



ORION Drills

High Performance Drills for Difficult-to-Cut Material



Excellent Hole Accuracy with a Low Cutting Force Design

- Optimized Cutting Edge
- Point Design for Accuracy
- 3xD Drilling Capabilities
- Increased Positional Accuracy
- Less Heat Build Up
- Excellent Pilot Hole Drill
- Match with HYDROS Deep Drills - Series 860/865



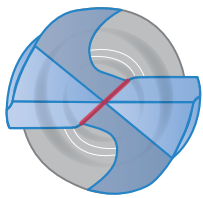
ORION High Performance Drill

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

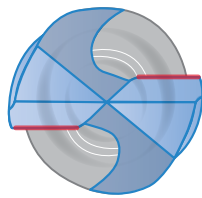
1 Optimized Cutting Edge for Increased Accuracy

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

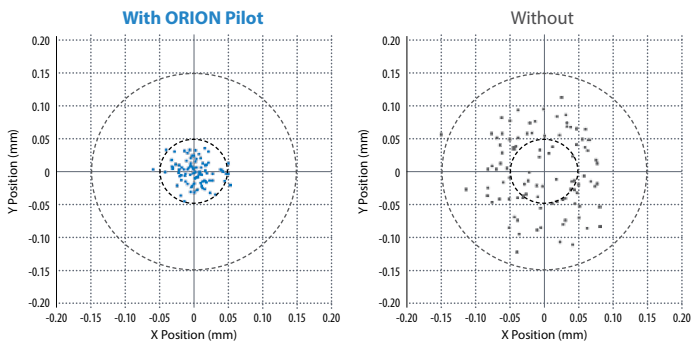


Primary Cutting Edge

Centering Edge



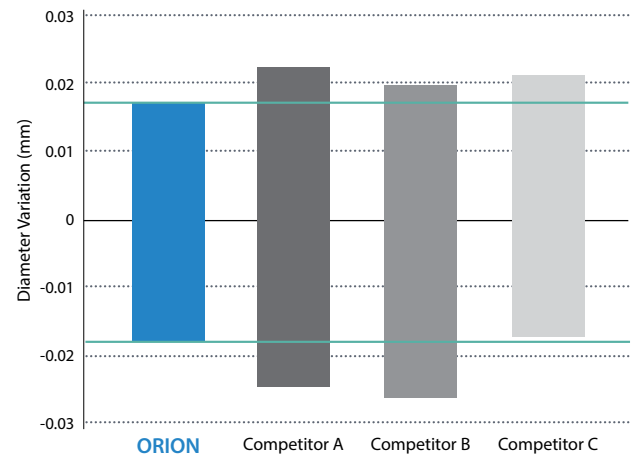
3mm Coolant Fed Drill Hole Positional Accuracy
(After using the ORION as a pilot drill)



	With ORION	Without
Cp	3.80	1.98
CpK	3.17	1.06
Spec (+/-)	0.15	0.15

Cutting Conditions : N = 2588rpm, Vf = 196mm/min Drill Diameter Ø3mm Drilling Depth 9mm 17-4PH-900

Hole Diameter Variation (In-house Evaluation)



Drill	No. of Holes	Diameter Variation (mm)
ORION	600	0.0071
Competitor A	600	0.0113
Competitor B	600	0.0109
Competitor C	600	0.0087

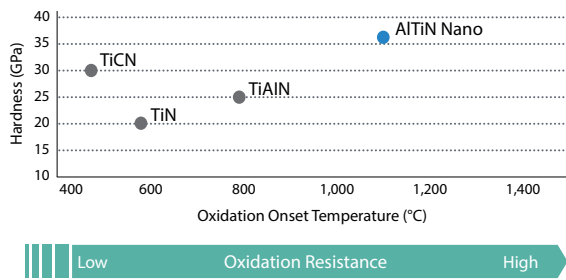
Cutting Conditions : N = 2588rpm, Vf = 196mm/min Drill Diameter Ø3mm Drilling Depth 9mm 17-4PH-900



