

Trac Materials 27.11.15

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PREVIOUS BOTH APPLIED	GRADE	CHARACTERISTICS	APPLICATION
EN5 (PLATE)	BS4360 GRADE 43A	Low Carbon Steel for General Use and Non-Stressed Parts. Good Welding Characteristics.	Typically Used for: <ul style="list-style-type: none">- Base Plates/Ribs Etc.- Fabrications- Non-Critical Details
EN5 (BAR/BLOCK) NOT FOR WELDING	BS970 080M40	Low Carbon Mild Steel for General Use and Low Stressed Parts. Not suitable for Welding.	Typically Used for: <ul style="list-style-type: none">- Mounting Blocks- Location Blocks with Inserts- General Tooling Details
EN5 (BAR/BLOCK) FOR WELDING	BS970 070M20	Low Carbon Mild Steel for General Use. May be used, as an alternative to 080M40, when welding is required.	Typically Used for: <ul style="list-style-type: none">- General Tooling Details- Location Blocks with Inserts- Fabrications
BS4659 BD3	BS4659 BD3	Wear Resistant Steel. Normally for Thin Walled Applications. May be Hardened to Rockwell Rc60 - 65	Typically Used for: <ul style="list-style-type: none">- Custom Made Bushes- Punches & Swaging Tools
BS4659 B01 (01)	BS4659 B01	Wear Resistant Steel. For General Use on Gauges. May be Hardened to Rockwell Rc60-65	Typically Used for: <ul style="list-style-type: none">- Gauge Details/Setting Blocks- Radial Plates/Location Blocks- Sighting Gauges- Packers/Adjustment Details
EN24T <i>FLAT PLATE OR DIA Q</i>	BS970 817M40T	General Alloy Steel. For Use on Stressed Parts not Requiring Case Hardening. Material is supplied in a Fully Heat Treated Condition.	Typically Used for: <ul style="list-style-type: none">- Threaded/Turned Parts- Support Pins/Pivot Pins- Screw Jacks & Jack Blocks
EN16T	BS970 605M36T	General Alloy Steel. For Use on Stressed Parts not Requiring Case Hardening. Material is supplied in a Fully Heat Treated Condition.	Typically Used for: <ul style="list-style-type: none">- Hook Clamps (Turned)- Support Pins/Jacks- Jack Blocks/Housings
BS1407	BS1407	Silver Steel. Supplied in a Fully Heat Treated Condition	Typically Used for: <ul style="list-style-type: none">- Hard Wearing Location Pins, where Tungsten Carbide is not suitable.
EN34 <i>DIA Ø</i>	BS970 665M17	Case Hardening Steel. Suitable where Accurate Faces/Diameters must be maintained and wear resistance is important. Gauges/Filing Jigs – Rockwell Rc62-65 General Parts – Rc57-62	Typically Used for: <ul style="list-style-type: none">- Plug Gauges- Height Pins- Filing Jigs- Location Buttons/Pads
EN39B	BS970 835M15	Case Hardening Steel. Similar application to 665M17 where improved Core Strength is required.	Typically Used for: <ul style="list-style-type: none">- Gears- Torque Shafts- Collets Etc.
BS970 321S12	BS970 321S12	Stainless Steel. Corrosion Resistant & Weldable Suitable for EDM/FHD Applications.	Typically Used for: <ul style="list-style-type: none">- Preferred for Tooling used during EDM/FHD Operations.
BS1452 GR250	BS1452 Grade 250	Cast Iron Used for Base Plates on Gauges and Wear resistant Applications. Excellent Stability & Strength.	Typically Used for: <ul style="list-style-type: none">- Gauge Base Plates- Wear Strips Etc.

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BS970 080MIS - CASE ITALY PENDING
IF IN DOUBT ASK.

ANY NON-EQUIVALENT MATERIAL
CHANGE MUST BE APPROVED BY
THE DESIGN OFFICE FIRST!



Manufacturing Standards

X

SELECTED FITS FOR ACCURATE TOOLWORK

Selected I.S.O. Fits				
	TYPE OF FIT	REMARKS	I.S.O. HOLE SYMBOL	I.S.O. SHAFT SYMBOL
INTERFERENCE	Press Fit	Soft Hole & Shaft	H7	ε6 up to ε50 r6 over ε50
	Press Fit	Soft Hole, Hard Shaft	H7	r6 up to ε50 p6 over ε50
	Press Fit-Precision	Hard Hole & Shaft	H6	p5
	Light Press	Soft Hole & Shaft Thin wall Section	H7	r6 up to ε50 p6 over ε50
	Light Press	Soft Hole Hard Shaft Thin wall section	H7	p6
	Light Press-Precision	Hard Hole & Shaft Thin wall section	H6	n5
TRANSITION	Tight Fit		H7	k6
	Tight Fit	For Dowel pins	H7	m6
CLEARANCE	Slide Fit		H7	h6
	Glide Fit-Precision		H6	h5
	Glide Fit-Special	For Pivot Pins	F7	m6
	Running Fit-Close		H7	g6
	Running Fit		H7	f7

Notes:

1. Numerical values for the I.S.O. tolerance-symbols according ISO R.286.
2. The general term "Hole" and "Shaft" can be taken as referring to the space containing or contained by two parallel faces of any part, such as width of slot, thickness of a key etc.
3. This standard applies only to the "General Purposes" of I.S.O. recommendation R 286 and covers only the constitution of the common use fits which do not require a more specific selection of tolerance zones. (e.g. Keyways according to I.S.O. R773 and 774) and manufacturers recommendation for fits relating to bearings etc.

Note: The shown I.S.O. Fits are empirically determined.

1) SPOUSE of Copies	2) Check Stamped by	3) MAT/L
4) RETAIN Record Copy	5) Rec Stamped until	6) SUSPENDED
7) CIVIL Schedule Number 5-2-8-1C		

13. ISO Tolerance Limits for Shafts and Holes

13.1. ISO Tolerance Limits for Shafts

Tolerance values in μm ($1 \mu\text{m} = 0,001 \text{ mm}$)

Tolerance zone	Deviation	Nominal dimension in mm																						
		over 3	over 6	over 10	over 18	over 30	over 40	over 50	over 65	over 80	over 100	over 120	over 140	over 160	over 180	over 200	over 225	over 250	over 280	over 315	over 355	over 400	over 450	
a 12	upper	-270	-280	-290	-300	-310	-320	-340	-360	-380	-410	-460	-520	-580	-660	-740	-820	-920	-1050	-1200	-1350	-1500	-1650	
a 12	lower	-390	-430	-470	-510	-560	-570	-640	-660	-730	-760	-860	-920	-980	-1120	-1200	-1280	-1440	-1570	-1770	-1920	-2130	-2280	
a 13	upper	-270	-280	-290	-300	-310	-320	-340	-360	-380	-410	-460	-520	-580	-660	-740	-820	-920	-1050	-1200	-1350	-1500	-1650	
a 13	lower	-450	-500	-560	-630	-700	-710	-800	-820	-920	-950	-1090	-1150	-1210	-1380	-1460	-1540	-1730	-1860	-2090	-2240	-2470	-2620	
c 12	upper	-70	-80	-95	-110	-120	-130	-140	-150	-170	-180	-200	-210	-230	-240	-260	-280	-300	-330	-360	-400	-440	-480	
c 12	lower	-190	-230	-275	-320	-370	-380	-440	-450	-520	-530	-600	-610	-630	-700	-720	-740	-820	-850	-930	-970	-1070	-1110	
d 6	upper	-30	-40	-50	-65	-80	-96	-100	-119	-120	-142	-145	-170	-179	-190	-210	-220	-230	-246	-270				
d 6	lower	-38	-49	-61	-78	-96	-119	-119	-142	-170	-179	-190	-210	-220	-230	-246	-270							
e 6	upper	-20	-25	-32	-40	-50	-66	-60	-79	-72	-94	-85	-100	-110	-125	-146	-110	-125	-135	-161	-175			
e 6	lower	-28	-34	-43	-53	-75	-90	-107	-125	-125	-146	-146	-162	-162	-182	-198								
e 7	upper	-20	-25	-32	-40	-50	-75	-60	-72	-85	-100	-110	-125	-125	-146	-162	-125	-135	-135	-182	-198			
e 7	lower	-32	-40	-50	-61	-75	-90	-107	-125	-125	-146	-146	-162	-162	-182	-198								
e 12	upper	-20	-25	-32	-40	-50	-300	-60	-72	-85	-100	-110	-125	-125	-146	-162	-125	-135	-135	-695	-765			
e 12	lower	-140	-175	-212	-250	-300	-360	-422	-485	-485	-560	-630	-630	-630	-630	-630	-630	-630	-630	-630	-630	-630	-630	
f 5	upper	-10	-13	-16	-20	-25	-36	-30	-43	-36	-51	-43	-50	-61	-70	-56	-62	-68	-79	-87	-95			
f 5	lower	-15	-19	-24	-29	-25	-41	-49	-58	-36	-43	-50	-56	-68	-79	-88	-62	-68	-75	-88	-98	-108		
	upper	-10	-13	-16	-20	-25	-41	-30	-49	-36	-43	-50	-56	-68	-79	-88	-62	-68	-75	-88	-98	-119		
	lower	-18	-22	-27	-33	-50	-60	-71	-83	-36	-43	-50	-56	-68	-79	-88	-62	-68	-75	-88	-98	-119		
g 5	upper	-4	-5	-6	-7	-9	-16	-10	-20	-12	-27	-14	-15	-32	-35	-17	-40	-18	-43	-47				
g 5	lower	-9	-11	-14	-16	-20	-23	-23	-27	-12	-34	-12	-15	-39	-44	-17	-49	-18	-54	-60				
g 6	upper	-4	-5	-6	-7	-9	-17	-10	-25	-12	-34	-14	-15	-39	-44	-17	-49	-18	-54	-60				
g 6	lower	-12	-14	-17	-20	-28	-34	-34	-40	-12	-34	-14	-15	-61	-69	-17	-69	-75	-83					
g 7	upper	-4	-5	-6	-7	-9	-16	-10	-40	-12	-47	-14	-15	-61	-69	-17	-69	-18	-20	-20				
g 7	lower	-16	-20	-24	-28	-34	-40	-40	-47	-12	-47	-14	-15	-61	-69	-17	-69	-75	-83					
h 5	upper	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
h 5	lower	-5	-6	-8	-9	-11	-13	-13	-15	-15	-18	-18	-20	-23	-25	-23	-25	-27	-27	-27	-27	-27	-27	
h 6	upper	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
h 6	lower	-8	-9	-11	-13	-16	-19	-19	-22	-22	-25	-25	-29	-32	-36	-32	-36	-40	-40	-40	-40	-40	-40	
h 7	upper	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
h 7	lower	-12	-15	-18	-21	-25	-30	-35	-40	-40	-46	-46	-52	-57	-63	-52	-57	-63	-63	-63	-63	-63	-63	
h 8	upper	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
h 8	lower	-18	-22	-27	-33	-39	-46	-54	-63	-63	-72	-72	-81	-89	-97	-81	-89	-97	-97	-97	-97	-97	-97	
h 10	upper	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
h 10	lower	-48	-58	-70	-84	-100	-120	-140	-160	-185	-210	-210	-230	-250	-270	-230	-250	-270	-270	-270	-270	-270	-270	
h 11	upper	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
h 11	lower	-75	-90	-110	-130	-160	-190	-220	-250	-290	-320	-320	-360	-360	-360	-360	-360	-360	-360	-360	-360	-400		
h 13	upper	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
h 13	lower	-180	-220	-270	-330	-390	-460	-540	-630	-720	-810	-810	-890	-890	-890	-890	-890	-890	-890	-890	-890	-970		
j 5	upper	+3	+4	+5	+5	+6	+6	+6	+7	+7	+7	+7	+7	+7	+7	+7	+7	+7	+7	+7	+7	+7	+7	
j 5	lower	-2	-2	-3	-3	-4	-5	-7	-9	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	-11	
j 7	upper	+8	+10	+12	+13	+15	+18	+20	+22	+25	+28	+33	+36	+40	+45	+50	+56	+61	+68	+75	+81	+88	+95	
j 7	lower	-4	-5	-6	-8	-10	-12	-15	-18	-20	-22	-25	-33	-36	-40	-45	-50	-56	-61	-68	-75	-81	-88	
js 5	upper	+2,5	+3	+4	+4,5	+5,5	+6,5	+6,5	+8,5	+7,5	+9	+9	+10	+10	+11,5	+11,5	+12,5	+12,5	+13,5	+13,5	+13,5	+13,5		
js 5	lower	-2,5	-3	-4	-4,5	-5,5	-6,5	-6,5	-8,5	-7,5	-11	-11	-11	-11	-11	-11	-12,5	-12,5	-12,5	-12,5	-12,5	-12,5		
js 6	upper	+4	+4,5	+5,5	+6,5	+8	+8	+9,5	+11	+12	+13	+14	+16	+18	+19	+20	+22	+24	+26	+28,5	+31,5	+36	+40	
js 6	lower	-4	-4,5	-5,5	-6,5	-8	-8	-9,5	-11	-12	-13	-14	-16	-18	-18	-18	-18	-18	-18	-18	-18	-18		
js 7	upper	+6	+7,5	+9	+10,5	+12,5	+15	+15	+17,5	+17,5	+20	+20	+23	+23	+26	+26	+28,5	+28,5	+31,5	+31,5	+31,5	+31,5		
js 7	lower	-6	-7,5	-9	-10,5	-12,5	-15	-15	-17,5	-17,5	-20	-20	-23	-23	-26	-26	-28,5	-28,5	-31,5	-31,5	-31,5	-31,5		
k 5	upper	+6	+7	+9	+11	+13	+15	+15	+18	+18	+21	+21	+24	+24	+27	+27	+29	+29	+32	+36	+40	+45		
k 5	lower	+1	+1	+1	+2	+2	+2	+2	+2	+2	+2	+3	+3	+3	+3	+3	+3	+4	+4	+4	+4	+4		
k 6	upper	+9	+10	+12	+15	+18	+21	+21	+24	+25	+28	+28	+32	+32	+36	+36	+39	+39	+43	+48	+56	+61	+68	
k 6	lower	+1	+1	+1	+2	+2	+2	+2	+2	+2	+2	+2	+2	+2	+2	+2	+2	+2	+2	+2	+2	+2		
k 7	upper	+13	+16	+19	+19	+23	+27	+27	+32	+32	+38	+43	+43	+43	+43	+43	+50	+50	+56	+61	+68	+68	+75	
k 7	lower	+1	+1	+1	+2	+2	+2	+2	+2	+2	+2	+3	+3	+3	+3	+3	+4	+4	+4	+4	+4	+4		
m 5	upper	+9	+12	+15	+17	+20	+21	+24	+28	+28	+32	+33	+38	+38	+45	+45	+53	+53	+60	+66	+73	+80	+90	
m 5	lower	+4	+6	+7	+8	+9	+11	+17	+20	+20	+23	+23	+27	+27	+31	+31	+37	+37	+43	+52	+57	+63	+73	
m 6	upper	+12	+15	+18	+21	+24	+25	+28	+33	+33	+39	+39	+45	+45	+52	+52	+60	+60	+66	+73	+80	+90	+100	
m 6	lower	+4	+6	+7	+8	+9	+11	+17	+20	+20	+23	+23	+27	+27	+31	+31	+37	+37	+43	+52	+57	+63	+73	
m 7	upper	+16	+21	+25	+29	+34	+41	+41	+48	+48	+55	+55	+63	+63	+72	+72	+78	+78	+86	+94	+103	+111	+120	
m 7	lower	+4	+6	+7</																				

