Technical Instructions
For
Material Specification

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CONTENTS

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REVISION HISTORY

REVISION	CHANGE NUMBER	AUTHOR	DATE
1	WAS EI080	MG	17/05/2012
2	CN1486	J.LEWIS	23/07/2013
3	CN1845	A.ROBERTS	16/09/2015
4	CN1957	N.ROBERTS	10/03/2016
5	ECN-300411	N.ROBERTS	25/08/2016
6	ECN-300415	R.BECK	01/09/2016
7	ECN-300722	V.MORARIS	15/12/2016
8	ECN-300941	V.MORARIS	08/05/2017
9	ECN-301301	R.BECK	17/08/2017
10	ECN-301612	R.BECK	10/01/2018
11	ECN-301685	R.BECK	13/02/2018
12	ECN-301726	R.BECK	28/02/2018
13	ECN-301871	N.ROBERTS	29/05/2018
14	ECN-302115	A.RUST	29/08/2018
15	ECN-302323	A.RUST	22/01/2019
16	ECN-302717	A.RUST	31/07/2019
17	ECN-303357	A.RUST	22/06/2020
18	ECN-303436	A.RUST	07/09/2020
19	ECN-303365	A.RUST	21/09/2020

1 INTRODUCTORY NOTES

This Technical Instruction (TI) is applicable to components where the material specification on a drawing is given by reference to a WSM number. Where the material reference is given as a WSM number this technical instruction details the cross reference to the allowable material(s) as specified by national standards or a proprietary material(s) that must be used. Where a material specification is quoted directly on the drawing with no reference to a WSM number this technical instruction does not apply.

1.1 The 'WSM' prefix applies to material reference numbers in the range 1000-9999, with content that follows the structure:

1.1.1 1000-1999: Aluminium & Aluminium Alloys.

1.1.2 2000-2999: Steel & Steel Alloys

1.1.3 3000-3999: Corrosion Resisting Steel & Steel Alloys (Annealed/as Rolled)

1.1.4 4000-4999: Corrosion Resisting Steel & Steel Alloys (Heat Treated)

1.1.5 5000-5999: Copper & Copper Alloys

1.1.6 6000-6999: Polymers & Exotic Metals

1.2 All the approved specifications within a preference listed under a WSM reference number may be regarded as mutually alternative, Further to this:

1.2.1 If a material is not available under the standard(s) listed on a drawing, contact PCS Engineering Department.

1.2.2 If it is stated under a WSM reference number that the “Material must be heat treated, as described on part drawing”, contact PCS Engineering Department if the drawing does not specify a heat treatment directly or with reference to TI102 heat treatment code number.

1.3 No other specification(s) may be used without Concessions in any application which specifies that WSM reference number. In special circumstances a drawing may restrict the range of alternatives listed under a WSM reference number.

1.4 All relevant Free Issue Notes, Orders, etc. must be endorsed with the WSM reference number followed by the specification(s) required of that material. These specifications should include the Certificate of Conformity and the Mill Certification for the supplied material.

1.5 New orders for 'stock materials' (bar, sheet, etc.), castings and forgings must be to a specification covered by this document. If a material has previously been ordered from a supplier and is required again, order the same part number (stock). Out of date drawings must be referred to the Drawing Office for updating (with the WSM reference number).

1.6 All material must originate from manufacturers assessed and registered by ISO 9001, AS9100 or by CAA, or it may be obtained from ISO 9001 registered stockists.

1.7 For all material to aerospace specifications, see Section 1.7.1, every consignment shall include a test certificate for each cast/heat-treatment batch in the consignment. In the absence of such certificate a Production Permit must be raised in order that the required level of testing may be defined for acceptance as 'material of assured quality'.

1.7.1 ‘Aerospace Specifications’ in this context are:

- BS L and S series (later versions of the same standard are acceptable, e.g. BS 6L 34 could be accepted as a later version of BS 5L 34).
- BS EN XXXX Aerospace Alloys.
- (U.S) AMS.

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- (U.S) FED-QQ.
- Rolls Royce MSRR
- DTD (but not including DTD 900 – series proprietary materials)

In the list of material specifications the aerospace materials are marked '#' in the WSM number column. All materials marked must be supplied with mill certificates.

1.7.2 All other material specifications permitted by this schedule are used in unstressed or lightly-stressed applications and a test certification is not mandatory; incoming materials may be accepted on a certificate of conformity.

1.8 Refer to Purchase Order terms and conditions for requirement for contractual compliance with DFARS (Defence Federal Acquisition Regulation Supplement) that may limit allowable material sources.

1.8.1 If DFARS are applicable, the material mill certificates (including manufacturer location) are required along with certificates of conformity for all changes of ownership of the material.

1.8.2 Materials listed in this document which are subject to control under the DFARS "speciality metals" clauses (Ref: DFARS 252.225-7008 & DFARS 252.225-7009) are marked in Section 3XXX in the column "DFARS S/M".