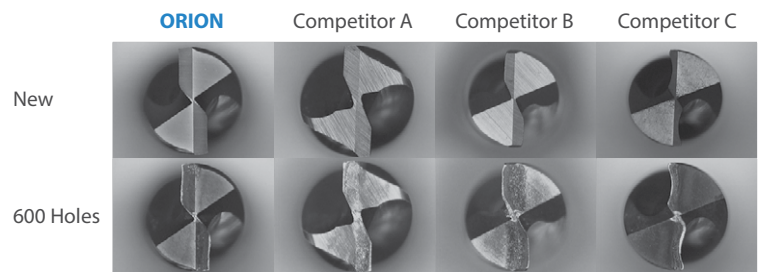
2 Nanocomposite Super-nitride AlTiN Coating Technology

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



Wear Resistance Comparison (In-house Evaluation)

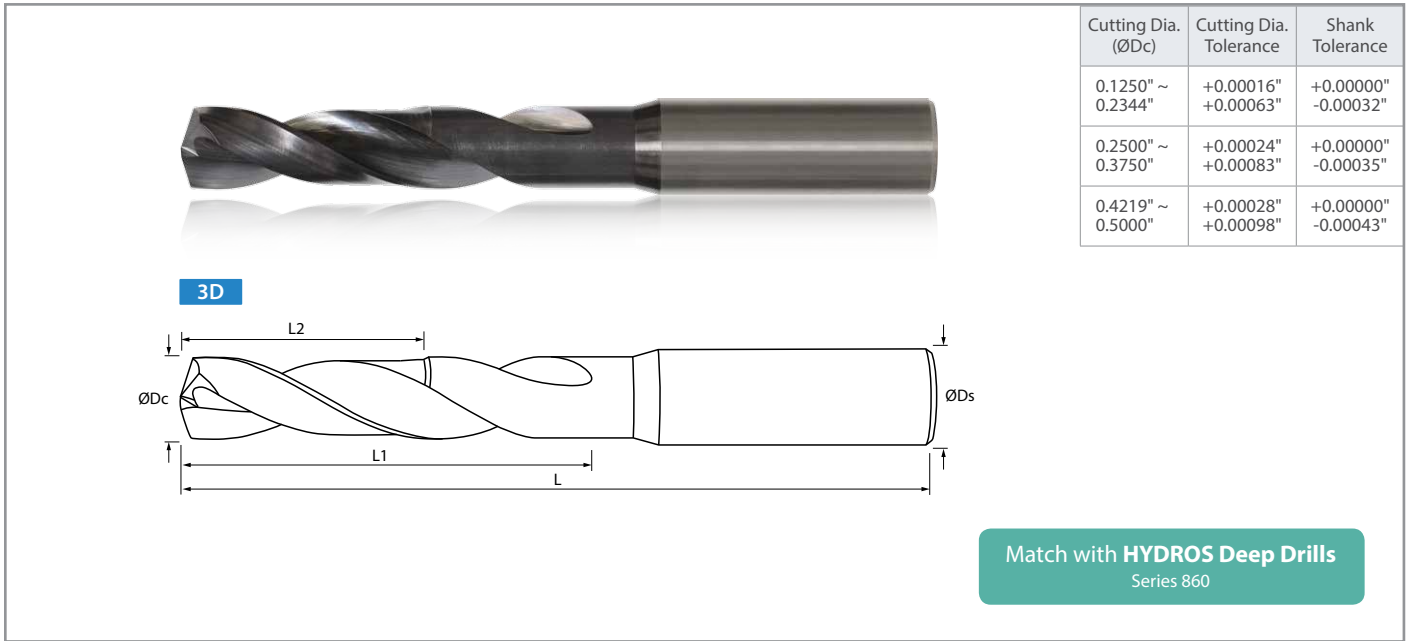


The ORION performed with good overall wear while still maintaining good tool finish

Drill	Total Holes	At 300 Holes	At 600 Holes
		Wear (mm)	Wear (mm)
ORION	600	0.032	0.068
Competitor A	600	0.031	0.057
Competitor B	600	0.044	0.073
Competitor C	600	0.044	0.071

Cutting Conditions : N = 2588rpm, Vf = 196mm/min Drill Diameter Ø3mm Drilling Depth 9mm 17-4PH-900

ORION Drills - Inch Sizes (Ø0.1250" - Ø0.5000")