13.2. ISO Tolerance Limits for Holes

Tolerance values in μm ($1 \mu\text{m} = 0.001 \text{ mm}$)

Tolerance zone	Deviation	Nominal dimension in mm																																																																					
		over 3	over 6	over 10	over 18	over 30	over 40	over 50	over 65	over 80	over 100	over 120	over 140	over 160	over 180	over 200	over 225	over 250	over 280	over 315	over 355	over 400	over 450	over 500	over 560	over 630	over 710	over 800	over 900																																										
		incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.																																											
E 6	upper	+ 28	+ 34	+ 43	+ 53	+ 66	+ 79	+ 94	+ 110	+ 129	+ 142	+ 161	+ 175	+ 189	+ 210	+ 226	+ 210	+ 216	+ 226	+ 210	+ 216	+ 226	+ 210	+ 216	+ 226	+ 210	+ 216	+ 226																																											
E 6	lower	+ 20	+ 25	+ 32	+ 40	+ 50	+ 60	+ 72	+ 85	+ 100	+ 110	+ 125	+ 140	+ 155	+ 170	+ 185	+ 195	+ 210	+ 215	+ 220	+ 215	+ 215	+ 220	+ 210	+ 215	+ 220	+ 210	+ 215	+ 220																																										
E 7	upper	+ 32	+ 40	+ 50	+ 61	+ 75	+ 90	+ 107	+ 125	+ 146	+ 162	+ 182	+ 198	+ 215	+ 240	+ 260	+ 270	+ 280	+ 295	+ 315	+ 355	+ 400	+ 450	+ 500	+ 560	+ 630	+ 710	+ 800	+ 900																																										
E 7	lower	+ 20	+ 25	+ 32	+ 40	+ 50	+ 60	+ 72	+ 85	+ 100	+ 110	+ 125	+ 140	+ 155	+ 170	+ 185	+ 195	+ 210	+ 215	+ 220	+ 215	+ 215	+ 220	+ 210	+ 215	+ 220	+ 210	+ 215	+ 220																																										
E 10	upper	+ 68	+ 83	+ 102	+ 124	+ 150	+ 180	+ 212	+ 245	+ 285	+ 320	+ 355	+ 385	+ 425	+ 480	+ 530	+ 585	+ 660	+ 730	+ 800	+ 900	+ 1000	+ 1100	+ 1200	+ 1300	+ 1400	+ 1500	+ 1600	+ 1700	+ 1800	+ 1900																																								
E 10	lower	+ 20	+ 25	+ 32	+ 40	+ 50	+ 60	+ 72	+ 85	+ 100	+ 110	+ 125	+ 140	+ 155	+ 170	+ 185	+ 195	+ 210	+ 215	+ 220	+ 215	+ 215	+ 220	+ 210	+ 215	+ 220	+ 210	+ 215	+ 220																																										
E 11	upper	+ 95	+ 115	+ 142	+ 170	+ 210	+ 250	+ 292	+ 335	+ 380	+ 430	+ 485	+ 535	+ 585	+ 660	+ 730	+ 800	+ 860	+ 930	+ 1000	+ 1070	+ 1140	+ 1210	+ 1280	+ 1350	+ 1420	+ 1490	+ 1560	+ 1630	+ 1700	+ 1770																																								
E 11	lower	+ 20	+ 25	+ 32	+ 40	+ 50	+ 60	+ 72	+ 85	+ 100	+ 110	+ 125	+ 140	+ 155	+ 170	+ 185	+ 195	+ 210	+ 215	+ 220	+ 215	+ 215	+ 220	+ 210	+ 215	+ 220	+ 210	+ 215	+ 220																																										
E 12	upper	+ 140	+ 175	+ 212	+ 250	+ 300	+ 360	+ 422	+ 485	+ 560	+ 630	+ 695	+ 765	+ 845	+ 920	+ 1000	+ 1070	+ 1140	+ 1210	+ 1280	+ 1350	+ 1420	+ 1490	+ 1560	+ 1630	+ 1700	+ 1770	+ 1840	+ 1910	+ 1980	+ 2050	+ 2120																																							
E 12	lower	+ 20	+ 25	+ 32	+ 40	+ 50	+ 60	+ 72	+ 85	+ 100	+ 110	+ 125	+ 140	+ 155	+ 170	+ 185	+ 195	+ 210	+ 215	+ 220	+ 215	+ 215	+ 220	+ 210	+ 215	+ 220	+ 210	+ 215	+ 220																																										
F 6	upper	+ 18	+ 22	+ 27	+ 33	+ 41	+ 49	+ 58	+ 68	+ 79	+ 88	+ 98	+ 108	+ 120	+ 130	+ 142	+ 152	+ 162	+ 176	+ 188	+ 200	+ 212	+ 222	+ 232	+ 242	+ 252	+ 262	+ 272	+ 282	+ 292	+ 302																																								
F 6	lower	+ 10	+ 13	+ 18	+ 20	+ 25	+ 30	+ 36	+ 43	+ 50	+ 56	+ 62	+ 68	+ 76	+ 80	+ 86	+ 92	+ 98	+ 104	+ 116	+ 126	+ 136	+ 146	+ 156	+ 166	+ 176	+ 186	+ 196	+ 206	+ 216	+ 226	+ 236	+ 246																																						
F 7	upper	+ 22	+ 28	+ 34	+ 41	+ 50	+ 60	+ 71	+ 83	+ 96	+ 108	+ 119	+ 131	+ 146	+ 160	+ 176	+ 192	+ 208	+ 224	+ 240	+ 256	+ 272	+ 288	+ 304	+ 320	+ 336	+ 352	+ 368	+ 384	+ 400	+ 416	+ 432																																							
F 7	lower	+ 10	+ 13	+ 18	+ 20	+ 25	+ 30	+ 36	+ 43	+ 50	+ 56	+ 62	+ 68	+ 76	+ 80	+ 86	+ 92	+ 100	+ 112	+ 125	+ 138	+ 150	+ 162	+ 175	+ 188	+ 200	+ 212	+ 225	+ 238	+ 250	+ 262	+ 275	+ 288	+ 300																																					
F 8	upper	+ 28	+ 35	+ 43	+ 53	+ 64	+ 76	+ 90	+ 106	+ 122	+ 137	+ 151	+ 165	+ 186	+ 205	+ 226	+ 246	+ 268	+ 286	+ 308	+ 332	+ 354	+ 376	+ 398	+ 420	+ 442	+ 464	+ 486	+ 508	+ 530	+ 552	+ 574	+ 596	+ 618																																					
F 8	lower	+ 10	+ 13	+ 18	+ 20	+ 25	+ 30	+ 36	+ 43	+ 50	+ 56	+ 62	+ 68	+ 76	+ 80	+ 86	+ 92	+ 104	+ 116	+ 128	+ 140	+ 152	+ 164	+ 176	+ 188	+ 200	+ 212	+ 224	+ 236	+ 248	+ 260	+ 272	+ 284	+ 296	+ 308																																				
G 6	upper	+ 12	+ 14	+ 17	+ 20	+ 25	+ 29	+ 34	+ 39	+ 44	+ 49	+ 54	+ 60	+ 66	+ 72	+ 78	+ 84	+ 90	+ 96	+ 102	+ 108	+ 114	+ 120	+ 126	+ 132	+ 138	+ 144	+ 150	+ 156	+ 162	+ 168	+ 174	+ 180	+ 186	+ 192																																				
G 6	lower	+ 4	+ 5	+ 6	+ 7	+ 9	+ 10	+ 12	+ 14	+ 15	+ 17	+ 18	+ 20	+ 22	+ 24	+ 26	+ 28	+ 30	+ 32	+ 34	+ 36	+ 38	+ 40	+ 42	+ 44	+ 46	+ 48	+ 50	+ 52	+ 54	+ 56	+ 58	+ 60	+ 62	+ 64	+ 66																																			
G 7	upper	+ 16	+ 20	+ 24	+ 28	+ 34	+ 40	+ 47	+ 54	+ 61	+ 69	+ 75	+ 83	+ 92	+ 104	+ 116	+ 126	+ 136	+ 146	+ 156	+ 166	+ 176	+ 186	+ 196	+ 206	+ 216	+ 226	+ 236	+ 246	+ 256	+ 266	+ 276	+ 286	+ 296	+ 306																																				
G 7	lower	+ 4	+ 5	+ 6	+ 7	+ 9	+ 10	+ 12	+ 14	+ 15	+ 17	+ 18	+ 20	+ 22	+ 24	+ 26	+ 28	+ 30	+ 32	+ 34	+ 36	+ 38	+ 40	+ 42	+ 44	+ 46	+ 48	+ 50	+ 52	+ 54	+ 56	+ 58	+ 60	+ 62	+ 64	+ 66																																			
G 8	upper	+ 22	+ 27	+ 33	+ 40	+ 48	+ 56	+ 66	+ 77	+ 87	+ 98	+ 108	+ 119	+ 132	+ 146	+ 160	+ 176	+ 192	+ 208	+ 224	+ 240	+ 256	+ 272	+ 288	+ 304	+ 320	+ 336	+ 352	+ 368	+ 384	+ 400	+ 416	+ 432	+ 448	+ 464																																				
G 8	lower	+ 4	+ 5	+ 6	+ 7	+ 9	+ 10	+ 12	+ 14	+ 15	+ 17	+ 18	+ 20	+ 22	+ 24	+ 26	+ 28	+ 30	+ 32	+ 34	+ 36	+ 38	+ 40	+ 42	+ 44	+ 46	+ 48	+ 50	+ 52	+ 54	+ 56	+ 58	+ 60	+ 62	+ 64	+ 66																																			
H 6	upper	+ 8	+ 9	+ 11	+ 13	+ 16	+ 19	+ 22	+ 25	+ 29	+ 32	+ 36	+ 40	+ 44	+ 49	+ 54	+ 58	+ 62	+ 66	+ 70	+ 74	+ 78	+ 82	+ 86	+ 90	+ 94	+ 98	+ 102	+ 106	+ 110	+ 114	+ 118	+ 122	+ 126	+ 130	+ 134																																			
H 6	lower	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0																																					
H 7	upper	+ 12	+ 15	+ 18	+ 21	+ 25	+ 30	+ 35	+ 40	+ 46	+ 52	+ 57	+ 63	+ 70	+ 76	+ 80	+ 86	+ 92	+ 98	+ 104	+ 110	+ 116	+ 122	+ 128	+ 134	+ 140	+ 146	+ 152	+ 158	+ 164	+ 170	+ 176	+ 182	+ 188	+ 194	+ 200	+ 206																																		
H 7	lower	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0																																				
H 8	upper	+ 18	+ 22	+ 27	+ 33	+ 39	+ 46	+ 54	+ 63	+ 72	+ 81	+ 89	+ 97	+ 106	+ 115	+ 125	+ 135	+ 145	+ 155	+ 165	+ 175	+ 185	+ 195	+ 205	+ 215	+ 225	+ 235	+ 245	+ 255	+ 265	+ 275	+ 285	+ 295	+ 305	+ 315	+ 325																																			
H 8	lower	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0																																			
H 9	upper	+ 30	+ 36	+ 43	+ 52	+ 62	+ 74	+ 87	+ 100	+ 115	+ 130	+ 140	+ 150	+ 160	+ 170	+ 180	+ 190	+ 200	+ 210	+ 220	+ 230	+ 240	+ 250	+ 260	+ 270	+ 280	+ 290	+ 300	+ 310	+ 320	+ 330	+ 340	+ 350	+ 360	+ 370	+ 380	+ 390	+ 400																																	
H 9	lower	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0																																		
H 10	upper	+ 48	+ 58	+ 70	+ 84	+ 100	+ 120	+ 140	+ 160	+ 185	+ 210	+ 230	+ 250	+ 280	+ 300	+ 320	+ 340	+ 360	+ 380	+ 400	+ 420	+ 440	+ 460	+ 480	+ 500	+ 520	+ 540	+ 560	+ 580	+ 600	+ 620	+ 640	+ 660	+ 680	+ 700	+ 720	+ 740	+ 760	+ 780	+ 800																															
H 10	lower	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0																									
H 11	upper	+ 75	+ 90	+ 110	+ 130	+ 160	+ 190	+ 220	+ 250	+ 290	+ 320	+ 360	+ 400	+ 440	+ 480	+ 520	+ 560	+ 600	+ 640	+ 680	+ 720	+ 760	+ 800	+ 840	+ 880	+ 920	+ 960	+ 1000	+ 1040	+ 1080	+ 1120	+ 1160	+ 1200	+ 1240	+ 1280	+ 1320	+ 1360	+ 1400	+ 1440	+ 1480	+ 1520	+ 1560	+ 1600	+ 1640	+ 1680	+ 1720	+ 1760	+ 1800	+ 1840	+ 1880	+ 1920	+ 1960	+ 2000	+ 2040	+ 2080	+ 2120	+ 2160	+ 2200	+ 2240	+ 2280	+ 2320	+ 2360	+ 2400	+ 2440	+ 2480	+ 2520	+ 2560	+ 2600	+ 2640	+ 2680	+ 2720</