1.9 WSM reference numbers that are noted "Material must be heat treated, as described on part drawing" cover materials that are supplied 'soft' and must be heat treated during manufacture of the components to develop the full properties of the relevant specification, because in the 'final' condition they are too hard for machining other than grinding. The necessary heat treatment will be called up by the drawing.

Note: that in the case of manufacture to 'stage' drawings, the heat treatment may not appear on the initial material call-up drawing, but will be called-up on a following Brazing Assembly drawing, for example.

1.10 New materials are continually being evaluated as part of the PCS continuous development policy.

1.10.1 Minor change requests to the data contained within this document will be logged and stored for a regular update process. Any major update (e.g. addition of a new material) will be carried out upon request, with all minor updates pending also being implemented at that time (Refer to PCS Engineering).

1.10.2 PCS are required to maintain design records up to twenty years after the completion of production contracts. Information regarding materials no longer used for new designs is stored but this document is only kept up to date with materials in use.

1.11 DTD material specifications are deemed obsolete and are not supported or updated, hence the listings within this procedure are for reference only. However, materials can still be manufactured to that specification at the issue that the document effectively became frozen.

1.12 Where mill certificates are required they must conform to BS EN 10204:2004 Type 2.2 unless a higher class is required as detailed on drawing or purchase order terms and conditions.

Note: BS EN 10204:2004 Type 3.1 or 3.2 materials documentation may be required for pressure equipment if vessels are classed as Type II or above in EU Directive 2014/68/EU relating to Pressure Equipment.

1.13 When mill certificates for material are supplied they must be provided with certificates of conformity for all changes of ownership of the material.

2 MATERIAL ALPHABETICAL INDEX

WSM(S)	DESCRIPTION
1175, 1225, 1255	AL.ALLOY BAR
1065, 1083, 1110, 1111, 1119, 1165	AL.ALLOY BAR & EXTRUSIONS
1099	AL.ALLOY CASTINGS
1093, 1115, 1120	AL.ALLOY PLATE
1059, 1070, 1113	AL.ALLOY SHEET & STRIP
1130, 1134	AL.ALLOY SHEET STRIP AND PLATE
1034	ALUMINIUM BAR & EXTRUSIONS
5042	ALUMINIUM BRASS
5297	ALUMINIUM-BRONZE BAR
5197	ALUMINIUM-BRONZE BAR AND FORGINGS
1017	ALUMINIUM PLATE, SHEET & PLATE
5020, 6080, 6081	BERYLLIUM COPPER
5015, 5722	BRASS BAR
5010	BRASS SHEET AND STRIP
2408	CARBON STEEL SHEET AND STRIP
6019	CHARCOAL CLOTH
5005	COPPER BAR
5001	COPPER SHEET AND STRIP
5043	COPPER
5044, 5045, 5046	LEADED BRASS
3318, 3320, 3347, 3643, 3970, 4431, 4600, 4643, 4659, 4970	CORROSION RESISTING STEEL: BAR
3130, 4080, 4124, 4143, 4145	CORROSION RESISTING STEEL: BAR AND FORGINGS
3016, 3317, 3321, 3525, 3527	CORROSION RESISTING STEEL: SHEET AND STRIP
3449	CORROSION RESISTING STEEL: SHEET STRIP AND PLATE
4177	CORROSION RESISTING STEEL: STRIP
4040, 4140	CORROSION RESISTING STEEL: THRO' HARDENING
3301	CORROSION RESISTING STEEL: TUBE
3205, 4678	CORROSION RESISTING STEEL: WIRE
4679	CORROSION RESISTING STEEL: SPRING WIRE
6032	'DELRIN'
6078	DELRIN 570
5037, 5038	DUCTILE BRASSES
5039, 5040	FREE CUTTING BRASSESWITH IMPROVED DUCTILITY

WSM(S)	DESCRIPTION
6087	GRAPHITE GASKET
6103	HDPE, EXTRUDED BAR
6086	HIGH TENSILE BRASS
5041	IMPROVED DUCTILITY
6099	MAGNETIC NICKEL IRON
2232	MARAGING STEEL: BAR
6012	'MONEL' K500
6024	NICKEL ALLOY: BAR (INCONEL 718)
5590	NICKEL-ALUMINIUM BRONZE BAR
2206	NITRIDING STEEL: BAR
2106, 2132, 2134, 2207	NITRIDING STEEL: BAR AND FORGINGS
6030	NYLON 6
6064	PEEK
6075	PEEK (BEARING GRADE)
6073	PEEK (CF REINFORCED)
6076	PEEK (GF REINFORCED)
5660	PHOSPHOR BRONZE
6107	POLYAMIDE
6074, 6094	PTFE
6007, 6092	PTFE ROD
6038	'RADIOMETAL'
6096	SILICON NITRIDE
6083	SILICON POLYMER
6100, 6110, 6111	STAINLESS STEEL, SOLENOID QUALITY
2001, 2003, 2004, 2005, 2092, 2093, 2195	STEEL: BAR
2095	STEEL: BAR AND FORGINGS
2407	STEEL: ROD
6006	'STELLITE 6' ROD AND CASTING
6107	TECASINT 2011
2135, 2235	THRO' HARDENING STEEL
6011	TITANIUM ALLOY BAR
6097	TORLON
6067	TRAFFOLYTE'
6101, 6102	TUNGSTEN-CARBIDE, ROD
6021	'VESPEL' GRADE SP1
6098	ZIRCONIA

