	500	0.008	460	0.006	350	0.006	620	0.010	850	0.009
5/8	0.6250	400	0.009	370	0.008	280	0.007	490	0.012	680	0.012
3/4	0.7500	340	0.010	310	0.009	230	0.008	410	0.013	570	0.013
7/8	0.8750	290	0.011	270	0.009	200	0.008	350	0.014	490	0.014
1	1.0000	250	0.012	230	0.010	180	0.009	310	0.015	430	0.014
1 1/8	1.1250	230	0.012	210	0.011	160	0.010	280	0.016	380	0.015
1 1/4	1.2500	200	0.014	190	0.011	140	0.010	250	0.016	340	0.016
1 3/8	1.3750	190	0.014	170	0.012	130	0.010	230	0.017	310	0.017
1 1/2	1.5000	170	0.014	160	0.012	120	0.011	210	0.017	290	0.017
1 5/8	1.6250	160	0.015	150	0.013	110	0.011	190	0.017	260	0.017
1 3/4	1.7500	150	0.016	140	0.013	100	0.011	180	0.018	250	0.018
1 7/8	1.8750	140	0.016	130	0.014	100	0.012	170	0.019	230	0.019
2	2.0000	130	0.016	120	0.014	90	0.012	160	0.020	220	0.020

Taper Shank Oil Hole Drills / Cobalt List No. 683

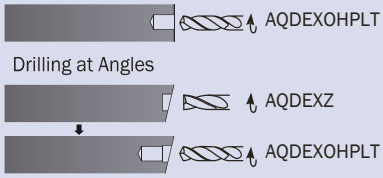
Workpiece Material / Speed (SFM) / Drill Diameter		Carbon Steels		Alloy Steels Hardened Steels		Mold Steels Stainless Steels		Cast Irons		Aluminum Alloys Nonferrous Metals	
		55 - 65 SFM		50 - 60 SFM		35 - 45 SFM		65 - 80 SFM		100 - 110 SFM	
Fractional	Decimal	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)	RPM	Feed (IPR)
3/8	0.3750	680	0.008	620	0.007	460	0.006	820	0.010	1,200	0.010
7/16	0.4375	580	0.009	530	0.007	400	0.006	700	0.011	970	0.011
1/2	0.5000	510	0.009	460	0.008	350	0.007	620	0.012	850	0.012
5/8	0.6250	410	0.011	370	0.010	280	0.008	490	0.014	680	0.014
23/32	0.7188	360	0.012	320	0.010	240	0.009	430	0.015	590	0.014
3/4	0.7500	340	0.013	310	0.011	230	0.009	410	0.015	570	0.015
7/8	0.8750	290	0.013	270	0.011	200	0.010	350	0.017	490	0.017
1	1.0000	260	0.014	230	0.012	180	0.011	310	0.018	430	0.018
1 1/4	1.2500	210	0.016	190	0.013	140	0.011	250	0.019	340	0.019
1 1/2	1.5000	170	0.017	160	0.014	120	0.012	210	0.021	290	0.021

1) The above values apply when coolant is used in a vertical machine. In a horizontal machine or deep hole, use pecking.
2) Adjust drilling condition when unusual vibration or different sound occurs.

Deep Hole Drilling Guide

Aqua Drill EX Oil Hole 10D, 15D, 20D, 25D, 30D, 40D, PLT

1. Use Guide Hole Drill (AQDEXOHPLT)



- We recommend pre-drilling with guide hole drill. Hole depth 1D - 2D
- We recommend using AQEXOHPLT for guide hole drilling. Select one with a diameter 0.015mm larger than deep hole drill
- If drilling at an angle use Aqua EX flat drill (AQDEXZ) to create a flat surface and then use Pilot Drill

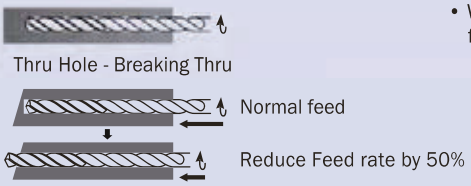
2. Deep Hole Drilling into Guide Hole

- Penetrate into the guide hole at 50% lower RPM until 0.5-1.0mm (0.02”-0.04”) from depth of guide

3. Deep Hole Drilling

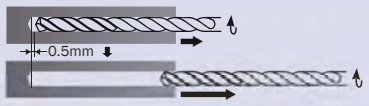
- Start Drilling at recommended Speeds & Feeds

4. Deep Hole Drilling (Breaking Thru or Blind Hole)



- When breaking thru for a thru hole reduce feed rate by 50% to prevent drill from breaking

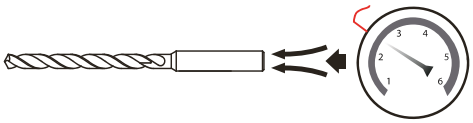
5. Retracting Drill from the Hole



- After drilling is complete, decrease RPM and pull the drill back through the hole

Precautions for Small Diameter Drills

1. Handling of Cutting Fluid
   - To prevent Coolant holes from being blocked use a fine mesh filter. (Recommended Filtration efficiency 5µm)
   - Water Soluble cutting fluid is recommended
2. Minimum Coolant pressure requirement
   - Minimum coolant pressure requirement = 300 psi or 2.0 Mpa
   - Above recommended pressure will enable stable machining
   - If using non-water soluble cutting oils, higher pressure might be required
3. ATC
   - To reduce shock and vibration, reduce ATC feed if required



Recommended Coolant Pressure 1000 psi, Minimum 300 psi

GUIDELINES FOR TROUBLESHOOTING TWIST DRILL PROBLEMS

○ **Remedial measure is highly effective**

● **Remedial measure is relatively effective**

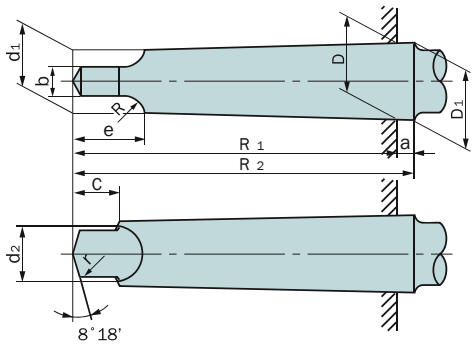
Problems	Solution	Possible Cause: Trouble with device	Faulty jig, clamp, or fixture	Faulty tool (design)	Faulty tool (regrinding)	Faulty tool holder	Defect in workplace	Unsatisfactory cutting conditions	Faulty coolant or lubricating system	Faulty process design
Oversize holes	Reduce material build up on cutting lips and flutes				(22)		24		29 30 31 32	
	Reduce difference in cutting resistance between right and left cutting lips		(4) (5B) 7	13B	● 9 0 (21)	2 8				
Curved hole or drilled off center	Prevent defective leading	(3)	3 ● 4 (5B) 7		13A 21	8			26B (27)	6 33
	Increase drill rigidity			(10)						
	Reduce difference in cutting resistance between right and left cutting lips				17B 19					
Distorted Holes	Prevent rifling		● 4		18B 19					
	Reduce irregular motion		3 7	(23)	● 20 (21)	8		26A		33
	Eliminate clogging with chips			9A 11 14 15						34
Hole position shift			(3) ● 4		20 21	8		27		33
Rough Finish or tearing in hole	Reduce galling (material build up on cutting lips)				22		(24)		29 30 31 32	
	Reduce wear				13A 19			25B		
	Reduce chatter and vibration	1	4 7	9A (23)	20 21			26A		33
Breakage of drill	Eliminate clogging with chips			9A 11 (14) 15				● 26A (36)		34
	Increase drill rigidity			(10) 23	17			● 26B		
	Reduce feed at breakthrough	1 (2)	(7)		(20) 18			● 28		
	Prevent drill deflection		3 ● 4 5B 7		13A 19 21			26B		
Abnormal wear of drill corner edge	Reduce wear			12 16	18A		24	● 25B ● 26B		
	Prevent drill deflection	(2)	(7)					26B		
Wrapping of chip around drill	Increase or decrease helix angle and cutting speed from the recommended angle and speed	(34)	5A	9 ● 11 14				26A		

GUIDELINES FOR TROUBLESHOOTING TWIST DRILL PROBLEMS

No.	Remedial action and important points
1	Increase rigidity (column and spindle) of machine tool.
2	Take steps to insure a steady feed (particularly components with pneumatic or hydraulic controls).
3	Increase accuracy of alignment of bushing. (Increase alignment of preliminary hole and spindle for hole with large diameter.)
4	Use bushing and reduce bushing clearance.
5 5A: 5B:	Clearance between workpiece to be drilled and bushing Widen this clearance. Narrow this clearance.
6	Rotate workpiece instead of tool.
7	Secure workpiece or replace fixture on the workpiece with fittings that have less clamp distortion.
8	Check contact of drill taper (clean) and reduce run-out of holder and spindle.
9 9A: 9B:	Helix angle Increase this angle. Decrease this angle.
10	Shorten overall length and flute length to Increase rigidity.
11	Provide chipbreaker.
12	Use surface treatment.
13	Point angle
13A: 13B:	Increase this angle Decrease this angle.
14	Increase flute width ratio.
15	Use oil-hole drill.
16	Upgrade material of tool.
17 17A: 17B:	Back taper Increase back taper. Decrease back taper (Check a slight decrease in diameter from point to back).
18 18A: 18B:	Lip relief angle Increase this angle. Decrease this angle.

No.	Remedial action and important points
19	Eliminate relative lip height (difference in cutting resistance between right and left cutting edges).
20	Thinning (take care to prevent excessive thinning).
21	Eliminate unevenly chiseled areas.
22	Rework worn margin completely.
23	Increase web thickness.
24	Check workpiece to be drilled, for proper grain structure and heat treatment. (HB: 180 or more)
25 25A: 25B:	Cutting speed Increase this speed. Decrease this speed.
26 26A: 26B:	Feed Increase feed rate. Decrease feed rate.
27	Decrease feed at entrance to workpiece.
28	Decrease feed at exit from workpiece.
29	Use non-water-soluble coolant.
30	Use sulfuric or chloric extreme-pressure oils.
31	Increase quantity of coolant discharged.
32	Feed oil in correct direction.
33	Drill center hole in preceding process.
34	Effect intermittent feed. (Narrow step for deep holes.)
35	Select such helix angle and end angle that cutting
36	Decrease feed rate for deep holes

TAPER SHANK WITH TENON



Morse taper	Taper		Angle on Side	Taper Shank with Tenon																
				D (2)	a	D1 (3)	d1 (3)	d2		R 1		R 2		b		C (4)	e		R	r
								Basic size	Tolerance	Basic size	Tolerance	Basic size	Tolerance	Basic size	Tolerance		Basic size	Tolerance	Max.	
0	1/19.212	0.05205	1°29'27"	9.045	3	9.201	6.104	6	0 −0.3	56.5	0 −1.2	59.5	0 −1.9	3.9	0 −0.180	6.5	10.5	0 −1.1	4	1
1	1/20.047	0.04988	1°25'43"	12.065	3.5	12.240	8.972	8.7	0 −0.3	62.0	0 −1.2	65.5	0 −1.9	5.2	0 −0.180	8.5	13.5	0 −1.1	5	1.2
2	1/20.020	0.04995	1°25'50"	17.780	5	18.030	14.034	13.5	0 −0.43	75.0	0 −1.2	80	0 −1.9	6.3	0 −0.220	10	16	0 −1.1	6	1.6
3	1/19.922	0.05020	1°26'16"	23.825	5	24.076	19.107	18.5	0 −0.52	94.0	0 −1.4	99	0 −2.2	7.9	0 −0.220	13	20	0 −1.3	7	2
4	1/19.254	0.05194	1°29'15"	31.267	6.5	31.605	25.164	24.5	0 −0.52	117.5	0 −1.4	124	0 −2.5	11.9	0 −0.270	16	24	0 −1.3	8	2.5
5	1/19.002	0.05263	1°30'26"	44.399	6.5	44.741	36.531	35.7	0 −0.62	149.5	0 −1.6	156	0 −2.5	15.9	0 −0.270	19	29	0 −1.3	10	3
6	1/19.180	0.05214	1°29'36"	63.348	8	63.765	52.399	51.0	0 −0.74	210.0	0 −1.85	218	0 −2.9	19	0 −0.330	27	40	0 −1.6	13	4

Tolerance of Drill Diameter

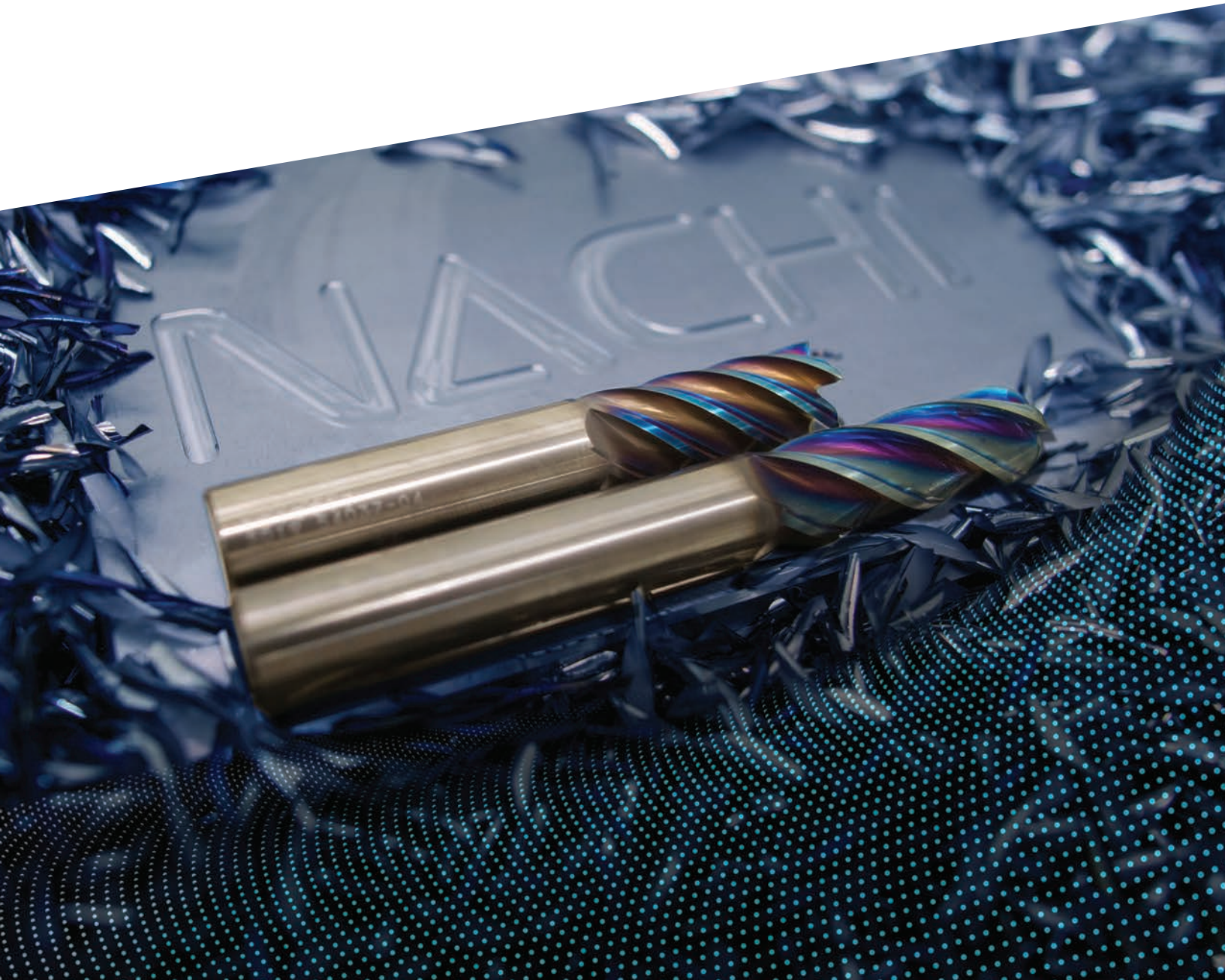
Unit : 0.001mm

Diameter (mm)		Under 3.0 D≦3	Above 3.0 Under 6.0 3<D≦6	Above 6.0 Under 10 6<D≦10	Above 10 Under 18 10<D≦18	Above 18 Under 30 18<D≦30	Above 30 Under 50 30<D≦50	Above 50 Under 80 50<D≦80	Above 80 Under 120 80<D≦120
Tolerance	js6	±3	±4	±4.5	±5.5	±6.5	±8	±8.5	±11
	h6	0 −6	0 −8	0 −9	0 −11	0 −13	0 −16	0 −19	0 −22
	h7	0 −10	0 −12	0 −15	0 −18	0 −21	0 −25	0 −30	0 −35
	h8	0 −14	0 −18	0 −22	0 −27	0 −33	0 −39	0 −46	0 −54

NACHI

High Performance Carbide End Mills

Expanded Offering with New Diameters, Cut Lengths, Corner Radius Sizes, and Neck Relieved Options



Aqua V Mill - 4 Flute

Offering

- 9701/9702 Square End
- 9703/9704 Corner Radius

Features

- Variable helix, variable index to reduce vibrations and chatter
- Excellent at HSM/HEM
- Versatile across a range of materials
- Available in Square End, Corner Radius
- Aqua Mill Nano-layer Coating for high heat and wear resistance

Work Materials

- Cast Iron
- Tool Steel
- Titanium
- Carbon Steel
- 300/400 Series SS
- High Temp Alloys
- Alloy Steel
- PH SS

Performance

For High Performance Machining of a Range of Materials

Aqua V Mill - 5 Flute

Offering

- 9705/9706 Square End
- 9707/9708 Corner Radius
- 9709/9710 Ball Nose
- 9727 Square End Neck Relief

Features

- Variable helix, variable index to reduce vibrations and chatter
- Excellent at HSM/HEM
- 5 Flute Design for faster feed rates and better surface finishes
- Available in Square End, Corner Radius and Ball End
- Aqua Mill Nano-layer Coating for high heat and wear resistance

Work Materials

- Cast Iron
- Tool Steel
- Titanium
- Carbon Steel
- 300/400 Series SS
- High Temp Alloys
- Alloy Steel
- PH SS

Performance

For High Performance Machining of a Range of Materials

Aqua Mill Hard

Offering

- 9711/9712 Square End
- 9713/9714 Corner Radius
- 9715/9716 Ball Nose
- 9729/9730 Corner Radius Neck Relief

Features

- Excellent for HSM of hardened steels up to 70 HRC
- Thick core and wide land width for increased rigidity
- Available in Square End, Corner Radius, and Ball End
- Aqua Mill Nano-layer Coating for high heat and wear resistance

Work Materials

- Tool steels 50+ HRC
- Hardened Steels 50+ HRC
- High Speed Steels

Performance

For Machining Hard Materials 50-70 HRC

ALH Mill

Offering

- 9717/9718 Square End
- 9719/9720 Corner Radius
- 9721/9722 Ball Nose
- 9723 Square End Neck Relief
- 9725 Ball Nose Neck Relief

Features

- Cylindrical land allows for great surface finishes and high feed rates
- 3 Flutes allow for faster feed rates while not sacrificing chip evacuation
- High polished flutes help shear and clear chips
- Available in Square End, Corner Radius, and Ball End
- Available with coating through our 72 hour modification service

Work Materials

- Aluminum alloys
- Aluminum castings
- Copper Alloys
- Magnesium

Performance

For Aluminum and Non-ferrous Materials

HIGH PERFORMANCE END MILLS

List No.	End Mill Name		Material	Coating	Stock Size		Product Page
Aqua V Mill Series							
9701 9702		**4 Flute Square End**	Carbide	Aqua Mill	Fractional Metric	1/8 to 3/4 3.0 to 20.0	p. 162
9703 9704		**4 Flute Corner Radius**			Fractional Metric	1/8 to 3/4 3.0 to 20.0	p. 163
9705 9706		**5 Flute Square End**			Fractional Metric	1/8 to 3/4 3.0 to 20.0	p. 164
9707 9708		**5 Flute Corner Radius**			Fractional Metric	1/8 to 3/4 3.0 to 20.0	p. 165-166
9709 9710		**5 Flute Ball Nose**			Fractional Metric	1/8 to 3/4 3.0 to 20.0	p. 168
9727		**5 Flute Neck Relieved**			Fractional	1/8 to 3/4	p. 167
Aqua Hard Mill Series							
9711 9712		**Square End**	Carbide	Aqua Mill	Fractional Metric	1/8 to 3/4 3.0 to 20.0	p. 171
9713 9714		**Corner Radius**			Fractional Metric	1/8 to 3/4 3.0 to 20.0	p. 172
9715 9716		**Ball Nose**			Fractional Metric	1/8 to 3/4 3.0 to 20.0	p. 173
9729 9730		**Corner Radius Neck Relief**			Fractional Metric	3/16 to 1/2 5.0 to 12.0	p. 174
ALH Mill Series							
9717 9718		**Square End**	Carbide	Bright	Fractional Metric	1/8 to 3/4 3.0 to 20.0	p. 179
9719 9120		**Corner Radius**			Fractional Metric	1/8 to 3/4 3.0 to 20.0	p. 180-181
9721 9722		**Ball Nose**			Fractional Metric	1/8 to 3/4 3.0 to 20.0	p. 182
9723		**Square End Neck Relief**			Fractional	1/8 to 3/4	p. 183
9725		**Ball Nose Neck Relief**			Fractional	1/8 to 3/4	p. 184

● : Great ○ : Good Δ : OK – : Not Recommended

List No.	Cutting Condition Page	Workpiece Material																
		Carbon Steel		Alloy Steel	Mold Steel	Hardened Steel			Stainless Steel		PH Stainless	Titanium Alloys	Nickel Alloys	Cast Iron		Aluminum		Copper Alloys
						HRc												
		Low Carbon	High Carbon	20 ~ 30	30 ~ 45	45 ~ 55	55 ~ 60	60 ~ 70	Austenitic 300 Series	Martensitic 400 Series				Soft <200HB	Hard >200HB	6061 7075	Cast	
Aqua V Mill Series																		
9701 9702	p. 169-170	●	●	●	●	–	–	–	●	●	●	○	○	○	○	–	–	–
9703 9704	p. 169-170	●	●	●	●	–	–	–	●	●	●	○	○	○	○	–	–	–
9705 9706	p. 169	●	●	●	●	–	–	–	●	●	●	○	○	○	○	–	–	–
9707 9708	p. 169	●	●	●	●	–	–	–	●	●	●	○	○	○	○	–	–	–
9709 9710	p. 169	●	●	●	●	–	–	–	●	●	●	○	○	○	○	–	–	–
9727	p. 169	●	●	●	●	–	–	–	●	●	●	○	○	○	○	–	–	–
Aqua Hard Mill Series																		
9711 9712	p. 175.176	–	–	–	–	●	●	●	–	–	–	–	○	–	–	–	–	–
9713 9714	p. 175-176	–	–	–	–	●	●	●	–	–	–	–	○	–	–	–	–	–
9715 9716	p. 177-178	–	–	–	–	●	●	●	–	–	–	–	○	–	–	–	–	–
9729 9730	p. 175-176	–	–	–	–	●	●	●	–	–	–	–	○	–	–	–	–	–
ALH Mill Series																		
9717 9718	p. 185-188	–	–	–	–	–	–	–	–	–	–	–	–	–	–	●	●	●
9719 9120	p. 185-188	–	–	–	–	–	–	–	–	–	–	–	–	–	–	●	●	●
9721 9722	p. 185-188	–	–	–	–	–	–	–	–	–	–	–	–	–	–	●	●	●
9723	p. 185-188	–	–	–	–	–	–	–	–	–	–	–	–	–	–	●	●	●
9725	p. 185-188	–	–	–	–	–	–	–	–	–	–	–	–	–	–	●	●	●

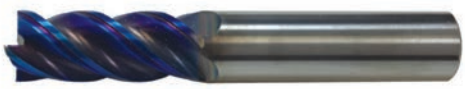
HIGH PERFORMANCE END MILLS

List No.	End Mill Name		Material	Coating	Stock Size		Product Page
DLC Mill Series							
6231HD		**2 Flute**	HSCO	DLC	Fractional	1/8 to 1	p. 189
AG Mill Series							
6485		**Rougher**	HSCO	AG	Fractional	1/4 to 2	p. 190
6403		**Heavy Rougher**	HSCO	AG	Fractional	1/4 to 2	p. 191
SG Mill Series							
6367X		**Roughing & Finishing**	HSCO	SG	Fractional	1/4 to 2	p. 192
6303X		**Roughing**			Fractional	1/4 to 2	p. 14
6231X		**2 Flute**			Fractional	1/8 to 1-1/2	p. 197
6211X		**Multi-Flute**			Fractional	1/8 to 1-1/2	p. 201
High Speed Steel Cobalt Mill Series							
6367		**Roughing & Finishing**	HSCO	Black Oxide	Fractional	1/4 to 3	p. 192
6303		**Roughing**		Bright Finish	Fractional	1/4 to 2	p. 194
6307		**Roughing**			Fractional	1/4 to 2	p. 195
6231		**2 Flute**			Fractional	1/8 to 2	p. 197
6233		**2 Flute Long**			Fractional	1/4 to 2	p. 198
6230		**2 Flute**			Fractional	1.0 to 30.0	p. 198
6210		**4 Flute**			Fractional	2.5 to 50.0	p. 200
6211M		**Multi-Flute**			Fractional	1/8 to 2	p. 201
6213		**Multi-Flute Long**			Fractional	1/4 to 1-1/4	p. 202

● : Great ○ : Good Δ : OK – : Not Recommended

List No.	Cutting Condition Page	Workpiece Material																
		Carbon Steel		Alloy Steel	Mold Steel	Hardened Steel			Stainless Steel		PH Stainless	Titanium Alloys	Nickel Alloys	Cast Iron		Aluminum		Copper Alloys
						HRc												
		Low Carbon	High Carbon	20 ~ 30	30 ~ 45	45 ~ 55	55 ~ 60	60 ~ 70	Austenitic 300 Series	Martensitic 400 Series				Soft <200HB	Hard >200HB	6061 7075	Cast	
DLC Mill Series																		
6231HD	p. 189	–	–	–	–	–	–	–	–	–	–	–	–	–	–	●	●	○
AG Mill Series																		
6485	p. 190	●	●	○	–	–	–	–	–	–	–	–	–	Δ	Δ	Δ	Δ	Δ
6403	p. 191	●	●	○	–	–	–	–	–	–	–	–	–	Δ	Δ	Δ	Δ	Δ
SG Mill Series																		
6367X	p. 193	●	●	○	–	–	–	–	–	–	–	–	–	Δ	Δ	Δ	Δ	Δ
6303X	p. 196	●	●	○	–	–	–	–	–	–	–	–	–	Δ	Δ	Δ	Δ	Δ
6231X	p. 199	●	●	○	–	–	–	–	–	–	–	–	–	Δ	Δ	Δ	Δ	Δ
6211X	p. 204	●	●	○	–	–	–	–	–	–	–	–	–	Δ	Δ	Δ	Δ	Δ
High Speed Steel Cobalt Mill Series																		
6367	p. 193	○	○	○	–	–	–	–	–	–	–	–	–	○	○	Δ	Δ	○
6303	p. 196	○	○	○	–	–	–	–	–	–	–	–	–	○	○	Δ	Δ	○
6307	p. 196	○	○	○	–	–	–	–	–	–	–	–	–	○	○	Δ	Δ	○
6231	p. 199	○	○	○	–	–	–	–	–	–	–	–	–	○	○	Δ	Δ	○
6233	p. 199	○	○	○	–	–	–	–	–	–	–	–	–	○	○	Δ	Δ	○
6230	p. 199	○	○	○	–	–	–	–	–	–	–	–	–	○	○	Δ	Δ	○
6210	p. 203	○	○	○	–	–	–	–	–	–	–	–	–	○	○	Δ	Δ	○
6211M	p. 203	○	○	○	–	–	–	–	–	–	–	–	–	○	○	Δ	Δ	○
6213	p. 203	○	○	○	–	–	–	–	–	–	–	–	–	○	○	Δ	Δ	○

Aqua V Mill - 4 Flute



List No. 9701 Fractional Sizes Shank Size Matches Cutting Diameter

EDP#	Cutting Diameter	Length of Cut	Overall Length	Flutes
41000409	1/8	1/4	1-1/2	
41000138	1/8	3/8	1-1/2	
41000410	1/8	1/2	2	
41000411	5/32	3/16	2	
41000412	5/32	7/16	2	
41000413	3/16	5/16	2	
41000139	3/16	7/16	2	
41000140	1/4	1/2	2-1/2	
41000583	1/4	3/4	2-1/2	
41000415	1/4	1	3	
41000416	5/16	1/2	2	
41000141	5/16	13/16	2-1/2	
41000417	5/16	1	3	
41000418	3/8	1/2	2	4
41000142	3/8	7/8	2-1/2	
41000419	3/8	1	3	
41000143	3/8	1-1/8	3	
41000420	1/2	5/8	2-1/2	
41000144	1/2	1	3	
41000145	1/2	1-1/4	3-1/4	
41000421	1/2	1-5/8	4	
41000422	5/8	3/4	3	
41000146	5/8	1-1/4	3-1/2	
41000423	5/8	2	4	
41000424	3/4	7/8	3	
41000147	3/4	1-1/2	4	
41000425	3/4	2-1/4	5	

List No. 9702 Metric Sizes

EDP#	Cutting Diameter	Length of Cut	Overall Length	Flutes
41000001	3	8	57	
41000002	4	11	57	
41000003	5	11	57	
41000004	6	13	57	
41000005	8	19	70	
41000006	10	22	70	4
41000007	12	26	75	
41000008	16	32	90	
41000009	18	38	100	
41000010	20	45	100	

1 per tube

⚠ WARNING: Cancer - www.P65Warnings.ca.gov

Aqua V Mill - 4 Flute Corner Radius

List No. 9703 Fractional Sizes Shank Size Matches Cutting Diameter

EDP#	Cutting Diameter	Length of Cut	Overall Length	0.010 CR	0.015 CR	0.030 CR	0.060 CR	0.090 CR	0.120 CR	Flutes
41000469	1/8	1/4	1-1/2	X						
41000470	1/8	3/8	1-1/2	X						
41000181	1/8	3/8	1-1/2		X					
41000471	1/8	1/2	2			X				
41000472	3/16	5/16	2		X					
41000182	3/16	7/16	2			X				
41000473	3/16	7/16	2		X					
41000183	1/4	1/2	2-1/2			X				
41000474	1/4	1/2	2-1/2		X					
41000475	1/4	3/4	2-1/2		X					
41000476	1/4	1	3			X				
41000477	5/16	1/2	2-1/2		X					
41000184	5/16	13/16	2-1/2			X				
41000478	5/16	1	3				X			
41000479	3/8	1/2	2		X					
41000185	3/8	7/8	2-1/2			X				
41000480	3/8	7/8	2-1/2				X			
41000481	3/8	1	3					X		4
41000482	1/2	5/8	2-1/2		X					
41000186	1/2	1	3			X				
41000187	1/2	1-1/4	3-1/4			X				
41000483	1/2	1-1/4	3-1/4					X		
41000189	1/2	1	3				X			
41000190	1/2	1	3						X	
41000484	5/8	3/4	3			X				
41000191	5/8	1-1/4	3-1/2			X				
41000192	5/8	1-1/4	3-1/2				X			
41000485	5/8	1-1/4	3-1/2					X		
41000193	5/8	1-1/4	3-1/2						X	
41000486	5/8	2	4			X				
41000487	3/4	7/8	3			X				
41000194	3/4	1-1/2	4			X				
41000195	3/4	1-1/2	4				X			
41000488	3/4	1-1/2	4					X		
41000196	3/4	1-1/2	4						X	

List No. 9704 Metric Sizes

EDP#	Cutting Diameter	Length of Cut	Overall Length	0.3 CR	0.5 CR	1.0 CR	2.0 CR	Flutes
41000021	3	8	57	X				
41000022	4	11	57	X				
41000023	5	11	57		X			
41000024	6	13	57		X			
41000025	8	19	70		X			
41000026	8	19	70			X		
41000027	10	22	80		X			
41000028	10	22	80			X		
41000029	12	26	90		X			4
41000030	12	26	90			X		
41000031	12	26	90				X	
41000032	16	32	90			X		
41000033	16	32	90				X	
41000034	18	38	100			X		
41000035	18	38	100				X	
41000036	20	45	100				X	

1 per tube

⚠ WARNING: Cancer - www.P65Warnings.ca.gov

Aqua V Mill - 5 Flute

List No. 9705

Fractional Sizes

Shank Size Matches Cutting Diameter

EDP#	Cutting Diameter	Length of Cut	Overall Length	Flutes
41000148	1/8	1/4	1-1/2	5
41000149	1/8	1/2	1-1/2	
41000150	1/8	3/4	2-1/2	
41000426	5/32	3/16	2	
41000427	5/32	7/16	2	
41000151	3/16	5/16	2	
41000152	3/16	9/16	2	
41000153	3/16	3/4	2-1/2	
41000154	1/4	3/8	2	
41000428	1/4	1/2	2-1/2	
41000155	1/4	3/4	2-1/2	
41000156	1/4	1-1/8	3	
41000157	5/16	7/16	2	
41000158	5/16	13/16	2-1/2	
41000159	5/16	1-1/4	3	
41000160	5/16	2-1/8	4	
41000161	3/8	1/2	2	
41000162	3/8	1	2-1/2	

EDP#	Cutting Diameter	Length of Cut	Overall Length	Flutes
41000163	3/8	1-1/4	3	5
41000164	3/8	1-5/8	4	
41000165	3/8	2-1/2	6	
41000166	1/2	5/8	2-1/2	
41000167	1/2	1	3	
41000168	1/2	1-1/4	3	
41000169	1/2	1-5/8	4	
41000170	1/2	2-1/8	4	
41000171	1/2	3-1/4	6	
41000172	5/8	3/4	3	
41000173	5/8	1-5/8	3-1/2	
41000174	5/8	2-1/8	4	
41000175	5/8	2-5/8	5	
41000176	5/8	3-1/4	6	
41000177	3/4	1	3	
41000178	3/4	1-5/8	4	
41000179	3/4	2-3/8	5	
41000180	3/4	3-1/4	6	

List No. 9706

Metric Sizes

EDP#	Cutting Diameter	Length of Cut	Overall Length	Flutes
41000011	3	8	57	5
41000012	4	11	57	
41000013	5	11	57	
41000014	6	13	57	
41000015	8	19	70	
41000016	10	22	70	
41000017	12	26	75	
41000018	16	32	90	
41000019	18	38	100	
41000020	20	45	100	

1 per tube

⚠ WARNING: Cancer - www.P65Warnings.ca.gov

Aqua V Mill - 5 Flute Corner Radius

List No. 9707 Fractional Sizes Shank Size Matches Cutting Diameter

EDP#	Cutting Diameter	Length of Cut	Overall Length	0.010 CR	0.015 CR	0.020 CR	0.030 CR	0.060 CR	0.090 CR	0.120 CR	0.125 CR	Flutes
41000197	1/8	1/4	1-1/2		X							
41000489	1/8	1/4	1-1/2	X								
41000198	1/8	1/2	1-1/2		X							
41000490	1/8	1/2	1-1/2	X								
41000491	1/8	1/2	1-1/2				X					
41000199	1/8	3/4	2-1/2		X							
41000589	3/16	5/16	2	X								
41000492	3/16	5/16	2		X							
41000200	3/16	5/16	2				X					
41000201	3/16	9/16	2				X					
41000578	3/16	5/8	2		X							
41000202	3/16	3/4	2-1/2				X					
41000493	1/4	3/8	2		X							
41000494	1/4	3/8	2				X					
41000203	1/4	3/8	2					X				
41000495	1/4	1/2	2-1/2				X					
41000496	1/4	1/2	2-1/2					X				
41000497	1/4	1/2	2-1/2						X			
41000204	1/4	3/4	2-1/2					X				
41000205	1/4	1-1/8	3					X				
41000498	5/16	7/16	2		X							
41000206	5/16	7/16	2				X					
41000207	5/16	7/16	2					X				
41000499	5/16	7/16	2						X			
41000500	5/16	13/16	2-1/2		X							5
41000208	5/16	13/16	2-1/2				X					
41000209	5/16	13/16	2-1/2					X				
41000210	5/16	1-1/4	3				X					
41000211	5/16	2-1/8	4				X					
41000590	3/8	1/2	2	X								
41000501	3/8	1/2	2		X							
41000212	3/8	1/2	2				X					
41000213	3/8	1/2	2					X				
41000502	3/8	1/2	2						X			
41000580	3/8	1/2	2-1/2		X							
41000579	3/8	7/8	2-1/2			X						
41000503	3/8	1	2-1/2		X							
41000214	3/8	1	2-1/2				X					
41000215	3/8	1	2-1/2					X				
41000504	3/8	1	2-1/2						X			
41000216	3/8	1	2-1/2							X		
41000217	3/8	1-1/4	3					X				
41000218	3/8	1-5/8	4					X				
41000219	3/8	2-1/2	6					X				
41000591	1/2	5/8	2-1/2	X								
41000505	1/2	5/8	2-1/2		X							
41000220	1/2	5/8	2-1/2				X					
41000221	1/2	5/8	2-1/2					X				
41000506	1/2	5/8	2-1/2						X			

(cont. on next page)

Aqua V Mill - 5 Flute Corner Radius (cont.)

