KYOCERA

HYDROS

Coolant Fed Deep Drill for Difficult-to-Cut Material

Excellent Hole Accuracy with a Low Cutting Force Design

Optimized Cutting Edge

Point Design for Accuracy

Double Margin for Smooth Hole Wall Finish

8xD, 10xD, and 15xD Drilling Capabilities

Match with ORION Pilot Drills - Series 160/165

NEW

New HYDROS Mini Added
Smaller Diameters from 1.00mm - 4.00mm (8xD / 15xD)

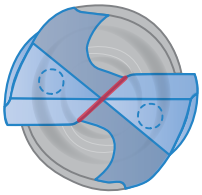
HYDROS Deep Drill

Excellent Hole Accuracy with a Low Cutting Force Design
Good for Difficult-to-Cut Materials

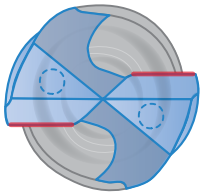
1 Optimized Cutting Edge for Increased Accuracy

The optimized cutting edge creates excellent drilling accuracy during the initial cut by consistently controlling the cutting force across the face of both cutting edges.

Cutting Edge



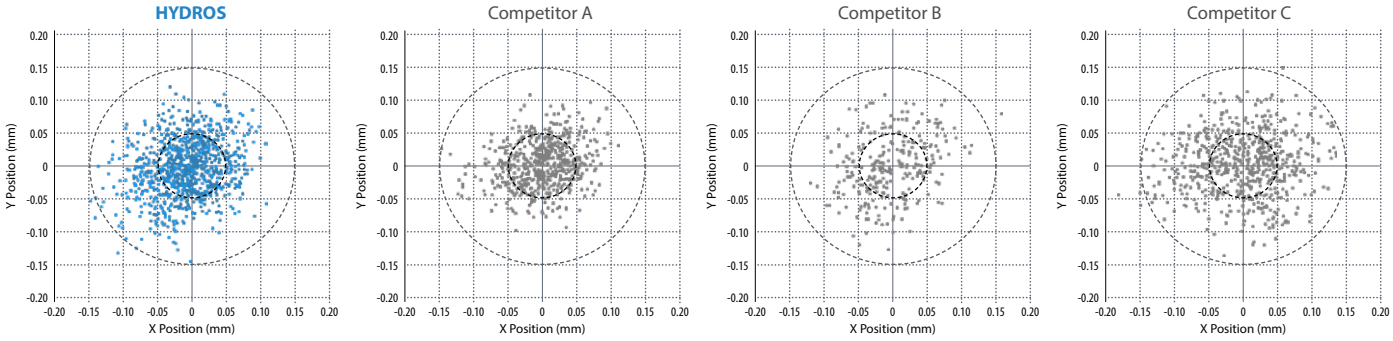
Centering Edge



Primary Cutting Edge

Centering Edge

Drill Hole Positional Accuracy After 1400 Holes (In-house Evaluation)

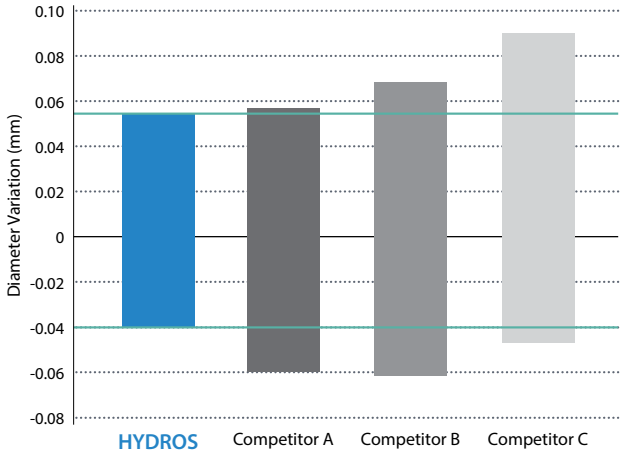


Excellent Hole Positional Accuracy

	HYDROS	Competitor A	Competitor B	Competitor C
Cp	1.92	1.97	1.70	1.50
CpK	1.34	1.35	1.03	0.86
Spec (+/-)	0.15mm	0.15mm	0.15mm	0.15mm

Cutting Conditions : N = 6468rpm, Vf = 575mm/min Drill Diameter Ø3mm Drilling Depth 25.4mm 17-4PH-900

Hole Diameter Variation (In-house Evaluation)