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3 MATERIAL SPECIFICATION

3.1 Aluminium & Aluminium Alloys

WSM	DESCRIPTION	SPECIFICATION(S)	MATERIAL CALLOUT(S) AND HEAT TREATMENT(S)	NOTES	DFARS S/M
1017	ALUMINIUM PLATE, SHEET & PLATE	BS EN 485-2	1050A-O 1080A-O 1200-O	Softened	
		BS 6L 17			
1034 #	ALUMINIUM BAR & EXTRUSIONS	BS EN 755-2	1200-F 1050A		
		BS 5L 34			
1059 #	AL.ALLOY SHEET & STRIP	BS 4L59	H16 H26		
1065 #	AL.ALLOY BAR & EXTRUSIONS	BS L 168	L168-T6 L168-T651 L168-T6510 L168-T6511	Solution treated & precipitation treated	
1070 #	AL.ALLOY SHEET & STRIP	BS EN 2395		Solution treated & aged	
		BS L 164			
1083 #	AL.ALLOY BAR & EXTRUSIONS	BS EN 3553		Solution & precipitation treated	
		DTD5014A			
1093 #	AL. ALLOY PLATE	BS 2L93		Solution treated, controlled stretched and precipitation treated	
1099 #	AL.ALLOY CASTINGS	BS 2L 99		Fully heat treated	
1110	AL.ALLOY BAR & EXTRUSIONS	BS EN 755-2	6082-T6 6082-T651 6082-T6510 6082-T6511	Solution & precipitation treated.	
		WSM1111			
1111 #	AL.ALLOY BAR & EXTRUSIONS	BS L 111		Solution & precipitation treated.	
		BS EN 2326			
1113 #	AL.ALLOY SHEET & STRIP	BS EN 4007		Solution treated, flattened & precipitation treated.	
		BS L 113			

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WSM	DESCRIPTION	SPECIFICATION(S)	MATERIAL CALLOUT(S) AND HEAT TREATMENT(S)	NOTES	DFARS S/M
1115 #	AL.ALLOY PLATE	BS EN 4202		Solution treated. Controlled stretched & precipitation treated.	
		BS L 115			
1119 #	AL.ALLOY BAR & EXTRUSIONS	AMS 4342	7050-T74511		
1120 #	AL. ALLOY PLATE	AMS 4050	7050-T7451		
1130	AL.ALLOY SHEET STRIP AND PLATE	BS EN 485-2	6082-T6 6082-T651 6082-T6510 6082-T6511	Solution & precipitation treated	
		WSM1113			
		WSM1115			
1134	AL.ALLOY SHEET STRIP AND PLATE	BS EN 485-2	5251-H22 5251-T6		
1165	AL.ALLOY BAR & EXTRUSIONS	BS EN 755-2	2014A-T6	Solution treated & precipitation treated	
		WSM1065			
1175	AL.ALLOY BAR	BS EN 755-2	2618A-T6 2618A-T6511	Solution treated & aged	
		WSM1083			
1255 #	AL.ALLOY BAR	QQ-A-225/9			
		BS L 170			
1256	AL ALLOY BAR	BS EN 755-2	7075-T6 7075-T651 7075-T6510 7075-T6511		
		WSM1255			

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3.2 Steel & Steel Alloys

WSM	DESCRIPTION	SPECIFICATION(S)	MATERIAL CALLOUT(S) AND HEAT TREATMENT(S)	NOTES	DFARS S/M
2001	STEEL: BAR	BS EN 10088-3	080M30		✓
		BS 7S 1	A, B or C		
		BS EN 4957			
2003	STEEL: BAR	BS EN 10088-3	080A15		✓
2004	STEEL:BAR	BS EN 10088-3	220M07 230M07		✓
2005 #	STEEL:BAR	BS 7S 1	A, B or C		✓
2092	STEEL: BAR	BS EN 10088-3	150M19-R	Material hardened and tempered prior to machining	✓
		BS 2S 92	B, C or D		
2093	STEEL: BAR	BS EN 10088-3	080M40		✓
		BS 2S 93	B, C or D		
2095 #	STEEL: BAR AND FORGINGS	BS S 154	B, C or D	Material hardened and tempered prior to machining	✓
		BS 3S 95	B, C or D		
2106 #	NITRIDING STEEL: BAR AND FORGINGS	BS 4S 106	B, C or D	Material hardened and tempered prior to machining	✓
2132 #	NITRIDING STEEL: BAR AND FORGINGS	BS 3S 132	B, C or D	Material supplied softened. Must be final heat treated and tempered as described in the material standard unless otherwise stated on drawing.	✓
2134 #	NITRIDING STEEL: BAR AND FORGINGS	BS 3S 132	B, C or D	Material supplied softened. Must be final heat treated and tempered as described in BS S134 unless otherwise stated on drawing	✓
		BS S 134 (obsolete material included for reference only)	B, C or D		

