

Troubleshooting Chart

Problem	Possible Solution																		
	Speed & Feed						Tool Geometry						Coolant & Stock Removal						
	Reduce Feed	Increase Feed	Reduce Speed	Increase Speed	Use Larger Reamer	Use Smaller Reamer	Bad Speed & Feed	Worn Tool Margin	Worn Cutting Edge	Uneven Lip Height	Chip Capacity of Reamer	Too Much Clearance	Grind Larger Back Taper	Bent Reamer	Insufficient Stock	Too Much Stock	Use Coolant	Run Dry	Poor Hole Prep
Burnishing		X								X				X					
Reamer Wear	X		X				X									X	X		X
Hole Quality	X		X				X	X	X						X	X	X		X
Hole Undersize	X		X		X			X	X						X	X	X		
Hole Oversize		X		X		X		X	X					X		X	X	X	X
Accuracy	X					X				X							X		
Chatter		X	X							X	X	X			X		X		
Out of Round Hole					X			X	X	X	X				X	X	X		
Hole Taper						X		X	X	X			X			X	X		
Bell Mouth		X					X	X	X		X		X	X			X		
Reamer Life		X	X				X			X		X					X		
Scoring in Bore							X	X	X	X					X	X	X		X
Deflection																			

Problem	Possible Solution													
	Set Up						Cutting Errors							
	Alignment	Holder Accuracy	Concentricity	Use Adjustable Holder	Use Floating Holder	Lack of Rigidity in Set-Up	Work Holding Error	Spindle Bearings	Tool Extended Too Far	Poor Regrind	Poor Machinability	Built Up Edge	Wrong Tool	Poor Chip Removal
Burnishing	X						X			X				
Reamer Wear	X	X					X			X	X		X	
Hole Quality	X		X				X			X	X	X	X	
Hole Undersize	X										X			
Hole Oversize	X		X				X			X	X	X	X	
Accuracy							X			X				
Chatter	X	X				X	X	X	X	X				
Out of Round Hole	X						X			X				
Hole Taper	X	X	X	X	X		X			X	X	X		
Bell Mouth	X	X	X	X	X		X			X	X			
Reamer Life	X	X	X			X	X	X	X	X				
Scoring in Bore			X								X	X		X
Deflection	X													

Technical data provided should be considered advisory only as variations may be necessary depending on the particular application.

Total Stock Allowance - Inch

Material		Drill Decimal Equivalent/Size										
		.0135	.029/.028	.055/.052	.113	.238	.3594	.4844	.6094	.7344	.8594	.9844/1.480
		#80	#69/#70	#54/#55	#33	LET "B"	23/64	31/64	39/64	47/64	55/64	63/64
		Reamer Diameter										
		.0150	.0320	.0625	.1250	.2500	.3750	.5000	.6250	.7500	.8750	1.000-1.500
		Total Stock Allowance										
Magnesium		.0014	.0030	.0060	.0110	.0120	.0150	.0160	.0180	.0200	.0210	.0220
Aluminum	< 5%SI	.0014	.0030	.0060	.0110	.0120	.0150	.0160	.0180	.0200	.0210	.0220
	> 5%SI	.0014	.0030	.0060	.0110	.0120	.0130	.0150	.0160	.0180	.0190	.0200
Brass & Soft Bronze	Brass	.0014	.0030	.0060	.0110	.0120	.0130	.0150	.0160	.0180	.0190	.0200
	Bronze	.0014	.0030	.0060	.0110	.0120	.0140	.0150	.0170	.0190	.0200	.0210
Copper & Hard Bronze		.0014	.0030	.0060	.0110	.0120	.0140	.0150	.0170	.0190	.0200	.0210
Cast Iron	Cast	.0013	.0028	.0055	.0099	.0110	.0130	.0140	.0160	.0180	.0190	.0200
	Ductile	.0013	.0028	.0055	.0099	.0110	.0130	.0140	.0150	.0170	.0180	.0190
Steel	< 35% C	.0013	.0028	.0055	.0099	.0110	.0130	.0140	.0160	.0170	.0180	.0190
	> 35% C	.0012	.0025	.0049	.0089	.0100	.0120	.0130	.0150	.0170	.0180	.0190
	Tool	.0012	.0025	.0049	.0089	.0100	.0120	.0130	.0150	.0170	.0180	.0190
	Hard	.0009	.0020	.0040	.0072	.0080	.0100	.0110	.0130	.0140	.0150	.0160
Stainless		.0012	.0025	.0049	.0089	.0100	.0120	.0130	.0150	.0160	.0170	.0180
High Temp Alloys	Soft	.0012	.0025	.0049	.0089	.0100	.0110	.0130	.0140	.0160	.0170	.0180
	Hard	.0010	.0023	.0044	.0081	.0090	.0100	.0120	.0130	.0140	.0150	.0160
Titanium		.0013	.0028	.0055	.0099	.0110	.0130	.0140	.0160	.0170	.0180	.0190