5.0 Convention

This layering convention is applicable to all definitions.

Layer No	Purpose
1	Component Solid (or solution final solids)
2	Manufacturing profiles for turning (Reserved for ME use)
9	2D Cross sectional geometry (as generated law PLMBP223)
10-190	Sketches/Geometry (& associated Datums) <i>SKETCH DATUMS</i>
191-200	Datum Planes & Axes
210	Fixed Datum Planes & Axes
221	DFE aerofoil surfaces
222	Routing Segment Centreline & Identity Marking Surface
223	All Routing Objects excluding Segment Centreline
224-5	Routing - Air Lines (discriminate colour 127)
226-7	Routing - Fuel Lines (discriminate colour 109)
228-9	Routing - Oil Lines (discriminate colour 47)
230-1	Routing - Drains and centrelines (discriminate colour 108)
232-3	Routing - Hydraulics and centrelines (discriminate colour 62)
234-5	Routing - Harness and centrelines (discriminate colour 37)
236-7	Routing - Raceway and centrelines (discriminate colour 173)
240	Routing - Ports
242	Text (including completion of Format), dimensions, labels, weld symbols, geometric's, datum's etc.
243	Dimensions required by PLMOP106 Drawing Definition to be highlighted as non-associative
245	Drafting environment entities
246-249	GD&T Instances
250	'Utility Symbol' centrelines used to create diametrical dimensions. Prior to printing/ issuing this layer is to be echoed off on the drawing sheet. If centrelines need to be visible move to layer 242.
254	Formats and Legends
255	Layer & database information (non-plotting)

NB: For Routing layering, the lower number is for path and stock, the higher number is for fittings etc.

Thread	Thread dia	Cap dia	Circ'drill dia	Chore dia	C'sink dia	C'sink angle	Button hd'ldia	Button hd'thick	Hex A/C	Nut thick	Bolt thick	Washer dia	Washer thick	Tap drill dia coarse	Tap drill dia fine		
1/4" B.S.	6.35	9.5	7.2	11	12.1	90°	11.1	2.6	11.3	13.0	5.1	4.8	3.3	14.2	1.5	5.1	5.3
5/16" B.S.	7.95	11.1	9	13	15.1	90°	13.9	3.4	13.3	15.5	6.4	5.6	4.3	15.7	1.8	6.5	6.8
3/8" B.S.	9.53	14.3	11	16	18.1	90°	16.7	4.2	15.2	17.5	7.6	6.9	5.3	19.1	1.8	7.9	8.5
7/16" B.S.	11.11	15.9	12.7	18	21.1	90°	n.a.	n.a.	18.0	20.8	9.4	8.4	6.4	22.2	2.3	9.25	9.7
1/2" B.S.	12.70	19.0	14	21	24.1	90°	22.2	5.0	20.8	24.1	11.2	9.7	7.4	25.4	2.3	10.5	11.1
5/8" B.S.	15.95	22.2	18	24	30.1	90°	n.a.	n.a.	25.6	29.7	14.2	12.4	9.4	31.8	3.0	13.5	14.0
3/4" B.S.	19.05	25.4	21	28	36.2	90°	n.a.	n.a.	30.5	35.3	17.5	15.2	11.7	38.1	3.6	16.3	16.8
1" B.S.	25.40	33.3	28	36	n.a.	n.a.	n.a.	n.a.	37.6	43.4	22.4	19.6	14.7	47.8	4.1	22.0	22.8
No.4-40 UNC	2.8	4.6	3.2	5.6	6.5	82°	5.4	1.5	4.8	5.5	2.5	2.5	2.5	7.9	0.9	2.3	2.4
No.6-32 UNC	3.5	5.7	4	6.7	7.8	82°	6.7	1.9	6.4	7.3	2.9	2.9	2.9	9.5	1.2	2.6	2.8
No.8-32 UNC	4.2	6.8	4.8	7.8	9.1	82°	7.9	2.2	7.9	9.2	3.3	3.3	3.3	11.1	1.2	3.4	3.5
No.10-32 UNF	4.8	7.9	5.6	9.0	10.4	82°	9.2	2.6	7.9	9.2	3.3	3.3	3.3	12.7	1.2	3.8	4.1
1/4"-20 UNC	6.35	9.5	7.2	11	13.5	82°	11.1	3.4	11.1	12.8	5.6	4.0	4.0	14.2	1.5	5.2	5.5
5/16"-18 UNC	7.95	11.1	9	13	16.7	82°	13.9	4.2	12.7	14.7	6.9	5.3	4.8	15.7	1.8	6.6	6.9
3/8"-16 UNC	9.53	14.3	11	16	19.8	82°	16.7	5.0	14.3	16.5	8.4	6.1	5.6	19.1	1.8	8.0	8.5
7/16"-14 UNC	11.11	15.9	12.7	18	n.a.	n.a.	n.a.	n.a.	15.9	18.3	9.7	7.4	6.6	22.2	2.3	9.4	9.9
1/2"-13 UNC	12.7	19.0	14	21	23.8	82°	22.2	6.7	19.0	22.0	11.2	8.1	8.1	28.4	2.5	10.8	11.4
5/8"-11 UNC	15.95	22.2	18	24	30.2	82°	n.a.	n.a.	23.8	27.5	14.0	10.2	9.5	35.1	3.3	13.5	14.5
3/4"-10 UNC	19.05	25.4	21	28	36.5	82°	n.a.	n.a.	28.6	33.0	16.8	12.2	10.7	41.1	3.6	16.5	17.5
1"-9 UNC	25.40	33.3	28	36	n.a.	n.a.	n.a.	n.a.	38.1	44.0	22.4	16.0	13.9	53.8	4.6	22.3	23.3
Thread	Thread dia	Cap dia	Circ'drill dia	Chore dia	C'sink dia	C'sink angle	Button hd'ldia	Button hd'thick	Hex A/C	Nut thick	Bolt thick	Washer dia	Washer thick	Tap drill dia coarse	Tap drill dia fine		
M3-0.5p	3	5.5	3.4	6	6.7	90°	5.5	1.6	5.5	6.4	2.4	2.0	n.a.	7	0.5	2.5	n.a.
M4-0.7	4	7.0	4.5	8	9.0	90°	7.5	2.1	7.0	8.1	3.2	2.8	n.a.	9	0.8	3.3	n.a.
M5-0.8	5	8.5	5.5	10	11.2	90°	9.5	2.7	8.0	9.2	4.0	3.6	n.a.	10	1.0	4.2	n.a.
M6-1.0	6	10.0	6.6	11	13.4	90°	10.5	3.2	10.0	11.5	5.0	4.0	n.a.	12.5	1.6	5.0	n.a.
M8-1.25	8	13.0	9	15	17.9	90°	14.0	4.3	13.0	15.0	6.5	5.5	5.0	17	1.6	6.8	n.a.
M10-1.5	10	16.0	11	18	22.4	90°	18.0	5.3	17.0	19.6	8.0	7.0	7.0	21	2.0	8.5	n.a.
M12-1.75	12	18.0	14	20	26.9	90°	n.a.	n.a.	19.0	21.9	10.0	8.0	7.0	24	2.5	10.2	n.a.
M16-2.0	16	24.0	18	26	33.6	90°	n.a.	n.a.	24.0	27.0	13.0	10.0	8.0	30	3.0	14.0	n.a.
M20-2.5	20	30.0	22	32	40.3	90°	n.a.	n.a.	30.0	34.6	16.0	13.0	9.0	37	3.0	17.0	n.a.
M24-3.0	24	36.0	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	36.0	41.6	19.0	15.0	10.0	50	4.0	21.0	n.a.
1/8 BSP	9.73															8.75	8.75
1/4 BSP	13.16															11.8	11.8
3/8 BSP	16.66															15.25	15.25
1/2 BSP	20.96															19.05	19.05