WSM	DESCRIPTION	SPECIFICATION(S)	MATERIAL CALLOUT(S) AND HEAT TREATMENT(S)	NOTES	DFARS S/M
2135 #	THRO' HARDENING STEEL	BS 2S 135	B, C or D	Material supplied Spheroidized. Must be final heat treated and tempered as described in the material standard unless otherwise stated on drawing.	✓
2195	STEEL: BAR	BS EN 10088-3	817M40-T	Material hardened and tempered prior to machining	✓
		WSM2095			
2206	NITRIDING STEEL: BAR	BS EN 10085	722M24-U	Material hardened and tempered prior to machining	✓
		WSM2106			
2207	NITRIDING STEEL: BAR	BS EN 10085	1.8523 (897M39)	Material supplied softened. Must be final heat treated and tempered as stated on drawing.	✓
		WSM2132			
2232 #	MARAGING STEEL: BAR	DTD 5212		Solution annealed, Material must be heat treated, as described on part drawing	✓
		BS S 162	B, C or D		
2235	THRO' HARDENING STEEL	BS EN 10083-1	534A99 535A99	Softened, Material must be heat treated, as described on part drawing	✓
		WSM2135			
2407	STEEL: ROD	BS 1407			✓
2408	CARBON STEEL SHEET AND STRIP	BS 2S 510			✓

3.3 Corrosion Resisting Steel & Steel Alloys (Annealed/as Rolled)

WSM	DESCRIPTION	SPECIFICATION(S)	MATERIAL CALLOUT(S) AND HEAT TREATMENT(S)	NOTES	DFARS S/M
3016	CORROSION RESISTING STEEL: SHEET & STRIP	BS EN 10088-2	1.4404 (316S11) 1.4432 (316S13) 1.4449 (316S13) 1.4435 (316S13) 1.4401 (316S31) 1.4436 (316S33)	Softened	✓
3130 #	CORROSION RESISTING STEEL: BAR AND FORGINGS	BS 2S 130 MSRR6522		Finally heat treated (softened)	✓
3205 #	CORROSION RESISTING STEEL: WIRE	BS 2S 205		Cold drawn. Must be final heat treated after forming to the material standard unless otherwise specified on the drawing	✓
3301	CORROSION RESISTING STEEL: TUBE	ASTM A240 ASTM A240M			✓
3317	**SEE 3016**				
3318	CORROSION RESISTING STEEL: BAR	BS EN 10088-3	1.4404 (316S11) 1.4432 (316S13) 1.4449 (316S13) 1.4435 (316S13) 1.4401 (316S31) 1.4436 (316S33)	Softened	✓
3320	CORROSION RESISTING STEEL: BAR	BS EN 10088-3	1.4404 (316S11) 1.4432 (316S13) 1.4449 (316S13) 1.4435 (316S13)	Softened	✓
3321	CORROSION RESISTING STEEL: SHEET AND STRIP	BS EN 10088-2 WSM3527	1.4541 (321S31) 1.4550 (347S31)	Softened	✓
3347	CORROSION RESISTING STEEL: BAR	BS EN 10088-3 WSM3130	1.4541 (321S31) 1.4550 (347S31)	Softened	✓

WSM	DESCRIPTION	SPECIFICATION(S)	MATERIAL CALLOUT(S) AND HEAT TREATMENT(S)	NOTES	DFARS S/M
3449	CORROSION RESISTING STEEL: SHEET STRIP AND PLATE	BS EN 10088-2	1.4310 (301S21) 1.4305 (303S31) 1.4307 (304S11) 1.4650 (304S11) 1.4301 (304S31) 1.4303 (305S19) 1.4541 (321S31) 1.4550 (347S31)	Softened	✓
		WSM3527			
3525 #	CORROSION RESISTING STEEL: SHEET AND STRIP	BS S 524		Cold rolled or cold rolled & tempered	✓
		BS S 525			
		BS S 526			
		BS S 527			
3527 #	CORROSION RESISTING STEEL: SHEET AND STRIP	BS S 526		Softened	✓
		BS S 527			
3643	**SEE 4643**				
3970	CORROSION RESISTING STEEL: BAR	BS EN 10088-3	1.4305 (303S31) 1.4307 (304S11) 1.4650 (304S11) 1.4301 (304S31) 1.4541 (321S31) 1.4550 (347S31)	Softened	✓
		WSM3130			