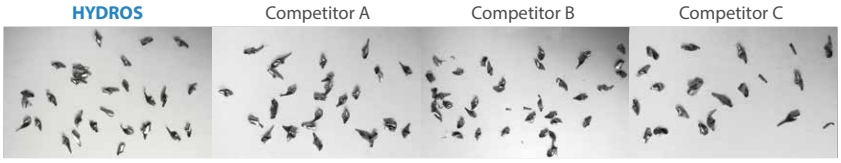
	No. of Holes	Diameter Variation (mm)
HYDROS	600	0.0937
Competitor A	600	0.1141
Competitor B	269 (Broken)	0.1281
Competitor C	600	0.1347

Cutting Conditions : N = 6468rpm, Vf = 575mm/min Drill Diameter Ø3mm Drilling Depth 25.4mm 17-4PH-900

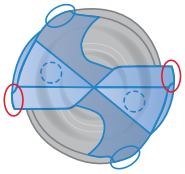
2 Double Margin for Smooth Hole Finish

Two margins create a cutting and wiping effect that create a smooth hole finish and smooth cutting performance along the hole wall.

Chip Comparison



Double Margins

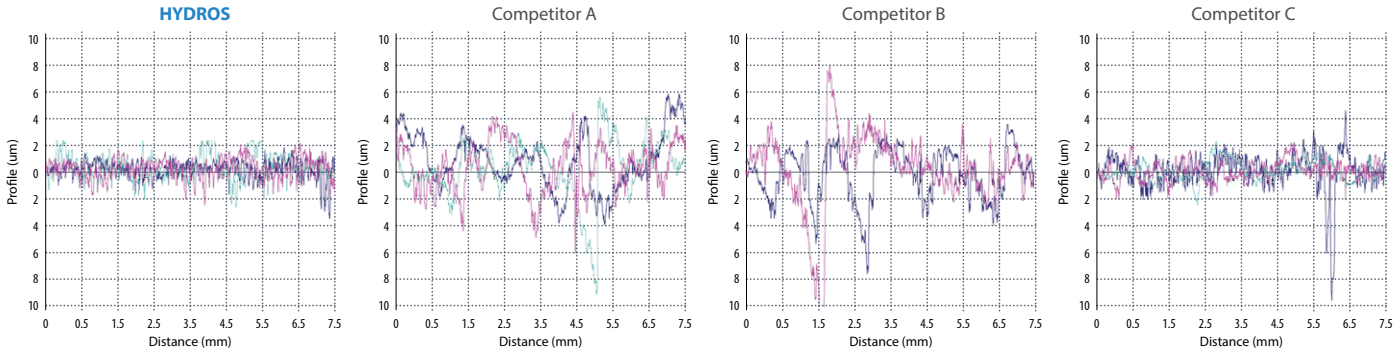


Cutting Edge

Wiping Edge

Optimized for smooth cutting performance with excellent chip evacuation

Hole Roughness (In-house Evaluation)



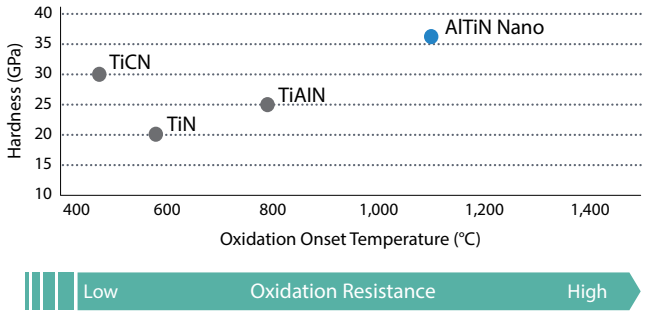
	HYDROS			Competitor A			Competitor B			Competitor C		
	Hole 1	Hole 300	Hole 600	Hole 1	Hole 300	Hole 600	Hole 1	Hole 300	Hole 600	Hole 1	Hole 300	Hole 600
R_a (μm)	0.421	0.539	0.676	1.705	1.540	1.572	1.638	1.977	Broken	0.893	0.559	0.562
R_q (μm)	0.554	0.677	0.869	2.123	1.832	2.113	1.979	2.581	Broken	1.249	0.712	0.687
R_z (μm)	3.282	3.478	4.406	8.076	8.480	10.077	8.847	10.973	Broken	7.178	3.845	3.206

Cutting Conditions : N = 6468rpm, Vf = 575mm/min Drill Diameter Ø3mm Drilling Depth 25.4mm 17-4PH-900

3 Nanocomposite Super-nitride AlTiN Coating Technology

Great for difficult-to-cut and hardened materials, the 2nd generation AlTiN supernitride with a nanocomposite coating structure has a hardness GPa of 36.3 and maximum application temperature (C°) of 1,100.