Manufacturing Standards



METHOD OF INDICATING SURFACE TEXTURE ON DRAWINGS

1. Scope

This Manufacturing Standard specifies how the surface texture is indicated on drawings for machines, manufacturing equipment, fixtures, tools, gauges etc.. The shown method of definition, the symbols, preferred values ect., are extracted from international Standard ISO 1302.

2. System

The surface roughness value is stated and shown as "arithmetical mean deviation" Ra (previously known as CLA) - and expressed numerically in micrometers (m).

For further information see International Standard ISO 468 and ISO 1302.

ISO symbols for surface texture with Ra values in μm	Comparison with other units or symbols			Surface finish description	Surface produced by:
	Ra μm inch (CLA)	Rt-values acc. to DIN 4767			
may be obtained by any manufacturing method.	—	—		Surface of required uniformity and smoothness as may be attained by careful non-cutting method.	
even ✓	—	—		Surface from which the removal of material by machining is required, but with no requirements of roughness limit.	
✓ no roughness value specified.	—	—			Rough cutting
25 ✓	1000	63 - 160		Surface as achieved by rough machining, on which tool-marks may be felt and discernible to the naked eye.	
6,3 ✓	250	16 - 50			Finish cutting
3,2 ✓	125	10 - 25			
1,6 ✓	63	5 - 16			Fine finish cutting (i.e. grinding, fine boring etc.)
0,8 ✓	32	3,2 - 8			
0,4 ✓	16	1,6 - 4			Superfinishing (i.e. fine grinding, honing, lapping, etc.)
0,2 ✓	8	0,8 - 2		High quality surfaces achieved by super-finish machining.	
0,1 ✓	4	0,4 - 1,25			
0,05 ✓	2	0,25 - 0,63			

When only one value is specified it represents the max. permissible value of surface roughness. If the surface roughness must be limited, the max. and min. Ra-value shall be shown.

If not otherwise specified: Sampling length (= roughness width out-off) to be 0,8mm and shall in a direction which gives the max. reading (normally across the lay).



Carbon Steel Bars

USA MILD

'20 Carbon Steel
compliance

Bright Flats As Drawn / Rolled

Colour code: Red / Blue

BS 970 1955 En3B
BS 970 1983 070M20

Size (mm.)						
8× 2	25× 1.5	40× 3	55× 5	70× 6	100× 5	140× 6
	25× 2	40× 5	55× 6	70×10	100× 6	140×10
	25× 3	40× 6	55×10	70×12	100×10	140×12
	25× 4	40× 8	55×12	70×16	100×12	
	25× 5	40×10	55×16	70×20	100×16	
10× 1.5	25× 6	40×12	55×20	70×25	100×20	
10× 2	25× 8	40×16	55×25	70×30	100×25	
10× 3	25×10	40×20	55×30	70×35	100×30	150×10
10× 5	25×12	40×25	55×40	70×40	100×40	150×12
10× 6	25×16	40×30		70×50	100×50	150×16
	25×20				100×65	150×20
					100×75	150×25
						150×30
12× 3		45× 5	60× 6	75× 6		
12× 5		45× 6	60× 8	75× 8		
12× 6	30× 3	45× 8	60×10	75×10		
12×10	30× 4	45×10	60×12	75×12		
	30× 5	45×12	60×16	75×16	110×10	160× 6
	30× 6	45×16	60×20	75×20	110×12	160×10
	30× 8	45×20	60×25	75×25	110×16	160×12
	30×10	45×25	60×30	75×35	110×20	160×16
15× 1.5	30×12	45×30	60×40	75×40	110×25	160×20
15× 3	30×16	45×35			110×30	160×25
15× 4	30×20	45×40			110×40	160×30
15× 5	30×25				110×50	160×40
15× 6						160×50
15× 8						
15×10					180× 3	
					80× 6	
					80×10	
		+50× 3	65× 5			
		50× 5	65× 6	80×12		
	32× 3	50× 6	65×10	80×16	125× 6	200×10
	32× 5	50× 8	65×12	80×20	125× 8	200×12
16× 3	32× 6	50×10	65×16	80×25	125×10	200×20
16× 5	32× 8	50×12	65×20	80×30	125×12	200×25
16× 6	32×10	50×16	65×25	80×40	125×16	
16×10	32×12	50×20	65×30	80×50	125×20	
16×12	32×16	50×25	65×40		125×25	
	32×20	50×30	65×50		125×30	
		50×35			125×40	
		50×40			125×50	
20× 1.5						
20× 2				90× 6		
20× 3				90×10		
20× 4	35× 6			90×12		
20× 5	35× 8			90×16		
20× 6	35×10			90×20	130× 6	
20× 8	35×16			90×25	130×10	
20×10	35×20			90×30	130×16	
20×12	35×25			90×40	130×20	
20×15	35×30			90×50	130×25	

Hot Rolled Bars As Rolled

Colour code: Red / Blue.

BS 970: 1955 73B
BS 970: 1983 070M20

Carbon Steel Bars

43C8 Pa. ≈ 28 Tons

USAMILD

20th Carbon Steel

BS 970: 1955 En3B

BS 970: 1983 070M20

MECHANICAL PROPERTIES

Condition	Size Range or LRS mm	Tensile Strength N/mm ²	Yield Strength N/mm ² min.	Elongation % min.	Izod ft.lb. min.	KCV J min.	0.2% Proof Stress N/mm ² min.	Hardness HB
Hot rolled + cold drawn	—	430 min.	—	12	—	—	—	—
GENERAL INFORMATION								
A mild steel used for general engineering purposes. Suitable for lightly stressed components including bolts, studs, shafts etc... It possesses good machining properties and is weldable.								

Chemical Composition		
C	%	0.25 max.
Mn	%	1.00 max.
Si	%	0.35 max.
S	%	0.060 max.
P	%	0.060 max.

Bright Round Bars As Drawn / Turned

Colour code: Red / Blue

BS 970: 1955 En3B
BS 970: 1983 070M20

Size (ins. dia.)	1/8	3/16	1/4	5/16	3/8	7/16	1/2	9/16	5/8	11/16	3/4	1 3/16	7/8	15/16	1	1 1/16
	1 1/8	1 3/16	1 1/4	1 5/16	1 3/8	1 7/16	1 1/2	1 5/8	1 3/4	1 7/8	2	2 1/8	2 1/4	2 3/8	2 1/2	2 5/8
	2 3/4	2 7/8	3	3 1/8	3 1/4	3 3/8	3 1/2	3 5/8	3 3/4	4	4 1/4	4 1/2	4 3/4	5	5 1/4	5 1/2
	5 3/4	6	6 1/4	6 1/2	6 3/4	7	7 1/4	7 1/2	8	8 1/2	9	9 1/2	10	10 1/2	11	12
	13	14	15	16												
Size (mm. dia.)	3	4	5	6	6.5	7	8	9	10	11	12	13	14	15	16	17
	18	19	20	22	24	25	26	27	28	30	32	33	35	36	38	39
	40	42	45	48	50	52	55	56	60	65	70	75	80	85	90	95
	100	105	110	115	120	125	130	140	150	160	180	190	200			

Bright Hexagon Bars As Drawn

Colour code: Red / Blue

BS 970: 1955 En3B
BS 970: 1983 070M20

Size (ins. A/F)	445	500	525	562	601	.625	687	710	750	812	820	875	920	.937	1.000	1.010
	1.100	1.125	1.200	1.250	1.300	1.500	1.670	1.860	1.875	2.000	2.048	2.220	2.410	2.580	2.760	3.150
	3.550															

Bright Square Bars As Drawn

Colour code: Red / Blue

BS 970: 1955 En3B
BS 970: 1983 070M20

Size (ins. sq.)	1/8	3/16	1/4	5/16	3/8	7/16	1/2	5/8	3/4	7/8	1	1 1/8	1 1/4	1 3/8	1 1/2	1 5/8
	1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/2	4	4 1/2	5	5 1/2	6				
Size (mm. sq.)	4	6	8	10	12	13	14	15	16	18	20	22	25	30	32	35
	40	45	50	55	60	65	70	75	80	90	100					

Material		TDS 300		Previous Identity
	Section	Page		
<u>STRUCTURAL MILD STEEL</u>				
Bar BS 970 070M20	4	1Y01	BS 4360 Grade 43A	En 3
Plate BS 4360 Grade 43A	4	1		BS-15
Sheet BS 1449 CR4/GP	4	3		S/MN
Tube BS 6323 CFS 3 BK BS 3601/2 (HFS)	4	2002	BS980 CDS 2	S/D
Rectangular Hollow Section RHS BS 4360 Grade 43C	4	3023	RHS	BS 15 S/MN
<u>HIGHER CARBON STEEL</u>				
Bar BS 970 080M40	4	1,302	ASME	En 8,9
<u>CASE HARDENING STEEL</u>				
Bar BS 970 665M17 835M15 722M24	5	2		En 33,34
				En 39B
				En 40B
<u>HIGHER TENSILE STEEL</u>				
Bar BS 970 605M36T 817M40T 835M30 817M40X	5	1		En 16T
				En 24T
				En 30B
<u>SPRING STEEL</u>				
Flat BS 970 070A78	5	2		EN42
Coil BS 5216 NS Grade 3				BS1408B
				range 3
<u>SILVER STEEL</u>				
Bar BS 1407	5	2		S/SR
<u>STAINLESS STEEL</u>				
Preferred for welding			(O)	
Bar BS 970 321S12	6			
Sheet BS 1449 321S12				
Tube BS 3065 316S18				
Not preferred for welding				
Bar BS 970 316S16	6			
Plate BS 1449 316S16				

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ISSUE & DATE	1 22/11/76	2) JUNE '87	DEVON 14
COMPILED	SIC/FC	I. WINTERTON	DEVON 14
ENDORSED		G	DEVON 14
APPROVED	K	G	DEVON 14