3.4 Corrosion Resisting Steel & Steel Alloys (Heat Treated)

WSM	DESCRIPTION	SPECIFICATION(S)	MATERIAL CALLOUT(S) AND HEAT TREATMENT(S)	NOTES	DFARS S/M
4040 #	CORROSION RESISTING STEEL: THRO' HARDENING	AMS 5618H		Softened, Material must be heat treated, as described on part drawing	✓
4080 #	CORROSION RESISTING STEEL: BAR AND FORGINGS	BS 7S 80 §	B, C or D	Material hardened and tempered prior to machining § BS 5S 80 D may be used for bar sizes less than or equal to 12.7mm diameter	✓
		BS 2S 137			
4124 #	CORROSION RESISTING STEEL: BAR AND FORGINGS	BS 2S 124	B, C or D	Material hardened and tempered prior to machining	✓
4140	CORROSION RESISTING STEEL: THRO' HARDENING	UNS S44004		Softened, Material must be heat treated, as described on part drawing	✓
		AMS 5618H			
		AMS 5630L			
		AMS 5880E			
		WSM4040			
4143 #	CORROSION RESISTING STEEL: BAR AND FORGINGS	BS 2S 143	B, C or D	Material hardened and tempered prior to machining	✓
4144 #	CORROSION RESISTING STEEL: BAR AND FORGINGS	BS 3S 144	B, C or D	Heat Treatment Described in the material standard unless otherwise specified on drawing	✓
4145 #	CORROSION RESISTING STEEL: BAR AND FORGINGS	BS 3S 145	B, C or D	Heat Treatment Described in the material standard unless otherwise specified on drawing	✓
4177 #	CORROSION RESISTING STEEL: STRIP	AMS 5528H		Annealed. Material must be heat treated, as described on part drawing.	✓

WSM	DESCRIPTION	SPECIFICATION(S)	MATERIAL CALLOUT(S) AND HEAT TREATMENT(S)	NOTES	DFARS S/M
4431	CORROSION RESISTING STEEL: BAR	BS EN 10088-3	1.4057-T (431S29-T) (441S49-T)	Hardened & tempered	✓
		WSM4080			
4600 #	CORROSION RESISTING STEEL: BAR	WSM4643			
		WSM4659			
4643 #	CORROSION RESISTING STEEL: BAR	AMS 5643T	17-4PH-H1025	Solution treated, Material must be purchased heat treated	✓
4659 #	CORROSION RESISTING STEEL: BAR	AMS 5659R	15-5PH-H1025	Solution treated & aged. Must be purchased heat treated	✓
		BS EN 2817			
4678 #	CORROSION RESISTING STEEL: WIRE	AMS 5678F		Cold drawn, Material must be heat treated, as described on part drawing	✓
4679	CORROSION RESISTING STEEL: SPRING WIRE	BS EN 10270-3	1.4310 NS	Unless otherwise stated on drawing: Post Forming, Stress relieve 250-425°C for 0.5 to 4hrs cool in air	✓
4970	CORROSION RESISTING STEEL: BAR	BS EN 10088-3	1.4006 (410S21) 1.4005 (416S21) (416S29) 1.4029 (416S37) 1.4021 (420S29) (420S37) 1.4028 (420S45) 1.4057 (431S29) (441S49)	Hardened & tempered	✓
		WSM4080			

3.5 Copper & Copper Alloys

WSM	DESCRIPTION	SPECIFICATION(S)	MATERIAL CALLOUT(S) AND HEAT TREATMENT(S)	NOTES	DFARS S/M
5001	COPPER SHEET AND STRIP	BS EN 1652 BS EN 13599	CW004A		
5005	COPPER BAR	BS EN 12163 BS EN 13601	CW004A CW008A CW024A CW118C CW114C		
5010	BRASS SHEET AND STRIP	BS EN 1652	CW508L	Half-hard unless otherwise stated on drawing	
5015	BRASS BAR	BS EN 12163 BS EN 12164	CW712R CW614N		
5020	BERYLLIUM COPPER	BS EN 1652 BS EN 1654	CW100C CW101C		
5037	DUCTILE BRASSES	Plate/Sheet/Strip BS EN1652 Spring strip BS EN1654 Rod BS EN12163 Wire BS EN12166 Tube BS EN12449	CW505L		
5038	DUCTILE BRASSES	Plate/Sheet/Strip BS EN1652 Spring strip BS EN1654 Rod BS EN12163 Wire BS EN12166 Rectangular Bar BS EN12167 Tube BS EN12449	CW507L		