List No. L9707 Fractional Sizes

EDP#	Cutting Diameter	Length of Cut	Overall Length	0.010 CR	0.015 CR	0.020 CR	0.030 CR	0.060 CR	0.090 CR	0.120 CR	0.125 CR	Flutes
41000222	1/2	5/8	2-1/2							X		5
41000507	1/2	1	3		X							
41000223	1/2	1	3				X					
41000224	1/2	1	3					X				
41000508	1/2	1	3						X			
41000225	1/2	1	3							X		
41000585	1/2	1-1/4	3		X							
41000226	1/2	1-1/4	3				X					
41000577	1/2	1-1/4	3								X	
41000227	1/2	1-5/8	4				X					
41000228	1/2	2-1/8	4				X					
41000229	1/2	3-1/4	6				X					
41000509	5/8	3/4	3		X							
41000230	5/8	3/4	3				X					
41000231	5/8	3/4	3					X				
41000510	5/8	3/4	3						X			
41000511	5/8	3/4	3							X		
41000232	5/8	1-5/8	3-1/2				X					
41000233	5/8	1-5/8	3-1/2					X				
41000234	5/8	1-5/8	3-1/2							X		
41000235	5/8	2-1/8	4				X					
41000236	5/8	2-5/8	5				X					
41000237	5/8	3-1/4	6				X					
41000512	3/4	1	3		X							
41000238	3/4	1	3				X					
41000239	3/4	1	3					X				
41000513	3/4	1	3						X			
41000240	3/4	1	3							X		
41000241	3/4	1-5/8	4				X					
41000242	3/4	1-5/8	4					X				
41000514	3/4	1-5/8	4						X			
41000243	3/4	1-5/8	4							X		
41000244	3/4	2-3/8	5				X					
41000245	3/4	3-1/4	6				X					

List No. L9708 Metric Sizes

EDP#	Cutting Diameter	Length of Cut	Overall Length	0.3 CR	0.5 CR	1.0 CR	2.0 CR	Flutes
41000037	3	8	57	X				5
41000038	4	11	57	X				
41000039	5	11	57		X			
41000040	6	13	57		X			
41000041	8	19	70		X			
41000042	8	19	70			X		
41000043	10	22	80		X			
41000044	10	22	80			X		
41000045	12	26	90		X			
41000046	12	26	90			X		
41000047	12	26	90				X	
41000048	16	32	90			X		
41000049	16	32	90				X	
41000050	18	38	100			X		
41000051	18	38	100				X	
41000052	20	45	100				X	

1 per tube

⚠ WARNING: Cancer - www.P65Warnings.ca.gov

Aqua V Mill - 5 Flute Neck Relief

List No. 9727 Fractional Sizes Shank Size Matches Cutting Diameter

EDP#	Size	Length of Cut	Neck Diameter	Neck Length	Overall Length	Flutes
41000447	1/8	5/32	0.118	3/4	2-1/2	5
41000448	1/8	5/32	0.118	1	2-1/2	
41000449	3/16	7/32	0.178	3/4	3	
41000450	3/16	7/32	0.178	1-1/8	3	
41000451	1/4	3/8	0.237	1-1/8	4	
41000452	1/4	3/8	0.237	1-5/8	4	
41000454	3/8	1/2	0.356	1-5/8	4	
41000455	3/8	1/2	0.356	2-1/8	4	
41000456	3/8	1/2	0.356	2-1/2	5	
41000458	1/2	5/8	0.475	1-3/4	4	
41000459	1/2	5/8	0.475	2-1/4	4	
41000460	1/2	5/8	0.475	2-3/4	5	
41000463	5/8	3/4	0.593	2-3/8	6	
41000464	5/8	3/4	0.593	3-3/8	6	
41000466	3/4	1	0.712	2-1/2	6	
41000467	3/4	1	0.712	2-7/8	6	

1 per tube ⚠ WARNING: Cancer - www.P65Warnings.ca.gov

Aqua V Mill - 5 Flute Ball Nose

List No. 9709

Fractional Sizes

Shank Size Matches Cutting Diameter

EDP#	Size	Length of Cut	Overall Length	Flutes
41000246	1/8	1/4	1-1/2	
41000247	1/8	1/2	1-1/2	
41000248	1/8	3/4	2-1/2	
41000249	3/16	5/16	2	
41000250	3/16	9/16	2	
41000251	3/16	3/4	2-1/2	
41000252	1/4	3/8	2	
41000253	1/4	3/4	2-1/2	5
41000254	1/4	1-1/8	3	
41000255	5/16	7/16	2	
41000256	5/16	13/16	2-1/2	
41000257	5/16	1-1/4	3	
41000258	3/8	1/2	2	
41000259	3/8	1	2-1/2	
41000260	3/8	1-1/4	3	

EDP#	Size	Length of Cut	Overall Length	Flutes
41000261	3/8	1-5/8	3-1/2	
41000262	3/8	1-5/8	6	
41000263	1/2	5/8	2-1/2	
41000264	1/2	1	3	
41000265	1/2	1-1/4	3	
41000266	1/2	1-5/8	4	
41000267	1/2	1-5/8	6	
41000268	5/8	3/4	3	5
41000269	5/8	1-5/8	3-1/2	
41000270	5/8	2-1/8	4	
41000271	5/8	2-1/8	6	
41000272	3/4	1	3	
41000273	3/4	1-5/8	4	
41000274	3/4	2-3/8	5	
41000275	3/4	2-3/8	6	

List No. 9710

Metric Sizes

EDP#	Size	Length of Cut	Overall Length	Flutes
41000053	3	8	57	
41000054	4	11	57	
41000055	5	11	57	
41000056	6	13	57	
41000057	8	19	70	5
41000058	10	22	90	
41000059	12	26	90	
41000060	16	32	100	
41000061	18	38	100	
41000062	20	45	100	

1 per tube

⚠ WARNING: Cancer - www.P65Warnings.ca.gov

Standard Milling Conditions

Aqua V Mill 4 & 5 Flute Series

List No. 9701, 9702, 9703, 9704, 9705, 9706, 9707, 9708, 9709, 9710, 9727

Profile Roughing

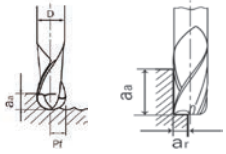
Mill Dia.	Radial WOC		Work Material								
			Cast Irons	Carbon Steel (1018/1020	Alloy Steels 4130/4140	Tool Steels < 40 HRC	Stainless Steels 400 series	Stainless Steels 300 series	Stainless Steels PH	Titanium	High Temp Alloys
			425-475 SFM	400-450 SFM	350-400 SFM	350-400 SFM	350-400 SFM	300-350 SFM	275-325 SFM	225-275 SFM	75-125 SFM
3	Ar	RPM	14550	13750	12150	12150	12150	10500	9700	8100	3250
	5%		0.0023	0.0023	0.0018	0.0015	0.0015	0.0018	0.0015	0.0015	0.0015
	10%	IPT	0.0016	0.0016	0.0013	0.0011	0.0011	0.0013	0.0011	0.0011	0.0011
	30%		0.0009	0.0009	0.0007	0.0006	0.0006	0.0007	0.0006	0.0006	0.0006
1/8	Ar	RPM	13750	13000	11450	11450	11450	9900	9200	7650	3050
	5%		0.0023	0.0023	0.0018	0.0018	0.0018	0.0018	0.0015	0.0015	0.0018
	10%	IPT	0.0016	0.0016	0.0013	0.0013	0.0013	0.0013	0.0011	0.0011	0.0013
	30%		0.0009	0.0009	0.0007	0.0007	0.0007	0.0007	0.0006	0.0006	0.0007
4	Ar	RPM	10900	10300	9100	9100	9100	7900	7300	6100	2400
	5%		0.0028	0.0028	0.0023	0.0020	0.0020	0.0023	0.0018	0.0018	0.0023
	10%	IPT	0.0020	0.0020	0.0016	0.0014	0.0014	0.0016	0.0013	0.0013	0.0016
	30%		0.0011	0.0011	0.0009	0.0008	0.0008	0.0009	0.0007	0.0007	0.0009
3/16	Ar	RPM	9150	8700	7650	7650	7650	6600	6100	5100	2000
	5%		0.0033	0.0033	0.0028	0.0025	0.0025	0.0028	0.0023	0.0023	0.0025
	10%	IPT	0.0023	0.0023	0.0020	0.0018	0.0018	0.0020	0.0016	0.0016	0.0018
	30%		0.0013	0.0013	0.0011	0.0010	0.0010	0.0011	0.0009	0.0009	0.0010
5	Ar	RPM	8750	8250	7300	7300	7300	6300	5800	4850	1950
	5%		0.0033	0.0033	0.0028	0.0028	0.0028	0.0030	0.0023	0.0025	0.0028
	10%	IPT	0.0023	0.0023	0.0020	0.0020	0.0020	0.0022	0.0016	0.0018	0.0020
	30%		0.0013	0.0013	0.0011	0.0011	0.0011	0.0012	0.0009	0.0010	0.0011
6	Ar	RPM	7300	6900	6100	6100	6100	5250	4850	4050	1600
	5%		0.0038	0.0038	0.0033	0.0033	0.0033	0.0035	0.0028	0.0028	0.0033
	10%	IPT	0.0027	0.0027	0.0023	0.0023	0.0023	0.0025	0.0020	0.0020	0.0023
	30%		0.0015	0.0015	0.0013	0.0013	0.0013	0.0014	0.0011	0.0011	0.0013
1/4	Ar	RPM	6900	6500	5700	5700	5700	5000	4600	3800	1500
	5%		0.0040	0.0040	0.0035	0.0033	0.0033	0.0038	0.0030	0.0030	0.0035
	10%	IPT	0.0029	0.0029	0.0025	0.0023	0.0023	0.0027	0.0022	0.0022	0.0025
	30%		0.0016	0.0016	0.0014	0.0013	0.0013	0.0015	0.0012	0.0012	0.0014
5/16	Ar	RPM	5500	5200	4600	4600	4600	4000	3700	3050	1200
	5%		0.0048	0.0048	0.0043	0.0043	0.0043	0.0045	0.0035	0.0038	0.0043
	10%	IPT	0.0034	0.0034	0.0031	0.0031	0.0031	0.0032	0.0025	0.0027	0.0031
	30%		0.0019	0.0019	0.0017	0.0017	0.0017	0.0018	0.0014	0.0015	0.0017
8	Ar	RPM	5500	5200	4600	4600	4600	4000	3700	3050	1200
	5%		0.0048	0.0048	0.0043	0.0043	0.0043	0.0045	0.0035	0.0038	0.0043
	10%	IPT	0.0034	0.0034	0.0031	0.0031	0.0031	0.0032	0.0025	0.0027	0.0031
	30%		0.0019	0.0019	0.0017	0.0017	0.0017	0.0018	0.0014	0.0015	0.0017
3/8	Ar	RPM	4600	4300	3800	3800	3800	3300	3050	2550	1000
	5%		0.0058	0.0058	0.0053	0.0050	0.0050	0.0055	0.0040	0.0045	0.0050
	10%	IPT	0.0041	0.0041	0.0038	0.0036	0.0036	0.0040	0.0029	0.0032	0.0036
	30%		0.0023	0.0023	0.0021	0.0020	0.0020	0.0022	0.0016	0.0018	0.0020
10	Ar	RPM	4350	4100	3600	3600	3600	3150	2900	2400	970
	5%		0.0060	0.0060	0.0055	0.0053	0.0053	0.0058	0.0043	0.0048	0.0053
	10%	IPT	0.0043	0.0043	0.0040	0.0038	0.0038	0.0041	0.0031	0.0034	0.0038
	30%		0.0024	0.0024	0.0022	0.0021	0.0021	0.0023	0.0017	0.0019	0.0021
7/16	Ar	RPM	3900	3700	3300	3300	3300	2800	2600	2200	870
	5%		0.0065	0.0065	0.0060	0.0058	0.0058	0.0065	0.0048	0.0053	0.0060
	10%	IPT	0.0047	0.0047	0.0043	0.0041	0.0041	0.0047	0.0034	0.0038	0.0043
	30%		0.0026	0.0026	0.0024	0.0023	0.0023	0.0026	0.0019	0.0021	0.0024
12	Ar	RPM	3600	3400	3000	3000	3000	2600	2400	2000	800
	5%		0.0070	0.0070	0.0065	0.0063	0.0063	0.0070	0.0050	0.0055	0.0065
	10%	IPT	0.0050	0.0050	0.0047	0.0045	0.0045	0.0050	0.0036	0.0040	0.0047
	30%		0.0028	0.0028	0.0026	0.0025	0.0025	0.0028	0.0020	0.0022	0.0026
1/2	Ar	RPM	3400	3250	2850	2850	2850	2500	2300	1900	760
	5%		0.0073	0.0073	0.0068	0.0065	0.0065	0.0073	0.0055	0.0060	0.0068
	10%	IPT	0.0052	0.0052	0.0049	0.0047	0.0047	0.0052	0.0040	0.0043	0.0049
	30%		0.0029	0.0029	0.0027	0.0026	0.0026	0.0029	0.0022	0.0024	0.0027
9/16	Ar	RPM	3050	2900	2550	2550	2550	2200	2000	1700	680
	5%		0.0083	0.0083	0.0078	0.0075	0.0075	0.0083	0.0060	0.0063	0.0075
	10%	IPT	0.0059	0.0059	0.0056	0.0054	0.0054	0.0059	0.0043	0.0045	0.0054
	30%		0.0033	0.0033	0.0031	0.0030	0.0030	0.0033	0.0024	0.0025	0.0030
5/8	Ar	RPM	2750	2600	2300	2300	2300	2000	1800	1500	600
	5%		0.0090	0.0090	0.0085	0.0083	0.0083	0.0093	0.0068	0.0070	0.0085
	10%	IPT	0.0065	0.0065	0.0061	0.0059	0.0059	0.0067	0.0049	0.0050	0.0061
	30%		0.0036	0.0036	0.0034	0.0033	0.0033	0.0037	0.0027	0.0028	0.0034
16	Ar	RPM	2750	2600	2300	2300	2300	2000	1800	1500	600
	5%		0.0090	0.0090	0.0085	0.0083	0.0083	0.0093	0.0068	0.0070	0.0085
	10%	IPT	0.0065	0.0065	0.0061	0.0059	0.0059	0.0067	0.0049	0.0050	0.0061
	30%		0.0036	0.0036	0.0034	0.0033	0.0033	0.0037	0.0027	0.0028	0.0034
3/4	Ar	RPM	2300	2150	1900	1900	1900	1650	1500	1300	500
	5%		0.0108	0.0108	0.0103	0.0098	0.0098	0.0110	0.0080	0.0083	0.0103
	10%	IPT	0.0077	0.0077	0.0074	0.0070	0.0070	0.0079	0.0058	0.0059	0.0074
	30%		0.0043	0.0043	0.0041	0.0039	0.0039	0.0044	0.0032	0.0033	0.0041
20	Ar	RPM	2200	2050	1800	1800	1800	1550	1450	1200	480
	5%		0.0113	0.0113	0.0108	0.0103	0.0103	0.0115	0.0083	0.0085	0.0108
	10%	IPT	0.0081	0.0081	0.0077	0.0074	0.0074	0.0083	0.0059	0.0061	0.0077
	30%		0.0045	0.0045	0.0043	0.0041	0.0041	0.0046	0.0033	0.0034	0.0043

Depth Of Cut = Aa

For applications with radial engagement > 15% of tool diameter, please use a max 1.5XD for depth of cut.

D: Dia. Of Mill

Side Milling



- For slotting, it is recommended to use Aqua V Mill 4 Flute. Please refer to slotting speed/feed chart.
- For Entry, it is recommended to reduce RPM and IPT by 50%.
- When using long reach, neck relieved tools, decrease width of cut and feed rate by 50%.
- Adjust milling condition when unusual vibration or sound occurs.
- For finishing parameters, please use 0.01XD WOC, max SFM shown on chart, and IPT value shown at 30% engagement.
- If assistance is needed please reach out to the cutting tools technical team.

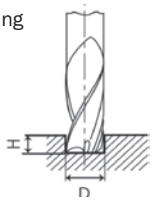
Standard Milling Conditions

Aqua V Mill 4 Flute Series List No. 9701, 9702, 9703, and 9704

Slotting

Mill Diameter		Work Material								
		Cast Irons	Carbon Steel 1018/1020	Medium Alloy Steels 4130/4140	Tool Steels <40 HRC	Stainless Steels 400 series	Stainless Steels 300 series	Stainless Steels PH	Titanium	High Temp Alloys
		325-375 SFM	325-375 SFM	275-325 SFM	275-325 SFM	275-325 SFM	250-300 SFM	225-275 SFM	225-275 SFM	60-80 SFM
3	RPM	11300	11300	9700	9700	9700	8900	8100	8100	1950
	IPT	0.0005	0.0006	0.0006	0.0006	0.0006	0.0006	0.0005	0.0005	0.0005
1/8	RPM	10700	10700	9150	8400	8400	8400	7650	7650	1850
	IPT	0.0006	0.0007	0.0006	0.0006	0.0006	0.0007	0.0005	0.0005	0.0005
4	RPM	8500	8500	7300	7300	7300	6700	6700	6100	1450
	IPT	0.0007	0.0008	0.0008	0.0008	0.0008	0.0008	0.0007	0.0007	0.0007
3/16	RPM	7100	7100	6100	6100	6100	5600	5100	5100	1200
	IPT	0.0008	0.0010	0.0009	0.0009	0.0009	0.0010	0.0008	0.0008	0.0008
5	RPM	6800	6800	5800	5800	5800	5350	4850	4850	1150
	IPT	0.0008	0.0011	0.0009	0.0009	0.0009	0.0011	0.0008	0.0008	0.0008
6	RPM	5650	5650	4850	4850	4850	4500	4050	4050	970
	IPT	0.0011	0.0013	0.0011	0.0011	0.0011	0.0013	0.0010	0.0010	0.0010
1/4	RPM	5350	5350	4600	4600	4600	4200	3800	3800	920
	IPT	0.0011	0.0013	0.0011	0.0011	0.0011	0.0013	0.0010	0.0010	0.0010
5/16	RPM	4300	4300	3700	3700	3700	3350	3050	3050	730
	IPT	0.0014	0.0017	0.0015	0.0015	0.0015	0.0017	0.0013	0.0013	0.0013
8	RPM	4300	4300	3700	3700	3700	3350	3050	3050	730
	IPT	0.0014	0.0017	0.0015	0.0015	0.0015	0.0017	0.0013	0.0013	0.0013
3/8	RPM	3550	3550	3050	3050	3050	2800	2550	2550	610
	IPT	0.0017	0.0020	0.0018	0.0018	0.0018	0.0020	0.0015	0.0016	0.0016
10	RPM	3400	3400	2900	2900	2900	2650	2400	2400	580
	IPT	0.0018	0.0021	0.0019	0.0019	0.0019	0.0021	0.0016	0.0016	0.0016
7/16	RPM	3050	3050	2600	2600	2600	2400	2200	2200	520
	IPT	0.0019	0.0023	0.0021	0.0021	0.0021	0.0023	0.0018	0.0018	0.0018
12	RPM	2800	2800	2400	2400	2400	2200	2000	2000	480
	IPT	0.0021	0.0025	0.0023	0.0023	0.0023	0.0025	0.0019	0.0019	0.0020
1/2	RPM	2650	2650	2300	2300	2300	2100	1900	1900	460
	IPT	0.0022	0.0026	0.0024	0.0024	0.0024	0.0026	0.0020	0.0020	0.0021
9/16	RPM	2400	2400	2000	2000	2000	1850	1700	1700	400
	IPT	0.0025	0.0030	0.0027	0.0027	0.0027	0.0030	0.0023	0.0023	0.0024
5/8	RPM	2150	2150	1800	1800	1800	1700	1500	1500	370
	IPT	0.0028	0.0033	0.0030	0.0030	0.0030	0.0033	0.0025	0.0025	0.0026
16	RPM	2150	2150	1800	1800	1800	1700	1500	1500	370
	IPT	0.0028	0.0033	0.0030	0.0030	0.0030	0.0033	0.0025	0.0025	0.0026
3/4	RPM	1800	1800	1500	1500	1500	1400	1250	1250	310
	IPT	0.0033	0.0039	0.0036	0.0036	0.0036	0.0039	0.0030	0.0030	0.0031
20	RPM	1700	1700	1450	1450	1450	1350	1200	1200	290
	IPT	0.0035	0.0041	0.0038	0.0038	0.0038	0.0041	0.0032	0.0032	0.0033
DOC	H	0.5D			0.25D					0.15D
	D	1.0D								

D: Dia. Of Mill Slotting



- Adjust milling condition when unusual vibration or sound occurs.
- When using long reach tools, decrease depth of cut and feed rate by 50%.
- If assistance is needed please reach out to the cutting tools technical team.

Aqua Mill Hard

List No. 9711

Fractional Sizes

Shank Size Matches Cutting Diameter

EDP#	Cutting Diameter	Length of Cut	Overall Length	Flutes
41000276	1/8	3/8	1-1/2	6
41000277	3/16	7/16	2	
41000278	1/4	5/8	2-1/2	
41000279	5/16	13/16	2-1/2	
41000280	3/8	1	3	
41000281	1/2	1-1/8	3	
41000282	5/8	1-1/2	4	8
41000283	3/4	1-3/4	4	

List No. 9712

Metric Sizes

EDP#	Cutting Diameter	Length of Cut	Overall Length	Flutes
41000063	3	8	50	6
41000064	4	11	50	
41000065	5	13	50	
41000066	6	13	50	
41000067	8	19	63	
41000068	10	22	70	
41000069	12	26	75	
41000070	16	32	93	8
41000071	20	38	150	

1 per tube

⚠ WARNING: Cancer - www.P65Warnings.ca.gov

Aqua Mill Hard Corner Radius

List No. 9713

Fractional Sizes

Shank Size Matches Cutting Diameter

EDP#	Cutting Diameter	Length of Cut	Overall Length	0.015 CR	0.030 CR	0.060 CR	Flutes
41000284	1/8	3/8	1-1/2	X			
41000285	3/16	7/16	2	X			
41000586	3/16	7/16	2			X	
41000286	1/4	5/8	2-1/2	X			
41000587	1/4	5/8	2-1/2			X	6
41000287	5/16	13/16	2-1/2	X			
41000288	3/8	1	3		X		
41000289	1/2	1-1/8	3		X		
41000588	1/2	1-1/8	3			X	
41000403	3/4	1-3/4	4			X	8

List No. 9714

Metric Sizes

EDP#	Cutting Diameter	Length of Cut	Overall Length	0.3 CR	0.5 CR	Flutes
41000072	3	8	50	X		
41000074	4	11	50	X		
41000076	5	13	63	X		
41000078	6	13	63	X		6
41000080	8	19	65	X		
41000083	10	22	70		X	
41000085	12	26	75		X	

1 per tube

⚠ WARNING: Cancer - www.P65Warnings.ca.gov

Aqua Mill Hard Ball Nose

List No. 9715 Fractional Sizes Shank Size Matches Cutting Diameter

EDP#	Cutting Diameter	Length of Cut	Overall Length	Flutes
41000298	1/8	3/16	2-1/2	2
41000299	3/16	9/32	2-1/2	
41000300	1/4	3/8	2-1/2	
41000301	5/16	15/32	2-1/2	
41000302	3/8	9/16	3	
41000303	1/2	5/8	4	

List No. 9716 Metric Sizes

EDP#	Cutting Diameter	Length of Cut	Overall Length	Flutes
41000093	3	3	50	2
41000094	6	6	76	
41000095	8	8	90	
41000096	10	10	100	
41000097	12	12	100	
41000098	16	16	100	

1 per tube

⚠ WARNING: Cancer - www.P65Warnings.ca.gov

Aqua Hard Mill Corner Radius - Neck Relief

Carbide | AQ Mill | h6 | Variable V | > 1/2, >12

List No. 9729 Fractional Sizes Shank Size Matches Cutting Diameter

EDP#	Cutting Diameter	Length of Cut	Neck Length	Overall Length	0.015 CR	Flutes
41000292	3/16	7/32	1	3	X	6
41000293	1/4	9/32	1	3	X	
41000294	3/8	15/32	1-1/4	3-1/2	X	
41000295	1/2	5/8	2-1/4	4	X	

List No. 9730 Fractional Sizes

EDP#	Cutting Diameter	Length of Cut	Neck Length	Overall Length	0.3 CR	Flutes
41000088	5	8	15	63	X	6
41000089	6	9	20	63	X	
41000091	10	15	30	100	X	
41000092	12	18	35	100	X	

1 per tube ⚠ WARNING: Cancer - www.P65Warnings.ca.gov

Standard Milling Conditions
Conventional

List No: 9711, 9712, 9713, 9714, 9729, 9730

Mill Diameter		Work Material			
		Hardened Steel 45-55 HRC	Hardened Steel 55-60 HRC	Hardened Steel 60-65 HRC	Hardened Steel 65-70 HRC
		280-320 SFM	220-250 SFM	200-220 SFM	140-160 SFM
3	RPM	10400	8200	7400	5200
	IPT	0.0007	0.0005	0.0005	0.0005
1/8	RPM	9200	7200	6400	4600
	IPT	0.0007	0.0006	0.0006	0.0005
4	RPM	7300	5700	5100	3600
	IPT	0.0010	0.0009	0.0008	0.0008
3/16	RPM	6100	4800	4300	3050
	IPT	0.0014	0.0011	0.0010	0.0010
5	RPM	5800	4500	4100	2900
	IPT	0.0014	0.0011	0.0010	0.0010
6	RPM	5200	4100	3700	2600
	IPT	0.0016	0.0013	0.0012	0.0012
1/4	RPM	4900	3850	3500	2450
	IPT	0.0017	0.0014	0.0013	0.0013
5/16	RPM	3900	3050	2800	1950
	IPT	0.0022	0.0017	0.0016	0.0016
8	RPM	3900	3050	2800	1950
	IPT	0.0022	0.0017	0.0016	0.0016
3/8	RPM	3250	2600	2300	1650
	IPT	0.0026	0.0020	0.0019	0.0019
10	RPM	3100	2450	2200	1550
	IPT	0.0028	0.0022	0.0020	0.0020
12	RPM	2600	2050	1850	1300
	IPT	0.0033	0.0026	0.0024	0.0024
1/2	RPM	2450	1950	1750	1250
	IPT	0.0035	0.0027	0.0025	0.0025
5/8	RPM	1950	1550	1400	980
	IPT	0.0041	0.0032	0.0030	0.0029
16	RPM	1950	1550	1400	980
	IPT	0.0041	0.0032	0.0030	0.0029
3/4	RPM	1650	1300	1150	820
	IPT	0.0045	0.0036	0.0032	0.0032
20	RPM	1450	1150	1000	780
	IPT	0.0046	0.0038	0.0034	0.0034
Depth of Cut	Aa	1-1.5D			
	Ar	0.07D		0.02D	
	H	0.07D		0.05D - Max 0.5mm	

- Recommended to run dry with air blow only.
- When altering depth of cut or speed, it is important to read chips in order to ensure that heat is coming off in chip.
- Adjust milling condition when unusual vibration or sound occurs.
- When using long reach tools, decrease the width of cut and feed rate by 50%.
- Conventional conditions are recommended for finishing

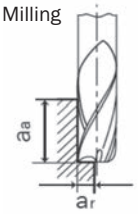
Standard Milling Conditions
High Speed

List No: 9711, 9712, 9713, 9714, 9729, 9730

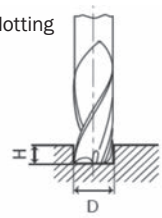
Mill Diameter		Work Material		
		Hardened Steel 45-55 HRC	Hardened Steel 55-60 HRC	Hardened Steel 60-65 HRC
		800-1000 SFM	600-740 SFM	400-450 SFM
3	RPM	32000	24000	13900
	IPT	0.0010	0.0007	0.0008
1/8	RPM	27500	20500	13150
	IPT	0.0012	0.0009	0.0009
4	RPM	24000	18000	10400
	IPT	0.0016	0.0012	0.0013
3/16	RPM	20100	15100	8700
	IPT	0.0020	0.0015	0.0015
5	RPM	19200	14400	8300
	IPT	0.0021	0.0015	0.0016
6	RPM	16000	12000	6950
	IPT	0.0024	0.0018	0.0018
1/4	RPM	15100	11500	6600
	IPT	0.0025	0.0018	0.0019
5/16	RPM	12000	9000	5250
	IPT	0.0032	0.0023	0.0025
8	RPM	12000	9000	5200
	IPT	0.0032	0.0023	0.0025
3/8	RPM	10000	7500	4400
	IPT	0.0038	0.0028	0.0030
10	RPM	9600	7200	4200
	IPT	0.0040	0.0029	0.0031
12	RPM	8000	6000	3500
	IPT	0.0048	0.0035	0.0039
1/2	RPM	7550	5750	3300
	IPT	0.0050	0.0037	0.0042
5/8	RPM	6000	4500	2600
	IPT	0.0059	0.0044	0.0050
16	RPM	6000	4500	2600
	IPT	0.0059	0.0044	0.0050
3/4	RPM	5000	3750	2200
	IPT	0.0063	0.0046	0.0055
20	RPM	4800	3600	2100
	IPT	0.0067	0.0049	0.0058
Depth of Cut	Aa	1-1.5D		
	Ar	0.03D		0.02D

D: Dia. Of Mill

Side Milling



Slotting

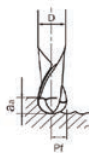


- Recommended to run dry with air blow only.
- When altering depth of cut or speed, it is important to read chips in order to ensure that heat is coming off in chip.
- Adjust milling condition when unusual vibration or sound occurs.
- When using long reach tools, decrease the width of cut and feed rate by 50%.
- Conventional conditions are recommended for finishing

Standard Milling Conditions
Roughing List No. 9715, 9716

Mill Diameter		Work Material		
		Hardened Steel 45-55 HRC	Hardened Steel 55-60 HRC	Hardened Steel 60-65 HRC
		320-350 SFM	250-280 SFM	200-250 SFM
3	RPM	11000	8600	7400
	IPT	0.0016	0.0012	0.0011
1/8	RPM	10400	8100	6900
	IPT	0.0017	0.0013	0.0012
4	RPM	8250	6450	5600
	IPT	0.0022	0.0018	0.0016
3/16	RPM	6900	5400	4700
	IPT	0.0026	0.0020	0.0018
5	RPM	660	5150	4450
	IPT	0.0027	0.0021	0.0019
6	RPM	5500	4300	3700
	IPT	0.0032	0.0025	0.0023
1/4	RPM	5200	4050	3500
	IPT	0.0034	0.0026	0.0024
5/16	RPM	4150	3200	2800
	IPT	0.0042	0.0033	0.0030
8	RPM	4150	3200	2800
	IPT	0.0042	0.0033	0.0030
3/8	RPM	3500	2700	2350
	IPT	0.0049	0.0040	0.0036
10	RPM	3300	2600	2250
	IPT	0.0050	0.0042	0.0038
12	RPM	2800	2150	1850
	IPT	0.0060	0.0050	0.0045
1/2	RPM	2600	2000	1800
	IPT	0.0063	0.0053	0.0048
5/8	RPM	2100	1600	1400
	IPT	0.0079	0.0066	0.0060
16	RPM	2100	1600	1400
	IPT	0.0079	0.0066	0.0060
3/4	RPM	1750	1350	1200
	IPT	0.0080	0.0067	0.0060
20	RPM	1650	1300	1100
	IPT	0.0082	0.0069	0.0062
Depth of Cut	Aa	0.025"-0.035"	0.015"-0.025"	
	Pf	0.25D		

D: Dia. Of Mill
R: Ball Radius



- Recommended to run dry with air blow.
- When altering depth of cut or speed, it is important to read chips in order to ensure that the heat is being removed in the chip.
- Adjust milling condition when unusual vibration or sound occurs.
- When using long reach tools, decrease the width of cut and feed rate by 50%

Standard Milling Conditions
High Speed Finishing List No. 9715, 9716

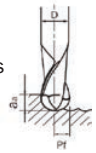
Mill Diameter		Work Material		
		Hardened Steel 45-55 HRC	Hardened Steel 55-60 HRC	Hardened Steel 60-65 HRC
		800-1000 SFM	700-900 SFM	600-800 SFM
3	RPM	29100	25900	22600
	IPT	0.0024	0.0014	0.0014
1/8	RPM	27500	24500	21400
	IPT	0.0025	0.0015	0.0015
4	RPM	21800	19400	17000
	IPT	0.0028	0.0016	0.0016
3/16	RPM	18300	16300	14300
	IPT	0.0028	0.0017	0.0017
5	RPM	17500	15500	13600
	IPT	0.0029	0.0017	0.0017
6	RPM	14550	13000	11300
	IPT	0.0031	0.0019	0.0019
1/4	RPM	13750	12200	10700
	IPT	0.0032	0.0019	0.0019
5/16	RPM	11000	9800	8550
	IPT	0.0034	0.0021	0.0021
8	RPM	10900	9700	8500
	IPT	0.0034	0.0021	0.0021
3/8	RPM	9150	8150	7100
	IPT	0.0038	0.0024	0.0024
10	RPM	8700	7800	6800
	IPT	0.0039	0.0024	0.0024
12	RPM	7300	6450	5650
	IPT	0.0041	0.0027	0.0027
1/2	RPM	6900	6100	5350
	IPT	0.0042	0.0028	0.0028
5/8	RPM	5500	4900	4300
	IPT	0.0049	0.0033	0.0033
16	RPM	5500	4900	4300
	IPT	0.0049	0.0033	0.0033
3/4	RPM	4600	4100	3550
	IPT	0.0056	0.0037	0.0037
20	RPM	4400	3900	3400
	IPT	0.0058	0.0039	0.0039
Depth of Cut	Aa	0.025"-0.035"	0.015"-0.025"	
	Pf	0.005"		

Standard Milling Conditions
Low Speed Finishing List No. 9715, 9716

Mill Diameter		Work Material		
		Hardened Steel 45-55 HRC	Hardened Steel 55-60 HRC	Hardened Steel 60-65 HRC
		245-275 SFM	150-180 SFM	120-150 SFM
3	RPM	8400	5350	4350
	IPT	0.0007	0.0006	0.0006
1/8	RPM	7950	5050	4100
	IPT	0.0007	0.0006	0.0006
4	RPM	6300	4000	3300
	IPT	0.0010	0.0007	0.0007
3/16	RPM	5300	3400	2750
	IPT	0.0010	0.0009	0.0009
5	RPM	5050	3200	2600
	IPT	0.0011	0.0009	0.0009
6	RPM	4200	2650	2200
	IPT	0.0013	0.0010	0.0010
1/4	RPM	4000	2500	2050
	IPT	0.0013	0.0011	0.0011
5/16	RPM	3200	2000	1650
	IPT	0.0016	0.0014	0.0014
8	RPM	3200	2000	1650
	IPT	0.0016	0.0014	0.0014
3/8	RPM	2650	1700	1400
	IPT	0.0019	0.0016	0.0016
10	RPM	2500	1600	1300
	IPT	0.0020	0.0017	0.0017
12	RPM	2100	1350	1100
	IPT	0.0024	0.0020	0.0020
1/2	RPM	2000	1250	1050
	IPT	0.0025	0.0021	0.0021
5/8	RPM	1600	1000	830
	IPT	0.0031	0.0026	0.0026
16	RPM	1600	1000	830
	IPT	0.0031	0.0026	0.0026
3/4	RPM	1300	850	700
	IPT	0.0037	0.0031	0.0031
20	RPM	1250	800	650
	IPT	0.0039	0.0033	0.0033
Depth of Cut	Aa	0.005"		
	Pf	0.005"		

- Recommended to run dry with air blow.
- When altering depth of cut or speed, it is important to read chips in order to ensure that the heat is being removed in the chip.
- Adjust milling condition when unusual vibration or sound occurs.
- When using long reach tools, decrease the width of cut and feed rate by 50%

D: Dia. Of Mill
R: Ball Radius



ALH Mill

List No. 9717 Fractional Sizes Shank Size Matches Cutting Diameter

EDP#	Cutting Diameter	Length of Cut	Overall Length	Flutes
41000304	1/8	1/4	1-1/2	3
41000305	1/8	3/8	2	
41000306	1/8	1/2	2-1/2	
41000515	1/8	3/4	2-1/2	
41000307	3/16	5/16	2	
41000308	3/16	9/16	2-1/2	
41000516	3/16	3/4	2-1/2	
41000309	1/4	3/8	2	
41000310	1/4	1/2	2-1/2	
41000311	1/4	5/8	2-1/2	
41000312	1/4	1	3	
41000517	1/4	1-1/4	3	
41000313	5/16	7/16	2	
41000314	5/16	5/8	2-1/2	
41000315	5/16	1	3	
41000316	5/16	1-1/4	3	
41000317	3/8	1/2	2	
41000518	3/8	3/4	2-1/2	

EDP#	Cutting Diameter	Length of Cut	Overall Length	Flutes
41000318	3/8	1	3	3
41000319	3/8	1-1/4	3-1/2	
41000320	3/8	1-1/2	4	
41000321	3/8	2	4	
41000322	1/2	5/8	2-1/2	
41000323	1/2	1	3	
41000324	1/2	1-1/4	3	
41000325	1/2	1-5/8	4	
41000326	1/2	2	4	
41000327	1/2	2-1/2	5	
41000328	5/8	3/4	3	
41000519	5/8	1-1/4	3-1/2	
41000329	5/8	1-5/8	3-1/2	
41000330	5/8	2-1/8	4	
41000331	3/4	1	4	
41000332	3/4	1-5/8	4	
41000333	3/4	2-1/4	5	

List No. 9718 Metric Sizes

EDP#	Cutting Diameter	Length of Cut	Overall Length	Flutes
41000100	3	8	57	3
41000101	4	11	57	
41000102	5	11	57	
41000103	6	13	57	
41000104	8	19	70	
41000105	10	22	70	
41000106	12	26	75	
41000107	12	32	94	
41000108	16	32	90	
41000109	18	38	90	
41000110	20	45	100	

1 per tube

⚠ WARNING: Cancer - www.P65Warnings.ca.gov

ALH Mill Corner Radius

List No. 9719 Fractional Sizes Shank Size Matches Cutting Diameter

EDP#	Cutting Diameter	Length of Cut	Overall Length	0.015 CR	0.20 CR	0.030 CR	0.060 CR	0.090 CR	0.120 CR	Flutes
41000334	1/8	1/4	1-1/2	X						
41000539	1/8	1/4	1-1/2			X				
41000335	1/8	3/8	2	X						
41000540	1/8	3/8	2			X				
41000336	1/8	1/2	2-1/2	X						
41000541	3/16	5/16	2	X						
41000337	3/16	5/16	2			X				
41000542	3/16	9/16	2-1/2	X						
41000338	3/16	9/16	2-1/2			X				
41000543	1/4	3/8	2	X						
41000339	1/4	3/8	2			X				
41000340	1/4	3/8	2				X			
41000544	1/4	1/2	2-1/2	X						
41000341	1/4	1/2	2-1/2			X				
41000545	1/4	1/2	2-1/2				X			
41000546	1/4	1	3	X						
41000345	5/16	7/16	2			X				
41000346	5/16	7/16	2				X			
41000347	5/16	5/8	2-1/2			X				
41000348	5/16	1	3			X				
41000349	5/16	1	3				X			3
41000350	5/16	1-1/4	3			X				
41000547	3/8	1/2	2	X						
41000351	3/8	1/2	2			X				
41000352	3/8	1/2	2				X			
41000548	3/8	1/2	2					X		
41000353	3/8	1/2	2						X	
41000549	3/8	1	3	X						
41000402	3/8	1	3		X					
41000354	3/8	1	3			X				
41000355	3/8	1	3				X			
41000550	3/8	1	3					X		
41000356	3/8	1	3						X	
41000357	3/8	1-1/4	3-1/2				X			
41000358	3/8	1-1/2	4				X			
41000359	3/8	2	4			X				
41000551	1/2	5/8	2-1/2	X						
41000360	1/2	5/8	2-1/2			X				
41000361	1/2	5/8	2-1/2				X			
41000552	1/2	5/8	2-1/2					X		
41000362	1/2	5/8	2-1/2						X	

(cont. on next page)