MANUFACTURING AND PRODUCTION STANDARDS

ROLLS-ROYCE plc, OR

Material	TDS 300		Previous Identity
	Section	Page	
<u>HEAT RESISTING STEEL</u>	11	100	JAR 171
<u>PIPE BENDING ALLOY</u>	12	170	64-12
<u>NON-DISTORT WEAR RESISTING STEELS</u>	12	170	64-12
Spec'd 0.95%			
Bar CNE BS 4659	BD3	3	BS 4659 100 as S/NWT
Gauge Steel			
Bar BS 4659	B01	3	BS 4659 100 as S/NWT
Plate BS 4659	B01 (Flat Stock)	3	Gauge Steel
Forgings BS 4659	BA6	3	Carrs 35B
Bar BS 970	722M24	3	Hykro
Bar BS 970	534A99	3	EN 31
<u>HIGH SPEED STEEL</u>			
CSS 10/M2			HSS 562
CSS 10/T1			HSS 18.4.1
CSS 10/M42			HSS 9M8
CSS 10/M15			HSS 35V
<u>DIE STEELS - HOT WORK</u>			
CSS 11/H13			
CSS 11/H10A			
<u>CAST IRON</u>			
Bar BS 1452	Grade 260	7	I/C Grade 17 B.S.1452 Grade 17
General Casting			
BS 1452	Grade 260		
BS 1452	Grade 300	7	I/C 20 B.S.1452 Grade 17 B.S.1452 Grade 20
<u>COPPER AND COPPER ALLOYS</u>			
99.9% Pure Copper			
BS 2874 C101 (O)			
BS 1400 HCC1-C			
72/28 Tungsten Copper			
Enfield Roll Mill NS			
Enfield Roll Mill 3A			
BS 3071 NA2			

MANUFACTURING AND
PRODUCTION STANDARDS
ROLLS-ROYCE plc



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4/July 87

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MATERIALS INDEX - DETAILED REFERENCE

PAGE 3

MATERIALS INDEX - DETAILED REFERENCE		PAGE 3
Material	TDS 300	Previous Identity
Section	Page	
COPPER AND COPPER ALLOYS (continued)		
High Tensile Brass BS 1400 HTB2-C	63	HTB
BS 2874 CZ114M		SM319/2X
Half Hard Brass BS 2870 CZ108	8	12.5.7.5
Leaded Brass BS 2874 CZ121M	13	13.5.1.10
Phos. Bronze Bar BS 2874 PB102		BZ/PD
Phos. Bronze Cast BS 1400 PB1		BZ/PC
ALUMINIUM AND ALUMINIUM ALLOYS		
Aluminium Rod BS 1474 HE15W BS 1474 HE30WP		Dural
Casting Alloy BS 3L51		
Dural Sheet BS 1470 HS30WP	9	1
Aluminium Sheet BS 1470/NS4		
Aluminium Plate BS 1470 HP30WP		
Dural Strip BS 1474 HE15WP	9	2
Aluminium Bronze Narite H.T. Alloy		
TUFNOL		
GRADE 6F/45 BS 3953 EP 1 & 2 BS 2572 Type P3	10	1
BS PL3 Type C BS 2572 Type F1		Tufnol 10G/40 Tufnol "KITE"
LAMINATED GLASS	10	Tufnol "CROW" Tufnol "CARP"
DELRIN 150 SERIES	2	L/EG

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MANUFACTURING AND
PRODUCTION STANDARDS
ROLLS-ROYCE plc

mm	up	H 6	H 7	F 7	f 7	g 6	h 5	k 6	m 6.	n 5	P 5	P 6	r 6	s 6
0	10	0	16	6	6	16	2	8	0	4	0	6	0	+
3	6	0	12	0	22	10	10	22	4	12	0	5	0	+
6	9	0	15	0	28	13	13	28	5	14	0	6	0	+
10	11	0	18	0	34	16	16	34	6	17	0	9	10	+
18	30	13	0	21	0	41	20	20	7	20	0	9	0	+
30	50	16	0	25	0	50	25	25	0	11	0	16	2	+
50	65	19	0	30	0	60	30	30	60	10	29	0	19	2
65	80	100	22	0	35	0	71	36	36	71	12	34	0	15
80	100	120	0	35	0	71	36	36	71	12	34	0	15	0
100	120	140	25	0	40	0	83	43	83	14	39	0	25	3
120	140	160	25	0	40	0	83	43	83	14	39	0	25	3
140	160	180	25	0	40	0	83	43	83	14	39	0	25	3
160	180	200	25	0	46	0	96	50	50	15	44	0	20	0
180	200	225	29	0	46	0	96	50	50	15	44	0	20	0
225	250	250	32	0	52	0	108	56	56	17	49	0	23	0
250	280	280	32	0	52	0	108	56	56	17	49	0	23	0
280	315	315	32	0	52	0	108	56	56	17	49	0	23	0
315	355	360	32	0	57	0	119	62	62	18	54	0	25	0
355	400	400	36	0	57	0	119	62	62	18	54	0	25	0
400	450	450	40	0	63	0	131	68	68	18	54	0	25	0
450	500	500	40	0	63	0	131	68	68	18	54	0	25	0
500	550	550	40	0	63	0	131	68	68	18	54	0	25	0
550	600	600	40	0	63	0	131	68	68	18	54	0	25	0
600	650	650	40	0	63	0	131	68	68	18	54	0	25	0
650	700	700	40	0	63	0	131	68	68	18	54	0	25	0
700	750	750	40	0	63	0	131	68	68	18	54	0	25	0
750	800	800	40	0	63	0	131	68	68	18	54	0	25	0
800	850	850	40	0	63	0	131	68	68	18	54	0	25	0
850	900	900	40	0	63	0	131	68	68	18	54	0	25	0
900	950	950	40	0	63	0	131	68	68	18	54	0	25	0
950	1000	1000	40	0	63	0	131	68	68	18	54	0	25	0
1000	1050	1050	40	0	63	0	131	68	68	18	54	0	25	0
1050	1100	1100	40	0	63	0	131	68	68	18	54	0	25	0
1100	1150	1150	40	0	63	0	131	68	68	18	54	0	25	0
1150	1200	1200	40	0	63	0	131	68	68	18	54	0	25	0
1200	1250	1250	40	0	63	0	131	68	68	18	54	0	25	0
1250	1300	1300	40	0	63	0	131	68	68	18	54	0	25	0
1300	1350	1350	40	0	63	0	131	68	68	18	54	0	25	0
1350	1400	1400	40	0	63	0	131	68	68	18	54	0	25	0
1400	1450	1450	40	0	63	0	131	68	68	18	54	0	25	0
1450	1500	1500	40	0	63	0	131	68	68	18	54	0	25	0
1500	1550	1550	40	0	63	0	131	68	68	18	54	0	25	0
1550	1600	1600	40	0	63	0	131	68	68	18	54	0	25	0
1600	1650	1650	40	0	63	0	131	68	68	18	54	0	25	0
1650	1700	1700	40	0	63	0	131	68	68	18	54	0	25	0
1700	1750	1750	40	0	63	0	131	68	68	18	54	0	25	0
1750	1800	1800	40	0	63	0	131	68	68	18	54	0	25	0
1800	1850	1850	40	0	63	0	131	68	68	18	54	0	25	0
1850	1900	1900	40	0	63	0	131	68	68	18	54	0	25	0
1900	1950	1950	40	0	63	0	131	68	68	18	54	0	25	0
1950	2000	2000	40	0	63	0	131	68	68	18	54	0	25	0
2000	2050	2050	40	0	63	0	131	68	68	18	54	0	25	0
2050	2100	2100	40	0	63	0	131	68	68	18	54	0	25	0
2100	2150	2150	40	0	63	0	131	68	68	18	54	0	25	0
2150	2200	2200	40	0	63	0	131	68	68	18	54	0	25	0
2200	2250	2250	40	0	63	0	131	68	68	18	54	0	25	0
2250	2300	2300	40	0	63	0	131	68	68	18	54	0	25	0
2300	2350	2350	40	0	63	0	131	68	68	18	54	0	25	0
2350	2400	2400	40	0	63	0	131	68	68	18	54	0	25	0
2400	2450	2450	40	0	63	0	131	68	68	18	54	0	25	0
2450	2500	2500	40	0	63	0	131	68	68	18	54	0	25	0
2500	2550	2550	40	0	63	0	131	68	68	18	54	0	25	0
2550	2600	2600	40	0	63	0	131	68	68	18	54	0	25	0
2600	2650	2650	40	0	63	0	131	68	68	18	54	0	25	0
2650	2700	2700	40	0	63	0	131	68	68	18	54	0	25	0
2700	2750	2750	40	0	63	0	131	68	68	18	54	0	25	0
2750	2800	2800	40	0	63	0	131	68	68	18	54	0	25	0
2800	2850	2850	40	0	63	0	131	68	68	18	54	0	25	0
2850	2900	2900	40	0	63	0	131	68	68	18	54	0	25	0
2900	2950	2950	40	0	63	0	131	68	68	18	54	0	25	0
2950	3000	3000	40	0	63	0	131	68	68	18	54	0	25	0
3000	3050	3050	40	0	63	0	131	68	68	18	54	0	25	0
3050	3100	3100	40	0	63	0	131	68	68	18	54	0	25	0
3100	3150	3150	40	0	63	0	131	68	68	18	54	0	25	0
3150	3200	3200	40	0	63	0	131	68	68	18	54	0	25	0
3200	3250	3250	40	0	63	0	131	68	68	18	54	0	25	0
3250	3300	3300	40	0	63	0	131	68	68	18	54	0	25	0
3300	3350	3350	40	0	63	0	131	68	68	18	54	0	25	0
3350	3400	3400	40	0	63	0	131	68	68	18	54	0	25	0
3400	3450	3450	40	0	63	0	131	68	68	18	54	0	25	0
3450	3500	3500	40	0	63	0	131	68	68	18	54	0	25	0
3500	3550	3550	40	0	63	0	131	68	68	18	54	0	25	0
3550	3600	3600	40	0	63	0	131	68	68	18	54	0	25	0
3600	3650	3650	40	0	63	0	131	68	68	18	54	0	25	0
3650	3700	3700	40	0	63	0	131	68	68	18	54	0	25	0
3700	3750	3750	40	0	63	0	131	68	68	18	54	0	25	0
3750	3800	3800	40	0	63	0	131	68	68	18	54	0	25	0
3800	3850	3850	40	0	63	0	131	68	68	18	54	0	25	0
3850	3900	3900	40	0	63	0	131	68	68	18	54	0	25	0
3900	3950	3950	40	0	63	0	131	68	68	18	54	0	25	0
3950	4000	4000	40	0	63	0	131	68	68	18	54	0	25	0
4000	4050	4050	40	0	63	0	131	68	68	18	54	0	25	0
4050	4100	4100	40	0	63	0	131	68	68	18	54	0	25	0
4100	4150	4150	40	0	63	0	131	68	68	18	54	0	25	0
4150	4200	4200	40	0	63	0	131	68	68	18	54	0	25	0
4200	4250	4250	40	0	63	0	131	68	68	18	54	0	25	0
4250	4300	4300	40	0	63	0	131	68	68	18	54	0	25	0
4300	4350	4350												