WSM	DESCRIPTION	SPECIFICATION(S)	MATERIAL CALLOUT(S) AND HEAT TREATMENT(S)	NOTES	DFARS S/M
5039	FREE CUTTING BRASSES WITH IMPROVED DUCTILITY	Free Machining Rod BS EN12164 Wire BS EN12166 Rectangular Bar BS EN12167 Free Machining Hollow Rod BS EN12168 Tube BS EN12449	CW601N		
5040	FREE CUTTING BRASSES WITH IMPROVED DUCTILITY	Plate/Sheet/Strip BS EN1652 Free Machining Rod BS EN12164 Wire BS EN12166 Rectangular Bar BS EN12167 Free Machining Hollow Rod BS EN12168	CW606N		
5041	IMPROVED DUCTILITY	Free Machining Rod BS EN12164 Wire BS EN12166 Rectangular Bar BS EN12167 Free Machining Hollow Rod BS EN12168 Tube BS EN12449	CW617N		
5042	ALUMINIUM BRASS	Plate/Sheet/Strip BS EN1652 Plate/Sheet/Circles BS EN1653 Tubes BS EN12449	CW702R		
5043	COPPER	Plate/Sheet/Strip/Circles BS EN1652 Plate/Sheet/Strip BS EN13599 Rod/Bar/Wire BS EN13601 Profiles 13605 Seamless Tube 13600	CW004A		

WSM	DESCRIPTION	SPECIFICATION(S)	MATERIAL CALLOUT(S) AND HEAT TREATMENT(S)	NOTES	DFARS S/M
5044	FREE MACHINING LEADED BRASS	Free Machining Rod BS EN 12164 Profiles and Rectangular Bar BS EN 12167 Free machining hollow rod BS EN 12168 Tube BS EN 12449	CW614N		
5045	FREE MACHINING LEADED BRASS	Free Machining Rod BS EN 12164 Profiles and Rectangular Bar BS EN 12167 Free machining hollow rod BS EN 12168 Tube BS EN 12449	CW609N		
5046	FREE MACHINING LEADED BRASS	WSM5044			
		WSM5045			
5197 #	ALUMINIUM-BRONZE BAR AND FORGINGS	DTD197A			
		BS 2B 23		Extruded & drawn	
5297	ALUMINIUM-BRONZE BAR	BS EN 12163	CW307G	Extruded & drawn	
		WSM5197			
5590	NICKEL-ALUMINIUM BRONZE BAR	AMS 4590C		Solution heat treated & tempered (TQ50)	
		UNS C63020			
5660	PHOSPHOR BRONZE	SAE660			
5722	BRASS BAR	BS EN 12163	CW722R		

3.6 Polymers & Exotic Metals

WSM	DESCRIPTION	SPECIFICATION(S)	MATERIAL CALLOUT(S) AND HEAT TREATMENT(S)	NOTES	DFARS S/M
6006	'STELLITE 6' ROD AND CASTING	KEBBANETAL-STELLITE Stellite 6 Alloy		As cast	
6007	PTFE ROD	BS EN ISO 13000-(1,2)	RS1 RS2 RS3	Rod, Dimensionally Stable, Minimum 15 MPa Tensile Strength, Minimum 150% Elongation at Break	
		BS 6564	Grade A, Type 1 Grade A1, Type 1 Grade B, Type 1		
6011 #	TITANIUM ALLOY BAR	BS 3TA 11		Softened	✓
		BS EN 3355			
		Ti-6AL-4V			
		BS EN 3310			
6012	'MONEL' K500	BS 3076 NA 18		Rolled/drawn	✓
6015	TUNGSTEN-CARBIDE, ROD	WSM 6102			
6019	CHARCOAL CLOTH	Chemviron Carbon (CalgonCarbon) - Zorflex activated carbon (knitted or woven) cloth			
6021	'VESPEL' GRADE SP1	ASTM-D 6456-99 Type 1 AMS 3644 Class 1	DuPont - Vespel SP-1		
6022	Specification obsolete - If required contact ULTRA-PCS Engineering department for updated information				
6024 #	NICKEL ALLOY: BAR (INCONEL 718)	AMS 5662M		Solution treated, material must be heat treated, as described on part drawing	✓
6030	NYLON 6	Quadrant - Ertalon 6SA			
6032	'DELRIN'	ASTM D6778-06 POM0111	Ensinger DELRIN acetal homopolymer		
			DuPont Delrin 100 Series		