ALH Mill Corner Radius *(cont.)*

List No. 9719

Fractional Sizes Shank Size Matches Cutting Diameter

EDP#	Cutting Diameter	Length of Cut	Overall Length	0.015 CR	0.20 CR	0.030 CR	0.060 CR	0.090 CR	0.120 CR	Flutes
41000553	1/2	1	3	X						
41000363	1/2	1	3			X				
41000364	1/2	1	3				X			
41000554	1/2	1	3					X		
41000365	1/2	1	3						X	
41000366	1/2	1-1/4	3			X				
41000584	1/2	1-1/4	3					X		
41000367	1/2	1-5/8	4			X				
41000368	1/2	2	4			X				
41000369	1/2	2-1/2	5			X				
41000555	5/8	3/4	3			X				
41000370	5/8	3/4	3				X			
41000556	5/8	3/4	3					X		
41000371	5/8	3/4	3						X	3
41000372	5/8	1-5/8	3-1/2				X			
41000557	5/8	1-5/8	3-1/2					X		
41000373	5/8	1-5/8	3-1/2						X	
41000374	5/8	2-1/8	4			X				
41000375	5/8	2-1/2	5			X				
41000376	3/4	1	4				X			
41000558	3/4	1	4					X		
41000377	3/4	1	4						X	
41000378	3/4	1-5/8	4				X			
41000379	3/4	1-5/8	4						X	
41000380	3/4	2-1/4	5			X				
41000381	3/4	3-1/4	6			X				

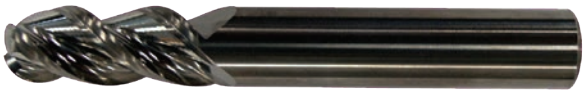
List No. 9720

Metric Sizes

EDP#	Cutting Diameter	Length of Cut	Overall Length	0.3 CR	0.5 CR	1.0 CR	2.0 CR	Flutes
41000111	3	8	57	X				
41000112	4	11	57	X				
41000113	5	11	57	X				
41000114	6	13	57	X				
41000115	6	13	57		X			
41000116	8	19	70		X			
41000117	8	19	70			X		
41000118	10	22	70		X			3
41000119	10	22	70			X		
41000120	12	26	75		X			
41000121	12	26	75			X		
41000123	16	32	90			X		
41000124	16	32	90				X	
41000126	18	38	90				X	
41000128	20	45	100				X	

1 per tube ⚠ WARNING: Cancer - www.P65Warnings.ca.gov

ALH Mill Ball Nose



List No. 9721 Fractional Sizes Shank Size Matches Cutting Diameter

EDP#	Cutting Diameter	Length of Cut	Overall Length	Flutes
41000382	1/8	1/4	1-1/2	3
41000383	1/8	3/8	2	
41000384	1/8	1/2	2-1/2	
41000385	3/16	3/8	2	
41000386	3/16	3/4	2-1/2	
41000387	3/16	1	3	
41000388	1/4	3/8	2	
41000389	1/4	3/4	2-1/2	
41000390	1/4	1	3	
41000391	5/16	13/16	2-1/2	
41000392	3/8	1/2	2	
41000393	3/8	1	2-1/2	
41000394	3/8	1-1/2	3-1/2	
41000395	1/2	5/8	2-1/2	
41000396	1/2	1	3	
41000397	1/2	1-1/4	3-1/2	
41000398	5/8	1	3	
41000399	5/8	1-5/8	4-1/2	
41000400	3/4	1	3	
41000401	3/4	1-5/8	4	

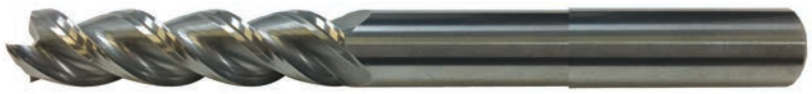
List No. L9722 Metric Sizes

EDP#	Cutting Diameter	Length of Cut	Overall Length	Flutes
41000129	3	8	57	3
41000130	4	11	57	
41000131	5	11	57	
41000132	6	13	57	
41000133	8	19	70	
41000134	10	22	70	
41000135	12	26	75	
41000136	16	32	90	
41000137	18	38	100	

1 per tube

⚠ WARNING: Cancer - www.P65Warnings.ca.gov

ALH Mill - Neck Relief



List No. 9723 Fractional Sizes Shank Size Matches Cutting Diameter

EDP#	Cutting Diameter	Length of Cut	Neck Diameter	Neck Length	Overall Length	Flutes
41000520	1/8	5/32	0.118	3/4	3	3
41000521	1/8	5/32	0.118	1	3	
41000522	3/16	7/32	0.178	3/4	3	
41000523	3/16	7/32	0.178	1	3	
41000524	1/4	3/8	0.237	1-1/8	3	
41000525	1/4	3/8	0.237	1-5/8	3	
41000527	3/8	1/2	0.356	1-5/8	3	
41000528	3/8	1/2	0.356	2-1/8	4	
41000530	1/2	5/8	0.475	1-3/4	3-1/2	
41000531	1/2	5/8	0.475	2-1/4	4	
41000532	1/2	5/8	0.475	2-3/4	4-1/2	
41000533	1/2	5/8	0.475	3-3/8	5	
41000535	5/8	3/4	0.593	2-3/8	4	
41000536	5/8	3/4	0.593	3-3/8	6	
41000537	3/4	1	0.712	2-1/2	5	
41000538	3/4	1	0.712	3-3/8	6	

1 per tube

⚠ WARNING: Cancer - www.P65Warnings.ca.gov

ALH Mill Ball Nose - Neck Relief

List No. 9725 Fractional Sizes Shank Size Matches Cutting Diameter

EDP#	Cutting Diameter	Length of Cut	Neck Diameter	Neck Length	Overall Length	Flutes
41000559	1/8	5/32	0.118	3/4	3	
41000560	1/8	5/32	0.118	1	3	
41000561	3/16	7/32	0.178	3/4	3	
41000562	3/16	7/32	0.178	1	3	
41000563	1/4	3/8	0.237	1-1/8	3	
41000564	1/4	3/8	0.237	1-5/8	3	
41000566	3/8	1/2	0.356	1-5/8	3	
41000567	3/8	1/2	0.356	2-1/8	4	3
41000569	1/2	5/8	0.475	1-3/4	3-1/2	
41000570	1/2	5/8	0.475	2-1/4	4	
41000571	1/2	5/8	0.475	2-3/4	4-1/2	
41000573	5/8	3/4	0.593	2-3/8	4	
41000574	5/8	3/4	0.593	3-3/8	6	
41000575	3/4	1	0.712	2	4	
41000576	3/4	1	0.712	3-3/8	6	

1 per tube

⚠ WARNING: Cancer - www.P65Warnings.ca.gov

Standard Milling Conditions
ALH 3 Flute Series
Profile Roughing

List No. 9717, 9718, 9719, 9720, 9721, 9722, 9723, 9725

Mill Dia.	Radial WOC		Work Material		
			Aluminum Alloys 2024, 6061, 7075	Aluminum Cast	Copper Alloys, Brass, Bronze
			950-1050 SFM	650-750 SFM	525-625 SFM
3	Ar	RPM	32300	22600	18600
	5%	IPT	0.0034	0.0030	0.0030
	10%		0.0025	0.0022	0.0022
	25%		0.0017	0.0015	0.0015
	50%		0.0015	0.0013	0.0013
1/8	Ar	RPM	30600	21400	17600
	5%	IPT	0.0037	0.0032	0.0032
	10%		0.0027	0.0023	0.0023
	25%		0.0018	0.0016	0.0016
	50%		0.0016	0.0014	0.0014
4	Ar	RPM	24300	17000	14000
	5%	IPT	0.0046	0.0041	0.0039
	10%		0.0033	0.0030	0.0028
	25%		0.0023	0.0021	0.0020
	50%		0.0020	0.0018	0.0017
3/16	Ar	RPM	20400	14300	11700
	5%	IPT	0.0055	0.0048	0.0048
	10%		0.0040	0.0035	0.0035
	25%		0.0028	0.0024	0.0024
	50%		0.0024	0.0021	0.0021
5	Ar	RPM	19400	13600	11200
	5%	IPT	0.0060	0.0050	0.0050
	10%		0.0043	0.0037	0.0037
	25%		0.0030	0.0025	0.0025
	50%		0.0026	0.0022	0.0022
6	Ar	RPM	16200	11300	9300
	5%	IPT	0.0071	0.0060	0.0060
	10%		0.0052	0.0043	0.0043
	25%		0.0036	0.0030	0.0030
	50%		0.0031	0.0026	0.0026
1/4	Ar	RPM	15300	10700	8800
	5%	IPT	0.0076	0.0064	0.0064
	10%		0.0055	0.0047	0.0047
	25%		0.0038	0.0032	0.0032
	50%		0.0033	0.0028	0.0028
5/16	Ar	RPM	12200	8550	7000
	5%	IPT	0.0094	0.0078	0.0078
	10%		0.0068	0.0057	0.0057
	25%		0.0047	0.0039	0.0039
	50%		0.0041	0.0034	0.0034
8	Ar	RPM	12200	8550	7000
	5%	IPT	0.0094	0.0080	0.0080
	10%		0.0068	0.0058	0.0058
	25%		0.0047	0.0040	0.0040
	50%		0.0041	0.0035	0.0035
3/8	Ar	RPM	10200	7100	5850
	5%	IPT	0.0112	0.0094	0.0094
	10%		0.0082	0.0068	0.0068
	25%		0.0057	0.0047	0.0047
	50%		0.0049	0.0041	0.0041

Mill Dia.	Radial WOC		Work Material		
			Aluminum Alloys 2024, 6061, 7075	Aluminum Cast	Copper Alloys, Brass, Bronze
			950-1050 SFM	650-750 SFM	525-625 SFM
10	Ar	RPM	9700	6800	5600
	5%	IPT	0.0119	0.0099	0.0099
	10%		0.0087	0.0072	0.0072
	25%		0.0060	0.0050	0.0050
	50%		0.0052	0.0043	0.0043
7/16	Ar	RPM	8700	6100	5000
	5%	IPT	0.0133	0.0110	0.0110
	10%		0.0097	0.0080	0.0080
	25%		0.0067	0.0055	0.0055
	50%		0.0058	0.0048	0.0048
12	Ar	RPM	8100	5650	4650
	5%	IPT	0.0142	0.0117	0.0119
	10%		0.0103	0.0085	0.0087
	25%		0.0072	0.0059	0.0060
	50%		0.0062	0.0051	0.0052
1/2	Ar	RPM	7600	5300	4400
	5%	IPT	0.0151	0.0124	0.0126
	10%		0.0110	0.0090	0.0092
	25%		0.0076	0.0062	0.0064
	50%		0.0066	0.0054	0.0055
9/16	Ar	RPM	6800	4800	3900
	5%	IPT	0.0170	0.0140	0.0142
	10%		0.0123	0.0102	0.0103
	25%		0.0085	0.0070	0.0072
	50%		0.0074	0.0061	0.0062
5/8	Ar	RPM	6100	4300	3500
	5%	IPT	0.0190	0.0156	0.0158
	10%		0.0138	0.0113	0.0115
	25%		0.0096	0.0079	0.0080
	50%		0.0083	0.0068	0.0069
16	Ar	RPM	6100	4300	3500
	5%	IPT	0.0190	0.0156	0.0158
	10%		0.0138	0.0113	0.0115
	25%		0.0096	0.0079	0.0080
	50%		0.0083	0.0068	0.0069
3/4	Ar	RPM	5100	3550	2900
	5%	IPT	0.0227	0.0186	0.0190
	10%		0.0165	0.0135	0.0138
	25%		0.0114	0.0094	0.0096
	50%		0.0099	0.0081	0.0083
20	Ar	RPM	4850	3400	2800
	5%	IPT	0.0239	0.0195	0.0200
	10%		0.0173	0.0142	0.0145
	25%		0.0120	0.0098	0.0100
	50%		0.0104	0.0085	0.0087
Depth Of Cut = Aa	If Radial Engagement is > 15% of Tool Diameter, Please Use Max 1.5D				

- For entry, it is recommended to use slotting conditions.
- Adjust milling condition when unusual vibration or sound occurs.
- When using long reach tools, decrease width of cut and feed rate by 50%.
- For Finishing, please use 0.01D WOC, Max SFM shown on chart, and the IPT value for 50% stepover.

Standard Milling Conditions
For Spindle Under 10K RPM
Profile Roughing

List No. 9717, 9718, 9719, 9720, 9721, 9722, 9723, 9725

Mill Diameter	Radial WOC		Work Material		
			Aluminum Alloys 2024, 6061, 7075	Aluminum Cast	Copper Alloys, Brass, Bronze
3	Ar	RPM	10000	10000	10000
	5%	IPT	0.0034	0.0030	0.0030
	10%		0.0025	0.0022	0.0022
	25%		0.0017	0.0015	0.0015
	50%		0.0015	0.0013	0.0013
1/8	Ar	RPM	10000	10000	10000
	5%	IPT	0.0037	0.0032	0.0032
	10%		0.0027	0.0023	0.0023
	25%		0.0018	0.0016	0.0016
	50%		0.0016	0.0014	0.0014
4	Ar	RPM	10000	10000	10000
	5%	IPT	0.0046	0.0041	0.0039
	10%		0.0033	0.0030	0.0028
	25%		0.0023	0.0021	0.0020
	50%		0.0020	0.0018	0.0017
3/16	Ar	RPM	10000	10000	10000
	5%	IPT	0.0055	0.0048	0.0048
	10%		0.0040	0.0035	0.0035
	25%		0.0028	0.0024	0.0024
	50%		0.0024	0.0021	0.0021
5	Ar	RPM	10000	10000	10000
	5%	IPT	0.0060	0.0050	0.0050
	10%		0.0043	0.0037	0.0037
	25%		0.0030	0.0025	0.0025
	50%		0.0026	0.0022	0.0022
6	Ar	RPM	10000	10000	
	5%	IPT	0.0071	0.0060	
	10%		0.0052	0.0043	
	25%		0.0036	0.0030	
	50%		0.0031	0.0026	
1/4	Ar	RPM	10000	10000	
	5%	IPT	0.0076	0.0064	
	10%		0.0055	0.0047	
	25%		0.0038	0.0032	
	50%		0.0033	0.0028	
5/16	Ar	RPM	10000		
	5%	IPT	0.0094		
	10%		0.0068		
	25%		0.0047		
	50%		0.0041		
8	Ar	RPM	10000		
	5%	IPT	0.0094		
	10%		0.0068		
	25%		0.0047		
	50%		0.0041		
3/8	Ar	RPM	10000		
	5%	IPT	0.0112		
	10%		0.0082		
	25%		0.0057		
	50%		0.0049		
Depth Of Cut = Aa			If Radial Engagement is > 15% of Tool Diameter, Please Use Max 1.5D		

- For entry, it is recommended to use slotting conditions.
- Adjust milling condition when unusual vibration or sound occurs.
- When using long reach tools, decrease width of cut and feed rate by 50%.
- For Finishing, please use 0.01D WOC, Max SFM shown on chart, and the IPT value for 50% stepover.

Standard Milling Conditions
ALH 3 Flute Series
Slotting

List No. 9717, 9718, 9719, 9720, 9721, 9722, 9723, 9725

Mill Diameter		Work Material		
		Aluminum Alloys 2024, 6061, 7075	Aluminum Cast	Copper Alloys, Brass, Bronze
		750-850 SFM	450-550 SFM	450-550 SFM
3	RPM	25900	16200	16200
	IPT	0.0014	0.0011	0.0011
1/8	RPM	24500	15300	15300
	IPT	0.0015	0.0011	0.0011
4	RPM	19400	12100	12100
	IPT	0.0019	0.0014	0.0014
3/16	RPM	16300	10200	10200
	IPT	0.0023	0.0017	0.0017
5	RPM	15500	9700	9700
	IPT	0.0024	0.0018	0.0018
6	RPM	12900	8100	8100
	IPT	0.0029	0.0021	0.0021
1/4	RPM	12200	7600	7600
	IPT	0.0030	0.0022	0.0022
5/16	RPM	9700	6100	6100
	IPT	0.0038	0.0028	0.0028
8	RPM	9700	6100	6100
	IPT	0.0038	0.0028	0.0028
3/8	RPM	8150	5100	5100
	IPT	0.0045	0.0033	0.0033
10	RPM	7750	4850	4850
	IPT	0.0047	0.0035	0.0035
7/16	RPM	7000	4350	4350
	IPT	0.0053	0.0039	0.0039
12	RPM	6500	4050	4050
	IPT	0.0057	0.0042	0.0042
1/2	RPM	6100	3800	3800
	IPT	0.0060	0.0044	0.0044
9/16	RPM	5400	3400	3400
	IPT	0.0068	0.0050	0.0050
5/8	RPM	4900	3050	3050
	IPT	0.0075	0.0055	0.0055
16	RPM	4900	3050	3050
	IPT	0.0076	0.0056	0.0056
3/4	RPM	4100	2550	2550
	IPT	0.0090	0.0066	0.0066
20	RPM	3900	2400	2400
	IPT	0.0095	0.0069	0.0069
Depth Of Cut = H		1D		

Standard Milling Conditions
Slotting

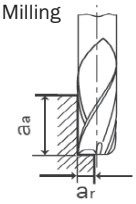
List No. 9717, 9718, 9719, 9720, 9721, 9722, 9723, 9725

Mill Diameter		Work Material		
		Aluminum Alloys 2024, 6061, 7075	Aluminum Cast	Copper Alloys, Brass, Bronze
		750-850 SFM	450-550 SFM	450-550 SFM
3	RPM	10000	10000	10000
	IPT	0.0014	0.0011	0.0011
1/8	RPM	10000	10000	10000
	IPT	0.0015	0.0011	0.0011
4	RPM	10000	10000	10000
	IPT	0.0019	0.0014	0.0014
3/16	RPM	10000	10000	10000
	IPT	0.0023	0.0017	0.0017
5	RPM	10000		
	IPT	0.0024		
6	RPM	10000		
	IPT	0.0029		
1/4	RPM	10000		
	IPT	0.0030		
Depth Of Cut = H		1D		

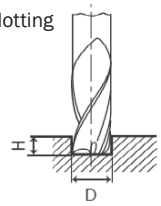
- For entry, it is recommended to use slotting conditions.
- Adjust milling condition when unusual vibration or sound occurs.
- When using long reach tools, decrease width of cut and feed rate by 50%.
- For Finishing, please use 0.01D WOC, Max SFM shown on chart, and the IPT value for 50% stepover.

D: Dia. Of Mill

Side Milling



Slotting



DLC Mill

SERIES WILL BE DISCONTINUED ONCE STOCK IS DEPLETED

List No. 6231HD Fractional sizes

EDP	Diameter of Mill	Shank Diameter	Length of Cut	Overall Length
1315363	1/8	3/8	3/8	2-5/16
1315370	3/16		7/16	
1315386	1/4		5/8	2-7/16
1315392	5/16		3/4	2-1/2
1315408	3/8			
1315414	7/16		1	2-11/16
1315420	1/2	1/2	1-1/4	3-1/4
1315437	5/8	5/8	1-5/8	3-3/4
1315443	3/4	3/4		4-1/8
1315450	1	1	2	4-1/2

1 per tube

WARNING: Cancer - www.P65Warnings.ca.gov

Standard Milling Conditions List No. 6231HD

Work Material / Milling Conditions / Dia. of Mill (inch)		Aluminum 1070		Aluminum Alloys					
				4032, 6061		5052		7075	
		960 - 980 SFM		650 - 670 SFM		820 - 825 SFM		650 - 655 SFM	
		RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)
1/8		30,000	31.5	19,900	14.9	25,100	22.6	19,900	11.9
3/16		20,000	38.0	13,300	17.5	16,800	26.5	13,300	14.0
1/4		15,000	39.4	10,000	17.5	12,600	26.5	9,940	13.9
5/16		12,000	39.4	8,000	21.5	10,030	32.0	7,950	16.9
3/8		10,000	45.0	6,700	22.6	8,360	33.9	6,630	17.9
7/16		8,500	47.2	5,700	23.9	7,160	37.6	5,680	19.9
1/2		7,500	47.2	5,000	25.0	6,270	37.6	4,970	19.9
5/8		6,000	47.2	4,000	25.0	5,020	37.7	3,980	19.9
3/4		5,000	47.2	3,400	25.5	4,180	37.6	3,320	19.9
1		3,700	47.2	2,500	25.0	3,140	37.7	2,490	19.9
Depth of Cut	a_a	1.5D							
	a_r	0.2D							
	H	1D							

AG Mill Roughing

SERIES WILL BE DISCONTINUED ONCE STOCK IS DEPLETED

List No. 6485 Fractional Sizes

EDP	Diameter of Mill	Shank Diameter	Length of Cut	Number of Flutes	Overall Length
1380710	1/4	3/8	5/8	4	2-7/16
1380726	5/16		3/4		2-1/2
1380732	3/8				
1380749	1/2	1/2	1-1/4		3-1/4
1380755	5/8	5/8	1-5/8		3-3/4
1380761	3/4	3/4			3-7/8
1380778	7/8	7/8	1-7/8	5	4-1/8
1380784	1	1	2		4-1/2
1380790	1-1/4	1-1/4		6	
1380806	1-1/2				
1380812	2			8	

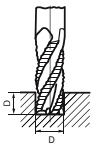
1 per tube

⚠ **WARNING:** Cancer - www.P65Warnings.ca.gov

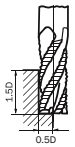
Standard Milling Conditions List No. 6485

Work Material / Milling Conditions	Structural Steels Carbon Steels		Alloy Steels Pre-Hardened Steels		Mold Steels Stainless Steels		Nickel Alloys Titanium Alloys		Cast Irons		Aluminum Alloys Copper Alloys Nonferrous Alloys	
	120 - 130 SFM		90 - 100 SFM		70 - 80 SFM		60 - 65 SFM		145 - 150 SFM		280 - 285 SFM	
Dia. Of Mill (inch)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)
-	2,000	10.2	1,500	7.1	1,200	3.9	1,000	3.0	2,400	12.6	4,500	47.2
1/4	1,900	10.4	1,400	7.3	1,100	4.0	950	3.1	2,200	12.6	4,300	48.3
5/16	1,500	11.0	1,200	7.5	1,000	4.6	720	3.1	1,800	13.3	3,400	51.3
-	1,500	11.0	1,200	7.5	1,000	4.7	720	3.1	1,800	13.4	3,400	51.2
3/8	1,300	11.0	1,000	7.6	760	4.6	630	3.2	1,500	13.5	2,900	51.7
-	1,200	11.0	900	7.5	720	4.7	590	3.1	1,400	13.4	2,700	51.2
-	1,000	11.0	800	7.5	600	4.7	490	3.3	1,200	13.4	2,300	51.2
1/2	950	11.0	720	7.6	570	4.7	470	3.3	1,100	13.5	2,200	51.7
-	800	11.0	610	7.5	480	4.7	400	3.3	950	13.4	1,800	51.2
5/8	760	11.0	570	7.5	460	4.7	380	3.3	900	13.5	1,700	51.3
3/4	630	11.0	480	7.5	380	4.5	320	3.3	750	13.5	1,400	50.8
-	600	11.0	450	7.1	360	4.3	290	3.1	720	13.4	1,400	51.2
7/8	540	11.8	410	8.6	330	5.3	270	3.6	640	16.3	1,200	59.2
-	480	11.4	360	7.9	290	5.1	250	3.4	550	15.4	1,100	55.1
1	470	11.4	360	7.9	290	5.0	240	3.2	560	15.7	1,100	54.4
-	400	10.2	300	7.1	240	4.3	200	3.1	470	14.2	900	51.2
1 1/4	380	11.4	290	7.7	230	4.8	190	3.5	450	15.2	860	55.6
1 1/2	320	8.0	240	4.7	190	3.4	160	2.6	370	10.1	720	38.8
-	300	6.7	250	4.3	180	2.9	150	2.0	360	9.1	670	33.1
-	240	4.3	180	2.8	140	1.8	120	1.3	290	5.9	550	20.5
2	240	5.3	180	3.7	140	2.5	120	1.7	280	7.2	540	25.9

Slotting



Side Milling



1) In dry miling which is recommended air blow, reduce the RPM and feed to 70% of above table values.
2) Adjust milling condition when unusual vibration or different sound occur.

AG Mill Heavy

SERIES WILL BE DISCONTINUED ONCE STOCK IS DEPLETED

List No. 6403 Fractional Sizes

EDP	Diameter of Mill	Shank Diameter	Length of Cut	Number of Flutes	Overall Length
1380600	1/4	3/8	5/8	4	2-7/16
1380617	5/16		3/4		2-1/2
1380623	3/8				
1380630	1/2	1/2	1-1/4		3-1/4
1380646	5/8	5/8	1-5/8		3-3/4
1380652	3/4	3/4			3-7/8
1380669	7/8	7/8	1-7/8		4-1/8
1380675	1	1	2	6	4-1/2
1380681	1-1/4	1-1/4			
1380698	1-1/2				
1380703	2			8	

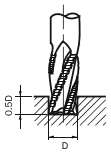
1 per tube

⚠ **WARNING:** Cancer - www.P65Warnings.ca.gov

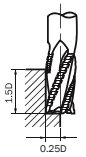
Standard Milling Conditions List No. 6403

Work Material / Milling Conditions	Structural Steels Carbon Steels		Alloy Steels Pre-Hardened Steels		Mold Steels Stainless Steels		Nickel Alloys Titanium Alloys		Cast Irons		Aluminum Alloys Copper Alloys Nonferrous Alloys	
	150 - 155 SFM		115 - 125 SFM		95 - 105 SFM		75 - 80 SFM		175 - 185 SFM		330 - 350 SFM	
Dia. Of Mill (inch)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)
-	5,000	11.4	3,800	7.5	3,200	5.1	2,500	3.5	5,800	30.3	10,800	52.0
-	3,000	11.4	2,300	7.5	1,900	5.1	1,600	3.5	3,500	30.3	6,500	52.0
-	2,500	11.4	1,900	7.5	1,600	5.1	1,300	3.5	2,900	31.1	5,400	52.0
1/4	2,300	11.2	1,800	7.7	1,500	5.2	1,200	3.3	2,800	31.1	5,200	53.0
5/16	1,900	11.5	1,400	7.6	1,200	5.1	1,000	3.5	2,200	31.0	4,100	52.2
-	1,900	11.4	1,400	7.5	1,200	5.1	1,000	3.5	2,200	31.1	4,100	52.0
3/8	1,600	11.5	1,200	7.7	1,000	4.9	790	3.3	1,800	31.6	3,500	53.0
-	1,500	11.8	1,200	7.9	1,000	5.1	800	3.5	1,700	31.5	3,200	52.0
-	1,300	11.4	1,000	7.9	800	5.1	600	3.5	1,400	31.1	2,800	52.0
1/2	1,200	11.2	920	7.7	760	5.3	600	3.6	1,400	31.6	2,600	51.9
-	1,000	11.4	800	7.9	600	5.1	500	3.5	1,200	31.1	2,200	52.0
5/8	940	11.2	730	7.7	610	5.3	480	3.5	1,100	30.0	2,100	52.0
3/4	780	10.5	610	7.7	510	4.7	400	3.1	920	28.9	1,700	52.0
-	750	10.2	600	7.9	500	4.7	400	3.1	900	29.1	1,700	52.0
7/8	670	9.4	520	7.0	440	4.0	340	2.6	790	26.1	1,500	46.7
-	600	8.7	500	5.9	400	3.5	300	2.4	700	22.8	1,300	38.6
1	580	10.5	460	6.3	380	4.1	300	2.7	690	26.8	1,300	46.0
-	500	7.9	400	4.7	300	3.1	250	2.0	600	20.1	1,100	33.9
1 1/4	470	7.4	370	4.4	310	3.2	240	2.5	550	16.9	1,000	29.6
1 1/2	390	7.0	310	4.1	260	3.2	200	2.1	460	10.3	870	18.7
-	370	6.7	300	4.3	220	2.9	180	2.0	450	9.1	800	15.5
-	300	4.3	240	2.8	160	1.8	120	1.3	320	5.9	620	10.5
2	290	5.1	230	3.3	150	2.2	120	1.5	310	7.3	610	13.7

Grooving



Side Milling



1) In dry miling which is recommended air blow, reduce the RPM and feed to 70% of above table values.
2) Adjust milling condition when unusual vibration or different sound occur.

Roughing and Finishing (Heavy Duty)

BOTH SERIES WILL BE DISCONTINUED ONCE STOCK IS DEPLETED

List No. 6367X

Fractional sizes
SG Coated, 8% Cobalt HSS

EDP	Diameter of Mill	Shank Diameter	Length of Cut	Number of Flutes	Overall Length
1175970	1/4	3/8	5/8	4	2-7/16
1175986	5/16		3/4		2-1/2
1175992	3/8		3/4		2-1/2
1176007	1/2	1/2	1-1/4		3-1/4
1176020	5/8	5/8	1-5/8		3-3/4
1176059	3/4	3/4	1-5/8		3-7/8
1176088	7/8	7/8	1-7/8		4-1/8
1176100	1	3/4	2	6	4-1/2
1176151	1	1	2		4-1/2
1176168	1		4		6-1/2
1176202	1-1/4	1-1/4	2		4-1/2
1176219	1-1/4		4		6-1/2
1176248	1-1/2		2		4-1/2
1176254	1-1/2		4		6-1/2
1176260	1-3/4		2		4-1/2
1176283	2		2	8	4-1/2
1176122	2	2	4		7-3/4

⚠ **WARNING:** Cancer - www.P65Warnings.ca.gov

List No. 6367

Fractional sizes
Surface Treat, 8% Cobalt HSS

EDP	Diameter of Mill	Shank Diameter	Length of Cut	Number of Flutes	Overall Length
1024726	1/4	3/8	5/8	4	2-7/16
1024732	5/16		3/4		2-1/2
1024761	3/8		3/4		2-1/2
1024812	1/2	1/2	1-1/4		3-1/4
1024858			2		4
1024864	5/8	5/8	1-5/8		3-3/4
1024870			2-1/2		4-5/8
1024921	3/4	3/4	1-5/8		3-3/4
1024950			1-5/8		3-7/8
1024915			3		5-1/4
1024996	7/8	7/8	1-7/8		4-1/8
1025000			1-7/8		4-1/8
1024967			3-1/2		5-3/4
1025067	1	3/4	2	6	4-1/2
1025103		1	2		4-1/2
1025023			4		6-1/2
1025190	1-1/8		2		4-1/2
1042873	1-1/4	3/4	2		4-1/2
1019565			4		6-1/2
1025212		1-1/4	2		4-1/2
1025315			4		6-1/2
1042880	1-1/2	3/4	2		4-1/2
1019600			4		6-1/2
1025350		1-1/4	2		4-1/2
1025396			4		6-1/2
1025401	1-3/4		2		4-1/2
1025418			4		6-1/2
1024282	2		2	8	4-1/2
1025447			4		6-1/2
1025620		2	4		7-3/4
1025499			6		9-3/4
1025591			8		11-3/4
1086318	2-1/2		4		7-3/4
1086324			6		9-3/4
1086330			8		11-3/4
1086347			10		13-3/4
1086353	3	2-1/2	4	10	7-3/4
1086360			6		9-3/4
1086376			8		11-3/4
1086382			10		13-3/4
1086399			12		15-3/4

1 per tube

⚠ **WARNING:** Cancer - www.P65Warnings.ca.gov

Shanks 2" and Larger Have Combination Drive
8 And 10 Flutes Are Not Center Cutting

Standard Milling Conditions List No. 6367X

Work Material / Milling Conditions / Dia. of Mill (inch)		Carbon Steels		Alloy Steels		Die Steels Stainless Steels		Nickel Alloys Titanium Alloys		Cast Iron		Aluminum Alloys Copper Alloys Nonferrous Alloys	
		118 SFM		83 SFM		70 SFM		60 SFM		130 SFM		260 SFM	
		RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)
1/4		1,800	9.4	1,300	6.8	1,100	4.8	890	2.8	2,000	24.0	4,000	48.0
3/8		1,200	8.6	840	5.4	680	3.5	600	2.4	1,400	22.4	2,700	43.2
1/2		880	8.4	630	5.8	510	3.7	450	2.7	1,000	22.4	2,000	46.4
5/8		710	8.5	510	5.7	410	3.4	360	2.6	800	22.4	1,600	44.8
3/4		590	8.0	420	5.2	340	3.3	300	2.4	670	21.4	1,400	41.4
1		440	8.4	320	6.0	260	3.6	230	2.8	500	24.0	1,000	45.0
1 1/4		360	5.8	260	4.1	210	2.5	180	1.9	400	16.3	800	29.8
1 1/2		300	4.7	210	3.2	170	1.9	150	1.5	340	13.5	700	25.2
1 3/4		260	3.4	180	2.2	150	1.4	130	1.1	290	11.3	600	18.0
Depth of Cut	a_a	1.5D											
	a_r	0.25D											
	H	0.5D											

Standard Milling Conditions List No. 6367

Work Material / Milling Conditions / Dia. of Mill (inch)		Carbon Steels		Carbon Steels Alloy Steels		Die Steels Stainless Steels		Nickel Alloys Titanium Alloys		Cast Iron		Aluminum Alloys Copper Alloys Nonferrous Alloys	
		80 SFM		60 SFM		40 SFM		33 SFM		100 SFM		200 SFM	
		RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)
1/4		1,300	5.9	900	3.7	700	2.1	510	1.5	1,600	17.3	3,100	31.5
3/8		820	5.9	600	3.8	410	2.1	340	1.5	1,100	17.7	2,100	32.1
1/2		620	5.9	450	3.8	310	2.1	260	1.5	800	17.3	1,600	31.9
5/8		490	5.9	360	3.7	250	2.1	210	1.5	610	17.1	1,300	31.5
3/4		410	5.6	300	3.6	210	2.0	170	1.4	510	16.3	1,100	31.5
1		310	5.5	230	3.5	160	2.2	130	1.4	380	15.7	800	29.5
1 1/4		250	4.3	180	2.7	130	1.5	110	1.1	310	12.6	700	23.6
1 1/2		210	3.5	150	2.2	110	1.2	90	0.8	260	9.8	600	18.5
1 3/4		180	2.4	130	1.6	90	0.9	80	0.6	220	7.5	500	13.8
2		160	2.0	120	1.4	80	0.7	70	0.5	190	5.9	400	11.0
Depth of Cut	a_a	1.5D											
	a_r	0.25D											
	H	0.5D											

Roughing (Hog)

BOTH SERIES WILL BE DISCONTINUED ONCE STOCK IS DEPLETED

List No. 6303

Bright Finish, 8% Cobalt HSS

EDP	Diameter of Mill	Shank Diameter	Length of Cut	Number of Flutes	Overall Length
1085363	1/4	3/8	5/8	4	2-7/16
1085370			1-1/4		3-1/16
1085386	5/16		3/4		2-1/2
1085392			1-3/8		3-1/8
1085408	3/8		3/4		2-1/2
1085414			1-1/2		3-1/4
1085420	1/2	1/2	1-1/4		3-1/4
1085437			2		4
1085443	5/8	5/8	1-5/8		3-3/4
1085450			2-1/2		4-5/8
1085466	3/4		1-5/8		3-7/8
1085472			3		5-1/4
1086267		3/4	1-5/8		3-7/8
1086273			3		5-1/4
1085489	7/8		1-7/8	5	4-1/8
1085495			3-1/2		5-3/4
1085500		7/8	1-7/8		4-1/8
1085517			3-1/2		5-3/4
1085523	1	3/4	2		4-1/4
1085530			1		3-1/4
1086003		1	2		4-1/2
1086010			4		6-1/2
1086026			3		5-1/2
1086032	1-1/8		2		4-1/2
1086049	1-1/4	3/4	2	6	4-1/2
1086055			4		6-1/2
1086061		1-1/4	2		4-1/2
1086078			4		6 1/2
1086084			3		5-1/2
1086090	1-1/2	3/4	2		4-1/2
1086106			4		6 1/2
1086112		1-1/4	2		4-1/2
1086129			4		6-1/2
1086135			3		5-1/2
1086141	1-3/4	3/4	2		4-1/2
1086158			4		6-1/2
1086164		1-1/4	2		4-1/2
1086170			4		6-1/2
1086187			3		5-1/2
1086193	2	2	4-1/2	8	4-1/2
1086209			4		6-1/2
1086215			3		5-1/2
1086221		2	4		7-3/4
1086238			6		9-3/4
1086244			8		11-3/4
1086250			3		6-3/4

1 per tube

⚠ **WARNING:** Cancer - www.P65Warnings.ca.gov

Shanks 2" And Larger Have Combination Drive
All Sizes Are Not Center Cutting

List No. 6303X

SG Coated, 8% Cobalt HSS

EDP	Diameter of Mill	Shank Diameter	Length of Cut	Number of Flutes	Overall Length
1175510	1/4	3/8	5/8	4	2-7/16
1175533	5/16		3/4		2-1/2
1175556	3/8		3/4		2-1/2
1175579	1/2	1/2	1-1/4		3-1/4
1175585			2		4
1175591	5/8	5/8	1-5/8		3-3/4
1175607			2-1/2		4-5/8
1175636	3/4	3/4	1-5/8		3-7/8
1175642			3		5-1/4
1175659	7/8	7/8	1-7/8	5	4-1/8
1175671			1-7/8		4-1/8
1175694	1	3/4	2		4-1/4
1175716		1	2		4-1/2
1175722			4		6-1/2
1175739			3		5-1/2
1175774	1-1/4	1-1/4	2	6	4-1/2
1175780			4		6-1/2
1175797			3		5-1/2
1175825	1-1/2		2		4-1/2
1175831			4		6-1/2
1175848			3		5-1/2
1175877	1-3/4		2		4-1/2
1175883			4		6-1/2
1175890			3		5-1/2
1175905	2		2	8	4-1/2
1175934		2	4		7-3/4
1175940			6		9-3/4
1175963			3		6-3/4

⚠ **WARNING:** Cancer - www.P65Warnings.ca.gov

Roughing (Hog)

SERIES WILL BE DISCONTINUED ONCE STOCK IS DEPLETED

List No. 6307 8% Cobalt HSS

EDP	Diameter of Mill	Shank Diameter	Length of Cut	Number of Flutes	Overall Length
1182749	1/4	3/8	5/8	3	2-7/16
1182755			1-1/4		3-1/16
1182761	5/16		3/4		2-1/2
1182778			1-3/8		3-1/8
1182784	3/8		3/4		2-1/2
1182790			1-1/2		3-1/4
1182806	1/2	1/2	1-1/4	4	3-1/4
1182812			2		4
1182829	5/8	5/8	1-5/8		3-3/4
1182835			2-1/2		4-5/8
1182841	3/4		1-5/8		3-7/8
1182864		3/4	1-5/8		3-7/8
1182887	7/8		1-7/8	5	4-1/8
1182909		7/8	1-7/8		4-1/8
1182921	1	3/4	2		4-1/4
1182944		1	2		4-1/2
1182950			4		6-1/2
1182967			3		5-1/2
1182973	1-1/8		2		4-1/2
1183000	1-1/4	1-1/4	2	6	4-1/2
1183017			4		6-1/2
1183023			3		5-1/2
1183052	1-1/2		2		4-1/2
1183069			4		6-1/2
1183075			3		5-1/2
1183103	1-3/4		2		4-1/2
1183132	2		2		4-1/2
1183149			4		6-1/2
1183161		2	4		7-3/4
1183178			6		9-3/4

1 per tube
Shanks 2” And Larger Have Combination Drive

⚠ **WARNING:** Cancer - www.P65Warnings.ca.gov

Standard Milling Conditions List No. 6303, 6307

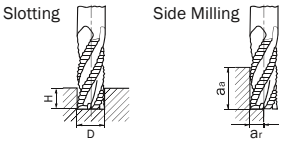
Work Material / Milling Conditions		Carbon Steels		Alloy Steels		Die Steels Stainless Steels		Nickel Alloys Titanium Alloys		Cast Iron		Aluminum Alloys Copper Alloys Nonferrous Alloys	
		80 SFM		60 SFM		40 SFM		33 SFM		100 SFM		200 SFM	
Dia. of Mill (inch)		RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)
1/4		1,300	5.1	900	3.1	700	1.7	510	1.2	1,600	6.7	3,100	26.4
3/8		820	5.1	600	3.1	410	1.7	340	1.2	1,100	6.7	2,100	26.4
1/2		620	5.1	450	3.2	310	1.7	260	1.2	800	6.7	1,600	26.4
5/8		490	5.1	360	3.1	250	1.7	210	1.2	610	6.7	1,300	26.4
3/4		410	5.1	300	3.0	210	1.7	170	1.2	510	6.7	1,100	26.4
1		310	5.1	230	3.1	160	1.8	130	1.2	380	6.7	800	26.4
1 1/4		250	4.9	180	3.1	130	1.8	110	1.2	310	6.7	700	26.4
1 1/2		210	3.5	150	2.3	110	1.3	90	0.9	260	5.3	600	21.7
1 3/4		180	2.6	130	1.6	90	0.9	80	0.6	220	3.7	500	15.7
2		160	2.4	120	1.6	80	0.9	70	0.6	190	3.5	400	14.2
Depth of Cut	a_a	1.5D											
	a_r	0.25D											
	H	0.5D											

1) The above cutting speeds and feeds apply to regular end mill flute length.
For long fluted end mills please use the following factors below:

Cutting Length	Reduce Feed by
2.5 × Diameter	15%
3 × Diameter	25%
4 × Diameter	55%

2) In dry milling, reduce the RPM and Feed 30% of values on table above. (recommended air blow)
3) Adjust drilling condition when unusual vibration or sound occurs.