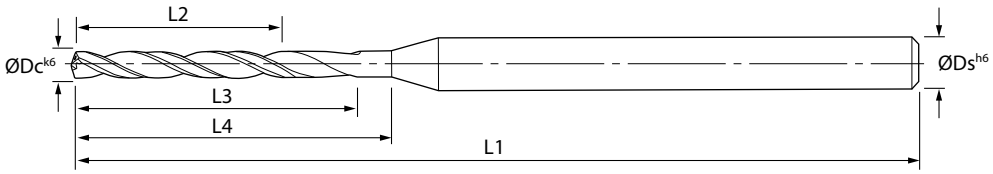
Coating Properties



HYDROS Mini 8xD Deep Drills - Metric Sizes (Ø1.00mm - Ø4.00mm) NEW

Cutting Dia. (ØDc)	Cutting Dia. Tolerance	Shank Tolerance
1.00mm ~ 4.00mm	K6	h6

8D



Metric Drill Dimensions

Part Number	Stock	Dimensions (mm)						Point Angle
		ØDc^{k6}	ØDs^{h6}	L1	*L2	L3	L4	
814-0394L524	●	1.00		53.00	8.00	13.30	14.36	
814-0433L555	●	1.10		53.00	8.80	14.10	15.23	
814-0472L587	●	1.20		53.00	9.60	14.90	16.09	
814-0512L618	●	1.30		53.00	10.40	15.70	16.96	
814-0551L650	●	1.40		53.00	11.20	16.50	17.82	
814-0591L681	●	1.50		53.00	12.00	17.30	18.68	
814-0630L713	●	1.60		64.00	12.80	18.10	19.55	
814-0669L744	●	1.70		64.00	13.60	18.90	20.41	
814-0709L803	●	1.80		64.00	14.40	20.40	22.03	
814-0748L835	●	1.90		64.00	15.20	21.20	22.90	
814-0787L866	●	2.00		64.00	16.00	22.00	23.76	
814-0827L898	●	2.10		64.00	16.80	22.80	24.62	
814-0866L1012	●	2.20		64.00	17.60	25.70	27.76	
814-0906L1043	●	2.30		64.00	18.40	26.50	28.62	
814-0945L1075	●	2.40		64.00	19.20	27.30	29.48	
814-0984L1106	●	2.50	4.00	64.00	20.00	28.10	30.35	140°
814-1024L1138	●	2.60		76.00	20.80	28.90	31.21	
814-1063L1169	●	2.70		76.00	21.60	29.70	32.08	
814-1102L1201	●	2.80		76.00	22.40	30.50	32.94	
814-1142L1268	●	2.90		76.00	23.20	32.20	34.78	
814-1181L1299	●	3.00		76.00	24.00	33.00	35.64	
814-1220L1331	●	3.10		76.00	24.80	33.80	36.50	
814-1260L1362	●	3.20		76.00	25.60	34.60	37.37	
814-1299L1394	●	3.30		76.00	26.40	35.40	38.23	
814-1339L1500	●	3.40		76.00	27.20	38.10	41.15	
814-1378L1531	●	3.50		76.00	28.00	38.90	42.01	
814-1417L1563	●	3.60		76.00	28.80	39.70	42.88	
814-1457L1594	●	3.70		76.00	29.60	40.50	43.74	
814-1496L1626	●	3.80		76.00	30.40	41.30	44.60	
814-1535L1657	●	3.90		76.00	31.20	42.10	45.47	
814-1575L1689	●	4.00		76.00	32.00	42.90	46.33	

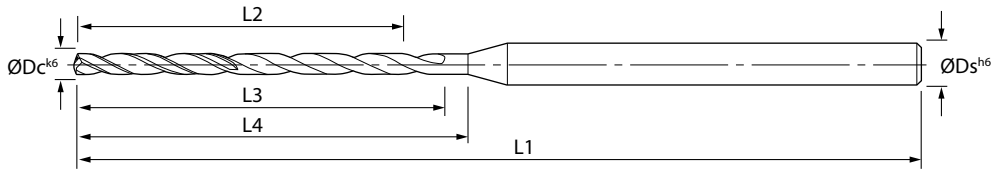
L2 dimension refers to the Max. Length of Cut (8 x ØDc).