WSM	DESCRIPTION	SPECIFICATION(S)	MATERIAL CALLOUT(S) AND HEAT TREATMENT(S)	NOTES	DFARS S/M
6035	Specification obsolete - If required contact ULTRA-PCS Engineering department for updated information.				
6038	'RADIOMETAL'	Telcon Radiometal 4550		Unless otherwise specified on the drawing: Heat to 1175°C and 1200°C for 4 hours in vacuum, hydrogen or cracked ammonia, then slowly cool to 300°C in a period of 8 hours (approximately 1.9°C per minute) maintaining the vacuum, hydrogen or cracked ammonia during cooling. If hydrogen or cracked ammonia is used the exit dew point must be maintained at -40°C or drier throughout the cycle	
6064	PEEK, EXTRUDED BAR	Ensinger - TECAPEEK NATURAL (VICTREX 450G) Quadrant - Ketron 1000 PEEK			
6067	TRAFFOLYTE'			Commercial quality. See part drawing for desired material colour	
6073	PEEK, EXTRUDED BAR (CF REINFORCED)	Ensinger - TECAPEEK CF30 Quadrant - Ketron CA30 PEEK			
6074	PTFE SHEET	BS 6564 BS EN ISO 13000-(1,2)	Grade B, Type 2 SP3	Sheet, as Processed, Minimum 15 Mpa Tensile Strength, Minimum 150% Elongation at Break	
6075	PEEK, EXTRUDED BAR (BEARING GRADE)	Ensinger - TECAPEEK PVX Quadrant - Ketron HPV PEEK			

WSM	DESCRIPTION	SPECIFICATION(S)	MATERIAL CALLOUT(S) AND HEAT TREATMENT(S)	NOTES	DFARS S/M
6076	PEEK, EXTRUDED BAR (GF REINFORCED)	Ensinger - TECAPEEK GF30			
		Quadrant - Ketron GF30 PEEK			
6078	DELRIN 570, EXTRUDED BAR	Ensinger - DELRIN 570 - 20% Glass Fiber Filled			
6079	Specification obsolete - If required contact ULTRA-PCS Engineering department for updated information				
6080	BERYLLIUM COPPER	ASTM B 196 ASTM B 196M	C17200 - TH04		
6081	BERYLLIUM COPPER	ASTM B 196 ASTM B 196M	C17200 - TD04		
6083	SILICON POLYMER	DS.4072 Bonded to Mylar film A50 (125µm)		Available from B S Elastomer, Trelleborg	
6086	HIGH TENSILE BRASS	BS EN 12163	CW721R		
6087	GRAPHITE GASKET	Geegraf NR40			
6091	Specification obsolete - If required contact ULTRA-PCS Engineering department for updated information				
6092	PTFE ROD	BS EN ISO 13000-1	RP2	Rod, as Processed, Minimum 20 Mpa Tensile Strength, Minimum 200% Elongation as Break	
6094	PTFE	Flourocarbon - FLOURINOID FL119 (Glass fibre, carbon and graphite filled PTFE)			
6096	SILICON NITRIDE	COORSTEK - SRBSN			
6097	TORLON	Solvay - Torlon PAI 4301			
		Quadrant - Duratron T4301 PAI			
6098	ZIRCONIA	COORSTEK - Technox 2000 (White)			

WSM	DESCRIPTION	SPECIFICATION(S)	MATERIAL CALLOUT(S) AND HEAT TREATMENT(S)	NOTES	DFARS S/M
6099	MAGNETIC NICKEL IRON	ArcelorMittal - SUPRA 50		Unless otherwise stated on the drawing: Heat to 1100/1150°C for 4 hours in a vacuum or dry hydrogen atmosphere. Cool to 300°C in a period of at least 2 hours maintaining the vacuum or dry hydrogen atmosphere. If using dry hydrogen the exit dew point must be maintained at -40°C or drier during the process cycle.	
6100	STAINLESS STEEL, SOLENOID QUALITY (*THIS SHOULD NOT BE USED ON ANY NEW DESIGNS*)	ASTM A838 Alloy 2 BS EN 10088-3 1.4105 AISI 430FR	Un-annealed Or Mill Annealed Rockwell BB 80/88 Or Mill Annealed Rockwell B 82/91 Or Full Annealed Rockwell B 80/88	Unless otherwise specified on drawing: Heat to 843/788°C for 2hrs in a vacuum or dry hydrogen atmosphere. Slowly cool to 427°C in a period of 7 hours (approx. 1°C per min) maintaining the vacuum or dry hydrogen atmosphere. If using dry hydrogen the exit dew point must be maintained at -40°C or drier during the process cycle.	✓
6101	TUNGSTEN-CARBIDE, ROD	Sandvik - H10F			
6102	TUNGSTEN-CARBIDE, ROD	Konrad Friedrichs - K40UF			
6103	HDPE, EXTRUDED BAR	ASTM D4020-05	Quadrant - TIVAR 1000 Ensinger - TECAFINE		
6107	Polyamide (PI)	TECASINT 2011	Ensinger – TECASINT 2011		