D: Dia. of Mill

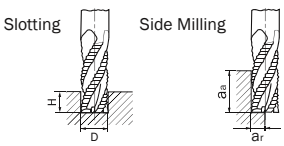


Standard Milling Conditions List No. 6303X

Work Material / Milling Conditions		Carbon Steels		Alloy Steels		Die Steels Stainless Steels		Nickel Alloys Titanium Alloys		Cast Iron		Aluminum Alloys Copper Alloys Nonferrous Alloys	
		118 SFM		83 SFM		70 SFM		60 SFM		130 SFM		260 SFM	
Dia. of Mill (inch)		RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)
1/4		1,800	7.2	1,300	4.7	1,100	3.5	890	2.1	2,000	9.6	4,000	36.8
3/8		1,200	7.2	840	5.0	680	2.7	600	1.9	1,400	9.0	2,700	33.5
1/2		880	7.0	630	4.8	510	2.9	450	2.0	1,000	8.8	2,000	36.0
5/8		710	7.1	510	4.5	410	3.0	360	2.1	800	8.6	1,600	35.2
3/4		590	6.8	420	4.4	340	2.7	300	2.0	670	8.6	1,400	34.7
1		440	7.8	320	5.0	260	3.4	230	2.5	500	11.3	1,000	42.5
1 1/4		360	7.6	260	5.0	210	3.3	180	2.3	400	11.0	800	40.8
1 1/2		300	5.2	210	3.2	170	2.0	150	1.5	340	7.3	700	28.6
1 3/4		260	3.6	180	2.2	150	1.4	130	1.1	290	4.9	600	19.8
—		1,900	7.1	1,300	4.3	1,100	2.8	930	2.1	2,100	8.7	4,200	35.0
Depth of Cut	a_a	1.5D											
	a_r	0.25D											
	H	0.5D											

1) In dry milling , reduce the RPM and feed rate 30% of values on table above. (recommended air blow)
2) Adjust milling condition when unusual vibration or sound occurs.

D: Dia. of Mill



Two Flute Single End

BOTH SERIES WILL BE DISCONTINUED ONCE STOCK IS DEPLETED

List No. 6231

8% Cobalt HSS

EDP	Diameter of Mill	Shank Diameter	Length of Cut	Overall Length
1030592	1/8	3/8	3/8	2-5/16
1230784	5/32			
1030614	3/16		7/16	
1230790	7/32			
1030637	1/4		1/2	
1230806	9/32			
1030672	5/16		9/16	
1230812	11/32			
1030775	3/8			
1230829	13/32		13/16	2-1/2
1030781	7/16			
1230835	15/32			
1030803	1/2	1/2	1	3
1230841		3/8	13/16	2-1/2
1230858	17/32	1/2	1-1/8	3-1/8
1030810	9/16			
1030855	5/8	5/8	1-5/16	3-7/16
1230864		1/2	1-1/8	3-1/8
1030941	11/16	5/8	1-5/16	3-7/16
1230870		1/2		3-5/16
1030958	3/4	5/8		3-7/16
1230887		1/2		3-5/16
1030964		3/4		3-9/16
1226927	13/16	5/8	1-1/2	3-5/8
1031066	7/8	7/8		3-3/4
1230893		5/8		3-5/8
1031117		3/4		3-3/4
1230909	15/16	5/8		3-5/8
1031130	1	1	1-5/8	4-1/8
1031146		3/4	1-1/2	3-3/4
1230915		5/8		3-5/8
1230703		7/8		3-3/4
1031169	1-1/8	1	1-5/8	4-1/8
1230710		3/4		3-7/8
1230726		7/8		3-7/8
1031198	1-1/4	1		4-1/8
1230732		3/4		3-7/8
1230749		7/8		3-7/8
1031203		1-1/4		4-1/8
1031226	1-3/8	1		4-1/8
1230755		3/4		3-7/8
1031261	1-1/2	1		4-1/8
1230761		3/4		3-7/8
1031290		1-1/4		4-1/8
1031341	1-3/4	1-1/4		4-1/8
1031393	2	1-1/4		4-1/8

1 per tube

⚠ **WARNING:** Cancer - www.P65Warnings.ca.gov

Shanks 2" and Larger Have Combination Drive

List No. 6231X

SG Coated, 8% Cobalt HSS

EDP	Diameter of Mill	Shank Diameter	Length of Cut	Overall Length
1176290	1/8	3/8	3/8	2-5/16
1176311	3/16		7/16	
1176334	1/4		1/2	
1176357	5/16		9/16	
1176370	3/8			
1176392	7/16		13/16	2-1/2
1176414	1/2	1/2	1	3
1176443	9/16	1/2	1-1/8	3-1/8
1176450	5/8	5/8	1-5/16	3-7/16
1176472	11/16			
1176495	3/4			
1176517		3/4		3-9/16
1176530	7/8	7/8	1-1/2	3-3/4
1176546		3/4		
1176569	1	1	1-5/8	4-1/8
1176575	1	3/4	1-1/2	3-3/4
1176603	1-1/8	1	1-5/8	4-1/8
1176661	1-1/4	1-1/4		
1176712	1-1/2			

⚠ **WARNING:** Cancer - www.P65Warnings.ca.gov

Two Flute Long Single End

Regular Single End

BOTH SERIES WILL BE DISCONTINUED ONCE STOCK IS DEPLETED

List No. 6230

8% Cobalt HSS

EDP	Diameter of Mill	Shank Diameter	Length of Cut	Overall Length
0107454	1.0	6.0	2.0	50.0
0107505	1.5		3.0	
0107528	2.0		7.0	
0107540	2.5			
0107730	3.0		9.0	
0107769	3.5	8.0	12.0	60.0
0107810	4.0			
0107855	4.5		15.0	
0107878	5.0			
0107935	5.5			
0107941	6.0			
0107970	6.5	10.0	20.0	65.0
0108066	7.0			
0108072	7.5			
0108089	8.0			
0108095	8.5		25.0	75.0
0108100	9.0			
0108117	9.5			
0108123	10.0			
0108249	12.0	12.0	30.0	80.0
0108278	13.0	16.0	35.0	90.0
0108358	14.0			
0108387	15.0		40.0	95.0
0108444	16.0			
0108530	17.0	20.0		105.0
0108576	19.0		45.0	110.0
0108640	20.0			
0108977	24.0	25.0	50.0	120.0
0109004	25.0			
0109027	26.0			
0109457	30.0		55.0	125.0

⚠ **WARNING:** Cancer - www.P65Warnings.ca.gov

List No. 6233

8% Cobalt HSS

EDP	Diameter of Mill	Shank Diameter	Length of Cut	Overall Length
1043479	1/4	3/8	1	3 1/16
1043485	5/16		1 1/4	3 5/16
1043491	3/8		1 1/2	3 1/4
1043507			1	2 3/4
1043513	1/2	1/2	2	4
1043520			1 1/2	3 1/2
1043536			3	5
1043542	5/8	5/8	2	4 1/8
1043571	3/4	3/4	2 1/4	4 1/2
1043600	7/8	7/8	2 1/2	4 3/4
1043639	1	1	3	5 1/2
1043674	1 1/8			
1043680	1 1/4	1 1/4		
1043702	1 1/2			
1043725	1 3/4			
1043760	2			

1 per tube

⚠ **WARNING:** Cancer - www.P65Warnings.ca.gov

Standard Milling Conditions List No. 6231, 6233, 6230

Work Material / Milling Conditions		Carbon Steels		Alloy Steels		Die Steels Stainless Steels		Nickel Alloys Titanium Alloys		Cast Iron		Aluminum Alloys Copper Alloys Nonferrous Alloys	
		85 SFM		60 SFM		40 SFM		33 SFM		100 SFM		200 SFM	
Dia. of Mill (inch)	(mm)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)
—	2	4,000	3.1	2,800	2.0	2,000	1.1	1,600	0.7	4,800	9.1	9,600	16.5
—	3	2,700	3.3	1,900	2.1	1,300	1.2	1,100	0.8	3,200	9.4	6,400	17.7
1/8	3.175	2,600	3.3	1,800	2.1	1,300	1.2	1,100	0.8	3,100	9.4	6,100	17.7
3/16	4.7625	1,700	3.3	1,200	2.1	840	1.2	680	0.8	2,100	9.4	4,100	17.7
—	5	1,600	3.3	1,100	2.1	800	1.2	640	0.8	1,900	9.4	3,800	17.7
—	6	1,300	3.3	930	2.1	660	1.2	530	0.8	1,600	9.4	3,200	17.7
1/4	6.35	1,300	3.3	890	2.1	630	1.2	510	0.8	1,600	9.4	3,100	17.7
—	8	1,000	3.3	700	2.1	500	1.2	400	0.8	1,200	9.4	2,400	17.7
3/8	9.525	850	3.3	600	2.1	420	1.2	340	0.8	1,100	9.4	2,100	17.7
—	10	800	3.4	560	2.1	400	1.2	320	0.8	960	9.4	1,900	17.7
—	12	660	3.3	460	2.1	330	1.2	270	0.8	800	9.4	1,600	17.7
1/2	12.7	640	3.3	450	2.1	320	1.2	260	0.8	800	9.4	1,600	17.7
—	15	530	3.3	370	2.1	270	1.2	210	0.8	640	9.4	1,300	17.7
5/8	15.875	510	3.3	360	2.1	260	1.2	210	0.8	610	9.4	1,300	17.7
3/4	19.05	430	3.2	300	2.0	210	1.1	170	0.7	510	9.1	1,100	16.9
—	20	400	3.1	280	2.0	200	1.1	160	0.7	480	9.1	960	16.5
—	25	320	2.4	220	1.5	160	0.8	130	0.6	380	7.1	760	12.6
1	25.4	320	2.4	230	1.5	160	0.8	130	0.6	380	7.0	770	12.4
—	30	270	1.9	190	1.2	130	0.7	110	0.5	320	5.5	640	10.2
1 1/4	—	260	1.8	180	1.1	130	0.6	110	0.5	310	5.1	610	9.8
1 1/2	—	220	1.5	150	0.9	110	0.5	90	0.4	260	4.1	510	7.9
—	—	200	1.3	140	0.8	100	0.5	80	0.3	240	3.8	480	7.1
1 3/4	—	190	1.1	130	0.6	90	0.4	80	0.3	220	3.0	440	5.9
—	—	160	0.7	110	0.4	80	0.2	60	0.2	190	2.0	380	3.5
2	—	160	0.6	120	0.4	80	0.2	70	0.2	190	1.9	390	3.4
Depth of Cut	a_a	1.5D											
	a_r	0.25D											
	H	0.5D											

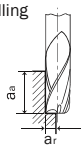
1) The above cutting speeds and feeds apply to regular end mill flute length.
For long fluted end mills please use the following factors below:

Cutting Length	Reduce Feed by
2.5 × Diameter	15%
3 × Diameter	25%
4 × Diameter	55%
5 × Diameter	65%
6 × Diameter	75%

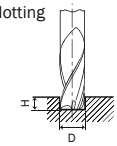
2) In dry milling, reduce the RPM and Feed 30% of values on table above. (recommended air blow)
3) Adjust drilling condition when unusual vibration or different sound occurs.

D: Dia. of Mill

Side Milling



Slotting



Standard Milling Conditions List No. 6231X

Work Material / Milling Conditions		Carbon Steels		Alloy Steels		Die Steels Stainless Steels		Nickel Alloys Titanium Alloys		Cast Iron		Aluminum Alloys Copper Alloys Nonferrous Alloys	
		118 SFM		83 SFM		70 SFM		60 SFM		130 SFM		260 SFM	
Dia. of Mill (inch)		RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)
1/8		3,600	5.5	2,600	3.5	2,100	2.2	1,800	1.7	4,000	15.2	8,000	28.0
3/16		2,400	5.5	1,700	3.5	1,400	2.2	1,200	1.6	2,700	15.1	5,300	28.0
1/4		1,800	5.5	1,300	3.5	1,100	2.2	890	1.7	2,000	15.4	4,000	28.0
3/8		1,200	5.5	840	3.6	680	2.2	600	1.7	1,400	15.7	2,700	28.3
1/2		880	5.5	630	3.6	510	2.2	450	1.7	1,000	15.4	2,000	28.3
5/8		710	5.5	510	3.5	410	2.2	360	1.7	800	15.3	1,600	28.0
3/4		590	5.5	420	3.5	340	2.1	300	1.6	670	14.8	1,400	27.2
1		440	3.9	320	2.6	260	1.6	230	1.2	500	11.0	1,000	20.5
1 1/4		360	3.0	260	2.0	210	1.3	180	0.9	400	8.3	800	15.0
1 1/2		300	2.6	210	1.6	170	1.0	150	0.8	340	6.7	700	12.6
Depth of Cut	a_a	1.5D											
	a_r	0.25D											
	H	0.5D											

Four Flute Single End

SERIES WILL BE DISCONTINUED ONCE STOCK IS DEPLETED

List No. 6210 8% Cobalt HSS

(Unit) : mm

EDP	Diameter of Mill	Shank Diameter	Length of Cut	Overall Length
0110773	2.5	6.0	7.0	50.0
0110824	3.0		9.0	
0111282	3.5	8.0	12.0	60.0
0111327	4.0			
0111459	4.5		15.0	
0111516	5.0			
0111619	5.5			
0111660	6.0			
0111866	6.5	10.0	20.0	65.0
0112060	7.0			
0112564	7.5			
0112667	8.0			
0112680	8.5		25.0	75.0
0112696	9.0			
0112701	9.5			
0112782	10.0			
0112810	11.0	12.0	30.0	80.0
0112879	12.0			
0112891	13.0	16.0	35.0	90.0
0113067	14.0			
0113118	15.0		40.0	95.0
0113227	16.0			
0113233	17.0	20.0		105.0
0113262	18.0			
0113320	19.0		45.0	110.0
0113336	20.0			
0113497	24.0	25.0	50.0	120.0
0113577	26.0			
0113611	28.0		55.0	125.0
0113772	30.0			

1 per tube

⚠ **WARNING:** Cancer - www.P65Warnings.ca.gov

Multi-Flute Single End Center Cutting

BOTH SERIES WILL BE DISCONTINUED ONCE STOCK IS DEPLETED

List No. 6211M 8% Cobalt HSS

EDP	Diameter of Mill	Shank Diameter	Length of Cut	Number of Flutes	Overall Length
1030345	1/8	3/8	3/8	4	2-5/16
1042290	3/16		1/2		2-3/8
1042305	1/4		5/8		2-7/16
1042311	5/16		3/4		2-1/2
1042328	3/8		3/4		2-1/2
1042334	1/2	1/2	1-1/4		3-1/4
1030351				6	
1042340	5/8	5/8	1-5/8	4	3-3/4
1030368				6	
1042357	3/4	3/4		4	3-7/8
1030374				6	
1042363	7/8	7/8	1-7/8	4	4-1/8
1030380				6	
1042370	1	1	2	4	4-1/2
1030402				6	
1042386	1-1/8			4	
1030419				6	
1042392	1-1/4	1-1/4		4	
1030425				6	
1042408	1-1/2			4	
1030586				6	
1042414	2				
1042850			4		6-1/2

⚠ **WARNING:** Cancer - www.P65Warnings.ca.gov

List No. 6211X 8% Cobalt HSS, SG Coated

EDP	Diameter of Mill	Shank Diameter	Length of Cut	Number of Flutes	Overall Length
1176729	1/8	3/8	3/8		2-5/16
1176735	3/16		1/2		2-3/8
1176741	1/4		5/8		2-7/16
1176758	5/16		3/4		2-1/2
1176764	3/8				
1176770	1/2	1/2	1-1/4		3-1/4
1176787				6	
1176793	5/8	5/8	1-5/8	4	3-3/4
1176809				6	
1176815	3/4	3/4		4	3-7/8
1176821				6	

1 per tube

EDP	Diameter of Mill	Shank Diameter	Length of Cut	Number of Flutes	Overall Length
1176838	7/8	7/8	1-7/8	4	4-1/8
1176844				6	
1176850	1	1	2	4	4-1/2
1176867				6	
1176873	1-1/8			4	
1176880				6	
1176896	1-1/4	1-1/4		4	
1176901				6	
1176918	1-1/2			4	
1176924				6	

⚠ **WARNING:** Cancer - www.P65Warnings.ca.gov

Multi-Flute Long Single End Center Cutting

SERIES WILL BE DISCONTINUED ONCE STOCK IS DEPLETED

List No. 6213 8% Cobalt HSS

EDP	Diameter of Mill	Shank Diameter	Length of Cut	Number of Flutes	Overall Length
1042741	1/4	3/8	1 1/4	4	3 1/16
1042758	5/16		1 3/8		3 1/8
1042764	3/8		1 1/2		3 1/4
1042770	1/2	1/2	2		4
1042787	5/8	5/8	2 1/2		4 5/8
1042793	3/4	3/4	3		5 1/4
1042809	7/8	7/8	3 1/2		5 3/4
1042815	1	1	4		6 1/2
1042821	1 1/4	1 1/4			

1 per tube

⚠ **WARNING:** Cancer - www.P65Warnings.ca.gov

Standard Milling Conditions List No. 6210, 6211M, 6213

4 Flute

Work Material / Milling Conditions		Carbon Steels		Alloy Steels		Die Steels Stainless Steels		Nickel Alloys Titanium Alloys		Cast Iron		Aluminum Alloys Copper Alloys Nonferrous Alloys	
		85 SFM		60 SFM		40 SFM		33 SFM		100 SFM		200 SFM	
Dia. of Mill (inch)	(mm)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)
—	3	2,700	5.1	1,900	3.1	1,300	1.8	1,100	1.2	3,200	14.2	6,400	26.4
1/8	3.175	2,600	5.1	1,800	3.1	1,300	1.8	1,100	1.2	3,100	14.2	6,100	26.4
3/16	4.7625	1,700	5.1	1,200	3.1	840	1.7	680	1.2	2,100	14.2	4,100	26.4
—	5	1,600	5.1	1,100	3.1	800	1.7	640	1.2	1,900	14.2	3,800	25.6
—	6	1,300	5.1	930	3.1	660	1.7	530	1.2	1,600	14.2	3,200	26.4
1/4	6.35	1,300	5.1	890	3.1	630	1.7	510	1.2	1,600	14.2	3,100	26.4
—	8	1,000	5.1	700	3.1	500	1.7	400	1.2	1,200	14.2	2,400	26.4
3/8	9.525	850	5.1	600	3.1	420	1.8	340	1.2	1,100	14.4	2,100	26.6
—	10	800	5.1	560	3.2	400	1.8	320	1.2	960	14.6	1,900	26.8
—	12	660	5.1	460	3.2	330	1.8	270	1.2	800	14.6	1,600	26.4
1/2	12.7	640	5.1	450	3.2	320	1.8	260	1.2	800	14.6	1,600	26.4
—	15	530	5.1	370	3.1	270	1.8	210	1.2	640	14.6	1,300	26.4
5/8	15.875	510	5.1	360	3.1	260	1.7	210	1.2	610	14.4	1,300	25.6
3/4	19.05	430	4.9	300	3.0	210	1.7	170	1.1	510	13.6	1,100	25.2
—	20	400	4.7	280	3.0	200	1.7	160	1.1	480	13.4	960	24.8
—	25	320	3.6	220	2.3	160	1.3	130	0.9	380	10.2	760	18.9
1	25.4	320	3.5	230	2.3	160	1.3	130	0.9	380	10.0	770	18.7
—	30	270	2.9	190	1.8	130	1.0	110	0.7	320	8.3	640	15.4
1 1/4	31.75	260	2.7	180	1.7	130	1.0	110	0.7	310	7.9	610	14.2
1 1/2	38.1	220	2.2	150	1.4	110	0.8	90	0.5	260	6.1	510	11.4
—	40	200	2.0	140	1.3	100	0.7	80	0.5	240	5.5	480	10.6
1 3/4	44.45	190	1.6	130	1.0	90	0.6	80	0.4	220	4.1	440	8.7
—	50	160	1.0	110	0.6	80	0.4	60	0.2	190	2.9	380	5.5
2	50.8	160	1.0	120	0.6	80	0.3	70	0.2	190	2.8	390	5.3
Depth of Cut	a_a	1.5D											
	a_r	0.25D											

Standard Milling Conditions List No. 6210, 6211M, 6213

6 Flute

Work Material / Milling Conditions		Carbon Steels		Alloy Steels		Die Steels Stainless Steels		Nickel Alloys Titanium Alloys		Cast Iron		Aluminum Alloys Copper Alloys Nonferrous Alloys	
		85 SFM		60 SFM		40 SFM		33 SFM		100 SFM		200 SFM	
Dia. of Mill (inch)		RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)
1/2		640	7.7	450	4.8	320	2.7	260	1.8	800	21.9	1,600	39.6
5/8		510	7.7	360	4.6	260	2.6	210	1.8	610	21.6	1,300	38.4
3/4		430	7.4	300	4.5	210	2.5	170	1.7	510	20.4	1,100	37.8
7/8		370	6.5	260	4.0	180	2.2	150	1.5	440	17.7	900	33.1
1		320	5.3	230	3.4	160	1.9	130	1.3	380	15.1	770	28.1
1 1/4		260	4.1	180	2.6	130	1.5	110	1.0	310	11.8	610	21.3
1 1/2		220	3.2	150	2.1	110	1.2	90	0.8	260	9.2	510	17.1
2		160	1.5	120	0.9	80	0.5	70	0.3	190	4.1	390	8.0
Depth of Cut	a_a	1.5D											
	a_r	0.25D											

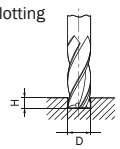
1) The above cutting speeds and feeds apply to regular end mill flute length.
For long fluted end mills please use the following factors below:

Cutting Length	Reduce Feed by
2.5 × Diameter	15%
3 × Diameter	25%
4 × Diameter	55%
5 × Diameter	65%
6 × Diameter	75%

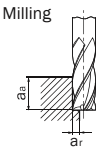
2) In dry milling, reduce the RPM and Feed 30% of values on table above. (recommended air blow)
3) Adjust drilling condition when unusual vibration or different sound occurs.

D: Dia. of Mill

Slotting



Side Milling



Standard Milling Conditions List No. 6211X

4 Flute

Work Material / Milling Conditions / Dia. of Mill (inch)		Carbon Steels		Alloy Steels		Die Steels Stainless Steels		Nickel Alloys Titanium Alloys		Cast Iron		Aluminum Alloys Copper Alloys Nonferrous Alloys	
		118 SFM		83 SFM		70 SFM		60 SFM		130 SFM		260 SFM	
		RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)
1/8		3,600	8.6	2,600	5.2	2,100	2.5	1,800	2.5	4,000	20.8	8,000	38.4
3/16		2,400	6.7	1,700	4.1	1,400	2.2	1,200	1.9	2,700	17.3	5,300	31.8
1/4		1,800	7.9	1,300	4.7	1,100	3.1	900	2.5	2,000	22.4	4,000	36.8
3/8		1,200	6.7	900	4.7	700	2.8	600	2.0	1,400	19.6	2,700	33.5
1/2		880	7.4	630	4.8	510	3.1	450	2.3	1,000	20.0	1,990	37.4
5/8		710	7.4	510	4.5	410	3.0	360	2.2	800	20.8	1,590	34.3
3/4		590	6.6	420	4.4	340	2.7	300	2.0	670	18.5	1,330	31.9
1		440	4.8	320	3.1	260	2.0	230	1.5	500	13.4	1,000	24.8
1 1/4		360	3.8	260	2.5	210	1.6	180	1.2	400	10.2	800	18.9
1 1/2		300	3.1	210	1.9	170	1.2	150	0.9	340	8.2	670	15.0
Depth of Cut	a_a	1.5D											
	a_r	0.25D											

6 Flute

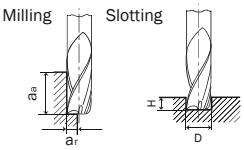
Work Material / Milling Conditions / Dia. of Mill (inch)		Carbon Steels		Alloy Steels		Die Steels Stainless Steels		Nickel Alloys Titanium Alloys		Cast Iron		Aluminum Alloys Copper Alloys Nonferrous Alloys	
		116 SFM		83 SFM		70 SFM		60 SFM		130 SFM		330 SFM	
		RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)	RPM	Feed (IPM)
1/2		880	11.1	630	7.2	510	4.6	450	3.4	1,000	30.0	2,700	56.1
5/8		710	11.1	510	6.7	410	4.4	360	3.2	800	31.2	1,990	51.5
3/4		590	9.9	420	6.6	340	4.1	300	3.1	670	27.7	1,590	47.9
1		440	7.3	320	4.7	260	3.0	230	2.3	500	20.1	1,330	37.2
1 1/4		360	5.7	260	3.7	210	2.3	180	1.7	400	15.4	1,000	28.3
1 1/2		300	4.6	210	2.9	170	1.8	150	1.4	340	12.2	800	22.5
Depth of Cut	a_a	1.5D											
	a_r	0.25D											

1) The above cutting speeds and feeds apply to regular end mill flute length.
For long fluted end mills please use the following factors below:

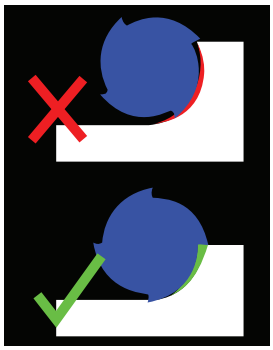
Cutting Length	Reduce Feed by
2.5 × Diameter	15%
3 × Diameter	25%
4 × Diameter	55%

2) In dry milling , reduce the RPM and Feed 30% of values on table above. (recommended air blow)
3) Adjust drilling condition when unusual vibration or different sound occurs.

D: Dia. of Mill



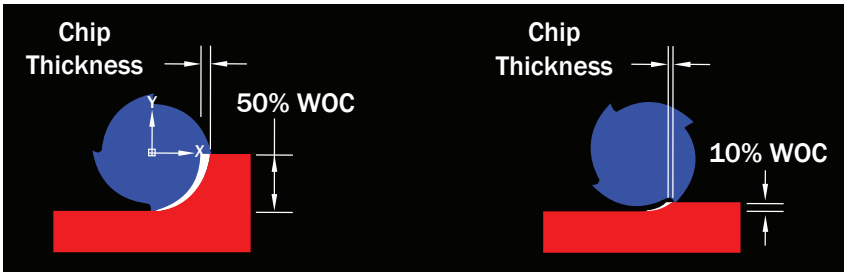
Shaping Up Your Chips



Chip Load vs. Chip Thickness

Chip shape plays an important role in proper performance, chip evacuation, and heat management while milling. A thick-to-thin chip shape is ideal. This is created when radial width of cut is 50% or less. This is a part of the reason slotting can be so hard on cutters.

Chip load and chip thickness are commonly mistaken as being one and the same. This stems from traditional toolpaths engaging half of cutter diameter. As a round tool comes around to shear a chip, width of cut plays an important role in how thick that chip will be.



Now comes the fun part- compensating for chip thinning allows for increased feed rates. As radial width of cut decreases, feed rate increases to maintain the same chip thickness. Use the formula below to find your ideal cutting condition.

$$\text{Adjusted Feed Rate} = \frac{IPT \times D}{2 \times \sqrt{(D \times RDOC) - RDOC}}$$

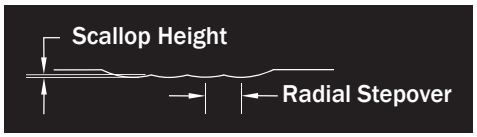
IPT = IPT @ 50% RDOC
D = Cutter Diameter
RDOC = Radial Depth of Cut

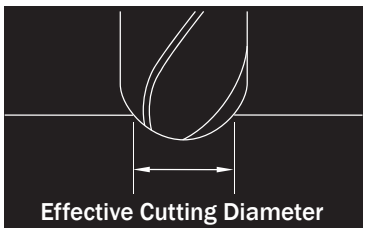
Ball Nose End Mill

Ball nose end mills are commonly used for finishing contoured surfaces. Being a full radius end, depth of cut determines effective cutting diameter. Calculating the effective cutting diameter is necessary to determine proper feed and speed adjustments.

$$\text{Effective Cutting Diameter} = 2 \times \sqrt{ADOC \times (D\text{-}ADOC)}$$

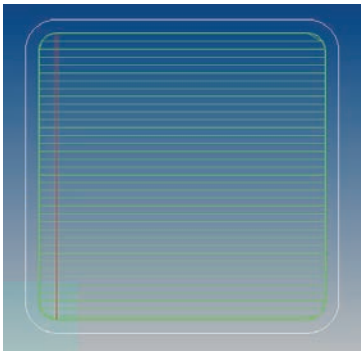
Radial stepover is a major variable in determining surface finish. This will create a “scallop height”.

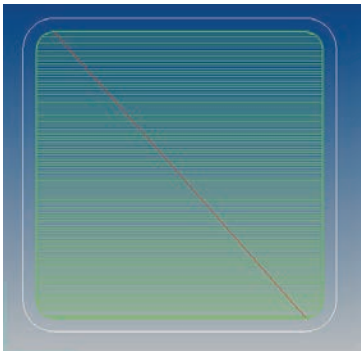




High Speed Machining

High Performance Tooling





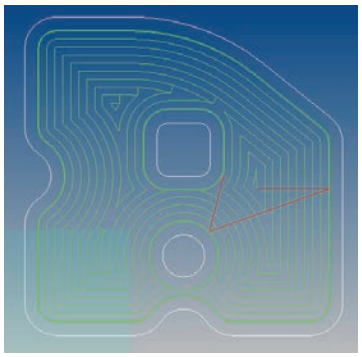
Machining 300 Series Stainless Steel

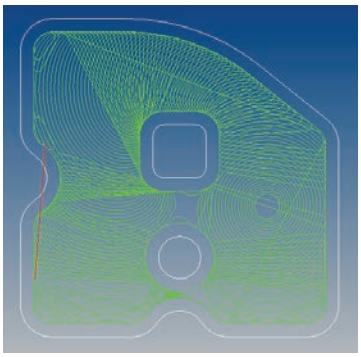
Traditional Strategy	HSM Strategy
½" 4 Flute End Mill	½" 4 Flute End Mill
290 SFM	720 SFM
0.0027 IPT	0.0046 IPT
0.5XD Axial DOC	1.5XD Axial DOC
0.3XD Radial WOC	0.1XD Radial WOC
30 Minute Cycle	18 Minute Cycle

High Speed Machining is a strategy used to decrease cycle time and increase tool life. HSM uses light radial width of cut and heavy axial depth of cut to remove a lot of material quickly. The light radial width of cut allows for faster feed rates. Using as much of the full LOC of the end mill promotes better work distribution through the flutes and leads to increased tool life. Along with increased feed rates, increased surface speed is also desirable with HSM. Because the tool is engaging less material, less heat is generated. SFM can be increased to achieve even faster cycle time.

High Efficiency Machining

HSM Meets Modern CAM





Machining 300 Series Stainless Steel

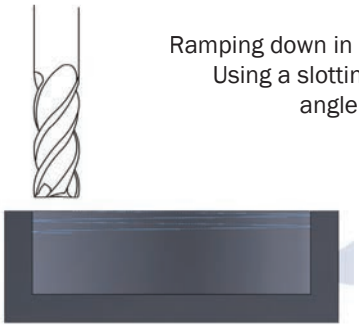
Traditional Strategy	HSM Strategy
½" 4 Flute End Mill	½" 4 Flute End Mill
290 SFM	720 SFM
0.0027 IPT	0.0046 IPT
0.5XD Axial DOC	1.5XD Axial DOC
0.3XD Radial WOC	0.1XD Radial WOC
22 Minute Cycle	11 Minute Cycle

High Efficiency Machining is a strategy combining HSM and modern CAM software capabilities. HEM strategy uses paths that create consistent chip load, avoiding sharp turns and crunching in corners. Utilizing chip thinning calculation, light radial depths of cut allow for faster feed rates with the same actual chip thickness. This not only allows for parts to be machined faster, but also is much easier on tooling.

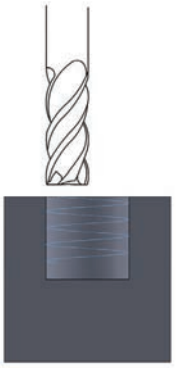
Entry Methods

Plunge • Ramp • Helix • Pilot

The simplest way, and harshest way, to enter a pocket is to plunge into the part. Using a decreased feed rate, plunge to the desired depth and then start milling. This is extremely rough on tools and will lead to a short tool life, especially in harder materials.



Ramping down in a straight line offers an advantage over plunging. Using a slotting speed/feed and ramping down at a 1-3 degree angle promote less tool wear than traditional plunging.



Helical ramp entry has always been known as a preferred method to enter a pocket. Using a slotting speed/feed and helixing down at a 1-3 degree angle promote less tool wear than traditional plunging.

Another common method to enter a pocket is to drill a pilot hole using a standard point drill. This leaves a drill point angle at the bottom of the pocket that must be cleaned up with the end mill.

Nachi offers a unique solution to pilot the starting hole with our Aqua EX Flat Bottom Drill. Creating this pilot hole allows for plunging straight down and getting to work. This eliminates the need to mill out a drill point angle at the bottom of the pocket. This is the fastest way, and the best method for tool life.

Finishing Methods

Radial width of cut can play an important role in finishing. When taking a finish pass, it is important to keep the cutter engaged enough that it does not chatter. Two common methods can be used to eliminate chatter.

Taking a heavier cut can engage the tool more and prevent it from vibrating too much.

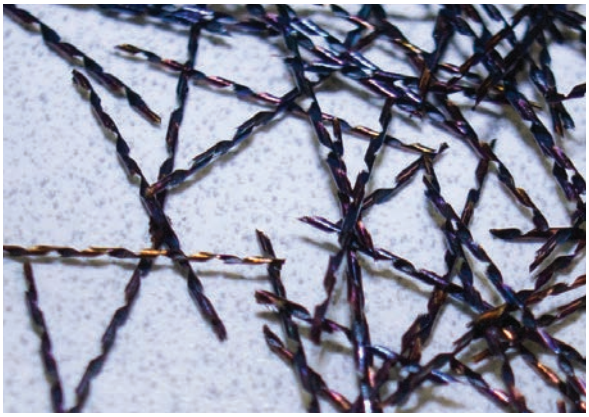
Tipping the balance between RPM and feed rate can engage the tool more to decrease vibration. Try decreasing RPM 5 or 10%, or increasing feed rate 5 or 10%.

Hard Milling

Read Your Chips

When hard milling, it is important to use air blow rather than coolant. Due to the high heat generated while machining hard materials, using coolant can cause a pulsating hot and cold effect that causes the carbide to fracture.

✓Good



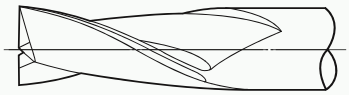
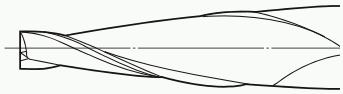
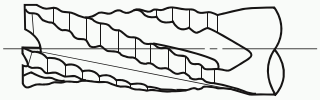
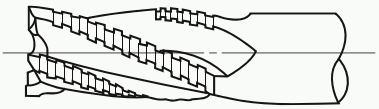
✓Good

It is important to read your chips while hard milling. The goal is to machine just enough material to pull the heat out in the chip. This will cause the chips to discolor, being blue, gold, purple, etc.

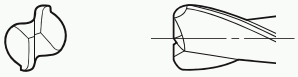
✗ Bad

A chip that is silver in color is a good indicator that the heat generated from milling is being left in the material and in the tool. This will lead to decreased tool life. This can also indicate that the tool is worn and near the end of it's life.

The Peripheral Teeth and the Features

Type	Form	Features
Square Type		• Used for general purpose, that is slotting, side milling, etc. • Used for every cutting. That is rough cut, semi-finish cut and finish cut.
Tapered Type		• Used for milling of draft angle of die components. • The peripheral teeth is taper.
Roughing Type (HOG)		• Suitable for rough milling, because of the small cutting resistance, and small cutting chips by the wavy type nicks. • Do not use for finish milling because of too much roughness.
HEAVY Type (Roughing and Finishing)		• The cutting resistance is larger than roughing end mill, but smaller than square teeth end mill. Suitable for semi-finish milling and parts which do not require accurate tolerance.

The End Teeth and the Features

Type	Form	Features
Square Type with Center Hole		• Used for general purpose, that is slotting, side milling, etc. • Cannot be used for plunge feed.
Square Type without Center Hole		• Used for general purpose, that is slotting, side milling, etc. • Can be used for plunge feed. 2 Flutes is better than multi-flutes for plunge cut.
Ball		• Used for contour milling or copy milling of die components. • The center of teeth does not have better cutting performance because of too small chip pocket and cutting speed.
Corner Radius		• Suitable for radius shape milling for corner of die components or machine parts. • Suitable for high-speed contour milling because of it's rigidity.

1. Correct Selection of End Mills

It is necessary to choose the most suitable end mills considering cutting efficiency, accuracy and so on for high efficient machining.