● : U.S. Stock

HYDROS Mini 15xD Deep Drills - Metric Sizes (Ø1.00mm - Ø4.00mm) NEW

Cutting Dia. (ØDc)	Cutting Dia. Tolerance	Shank Tolerance
1.00mm ~ 4.00mm	K6	h6

15D



Metric Drill Dimensions

Part Number	Stock	Dimensions (mm)						Point Angle
		ØDc k6	ØDs h6	L1	*L2	L3	L4	
814-0394L799	●	1.00		64.00	15.00	20.30	21.32	
814-0433L858	●	1.10		64.00	16.50	21.80	22.89	
814-0472L917	●	1.20		64.00	18.00	23.30	24.47	
814-0512L976	●	1.30		64.00	19.50	24.80	26.04	
814-0551L1035	●	1.40		64.00	21.00	26.30	27.62	
814-0591L1094	●	1.50		64.00	22.50	27.80	29.19	
814-0630L1154	●	1.60		81.00	24.00	29.30	30.77	
814-0669L1213	●	1.70		81.00	25.50	30.80	32.34	
814-0709L1299	●	1.80		81.00	27.00	33.00	34.65	
814-0748L1358	●	1.90		81.00	28.50	34.50	36.23	
814-0787L1417	●	2.00		81.00	30.00	36.00	37.80	
814-0827L1476	●	2.10		81.00	31.50	37.50	39.38	
814-0866L1618	●	2.20		81.00	33.00	41.10	43.16	
814-0906L1677	●	2.30		81.00	34.50	42.60	44.73	
814-0945L1736	●	2.40		81.00	36.00	44.10	46.31	
814-0984L1795	●	2.50	4.00	90.00	37.50	45.60	47.88	140°
814-1024L1854	●	2.60		90.00	39.00	47.10	49.46	
814-1063L1913	●	2.70		90.00	40.50	48.60	51.03	
814-1102L1972	●	2.80		90.00	42.00	50.10	52.61	
814-1142L2067	●	2.90		90.00	43.50	52.50	55.13	
814-1181L2126	●	3.00		90.00	45.00	54.00	56.70	
814-1220L2185	●	3.10		106.00	46.50	55.50	58.28	
814-1260L2244	●	3.20		106.00	48.00	57.00	59.85	
814-1299L2303	●	3.30		106.00	49.50	58.50	61.43	
814-1339L2437	●	3.40		106.00	51.00	61.90	65.00	
814-1378L2496	●	3.50		106.00	52.50	63.40	66.57	
814-1417L2555	●	3.60		106.00	54.00	64.90	68.15	
814-1457L2614	●	3.70		106.00	55.50	66.40	69.72	
814-1496L2673	●	3.80		106.00	57.00	67.90	71.30	
814-1535L2732	●	3.90		106.00	58.50	69.40	72.87	
814-1575L2791	●	4.00		106.00	60.00	70.90	74.45	

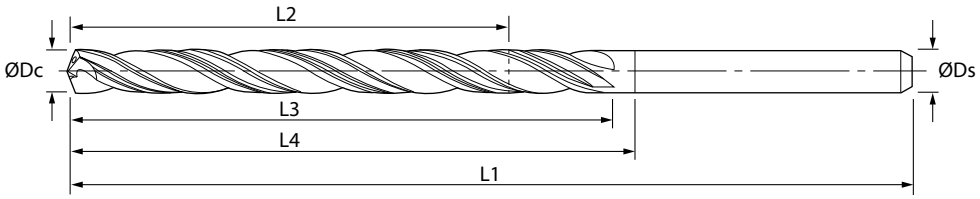
L2 dimension refers to the Max. Length of Cut (15 x ØDc).

