



## Multi-Material (Non-Coolant Fed) Drills Technical Information

- RedLine Hole Shot High Performance Drills are designed to give optimal performance in a wide range of materials. Our 142° point is designed to reduce thrust and our flute design stabilizes our drills for better positioning and for a more accurate hole.
- All shanks are manufactured to h6 tolerance, suitable for use in shrink-fit holders.
- Multi-Material, Non-Coolant Fed, High Performance Drills found on pages 115-123.

### Multi-Material, Solid Carbide (Non-Coolant) Speeds & Feeds

Workpiece Material	Speed (SFM)	IPR by Drill Diameter (Inches)						Speed (M/Min)	(MM/Rev) by Drill Diameters (Millimeters)					
		1/8	1/4	3/8	1/2	5/8	3/4		3.0	6.0	10.0	12.0	16.0	19.0
<b>Steels</b>														
Low Carbon Steels 1018, 12L14	340-400	.0035-.0065	.0065-.009	.009-.011	.010-.013	.011-.015	.013-.017	105-125	.100-.150	.150-.230	.230-.280	.255-.330	.280-.380	.305-.430
Alloy Steels < 35Rc 4140, A2, D2	275-350	.0035-.0065	.0065-.009	.009-.011	.010-.013	.011-.015	.013-.017	85-105	.100-.150	.150-.230	.230-.280	.255-.330	.280-.380	.305-.430
Alloy Steels >35 Rc 4140, A2, D2	175-210	.002-.003	.004-.006	.005-.009	.006-.010	.009-.012	.010-.014	50-65	.050-.075	.100-.150	.125-.230	.150-.255	.230-.305	.255-.355
<b>Cast Iron</b>														
Gray Cast Iron A48, Class 20, G4000	400-500	.004-.0065	.006-.009	.009-.011	.010-.013	.011-.015	.012-.017	125-150	.100-.150	.150-.230	.230-.280	.255-.330	.280-.380	.305-.430
Ductile Iron 60-40-18	300-375	.004-.0065	.006-.009	.009-.011	.010-.013	.011-.015	.012-.017	95-115	.100-.150	.150-.230	.230-.280	.255-.330	.280-.380	.305-.430
<b>Stainless Steels</b>														
Austenitic 304, 316	125-200	.004-.0065	.0065-.009	.009-.011	.010-.013	.011-.015	.012-.017	40-60	.100-.150	.150-.230	.230-.280	.255-.330	.280-.380	.305-.430
Precipitation Hardened 17-4PH, 13-8PH	100-155	.002-.003	.004-.006	.005-.009	.006-.010	.009-.012	.010-.014	30-50	.050-.075	.100-.150	.125-.230	.150-.255	.230-.305	.255-.355
<b>High Temperature Alloys</b>														
Titanium 6AL-4V	150	.001	.003	.004	.005	.006	.008	45	.025	.065	.103	.125	.153	.192
Cobalt Based Alloys Stellite, Haynes 25,188	40	.001	.003	.004	.005	.006	.008	15	.025	.065	.103	.125	.153	.192
Nickel Based Alloys Inconel 625, 718	80	.001	.003	.004	.005	.006	.008	25	.025	.065	.103	.125	.153	.192
Iron Based Alloys Incoloy 800-802, Multimet	80	.001	.003	.004	.005	.006	.008	25	.025	.065	.103	.125	.153	.192
High Nickel Alloys Monel	100	.001	.003	.004	.005	.006	.008	30	.025	.065	.103	.125	.153	.192

Drills

High Performance Drills Tolerances (Inch)		
Size	Drill $\sigma$ (h7)	Shank $\sigma$ (h6)
.0000-.1181	+0/-.00039	+0/-.00024
.1182-.2362	+0/-.00047	+0/-.00031
.2363-.3937	+0/-.00059	+0/-.00035
.3938-.7087	+0/-.00071	+0/-.00043
.7088-1.181	+0/-.00083	+0/-.00051