Table 30 - ISO tolerance limits for shafts

Nominal dimension in mm		Tolerance values in μm ($1 \mu\text{m} = 0.001 \text{mm}$)																						
		over				over				over				over				over				over		
Deviation zone	Ratio	3	6	10	18	30	40	50	65	80	100	120	140	160	180	200	225	250	280	315	355	400	450	
		incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.
a12	upper	-270	-280	-290	-300	-310	-320	-340	-360	-380	-410	-460	-520	-580	-660	-740	-820	-920	-1050	-1200	-1350	-1500	-1650	
	lower	-390	-430	-470	-510	-560	-570	-640	-660	-730	-760	-860	-920	-980	-1120	-1200	-1280	-1440	-1570	-1770	-1920	-2130	-2280	
a13	upper	-270	-280	-290	-300	-310	-320	-340	-360	-380	-410	-460	-520	-580	-660	-740	-820	-920	-1050	-1200	-1350	-1500	-1650	
	lower	-450	-500	-560	-630	-700	-710	-800	-820	-920	-950	-1090	-1150	-1210	-1380	-1460	-1540	-1730	-1860	-2090	-2240	-2470	-2620	
c12	upper	-70	-80	-95	-110	-120	-130	-140	-150	-170	-180	-200	-210	-230	-240	-260	-280	-300	-330	-360	-400	-440	-480	
	lower	-190	-230	-275	-320	-370	-380	-440	-450	-520	-530	-600	-610	-630	-700	-720	-740	-820	-850	-930	-970	-1070	-1110	
d6	upper	-30	-40	-50	-65	-80	-96	-119	-142	-170	-199	-222	-246	-270	-300	-330	-360	-390	-420	-450	-480	-510	-540	
	lower	-38	-49	-61	-78	-96	-119	-142	-170	-199	-222	-246	-270	-300	-330	-360	-390	-420	-450	-480	-510	-540	-570	
e6	upper	-20	-25	-32	-40	-50	-60	-72	-85	-100	-110	-129	-142	-161	-180	-200	-220	-240	-260	-280	-300	-320	-340	
	lower	-28	-34	-43	-53	-66	-79	-94	-110	-129	-142	-161	-175	-194	-213	-232	-251	-270	-289	-308	-327	-346	-365	
e12	upper	-20	-25	-32	-40	-50	-60	-72	-85	-100	-110	-129	-142	-161	-180	-200	-220	-240	-260	-280	-300	-320	-340	
	lower	-140	-175	-212	-250	-300	-360	-422	-485	-560	-630	-695	-765	-830	-900	-970	-1040	-1110	-1180	-1250	-1320	-1390	-1460	
f5	upper	-10	-13	-16	-20	-25	-30	-36	-43	-51	-61	-70	-80	-90	-100	-110	-120	-130	-140	-150	-160	-170	-180	
	lower	-15	-19	-24	-29	-36	-43	-51	-61	-70	-80	-90	-100	-110	-120	-130	-140	-150	-160	-170	-180	-190	-200	
f6	upper	-10	-13	-16	-20	-25	-30	-36	-43	-51	-61	-70	-80	-90	-100	-110	-120	-130	-140	-150	-160	-170	-180	
	lower	-18	-22	-27	-33	-41	-49	-58	-68	-77	-86	-96	-105	-115	-125	-135	-145	-155	-165	-175	-185	-195	-205	
f7	upper	-10	-13	-16	-20	-25	-30	-36	-43	-51	-61	-70	-80	-90	-100	-110	-120	-130	-140	-150	-160	-170	-180	
	lower	-22	-28	-34	-41	-50	-60	-71	-83	-96	-108	-120	-132	-144	-156	-168	-180	-192	-204	-216	-228	-240	-252	
g5	upper	-4	-5	-6	-7	-8	-10	-12	-14	-16	-23	-27	-32	-36	-43	-50	-56	-62	-68	-74	-80	-86	-92	
	lower	-9	-11	-14	-16	-20	-25	-30	-36	-43	-51	-61	-71	-81	-91	-101	-111	-121	-131	-141	-151	-161	-171	
g6	upper	-4	-5	-6	-7	-9	-10	-12	-14	-16	-17	-18	-19	-20	-21	-22	-23	-24	-25	-26	-27	-28	-29	
	lower	-12	-14	-17	-20	-25	-29	-34	-39	-44	-49	-54	-59	-64	-69	-74	-79	-84	-89	-94	-99	-104	-109	
g7	upper	-4	-5	-6	-7	-9	-10	-12	-14	-16	-17	-18	-19	-20	-21	-22	-23	-24	-25	-26	-27	-28	-29	
	lower	-16	-20	-24	-28	-34	-40	-47	-54	-61	-68	-75	-82	-89	-96	-103	-110	-117	-124	-131	-138	-145	-152	
h4	upper	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	lower	-4	-4	-5	-6	-7	-8	-9	-10	-11	-12	-13	-14	-15	-16	-17	-18	-19	-20	-21	-22	-23	-24	
h5	upper	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	lower	-5	-6	-8	-9	-11	-13	-16	-19	-22	-25	-28	-31	-34	-37	-40	-43	-46	-49	-52	-55	-58	-61	
h6	upper	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	lower	-8	-9	-11	-13	-16	-19	-22	-25	-28	-31	-34	-37	-40	-43	-46	-49	-52	-55	-58	-61	-64	-67	
h7	upper	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	lower	-12	-15	-18	-21	-25	-30	-35	-40	-46	-54	-63	-72	-81	-90	-99	-108	-117	-126	-135	-144	-153	-162	
h8	upper	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	lower	-18	-22	-27	-33	-39	-46	-54	-63	-72	-81	-90	-99	-108	-117	-126	-135	-144	-153	-162	-171	-180	-189	
h10	upper	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	lower	-48	-58	-70	-84	-100	-120	-140	-160	-185	-210	-230	-250	-270	-290	-310	-330	-350	-370	-390	-410	-430	-450	
h11	upper	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	lower	-10	-12	-15	-18	-21	-25	-30	-35	-40	-46	-54	-63	-72	-81	-90	-99	-108	-117	-126	-135	-144	-153	

	lower	-180	-220	-270	-330	-390	-460	-540	-630	-720	-810	-890	-890	-970
j5	upper	+ 3 + 4	+ 5 + 5	+ 5 + 4	+ 5 + 3	+ 6 + 3	+ 6 + 7	+ 6 + 9	+ 6 + 11	+ 7 + 13	+ 7 + 16	+ 7 + 16	+ 7 + 18	+ 7 + 20
j5	lower	- 2 - 2	- 3 - 3	- 3 - 4	- 4 - 3	- 7 - 3	- 7 - 7	- 9 - 7	- 9 - 11	- 11 - 13	- 13 - 16	- 16 - 16	- 16 - 18	- 16 - 20
j6	upper	+ 6 + 7	+ 8 + 9	+ 9 + 11	+ 11 + 12	+ 13 + 12	+ 14 + 13	+ 14 + 11	+ 14 + 11	+ 16 + 13	+ 16 + 16	+ 16 + 16	+ 18 + 18	+ 18 + 20
j6	lower	- 2 - 2	- 3 - 3	- 4 - 5	- 5 - 5	- 7 - 7	- 9 - 7	- 9 - 7	- 11 - 9	- 13 - 13	- 13 - 16	- 16 - 16	- 18 - 18	- 18 - 20
j7	upper	+ 8 + 10	+ 12 + 13	+ 13 + 15	+ 15 + 18	+ 20 + 18	+ 22 + 20	+ 22 + 18	+ 25 + 21	+ 25 + 21	+ 26 + 26	+ 26 + 26	+ 29 + 29	+ 31 + 32
j7	lower	- 4 - 5	- 5 - 6	- 6 - 8	- 8 - 10	- 10 - 12	- 12 - 15	- 15 - 15	- 18 - 18	- 21 - 21	- 26 - 26	- 26 - 26	- 28 - 28	- 32 - 32
js5	upper	+ 2,5 + 3	+ 4 + 4,5	+ 4,5 + 5,5	+ 5,5 + 5,5	+ 6,5 + 6,5	+ 7,5 + 7,5	+ 9 + 9	+ 10 + 9	+ 10 + 10	+ 11,5 + 11,5	+ 12,5 + 12,5	+ 12,5 + 12,5	+ 13,5 + 13,5
js5	lower	- 2,5 - 3	- 4 - 4	- 4 - 4,5	- 4,5 - 5,5	- 5,5 - 6,5	- 6,5 - 6,5	- 9,5 - 9,5	- 11 - 11	- 11 - 12,5	- 12,5 - 14,5	- 14,5 - 14,5	- 16 - 16	- 18 - 18
js6	upper	+ 4 + 4,5	+ 5,5 + 6,5	+ 6,5 + 6,5	+ 8 + 8	+ 9,5 + 9,5	+ 11 + 11	+ 12,5 + 12,5	+ 14,5 + 14,5	+ 14,5 + 14,5	+ 16 + 16	+ 18 + 18	+ 20 + 20	
js6	lower	- 4 - 4,5	- 5,5 - 6,5	- 6,5 - 6,5	- 8 - 8	- 9,5 - 9,5	- 11 - 11	- 12,5 - 12,5	- 14,5 - 14,5	- 14,5 - 14,5	- 16 - 16	- 18 - 18	- 20 - 20	
js7	upper	+ 6 + 7,5	+ 9 + 10,5	+ 10,5 + 12,5	+ 12,5 + 15	+ 15 + 15	+ 17,5 + 17,5	+ 20 + 20	+ 23 + 23	+ 23 + 23	+ 26 + 26	+ 28,5 + 28,5	+ 31,5 + 31,5	
js7	lower	- 6 - 7,5	- 9 - 10,5	- 10,5 - 12,5	- 12,5 - 15	- 15 - 15	- 17,5 - 17,5	- 20 - 20	- 23 - 23	- 23 - 23	- 26 - 26	- 28,5 - 28,5	- 31,5 - 31,5	
k5	upper	+ 6 + 7	+ 9 + 11	+ 11 + 13	+ 13 + 15	+ 15 + 15	+ 17,5 + 18	+ 20 + 21	+ 23 + 21	+ 23 + 21	+ 26 + 24	+ 27 + 27	+ 29 + 29	
k5	lower	- 6 - 7	- 9 - 11	- 11 - 12	- 12 - 15	- 15 - 15	- 17,5 - 17,5	- 20 - 20	- 23 - 23	- 23 - 23	- 26 - 24	- 27 - 24	- 29 - 24	
k6	upper	+ 9 + 10	+ 12 + 15	+ 15 + 18	+ 18 + 21	+ 21 + 21	+ 25 + 25	+ 28 + 28	+ 28 + 28	+ 28 + 28	+ 33 + 33	+ 36 + 36	+ 40 + 40	
k6	lower	- 1 + 1	- 1 + 2	- 1 + 2	- 2 + 2	- 2 + 2	- 3 + 3	- 3 + 3	- 3 + 3	- 3 + 3	- 4 + 4	- 4 + 4	- 4 + 4	
k7	upper	+ 13 + 16	+ 19 + 23	+ 23 + 27	+ 27 + 27	+ 32 + 32	+ 38 + 38	+ 43 + 43	+ 43 + 43	+ 43 + 43	+ 50 + 50	+ 56 + 56	+ 61 + 61	
k7	lower	+ 1 + 1	+ 1 + 2	+ 1 + 2	+ 2 + 2	+ 2 + 2	+ 3 + 3	+ 3 + 3	+ 3 + 3	+ 3 + 3	+ 4 + 4	+ 4 + 4	+ 4 + 4	
m5	upper	+ 9 + 12	+ 15 + 17	+ 17 + 20	+ 20 + 24	+ 24 + 24	+ 28 + 28	+ 33 + 33	+ 37 + 37	+ 37 + 37	+ 43 + 43	+ 46 + 46	+ 50 + 50	
m5	lower	- 4 + 6	- 7 + 8	- 8 + 9	- 9 + 9	- 11 + 11	- 13 + 11	- 13 + 11	- 15 + 15	- 15 + 15	- 20 + 20	- 21 + 21	- 23 + 23	
m6	upper	+ 12 + 15	+ 18 + 21	+ 21 + 25	+ 25 + 29	+ 30 + 30	+ 35 + 35	+ 40 + 40	+ 46 + 46	+ 46 + 46	+ 52 + 52	+ 57 + 57	+ 63 + 63	
m6	lower	- 4 + 6	- 7 + 8	- 8 + 9	- 9 + 9	- 11 + 11	- 13 + 11	- 13 + 11	- 15 + 15	- 15 + 15	- 20 + 20	- 21 + 21	- 23 + 23	
m7	upper	+ 16 + 21	+ 25 + 29	+ 29 + 34	+ 34 + 41	+ 41 + 41	+ 48 + 48	+ 55 + 55	+ 63 + 63	+ 63 + 63	+ 72 + 72	+ 78 + 78	+ 86 + 86	
m7	lower	- 4 + 6	- 7 + 8	- 8 + 9	- 9 + 9	- 11 + 11	- 13 + 11	- 13 + 11	- 15 + 15	- 15 + 15	- 20 + 20	- 21 + 21	- 23 + 23	
n5	upper	+ -13 + 16	+ 20 + 24	+ 24 + 28	+ 28 + 33	+ 33 + 33	+ 38 + 38	+ 45 + 45	+ 51 + 51	+ 51 + 51	+ 57 + 57	+ 62 + 62	+ 67 + 67	
n5	lower	- 8 + 10	- 12 + 15	- 15 + 17	- 17 + 20	- 20 + 20	- 23 + 23	- 27 + 27	- 31 + 31	- 31 + 31	- 34 + 34	- 37 + 37	- 40 + 40	
n6	upper	+ 16 + 19	+ 23 + 28	+ 28 + 33	+ 33 + 39	+ 39 + 39	+ 45 + 45	+ 52 + 52	+ 60 + 60	+ 66 + 66	+ 73 + 73	+ 80 + 80		
n6	lower	- 8 + 10	- 12 + 15	- 15 + 17	- 17 + 20	- 20 + 20	- 23 + 23	- 27 + 27	- 31 + 31	- 31 + 31	- 34 + 34	- 37 + 37	- 40 + 40	
n7	upper	+ 20 + 25	+ 30 + 36	+ 36 + 42	+ 42 + 50	+ 50 + 58	+ 67 + 67	+ 77 + 77	+ 86 + 86	+ 86 + 86	+ 94 + 94	+ 103 + 103		
n7	lower	- 8 + 10	- 12 + 15	- 15 + 17	- 17 + 20	- 20 + 20	- 23 + 23	- 27 + 27	- 31 + 31	- 31 + 31	- 34 + 34	- 37 + 37	- 40 + 40	
p5	upper	+ 17 + 21	+ 26 + 31	+ 31 + 37	+ 37 + 45	+ 45 + 45	+ 52 + 52	+ 70 + 70	+ 79 + 79	+ 79 + 79	+ 87 + 87	+ 95 + 95		
p5	lower	- 12 + 15	- 18 + 22	- 22 + 26	- 26 + 32	- 32 + 37	- 43 + 43	- 50 + 50	- 56 + 56	- 56 + 56	- 62 + 62	- 68 + 68		
p6	upper	+ 20 + 24	+ 29 + 35	+ 35 + 42	+ 42 + 51	+ 51 + 59	+ 68 + 68	+ 79 + 79	+ 88 + 88	+ 88 + 88	+ 98 + 98	+ 108 + 108		
p6	lower	- 12 + 15	- 18 + 22	- 22 + 26	- 26 + 32	- 32 + 37	- 43 + 43	- 50 + 50	- 56 + 56	- 56 + 56	- 62 + 62	- 68 + 68		
p7	upper	+ 24 + 30	+ 36 + 43	+ 43 + 51	+ 51 + 62	+ 62 + 72	+ 83 + 83	+ 96 + 96	+ 108 + 108	+ 108 + 108	+ 119 + 119	+ 131 + 131		
p7	lower	- 12 + 15	- 18 + 22	- 22 + 26	- 26 + 32	- 32 + 37	- 43 + 43	- 50 + 50	- 56 + 56	- 56 + 56	- 62 + 62	- 68 + 68		