● : U.S. Stock

HYDROS 10xD Deep Drills - Inch Sizes (Ø0.1250" - Ø0.5000")

Cutting Dia. (ØDc)	Cutting Dia. Tolerance	Shank Tolerance
0.1250" ~ 0.2344"	+0.0000" -0.0005"	+0.00000" -0.00032"
0.2500" ~ 0.3750"	+0.0000" -0.0006"	+0.00000" -0.00035"
0.4219" ~ 0.5000"	+0.0000" -0.0007"	+0.00000" -0.00043"

10D



Match with **ORION Pilot Drills**
Series 160

Inch Drill Dimensions

Part Number	Stock	Dimensions (in)							Point Angle
		ØDc		ØDs	L1	*L2	L3	L4	
860-1250AG1625	●	0.1250	1/8	0.1250	3-1/2	1.2500	1.6250	1.6875	135°
860-1406AG1828	●	0.1406	9/64	0.1875	4	1.4060	1.8280	1.8983	
860-1563AG2031	●	0.1563	5/32		4	1.5630	2.0310	2.1091	
860-1719AG2234	●	0.1719	11/64		4	1.7190	2.2340	2.3199	
860-1875AG2438	●	0.1875	3/16		4-1/2	1.8750	2.4380	2.5318	
860-2031AG2641	●	0.2031	13/64	0.2500	4-1/2	2.0310	2.6410	2.7426	
860-2188AG2844	●	0.2188	7/32		5	2.1880	2.8440	2.9534	
860-2344AG3047	●	0.2344	15/64		5	2.3440	3.0470	3.1642	
860-2500AG3250	●	0.2500	1/4		5	2.5000	3.2500	3.3750	
860-2570AG3341	●	0.2570	F	0.3125	5-1/2	2.5700	3.3410	3.4695	
860-2656AG3453	●	0.2656	17/64		5-1/2	2.6560	3.4530	3.5858	
860-2813AG3656	●	0.2813	9/32		5-1/2	2.8130	3.6560	3.7966	
860-3125AG4063	●	0.3125	5/16		6	3.1250	4.0630	4.2193	
860-3320AG4316	●	0.3320	Q	0.3750	6-1/2	3.3200	4.3160	4.4820	
860-3438AG4469	●	0.3438	11/32		6-1/2	3.4380	4.4690	4.6409	
860-3750AG4875	●	0.3750	3/8		7	3.7500	4.8750	5.0625	
860-4219AG5484	●	0.4219	27/64	0.4375	7-1/2	4.2190	5.4840	5.6949	
860-4375AG5688	●	0.4375	7/16		7-1/2	4.3750	5.6880	5.9068	
860-4531AG5891	●	0.4531	29/64	0.5000	8	4.5310	5.8910	6.1176	
860-5000AG6500	●	0.5000	1/2		8-1/2	5.0000	6.5000	6.7500	

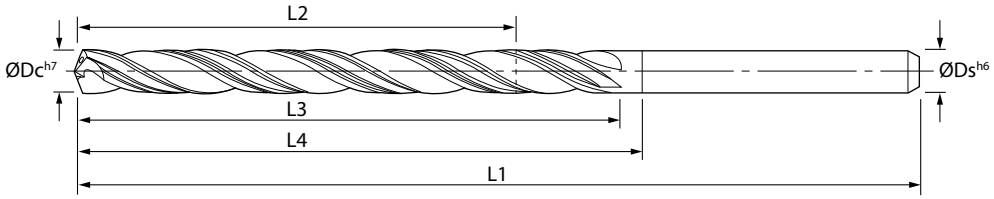
L2 dimension refers to the Max. Length of Cut (10 x ØDc).

● : U.S. Stock

HYDROS 10xD Deep Drills - Metric Sizes (Ø3.00mm - Ø5.90mm)