High Performance Drills Tolerances (mm)		
Size	Drill $\sigma$ (h7)	Shank $\sigma$ (h6)
0-3.00	+0/-.010	+0/-.006
3.01-6.00	+0/-.012	+0/-.008
6.01-10.00	+0/-.015	+0/-.009
10.01-18.00	+0/-.018	+0/-.011
18.01-30.00	+0/-.021	+0/-.013





## Multi-Material, Coolant Fed, Regular Length Drills Technical Information

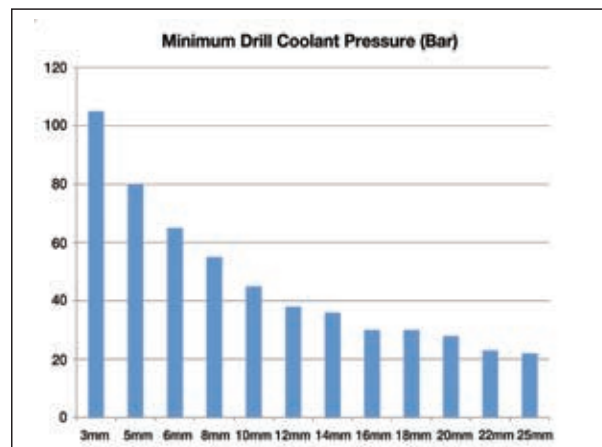
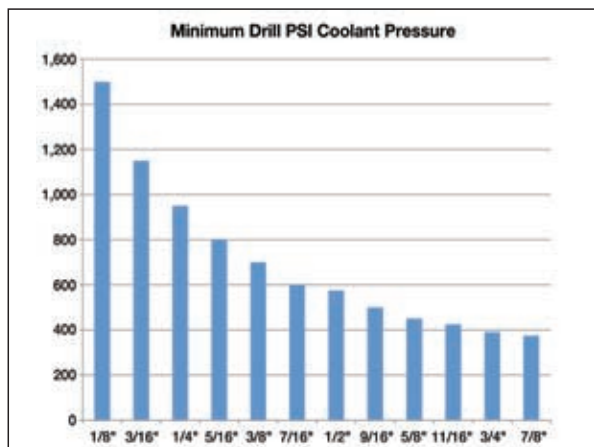


- RedLine Hole Shot High Performance Drills are designed to give optimal performance in a wide range of materials. Our 142° point is designed to reduce thrust and our flute design stabilizes our drills for better positioning and for a more accurate hole.
- All shanks are manufactured to h6 tolerance, suitable for use in shrink-fit holders.
- Multi-Material, Coolant-Fed, High Performance Drills found on pages 124-128.