Cutting Dia. (ØDc)	Cutting Dia. Tolerance	Shank Tolerance
0.1250" ~ 0.2344"	+0.00016" +0.00063"	+0.00000" -0.00032"
0.2500" ~ 0.3750"	+0.00024" +0.00083"	+0.00000" -0.00035"
0.4219" ~ 0.5000"	+0.00028" +0.00098"	+0.00000" -0.00043"

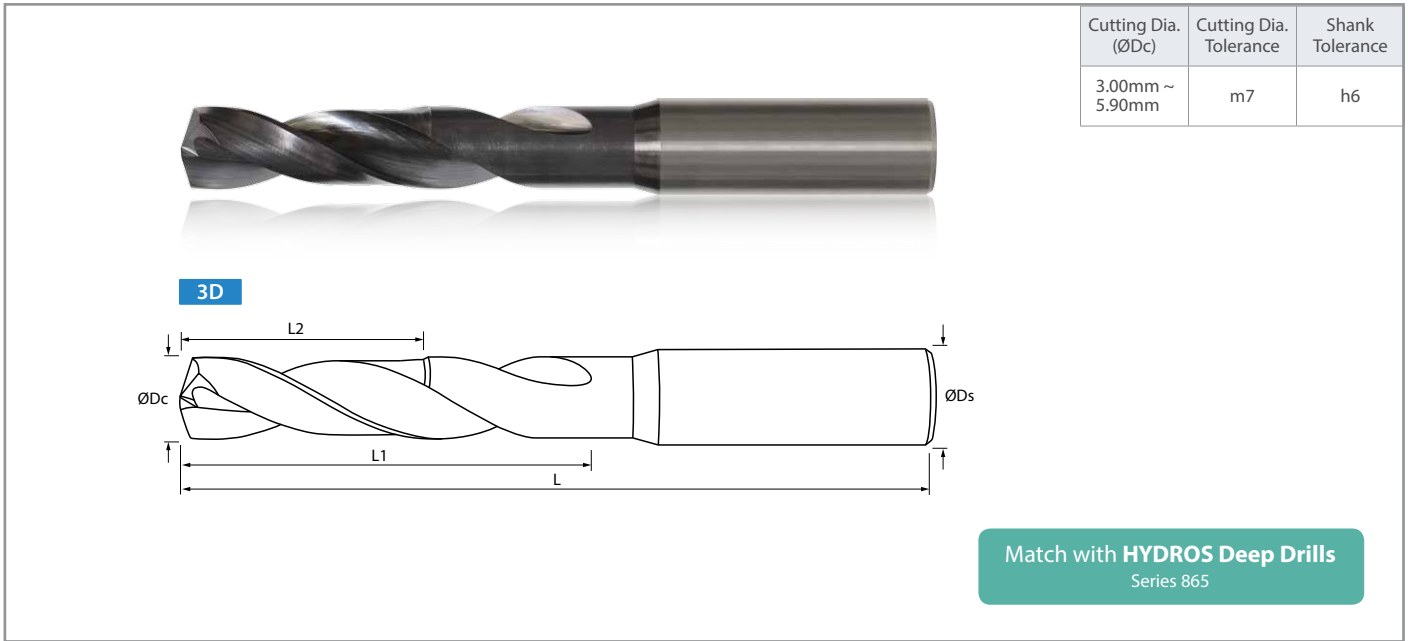
Inch Drill Dimensions

Part Number	Stock	Dimensions (in)					Point Angle	
		ØDc		ØDs	L	L1		*L2
160-1250AG625	●	0.1250	1/8	0.1875	2.5	0.625	0.375	142°
160-1406AG703	●	0.1406	9/64			0.703	0.422	
160-1563AG781	●	0.1563	5/32			0.781	0.468	
160-1719AG859	●	0.1719	11/64			0.859	0.515	
160-1875AG938	●	0.1875	3/16	0.2500	2.5	0.938	0.563	
160-2031AG1016	●	0.2031	13/64			1.016	0.610	
160-2188AG1094	●	0.2188	7/32			1.094	0.656	
160-2344AG1172	●	0.2344	15/64			1.172	0.703	
160-2500AG1250	●	0.2500	1/4	0.3125	3.0	1.250	0.750	
160-2570AG1285	●	0.2570	F			1.285	0.771	
160-2656AG1328	●	0.2656	17/64			1.328	0.797	
160-2813AG1406	●	0.2813	9/32			1.406	0.843	
160-3125AG1563	●	0.3125	5/16	0.3750	4.0	1.563	0.938	
160-3320AG1660	●	0.3320	Q			1.660	0.996	
160-3438AG1719	●	0.3438	11/32			1.719	1.031	
160-3750AG1875	●	0.3750	3/8	0.4375	4.5	1.875	1.125	
160-4219AG2109	●	0.4219	27/64			2.109	1.265	
160-4375AG2188	●	0.4375	7/16	0.5000	5.0	2.188	1.313	
160-4531AG2266	●	0.4531	29/64			2.266	1.360	
160-5000AG2500	●	0.5000	1/2			2.500	1.500	