Cutting Dia. (ØDc)	Cutting Dia. Tolerance	Shank Tolerance
3.00mm ~ 5.90mm	h7	h6

10D



Match with **ORION Pilot Drills**
Series 165

Metric Drill Dimensions

Part Number	Stock	Dimensions (mm)						Point Angle
		ØDc h7	ØDs h6	L1	*L2	L3	L4	
865-1181AG1535	●	3.00	3.00	90.00	30.00	39.00	40.50	135°
865-1220AG1587	●	3.10	4.00	90.00	31.00	40.30	41.85	
865-1260AG1638	●	3.20		90.00	32.00	41.60	43.20	
865-1299AG1689	●	3.30		90.00	33.00	42.90	44.55	
865-1339AG1740	●	3.40		90.00	34.00	44.20	45.90	
865-1378AG1791	●	3.50		90.00	35.00	45.50	47.25	
865-1417AG1843	●	3.60		90.00	36.00	46.80	48.60	
865-1457AG1894	●	3.70		100.00	37.00	48.10	49.95	
865-1496AG1945	●	3.80		100.00	38.00	49.40	51.30	
865-1535AG1996	●	3.90		100.00	39.00	50.70	52.65	
865-1575AG2047	●	4.00		100.00	40.00	52.00	54.00	
865-1614AG2098	●	4.10	6.00	100.00	41.00	53.30	55.35	
865-1654AG2150	●	4.20		110.00	42.00	54.60	56.70	
865-1693AG2201	●	4.30		110.00	43.00	55.90	58.05	
865-1732AG2252	●	4.40		110.00	44.00	57.20	59.40	
865-1772AG2303	●	4.50		110.00	45.00	58.50	60.75	
865-1811AG2354	●	4.60		110.00	46.00	59.80	62.10	
865-1850AG2406	●	4.70		110.00	47.00	61.10	63.45	
865-1890AG2457	●	4.80		110.00	48.00	62.40	64.80	
865-1929AG2508	●	4.90		110.00	49.00	63.70	66.15	
865-1969AG2559	●	5.00		110.00	50.00	65.00	67.50	
865-2008AG2610	●	5.10		120.00	51.00	66.30	68.85	
865-2047AG2661	●	5.20		120.00	52.00	67.60	70.20	
865-2087AG2713	●	5.30		120.00	53.00	68.90	71.55	
865-2126AG2764	●	5.40		120.00	54.00	70.20	72.90	
865-2165AG2815	●	5.50		120.00	55.00	71.50	74.25	
865-2205AG2866	●	5.60		120.00	56.00	72.80	75.60	
865-2244AG2917	●	5.70		120.00	57.00	74.10	76.95	
865-2283AG2969	●	5.80		120.00	58.00	75.40	78.30	
865-2323AG3020	●	5.90		120.00	59.00	76.70	79.65	

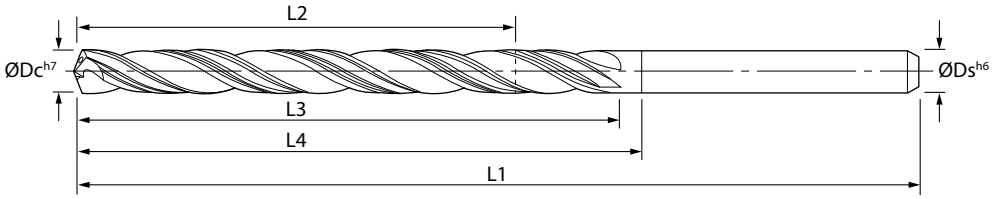
L2 dimension refers to the Max. Length of Cut (10 x ØDc).

● : U.S. Stock

HYDROS 10xD Deep Drills - Metric Sizes (Ø6.00mm - Ø9.00mm)

Cutting Dia. (ØDc)	Cutting Dia. Tolerance	Shank Tolerance
6.00mm ~ 9.00mm	h7	h6

10D



Match with **ORION Pilot Drills**
Series 165

Metric Drill Dimensions

Part Number	Stock	Dimensions (mm)						Point Angle
		ØDc h7	ØDs h6	L1	*L2	L3	L4	
865-2362AG3071	●	6.00	6.00	130.00	60.00	78.00	81.00	135°
865-2402AG3122	●	6.10	8.00	130.00	61.00	79.30	82.35	
865-2441AG3173	●	6.20		130.00	62.00	80.60	83.70	
865-2480AG3224	●	6.30		130.00	63.00	81.90	85.05	
865-2520AG3276	●	6.40		130.00	64.00	83.20	86.40	
865-2559AG3327	●	6.50		140.00	65.00	84.50	87.75	
865-2598AG3378	●	6.60		140.00	66.00	85.80	89.10	
865-2638AG3429	●	6.70		140.00	67.00	87.10	90.45	
865-2677AG3480	●	6.80		140.00	68.00	88.40	91.80	
865-2717AG3531	●	6.90		140.00	69.00	89.70	93.15	
865-2756AG3583	●	7.00		140.00	70.00	91.00	94.50	
865-2795AG3634	●	7.10		140.00	71.00	92.30	95.85	
865-2835AG3685	●	7.20		140.00	72.00	93.60	97.20	
865-2874AG3736	●	7.30		140.00	73.00	94.90	98.55	
865-2913AG3787	●	7.40		150.00	74.00	96.20	99.90	
865-2953AG3839	●	7.50		150.00	75.00	97.50	101.25	
865-2992AG3890	●	7.60		150.00	76.00	98.80	102.60	
865-3031AG3941	●	7.70		150.00	77.00	100.10	103.95	
865-3071AG3992	●	7.80		150.00	78.00	101.40	105.30	
865-3110AG4043	●	7.90		150.00	79.00	102.70	106.65	
865-3150AG4094	●	8.00		150.00	80.00	104.00	108.00	
865-3189AG4146	●	8.10	10.00	160.00	81.00	105.30	109.35	
865-3228AG4197	●	8.20		160.00	82.00	106.60	110.70	
865-3268AG4248	●	8.30		160.00	83.00	107.90	112.05	
865-3307AG4299	●	8.40		160.00	84.00	109.20	113.40	
865-3346AG4350	●	8.50		160.00	85.00	110.50	114.75	
865-3386AG4402	●	8.60		160.00	86.00	111.80	116.10	
865-3425AG4453	●	8.70		160.00	87.00	113.10	117.45	
865-3465AG4504	●	8.80		170.00	88.00	114.40	118.80	
865-3504AG4555	●	8.90		170.00	89.00	115.70	120.15	
865-3543AG4606	●	9.00		170.00	90.00	117.00	121.50	