### Multi-Material, Coolant Fed, Regular Length Speeds & Feeds

Workpiece Material	Speed (SFM)	IPR by Drill Diameter (Inches)						Speed (M/Min)	(MM/Rev) by Drill Diameters (Millimeters)					
		1/8	1/4	3/8	1/2	5/8	3/4		3.0	6.0	10.0	12.0	16.0	19.0
<b>Steels</b>														
Low Carbon Steels 1018, 12L14	500-625	.0035-.0065	.0065-.009	.009-.011	.010-.013	.011-.015	.013-.017	150-190	.100-.150	.150-.230	.230-.280	.255-.330	.280-.380	.305-.430
Alloy Steels < 35Rc 4140, A2, D2	315-435	.0035-.0065	.0065-.009	.009-.011	.010-.013	.011-.015	.013-.017	95-130	.100-.150	.150-.230	.230-.280	.255-.330	.280-.380	.305-.430
Alloy Steels >35 Rc 4140, A2, D2	190-250	.002-.003	.004-.006	.005-.009	.006-.010	.009-.012	.010-.014	60-75	.050-.075	.100-.150	.125-.230	.150-.255	.230-.305	.255-.355
<b>Cast Iron</b>														
Gray Cast Iron A48, Class 20, G4000	500-625	.004-.0065	.006-.009	.009-.011	.010-.013	.011-.015	.012-.017	150-190	.100-.150	.150-.230	.230-.280	.255-.330	.280-.380	.305-.430
Ductile Iron 60-40-18	560-625	.004-.0065	.006-.009	.009-.011	.010-.013	.011-.015	.012-.017	170-190	.100-.150	.150-.230	.230-.280	.255-.330	.280-.380	.305-.430
<b>Stainless Steels</b>														
Austenitic 304, 316	220-315	.004-.0065	.0065-.009	.009-.011	.010-.013	.011-.015	.012-.017	220-315	.100-.150	.150-.230	.230-.280	.255-.330	.280-.380	.305-.430
Precipitation Hardened 17-4PH, 13-8PH	150-220	.002-.003	.004-.006	.005-.009	.006-.010	.009-.012	.010-.014	150-220	.050-.075	.100-.150	.125-.230	.150-.255	.230-.305	.255-.355
<b>High Temperature Alloys</b>														
Titanium 6AL-4V	180	.001	.003	.004	.005	.006	.008	55	.025	.065	.103	.125	.153	.192
Cobalt Based Alloys Stellite, Haynes 25,188	50	.001	.003	.004	.005	.006	.008	15	.025	.065	.103	.125	.153	.192
Nickel Based Alloys Inconel 625, 718	95	.001	.003	.004	.005	.006	.008	30	.025	.065	.103	.125	.153	.192
Iron Based Alloys Incoloy 800-802, Multimet	95	.001	.003	.004	.005	.006	.008	30	.025	.065	.103	.125	.153	.192
High Nickel Alloys Monel	120	.001	.003	.004	.005	.006	.008	35	.025	.065	.103	.125	.153	.192

### Coolant Pressure Requirements





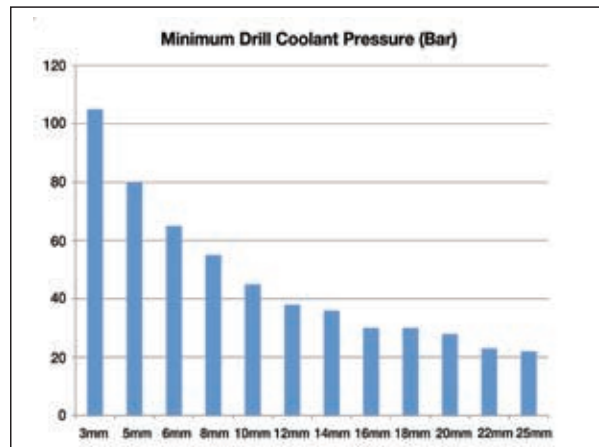
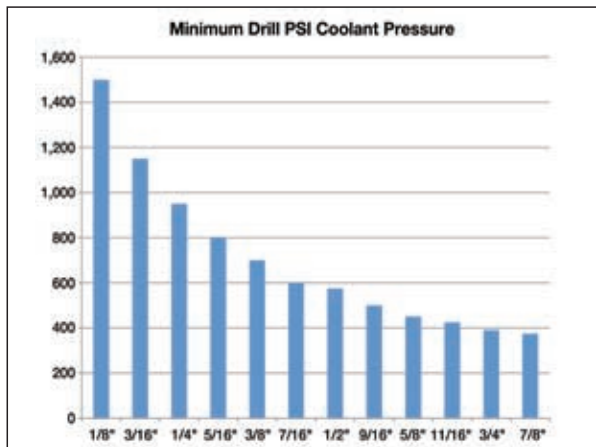
## Multi-Material, Coolant Fed, Long Length Drills Technical Information

- RedLine Hole Shot High Performance Drills are designed to give optimal performance in a wide range of materials. Our 142° point is designed to reduce thrust and our flute design stabilizes our drills for better positioning and for a more accurate hole.
- All shanks are manufactured to h6 tolerance, suitable for use in shrink-fit holders.
- Multi-Material, Coolant-Fed, High Performance Drills found on pages 129-132.