L2 dimension refers to the Max. Length of Cut (3 x ØDc).
There is a 2 x ØDc length at the top of the flute for chip exhaust.

● : U.S. Stock

ORION Drills - Metric Sizes (Ø3.00mm - Ø5.90mm)



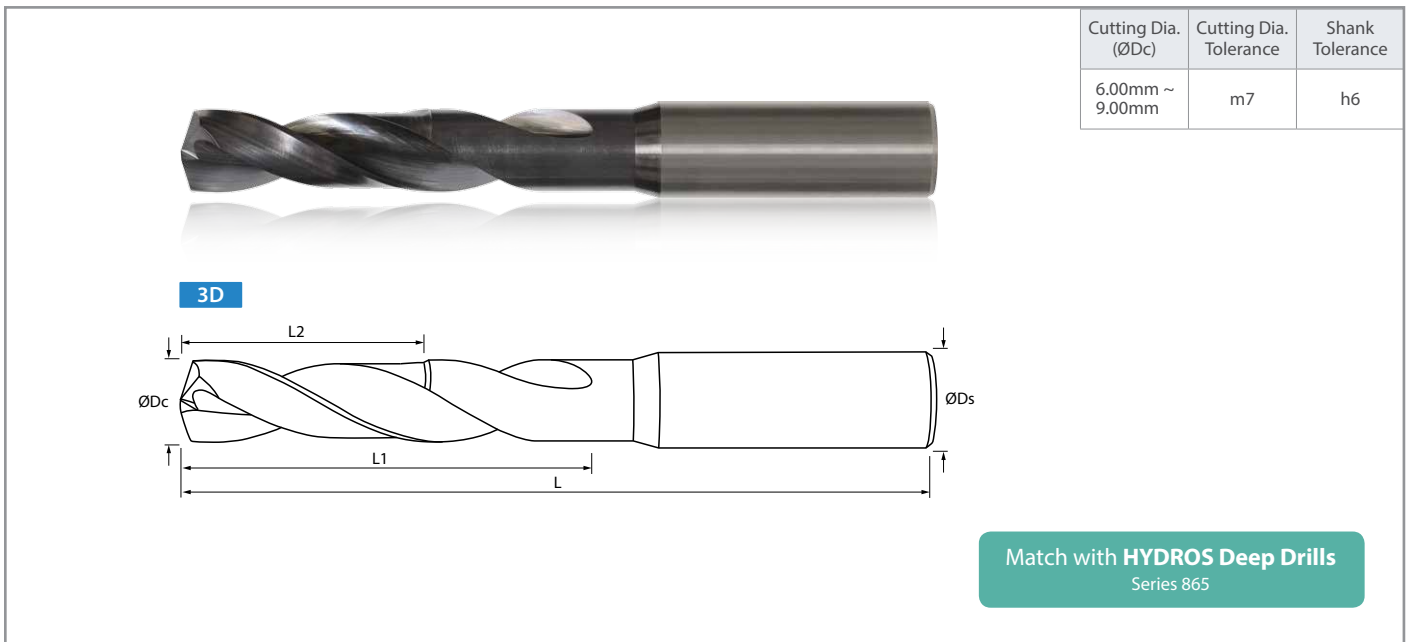
Metric Drill Dimensions

Part Number	Stock	Dimensions (mm)					Point Angle
		ØDc ^{m7}	ØDs ^{h6}	L	L1	*L2	
165-1181AG591	●	3.00	4	60	15.00	9.00	142°
165-1220AG610	●	3.10			15.50	9.30	
165-1260AG630	●	3.20			16.00	9.60	
165-1299AG650	●	3.30			16.50	9.90	
165-1339AG669	●	3.40			17.00	10.20	
165-1378AG689	●	3.50			17.50	10.50	
165-1417AG709	●	3.60			18.00	10.80	
165-1457AG728	●	3.70			18.50	11.10	
165-1496AG748	●	3.80			19.00	11.40	
165-1535AG768	●	3.90			19.50	11.70	
165-1575AG787	●	4.00			20.00	12.00	
165-1614AG807	●	4.10			20.50	12.30	
165-1654AG827	●	4.20	21.00	12.60			
165-1693AG846	●	4.30	21.50	12.90			
165-1732AG866	●	4.40	22.00	13.20			
165-1772AG886	●	4.50	22.50	13.50			
165-1811AG906	●	4.60	23.00	13.80			
165-1850AG925	●	4.70	23.50	14.10			
165-1890AG945	●	4.80	24.00	14.40			
165-1929AG965	●	4.90	24.50	14.70			
165-1969AG984	●	5.00	25.00	15.00			
165-2008AG1004	●	5.10	25.50	15.30			
165-2047AG1024	●	5.20	26.00	15.60			
165-2087AG1043	●	5.30	26.50	15.90			
165-2126AG1063	●	5.40	27.00	16.20			
165-2165AG1083	●	5.50	27.50	16.50			
165-2205AG1102	●	5.60	28.00	16.80			
165-2244AG1122	●	5.70	28.50	17.10			
165-2283AG1142	●	5.80	29.00	17.40			
165-2323AG1161	●	5.90	29.50	17.70			

L2 dimension refers to the Max. Length of Cut (3 x ØDc).
There is a 2 x ØDc length at the top of the flute for chip exhaust.

● : U.S. Stock

ORION Drills - Metric Sizes (Ø6.00mm - Ø9.00mm)