Tool Material

HSS-Co (equivalent to SKH59) shows excellent performance for cutting normal steel to non-ferrous alloy and cast iron. Select coated HSS, PM-HSS, FAX or Carbide for more efficient and long lasting milling.

Number of Flutes

Generally, 2 Flute is used for slot milling because of its wide chip pocket. 4 Flute is used for side milling because of its high rigidity.

Helix Angle

Generally 30° is used because better surface finish is obtained by helix angle around 30°. Lower helix is good for keyway slotting because the slot inclination is small. The bigger is the helix, the better will be the surface finish so that the high helix end mills will be used for contour milling.

Guidance for Number of Flutes Selection

Functions	Characteristics	No. of Flutes	
		2 Flute	4 Flute
Strength	Twist Rigidity	○	◎
	Bending Rigidity	○	◎
Surface Finish	Roughness	○	◎
	Waving	○	◎
	Inclination	○	◎
Tool Life **S50C** (200HB)	Feed (mm/tooth) Wear	○	◎
	Constant Broken	○	◎
SKD11 (320HB)	Feed (mm/tooth) Wear	○	◎
	Constant Broken	○	◎
Chip Disposal	Chip Jam	○	◎
	Chip Exhaust	○	◎
Resharpening	Out Dia. Relief	◎	○
	End Teeth	◎	○
Form Modify	Ball Nose, Taper Form	◎	○

◎ Great ○ Good

Functions	Characteristics	No of Flutes	
		2 Flute	4 Flute
Drilling	Counter Sink	◎	○
	Surface Roughness	◎	○
	Enlargement of Holes	◎	○
Cutting	Finishing	○	◎
	Light Duty	○	◎
	Heavy Duty	○	◎
Slotting	Chip Exhaust	◎	○
	Enlarge, Eccentricity	◎	○
	Keyway Cutting	◎	○
Side Milling	Milling Accuracy	○	◎
	Chattering Vibration	◎	○
Work Material	Alloy Steel	○	◎
	Cast Iron	○	◎
	Non-ferrous Material	◎	○
	Difficult Machining	○	◎

◎ Great ○ Good

Characteristics of End Mill Helix

Range of Helix Angle	Cutting Resistance			Surface Accuracy			Tool Life			Resharpening	
	Torque	Bending	Thrust	Roughness	Waving	Inclination	Flank Wear	Out Dia. Downsize	Breakage	Peripheral Relief	End Teeth
Low Helix	○	○	●	○	●	●	○	△	○	●	●
Standard Helix	●	●	○	●	○	○	●	○	●	●	●
High Helix	●	●	△	●	△	○	○	●	○	○	○

● Great ○ Good △ OK – Judging from usage of end mills

TROUBLE-SHOOTING GUIDE FOR END MILL PROBLEMS

	Problem	Factors	Countermeasures
Surface Roughness	Rough Finish	Chatter	• Increase rigidity of workpiece fixture • Check machine condition, horsepower (H,P) • Reduce cutting speed • Consider conventional (up-cut) milling • Use shortest possible length of tool, consider using special long reach holder
		Uneven hardness of workpiece	• Use even hardness material
		Insufficient rake or relief	• Resharpen cutter to correct geometry to suit cutting conditions
		Built-up edge, cold welding	• Remove build-up edge & cold welding • Check deterioration of cutting fluid
		Dull cutting edge	• Provide timely resharpening
		Speed too high	• Reduce cutting speed
		Improper or lack of cutting fluid	• Change cutting fluid or lubricating system
	Torn Finish	Uneven wear on teeth	• Remove wear by regrinding
		Cold welding on teeth	• Remove cold welding • Change cutting fluid
		Bruise on teeth	• Handle end mill carefully
	Waviness	Too small number of flutes Heavy cutting conditions Helix angle too big	• Try multi flute end mill, 2FLfi3FLfi4FL • Reduce amount of radial depth of cut and feed • Use lower helix angle end mill
Form Error	Squareness (Perpendicularity)	Heavy cutting conditions Excessive overhang of cutter or workpiece Angular error of fixture	• Reduce depth of cut and feed • Use shortest possible length of tool, consider using special long reach holder • Correct fixture angle
Tool Life	Short Life per Resharpening	Material too hard	• Provide proper annealing • Reduce feed and use upper grade material end mill
		Incorrect feed	• Define proper feed
		Built-up edge, cold welding	• Remove build-up edge or cold welding • Use activative cutting fluid
		Insufficient coolant	• Use proper cutting fluid • Increase rate of coolant flow
		Incorrect resharpening	• Resharpen cutter to correct geometry to suit cutting conditions
	Total Tool Life Too Short	Less number of resharpening	• Regrind relief angle smaller • Provide proper resharpening amount
		Improper time of resharpening	• Provide timely resharpening
	Excessive Wear	Material defect of workpiece	• Use evenness hardness material
		Improper rake or relief	• Resharpen cutter to correct geometry to suit cutting conditions
		Insufficient performance of end mill	• Use upper grade material end mill • Try to use coated end mill
		Unsuitable cutting fluid	• Select proper cutting fluid • Correct lubricating system
		Improper time of resharpening	• Provide timely resharpening
		Incorrect resharpening	• Improve surface roughness on resharpening • Prevent overheat of cutter grinding • Remove build-up edge and weld deposit
	Chipping or Cracking	Chatter	• Increase rigidity of workpiece fixture
		Material defect or workpiece	• Use even hardness material • Remove abnormal parts such as scale, sandtumbling etc.
		Feed too high	• Reduce feed speed
		Dull cutting edge	• Provide resharpening
		Deterioration of cutting fluid	• Provide new cutting fluid
	Breakage	Lack of rigidity in set-up	• Check component or fixture for security and rigidity
		Dull cutting edge	• Provide Resharpening
		Careless handling	• Handle end mill carefully
		Chip cram	• Remove chips by air-jet cutting fluid

TAPS

SGSP - DIN
Spiral Fluted Taps

SGPO - DIN
Spiral Pointed Taps

NACHI

Features:

- Made from high grade powder HSS and SG coating for longer tool life
- High flexibility for superior performance on a variety of materials, machines, and cutting conditions
- Stable cutting threads and long tool life regardless of cutting speed
- Achieves easy flow of chips while cutting on Stainless Steels, Structural Steels and Aluminum Alloys

Features

- Made from high grade powder HSS and SG coating for longer tool life
- Optimized edge and flute shape allow for stable cutting threads, high rigidity and chip ejection
- High flexibility for superior performance on a variety of materials, machines, and cutting conditions
- Stable cutting threads and long tool life regardless of cutting speed
- Achieves easy flow of chips while cutting on Stainless Steels, Structural Steels and Aluminum Alloys
- ANSI Shank DIN Overall Length

Work Materials

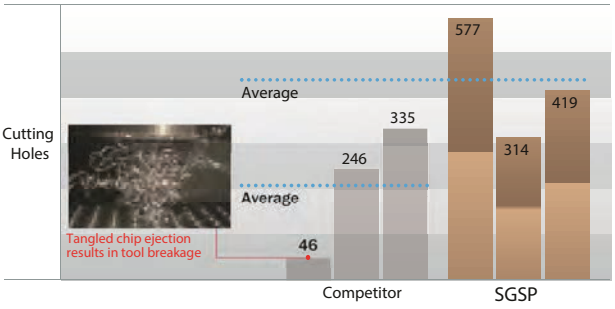
- Covers a wide range of applications -
  - Aluminum
  - Alloy Steel
  - Cast Iron
  - Stainless Steel
  - Carbon Steel

Properties

Properties of NACHI Premium P-HSS
High toughness can be obtained even at high hardness levels

Performance

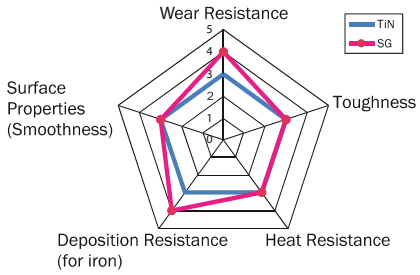
Long tool life with Stainless Steels



Tapping Condition	M6 x 1 Depth 12 mm 25 SFM	304 Stainless Vertical m/c

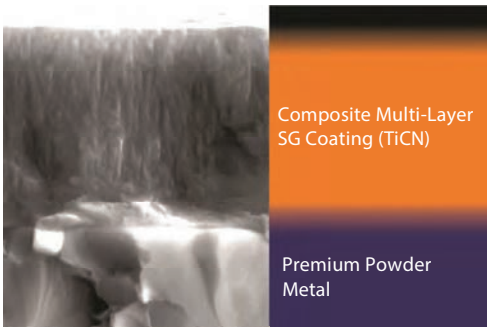
Characteristics

Characteristics of SG Coating



Composite multi-layer film coating method characterized by improved wear resistance as compared to TiN.

SG Coating (Tin + TiCN)



Application

Selection Chart

● : Great ○: Good △: OK

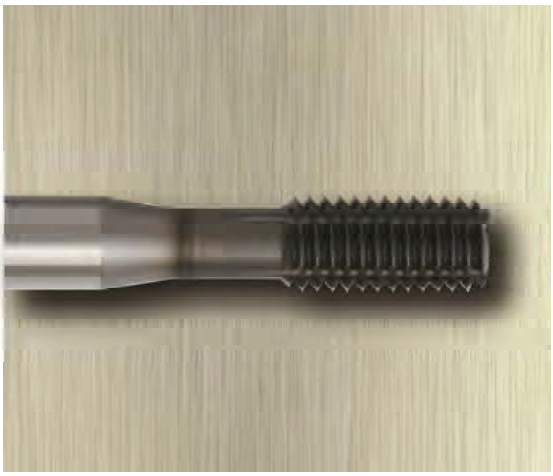
Carbon Steel			Alloy Steel	Die Steel	Aluminum	Stainless Steel			Cast Iron	Nickel	Titanium	Hardened
Low Carbon 1010,1018	Medium Carbon 1035,1045	High Carbon 1065,1095	4140,4340	~20Hrc D2,H13	6061 7075	300 Series	400 Series	17-4PH	Grey Ductile	Alloy	Alloy	Steel >35Hrc
●	●	●	●	○	○	●	○	△	○		△	

TAPS

Features

- **Nachi Viper Taflet Taps** are specially engineered for steels, and require less torque than conventional coldform taps. This reduces the chance of breakage.
- **Nachi Viper Taflet Taps** are steam oxide surface treated to limit adhesion from fusion, and carries coolant to the work area. Bright finish is available when required.
- **Nachi Viper Taflet Taps** have more radial sections for higher accuracy of internal threads in steel.This compares favorably to coldform internal threads, which aren't always clean and accurate.

VIPER TAFLET



DLC Taflet

Work Materials

- Structural Steels
- Stainless Steels
- Carbon Steels
- Aluminum Alloys
- Alloy Steels

Performance

TAFLET

Fiber flow is:

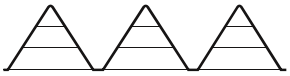
NOT INTERRUPTED

Female thread cut by a TAFLET

Cutting Tap

Fiber flow is:

INTERRUPTED



Female thread cut by a cutting tap

Features of Taflet

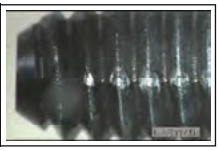
Item	Cutting Tap	Taflet	Taflet Features
Tap breakdown	×	○	Does not break because there is no groove
Trouble caused by chips	×	○	No trouble because there is no chip
Accuracy of female thread	×	○	Little variations because of cold forming tapping
Female thread surface roughness	×	○	Excellent because threads are finished by sliding over the tap surface
Tapping torque	○	×	1.5 through 2.5 times the torque of a cutting tap
Female thread strength	×	○	Excellent because fiber flow is not interrupted in plastic working
Workpiece	○	×	Limited to the material of good malleability

DLC TAFLET

Semi-Dry Tapping

Forming tap with DLC coating can be used in Aluminum, Aluminum Alloys, Die Cast Aluminum.
The tap shown below, M6x1.0, tapped 1,000 holes in A6061 with mist hole lube applied and has minimum adhesion of material.

Tapping Condition	
Size	M6x1.0
Material	A6061-T6
Speed	15 m/min (49.2 SFM)
Feed	1.0 mm/rev (0.039 IPM)
Depth of Thread	13 mm
Coolant	Mist Lube (25cc x 2 nozzle/h)

1000 Hole	

Viper Taflet Taps Thread Forming

Features

- NACHI Viper Taflet taps are designed for economical and efficient tapping of steel.
- No chips are produced with Taflet Taps, the threads are formed by the displacement of the metal. Threads produced this way are generally more accurate and stronger than threads produced by conventional tapping.

Performance

Advantages of NACHI Viper Taflet Taps

Conventional coldform taps for steel require high torque. NACHI Viper Taflet taps have been specially engineered for steels and require less torque, reducing the chance of breaking.

In conventional coldform threading, rapid wear and adhesion due to high frictional heat may occur. NACHI Viper Taflet tap's steam oxide surface treatment limits adhesion from fusion and carries coolant to the work area. Bright finish is also available when required.

Conventional coldform internal threads aren't always clean and accurate. NACHI Viper Taflet taps have more radial sections for higher accuracy of internal threads in steel.

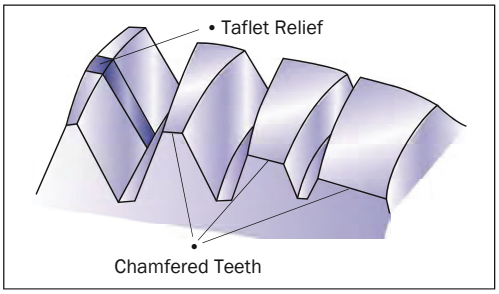
Features

- VTP Series are suitable for various material.

Work Materials

- Structural Steels
- Alloy Steels
- Aluminum Alloys
- Carbon Steels
- Stainless Steels

Performance



The results provide two-fold benefits. The first is minimal or no oversized thread diameter over the entire thread length, with smooth thread surfaces. The second is smooth chip ejecion, ensuring freedome from chips for trouble-free performance, especially on machining centers and on unattended machining lines.

VTP Series Taps

Nachi VTP Series Taps were specifically designed to overcome the major difficulties of spiral fluted taps: oversizing and chip control. An all-new approach to these limitations also provides double-action tapping - cutting with chamfered teeth, *plus cold rolled forming with a* specially engineered shape of thread that we call *Taflet Relief.*

Conventional Taps **VTP-Series Taps**

HIGH PERFORMANCE TAPS

List No.	Tap Name		Chamfer	Material	Coating	Stock Size		Product Page
SG Tap Series								
6800		**SGSP-DIN Spiral Flute**	Modified Bottoming	PM-HSS	SG	Metric	M3 to M24	p. 222-223
6801						Fractional	1/4 to 1	p. 222-223
6801						Machine Screw	2 to 12	p. 222-223
6802		**SGPO-DIN Spiral Point**	Plug			Metric	M3 to M24	p. 224-225
6803						Fractional	1/4 to 1	p. 224-225
6803						Machine Screw	2 to 12	p. 224-225
6958		**SG Low Spiral**	Modified Bottoming	HSSE		Metric	M3 to M24	p. 226-227
6959						Fractional	1/4 to 1	p. 226-227
6959						Machine Screw	2 to 12	p. 226-227
Taflet Thread Forming Series								
6956		**DLC Taflet**	Plug & Bottom	HSSE-V	DLC	Metric	M3 to M24	p. 228-229
6955						Fractional	1/4 to 1	p. 228-229
6957						Machine Screw	2 to 12	p. 228-229
996		**Viper Taflet**			Black Oxide	Metric	M3 to M24	p. 230
995						Fractional	1/4 to 1	p. 231-232
995						Machine Screw	2 to 12	p. 231-232
VTP Spiral Flute Series								
980		**VTP Spiral Flute**	Modified Bottoming	HSSE-V	Black Oxide	Metric	M3 to M24	p. 233
981						Fractional	1/4 to 1	p. 234
983						Machine Screw	2 to 12	p. 234
982		**VTP Spiral Point**	Plug			Metric	M3 to M24	p. 233
971						Fractional	1/4 to 1	p. 235
973						Machine Screw	2 to 12	p. 235
General Purpose Hand Tap Series								
911		**Standard Hand Tap**	Taper, Plug, & Bottom	HSSE-V	Bright	Fractional	1/ to 1-1/2	p. 236
913		**Standard Hand Tap**				Machine Screw	0 to 12	p. 237
910		**Standard Hand Tap**		HSS		Metric	M2 to M30	p. 240
969		**Hand Tap for Cast Iron**	Plug & Bottom	HSSE-V	Black Oxide	Fractional	1/4 to 3/14	p. 238

● : Great ○ : Good Δ : OK – : Not Recommended

List No.	Cutting Condition Page	Workpiece Material														
		Carbon Steel	Alloy Steel	Pre Hardened Steel	Die Steel	Hardened Steel		Stainless Steel		PH Stainless	Titanium Alloys	Nickel Alloys	Cast Iron	Ductile Cast Iron	Aluminum Alloy	Copper Alloys
						HRc		Austenitic 300 Series	Martensitic 400 Series							
			20 ~ 30		25 ~ 40	40 ~ 50	50 ~ 65									
6800	p. 222															
6801	p. 222	●	●	●	○	–	–	●	●	○	–	–	–	○	○	○
6801	p. 222															
6802	p. 224															
6803	p. 224	●	●	●	○	○	–	●	●	○	–	–	○	○	○	○
6803	p. 224															
6958	p. 226															
6959	p. 226	○	○	○	●	Δ	–	–	–	–	–	–	Δ	Δ	–	–
6959	p. 226															
6956	p. 228															
6955	p. 228	–	–	–	–	–	–	–	–	–	–	–	–	–	●	●
6957	p. 228															
996	p. 231															
995	p. 231-232	●	○	–	–	–	–	○	○	Δ	–	–	–	–	–	–
995	p. 231-232															
980	p. 235															
981	p. 235	●	●	○	–	–	–	Δ	Δ	Δ	–	–	○	○	○	○
983	p. 235															
982	p. 235															
971	p. 235	●	●	○	–	–	–	Δ	Δ	Δ	–	–	○	○	○	○
973	p. 235															
911	p. 244	Δ	Δ	Δ	–	–	–	–	–	–	–	–	Δ	Δ	Δ	Δ
913	p. 244	Δ	Δ	Δ	–	–	–	–	–	–	–	–	Δ	Δ	Δ	Δ
910	p. 244	Δ	Δ	Δ	–	–	–	–	–	–	–	–	Δ	Δ	Δ	Δ
969	p. 244	Δ	Δ	Δ	–	–	–	–	–	–	–	–	●	●	–	–

TAPS

STANDARD TAPS

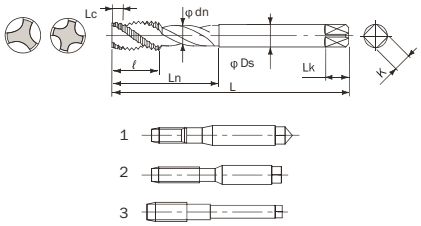
List No.	Tap Name		Chamfer	Material	Coating	Stock Size		Product Page
General Purpose Spiral Point Tap Series								
923		**Standard Spiral Point**	Plug	HSS	Bright	Machine Screw	0 to 12	p. 239
921		**Standard Spiral Point**		HSSE-V		Fractional	1/4 to 3/4	p. 238
920		**Standard Spiral Point**		HSS		Metric	M2.5 to M16	p. 240
General Purpose Pipe Tap Series								
941 941D		**Taper Straight Fluted**		HSS	Bright	NPT NPTF	1/16 to 2	p. 241
943 943D		**Taper Interrupted**				NPT NPTF	1/8 to 1	p. 241
947 947D		**Taper Spiral Fluted**		HSSE-V	Black Oxide	NPT NPTF	1/16 to 1	p. 242
945 945D		**Straight Pipe Tap**		HSS	Bright	NPS NPSF	1/8 to 1	p. 242
959 959D		**Short Projection**				NPT NPTF	1/8 to 1	p. 243
957		**6” Extension**				NPT	1/16 to 1	p. 243

● : Great ○ : Good Δ : OK – : Not Recommended

List No.	Cutting Condition Page	Workpiece Material														
		Carbon Steel	Alloy Steel	Pre Hardened Steel	Die Steel	Hardened Steel		Stainless Steel		PH Stainless	Titanium Alloys	Nickel Alloys	Cast Iron	Ductile Cast Iron	Aluminum Alloy	Copper Alloys
						HRc		Austenitic 300 Series	Martensitic 400 Series							
			20 ~ 30		25 ~ 40	40 ~ 50	50 ~ 65									
923	p. 244	Δ	Δ	Δ	–	–	–	–	–	–	–	–	Δ	Δ	Δ	Δ
921	p. 244	Δ	Δ	Δ	–	–	–	–	–	–	–	–	Δ	Δ	Δ	Δ
920	p. 244	Δ	Δ	Δ	–	–	–	–	–	–	–	–	Δ	Δ	Δ	Δ
941 941D	p. 244	Δ	Δ	Δ	–	–	–	–	–	–	–	–	Δ	Δ	Δ	Δ
943 943D	p. 244	Δ	Δ	Δ	–	–	–	–	–	–	–	–	Δ	Δ	Δ	Δ
947 947D	p. 244	○	○	○	–	–	–	–	–	–	–	–	○	○	○	○
945 945D	p. 244	○	○	○	–	–	–	–	–	–	–	–	○	○	○	○
959 959D	p. 244	Δ	Δ	Δ	–	–	–	–	–	–	–	–	Δ	Δ	Δ	Δ
957	p. 244	○	○	○	–	–	–	–	–	–	–	–	○	○	○	○

SGSP-DIN Spiral Fluted Tap

- Modified Bottoming Style 2.5 Thread Chamfer
- SG Coating
- DIN Overall Length
- Premium Powdered High Speed Steel



List 6800 Metric Sizes

Size	Thread Limit	EDP No	No. of Flutes	Dimensions				
				Overall Length	Length of Thread	Under Neck Length	Shank Dia.	Style
METRIC SIZES				L	ℓ	Ln	Ds	
M3 X 0.5	D3	1486233	3F	2.205	0.228	0.626	0.141	1
M4 X 0.7	D4	1486256		2.480	0.307	0.689	0.168	
M5 X 0.8		1486262		2.756	0.374	0.874	0.194	
M6 X 1.0	D5	1486279		3.150	0.453	1.000	0.255	
M8 X 1.25		1486307		3.543	0.594	1.126	0.318	2
M10 X 1.25		1486313		3.937		1.252	0.381	
M10 X 1.5	D6	1486320			0.740			
M12 X 1.25		1486336			0.634	1.425	0.367	3
M12 X 1.5		1514479			0.780			
M12 X 1.75		1486342		4.331	0.882			
M14 X 2.0	D7	1514491			1.024	1.669	0.429	
M16 X 2.0		1514513				1.748	0.480	
M18 X 2.5		1514536	4F	4.921	1.280	1.937	0.542	
M20 X 2.5		1514559		5.512		1.996	0.652	
M24 X 3.0	D8	1514594		6.299	1.535	2.323	0.760	

1 piece per package

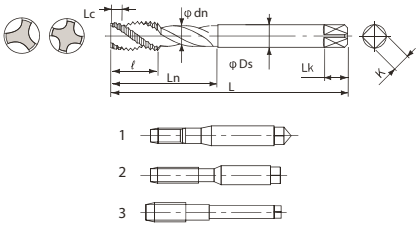
⚠ WARNING: Cancer - www.P65Warnings.ca.gov

SGSP Work Material & Cutting Condition Recommendations

Work Material		Tapping Speed SFM
Low Carbon Steel	1010 1018	80 - 100
Medium Carbon Steel	1035 1045	80 - 100
High Carbon Steel	1065 1095	80 - 100
Alloy Steel	4140 4130	25 - 45
Die Steel	D2 H13 (up to 20 HRC)	20 - 40
Hardened Steel	~ 35 HRC	15 - 35
Stainless Steel Austentic	303 304 316	10 - 25
Stainless Steel Martenstic	410 430	10 - 25
Stainless Steel	17-4PH	10 - 25
Aluminum	6061 7075 Casting	80 - 100
Cast Iron	Grey Nodular	90 - 110

SGSP-DIN Spiral Fluted Tap

- Modified Bottoming Style 2.5 Thread Chamfer
- SG Coating
- DIN Overall Length
- Premium Powdered High Speed Steel



List 6801

Machine Screw & Fractional Sizes

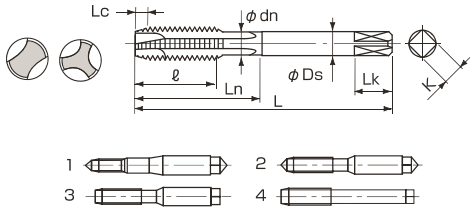
Size	Thread Limit	No. of Flutes	EDP No	Dimensions				
				Overall Length	Length of Thread	Under Neck Length	Shank Dia.	Style
MACHINE SCREW SIZES				L	ℓ	Ln	Ds	
2-56	H2	3F	1539482	1.772	0.441	0.591	0.141	1
4-40	H2		1539499	2.205	0.272	0.563		
6-32	H2		1540459		0.374	0.689		
	H3		1486439					
8-32	H2		1540465	2.480		0.752	0.168	
	H3		1486451					
10-24	H3		1486474	2.756	0.496	0.874	0.194	
10-32	H2		1540471					
	H3		1486480					
12-24	H3		1486497	3.150		0.937	0.220	
FRACTIONAL SIZES								
1/4 - 20	H3	3F	1486519	3.150	0.606	1.000	0.255	1
	H5		1540488					
1/4 - 28	H3		1486525		0.413			
	H4		1540494					
5/16 - 18	H3		1486531	3.543	0.697	1.126	0.318	2
	H5		1540500					
5/16 - 24	H3		1486548		0.480			
	H4		1540516					
3/8 - 16	H3		1486554	3.937	0.783	1.252	0.381	
	H5		1540522					
3/8 - 24	H3		1486560	3.543	0.480			
	H4		1540539					
7/16 - 14	H3		1486577	3.937	0.894	1.236	0.323	3
	H5		1540545					
7/16 - 20	H3		1486583		0.626			
	H5		1540551					
1/2 - 13	H3		1486590	4.331	1.024	1.425	0.367	
	H5		1540568					
1/2 - 20	H3		1486605	3.937	0.646			
	H5		1540574					
5/8 - 11	H4		1514622	4.331	1.185	1.748	0.480	
	H6		1540580					
5/8 - 18	H4		1514639	3.937	0.732			
	H6		1540597					
3/4 - 10	H4	4F	1514645	4.921	1.303	1.937	0.590	
	H6		1540602					
3/4 - 16	H4		1514651	4.331	0.827			
	H6		1540619					
1 - 8	H4		1514680	6.299	1.626	2.323	0.800	
	H6		1540625					

Order by EDP Number
1 piece per package

⚠ WARNING: Cancer - www.P65Warnings.ca.gov

SGPO-DIN Spiral Pointed Tap

- Plug Style 5 Thread Chamfer
- SG Coating
- DIN Overall Length
- Premium Powdered High Speed Steel



List 6802 Metric Sizes

Nominal Size	Pitch	No. of Flutes	EDP No D3	EDP No D4	EDP No D5	EDP No D6	EDP No D7	EDP No D8	Dimensions Overall Length	Dimensions Length of Thread	Dimensions Under Neck Length	Dimensions Shank Dia.	Style
METRIC SIZES									L	ℓ	Ln	Ds	
M3	0.5	3F	1542451						2.205	0.394	0.630	0.141	2
M4	0.7	3F		1542898					2.480	0.492	0.752	0.168	
M5	0.8	3F		1542903					2.756	0.571	0.882	0.194	
M6	1.0	3F			1542910				3.150	0.669	1.000	0.255	
M8	1.25	3F			1542926				3.543	0.866	1.181	0.318	3
M10	1.25	3F			1542932				3.937		1.437	0.381	
M10	1.5	3F				1542949				1.063			
M12	1.25	3F			1542955					0.906	-	0.367	4
M12	1.5	3F				1542978				1.102	-		
M12	1.75	3F				1542961			4.331	1.260	-		
M14	2.0	3F					1542468				-	0.429	
M16	2.0	3F					1542474				-	0.480	
M18	2.5	3F					1542480		4.921	1.476	-	0.542	
M20	2.5	3F					1542497		5.512		-	0.652	
M24	3.0	3F						1542502	6.299	1.772	-	0.760	

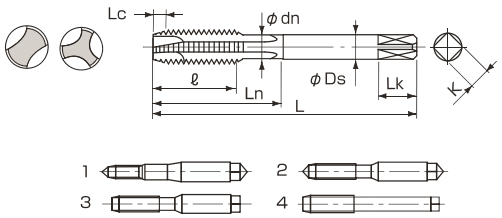
Order by EDP Number
1 piece per package

SGPO Work Material & Cutting Condition Recommendations

Work Material		Tapping Speed SFM
Low Carbon Steel	1010 1018	70 - 90
Medium Carbon Steel	1035 1045	90 - 110
High Carbon Steel	1065 1095	90 - 110
Alloy Steel	4140 4130	45 - 65
Die Steel	D2 H13 (up to 20 HRC)	25 - 45
Hardened Steel	~ 35 HRC	15 - 35
Stainless Steel Austentic	303 304 316	10 - 30
Stainless Steel Martenstic	410 430	10 - 30
	17-4PH	10 - 30
Aluminum	6061 7075 Casting	100 - 120
Cast Iron	Grey Nodular	110 - 130

SGPO-DIN Spiral Pointed Tap

- Plug Style 5 Thread Chamfer
- SG Coating
- DIN Overall Length
- Premium Powdered High Speed Steel



List 6803 Machine Screw & Fractional Sizes

Nominal Size	Thread/Inch NC/UNC	Thread/Inch NF/UNF	No. of Flutes	EDP No H2	EDP No H3	EDP No H4	EDP No H5	EDP No H6	Dimensions Overall Length	Dimensions Length of Thread	Dimensions Under Neck Length	Dimensions Shank Dia.	Style
MACHINE SCREW SIZES									L	ℓ	Ln	Ds	
2	56		2F	1543378					1.772	0.441	0.591		1
4	40		2F	1543384					2.205	0.469	0.602	0.141	2
6	32		3F	1542519	1542525					0.555	0.768		
8	32		3F	1542531	1542548				2.480			0.168	
10	24		3F		1542554				2.756	0.709	0.984	0.194	
		32	3F	1542560	1542577					0.555			
12	24		3F		1542583				3.150	0.709		0.220	
FRACTIONAL SIZES													
1/4	20		3F		1542590		1542605		3.150	0.850	1.181	0.255	
		28	3F		1542611	1542628				0.618			
5/16	18		3F		1542634		1542640		3.543	0.945	1.299	0.318	3
		24	3F		1542657	1542663				0.709			
3/8	16		3F		1542670		1542686		3.937	1.063	1.457	0.381	
		24	3F		1542692	1542708			3.543	0.709			
7/16	14		3F		1542714		1542720		3.937	1.142	-	0.323	4
		20	3F		1542737		1542743			0.902	-		
1/2	13		3F		1542750		1542766		4.331	1.232	-	0.367	
		20	3F		1542772		1542789		3.937	0.902	-		
5/8	11		3F			1542795		1542800	4.331	1.181	-	0.480	
		18	3F			1542817		1542823	3.937	0.835	-		
3/4	10		3F			1542830		1542846	4.921	1.299	-	0.590	
		16	3F			1542852		1542869	4.331	0.937	-		
1	8		3F			1542875		1542881	6.299	1.626	-	0.800	

Order by EDP Number
1 piece per package

⚠ WARNING: Cancer - www.P65Warnings.ca.gov

TAPS

SG Lo-Spiral Fluted Tap

SERIES WILL BE DISCONTINUED ONCE STOCK IS DEPLETED

Modified Bottoming Style 2 1/2 to 3 Thread Lead
SG Coating

List No. 6958 Metric Sizes

*GT to H-limit conversion chart refer to Page: 226

Nominal Size (mm)	Pitch (mm)	E.D.P. Numbers					No. Of Flutes	Dimensions		
		GT5	GT6	GT7	GT8	GT9		Overall Length	Length of Thread	Shank Dia.
METRIC										
M3	0.5	59615					3	1 15/16	0.236	0.141
M4	0.7	59617						2 1/8	0.276	0.168
M5	0.8		59619					2 3/8	0.354	0.194
M6	1		59620					2 1/2	0.433	0.255
M8	1		59622					2 23/32	0.472	0.318
	1.25		59623							
M10	1.25		59624					2 15/16	0.551	0.381
	1.5			59625						
M12	1.25				59626			3 3/8	0.669	0.367
	1.75				59627					
M14	1.5				59628			3 19/32	0.787	0.429
	2				59629					
M16	1.5				59630			3 13/16	0.787	0.480
	2				59631					
M18	1.5				59632		4	4 1/32	0.984	0.542
	2.5					59633				
M20	1.5				59634			4 15/32	0.984	0.652
	2.5					59635				
M22	1.5				59636			4 11/16	0.984	0.697
	2.5					59637				
M24	1.5				59638			4 29/32	1.181	0.760
	3					59639				

Order by EDP Number

Tapping Speeds

SG-Low Spiral Taps List No. 6958, 6959
SFM : Surface Feet per Minutes

Work Materials		Tapping Speed SFM
Low Carbon Steel	1010,1018	25-50
Medium Carbon Steel	1035,1045	20-50
High Carbon Steel	1065,1095	15-30
Alloy Steel	4140,4130	15-30
Die Steels	D2,H13	15-35
Hardened Die Steels (20-40HRC)	D2,H13	8-15
Stainless Steel (Austentic)	303,304,316	15-45
Stainless Steel (Martensitic)	410,430	12-20
Stainless Steel (PH) up to 35HRC	17-4PH	12-20
Titanium Alloy Up to 32HRC	6AL4V	15-20
Magnesium Alloy		40-80
Ductile Cast Irons	80-55-06	20-50
Cast Irons	Nodular,Grey	30-65

1. These are general tapping condition, may be altered by your condition.
2. These conditions are for tapping depth 1.5D. In case of deeper thread you may multiply these values by the coefficient of next table.

Thread Depth	Coefficient
Up to 1.5D	1
1.5D～2.5D	0.9
2.5D～3D	0.8
Over 3D	0.7

SG Lo-Spiral Fluted Tap

SERIES WILL BE DISCONTINUED ONCE STOCK IS DEPLETED

Modified Bottoming Style 2 1/2 to 3 Thread Lead
SG Coating

List No. 6959 Machine Screw & Fractional Sizes

*GT to H-limit conversion chart refer to Page: 226

Nominal Size	Thread/Inch		E.D.P. Numbers							No. of Flutes	Dimensions		
	NC UNC	NF UNF	GT3	GT4	GT5	GT6	GT7	GT8	GT9		Overall Length	Length of Thread	Shank Dia.
MACHINE SCREW SIZES													
2	56		94597							3	1 3/4	0.437	0.141
		64	94598										
3	48			94599							1 13/16	0.500	
		56	94600										
4	40				94601						1 7/8	0.236	
		48		94602									
5	40				94603						1 15/16		
		44			94604								
6	32				94605						2	0.276	
		40			94606								
8	32				94607						2 1/8		0.168
		36			94608								
10	24					94609					2 3/8	0.354	0.194
		32			94610								
12	24					94611							0.220
		28				94612							
FRACTIONAL SIZES													
1/4	20			94633			94613			3	2 1/2	0.433	0.255
		28		94634		94614							
5/16	18			94635			94615				2 23/32	0.472	0.318
		24		94636			94616						
3/8	16			94637				94617			2 15/16	0.551	0.381
		24		94638			94618						
7/16	14							94619			3 5/32	0.709	0.323
		20		94639				94620					
1/2	13			94640				94621			3 3/8	0.787	0.367
		20		94641				94622					
9/16	12							94623			3 19/32	0.827	0.429
		18						94624					
5/8	11								94625		3 13/16	0.905	0.480
		18						94626					
3/4	10								94627	4	4 1/4	0.984	0.590
		16						94628					
7/8	9								94629		4 11/16	1.102	0.697
		14							94630				
1	8								94631		5 1/8	1.260	0.800
		12							94632				

Order by EDP Number

DLC Taflet Thread Forming Taps

SERIES WILL BE DISCONTINUED ONCE STOCK IS DEPLETED

Forming TAP with DLC coating can be used in Aluminum Alloy, Die Cast Aluminum and Copper.