SPRING CALCS.

OVERALL LENGTH = 15 mm
RATE = 7.60 lbs/in

$$\begin{aligned} \text{INITIAL COMPRESSION} &= 5 \text{ mm} \\ \therefore (5 \div 25.4) \times (7.60 \div 56) &= 0.19608 \times 0.1357 \text{ kN/mm} \\ &= 0.02670576 \times 56 \\ &= \underline{1.4955} \text{ lbs LOAD AT INITIAL COMPRESSION.} \end{aligned}$$

→ Planned for.

COMPOUND ANGLE FORMULA

$$\frac{\tan \text{APPARENT } \angle}{\cos \angle} = \tan^{-1} \text{ CAN BE TRANSPOSED.}$$

APPARENT = \angle TO BE CORRECTED.

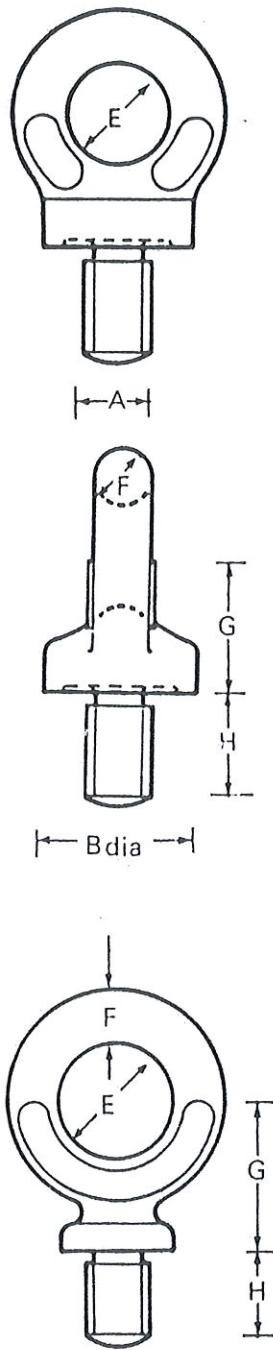
$\cos \angle$ = \angle TO BE TURNED THRO'

Collar Eyebolts

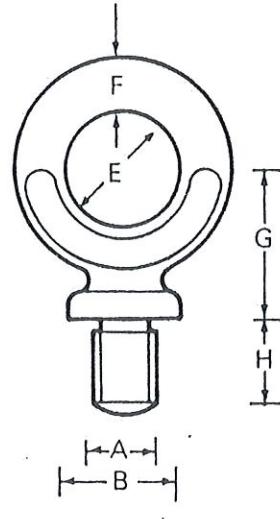
To BS 4278 (Table 1)

The plane of the eye of each pair of collar eyebolts must not be inclined to the plane containing the axes of the 2 eyebolts by more than 5°

Safe working load (Vertical)	tonnef	0.32	0.63	1	1.25	1.6	2	2.5	3.2	4
Dimensions	A mm	12	16	18	20	22	24	27	30	33
	B mm	22	29	36	40	45	52	58	65	72
	E mm	15	20	24	27	30	35	39	44	48
	F mm	9	12	14	16	18	21	23	26	29
	G mm	20	26	32	36	40	46	52	58	64
	H mm	18	23	28	32	35	40	46	51	56
*Maximum Load W	0°<θ<30°	tonne	0.4	0.8	1.3	1.6	2	2.5	3.2	4
	30°<θ<60°	tonne	0.25	0.5	0.8	1	1.25	1.6	2	2.5
	60°<θ<90°	tonne	0.16	0.32	0.5	0.63	0.8	1	1.25	1.6



Safe working load (Vertical)	tonnef	5	6.3	8	10	12.5	16	20	25	
Dimensions	A mm	36	39	45	52	56	64	70	76	
	B mm	81	90	101	115	128	144	162	180	
	E mm	54	60	68	76	86	96	108	120	
	F mm	32	36	40	46	51	58	65	72	
	G mm	72	80	90	102	114	128	144	160	
	H mm	63	70	79	89	100	112	126	140	
*Maximum Load W	0°<θ<30°	tonne	6.3	8	10	12.5	16	20	25	32
	30°<θ<60°	tonne	4	5	6.3	8	10	12.5	16	20
	60°<θ<90°	tonne	2.5	3.2	4	5	6.3	8	10	12.5



Dynamo Eyebolts

To BS 4278 (Table 3)

Safe working load (Vertical)	tonnef	0.32	0.63	1	1.25	1.6	2	2.5	3.2	4	5	6.3	8	10
Dimensions	A mm	12	16	18	20	22	24	27	30	33	36	39	45	52
	B mm	17	23	28	32	35	40	46	51	56	63	70	79	89
	E mm	22	29	35	40	44	51	57	64	70	79	88	99	112
	F mm	9	11	14	15	17	19	22	24	27	30	33	37	42
	G mm	27	34	42	47	53	60	68	76	84	95	105	118	134
	H mm	18	23	28	32	35	40	46	51	56	63	70	79	89

ROLLS ROYCE LIMITED , BRISTOL

PRODUCTION ENGINEERING OPERATING INSTRUCTIONS

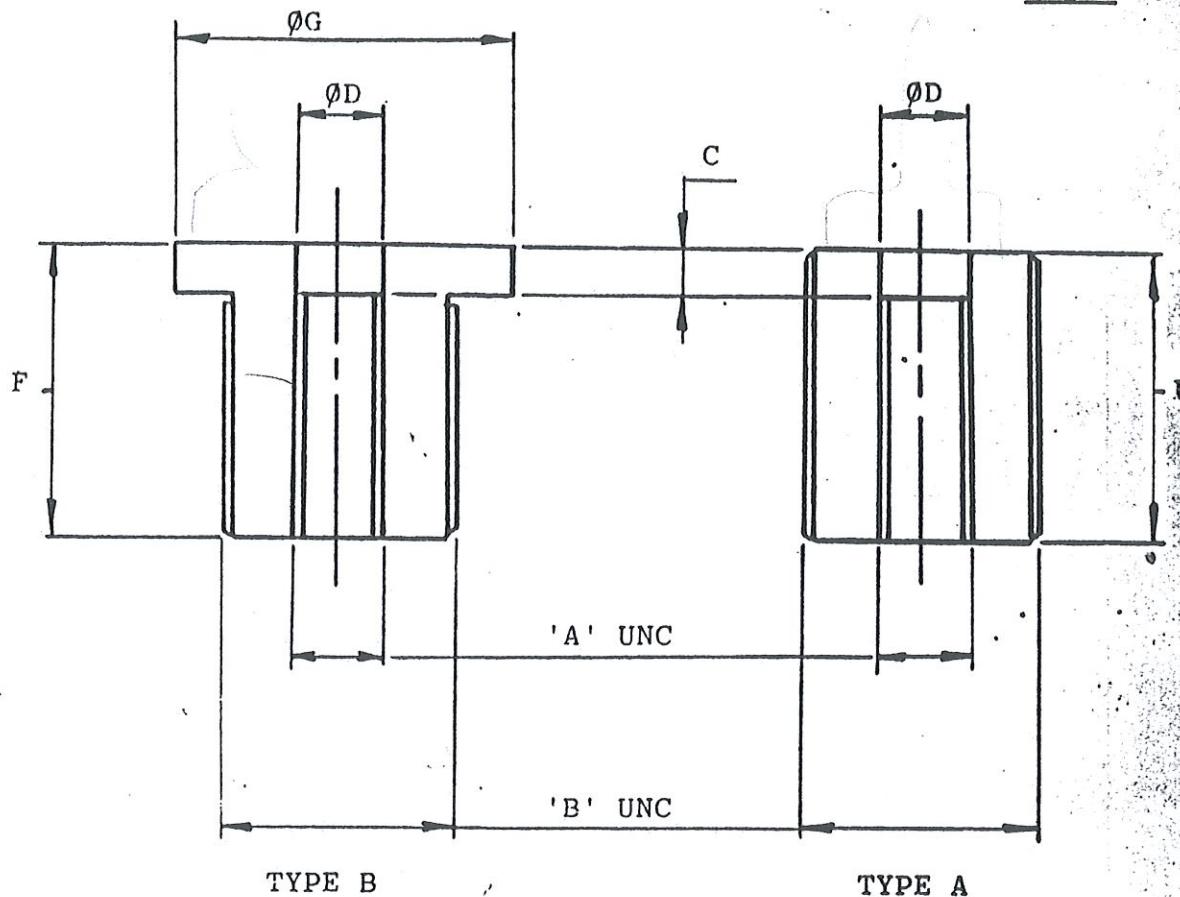
sheet
5
5
sheets

Instruction No
5/3

TITLE

LIFTING TACKLE (JIGS & FIXTURES)