Dowel Pin Chart - Inch

Dowel Pin	Nominal Dowel Decimal	Tight Press Fit Reamer		Tight Press Fit Reamer 0.0005		Loose Press Fit Reamer		Tight Slip Fit		Loose Slip Fit Reamer	
Size	Decimal	0.0005	Tool No.	DP(2)	Tool No.	DP(1)	Tool No.	Reamer	Tool No.	OS	Tool No.
1/8	.1250	.1230	27212300	.1245	27212450	.1248	27212480	.1255	27212550	.1260	27212601
3/16	.1875	.1855	27218550	.1870	27218701	.1873	27218730	.1880	27218800	.1885	27218850
1/4	.2500	.2480	27224801	.2495	27224950	.2498	27224980	.2505	27225050	.2510	27225100
5/16	.3125	.3110	27231100	.3120	27231200	.3123	27231230	.3130	27231300	.3135	27231350
3/8	.3750	.3740	27237401	.3745	27237450	.3748	27237480	.3750	27237500	.3760	27237600
7/16	.4735	.4360	27243600	.4370	27243700	.4373	27243730	.4380	27243800	.4385	27243850
1/2	.5000	.4990	27249900	.4995	27249950	.4998	27249980	.5000	27250000	.5010	27250100

+ 0.0001/ +0.0003 Tolerance (Reamer) Normal Dowels are nominal Size +.0001/ -.0001

Safety Note

Always wear the appropriate personal protective equipment such as safety glasses and protective clothing when using solid carbide or HSS cutting tools. Machines should be fully guarded. Technical data provided should be considered advisory only as variations may be necessary depending on the particular application.

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Total Stock Allowance - Metric

Material		Drill Size (mm)										
		0.30	0.90	1.80	2.70	3.70	4.70	5.70	7.60	9.60	11.60	15.50
		Reamer Diameter										
		0.35	1.00	2.00	3.00	4.00	5.00	6.00	8.00	10.00	12.00	16.00
		Total Stock Allowance										
Magnesium		.04	.09	.19	.27	.29	.29	.30	.34	.38	.40	.46
Aluminum	< 5%Si	.04	.09	.19	.27	.29	.29	.30	.34	.38	.40	.46
	> 5%Si	.04	.09	.19	.27	.29	.29	.30	.32	.34	.37	.41
Brass & Soft Bronze	Brass	.04	.09	.19	.27	.29	.29	.30	.32	.34	.37	.41
	Bronze	.04	.09	.19	.27	.29	.29	.30	.33	.36	.38	.43
Copper & Hard Bronze		.04	.09	.19	.27	.29	.29	.30	.33	.36	.38	.43
Cast Iron	Cast	.03	.09	.17	.24	.26	.27	.28	.31	.33	.35	.41
	Ductile	.03	.09	.17	.24	.26	.27	.28	.31	.33	.35	.38
Steel	< 35% C	.03	.09	.17	.24	.26	.27	.28	.31	.33	.35	.41
	> 35% C	.03	.08	.15	.21	.23	.24	.25	.28	.31	.32	.38
	Tool	.03	.08	.15	.21	.23	.24	.25	.28	.31	.32	.38
	Hard	.02	.06	.12	.17	.19	.19	.20	.23	.26	.27	.33
Stainless		.03	.08	.15	.21	.23	.24	.25	.28	.31	.32	.38
High Temp Alloys	Soft	.03	.08	.15	.21	.23	.24	.25	.27	.29	.32	.36
	Hard	.03	.07	.14	.20	.21	.22	.23	.24	.26	.29	.33
Titanium		.03	.09	.17	.24	.26	.27	.28	.31	.33	.35	.41

Dowel Pin Chart - Metric

Dowel Pin	Nominal Dowel Decimal	Tight Press Fit Reamer		Tight Press Fit Reamer 0.013		Loose Press Fit Reamer		Tight Slip Fit		Loose Slip Fit Reamer	
Size (mm)	Decimal	0.013	Tool No.	DP(2)	Tool No.	DP(1)	Tool No.	Reamer	Tool No.	OS	Tool No.
2	0.0787	1.95	27207670	1.98	27207810	1.99	27207850	2.01	27207900	2.02	27207950
3	0.1181	2.95	27211610	2.98	27211750	3.00	27211800	3.01	27211850	3.02	27211900
4	0.1575	3.95	27215550	3.99	27215700	4.00	27215750	4.01	27215800	4.03	27215850
5	0.1969	4.95	27219490	4.99	27219650	5.00	27219690	5.02	27219750	5.03	27219800
6	0.2362	5.95	27223430	5.98	27223550	5.99	27223600	6.01	27223650	6.02	27223700
8	0.3150	7.95	27231300	7.98	27231400	8.00	27231500	8.00	27231500	8.03	27231600
10	0.3937	9.96	27239200	9.98	27239300	10.00	27239370	10.01	27239400	10.03	27239500
12	0.4724	11.96	27247100	11.99	27247200	12.00	27247240	12.01	27247300	12.01	27247300

Tolerance (Reamer) Per **DIN 1420 H7** Normal Dowels are nominal size +.0001" / -.0001" (+.0025/- .0025mm)

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