List No. 6956 Metric Sizes

Bottoming Style
DLC Coating

Nominal Size (mm)	Pitch (mm)	E. D. P. Numbers								Dimensions		
		D3	D4	D5	D6	D7	D8	D9	D10	Overall Length	Length of Thread	Shank Dia.
M2	0.4	91002								1 3/4	0.437	0.141
M2.5	0.45	91008								1 13/16	0.500	0.141
M3	0.5	91011								1 15/16	0.394	0.141
M4	0.7		91017							2 1/8	0.472	0.168
M5	0.8		91023							2 3/8	0.551	0.194
M6	1			91026				91027		2 1/2	0.591	0.255
M8	1.25						91035	91036		2 23/32	0.669	0.318
M10	1.25						91038			2 15/16	0.748	0.381
	1.5							91041				
M12	1.75								91047	3 3/8	0.984	0.367

Order by EDP Number

Tapping Speeds

DLC Taflet Thread Forming Taps List No. 6955, 6956, 6957

Work Materials	Tapping Speed SFM
Aluminum Alloys	70 - 130

DLC Taflet Thread Forming Tap

BOTH SERIES WILL BE DISCONTINUED ONCE STOCK IS DEPLETED

List No. 6955 Fractional Size

Bottoming Style
DLC Coating

Nominal Size	Thread/Inch		E. D. P. Numbers								Dimensions		
	NC UNC	NF UNF	H2	H3	H4	H5	H6	H7	H8	H10	Overall Length	Length of Thread	Shank Dia.
1/4	20				97838		97912				2 1/2	0.591	0.255
		28			97840		97914						
5/16	18					97873		97931			2 23/32	0.669	0.318
		24				97875		97933					
3/8	16					97877		97935			2 15/16	0.748	0.381
		24				97879		97937					
7/16	14					97881			97961		3 5/32	0.866	0.323
1/2	13					97885			97965		3 3/8	0.984	0.367

Order by EDP Number

List No. 6957 Machine Screw Sizes

Bottoming Style
DLC Coating

Nominal Size	Thread/Inch		E. D. P. Numbers								Dimensions		
	NC UNC	NF UNF	H2	H3	H4	H5	H6	H7	H8	H10	Overall Length	Length of Thread	Shank Dia.
2	56		97738	97776							1 3/4	0.437	
4	40			97784		97857					1 7/8	0.354	0.141
6	32			97792		97865					2	0.433	
8	32			97796		97869					2 1/8	0.472	0.168
10	24				97830		97904				2 3/8	0.551	0.194
		32			97832		97906						
12	24				97834		97908						0.220

Order by EDP Number

Viper Taflet for Steel

HSSE-V | P CHAMFER | B CHAMFER

SERIES WILL BE DISCONTINUED ONCE STOCK IS DEPLETED

Plug & Bottoming Style
Surface Treated

List No. 996 Metric Sizes

VANADIUM HIGH SPEED STEEL HSSE-V

Nominal Size (mm)	Pitch (mm)	Chamfer Style*	E.D.P. Numbers									Dimensions		
			D3	D4	D5	D6	D7	D8	D9	D10	D11	Overall Length	Length of Thread	Shank Dia.
M2	0.4	P	51001	–	–	–	–	–	–	–	–	1 3/4	0.437	0.141
		B	51002	–	–	–	–	–	–	–	–			
M2.2	0.45	P	51004	–	–	–	–	–	–	–	–			
		B	51005	–	–	–	–	–	–	–	–			
M2.5	0.45	P	51007	–	–	–	–	–	–	–	–	1 13/16	0.500	
		B	51008	–	–	–	–	–	–	–	–			
M3	0.5	P	51010	–	–	–	–	–	–	–	–	1 15/16	0.394	
		B	51011	–	–	–	–	–	–	–	–			
M3.5	0.6	P	51013	–	–	–	–	–	–	–	–	2	0.433	
		B	51014	–	–	–	–	–	–	–	–			
M4	0.7	P	–	51016	–	–	–	–	–	–	–	2 1/8	0.472	0.168
		B	–	51017	–	–	–	–	–	–	–			
M4.5	0.75	P	–	51019	–	–	–	–	–	–	–	2 3/8	0.551	0.184
		B	–	51020	–	–	–	–	–	–	–			
M5	0.8	P	–	51022	–	–	–	–	–	–	–			0.194
		B	–	51023	–	–	–	–	–	–	–			
M6	1	P	–	–	51025	–	–	–	–	–	–	2 1/2	0.591	0.255
		B	–	–	51026	–	–	–	–	–	–			
M7	1	P	–	–	–	51028	–	–	–	–	–	2 23/32	0.669	0.318
		B	–	–	–	51029	–	–	–	–	–			
M8	1	P	–	–	51031	–	–	–	–	–	–			
		B	–	–	51032	–	–	–	–	–	–			
	1.25	P	–	–	–	–	–	51034	–	–	–			
		B	–	–	–	–	–	51035	–	–	–			
M10	1.25	P	–	–	–	–	–	51037	–	–	–	2 15/16	0.748	0.381
		B	–	–	–	–	–	51038	–	–	–			
	1.50	P	–	–	–	–	–	–	51040	–	–			
		B	–	–	–	–	–	–	51041	–	–			
M12	1.25	P	–	–	–	–	–	–	51043	–	–	3 3/8	0.984	0.367
		B	–	–	–	–	–	–	51044	–	–			
	1.75	P	–	–	–	–	–	–	–	51046	–			
		B	–	–	–	–	–	–	–	51047	–			
M14	1.5	P	–	–	–	–	–	–	–	51049	–	3 19/32		0.429
		B	–	–	–	–	–	–	–	51050	–			
	2	P	–	–	–	–	–	–	–	–	51052			
		B	–	–	–	–	–	–	–	–	51053			
M16	1.5	P	–	–	–	–	–	–	–	51055	–	3 13/16	1.102	0.480
		B	–	–	–	–	–	–	–	51056	–			
	2	P	–	–	–	–	–	–	–	–	51058			
		B	–	–	–	–	–	–	–	–	51059			
M18	1.5	P	–	–	–	–	–	–	–	51061	–	4 1/32		0.542
		B	–	–	–	–	–	–	–	51062	–			
	2.5	P	–	–	–	–	–	–	–	–	51064			
		B	–	–	–	–	–	–	–	–	51065			
M20	1.5	P	–	–	–	–	–	–	–	51067	–	4 15/32	1.181	0.652
		B	–	–	–	–	–	–	–	51068	–			
	2.5	P	–	–	–	–	–	–	–	–	51070			
		B	–	–	–	–	–	–	–	–	51071			

Order by EDP Number

* P : Plug, B : Bottom

TAPS

Viper Taflet for Steel

HSSE-V | P CHAMFER | B CHAMFER

SERIES WILL BE DISCONTINUED ONCE STOCK IS DEPLETED

Plug & Bottoming Style
Surface Treated

List No. 995 Fractional Sizes

VANADIUM HIGH SPEED STEEL HSSE-V

Nominal Size	Thread/Inch NC UNC	Thread/Inch NF UNF	Chamfer Style*	E.D.P. Numbers H4	H5	H6	H7	H8	H10	Dimensions Overall Length	Length of Thread	Shank Dia.
1/4	20		P	77837	–	77911	–	–	77978	2 1/2	0.591	0.255
			B	77838	–	77912	–	–	77979			
		28	P	77839	–	77913	–	–	77980			
			B	77840	–	77914	–	–	77981			
5/16	18		P	–	77872	–	77930	–	–	2 23/32	0.669	0.318
			B	–	77873	–	77931	–	–			
		24	P	–	77874	–	77932	–	–			
			B	–	77875	–	77933	–	–			
3/8	16		P	–	77876	–	77934	–	–	2 15/16	0.748	0.381
			B	–	77877	–	77935	–	–			
		24	P	–	77878	–	77936	–	–			
			B	–	77879	–	77937	–	–			
7/16	14		P	–	77880	–	–	77960	–	3 5/32	0.866	0.323
			B	–	77881	–	–	77961	–			
		20	P	–	77882	–	–	77962	–			
			B	–	77883	–	–	77963	–			
1/2	13		P	–	77884	–	–	77964	–	3 3/8	0.984	0.367
			B	–	77885	–	–	77965	–			
		20	P	–	77886	–	–	77966	–			
			B	–	77887	–	–	77967	–			
9/16	12		P	–	–	–	77946	–	77990	3 19/32	0.984	0.429
			B	–	–	–	77947	–	77991			
		18	P	–	–	–	77948	–	77992			
			B	–	–	–	77949	–	77993			
5/8	11		P	–	–	–	77950	–	77994	3 13/16	1.102	0.480
			B	–	–	–	77951	–	77995			
		18	P	–	–	–	77952	–	77996			
			B	–	–	–	77953	–	77997			
3/4	10		P	–	–	–	77954	–	77998	4 1/4	1.181	0.590
			B	–	–	–	77955	–	77999			
		16	P	–	–	–	77956	–	78000			
			B	–	–	–	77957	–	78001			

Order by EDP Number

* P : Plug, B : Bottom

Tapping Speeds

List No. 995, 996

Viper Taflet Thread Forming Taps

Work Materials	Tapping Speed SFM
Structural Steels/Carbon Steels	30 - 50
Alloy Steels (20-30 HRC)	20 - 30
Stainless Steel	10 - 15

Viper Taflet for Steel

HSSE-V | P CHAMFER | B CHAMFER

SERIES WILL BE DISCONTINUED ONCE STOCK IS DEPLETED

Plug & Bottoming Style
Surface Treated

List No. 995 Machine Screw Sizes

VANADIUM HIGH SPEED STEEL HSSE-V

Nominal Size	Thread/Inch		Chamfer Style*	E.D.P. Numbers						Dimensions		
	NC UNC	NF UNF		H2	H3	H4	H5	H6	H10	Overall Length	Length of Thread	Shank Dia.
0		80	B	77732	—	—	—	—	—	1 5/8	0.311	0.141
1	64		B	77734	—	—	—	—	—	1 11/16	0.374	
		72	B	77736	—	—	—	—	—			
2	56		B	77738	77776	—	—	—	—	1 3/4	0.437	
		64	B	77740	77778	—	—	—	—			
3	48		B	77742	77780	—	—	—	—	1 13/16	0.500	
		56	B	77744	77782	—	—	—	—			
4	40		P	—	77783	—	77856	—	—	1 7/8	0.354	
			B	—	77784	—	77857	—	—			
		48	P	—	77785	—	77858	—	—			
			B	—	77786	—	77859	—	—			
5	40		P	—	77787	—	77860	—	—	1 15/16	0.394	
			B	—	77788	—	77861	—	—			
		44	P	—	77789	—	77862	—	—			
			B	—	77790	—	77863	—	—			
6	32		P	—	77791	—	77864	—	77970	2	0.433	
			B	—	77792	—	77865	—	77971			
		40	P	—	77793	—	77866	—	—			
			B	—	77794	—	77867	—	—			
8	32		P	—	77795	—	77868	—	77972	2 1/8	0.472	0.168
			B	—	77796	—	77869	—	77973			
		36	P	—	77797	—	77870	—	—			
			B	—	77798	—	77871	—	—			
10	24		P	—	—	77829	—	77903	77974	2 3/8	0.551	0.194
			B	—	—	77830	—	77904	77975			
		32	P	—	—	77831	—	77905	77976			
			B	—	—	77832	—	77906	77977			
12	24		P	—	—	77833	—	77907	—			0.220
			B	—	—	77834	—	77908	—			
		28	P	—	—	77835	—	77909	—			
			B	—	—	77836	—	77910	—			

Order by EDP Number

* P : Plug, B : Bottom

Tapping Speeds

List No. 995, 996

Viper Taflet Thread Forming Taps

Work Materials	Tapping Speed SFM
Structural Steels/Carbon Steels	30 - 50
Alloy Steels (20-30 HRC)	20 - 30
Stainless Steel	10 - 15

VTP Tap Spiral Fluted

Modified Bottoming Style 2-1/2 To 3 Thread Lead
Surface Treated

List No. 980 Metric Sizes

VANADIUM HIGH SPEED STEEL HSSE-V

*Replacing VIPER T Series

Nominal Size (mm)	Pitch (mm)	E.D.P. Number					No. Of Flutes	Dimensions		
		D3	D4	D5	D6	D7		Overall Length	Length of Thread	Shank Dia.
M3	0.5	54615	—	—	—	—	3	1 15/16	0.236	0.141
M3.5	0.6	—	54616	—	—	—		2	0.276	
M4	0.7	—	54617	—	—	—		2 1/8		0.168
M5	0.8	—	54619	—	—	—		2 3/8	0.354	0.194
M6	1	—	—	54620	—	—		2 1/2	0.433	0.255
M7	1	—	—	54621	—	—		2 23/32	0.472	0.318
M8	1	—	—	54622	—	—				
	1.25	—	—	54623	—	—				
M10	1.25	—	—	54624	—	—		2 15/16	0.551	0.381
	1.5	—	—	—	54625	—				
M12	1.25	—	—	54626	—	—		3 3/8	0.630	0.367
	1.75	—	—	—	54627	—				
M14	1.5	—	—	—	54628	—		3 19/32	0.551	0.429
	2	—	—	—	—	54629			0.709	
M16	1.5	—	—	—	54630	—		3 13/16	0.551	0.480
	2	—	—	—	—	54631			0.709	
M18	1.5	—	—	—	54632	—		4 1/32	0.551	0.542
	2.5	—	—	—	—	54633			0.874	

Order by EDP Number

VTP Tap Spiral Pointed

Plug Style, 4 To 5 Thread Lead
Surface Treated

List No. 982 Metric Sizes

VANADIUM HIGH SPEED STEEL HSSE-V

*Replacing VIPER T Series

Nominal Size (mm)	Pitch (mm)	E.D.P. Number					No. Of Flutes	Dimensions		
		D3	D4	D5	D6	D7		Overall Length	Length of Thread	Shank Dia.
M3	0.5	52615	—	—	—	—	3	1 15/16	0.394	0.141
M3.5	0.6	—	52616	—	—	—		2	0.433	
M4	0.7	—	52617	—	—	—		2 1/8	0.472	0.168
M5	0.8	—	52619	—	—	—		2 3/8	0.551	0.194
M6	1	—	—	52620	—	—		2 1/2	0.591	0.255
M7	1	—	—	52621	—	—		2 23/32	0.669	0.318
M8	1	—	—	52622	—	—				
	1.25	—	—	52623	—	—				
M10	1.25	—	—	52624	—	—		2 15/16	0.748	0.381
	1.5	—	—	—	52625	—				
M12	1.25	—	—	52626	—	—		3 3/8	0.984	0.367
	1.75	—	—	—	52627	—				
M14	1.5	—	—	—	52628	—		3 19/32		0.429
	2	—	—	—	—	52629				
M16	1.5	—	—	—	52630	—		3 13/16	1.102	0.480
	2	—	—	—	—	52631				
M18	1.5	—	—	—	52632	—		4 1/32		0.542
	2.5	—	—	—	—	52633				

Order by EDP Number

VTP Spiral Fluted

Modified Bottoming Style 2-1/2 To 3 Thread Lead
Surface Treated

List No. 983 Machine Screw Sizes
List No. 981 Fractional Sizes

VANADIUM HIGH SPEED STEEL HSSE-V

***Replacing VIPER T Series**

Nominal Size	Thread/Inch		E.D.P. Numbers						No. of Flutes	Dimensions		
	NC UNC	NF UNF	H2	H3	H4	H5	H6	H7		Overall Length	Length of Thread	Shank Dia.
MACHINE SCREW SIZES - L983												
2	56		88239	–	–	–	–	–	2	1 3/4	0.433	0.141
3	48		88240	–	–	–	–	–		1 13/16	0.500	
4	40	48	88241 88245	88242 –	88243 –	– –	– –	– –		1 7/8	0.236	
5	40		88253	–	–	–	–	–	3	1 15/16		
6	32	40	– 88269	88263 –	88264 –	88265 –	88266 –	88267 –		2	0.276	
8	32		–	88277	88278	88279	88280	88281		2 1/8		0.168
10	24	32	– –	88291 88299	– 88300	88292 88301	88293 –	88294 88303		2 3/8	0.354	0.194
12	24	28	– –	88311 88312	– –	– –	– –	– –				0.220
FRACTIONAL - L981												
1/4	20		–	88057	–	88060	–	88062	3	2 1/2	0.433	0.255
		28	–	88071	88072	88073	88074	88075				
5/16	18		–	88081	–	88083	–	88085		2 23/32	0.472	0.318
		24	–	88095	88096	88097	–	88098				
3/8	16		–	88103	–	88105	–	88107		2 15/16	0.551	0.381
		24	–	88111	88112	88113	–	88115				
7/16	14		–	88117	–	88119	–	–		3 5/32	0.591	0.323
		20	–	88123	–	88125	–	–				
1/2	13		–	88131	–	88133	–	88135		3 3/8	0.630	0.367
		20	–	88139	–	88141	–	–				
9/16	12		–	88145	–	–	–	–		3 19/32	0.709	0.429
		18	–	88146	–	–	–	–				
5/8	11		–	88149	–	88151	–	88153		3 13/16	0.748	0.480
		18	–	88157	–	88159	–	–				
3/4	10		–	88167	–	–	–	88171		4 1/4	0.827	0.590
		16	–	88175	–	88177	–	–				
7/8	9		–	88180	–	–	–	–	4	4 11/16	0.906	0.697
		14	–	88185	–	–	–	–				
1	8	12	– –	88190 –	– 88192	– –	– –	– –		5 1/8	0.984	0.800

Order by EDP Number

VTP Spiral Pointed

Plug Style 4 to 5 Threads
Surface Treated

List No. 973 Machine Screw Sizes

List No. 971 Fractional Sizes

VANADIUM HIGH SPEED STEEL HSSE-V

***Replacing VIPER T Series**

Nominal Size	Thread/Inch		E.D.P. Numbers						No. of Flutes	Dimensions		
	NC UNC	NF UNF	H2	H3	H4	H5	H6	H7		Overall Length	Length of Thread	Shank Dia.
MACHINE SCREW SIZES - L973												
2	56		87216	87218	—	—	—	—	2	1 3/4	0.437	0.141
3	48		87220	—	—	—	—	—		1 13/16	0.500	
4	40	48	87240 87245	87242 —	87243 —	87244 —	— —	— —		1 7/8	0.354	
5	40		87252	—	—	—	—	—		1 15/16	0.394	
6	32	40	87258 87269	87260 —	87261 —	87264 —	87265 —	87266 —		2	0.433	
8	32		87272	87274	87275	87278	87279	87280	3	2 1/8	0.472	0.168
10	24	32	— 87294	87288 87296	— 87297	87290 87300	— 87301	— 87302		2 3/8	0.551	0.194
12	24	28	— —	87311 87312	— —	— —	— —	— —			0.500	0.220
FRACTIONAL SIZES - L971												
1/4	20		87052	87056	—	87060	—	87062	3	2 1/2	0.591	0.255
		28	87066	87068	87070	87071	87072	87073				
5/16	18		—	87080	—	87084	—	87086		2 23/32	0.669	0.318
		24	—	87094	87096	87097	87098	87099				
3/8	16		—	87102	—	87104	—	87106		2 15/16	0.748	0.381
		24	—	87110	87112	87113	87114	87115				
7/16	14		—	87116	—	87120	—	—		3 5/32	0.866	0.323
		20	—	87122	—	87126	87127	87129				
1/2	13		—	87130	—	87134	—	87136		3 3/8	0.984	0.367
		20	—	87138	—	87140	87141	87142				
9/16	12		—	87143	—	—	—	—		3 19/32		0.429
		18	—	87144	—	—	—	—				
5/8	11		—	87148	—	87152	—	87154		3 13/16	1.102	0.480
		18	—	87158	—	87159	—	—				
3/4	10		—	87164	—	—	—	87167		4 1/4	1.181	0.590
		16	—	87168	—	87169	—	—				
7/8	9		—	87170	—	—	—	—		4 11/16	1.299	0.697
		14	—	87171	—	—	—	—				
1	8	12	— —	87172 —	— 87176	— —	— —	— —		5 1/8	1.378	0.800

Order by EDP Number

VTP Series Tapping Speeds

SFM: Surface Feet per Minutes

VTP Spiral Flute TAP List 980, 983, 981

Work Materials		Tapping Speed SFM
Low Carbon Steel	1010,1018	30-60
Medium Carbon Steel	1035,1045	15-40
High Carbon Steel	1065,1095	15-25
Alloy Steel	4140,4130	15-40
Die Steels	D2,H13	10-25
Hardened Die Steels (20-40HRC)	D2,H13	6-12
Stainless steel (Austentic)	303,304,316	10-25
Stainless steel (Martensitic)	410,430	10-25
Stainless steel (PH) up to 35HRC	17-4PH	8-15
Titanium Alloy Up to 32HRC	6AL4V	10-15
Magnesium Alloy		30-60
Ductile Cast Irons	80-55-06	15-40
Cast Irons	Nodular,Grey	-
Copper		15-40
Brass, Brass Casting		40-60
Bronze, Brass Casting		25-50

1. These are general tapping conditions, may be altered by your condition.
2. These conditions are for tapping depth 1.5D. In case of deeper thread you may multiply these values by the coefficient of next table

Thread Depth	Coefficient
Up to 1.5D	1
1.5D～2.5D	0.9
2.5D～3D	0.8
Over 3D	0.7

SFM: Surface Feet per Minutes

VTP Spiral Point TAP List 982, 973, 971

Work Materials		Tapping Speed SFM
Low Carbon Steel	1010,1018	35-75
Medium Carbon Steel	1035,1045	20-50
High Carbon Steel	1065,1095	15-30
Alloy Steel	4140,4130	20-50
Die Steels	D2,H13	15-30
Hardened Die Steels (20-40HRC)	D2,H13	38-15
Stainless steel (Austentic)	303,304,316	15-35
Stainless steel (Martensitic)	410,430	15-35
Stainless steel (PH) up to 35HRC	17-4PH	10-20
Titanium Alloy Up to 32HRC	6AL4V	15-20
Magnesium Alloy		40-80
Ductile Cast Irons	80-55-06	20-50
Cast Irons	Nodular,Grey	30-60
Copper		20-50
Brass, Brass Casting		50-80
Bronze, Brass Casting		30-60

1.These are general tapping conditions, may be altered by your condition.
2.These conditions are for tapping depth 1.5D. In case of deeper thread you may multiply these values by the coefficient of next table

Standard Hand Tap

Bright Finish

List No. 911 Fractional Sizes

HIGH SPEED STEEL

Size	Thread			Pitch Diameter Limits	E.D.P.			Number of Flutes	Dimensions		
					Taper	Plug	Bottom		Overall Length	Thread Length	Shank Dia.
	UNC	UNF	UNS		L911	L911	L911				
1/4	20			H2	64059	64060	64061	4	2 1/2	1	0.255
	20			H3	64068	64069	64070				
	20			H5		64075	64076				
		28		H3	64089	64090	64091				
		28		H4		64093	64094				
5/16	18			H2	64098	64099	64100		2 23/32	1 1/8	0.318
	18			H3	64107	64108	64109				
	18			H5		64111	64112				
		24		H3	64122	64123	64124				
		24		H4		64126	64127				
3/8	16			H2	64131	64132	64133		2 15/16	1 1/4	0.381
	16			H3	64137	64138	64139				
	16			H5		64141	64142				
		24		H3	64152	64153	64154				
		24		H4		64156	64157				
7/16	14			H3	64167	64168	64169		3 5/32	1 7/16	0.323
		20		H3	64182	64183	64184				
1/2	13			H3	64197	64198	64199		3 3/8	1 21/32	0.367
	13			H5		64201	64202				
		20		H3	64212	64213	64214				
		20		H5		64216	64217				
9/16	12			H3	64221	64222	64223		3 19/32		0.429
		18		H3	64230	64231	64232				
5/8	11			H3	64242	64243	64244		3 13/16	1 13/16	0.480
	11			H5		64246	64247				
		18		H3	64254	64255	64256				
		18		H5		64258	64259				
11/16			11	H3	64260	64261	64262		4 1/32		0.542
			16	H3	64263	64264	64265				
3/4	10			H3	64272	64273	64274		4 1/4	2	0.590
	10			H5		64276	64277				
		16		H3	64284	64285	64286				
		16		H5		64288	64289				
7/8	9			H4	64293	64294	64295		4 11/16	2 7/32	0.697
		14		H4	64302	64303	64304				
1	8			H4	64311	64312	64313		5 1/8	2 1/2	0.800
		12		H4	64314	64315	64316				
			14	H4	64320	64321	64322				
1 1/8	7			H4	64323	64324	64325		5 7/16	2 9/16	0.896
		12		H4	64326	64327	64328				
1 1/4	7			H4	64329	64330	64331		5 3/4		1.021
		12		H4	64332	64333	64334	6			
1 3/8	6			H4	64335	64336	64337	4	6 1/16	3	1.108
		12		H4	64338	64339	64340	6			
1 1/2	6			H4	64341	64342	64343	4	6 3/8		1.233
		12		H4	64344	64345	64346	6			

Order by EDP Number

Standard Hand Tap

Bright Finish

List No. 913 Machine Screw Size

HIGH SPEED STEEL

Nominal Tap Size	Threads		Pitch Diameter Limits	E.D.P. Numbers			Number of Flutes	Dimensions		
	NC UNC	NF UNF		Taper	Plug	Bottom		Overall Length	Thread Length	Shank Dia.
				L913	L913	L913				
0		80	H1	64360	64361	64362	2	1 5/8	5/16	0.141
		80	H2		64364	64365				
1	64		H1	64366	64367	64368		1 11/16	3/8	
	64		H2		64370					
		72	H1	64372	64373	64374				
		72	H2		64376	64377				
2	56		H1	64381	64382	64383	3	1 3/4	7/16	
	56		H2	64387	64388	64389				
		64	H1	64390	64391	64392				
		64	H2	64393	64394	64395				
3	48		H1		64397			1 13/16	1/2	
	48		H2	64402	64403	64404				
		56	H1		64406					
		56	H2	64408	64409	64410				
4	36NS		H2	64411	64412	64413		1 7/8	9/16	
	40		H1	64417	64418	64419				
	40		H2	64423	64424	64425				
		48	H1		64427					
		48	H2	64429	64430	64431				
5	40		H1		64433	64434		1 15/16	5/8	
	40		H2	64438	64439	64440				
		44	H1		64442	64443				
		44	H2	64447	64448	64449				
6	32		H2	64459	64460	64461		2	11/16	
	32		H3	64465	64466	64467				
	32		H7		64469	64470				
		40	H1		64472					
		40	H2	64477	64478	64479				
8	32		H2	64495	64496	64497	4	2 1/8	3/4	0.168
	32		H3	64504	64505	64506				
	32		H7		64508	64509				
		36	H1		64515					
		36	H2	64517	64518	64519				
10	24		H2	64532	64533	64534		2 3/8	7/8	0.194
	24		H3	64541	64542	64543				
	24		H7		64548	64549				
		32	H2	64562	64563	64564				
		32	H3	64571	64572	64573				
		32	H7		64578	64579				
12	24		H3	64583	64584	64585			15/16	0.220
		28	H3	64589	64590	64591				

Order by EDP Number

Standard Tap Spiral Pointed

Plug Style, Bright Finish

List No. 921 Fractional Sizes

HIGH SPEED STEEL

Nominal Tap Size	Threads per inch		Pitch Diameter Limits	E.D.P. Numbers	Number of Flutes	Dimensions		
	NC UNC	NF UNF				Overall Length	Thread Length	Shank Dia.
1/4	20		H3	67054	2	2 1/2	1	0.255
	20		H3	67056	3			
		28	H3	67068	2			
5/16	18		H3	67078		2 23/32	1 1/8	0.318
	18		H3	67080	3			
		24	H3	67092	2			
3/8	16		H2	67100	3	2 15/16	1 1/4	0.381
	16		H3	67102				
	16		H5	67104				
		24	H3	67110				
7/16	14		H3	67116		3 5/32	1 7/16	0.323
		20	H3	67122				
1/2	13		H3	67130		3 3/8	1 21/32	0.367
		20	H3	67138				
9/16	12		H3	67142		3 19/32	1 21/32	0.429
5/8	11		H3	67148		3 13/16	1 13/16	0.480
3/4	10		H3	67150		4 1/4	2	0.590

Order by EDP Number

Standard Hand Tap for Cast Iron

Surface Treated

List No. 969 Fractional Sizes

HIGH SPEED STEEL

Size	Threads		Thread Limits	E.D.P.		Number of Flutes	Dimensions		
	UNC	UNF		Plug	Bottom		Overall Length	Thread Length	Shank Dia.
1/4	20		H3	76001	76002	4	2 1/2	1	0.255
	20		H5	76003	76004				
		28	H3	76005	76006				
5/16	18		H3	76007	76008		2 23/32	1 1/8	0.318
	18		H5	76009	76010				
		24	H3	76011	76012				
3/8	16		H3	76013	76014		2 15/16	1 1/4	0.381
	16		H5	76015	76016				
		24	H3	76017	76018				
7/16	14		H3	76019	76020		3 5/32	1 7/16	0.323
	14		H5	76021	76022				
		20	H3	76023	76024				
		20	H5	76025	76026				
1/2	13		H3	76027	76028		3 3/8	1 21/32	0.367
	13		H5	76029	76030				
		20	H3	76031	76032				
		20	H5	76033	76034				
9/16	12		H3	76035	76036		3 19/32	1 21/32	0.429
		18	H3	76037	76038				
5/8	11		H3	76039	76040		3 13/16	1 13/16	0.480
		18	H3	76041	76042				
3/4	10		H3	76043	76044		4 1/4	2	0.590
		16	H3	76045	76046				

Order by EDP Number

Standard Tap Spiral Pointed

Plug Style
Bright Finish

List No. 923 Machine Screw Sizes

HIGH SPEED STEEL

Nominal Tap Size	Threads per inch		Pitch Diameter Limits	E.D.P. Numbers	Number of Flutes	Dimensions		
	NC UNC	NF UNF		Plug L923		Overall Length	Thread Length	Shank Dia.
0		80	H1	67200	2	1 5/8	5/16	0.141
			H2	67202				
1	64		H1	67206		1 11/16	3/8	
			H2	67208				
		72	H1	67210				
			H2	67212				
2	56		H1	67214		1 3/4	7/16	
			H2	67216				
		64	H2	67224				
3	48		H2	67228		1 13/16	1/2	
		56	H2	67234				
4	36NS		H2	67236		1 7/8	9/16	
	40		H1	67238				
			H2	67240				
		48	H2	67248				
5	40		H1	67250		1 15/16	5/8	
			H2	67252				
		44	H2	67254				
6	32		H2	67258		2	11/16	
			H3	67260				
			H7	67264				
		40	H2	67268				
8	32		H2	67272		2 1/8	3/4	0.168
			H3	67274				
			H7	67278				
		36	H2	67282				
10	24		H2	67286		2 3/8	7/8	0.194
			H3	67288				
			H7	67290				
		32	H2	67294				
			H3	67296				
			H7	67300				
12	24		H3	67304			15/16	0.220

Order by EDP Number

Standard Hand Tap

Bright Finish

List No. 910 Metric Sizes

HIGH SPEED STEEL

Nominal Tap Size (mm)	Millimeter Pitch (mm)	Pitch Dia. Limits	E.D.P. Numbers			Number of Flutes	Dimensions		
			Taper	Plug	Bottom		Overall Length	Thread Length	Shank Dia.
M2	0.4	D3	54056	54057	54058	3	1 3/4	7/16	0.141
M3	0.5		54071	54072	54073		1 15/16	5/8	
M3.5	0.6	D4	54074	54075	54076		2	11/16	
M4	0.7		54080	54081	54082	4	2 1/8	3/4	0.168
M5	0.8		54095	54096	54097		2 3/8	7/8	0.194
M6	1.0	D5	54107	54108	54109		2 1/2	1	0.255
M7	1.0		54113	54114	54115		2 23/32	1 1/8	0.318
M8	1.25		54125	54126	54127				
M10	1.5	D6	54140	54141	54142		2 15/16	1 1/4	0.381
M12	1.75		54155	54156	54157		3 3/8	1 21/32	0.367
M14	1.25	D5	54161	54162	54163		3 19/32		0.429
M14	2.0	D7	54167	54168	54169				
M16	2.0		54176	54177	54178		3 13/16	1 13/16	0.480
M18	1.5		54182	54183	54184		4 1/32		0.542
M18	2.5		54188	54189	54190				
M20	2.5		54200	54201	54202		4 15/32	2	0.652
M22	2.5		54212	54213	54214		4 11/16	2 7/32	0.697
M24	3.0	D8	54224	54225	54226		4 29/32		0.760
M27	3.0		54239	54240	54241		5 1/8	2 1/2	0.896
M30	3.5	D9	54251	54252	54253		5 7/16	2 9/16	1.021

Order by EDP Number

Standard Tap Spiral Pointed

Bright Finish

List No. 920 Metric Sizes

HIGH SPEED STEEL

Nominal Tap Size (mm)	Pitch (mm)	Pitch Diameter Limits	E.D.P. Numbers	Number of Flutes	Dimensions		
					Overall Length	Thread Length	Shank Dia.
M2.5	0.45	D3	57054	2	1 13/16	1/2	0.141
M3	0.50		57055		1 15/16	5/8	
M4	0.70	D4	57058		2 1/8	3/4	0.168
M5	0.80		57061		2 3/8	7/8	0.194
M6	1.00	D5	57063		2 1/2	1	0.255
M8	1.25		57068		2 23/32	1 1/8	0.318
M10	1.50	D6	57082	3	2 15/16	1 1/4	0.381
M12	1.75		57073		3 3/8	1 21/32	0.367
M14	2.00	D7	57076		3 19/32		0.429
M16	2.00		57078		3 13/16	1 13/16	0.480

Order by EDP Number

Taper Pipe Tap Straight Fluted

Bright Finish

List No. 941 **(NPT)**
List No. 941D **(NPTF)** Dry Seal

Nominal Tap Size	Threads per Inch	E.D.P. Number		Number of Flutes	Dimensions				
		L941 NPT	L941D NPTF		Overall Length	Thread Length	Shank Dia.	Square Length	Size of Square
1/16	27	74051	74062	4	2.126	0.6890	0.3125	0.374	0.2339
1/8		74052	74063			0.7520	0.4375		0.3280
1/8SS		74053	74064				0.3125		0.2339
1/4	18	74054	74065		2.437	1.0630	0.5625	0.437	0.4209
3/8		74055	74066		2.563		0.7000	0.500	0.5307
1/2	14	74056	74067		3.126	1.3740	0.6875	0.626	0.5150
3/4		74057	74068	5	3.252		0.9063	0.689	0.6787
1	11 1/2	74058	74069		3.752	1.7520	1.1250	0.811	0.8429
1 1/4		74059	74070		4.000		1.3125	0.937	0.9839
1 1/2		74060	74071	7	4.252		1.5000	1.000	1.1248
2		74061	74072		4.500		1.8750	1.126	1.4059

Order by EDP Number

Taper Pipe Tap Interrupted

Bright Finish

List No. 943 **(NPT)**
List No. 943D **(NPTF)** Dry Seal

Nominal Tap Size	Thread Per Inch	E.D.P. Numbers		Number of Flutes	Dimensions				
		L943 NPT	L943D NPTF		Overall Length	Thread Length	Shank Dia.	Square Length	Size of Square
1/8	27	74073	74173	5	2.126	0.752	0.4375	0.374	0.3280
1/4	18	74075	74175		2.437	1.063	0.5625	0.437	0.4209
3/8		74076	74176		2.563		0.7000	0.500	0.5307
1/2	14	74077	74177		3.126	1.374	0.6875	0.626	0.5150
3/4		74078	74178		3.252		0.9063	0.689	0.6787
1	11 1/2	74079	74179		3.752	1.752	1.1250	0.811	0.8429

Order by EDP Number

Taper Pipe Tap Spiral Fluted

Surface Treated

List No. 947 (NPT)
List No. 947D (NPTF) Dry Seal

PREMIUM TYPE STEEL

Nominal Tap Size	Thread Per Inch	E.D.P. Numbers		Number of Flutes	Dimensions				
		L947 NPT	L947D NPTF		Overall Length	Thread Length	Shank Dia.	Square Length	Size of Square
1/16	27	84051	84062	4	2.126	0.689	0.3125	0.374	0.2339
1/8		84052	84063			0.752	0.4375		0.3280
1/8SS		84053	84064				0.3125		0.2339
1/4	18	84054	84065		2.437	1.063	0.5625	0.437	0.4209
3/8		84055	84066		2.563		0.7000	0.500	0.5307
1/2	14	84056	84067		3.126	1.374	0.6875	0.626	0.5150
3/4		84057	84068	5	3.252		0.9063	0.689	0.6787
1	11 1/2	84058	84069		3.752	1.752	1.1250	0.811	0.8429

Order by EDP Number

Straight Pipe Tap Straight Fluted

Bright Finish

List No. 945 (NPS)
List No. 945D (NPSF) Dry Seal

HIGH SPEED STEEL

Nominal Tap Size	Threads per Inch	E.D.P. Numbers		Number of Flutes	Dimensions				
		L941 NPS	L941D NPSF		Overall Length	Thread Length	Shank Dia.	Square Length	Size of Square
1/8	27	74083	74090	4	2.126	0.752	0.4375	0.374	0.3280
1/4	18	74085	74092		2.437	1.063	0.5625	0.437	0.4209
3/8		74086	74093		2.563		0.7000	0.500	0.5307
1/2	14	74087	74094		3.126	1.374	0.6875	0.626	0.5150
3/4		74088	74095	5	3.252		0.9063	0.689	0.6787
1	11 1/2	74089			3.752	1.752	1.1250	0.811	0.8429

Order by EDP Number

Taper Pipe Tap Short Projection

Bright Finish

List No. 959 (NPT)
List No. 959D (NPTF) Dry Seal
HIGH SPEED STEEL

Nominal Tap Size	Thread Per Inch	E.D.P. Numbers		Number of Flutes	Dimensions					
		L959 NPT	L959D NPTF		Projection*	Overall Length	Thread Length	Shank Dia.	Square Length	Size of Square
1/8	27	74100	74107	4	.241	2.126	0.752	0.4375	0.374	0.3280
1/4	18	74102	74109		.361	2.437	1.063	0.5625	0.437	0.4209
3/8		74103	74110			2.563		0.7000	0.500	0.5307
1/2	14	74104	74111		.464	3.126	1.374	0.6875	0.626	0.5150
3/4		74105	74112	5		3.252		0.9063	0.689	0.6787
1	11 1/2	74106	74113		.565	3.752	1.752	1.1250	0.811	0.8429

Order by EDP Number

*** Projection Tolerance:** **1/8" - 3/4" ..... ± 1/16"**
1" ..... ± 3/32"

Taper Pipe Tap 6" Extension

Bright Finish

List No. 957 (NPT)
HIGH SPEED STEEL

Nominal Tap Size	Threads per Inch	E.D.P. Numbers	Number of Flutes	Dimensions				
		L957 NPT		Overall Length	Thread Length	Shank Dia.	Square Length	Size of Square
1/16	27	74120	4	6	0.689	0.3125	0.374	0.2339
1/8		74121			0.752	0.4375		0.3280
1/4	18	74123			1.063	0.5625	0.437	0.4209
3/8		74124				0.7000	0.500	0.5307
1/2	14	74125			1.374	0.6875	0.626	0.5150
3/4		74126	5			0.9063	0.689	0.6787
1	11 1/2	74127			1.752	1.1250	0.811	0.8429

Order by EDP Number

Tapping Speeds

Standard Taps

Material		Tapping Speed SFM
Aluminum Alloys		90-100
Brass		60-100
Bronze		40-60
Copper		40-60
High Temperature Alloys	Cobalt Base	5-10
	Iron Base	10-15
	Nickel Base	5-10
Iron, Ductile	Annealed	60
	as Cast	30
	Tempered	15-20
Gray	Annealed	80
	as Cast	35-60
Malleable		60
	Heat Treated	25-50
Magnesium Alloys	Annealed	175
Manganese		20
Molybdenum Alloys	Stress Relieved	50
Monel	Annealed	20
Nickel Alloys	Annealed	25
Plastics, Reinforced		25
Thermoplastics		50
Thermosetting Plastics		50
Steels, Alloys, Annealed or Cold Drawn		40-60
Quenched & Tempered		15-35
Armor Plate		10

Material		Tapping Speed SFM
(Steels Cont.)		
Carbon Steel, Plain	Annealed	40-80
	Tempered	15-40
Cast Carbon	Annealed	40-50
	Tempered	30
Cast, Corrosion Resistant	Annealed	20-30
Heat Resistant	as Cast	20-25
Low Alloy	Annealed	30-45
	Tempered	15-25
Precipitation Hardening	Treated	10-15
Stainless	Annealed	15-45
	Tempered	15-75
Free Machining	Annealed	45-75
Tool Steels, High Speed	Annealed	15-25
Water Hardening	Annealed	50
Ultra High Strength Steels	Annealed	35
	Normalized	20
	Tempered	3-7
Maraging Steels	Annealed	20-15
	Maraged	5-10
Tantalum Alloys	Stress Relieved	3
Titanium Alloys		
Commercial Pure	Annealed	40-60
Alpha & Alpha Beta Alloys	Annealed	10-25
Tungsten Alloys, Pressed & Sintered		50
Zinc Alloys	Die Cast	150

CONVERSION TABLE

Surface Feet Per Minute to Revolutions Per Minute

SFM	20	25	30	40	50	60	70	80	90	100	110	120	130	140	150
TAP SIZE	REVOLUTIONS PER MINUTE														
0	1270	1590	1910	2540	3100	3850	4450	5100	5750	6350	7000	7650	8200	8900	9550
1	1040	1310	1550	2100	2600	3140	3650	4150	4710	5200	5750	6250	6800	7300	7850
2	850	1100	1300	1750	2250	2650	3100	3550	4000	4450	4850	5350	5750	6200	6650
3	750	950	1150	1550	1900	2300	2700	3050	3450	3850	4250	4600	5000	5400	5750
4	650	850	1050	1350	1700	2050	2300	2700	3050	3400	3750	4100	4450	4750	5100
5	600	750	900	1200	1550	1850	2100	2400	2750	3100	3350	3650	3950	4250	4550
6	550	650	850	1100	1350	1650	1950	2200	2450	2750	3050	3300	3600	3850	4150
8	450	580	700	950	1150	1400	1650	1850	2100	2350	2550	2800	3000	3250	3500
10	400	500	600	800	1005	1200	1400	1600	1800	2000	2200	2400	2600	2800	3000
12	350	450	550	700	850	1050	1250	1400	1550	1750	1950	2100	2300	2450	2650
1/4	300	380	450	600	750	900	1050	1200	1350	1500	1650	1800	1950	2150	2300
5/16	250	300	350	480	600	750	850	950	1100	1250	1350	1450	1550	1700	1850
3/8	200	250	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500
7/16	170	210	250	350	450	520	600	700	750	850	950	1050	1150	1250	1300
1/2	150	190	220	300	350	450	530	600	650	750	850	900	950	1050	1150
9/16	130	170	200	250	350	400	450	550	600	650	750	800	900	950	1050
5/8	120	150	180	250	300	350	400	450	550	600	650	750	800	850	900
3/4	100	120	150	200	250	300	350	400	450	500	550	600	650	700	750
7/8	80	100	130	170	200	250	300	350	400	450	480	520	550	600	650
1	70	90	100	150	190	230	260	300	350	380	420	450	500	530	570

The material being tapped is the primary factor in determining the most effective TAPPING SPEED. However there are a number of other factors which may require consideration. Among these are: thread pitch, thread length, percent of thread, lubrication, tap flute style and chamfer, equipment and method of tapping. The best speed is determined by experiment on the iob. The table below lists speeds which have proven satisfactory under average conditions.