Fig.2



'A' UNC	3/8	1/2	5/8	3/4
'B' UNC	3/4	1	1 1/4 -7	1 1/2
C	5/32 4	5/32 4	5/32 4	3/16 5
ØD	13/32 10	17/32 14	21/32 17	25/32 20
E	1 25	1 5/16 34	1 1/2 38	1 3/4 45
F	1 1/8 28	1 1/2 38	1 5/8 42	2 51
ØG (Mach size)	1 1/8 30	1 1/2 40	1 3/4 45	2 50

NOTE INSERTS MAY BE FLANGED OR NOT ACCORDING TO APPLICATION
TO BE SECURED IN POSITION WITH LOCTITE 270.

Issue No	1	2	3	4	5	6	Approved
Date	14/9/84						4

ALL DIMENSIONS IN MM / INCHES

REF.



GEOMETRIC CHARACTERISTIC	SYMBOLS	FEATURE
FLATNESS OF A SURFACE	—	SQUARENESS
STRAIGHTNESS OF A LINE	—	PARALLELISM
ACCURACY OF A SURFACE	□	BASIC DIMENSION
ROUNDNESS	○	CYLINDRICITY
PROFILE OF A LINE	—	CONCENTRICITY
GEOMETRIC TOLERANCES & DATUM FEATURES ARE REGARDLESS OF FEATURE SIZE U.O.S.	—	DIAMETER
	—	GEOMETRIC CHARACT



COVENTRY CARBIDE (TOOLS) LTD

02476365490

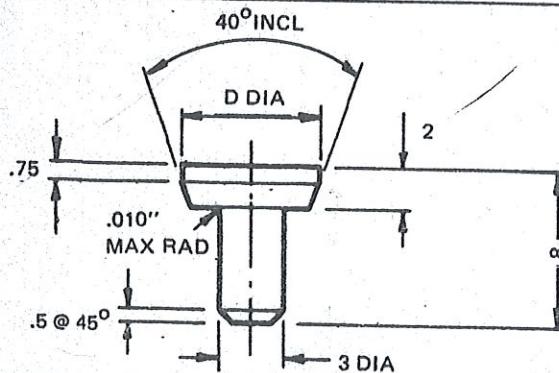
MANUFACTURERS OF SPECIAL CARBIDE TIPPED TOOLS SOLID CARBIDE TOOLING

BRINDLEY ROAD NORTH, EXHALL, COVENTRY CV7 9EP Tel: COV 365490

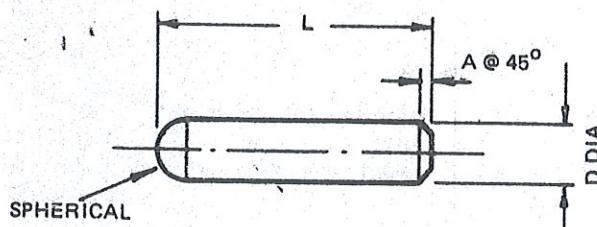
Tel: 02476365490, Fax: 02476365490, E-mail: info@coventrycarbide.co.uk

201205
305x40

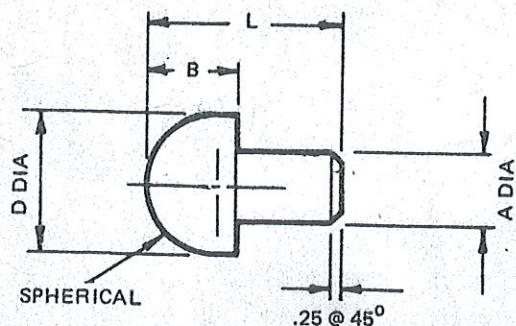
PRECISION GROUND SOLID CARBIDE LOCATION BUTTONS



REF	D
LB1	6
LB2	10

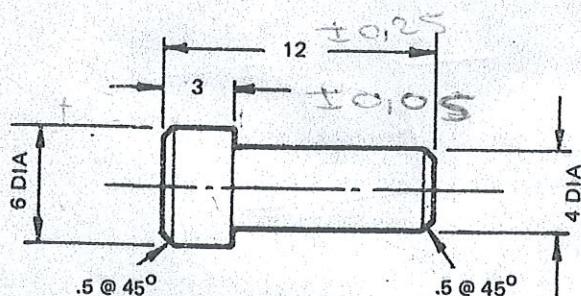


REF	D	L	A
LB3	3	16	.5
LB4	1.5	5	.25
LB8	1.5	6	.25



Concave 0.01
SPHERICAL 0.025
DIA 0.025
mm

REF	D	L	A	B
LB5	3	5	2.5	2.5
LB6	6	8	3	4
LB10	3	4	1.5	1.6
LB13	5	8	3	4



REF LB7

Ref 6

- All dimensions in millimetres — delivery ex stock.
Variation to standard supplied on request.
- For jig, fixture and gauging applications, etc., where extremely hard location points are required with the facility to be replaced without affecting the parent part
- Just drill a hole and drive in.

COVENTRY CARBIDE (TOOLS) LTD

MANUFACTURERS OF SPECIAL CARBIDE TIPPED TOOLS SOLID CARBIDE TOOLING

BS.5750 PART 2

I.S.O. 9002 - 1987

EN. 29002 - 1987

CERT. No. - 3241

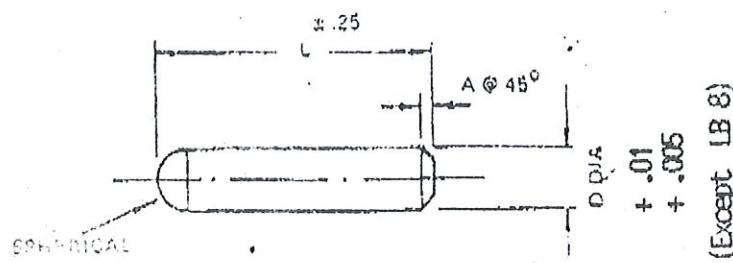


Registered Office
BRINDLEY ROAD NORTH
EXHALL
COVENTRY CV7 9EP

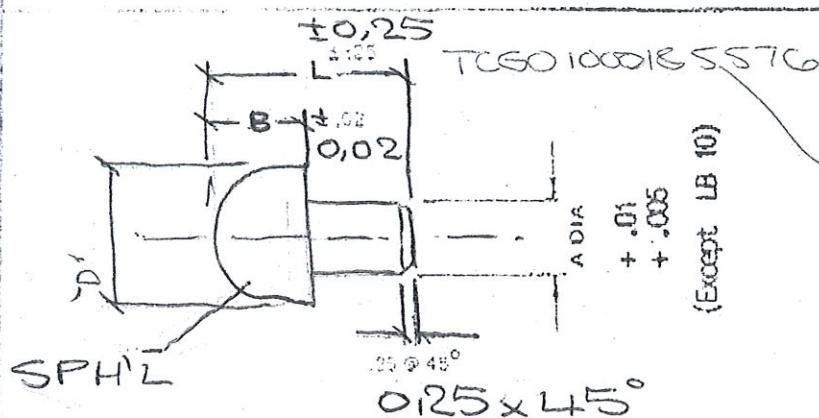
Tel. (0203) 365490

Fax. (0203) 365465

PRECISION GROUND SOLID CARBIDE LOCATION BUTTONS



REF	D	L	A
LB3	3	.16	.5
LB4	1.5	5	.25
LB8	^{.012} 1.5	6	.25
LB18	4	.16	.5
LB19	5	.16	.5
LB20	6	.16	.5



REF	D	L	A	B
LB5	3	5	.25	2.5
LB6	6	8	3	4
LB10	3	4	^{.012} 1.5	1.6
LB13	5	8	3	4
LB14	6	8	4	4
LB15	7	8	5	4
LB16	8	9	6	5
LB17	10	10	8	6

All dimensions in millimetres - delivery ex stock.
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COVENTRY CARBIDE (TOOLS) LTD

MANUFACTURERS OF SPECIAL CARBIDE TIPPED TOOLS SOLID CARBIDE TOOLING

BS.5750 PART 2

I.S.O. 9002 - 1987

EN. 29002 - 1987

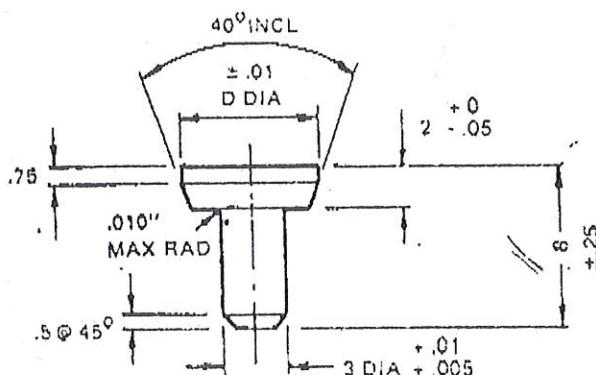
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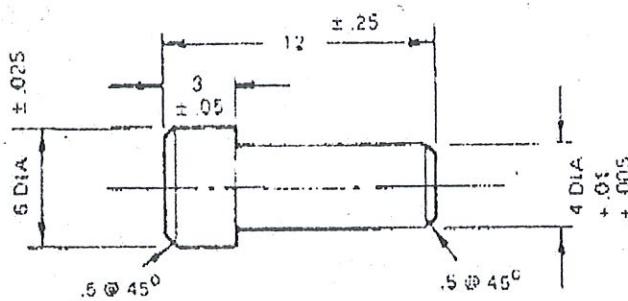
Registered Office
BRINDLEY ROAD NORTH
EXHALL
COVENTRY CV7 9EP

Tel. (0203) 365490
Fax. (0203) 365465

PRECISION GROUND SOLID CARBIDE LOCATION BUTTONS



REF	D
LB1	6
LB2	10



REF LB7

All dimensions in millimetres - delivery ex stock.
Variation to standard supplied on request.

For jig, fixture and gauging applications, etc., where extremely hard location points are required with the facility to be replaced without affecting the parent part

Just drill a hole and drive in.

Here are the special symbols you were requested.

ALT+ (uses the windows Arial font file)

0223	ß	0186	¢	0188	¼
0228	ä	0178	²	0189	½
0246	ö	0179	³	0190	¾
0252	Ü	0162	ƒ		
0196	Ä	0181	¤		
0214	Ö	0177	±		
0220	Ü	0247	÷		
0216	Ø				

Best regards
Martin

Dagmar 0170