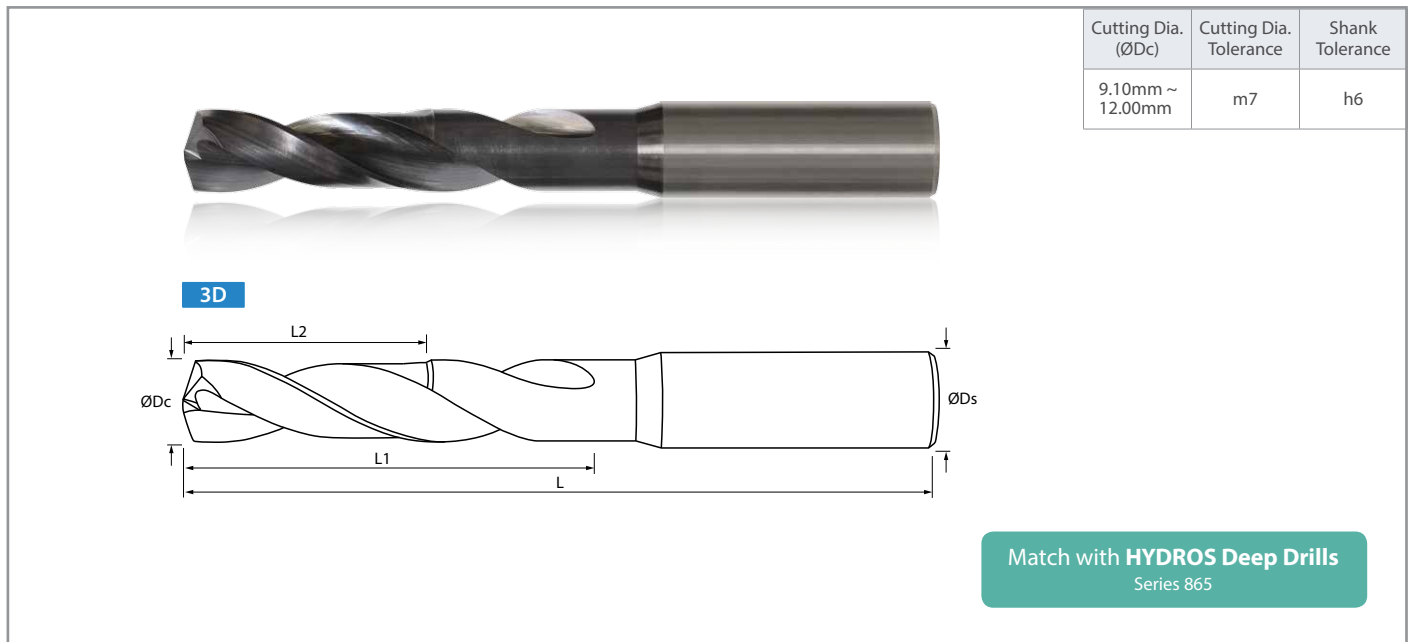
Metric Drill Dimensions

Part Number	Stock	Dimensions (mm)					Point Angle
		ØDc ^{m7}	ØDs ^{h6}	L	L1	*L2	
165-2362AG1181	●	6.00	8	80	30.00	18.00	142°
165-2402AG1201	●	6.10			30.50	18.30	
165-2441AG1220	●	6.20			31.00	18.60	
165-2480AG1240	●	6.30			31.50	18.90	
165-2520AG1260	●	6.40			32.00	19.20	
165-2559AG1280	●	6.50			32.50	19.50	
165-2598AG1299	●	6.60			33.00	19.80	
165-2638AG1319	●	6.70			33.50	20.10	
165-2677AG1339	●	6.80			34.00	20.40	
165-2717AG1358	●	6.90			34.50	20.70	
165-2756AG1378	●	7.00			35.00	21.00	
165-2795AG1398	●	7.10			35.50	21.30	
165-2835AG1417	●	7.20			36.00	21.60	
165-2874AG1437	●	7.30			36.50	21.90	
165-2913AG1457	●	7.40			37.00	22.20	
165-2953AG1476	●	7.50			37.50	22.50	
165-2992AG1496	●	7.60			38.00	22.80	
165-3031AG1516	●	7.70			38.50	23.10	
165-3071AG1535	●	7.80			39.00	23.40	
165-3110AG1555	●	7.90			39.50	23.70	
165-3150AG1575	●	8.00	10	100	40.00	24.00	
165-3189AG1594	●	8.10			40.50	24.30	
165-3228AG1614	●	8.20			41.00	24.60	
165-3268AG1634	●	8.30			41.50	24.90	
165-3307AG1654	●	8.40			42.00	25.20	
165-3346AG1673	●	8.50			42.50	25.50	
165-3386AG1693	●	8.60			43.00	25.80	
165-3425AG1713	●	8.70			43.50	26.10	
165-3465AG1732	●	8.80			44.00	26.40	
165-3504AG1752	●	8.90			44.50	26.70	
165-3543AG1772	●	9.00			45.00	27.00	

L2 dimension refers to the Max. Length of Cut (3 x ØDc).