### Multi-Material, Coolant Fed, Long Length Speeds & Feeds

Workpiece Material	Speed (SFM)	IPR by Drill Diameter (Inches)						Speed (M/Min)	(MM/Rev) by Drill Diameters (Millimeters)					
		1/8	1/4	3/8	1/2	5/8	3/4		3.0	6.0	10.0	12.0	16.0	19.0
<b>Steels</b>														
Low Carbon Steels 1018, 12L14	530-625	.0035-.0065	.0065-.009	.009-.011	.010-.013	.011-.015	.013-.017	160-180	.100-.150	.150-.230	.230-.280	.255-.330	.280-.380	.305-.430
Alloy Steels < 35Rc 4140, A2, D2	280-375	.0035-.0065	.0065-.009	.009-.011	.010-.013	.011-.015	.013-.017	85-120	.100-.150	.150-.230	.230-.280	.255-.330	.280-.380	.305-.430
Alloy Steels >35 Rc 4140, A2, D2	170-225	.002-.003	.004-.006	.005-.009	.006-.010	.009-.012	.010-.014	50-70	.050-.075	.100-.150	.125-.230	.150-.255	.230-.305	.255-.355
<b>Cast Iron</b>														
Gray Cast Iron A48, Class 20, G4000	475-590	.004-.0065	.006-.009	.009-.011	.010-.013	.011-.015	.012-.017	140-180	.100-.150	.150-.230	.230-.280	.255-.330	.280-.380	.305-.430
Ductile Iron 60-40-18	530-590	.004-.0065	.006-.009	.009-.011	.010-.013	.011-.015	.012-.017	160-180	.100-.150	.150-.230	.230-.280	.255-.330	.280-.380	.305-.430
<b>Stainless Steels</b>														
Austenitic 304, 316	185-280	.004-.0065	.0065-.009	.009-.011	.010-.013	.011-.015	.012-.017	50-85	.100-.150	.150-.230	.230-.280	.255-.330	.280-.380	.305-.430
Precipitation Hardened 17-4PH, 13-8PH	125-190	.002-.003	.004-.006	.005-.009	.006-.010	.009-.012	.010-.014	40-60	.050-.075	.100-.150	.125-.230	.150-.255	.230-.305	.255-.355
<b>High Temperature Alloys</b>														
Titanium 6AL-4V	180	.001	.003	.004	.005	.006	.008	55	.025	.065	.103	.125	.153	.192
Cobalt Based Alloys Stellite, Haynes 25,188	50	.001	.003	.004	.005	.006	.008	15	.025	.065	.103	.125	.153	.192
Nickel Based Alloys Inconel 625, 718	95	.001	.003	.004	.005	.006	.008	30	.025	.065	.103	.125	.153	.192
Iron Based Alloys Incoloy 800-802, Multimet	95	.001	.003	.004	.005	.006	.008	30	.025	.065	.103	.125	.153	.192
High Nickel Alloys Monel	120	.001	.003	.004	.005	.006	.008	35	.025	.065	.103	.125	.153	.192

### Coolant Pressure Requirements





## Aluminum & Non-Ferrous Technical Information

- RedLine Aluminum & Non-Ferrous High Performance Drills have been specifically designed for high penetration rates, great chip evacuation, and improved hole quality, speed and performance for lower hole costs!
- All shanks are manufactured to h6 tolerance, suitable for use in shrink-fit holders.
- Aluminum & Non-Ferrous, High Performance Drills found on pages 133-136.