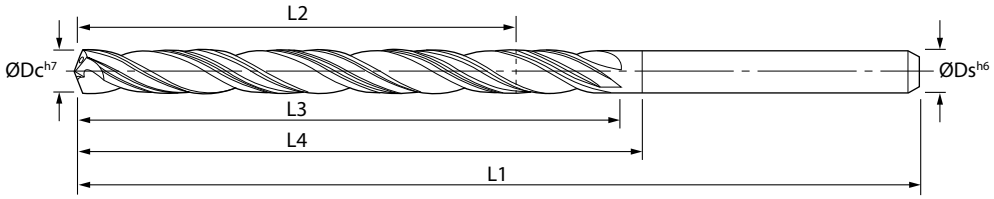
L2 dimension refers to the Max. Length of Cut (10 x ØDc).

● : U.S. Stock

HYDROS 10xD Deep Drills - Metric Sizes (Ø9.10mm - Ø12.00mm)

Cutting Dia. (ØDc)	Cutting Dia. Tolerance	Shank Tolerance
9.10mm ~ 12.00mm	h7	h6

10D



Match with **ORION Pilot Drills**
Series 165

Metric Drill Dimensions

Part Number	Stock	Dimensions (mm)						Point Angle
		ØDc h7	ØDs h6	L1	*L2	L3	L4	
865-3583AG4657	●	9.10	10.00	170.00	91.00	118.30	122.85	135°
865-3622AG4709	●	9.20		170.00	92.00	119.60	124.20	
865-3661AG4760	●	9.30		170.00	93.00	120.90	125.55	
865-3701AG4811	●	9.40		170.00	94.00	122.20	126.90	
865-3740AG4862	●	9.50		170.00	95.00	123.50	128.25	
865-3780AG4913	●	9.60		180.00	96.00	124.80	129.60	
865-3819AG4965	●	9.70		180.00	97.00	126.10	130.95	
865-3858AG5016	●	9.80		180.00	98.00	127.40	132.30	
865-3898AG5067	●	9.90		180.00	99.00	128.70	133.65	
865-3937AG5118	●	10.00		180.00	100.00	130.00	135.00	
865-3976AG5169	●	10.10	12.00	180.00	101.00	131.30	136.35	
865-4016AG5220	●	10.20		190.00	102.00	132.60	137.70	
865-4055AG5272	●	10.30		190.00	103.00	133.90	139.05	
865-4094AG5323	●	10.40		190.00	104.00	135.20	140.40	
865-4134AG5374	●	10.50		190.00	105.00	136.50	141.75	
865-4173AG5425	●	10.60		190.00	106.00	137.80	143.10	
865-4213AG5476	●	10.70		190.00	107.00	139.10	144.45	
865-4252AG5528	●	10.80		190.00	108.00	140.40	145.80	
865-4291AG5579	●	10.90		190.00	109.00	141.70	147.15	
865-4331AG5630	●	11.00		200.00	110.00	143.00	148.50	
865-4370AG5681	●	11.10		200.00	111.00	144.30	149.85	
865-4409AG5732	●	11.20		200.00	112.00	145.60	151.20	
865-4449AG5783	●	11.30		200.00	113.00	146.90	152.55	
865-4488AG5835	●	11.40		200.00	114.00	148.20	153.90	
865-4528AG5886	●	11.50		200.00	115.00	149.50	155.25	
865-4567AG5937	●	11.60		200.00	116.00	150.80	156.60	
865-4606AG5988	●	11.70		200.00	117.00	152.10	157.95	
865-4646AG6039	●	11.80		200.00	118.00	153.40	159.30	
865-4685AG6091	●	11.90		210.00	119.00	154.70	160.65	
865-4724AG6142	●	12.00		210.00	120.00	156.00	162.00	

L2 dimension refers to the Max. Length of Cut (10 x ØDc).