There is a 2 x ØDc length at the top of the flute for chip exhaust.

● : U.S. Stock

ORION Drills - Metric Sizes (Ø9.10mm - Ø12.00mm)



Metric Drill Dimensions

Part Number	Stock	Dimensions (mm)					Point Angle
		ØDc ^{m7}	ØDs ^{h6}	L	L1	*L2	
165-3583AG1791	●	9.10	10	100	45.50	27.30	142°
165-3622AG1811	●	9.20			46.00	27.60	
165-3661AG1831	●	9.30			46.50	27.90	
165-3701AG1850	●	9.40			47.00	28.20	
165-3740AG1870	●	9.50			47.50	28.50	
165-3780AG1890	●	9.60			48.00	28.80	
165-3819AG1909	●	9.70			48.50	29.10	
165-3858AG1929	●	9.80			49.00	29.40	
165-3898AG1949	●	9.90			49.50	29.70	
165-3937AG1969	●	10.00			50.00	30.00	
165-3976AG1988	●	10.10	50.50	30.30			
165-4016AG2008	●	10.20	51.00	30.60			
165-4055AG2028	●	10.30	51.50	30.90			
165-4094AG2047	●	10.40	52.00	31.20			
165-4134AG2067	●	10.50	52.50	31.50			
165-4173AG2087	●	10.60	53.00	31.80			
165-4213AG2106	●	10.70	53.50	32.10			
165-4252AG2126	●	10.80	54.00	32.40			
165-4291AG2146	●	10.90	54.50	32.70			
165-4331AG2165	●	11.00	55.00	33.00			
165-4370AG2185	●	11.10	55.50	33.30			
165-4409AG2205	●	11.20	56.00	33.60			
165-4449AG2224	●	11.30	56.50	33.90			
165-4488AG2244	●	11.40	57.00	34.20			
165-4528AG2264	●	11.50	57.50	34.50			
165-4567AG2283	●	11.60	58.00	34.80			
165-4606AG2303	●	11.70	58.50	35.10			
165-4646AG2323	●	11.80	59.00	35.40			
165-4685AG2343	●	11.90	59.50	35.70			
165-4724AG2362	●	12.00	14	110	60.00	36.00	