### Aluminum & Non-Ferrous, Speeds & Feeds

Workpiece Material	Speed (SFM)	IPR by Drill Diameter (Inches)							Speed (M/Min)	(MM/Rev) by Drill Diameters (Millimeters)						
		1/32	1/16	1/8	1/4	3/8	1/2	5/8		1.0	1.5	3.0	6.0	10.0	12.0	16.0
Aluminum & Non-Ferrous																
Aluminum < 14% on T6	750	.002	.003	.008	.012	.014	.018	.022	215	.038	.076	.203	.305	.356	.457	.508
Aluminum >14% Silicon	500	.001	.002	.003	.006	.008	.010	.011	150	.025	.051	.076	.152	.203	.254	.279
Brass Copper	225	.001	.002	.003	.006	.008	.010	.011	70	.025	.051	.076	.152	.203	.254	.279
Plastics	300	.001	.002	.003	.006	.008	.010	.011	90	.025	.051	.076	.152	.203	.254	.279

### Aluminum & Non-Ferrous Tolerances (Inch)

Size	Drill $\phi$
.0625-.1250	+.0001/+.0004
.1251-.2500	+.0002/+.0006
.2501-.3750	+.0003/+.0008
.3751-.7500	+.0003/+.0010

### Aluminum & Non-Ferrous Tolerances (Metric)

Size	Drill $\phi$
2.00-3.00	+.002/+.012
3.01-6.00	+.004/+.016
6.01-10.00	+.006/+.021
10.01-16.00	+.007/+.025



<b>General Purpose Carbide Drills Speeds &amp; Feeds</b>						
Workpiece Material	Speed (SFM)	(Feed/Tooth) by Drill Diameter (Inches)				
		1/8	1/4	1/2	3/4	1
<b>Non-Ferrous Materials</b>						
Aluminum	150-400	.0015	.003	.005	—	—
Brass/Bronze	100-300	.001	.002	.003	—	—
Copper/Copper Alloys	150-400	.002	.004	.009	—	—
Plastics	250-600	.003	.005	.012	—	—
<b>Cast Iron</b>						
Malleable	100-300	.002	.003	.006	.010	.012
Ductile	70-250	.0015	.003	.005	.008	.014
<b>Steels</b>						
Low Carbon Steels	85-150	.001	.002	.004	.008	.010
Medium Alloy Steels 200, 250, 300	65-120	.001	.0015	.003	.007	.009
High Strength Steels	30-90	.0005	.0015	.0025	.004	.006
<b>Stainless Steels</b>						
PH Series	50-125	.0005	.0005	.002	.005	.006
Austenitic 200, 302, 303, 304(L), 316(L)	30-90	.0005	.0005	.002	.005	.006
Martensitic 403, 410, 416, 420, 440	50-125	.0005	.0005	.002	.005	.006
<b>High Temp Alloys</b>						
Nickel Base Inconel 601, 625, 718 Waspalloy, Hastelloy	30-90	.0005	.0007	.001	.002	.0025
Cobalt Base Stellite, Haynes 25	30-90	.0005	.0007	.001	.002	.0025
Iron Base Incoloy 800-802, Haynes 556	40-100	.0007	.001	.0015	.0025	.003
Titanium	45-200	.001	.003	.005	.010	.011

**NOTES:** (1) Speeds and Feeds listed are estimated and will vary by application.  
 (2) Reduce Speeds by 20-30% when exceeding 2x length to diameter.

<b>N/C Spotting for Hole Shot High Performance Drills Speeds &amp; Feeds</b>						
Workpiece Material	Speed (M/Min)	(MM/Rev) by Drill Diameter (Metric)				
		6	8	10	12	16
<b>Cast Iron</b>						
Malleable	100-120	.075	.100	.125	.153	.155
Ductile	75-90	.075	.100	.125	.153	.155
<b>Steels</b>						
Low Carbon Steels	100-120	.075	.100	.125	.153	.155
Medium Alloy Steels 200, 250, 300	75-90	.075	.100	.125	.153	.155
High Strength Steels	40-50	.075	.100	.125	.153	.155
<b>Stainless Steels</b>						
PH Series	25-35	.075	.100	.125	.153	.155
Austenitic 200, 302, 303, 304(L), 316(L)	40-45	.075	.100	.125	.153	.155
Martensitic 403, 410, 416, 420, 440	45-50	.075	.100	.125	.153	.155
<b>High Temp Alloys</b>						
Nickel Base Inconel 601, 625, 718	20-25	.075	.100	.125	.153	.155
Waspalloy, Hastelloy	20-25	.075	.100	.125	.153	.155
Cobalt Base Stellite, Haynes 25	20-25	.075	.100	.125	.153	.155
Iron Base Incoloy 800-802,	20-25	.075	.100	.125	.153	.155
Haynes 556	20-25	.075	.100	.125	.153	.155
Titanium	50-55	.075	.100	.125	.153	.155