Standards & Dimensions

Standard System of Marking

General

Taps, dies, and other threading tools will be marked with the nominal size, number of threads per inch, and the proper symbol to identify the thread form. These symbols are in agreement with the ANSIB94.9 1979 Standard on Nomen-clature, Definitions and Letter Symbols for Screw Threads.

Symbols used for American Threads are:

Symbol	Reference
NC	American National Coarse Thread Series
NF	American National Fine Thread Series
NEF	American National Extra Fine Thread Series
N	American National 8,12 and 16 Thread Series (8N, 12N, i6N)
NH	American (National) Hose Coupling and Fire Hose Coupling Threads
NM	National Miniature Screw Thread
NGO	American (National) Gas Outlet Thread
NS	American Special Thread
NPT	American (National) Taper Pipe Thread
NPTF	Dryseal American (National) Taper Pipe Thread
ANPT	Military Aeronautical Pipe Thread Specification MIL-P-71 05
NPS	American (National) Straight Pipe Thread
NPSC	American (National) Straight Pipe Thread in Pipe Couplings
NPSF	Dryseal American (National) Fuel Internal Straight Pipe Thread
NPSH	American (Standard) Straight Pipe Thread for Hose Couplings and Nipples
NPSI	Dryseal American (National) Intermediate Internal Straight Pipe Thread
NPSL	American (National) Internal Straight Pipe Thread for Locknut Connections (Loose Fitting Mechanical Joints)
NPSM	American (National) Internal Straight Pipe Thread for Mechanical Joints (Free Fitting)
NPTR	American (National) Internal Taper Pipe Thread for Railing Joints (Mechanical Joints)
AMO	American Standard Microscope Objective Thread
ACME C	Acme Screw Thread — Centralizing Type
ACME G	Acme Screw Thread — General Purpose Type
STUB ACME	Stub Acme Threads
NBUTT	National Buttress Screw Thread
V	A 60° "V" Thread with Truncated Crests and Roots. The Theoretical "V" Form is usually flatted several thousandths of an inch to the user's specifications.
SB	Manufacturers Stovebolt Standard Thread
STI	Special Threads for Helical Coil Wire Screw Thread Inserts.

Group Thread Taps - Limit Numbers

All standard Ground Thread Taps will be marked with the letter G to designate Ground Thread. The letter G will be followed by the letter H to designate above basic (L below basic) and a numeral to designate the Pitch Diameter limits.

Example: GH3 indicates a Group thread Tap with Pitch Diameter limits .0010 to .0015 over basic.

Pitch Diameter limits for Taps to 1" diameter inclusive.

L1 = Basic to Basic minus .0005
H1 = Basic to Basic plus .0005
H2 = Basic plus .0005 to Basic plus .0010
H3 = Basic plus .0010 to Basic plus .0015
H4 = Basic plus .0015 to Basic plus .0020
H5 = Basic plus .0020 to Basic plus .0025
H6 = Basic plus .0025 to Basic plus .0030

Pitch Diameter limits for Taps over 1" diameter to 1 1/2" diameter inclusive.

H4 = Basic plus .0010 to Basic plus .0020

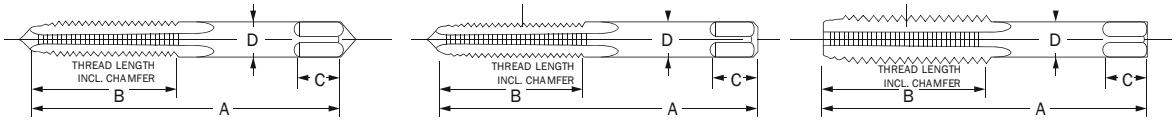
American National 8, 12, 16 and NEF Thread Series

National 8 pitch Series	1" to 2 1/4" by 1/8ths
	21/4" to 6" by 1/4ths
National 12 pitch Series	1/2" to 1 1/2" 1/16ths
	1 1/2" to 4" by 1/8ths
	4" to 6" by 1/4thS
National 16 pitch Series	3/4" to 2 1/2" by 1/16ths
	2 1/2" to 4" by 1/8ths
	4" to 6" by 1/4ths

National Extra Fine Thread Series

#12	–32	1 1/6"	–18
1/4"	–32	1 1/16"	–18
5/16"	–32	1 1/18"	–18
3/8"	–32	1 3/16"	–18
7/16"	–28	1 1/4"	–18
1/2"	–28	1 5/16"	–18
9/16"	–24	1 3/8"	–18
5/8"	–24	1 7/16"	–18
11/16"	–24	1 1/2"	–18
3/4"	–20	1 9/16"	–18
13/16"	–20	1 5/8"	–18
7/8"	–20	1 11/16"	–18
15/16"	–20	1 3/4"	–16
1"	–20	2"	–16

Standard Tap Blank Dimensions



STYLE 1 STYLE 2 STYLE 3

Table 302 - General Dimensions

Nominal Diameter Range - Inches		Machine Screw Size No.	Nominal Fractional Diameter Inches	Nominal Metric Diameter Mill.	Style*	Tap Dimensions — Inches				
Over	To (Incl)					Overall Length A	Thread Length B	Square Length C	Shank Diameter D	Size of Square
.052	.065	0	1/16	M1.6	1	1 5/8	5/16	3/16	.141	.110
.065	.078	1		M1.8	1	1 11/16	3/8	3/16	.141	.110
.078	.091	2		M2,MZ2	1	1 3/4	7/16	3/16	.141	.110
.091	.104	3	3/32	M2.5	1	1 13/16	1/2	3/16	.141	.110
.104	.117	4			1	1 7/8	9/16	3/16	.141	.110
.117	.130	5	1/8	M3, M3.15	1	1 15/16	5/8	3/16	.141	.110
.130	.145	6		M3.5	1	2	11/16	3/16	.141	.110
.145	.171	8	5/32	M4	1	2 1/8	3/4	1/4	.168	.131
.171	.197	10	3/16	M4.5, M5	1	2 3/8	7/8	1/4	.194	.152
.197	.223	12	7/32		1	2 3/8	15/16	9/32	.220	.165
.223	.260	14	1/4	M6, M6.3	2	2 1/2	1	5/16	.255	.191
.260	.323		5/16	M7, M8	2	2 23/32	1 1/8	3/8	.318	.238
.323	.385		3/8	M10	2	2 15/16	1 1/4	7/16	.381	.286
.385	.448		7/16		3	3 5/32	1 7/16	13/32	.323	.242
.448	.510		1/2	MI2 M12.5	3	3 3/8	1 21/32	7/16	.367	.275
.510	.573		9/16	M14	3	3 19/32	1 21/32	1/2	.429	.322
.573	.635		5/8	M16	3	3 13/16	1 13/16	9/16	.480	.360
.635	.709		11/16	M18	3	4 1/32	1 13/16	5/8	.542	.406
.709	.760		3/4		3	4 1/4	2	11/16	.590	.442
.760	.823		13/16	M20	3	4 15/32	2	11/16	.652	.489
.823	.885		7/8	M22	3	4 11/16	2 7/32	3/4	.697	.523
.885	.948		15/16	M24	3	4 29/32	2 7/32	3/4	.760	.570
.948	1.010		1	M25	3	5 1/8	2 1/2	13/16	.800	.600
1.010	1.073		1 1/16	M27	3	5 1/8	2 1/2	7/8	.896	.672
1.073	1.135		1 1/8		3	5 7/16	2 9/16	7/8	.896	.672
1.135	1.198		1 3/16	M30	3	5 7/16	2 9/16	1	1.021	.766
1.198	1.260		1 1/4		3	5 3/4	2 9/16	1	1.021	.766
1.260	1.323		1 5/16	M33	3	5 3/4	2 9/16	1 1/16	1.108	.831
1.323	1.385		1 3/8		3	6 1/16	3	1 1/16	1.108	.831
1.385	1.448		1 7/16	M36	3	6 1/16	3	1 1/8	1.233	.925
1.448	1.510		1 1/2		3	6 3/8	3	1 1/8	1.233	.925
1.510	1.635		1 5/8	M39	3	6 11/16	3 3/16	1 1/8	1.305	.979
1.635	1.760		1 3/4	M42	3	7	3 3/16	1 1/4	1.430	1.072
1.760	1.885		1 7/8		3	7 5/16	3 9/16	1 1/4	1.519	1.139
1.885	2.010		2	M48	3	7 5/8	3 9/16	1 3/8	1.644	1.233
2.010	2.135		2 1/8		3	8	3 9/16	1 3/8	1.769	1.327
2.135	2.260		2 1/4	M56	3	8 1/4	3 9/16	1 7/16	1.894	1.420
2.260	2.385		2 3/8		3	8 1/2	4	1 7/16	2.019	1.514
2.385	2.510		2 1/2		3	8 3/4	4	1 1/2	2.100	1.575
2.510	2.635		2 5/8	M64	3	8 3/4	4	1 1/2	2.225	1.669
2.635	2.760		2 3/4		3	9 1/4	4	1 9/16	2.350	1.762
2.760	2.885		2 7/8	M72	3	9 1/4	4	1 9/16	2.475	1.856
2.885	3.010		3		3	9 3/4	4 9/16	1 5/8	2.543	1.907
3.010	3.135		3 1/8		3	9 3/4	4 9/16	1 5/8	2.668	2.001
3.135	3.260		3 1/4	M80	3	10	4 9/16	1 3/4	2.793	2.095
3.260	3.385		3 3/8		3	10	4 9/16	1 3/4	2.883	2.162
3.385	3.510		3 1/2		3	10 1/4	4 15/16	2	3.008	2.256
3.510	3.635		3 5/8	M90	3	10 1/4	4 15/16	2	3.133	2.350
3.635	3.760		3 3/4		3	10 1/2	5 5/16	2 1/8	3.217	2.413
3.760	3.885		3 7/8		3	10 1/2	5 5/16	2 1/8	3.342	2.506
3.885	4.010		4	M100	3	10 3/4	5 5/16	2 1/4	3.467	2.600

* Styles shown are for ground thread taps

Tap Recommendation for Classes 2B & 3B
Unified Inch Screw Threads

Size	Threads Per Inch		Recommended Tap Limits		Internal Thread Pitch Diameter Units		
	NC UNC	NF UNF	Class 2B	Class 3B	Min. All Classes (BASIC)	Max. Class 2B	Max. Class 3B
0	–	80	H2	H1	.0519	.0542	.0536
1	64	–	H2	H1	.0629	.0655	.0648
1	–	72	H2	H1	.0640	.0665	.0659
2	56	–	H2	H1	.0744	.0772	.0765
2	–	64	H2	H1	.0759	.0786	.0779
3	48	–	H2	H1	.0855	.0885	.0877
3	–	56	H2	H1	.0874	.0902	.0895
4	40	–	H2	H2	.0958	.0991	.0982
4	–	48	H2	H1	.0985	.1016	.1008
5	40	–	H2	H2	.1088	.1121	.1113
5	–	44	H2	H1	.1102	.1134	.1126
6	32	–	H3	H2	.1177	.1214	.1204
6	–	40	H2	H2	.1218	.1252	.1243
8	32	–	H3	H2	.1437	.1475	.1465
8	–	36	H2	H2	.1460	.1496	.1487
10	24	–	H3	H3	.1629	.1672	.1661
10	–	32	H3	H2	.1697	.1736	.1726
12	24	–	H3	H3	.1889	.1933	.1922
12	–	28	H3	H3	.1928	.1970	.1959
1/4	20	–	H5	H3	.2175	.2223	.2211
1/4	–	28	H4	H3	.2268	.2311	.2300
5/16	18	–	H5	H3	.2764	.2817	.2803
5/16	–	24	H4	H3	.2854	.2902	.2890
3/8	16	–	H5	H3	.3344	.3401	.3387
3/8	–	24	H4	H3	.3479	.3528	.3516
7/16	14	–	H5	H3	.3911	.3972	.3957
7/16	–	20	H5	H3	.4050	.4104	.4091
1/2	13	–	H5	H3	.4500	.4565	.4548
1/2	–	20	H5	H3	.4675	.4731	.4717
9/16	12	–	H5	H3	.5084	.5152	.5135
9/16	–	18	H5	H3	.5264	.5323	.5308
5/8	11	–	H5	H3	.5660	.5732	.5714
5/8	–	18	H5	H3	.5889	.5949	.5934
3/4	10	–	H5	H5	.6850	.6927	.6907
3/4	–	16	H5	H3	.7094	.7159	.7143
7/8	9	–	H6	H4	.8028	.8110	.8089
7/8	–	14	H6	H4	.8286	.8356	.8339
1	8	–	H6	H4	.9188	.9276	.9254
1	–	12	H6	H4	.9459	.9535	.9516
1	14 NS		H6	H4	.9536	.9609	.9590
1 1/8	7	–	H8	H4	1.0332	1.0416	1.0393
1 1/8	–	12	H6	H4	1.0709	1.0787	1.0768
1 1/4	7	–	H8	H4	1.1572	1.1668	1.1644
1 1/4	–	12	H6	H4	1.1959	1.2039	1.2019
1 3/8	6	–	H8	H4	1.2667	1.2771	1.2745
1 3/8	–	12	H6	H4	1.3209	1.3291	1.3270
1 1/2	6	–	H8	H4	1.3917	1.4022	1.3996
1 1/2	–	12	H6	H4	1.4459	1.4542	1.4522

The above recommended taps normally produce the Class of Thread indicated average materials when used with reasonable care. However, if the tap specified does not give a satisfactory gauge fit in the work, a choice of some other limit tap will be necessary.

Tap Drill Sizes

The following tables show the Theoretical Percentage of Thread obtained from stock sizes of drills and also the Probable Percentage after allowance for oversize drilling.

Tap	Tap Drill	Decimal Equiv. of Tap Drill	Probable Hole Size	Percent of Thread	Tap	Tap Drill	Decimal Equiv. of Tap Drill	Probable Hole Size	Percent of Thread	Tap	Tap Drill	Decimal Equiv. of Tap Drill	Probable Hole Size	Percent of Thread
0-80	56	.0465	.0480	74	8-32	29	.1360	.1389	62	3/8-16	5/16	.3125	.3160	72
	3/64	.0469	.0484	71		28	.1405	.1434	51		O	.3160	.3204	68
1-64	54	.0550	.0565	81	8-36	29	.1360	.1389	70		P	.3230	.3274	59
	53	.0595	.0610	59		28	.1405	.1434	57	3/8-24	21/64	.3281	.3325	79
1-72	53	.0595	.0610	67		9/64	.1406	.1435	57		Q	.3320	.3364	71
	1/16	.0625	.0640	50	10-24	27	.1440	.1472	79		R	.3390	.3434	58
2-56	51	.0670	.0687	74		26	.1470	.1502	74	7/16-14	T	.3580	.3626	81
	50	.0700	.0717	62		25	.1495	.1527	69		23/64	.3594	.3640	79
	49	.0730	.0747	49		24	.1520	.1552	64		U	.3680	.3726	70
2-64	50	.0700	.0717	70		23	.1540	.1572	61		3/18	.3750	.3796	62
	49	.0730	.0747	56		5/32	.1563	.1595	56		V	.3770	.3816	60
3-48	48	.0760	.0779	78		22	.1570	.1602	55	7/16-20	W	.3860	.3906	72
	5/64	.0781	.0800	70	10-32	5/32	.1563	.1595	75		25/64	.3906	.3952	65
	47	.0785	.0804	69		22	.1570	.1602	73		X	.3970	.4016	55
	46	.0810	.0829	60		21	.1590	.1622	68	1/2-13	27/64	.4219	.4216	73
	45	.0820	.0839	56		20	.1610	.1642	64		7/16	.4375	.4422	58
3-56	46	.0810	.0829	69		19	.1660	.1692	51	1/2-20	29/64	.4531	.4578	65
	45	.0820	.0839	65	12-24	11/64	.1719	.1754	75	9/16-12	15/32	.4688	.4736	82
	44	.0860	.0879	48		17	.1730	.1765	73		31/64	.4844	.4892	68
4-40	44	.0860	.0880	74		16	.1770	.1805	66	9/16-18	1/2	.5000	.5048	80
	43	.0890	.0910	65		15	.1800	.1835	60		33/64	.5156	.5204	58
	42	.0935	.0955	55		14	.1820	.1855	56	5/8-11	17/32	.5313	.5362	75
	3/32	.0938	.0958	50	12-28	16	.1770	.1805	77		35/64	.5469	.5518	62
4-48	42	.0935	.0955	61		15	.1800	.1835	70	5/8-18	9/16	.5625	.5674	80
	3/32	.0938	.0958	60		14	.1820	.1855	66		37/64	.5781	.5831	58
	41	.0960	.0980	52		13	.1850	.1885	59	3/4-10	41/64	.6406	.6456	80
5-40	40	.0980	.1003	76		3/16	.1875	.1910	54		21/32	.6563	.6613	68
	39	.0995	.1018	71	1/4-20	9	.1960	.1998	77	3/4-16	11/16	.6875	.6925	71
	38	.1015	.1038	65		8	.1990	.2028	73	7/8-9	49/64	.7656	.7708	72
	37	.1040	.1063	58		7	.2010	.2048	70		25/32	.7812	.7864	61
5-44	38	.1015	.1038	72		13/64	.2031	.2069	66	7/8-14	51/64	.7969	.8021	79
	37	.1040	.1063	63		6	.2040	.2078	65		13/16	.8125	.8177	62
	36	.1065	.1088	55		5	.2055	.2093	63	1"-8	55/64	.8594	.8653	83
6-32	37	.1040	.1063	78		4	.2090	.2128	57		7/8	.8750	.8809	73
	36	.1065	.1091	71	1/4-28	3	.2130	.2168	72		57/64	.8906	.8965	64
	7/64	.1094	.1120	64		7/32	.2188	.2226	59		29/32	.9063	.9122	54
	35	.1100	.1126	63		2	.2210	.2248	55	1"-12	29/32	.9063	.9123	81
	34	.1110	.1136	60	5/16-18	F	.2570	.2608	72		59/64	.9219	.9279	67
	33	.1130	.1156	55		G	.2610	.2651	66		15/16	.9375	.9435	52
6-40	34	.1110	.1136	75		17/64	.2656	.2697	59	1"-14	59/64	.9219	.9279	78
	33	.1130	.1156	69		H	.2660	.2701	59		15/16	.9375	.9435	61
	32	.1160	.1186	60	5/16-24	H	.2660	.2701	78					
						I	.2720	.2761	67					

Formula for Obtaining Tap Drill Sizes

(Select nearest commercial stock drill)

$$\text{Percent of Thread} = \frac{\text{Basic thread OD.} \times \text{Pre-Tapping Diameter}}{2 \times (\text{Basic Height of Thread})} \times 100\%$$

- **Pre-Tapping Diameter for Cutting Taps**

$$\text{Pre-tapping Diameter} = \text{Basic thread OD.} - \frac{.01299 \times \text{Percent of Thread}}{\text{No. of threads per inch}}$$

- **Pre-Tapping Diameter for Roll Forming Taps**

$$\text{Pre-tapping Diameter} = \text{Basic thread OD.} - \frac{.0068 \times \text{Percent of Thread}}{\text{No. of threads per inch}}$$

Tap Drill Sizes

For Thread Forming Taps

Nominal Size	Threads per Inch		75% Thread			70% Thread			65% Thread			60% Thread		
	NC UNC	NF UNF	Theor. Hole Core Size	Nearest Drill Size	Dec. Equiv.	Theor. Hole Core Size	Nearest Drill Size	Dec. Equiv.	Theor. Hole Core Size	Nearest Drill Size	Dec. Equiv.	Theor. Hole Core Size	Nearest Drill Size	Dec. Equiv.
0	–	80	.0536	1.35mm	.0531	.0540	1.35mm	.0531	.0545	–	–	.0549	54	.0550
1	64	–	.0650	1.65mm	.0650	.0655	1.65mm	.0650	.0661	–	–	.0666	–	–
1	–	72	.0659	1.65mm	.0650	.0663	–	–	.0669	1.7mm	.0669	.0673	51	.0670
2	56	–	.0769	1.95mm	.0768	.0774	1.95mm	.0768	.0781	3/64	.0781	.0787	47	.0785
2	–	64	.0780	5/64	.0781	.0785	47	.0785	.0791	2.0mm	.0787	.0796	2.0mm	.0787
3	48	–	.0884	2.25mm	.0886	.0890	43	.0890	.0898	43	.0890	.0905	2.3mm	.0906
3	–	56	.0899	43	.0890	.0904	–	–	.0911	2.3mm	.0906	.0917	2.3mm	.0906
4	40	–	.0993	2.5mm	.0984	.1000	39	.0995	.1010	39	.0995	.1018	38	.1015
4	–	48	.1014	38	.1015	.1020	38	.1015	.1028	2.6mm	.1024	.1035	2.6mm	.1024
5	40	–	.1123	34	.1110	.1130	33	.1130	.1140	33	.1130	.1148	2.9mm	.1142
5	–	44	.1134	33	.1130	.1141	2.9mm	.1142	.1150	2.9mm	.1142	.1157	–	–
6	32	–	.1221	2.1mm	.1220	.1230	3.1mm	.1220	.1243	–	–	.1252	1/8	.1250
6	–	40	.1253	1/8	.1250	.1260	3.2mm	.1260	.1270	3.2mm	.1260	.1278	3.25mm	.1280
8	32	–	.1481	3.75mm	.1476	.1490	–	–	.1503	25	.1495	.1512	3.8mm	.1496
8	–	36	.1498	25	.1495	.1507	3.8mm	.1496	.1518	24	.1520	.1526	24	.1520
10	24	–	.1688	–	–	.1700	18	.1695	.1717	11/64	.1719	.1729	11/64	.1719
10	–	32	.1741	17	.1730	.1750	–	–	.1763	–	–	.1772	16	.1770
12	24	–	.1948	10	.1935	.1960	9	.1960	.1977	5.0mm	.1968	.1989	8	.1990
12	–	28	.1978	5.0mm	.1968	.1989	8	.1990	.2003	8	.1990	.2014	7	.2010
1/4	20	–	.2245	5.7mm	.2244	.2260	–	–	.2280	1	.2280	.2295	1	.2280
1/4	–	28	.2318	–	–	.2329	5.9mm	.2323	.2343	A	.2340	.2354	15/64	.2344
5/16	18	–	.2842	7.2mm	.2835	.2861	7.25mm	.2854	.2879	7.3mm	.2874	.2898	L	.2900
5/16	–	24	.2912	7.4mm	.2913	.2927	–	–	.2941	M	.2950	.2955	7.5mm	.2953
3/8	16	–	.3431	11/32	.3437	.3452	8.75mm	.3445	.3474	S	.3480	.3495	8.9mm	.3504
3/8	–	24	.3537	9.0mm	.3543	.3552	9.0mm	.3543	.3566	–	–	.3580	T	.3580
7/16	14	–	.4011	–	–	.4035	Y	–	.4059	13/32	–	.4084	–	–
7/16	–	20	.4120	Z	–	.4137	10.5mm	–	.4154	–	–	.4171	–	–
1/2	13	–	.4608	–	–	.4634	–	–	.4660	–	–	.4686	15/32	–
1/2	–	20	.4745	–	–	.4762	–	–	.4779	–	–	.4796	–	–
9/16	12	–	.5200	–	–	.5229	–	–	.5257	–	–	.5285	–	–
9/16	–	18	.5342	13.5mm	.5315	.5361	–	–	.5380	–	–	.5398	–	–
5/8	11	–	.5787	37/64	.5781	.5817	37/64	.5781	.5848	–	–	.5879	–	–
5/8	–	18	.5967	19/32	.5937	.5986	–	–	.6004	–	–	.6023	–	–
3/4	10	–	.6990	–	–	.7024	–	–	.7058	45/64	.7031	.7092	18.0mm	.7087
3/4	–	16	.7181	23/32	.7187	.7202	23/32	.7187	.7224	–	–	.7245	–	–

Nom. Dia	Pitch	Theoretical Core Hole Size						Suggested	Taps
		Min.		Max.					
				5H Class		6H Class			
		Inches	mm	Inches	mm	Inches	mm		
3	0.5	.1071	2.72	.1094	2.79	.1098	2.79	H5	H6
3.5	0.6	.1244	3.16	.1268	3.22	.1276	3.24	H5	H7
4	0.7	.1417	3.60	.1445	3.67	.1453	3.69	H6	H7
5	0.8	.1791	4.55	.1823	4.63	.1831	4.65	H6	H8
6	1	.2142	5.44	.2177	5.53	.2185	5.55	H7	H9
8	1.25	.2870	7.29	.2913	7.40	.2925	7.43	H8	H10
10	1.5	.3602	9.15	.3602	9.27	.3665	9.31	H9	H11
12	1.75	.4335	11.01	.4368	11.14	.4402	11.18	H10	H12
14	2	.5067	12.87	.5126	13.02	.5142	13.06	H11	H13
16	2	.5854	14.87	.5913	15.02	.5929	15.06	H11	H13
20	2.5	.7315	18.58	.7386	18.76	.7409	18.82	H11	H14

For Pipe Taps

Nominal Pipe Size	Threads Per Inch	NPT–NPTF (When Drilled Only)		NPT–NPTF–ANPT (When Taper Reamed)		NPS–NPSF	
		Dr. Size	Dec. Equiv.	Dr. Size	Dec. Equiv.	Dr. Size	Dec. Equiv.
1/16	27	D	.2460	15/64	.2344	1/4	.2500
1/8	27	R	.3390	21/64	.3281	11/32	.3438
1/4	18	7/16	.4375	27/64	.4219	7/16	.4375
3/8	18	37/64	.5781	9/16	.5625	37/64	.5781
1/2	14	45/64	.7031	11/16	.6875	23/32	.7188
3/4	14	59/64	.9219	57/64	.8906	59/64	.9218
1	11-1/2	1 5/32	1.1562	1 1/8	1.1250	1 5/32	1.1562
1 1/4	11-1/2	1 1/2	1.5000	1 15/32	1.4688		
1 1/2	11-1/2	1 47/64	1.7344	1 45/64	1.7031		
2	11-1/2	2 7/32	2.2188	2 3/16	2.1875		

Tap Drill Sizes (Metric)

For Cutting Taps

Unit : mm

Nominal Size	Pitch	Percentage of Thread Engagement Hole Diameter				Minor Dia. of Internal Thread
		100%	90%	80%	70%	
M2	0.4	1.57	1.61	1.65	1.70	1.567~1.679
M3	0.5	2.46	2.51	2.57	2.62	2.459~2.599
M3.5	0.6	2.85	2.92	2.98	3.05	2.850~3.010
M4	0.7	3.24	3.32	3.39	3.47	3.242~3.422
M5	0.8	4.13	4.22	4.31	4.39	4.134~4.334
M6	1	4.92	5.03	5.13	5.24	4.917~5.153
M7	1	5.92	6.03	6.13	6.24	5.917~6.153
M8	1.25	6.65	6.78	6.92	7.05	6.647~6.912
	1	6.92	7.03	7.13	7.24	6.917~7.153
M10	1.5	8.38	8.54	8.70	8.86	8.376~8.676
	1.25	8.65	8.78	8.92	9.05	8.647~8.912
M12	1.75	10.11	10.30	10.50	10.70	10.106~10.441
	1.25	10.65	10.78	10.92	11.05	10.647~10.912
M14	2	11.80	12.10	12.30	12.50	11.835~12.210
	1.25	12.65	12.78	12.92	13.05	12.647~19.912
M16	2	13.80	14.10	14.30	14.50	13.835~14.210
	1.5	14.38	14.54	14.70	14.86	14.376~14.676
M18	2.5	15.30	15.60	15.80	16.10	15.294~15.744
	1.5	16.38	16.54	16.70	16.86	16.376~16.676
M20	2.5	17.30	17.60	17.80	18.10	17.294~17.744
	1.5	18.38	18.54	18.70	18.86	18.376~18.676
M22	2.5	19.30	19.60	19.80	20.10	19.264~19.744
	1.5	20.38	20.54	20.70	20.86	20.367~20.676
M24	3	20.80	21.10	21.40	21.70	20.752~21.252
	1.5	22.38	22.54	22.70	22.86	22.376~22.676
M27	3	23.80	24.10	24.40	24.70	23.752~24.252
M30	3.5	26.20	26.60	27.00	27.30	26.211~26.711

For Thread Forming Taps

Unit : mm

Nominal Size	Pitch	Percentage of Thread Engagement Hole Diameter			
		100%	90%	80%	70%
M2	0.4	1.77	1.80	1.82	1.84
M2.2	0.45	1.94	1.97	2.00	2.02
M2.5	0.45	2.24	2.27	2.30	2.32
M3	0.5	2.72	2.74	2.77	2.80
M3.5	0.6	3.16	3.19	3.23	3.26
M4	0.7	3.60	3.64	3.68	3.72
M4.5	0.75	4.07	4.12	4.16	4.20
M5	0.8	4.55	4.59	4.64	4.68
M6	1	5.43	5.49	5.55	5.60
M7	1	6.43	6.49	6.55	6.60
M8	1.25	7.29	7.36	7.43	7.50
	1	7.43	7.49	7.55	7.60
M10	1.5	9.15	9.23	9.32	9.40
	1.25	9.29	9.36	9.43	9.50
M12	1.75	11.01	11.11	11.21	11.31
	1.25	11.29	11.36	11.43	11.50
M14	2	12.87	12.98	13.09	13.21
	1.5	13.15	13.23	13.32	13.40
M16	2	14.87	14.98	15.09	15.21
	1.5	15.15	15.23	15.32	15.40
M18	2.5	16.58	16.72	16.87	17.01
	1.5	17.15	17.23	17.32	17.40
M20	2.5	18.58	18.72	18.87	19.01
	1.5	19.15	19.23	19.32	19.40

Note:
1.Determine hole diameter by tapping test. The dimensions in this table are for reference only.

Tap Tolerance Table

GT Limits Table

Fractional, Machine screw, and Metric Taps
Over 42 TPI, or less than 0.6mm pitch

Class	MIN	MAX
GT2	0.0002	0.0008
GT3	0.0006	0.0012
GT4	0.0010	0.0016
GT5	0.0014	0.0020
GT6	0.0018	0.0024
GT7	0.0022	0.0028

Fractional, Machine Screw, and Metric Taps
Less than 42 TPI, or over 0.6mm pitch

Class	MIN	MAX
GT2	0.0000	0.0008
GT3	0.0004	0.0012
GT4	0.0008	0.0016
GT5	0.0012	0.0020
GT6	0.0016	0.0024
GT7	0.0020	0.0028
GT8	0.0024	0.0031
GT9	0.0028	0.0035
GT10	0.0031	0.0039

GT Limits Conversion Chart

Recommended tap limits for 2B and 3B

TAP SIZE	CLASS 2B		CLASS 3B	
	H LIMITS	GT LIMITS	H LIMITS	GT LIMITS
2-56	H2	GT3	H1	-
2-64	H2	GT3	H1	-
3-48	H2	GT4	H1	-
3-56	H2	GT3	H1	-
4-40	H2	GT5	H2	-
4-48	H2	GT4	H1	-
5-40	H2	GT5	H2	-
5-44	H2	GT5	H2	-
6-32	H3	GT5	H2	-
6-40	H2	GT5	H2	-
8-32	H3	GT5	H2	-
8-36	H2	GT5	H2	-
10-24	H3	GT6	H3	-
10-32	H3	GT5	H2	-
12-24	H3	GT6	H3	-
12-28	H3	GT6	H3	-
1/4-20	H5	GT7	H3	GT4
1/4-28	H4	GT6	H3	GT4
5/16-18	H5	GT7	H3	GT4
5/16-24	H4	GT7	H3	GT4
3/8-16	H5	GT8	H3	GT4
3/8-24	H4	GT7	H3	GT4
7/16-14	H5	GT8	H3	GT4
7/16-20	H5	GT8	H3	GT4
1/2-13	H5	GT8	H3	GT4
1/2-20	H5	GT8	H3	GT4
9/16-12	H5	GT8	H3	GT4
9/16-18	H5	GT8	H3	GT4
5/8-11	H5	GT9	H3	GT4
5/8-18	H5	GT8	H3	GT4
3/4-10	H5	GT9	H5	GT4
3/4-16	H5	GT8	H3	GT4
7/8-9	H6	GT9	H4	GT5
7/8-14	H6	GT9	H4	GT5
1-8	H6	GT9	H4	GT5
1-12	H6	GT9	H4	GT5

Tap Tolerance Table

H Limits Table

Fractional and Machine Screw Types

Class	MIN	MAX
H1	0.0000	0.0005
H2	0.0005	0.0010
H3	0.0010	0.0015
H4	0.0015	0.0020
H5	0.0020	0.0025
H6	0.0025	0.0030
H7	0.0030	0.0035
H8	0.0035	0.0040
H9	0.0040	0.0045
H10	0.0045	0.0050
H11	0.0050	0.0055
H12	0.0055	0.0060

D Limits Table

Metric Taps

Tap Size	D Class	MIN	MAX
M2X0.4	D3	0.0009	0.0015
M2.5X0.45	D3	0.0009	0.0015
M3X0.5	D3	0.0009	0.0015
M3.5X0.6	D4	0.0012	0.0020
M4X0.7	D4	0.0012	0.0020
M5X0.8	D4	0.0012	0.0020
M6X1	D5	0.0015	0.0025
M7X1	D5	0.0015	0.0025
M8X1	D5	0.0015	0.0025
M8X1.25	D5	0.0015	0.0025
M10X1.25	D5	0.0015	0.0025
M10X1.5	D6	0.0018	0.0030
M12X1.25	D5	0.0015	0.0025
M12X1.75	D6	0.0018	0.0030
M14X1.5	D6	0.0018	0.0030
M14X2	D7	0.0019	0.0035
M16X1.5	D6	0.0018	0.0030
M16X2.0	D7	0.0019	0.0035
M18X1.50	D6	0.0018	0.0030
M18X2.5	D7	0.0019	0.0035
M20X2.5	D7	0.0019	0.0035
M22X2.5	D7	0.0019	0.0035
M24X3.0	D8	0.0024	0.0040
M27X3.0	D8	0.0024	0.0040
M30X3.5	D9	0.0025	0.0045

SGSP/SGPO Tap Drill Size Recommendations

***Recommend using SG-ESS, AQRVDS, or AQRVDOH3D as Tap Drill**

Tap Size	Theoretical Hole Size % Thread (Inch)					Class 2B Fit (Inch)			Class 3B Fit (Inch)		
	80%	75%	70%	65%	60%	Minor Dia. Min.	Minor Dia. Max.	Recommended Drill	Minor Dia. Min.	Minor Dia. Max.	Recommended Drill
2-56	0.0674	0.0686	0.0698	0.0709	0.0721	0.0667	0.0737	#50 (0.070)	0.0667	0.0737	#50 (0.070)
4-40	0.0860	0.0876	0.0893	0.0909	0.0925	0.0849	0.0939	#43 (0.089)	0.0849	0.0939	#43 (0.089)
6-32	0.1055	0.1076	0.1096	0.1116	0.1136	0.1040	0.1140	#35 (0.110)	0.1040	0.1140	#35 (0.110)
8-32	0.1315	0.1336	0.1356	0.1376	0.1396	0.1300	0.1390	#29 (0.136)	0.1300	0.1389	#29 (0.136)
10-24	0.1467	0.1494	0.1521	0.1548	0.1575	0.1450	0.1560	#24 (0.152)	0.1450	0.1560	#24 (0.152)
10-32	0.1575	0.1596	0.1616	0.1636	0.1656	0.1560	0.1640	#20 (0.161)	0.1560	0.1641	#20 (0.161)
12-24	0.1727	0.1754	0.1781	0.1808	0.1835	0.1710	0.1810	#16 (0.177)	0.1710	0.1810	#16 (0.177)
1/4 - 20	0.1980	0.2013	0.2045	0.2078	0.2110	0.1960	0.2070	13/64 (0.2031)	0.1960	0.2067	13/64 (0.2031)
1/4 - 28	0.2129	0.2152	0.2175	0.2198	0.2222	0.2110	0.2200	5.5mm (0.2165)	0.2110	0.2190	5.5mm (0.2165)
5/16 - 18	0.2548	0.2584	0.2620	0.2656	0.2692	0.2520	0.2650	G (0.261)	0.2520	0.2630	F (0.257)
5/16 - 24	0.2692	0.2719	0.2746	0.2773	0.2800	0.2670	0.2770	I (0.272)	0.2670	0.2754	I (0.272)
3/8 - 16	0.3101	0.3141	0.3182	0.3222	0.3263	0.3070	0.3210	O (0.316)	0.3070	0.3182	5/16 (0.3125)
3/8 - 24	0.3317	0.3344	0.3371	0.3398	0.3425	0.3300	0.3400	Q (0.332)	0.3300	0.3372	Q (0.332)
7/16 - 14	0.3633	0.3679	0.3726	0.3772	0.3818	0.3600	0.3760	U (0.368)	0.3600	0.3717	U (0.368)
7/16 - 20	0.3855	0.3888	0.3920	0.3953	0.3985	0.3830	0.3950	25/64 (0.3906)	0.3830	0.3916	W (0.386)
1/2 - 13	0.4201	0.4251	0.4301	0.4351	0.4400	0.4170	0.4340	27/64 (0.4219)	0.4170	0.4284	27/64 (0.4219)
1/2 - 20	0.4480	0.4513	0.4545	0.4578	0.4610	0.4460	0.4570	29/64 (0.4531)	0.4460	0.4537	11.4mm (0.4488)
5/8 - 11	0.5305	0.5364	0.5423	0.5482	0.5541	0.5270	0.5460	17/32 (0.5312)	0.5270	0.5391	17/32 (0.5312)
5/8 - 18	0.5673	0.5709	0.5745	0.5781	0.5817	0.5650	0.5780	14.5mm (0.5709)	0.5650	0.5730	14.5mm (0.5709)
3/4 - 10	0.6461	0.6526	0.6591	0.6656	0.6721	0.6420	0.6630	21/32 (0.6562)	0.6420	0.6545	16.5mm (0.6496)
3/4 - 16	0.6851	0.6891	0.6932	0.6972	0.7013	0.6820	0.6960	11/16 (0.6875)	0.6820	0.6908	11/16 (0.6875)
1 - 8	0.8701	0.8782	0.8863	0.8945	0.9026	0.8650	0.8900	7/8 (0.875)	0.8650	0.8797	7/8 (0.875)