L2 dimension refers to the Max. Length of Cut (3 x ØDc).
There is a 2 x ØDc length at the top of the flute for chip exhaust.

● : U.S. Stock

Recommended Cutting Conditions

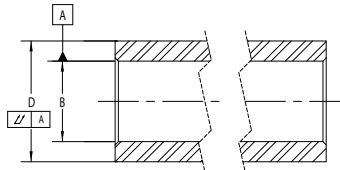
Workpiece Material	Hardness	Cutting Speed (sfm)	Drill Diameter / Feed Rate (ipr)			
			Ø3.00mm - Ø5.90mm Ø0.1250" - Ø0.2344"	Ø6.00mm - Ø9.90mm Ø0.2500" - Ø0.3438"	Ø10.00mm - Ø11.90mm Ø0.3750" - Ø0.4531"	Ø12.00mm Ø0.5000"
Low Carbon Steel	< 24 HRc	350	0.0035	0.0080	0.0110	0.0150
Alloy Steel	24 - 30 HRc	250	0.0030	0.0080	0.0100	0.0120
Stainless Steel	< 30HRc	150	0.0030	0.0050	0.0070	0.0080
Gray Cast Iron	< 50 kpsi	375	0.0050	0.0100	0.0150	0.0180
Nodular Cast Iron	< 60 kpsi	275	0.0050	0.0090	0.0120	0.0160
Aluminum	-	750	0.0070	0.0120	0.0160	0.0220
Copper	-	400	0.0040	0.0060	0.0080	0.0120
Heat Resistant Alloy	-	70	0.0020	0.0035	0.0050	0.0060
Titanium Alloy	-	110	0.0025	0.0040	0.0055	0.0065
Hardened Steel	30 - 50 HRc	150	0.0020	0.0045	0.0060	0.0070
Tool Steel	> 50 HRc	70	0.0020	0.0030	0.0040	0.0050

• Above recommendations are suggested starting parameters. Cutting speeds and feed rates may vary according to machining application.

Case Studies

Bushing 17-4PH Stainless Steel

Vc = 147.3 sfm (n = 1,800 rpm)
Vf = 4.32 ipm
D.O.C. = 0.500"
Ø0.3125"
160-3125AG1563



Tool Life

ORION Ø0.3125"

659 pcs / tool

3.3x

Competitor A
Ø0.3125"

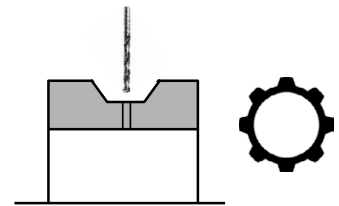
200 pcs / tool

The ORION drill showed 3.3 times the tool life of Competitor A.

(User Evaluation)

Gear 1045 Steel

Vc = 165 sfm (n = 7,583 rpm)
Vf = 0.005 ipt
D.O.C. = 0.276"
Ø2.1mm
165-0827AG413 (Special)
Number of Holes: 4



Tool Life

ORION Ø2.1mm

1,000 Parts (4,000 Holes)

1.7x

Competitor B
Ø2.1mm

600 Parts (2,400 Holes)

The ORION drill showed 1.7 times the tool life of Competitor B.
There is also a 10% better cost performance.

(User Evaluation)



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