● : U.S. Stock

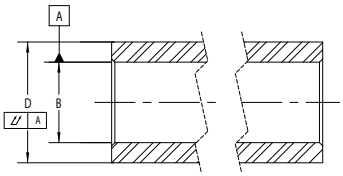
Recommended Cutting Conditions

Workpiece Material	Hardness	Cutting Speed (sfm)	Drill Diameter / Feed Rate (ipr)						
			Below Ø2.00mm Below 0.0787"	Ø2.00mm - Ø3.90mm Ø0.1250" - Ø0.1563"	Ø4.00mm - Ø5.90mm Ø0.1719" - Ø0.2188"	Ø6.00mm - Ø7.90mm Ø0.2344" - Ø0.3125"	Ø8.00mm - Ø9.90mm Ø0.3320" - Ø0.3750"	Ø10.00mm - Ø11.90mm Ø0.4219" - Ø0.4531"	Ø12.00mm Ø0.5000"
Low Carbon Steel	-	325-375	0.0020	0.0040	0.0060	0.0090	0.0110	0.0140	0.0160
Alloy Steel	24 - 30 HRc	275-325	0.0015	0.0030	0.0050	0.0070	0.0090	0.0100	0.0120
Stainless Steel	< 30HRc	175-225	0.0015	0.0030	0.0050	0.0070	0.0090	0.0100	0.0120
Gray Cast Iron	-	325-375	0.0025	0.0050	0.0080	0.0120	0.0150	0.0170	0.0190
Nodular Cast Iron	-	225-275	0.0023	0.0040	0.0070	0.0100	0.0130	0.0160	0.0170
Aluminum	-	375-450	0.0028	0.0050	0.0090	0.0120	0.0160	0.0190	0.0210
Copper	-	250-300	0.0026	0.0050	0.0080	0.0120	0.0150	0.0180	0.0200
Heat Resistant Alloy	-	75-100	0.0009	0.0020	0.0030	0.0040	0.0050	0.0060	0.0070
Titanium Alloy	-	125-175	0.0012	0.0020	0.0040	0.0050	0.0070	0.0080	0.0090
Hardended Steel	30 - 50 HRc	125-175	0.0009	0.0020	0.0030	0.0040	0.0050	0.0060	0.0070
Tool Steel	> 50 HRc	80-100	0.0007	0.0010	0.0020	0.0030	0.0040	0.0050	0.0060

- Above recommendations are suggested starting parameters based on using thru-coolant and a good setup. Cutting speeds and feed rates may vary according to machining application.

Case Studies

Adapter - Aerospace
17-4PH1150



Vc = 67sfm (n = 1,050rpm)
Vf = 4.2ipm
D.O.C. = 2.000"
Wet (Internal Coolant)
∅0.244"
865-2441AG3173

Tool LIfe

HYDROS Ø0.244" — **130 pcs / tool** — Tool Life 1.6x

Competitor A
Ø0.244" — **80 pcs / tool**

The HYDROS drill showed 1.6 times the tool life of Competitor A.

(User Evaluation)

Implant Device - Medical
17-4

Vc = 125sfm (n = 3,970rpm)
Vf = 4.76ipm
D.O.C. = 1.000"
Wet (Internal Coolant)
∅0.118"
865-1181AG1535

Tool Life

HYDROS Ø0.118" — **180 pcs / tool** — Tool Life 1.1x

Competitor B
Ø0.118" — **165 pcs / tool**

The HYDROS showed better wear and tool life was 1.1 times that of Competitor B.

(User Evaluation)

KYOCERA Precision Tools, Inc.
3565 Cadillac Ave.
Costa Mesa, CA 92626
Customer Service | 888.848.8449
Technical Support | 800.823.7284

Official Website | www.kyoceraprecisiontools.com
Distributor Website | mykpti.kyocera.com
Email | cuttingtools@kyocera.com

02/18, 5K Printed in U.S.A.