Tap Size	Theoretical Hole Size % Thread (Inch)					Class 6H Fit (Inch)		
	80%	75%	70%	65%	60%	Minor Dia. Min.	Minor Dia. Max.	Recommended Drill
M3 X 0.5	0.0976	0.0988	0.1004	0.1016	0.1028	0.0968	0.1023	#39 (0.0995)
M4 X 0.7	0.1287	0.1307	0.1323	0.1343	0.1358	0.1276	0.1347	3.3mm (0.1299)
M5 X 0.8	0.1642	0.1661	0.1681	0.1701	0.1724	0.1628	0.1706	#19 (0.1660)
M6 X 1.0	0.1953	0.1980	0.2004	0.2031	0.2055	0.1936	0.2029	5.0mm (0.1969)
M8 X 1.25	0.2638	0.2669	0.2701	0.2732	0.2768	0.2617	0.2721	H (0.2660)
M10 X 1.25	0.3425	0.3457	0.3488	0.3520	0.3555	0.3404	0.3509	8.8mm (0.3465)
M10 X 1.5	0.3323	0.3362	0.3402	0.3437	0.3476	0.3298	0.3416	8.5mm (0.3346)
M12 X 1.25	0.4213	0.4244	0.4276	0.4307	0.4343	0.4192	0.4296	10.8mm (0.4252)
M12 X 1.5	0.4110	0.4150	0.4189	0.4224	0.4264	0.4085	0.4203	10.6mm (0.4173)
M12 X 1.75	0.4008	0.4055	0.4098	0.4142	0.4189	0.3979	0.4111	13/32 (0.4063)
M14 X 2.0	0.4693	0.4744	0.4795	0.4846	0.4898	0.4659	0.4807	12.2mm (0.4803)
M16 X 2.0	0.5480	0.5531	0.5583	0.5634	0.5685	0.5447	0.5594	14.2mm (0.5591)
M20 X 2.5	0.6850	0.6913	0.6980	0.7043	0.7106	0.6809	0.6986	17.7mm (0.6969)
M24 X 3.0	0.8220	0.8299	0.8374	0.8453	0.8528	0.8170	0.8367	21.2mm (0.8346)

Suggested Percentage of Full Thread in Tapped Holes

Material		Deep Hole Tapping	Average Commercial Work	Thin Sheet Stock or Stamping
Free Cutting	Aluminum, Brass, Bronze, Cast Iron, Copper, Mild Steel, Tool Steel	60%-70%	65%-70%	75%-85%
Hard or Tough Cutting	Cast Steel, Drop Forging, Monel Metal, Nickel Steel, Stainless Steel	55%-65%	60%-70%	

Classes and Tap Recommendations

Tap Size	Basic Pitch Diameter	Class 2B		Class 3B	
	All Classes Min.	Pitch Diameter Limits Max	Recommended Tap	Pitch Diameter Limits Max	Recommended Tap
2-56	0.0744	0.0772	H2	0.0765	H2
4-40	0.0958	0.0991	H2	0.0982	H2
6-32	0.1177	0.1214	H3	0.1204	H2
8-32	0.1437	0.1475	H3	0.1465	H2
10-24	0.1629	0.1672	H3	0.1661	H3
10-32	0.1697	0.1736	H3	0.1726	H2
12-24	0.1889	0.1933	H3	0.1922	H3
1/4 - 20	0.2175	0.2224	H5	0.2211	H3
1/4 - 28	0.2268	0.2311	H4	0.2300	H3
5/16 - 18	0.2764	0.2817	H5	0.2803	H3
5/16 - 24	0.2854	0.2902	H4	0.2890	H3
3/8 - 16	0.3344	0.3401	H5	0.3387	H3
3/8 - 24	0.3479	0.3528	H4	0.3516	H3
7/16 - 14	0.3911	0.3972	H5	0.3957	H3
7/16 - 20	0.4050	0.4104	H5	0.4091	H3
1/2 - 13	0.4500	0.4565	H5	0.4548	H3
1/2 - 20	0.4675	0.4731	H5	0.4717	H3
5/8 - 11	0.5660	0.5732	H6	0.5714	H4
5/8 - 18	0.5889	0.5949	H6	0.5934	H4
3/4 - 10	0.6850	0.6927	H6	0.6907	H4
3/4 - 16	0.7094	0.7159	H6	0.7143	H4
1 - 8	0.9188	0.9276	H6	0.9254	H4

Tap Size	Pitch Diameter Limits - Class 6H		Class 6H
	Maximum	Minimum	Recommended Tap
M3 x 0.5	0.1054	0.1092	D3
M4 x 0.7	0.1396	0.1442	D4
M5 x 0.8	0.1764	0.1812	D4
M6 x 1.0	0.2107	0.2165	D5
M8 x 1.25	0.2830	0.2892	D5
M10 x 1.25	0.3617	0.3680	D5
M10 x 1.5	0.3554	0.3624	D6
M12 x 1.25	0.4405	0.4476	D6
M12 x 1.5	0.4341	0.4416	D6
M12 x 1.75	0.4277	0.4355	D6
M14 x 2.0	0.5001	0.5083	D7
M16 x 2.0	0.5788	0.5871	D7
M20 x 2.5	0.7235	0.7322	D7
M24 x 3.0	0.8682	0.8785	D8

H2 = Basic P.D. + .0005" to Basic P.D. + .0010"
H3 = Basic P.D. + .0010" to Basic P.D. + .0015"
H4 = Basic P.D. + .0015" to Basic P.D. + .0020"
H5 = Basic P.D. + .0020" to Basic P.D. + .0025"
H6 = Basic P.D. + .0025" to Basic P.D. + .0030"

D3 = Basic P.D. + .0009" to Basic P.D. + .0015"
D4 = Basic P.D. + .0012" to Basic P.D. + .0020"
D5 = Basic P.D. + .0015" to Basic P.D. + .0025"
D6 = Basic P.D. + .0018" to Basic P.D. + .0030"
D7 = Basic P.D. + .0019" to Basic P.D. + .0035"
D8 = Basic P.D. + .0024" to Basic P.D. + .0040"

The above recommended taps normally produce the class of thread indicated in average materials when used with reasonable care. However, if the tap specified does not give a satisfactory gage fit in the work, a choice of some other limit tap may be necessary.

Trouble-Shooting Guide for Tapping Problems

	Troubles	Factors	Countermeasures
Surface Roughness	Torn or Rough Thread	Chamfer length too short	• Increase chamfer length
		Wrong cutting angle	• Apply proper cutting angle
		Galling	• Use thread relieved taps • Reduce land width • Apply surface treatment such as steam oxide or chrome • Use proper cutting lubricant • Reduce tapping speed • Use larger drill size • Obtain proper alignment between tap and work
		Chip Packing	• Use spiral pointed or spiral fluted taps • Use larger drill size
	Chattering on Tapped Thread	Tool Free Cutting	• Avoid too narrow land width • Reduce amount of thread relief
		Tool Condition	• Reduce cuffing angle • Do not grind the bottom of the flute
Dimensional Error	Oversize Pitch Diameter	Incorrect Taps	• Use proper GH limits • Use longer chamfered taps
		Chip Packing	• Use spiral point or spiral fluted taps • Reduce number of flutes to provide extra chip room • Use National fine pitch, if applicable • Use larger drill size • If tapping a blind hole, allow deeper hole where applicable or shorten the thread length of the parts • Use proper lubricant
		Galling	• Apply proper surface treatment such as steamoxide • Use proper cutting lubricant • Reduce tapping speed • Use proper cutting angle in accordance with material being tapped. • Use larger drill size
		Operating Conditions	• Apply proper tapping speed • Correct alignment of tap and drill hole • Free cutting either tap or workpiece • Use proper tapping speed to avoid torn or rough thread • Use lead screw tapper • Use proper tapping machine with suitable power • Avoid misalignment of tap and drill hole from loose spindle or worn holder
		Tool Conditions	• Obtain proper indexing angle for the flutes at the cutting edge • Grind proper indexing angle and chamfer angle • Avoid too narrow land width • Remove burrs from reground edge
	Oversize Internal Diameter	Drill Hole Size	• Use minimum size drill hole • Avoid tapered hole • Use proper chamfered taps
		Galling	• Galling solutions I through 4 above can be applied to this specific problem

	Troubles	Factors	Countermeasures
Dimensional Error	Undersize Pitch Diameter	Incorrect Tap Selection	• Use one oversize taps 1) Use for cuffing materials such as copper alloy, aluminum alloy, and cast iron 2) Use for cuffing tubing which will have "spring back" action after tapping • Apply proper chamfer angle • Increase cutting angle
		Damaged Thread	• Use proper reversing speed to avoid damaging tapped thread on the way out of the hole
		Left over Chips	• Increase cutting performance to avoid any leftover chip in the hole • Remove leftover chip from the hole for gauge checking
	Undersize Internal Diameter	Drill Hole size	• Use maximum drill size
Tool Life	Breakage	Incorrect Tap Selection	• Use high speed steel taps • Avoid chip packing in the flutes or the bottom of hole • Use spiral pointed or spiral fluted taps or Roll Taps • Apply correct surface treatment such as steam oxide or other coating
		Excessive Tapping Torque	• Use larger drill size • Try to shorten thread length • Apply National Fine Pitch if applicable • Increase cutting angle • Apply a tap with more thread relief and reduced land width • Use spiral pointed or spiral fluted taps
		Operating Conditions	• Reduce tapping speed • Avoid misalignment between tap and the hole and tapered hole • Use floating type of tapping holder • Use tapping holder with torque adjustment • Avoid hitting bottom of the hole with tap
		Tool Condition	• Do not grind the bottom of the flutes • Avoid too narrow a land width • Do not leave sections on the reground flutes which tapping wear still remains • Regrind tool more frequently
	Chipping	Incorrect Tap Selection	• Reduce cutting angle • Use a different kind of high speed steel taps • Reduce hardness of the taps • Increase chamfer length • Avoid chip packing in the flutes or the bottom of the hole by using spiral pointed or fluted taps
		Operating Conditions	• Reduce tapping speed • Avoid misalignment between tap and hole • Avoid sudden return or reverse in blind hole tapping • Avoid galling • Use larger drill size
	Wear	Incorrect Tap Selection	• Apply specially designed taps for tapping heat treated material • Change to a type of high speed steel material contained vanadium • Apply special surface treatment such as nitriding or TiN • Increase chamfer length
		Operating Conditions	• Reduce tapping speed • Apply proper cutting lubricants • Avoid work hardened hole • Use larger drill size
		Tool Condition	• Grind proper cutting angle • Avoid hardness reduction from grind process

MATERIAL SYMBOL CHART BY STANDARD

Description	U.S.A.		Japan	Germany	ISO
	ASTM	AISI	JIS	DIN	
General Structural Steel			SM490A SM490B SM570 SS400		
	C		SS330	St33	
	A B C 30 33 36 40				
	70		SS490	St52-3	
	C D E		SS540 SM490A SM490B		
	A B		SM490C SM490Y		
	50W A B		SM520 SV330 SV400	Ust36	
Carbon Steel		1015	S15C	CK15 C15	C15E4
		1025	S25C	CK25 C25	C25 C25E4
		1045	S45C	CK45	C45
		1046		C45	C45E4
		1050	S50C	CK50 C50	C50 C50E4
	60		SB410	H@	P7
	65 A		SB450 SB450M	17Mn4	P11 P28
	70 B		SB480 SB480M		
Alloy Steel			SCM415 SCM415H SCM415TK		
			SCM418		18CrMo4
			SCM418H SCM418TK SCM420 SCM420H SCM420TK SCM421		18CrMo4
		4130	SCM430 SCM430TK SCM432		
		4135 4137	SCM435	34CrMo4	34CrMo4
		4135H 4137H	SCM435H SCM435TK	34CrMo4	34CrMo4
		4140 4142		42CrMo4	
		4140H 4142H	SCM440H SCM440TK	42CrMo4	42CrMo4
		4145 4147	SCM445		
		4145H 4147H	SCM445H SCM822 SCM822H		
			SCr415		16MnCr5
			SCr415H SCr420		16MnCr5 16MnCr5
			SCr420H SCr420TK		16MnCr5
		5130 5132	SCr430	34Cr4	34Cr4
		5130H 5132H	SCr430H	34Cr4	34Cr4
		5135	SCr435	34Cr4 37Cr4	34Cr4 37Cr4
		5135H	SCr435H	34Cr4 37Cr4	34Cr4 37Cr4
		5140	SCr440	37Cr4 41Cr4	37Cr4 41Cr4
		5140H	SCr440H	37Cr4 41Cr4	37Cr4 41Cr4
		5147	SCr445		
		1522	SMn420		22Mn6
		1522H	SMn420H SMn433		22Mn6
		1541H	SMn433H		36Mn6
		1541	SMn438		36Mn6
		1541H	SMn438H		36Mn6

Description	U.S.A.		Japan	Germany	ISO
	ASTM	AISI	JIS	DIN	
Alloy Steel			SMn443		
		1541H	SMn443H		42Mn6
			SNC326 SNC415 SNC415H SNC631 SNC631H SNC815		
			SNC815H SNC836		15NiCr13
		8615	SNCM220		20NiCrMo2
		8617 8620 8622			
		8617H 8620H 8622H	SNCM220H		20NiCrMo2
		8637 8640	SNCM240		41CrNiMo2
			SNCM415		
		4320	SNCM420		
		4320H	SNCM420H		
			SNCM431		
		4340	SNCM439		
			SNCM447 SNCM616 SNCM625 SNCM630 SNCM815		
Carbon Tool Steel	W1-111/2		SK1		TC140
	W1-10		SK2		TC120
	W1-9		SK3	C105W1	TC105
	W1-8		SK4		TC90
			SK5	C80W1	TC90
			SK6	C80W1	TC80 TC70
			SK7	C70W2	
			SKS2	105WCr6	105WCr1
			SKS3 SKS4 SKS5 SKS6 SKS7 SKS8		
	F2		SKS11 SKS21		
			SKS31 SKS41	105WCr6	105WCr1
	W2-91/2		SKS43		TCV105
	W2-81/2		SKS44		
	L6		SKS51 SKS93 SKS94 SKS95		
	52100		SUJ2	100Cr6	1
Die Steel	D2		SKD11		
	H13		SKD61	X40CrMoV51	40CrMoV5
Tool Steel			SKT3		
			SKT4	55NiCrMoV6	55NiCrMoV2
Pipe Steel			STAM290GB	St28	
	TypeF		SGP	St33	
	1008		STKM11A	St34-2	
	A		STPT370	St35.8	
			STB340	St35.8 St37.8	
	E-A		STPG370	St37.0	
	A				
			STS370	St37.4	
	B		STPT410	St42.8	
	C		STB410	St42.8 St45.8	
	A-1				
	E-B		STPG410	St44.0	
	B			St44.0	
			STK400	St44-2	TS9
			STKM12B	St44-2	
			STKR400	St44-2	
			STAM390G	St44-2	
			STS410	St44.4	
			STKM14A	St45	
	1020		STKM13C	St45	
			STKM18C	St52	
			STKM19A	St52	
			STKM19C	St52	
			STK490	St52-3	TS18
			STKR490	St52-3	

REFERENCE

MATERIAL SYMBOL CHART BY STANDARD

Description	U.S.A.		Japan	Germany	ISO
	ASTM	AISI	JIS	DIN	
Pipe Steel			STS480	St52.4	
			STKM12A		R33
			STKM12C		
			STKM13B		
	1026		STKM14B		
	1025				
	1026		STKM14C		
			STKM15A		
			STKM15C		
			STKM16A		
			STKM16C		
	1050		STKM17A		
			STKM17C		
			STKM18A		
			STKM18B		R50
			STKM20A		
Heat Resistant Steel	S65007		SUH1		
			SUH3		
			SUH4		
			SUH11		
			SUH21		
			SUH31		
			SUH35		
	S63008		SUH36		
	S63017		SUH37		
			SUH38		
	S30900		SUH309		
	S31000		SUH310		
	N08330		SUH330		
	S40900		SUH409	X6CrTi12	1Ti
			SUH409L		
	S44600		SUH446		H7
			SUH600		
	S42200		SUH616		
	S66286		SUH660		
	R30155		SUH661		
Free Cutting Steel		1110	SUM11		
		1108	SUM12		
		1212	SUM21		9S20
		1213	SUM22	9SMn28	11SMn28
			SUM22L	9SMnPb28	11SMnPb
		1215	SUM23		
			SUM23L		
		12L14	SUM24L	9SMnPb28	11SMnPb28
			SUM25	9SMn36	12SMn35
		1117	SUM31	15S10	
			SUM31L		
			SUM32		
		1137	SUM41		
		1141	SUM42		
		1144	SUM43		44SMn28
Spring Steel		1075	SUP3		
		1078			
			SUP6		1
		9260	SUP7		1
		5155	SUP9	55Cr3	5
		5160	SUP9A		
		6150	SUP10	50CrV4	9
		51B60	SUP11A		7
			SUP12	54SiCr6	4
		4161	SUP13		8
Stainless Steel	S30400		SUS304	X5CrNi1810	11
	S40500		SUS405	X6CrAl13	2
	S42020		SUS420F		
	S43000		SUS430	X6Cr17	8
	S44002		SUS440A		
	S17400		SUS630		1
	S17700		SUS631	X7CrNiAl177	2
	S41000		SUS410	X10Cr13	3
Cast Steel	HT		SCH15		
Cast Iron	40		FC250		
	45		FC300		
Ductile Cast Iron	60-40-18		FCD400		
	80-55-06		FCD600	GGG-60	
Aluminum Alloy			A1080	Al99.8	
			A1070	Al99.7	
			A1050	Al99.5	Al99.5
	1100		A1100		Al99.0Cu
			A1200	Al99	Al99.0
	2014		A2014	AlCuSiMn	Al-Cu4SiMg
			A2017	AlCuMg1	Al-Cu4MgSi
	2014		A2017	AlCuSiMn	Al-Cu4SiMg
	2024		A2024BD	AlCuMg2	AlCu4Mg1
	2024		A2024BE	AlCuMg2	AlCu4Mg1
	2024		A2024 P	EN AW-2024	AlCu4Mg1

Description	U.S.A.		Japan	Germany	ISO
	ASTM	AISI	JIS	DIN	
Aluminum Alloy	2024		A2024 S	AlCuMg2	AlCu4Mg1
	2024		A2024 TD	AlCuMg2	
	2024		A2024 TE	AlCuMg2	AlCu4Mg1
	2024		A2024 W	AlCuMg2	AlCu4Mg1
	3003		A3003		
	5052		A5052 BD	AlMg2.5	AlMg2.5
	5052		A5052 BE		
			A5052 FH		
	5052		A5052 P	EN AW-5052	AlMg2.5
	5052		A5052 S		
	5052		A5052 TD		AlMg2.5
	5052		A5052 TE		
	5052		A5052 W	AlMg2.5	AlMg2.5
			A5056	AlMg5	
	5083		A5083	AlMg4.5Mn	Al-Mg4.5Mn0.7
	6061		A6061		Al-Mg1SiCu
	6063		A6063		Al-Mg0.7Si
	7075		A7075 BD	AlZnMgCu1.5	AlZn5.5MgCu
	7075		A7075 BE	AlZnMgCu1.5	AlZn5.5MgCu
	7075		A7075 FD	AlZnMgCu1.5	
	7075		A7075 FH	AlZnMgCu1.5	
	7075		A7075 P	EN AW-7075	AlZn5.5MgCu
	7075		A7075 S	AlZnMgCu1.5	AlZn5.5MgCu
	7075		A7075 TD	AlZnMgCu1.5	AlZn5.5MgCu
	7075		A7075 TE	AlZnMgCu1.5	AlZn5.5MgCu
Aluminum Alloy Casting	295.0		AC1A	G(GK)-AlCu4Ti	
	204.0		AC1B	G(GK)-AlCu4TiMg	Al-Cu4MgTi
			AC2A		Al-Si5Cu3
	319.0		AC2B		Al-Si6Cu4
			AC3A	G(GK)AlSi2	Al-Sil2
			AC4A	G(GK)-AlSi10Mg	Al-Si10Mg
	333.0		AC4B	G(GK)-AlSiCu3	
	356.0		AC4C		Al-Si7Mg
	A356.0		AC4CH	G(GK)AlSi7Mg	Al-Si7Mg
	355.0		AC4D		Al-Si5Cu1Mg
	242.0		AC5A		Al-Cu4Ni2Mg2
	514.0		AC7A	G(GK)-AlMg5	
	520.0		AC7B		Al-Mg10
	336.0		AC8A		
			AC8B		
	332.0		AC8C		
			AC9A		
			AC9B		
	A413.0		ADC1	GD-AlSi12(Cu)	Al-Sil2CuFe
	A360.0		ADC3	GD-AlSi10Mg	
	518.0		ADC5	GD-AlMg9	
			ADC6		
	A380.0		ADC10	GD-AlSi9Cu3	Al-Si8Cu3Fe
	A380.0		ADC10Z	GD-AlSi9Cu3	Al-Si9Cu3Fe
	383.0		ADC12		
	383.0		ADC12Z		
	A390.0		ADC14		
Magnesium Alloy	AZ91A		MD1A	DG-MgAl9Zn1	
	AZ91B		MD1B	DG-MgAl9Zn1	
	AZ91D		MD1D		
	AZ60A				
	AZ60B				
	AZ41A				
	AZ80A		MB3	MgAl8Zn	Mg-Al8Zn
	AM20A				
	AM50A				
	AM60B		MD2B		
	AS22A				
	AS41B				
	AE42A				
Copper, Copper Casting	C10200(B187:94)		C1020 B	OF-Cu	Cu-OF
	C10200(B152:94)		C1020 P	OF-Cu	Cu-OF
	C10200(B152:94)		C1020 R	OF-Cu	Cu-OF
Brass, Brass Casting	C26000(B36:95)		C2600 B	CuZn30 17660:83	426/I:83 CuZn30
	C26000(B36:95)		C2600 P	CuZn30 17660:83	426/I:83 CuZn30
	C26000(B36:95)		C2600 R	CuZn30 17660:83	426/I:83 CuZn30
				CuZn30 17670:83	
	C26000(B135:95)		C2600 T	CuZn30	CuZn30
	C26000(B134:93)		C2600 W	CuZn30	CuZn30
Bronze, Bronze Casting	C61400(B169:95)		C6140 P		428:83 CuAl 8Fe3

REFERENCE

MATERIAL SYMBOL CHART BY STANDARD

(HRC) Rockwell Hardness C Scale 150kg Brale	(HV) Diamond Pyramid Hardness Number, Vickers	(HB) Brinell Hardness 29.42kN			Rockwell Hardness			Rockwell Hardness			(Hs) Shore Scleroscope Hardness Number	Approx. Tensile Strength N/mm²	(HRC) Rockwell Hardness C Scale 150kg Brale
		Standard 10mm Ball	Hultgren 10mm Ball	Tungsten Carbide 10mm	(HRA) A Scale 588.4N (60kg) Brale	(HRB) B Scale 980.7N (100kg) 1/16" in Ball	(HRD) D Scale 980.7N (100kg) Brale	15N Superficial Load 147.1N	30N Superficial Load 294.2N	45N Superficial Load 441.3N			
68	940	—	—	—	85.6	—	76.9	93.2	84.4	75.4	97	—	68
67	900	—	—	—	85.0	—	76.1	92.9	83.6	74.2	95	—	67
66	865	—	—	—	84.5	—	75.4	92.5	82.8	73.3	92	—	66
65	832	—	—	739	83.9	—	74.5	92.2	81.9	72.0	91	—	65
64	800	—	—	722	83.4	—	73.8	91.8	81.1	71.0	88	—	64
63	772	—	—	705	82.8	—	73.0	91.4	80.1	69.9	87	—	63
62	746	—	—	688	82.3	—	72.2	91.1	79.3	68.8	85	—	62
61	720	—	—	670	81.8	—	71.5	90.7	78.4	67.7	83	—	61
60	697	—	613	654	81.2	—	70.7	90.2	77.5	66.6	81	—	60
59	674	—	599	634	80.7	—	69.9	89.8	76.6	65.5	80	—	59
58	653	—	587	615	80.1	—	69.2	89.3	75.7	64.3	78	—	58
57	633	—	575	595	79.6	—	68.5	88.9	74.8	63.2	76	—	57
56	613	—	561	577	79.0	—	67.7	88.3	73.9	62.0	75	—	56
55	595	—	546	560	78.5	—	66.9	87.9	73.0	60.9	74	2079	55
54	577	—	534	543	78.0	—	66.1	87.4	72.0	59.8	72	2010	54
53	560	—	519	525	77.4	—	65.4	86.9	71.2	58.6	71	1952	53
52	544	500	508	512	76.8	—	64.6	86.4	70.2	57.4	69	1883	52
51	528	487	494	496	76.3	—	63.8	85.9	69.4	56.1	68	1824	51
50	513	475	481	481	75.9	—	63.1	85.5	68.5	55.0	67	1755	50
49	498	464	469	469	75.2	—	62.1	85.0	67.6	53.8	66	1687	49
48	484	451	455	455	74.7	—	61.4	84.5	66.7	52.5	64	1638	48
47	471	442	443	443	74.1	—	60.8	83.9	65.8	51.4	63	1579	47
46	458	432	432	432	73.6	—	60.0	83.5	64.8	50.3	62	1530	46
45	446	421	421	421	73.1	—	59.2	83.0	64.0	49.0	60	1481	45
44	434	409	409	409	72.5	—	58.5	82.5	63.1	47.8	58	1432	44
43	423	400	400	400	72.0	—	57.7	82.0	62.2	46.7	57	1383	43
42	412	390	390	390	71.5	—	56.9	81.5	61.3	45.5	56	1334	42
41	402	381	381	381	70.9	—	56.2	80.9	60.4	44.3	55	1294	41
40	392	371	371	371	70.4	—	55.4	80.4	59.5	43.1	54	1245	40
39	382	362	362	362	69.9	—	54.6	79.9	58.6	41.9	52	1216	39
38	372	353	353	353	69.4	—	53.8	79.4	57.7	40.8	51	1177	38
37	363	344	344	344	68.9	—	53.1	78.8	56.8	39.6	50	1157	37
36	354	336	336	336	68.4	(109.0)	52.3	78.3	55.9	38.4	49	1118	36
35	345	327	327	327	67.9	(108.5)	51.5	77.7	55.0	37.2	48	1079	35
34	336	319	319	319	67.4	(108.0)	50.8	77.2	54.2	36.1	47	1059	34
33	327	311	311	311	66.8	(107.5)	50.0	76.6	53.3	34.9	46	1030	33
32	318	301	301	301	66.3	(107.0)	49.2	76.1	52.1	33.7	44	1000	32
31	310	294	294	294	65.8	(106.0)	48.4	75.6	51.3	32.5	43	981	31
30	302	286	286	286	65.3	(105.5)	47.7	75.0	50.4	31.3	42	951	30
29	294	279	279	279	64.7	(104.5)	47.0	74.5	49.5	30.1	41	932	29
28	286	271	271	271	64.3	(104.0)	46.1	73.9	48.6	28.9	41	912	28
27	279	264	264	264	63.8	(103.0)	45.2	73.3	47.7	27.8	40	883	27
26	272	258	258	258	63.3	(102.5)	44.6	72.8	46.8	26.7	38	863	26
25	266	253	253	253	62.8	(101.5)	43.8	72.2	45.9	25.5	38	843	25
24	260	247	247	247	62.4	(101.0)	43.1	71.6	45.0	24.3	37	824	24
23	254	243	243	243	62.0	100.0	42.1	71.0	44.0	23.1	36	804	23
22	248	237	237	237	61.5	99.0	41.6	70.5	43.2	22.0	35	785	22
21	243	231	231	231	61.0	98.5	40.9	69.9	42.3	20.7	35	775	21
20	238	226	226	226	60.5	97.8	40.1	69.4	41.5	19.6	34	755	20
(18)	230	219	219	219	—	96.7	—	—	—	—	33	736	(18)
(16)	222	212	212	212	—	95.5	—	—	—	—	32	706	(16)
(14)	213	203	203	203	—	93.9	—	—	—	—	31	677	(14)
(12)	204	194	194	194	—	92.3	—	—	—	—	29	647	(12)
(10)	196	187	187	187	—	90.7	—	—	—	—	28	618	(10)
(8)	188	179	179	179	—	89.5	—	—	—	—	27	598	(8)
(6)	180	171	171	171	—	87.1	—	—	—	—	26	579	(6)
(4)	173	165	165	165	—	85.5	—	—	—	—	25	549	(4)
(2)	166	158	158	158	—	83.5	—	—	—	—	24	530	(2)
(0)	160	152	152	152	—	81.7	—	—	—	—	24	520	(0)

In the above chart, figures with ( ) are not commonly used.

INDEX

DRILLS

LIST NUMBER INDEX

END MILLS

TAPS

NACHI CONVERSION TABLE

Decimal	Fraction	Wire, Letter	mm	Tap Sizes To be used with drills as indicated
.0059		97	.15	
.0063		96	.16	
.0067		95	.17	
.0071		94	.18	
.0075		93	.19	
.0079		92	.2	
.0083		91		
.0087		90	.22	
.0091		89		
.0095		88		
.0098			.25	
.0100		87		
.0105		86		
.0110		85	.28	
.0115		84		
.0118			.3	
.0120		83		
.0125		82		
.0126			.32	
.0130		81		
.0135		80		
.0138			.35	
.0145		79		
.0150			.38	
.0156	1/64			
.0157			.4	
.0160		78		
.0177			.45	
.0180		77		
.0197			.5	
.0200		76		
.0210		75		
.0217			.55	
.0225		74		
.0236			.6	
.0240		73		
.0250		72		
.0256			.65	
.0260		71		
.0276			.7	
.0280		70		
.0292		69		
.0295			.75	M1x0.25
.0310		68		
.0312	1/32			
.0315			.8	
.0320		67		
.0330		66		
.0335			.85	M1.1x0.25
.0350		65		
.0354			.9	
.0360		64		
.0370		63		
.0374			.95	M1.2x0.25
.0380		62		
.0390		61		
.0394			1.0	
.0400		60		
.0410		59		
.0413			1.05	
.0420		58		
.0430		57		
.0433			1.1	M1.4x0.3
.0453			1.15	
.0465		56		
.0469	3/64			No.0-80
.0472			1.2	
.0492			1.25	M1.6x0.35
.0512			1.3	
.0520		55		
.0531			1.35	
.0550		54		
.0551			1.4	
.0571			1.45	M1.8x0.35
.0591			1.5	
.0595		53		No.1-64 No.1-72
.0610			1.55	
.0625	1/16			
.0630			1.6	M2x0.4
.0635		52		
.0650			1.65	
.0669			1.7	
.0670		51		
.0689			1.75	M2.2x0.45
.0700		50		No.2-56 No.2-64
.0709			1.8	
.0728			1.85	
.0730		49		
.0748			1.9	
.0760		48		
.0768			1.95	
.0781	5/64			
.0785		47		
.0787			2.0	
.0807			2.05	M2.5x0.45
.0810		46		
.0820		45		No.3-56
.0827			2.1	
.0846			2.15	
.0860		44		
.0866			2.2	
.0886			2.25	
.0890		43		No.4-40
.0906			2.3	
.0925			2.35	
.0935		42		No.4-48
.0938	3/32			
.0945			2.4	
.0960		41		
.0965			2.45	
.0980		40		
.0984			2.5	M3x0.5
.0995		39		
.1015		38		No.5-40
.1024			2.6	
.1040		37		No.5-44
.1063			2.7	
.1065		36		No.6-32
.1094	7/64			
.1100		35		
.1102			2.8	
.1110		34		
.1130		33		No.6-40
.1142			2.9	M3.5x0.6
.1160		32		
.1181			3.0	
.1200		31		
.1220			3.1	
.1250	1/8			
.1260			3.2	
.1285		30		
.1299			3.3	M4x0.7
.1339			3.4	
.1360		29		No.8-32 No.8-36
.1378			3.5	
.1405		28		
.1406	9/64			
.1417			3.6	
.1440		27		
.1457			3.7	M4.5x0.75
.1470		26		
.1495		25		No.10-24
.1496			3.8	
.1520		24		
.1535			3.9	
.1540		23		
.1562	5/32			
.1570		22		
.1575			4.0	
.1590		21		No.10-32
.1610		20		
.1614			4.1	
.1654			4.2	M5x0.8
.1660		19		
.1693			4.3	
.1695		18		
.1719	11/64			
.1730		17		
.1732			4.4	
.1770		16		No.12-24
.1772			4.5	
.1800		15		
.1811			4.6	
.1820		14		No.12-28
.1850		13	4.7	No.12-32
.1875	3/16			
.1890		12	4.8	
.1910		11		
.1929			4.9	
.1935		10		
.1960		9		
.1969			5.0	M6x1
.1990		8		
.2008			5.1	
.2010		7		1/4-20
.2031	13/64			
.2040		6		
.2047			5.2	
.2055		5		
.2087			5.3	
.2090		4		
.2126			5.4	
.2130		3		
.2165			5.5	
.2188	7/32			1/4-28 1/4-32
.2205			5.6	
.2210		2		
.2244			5.7	
.2280		1		
.2283			5.8	
.2323			5.9	
.2340		A		
.2344	15/64			
.2362			6.0	M7x1
.2380		B		
.2402			6.1	
.2420		C		
.2441			6.2	
.2460		D		
.2480			6.3	
.2500	1/4	E		
.2520			6.4	
.2559			6.5	
.2570		F		5/16-18
.2598			6.6	
.2610		G		
.2638			6.7	
.2656	17/64			5/16-20
.2660		H		
.2677			6.8	M8x1.25
.2717			6.9	
.2720		I		5/16-24
.2756			7.0	
.2770		J		5/16-28
.2795			7.1	
.2810		K		
.2812	9/32			5/16-32
.2835			7.2	
.2874			7.3	
.2900		L		
.2913			7.4	
.2950		M		
.2953			7.5	
.2969	19/64			
.2992			7.6	
.3020		N		
.3031			7.7	
.3071			7.8	M9x1.25
.3110			7.9	
.3125	5/16			3/8-16
.3150			8.0	
.3160		O		
.3189			8.1	
.3228			8.2	
.3230		P		
.3268			8.3	
.3281	21/64			3/8-20
.3307			8.4	
.3320		Q		
.3346			8.5	M10x1.5
.3386			8.6	
.3390		R		3/8-24
.3425			8.7	
.3438	11/32			3/8-28 3/8-32
.3465			8.8	
.3480		S		
.3504			8.9	
.3543			9.0	
.3580		T		
.3583			9.1	
.3594	23/64			
.3622			9.2	
.3661			9.3	
.3680		U		7/16-14
.3701			9.4	
.3740			9.5	
.3750	3/8			7/16-16
.3770		V		
.3780			9.6	
.3819			9.7	
.3858			9.8	
.3860		W		
.3898			9.9	
.3906	25/64			7/16-20
.3937			10.0	
.3970		X		
.4016			10.2	M12x1.75
.4040		Y		7/16-28
.4062	13/32			7/16-32
.4130		Z		
.4134			10.5	
.4219	27/64			1/2-13
.4252			10.8	
.4331			11.0	
.4375	7/16			1/2-16
.4409			11.2	
.4528			11.5	
.4531	29/64			1/2-20
.4646			11.8	
.4688	15/32			1/2-28 1/2-32
.4724			12.0	M14x2
.4803			12.2	
.4844	31/64			9/16-12
.4921			12.5	
.5000	1/2			9/16-16
.5039			12.8	
.5118			13.0	
.5156	33/64			9/16-18 9/16-20
.5197			13.2	
.5312	17/32			9/16-24 9/16-28 9/16-32 5/8-11
.5315			13.5	
.5433			13.8	
.5469	35/64			5/8-12
.5512			14.0	M16x2
.5610			14.25	
.5625	9/16			5/8-16
.5709			14.5	
.5781	37/64			5/8-18 5/8-20
.5807			14.75	
.5906			15.0	
.5938	19/32			5/8-24 5/8-28 5/8-32
.6004			15.25	
.6094	39/64			11/16-12
.6102			15.5	M18x2.5
.6201			15.75	
.6250	5/8			11/16-16
.6299			16.0	
.6398			16.25	
.6406	41/64			11/16-20
.6496			16.5	
.6562	21/32			11/16-24 11/16-28 11/16-32 3/4-10
.6594			16.75	
.6693			17.0	
.6719	43/64			3/4-12
.6791			17.25	
.6875	11/16			3/4-16
.6890			17.5	M20x2.5
.7031	45/64			3/4-20
.7087			18.0	
.7188	23/32			3/4-28 3/4-32
.7283			18.5	
.7344	47/64			13/16-12
.7480			19.0	
.7500	3/4			13/16-16
.7656	49/64			13/16-20 7/8-9
.7677			19.5	M22x2.5
.7812	25/32			13/16-28 13/16-32
.7874			20.0	
.7969	51/64			7/8-12
.8071			20.5	
.8125	13/16			7/8-14 7/8-16
.8268			21.0	M24x3
.8281	53/64			7/8-20
.8438	27/32			7/8-28 7/8-32
.8465			21.5	
.8594	55/64			15/16-12
.8661			22.0	
.8750	7/8			15/16-16 1-8
.8858			22.5	
.8906	57/64			15/16-20
.9055			23.0	
.9062	29/32			15/16-28 15/16-32
.9219	59/64			1-12
.9252			23.5	
.9375	15/16			1-16 1 1/16-8
.9449			24.0	M27x3
.9531	61/64			1-20
.9646			24.5	
.9688	3/64			1-28 1-32
.9843			25.0	
.9844	63/64			1 1/16-12 1 1/8-7
1.0000	1			1 1/16-16 1 1/8-8

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