**NOTES:** Speeds and Feeds listed are estimated and will vary by application.



<b>High Speed Steel Drills Speeds &amp; Feeds</b>		
Workpiece Material	Speed (SFM)	Feed Rate
<b>Non-Ferrous Materials</b>		
Aluminum	200-300	M-H
Brass/Bronze	75-150	M-H
Copper/Copper Alloys	80-85	L
Plastics	100-200	M-H
<b>Cast Iron</b>		
Malleable	75-125	M
Ductile	50-100	L-M
<b>Steels</b>		
Low Carbon Steels	50-100	M-H
Medium Alloy Steels 200, 250, 300	45-80	M
High Strength Steels	40-60	M
<b>Stainless Steels</b>		
PH Series	20-80	M
Austenitic 200, 302, 303, 304, 304(L), 316(L)	30-100	M
Martensitic 403, 410, 416, 420, 440	10-30	M
<b>High Temp Alloys</b>		
Nickel Base Inconel 601, 625, 718 Waspalloy, Hastelloy	5-15	M
Cobalt Base Stellite, Haynes 25	7-20	M
Iron Base Incoloy 800-802, Haynes 556	7-20	M
<b>Titanium</b>	15-45	M

**NOTES:** Speeds and Feeds listed are estimated and will vary by application.

<b>Drill Feed Rate Per Revolution Based on Cut</b>			
Drill/Reamer Size	Light	Medium	Heavy
1/16"-1/8"	.0005-.0010	.0010-.0020	.0020-.0030
1/8"-1/4"	.0010-.0030	.0030-.0050	.0050-.0070
1/4"-1/2"	.0030-.0050	.0050-.0070	.0070-.0090
1/2"-3/4"	.0050-.0080	.0080-.0110	.0110-.0140
3/4"-1"	.0080-.0110	.0110-.0140	.0140-.0170
>1"	.0120-.0150	.0150-.0200	.0200-.0250



<b>Countersink Speeds</b>			
<b>Workpiece Material</b>	<b>HSS</b>	<b>Cobalt</b>	<b>Carbide</b>
<b>Non-Ferrous Materials</b>			
Aluminum	150-200	175-250	350-500
Brass/Bronze	100-125	100-150	150-250
Copper/Copper Alloys	100-125	100-150	150-225
Plastics	100-225	150-300	250-350
<b>Cast Iron</b>			
Malleable	100-125	100-150	150-225
Ductile	80-100	90-115	135-200
<b>Steels</b>			
Low Carbon Steels	30-50	50-75	60-80
Medium Alloy Steels 200, 250, 300	25-50	40-60	40-70
High Strength Steels	20-35	30-50	30-60
<b>Stainless Steels</b>			
PH Series	15-50	25-70	85-130
Austenitic 200,302, 303,304,304(L), 316(L)	35-75	50-80	50-100
Martensitic 403,410,416,420,440	10-50	25-70	40-85
<b>High Temp Alloys</b>			
Nickel Base Inconel 601,625,718 Waspalloy, Hastelloy	10-25	25-50	40-60
Cobalt Base Stellite, Haynes 25	15-30	20-40	30-50
Iron Base Incolloy 800-802 Haynes 556	15-30	20-40	30-50
<b>Titanium</b>	40-50	50-75	60-80

**NOTES: Speeds listed are estimated and will vary by application.**