WSM	DESCRIPTION	SPECIFICATION(S)	MATERIAL CALLOUT(S) AND HEAT TREATMENT(S)	NOTES	DFARS S/M
6110	STAINLESS STEEL, SOLENOID QUALITY	ASTM A838 Alloy 1 BS EN 10088-3 1.4104 AISI 430F	Un-annealed Or Mil-Annealed Rockwell B 82/91 Or Mil-Annealed Rockwell B 75/82 Or Full Annealed Rockwell B 72/80	Unless otherwise stated on drawing: Anneal at 788/843°C for 2hrs in a vacuum or dry hydrogen atmosphere. Then slowly cool to 427°C in a period of 7hrs (approx. 56°C per hour) while maintaining the vacuum or hydrogen atmosphere during cooling. If using dry hydrogen the exit dew point must be maintained at -40°C or drier during the process cycle.	✓
6111	STAINLESS STEEL, SOLENOID QUALITY	ASTM A838 Alloy 1 BS EN 10088-3 1.4104 AISI 430F	Mil-Annealed Rockwell B 82/91	DO NOT HEAT TREAT POST MACHINING	✓
6112	STAINLESS STEEL, SOLENOID QUALITY	ASTM A838 Alloy 2 BS EN 10088-3 1.4105 AISI 430FR	Un-annealed Or Mill Annealed Rockwell BB 80/88 Or Mill Annealed Rockwell B 82/91 Or Full Annealed Rockwell B 80/88	Unless otherwise specified on drawing: Heat to 843/1000°C for 2hrs in a vacuum or dry hydrogen atmosphere. Then slowly cool at a rate approx. 56°C per hour while maintaining the vacuum or dry hydrogen atmosphere. If using dry hydrogen the exit dew point must be maintained at -40°C or drier during the process cycle.	✓

MODIFICATION HISTORY

REV	DETAILS OF CHANGE
1	INITIAL RELEASE
2	-
3	MATERIAL ADDITION
4	FULL RE-WRITE
5	MATERIAL ADDITION, STANDARD UPDATES & TEMPLATE UPDATES
6	CHANGE WSM1119 TO CALL OUT AMS 4342, WAS AMS 4341. ADD 6107. UPDATE REQUIREMENTS FOR MATERIAL CERTIFICATES
7	MATERIAL ADDITIONS WSM3037-5042, STANDARD UPDATES AND HEAT TREATMENT UPDATES
8	REMOVED (SP 510) FROM WSM6099 'COMMERCIAL IN CONFIDENCE' REMOVED FROM DOCUMENT FOR RELEASE ON PCS WEB SITE. 'NOT PROTECTIVELY MARKED' ADDED TO HEADER. STATEMENT ADDED UNDER: INTRODUCTORY NOTES. MATERIAL ADDITION WSM 2408, 5043, 5044 FORMAT CHANGE: PALS TO PCS
9	REINSTATED WSM2106, WSM2135, AND WSM4124, ADDED WSM1059, WSM5045 AND WSM5046
10	ADDED: WSM1093 WSM2004, WSM2005
11	PARA 1.12 & SECTION 4 DELETED. ADDED WSM1120, REINSTATED WS2132, WSM2207 UPDATED NOTES WSM1110, WSM1111, WSM1113, WSM1115, WSM1130, WSM2134, WSM2232, WSM3205, WSM4040, WSM4140, WSM4177, WSM4143, WSM4144, WSM4145, WSM5010, WSM6038, WSM6099, WSM6100, UPDATED DESCRIPTION WSM2106 CROSS REF FROM WSM6015 TO WSM6102 ADDED CROSS REFERENCES BETWEEN WSM4144 AND WSM4145 DELETED PARA 1.2.2 UPDATES TO DETAIL CROSS REFERENCE TO TI102. HEAT TREATMENT CODE NUMBERS DETAILED AS DRAWING OFFICE REFERENCE REMOVED FOR CLARITY TO SUPPLIERS
12	PARA 1.8 UPDATED, PARA 1.8.2 ADDED, PARA.1.14 ADDED SECTION 3 DFARS SPECIAL METAL COLUMN ADDED COMPLETE
13	REINSTATED WSM1017. UPDATED WSM1017 STANDARDS
14	UPDATE TO NEWEST TEMPLATE. REMOVED 1.12. WSM1175 – ADDED 2618A-T6511 WSM5020 – ADDED BSEN1654 & CW101C
15	WSM6080 – ADDED "C17200" WSM6081 – ADDED "C17200" WSM1083 – REINTRODUCED "DTD5014A! WSM6086 – TYPO FIXED, WAS "BRAS" NOW "BRASS" WSM6100 – TYPO FIXED, WAS "(AISI 430FR" NOW "(AISI 430FR)" SECTION 1.8.2 – TYPO FIXED, WAS "DRARS" NOW "DFARS" FORMATTING FOR LINE SPACING ON WSM3347, WSM6007 AND WSM6021
16	ADDED NEW WSM 6110 & 6111 FOR AISI430F ST. STEEL & UPDATED WSM6100 (AISI430FR)
17	ADDED NEW WSM 4679 FOR CORROSION RESISTING STEEL: SPRING WIRE TO BS EN 10270-3-1.4310 NS
18	ADDED NEW WSM 5660 FOR PHOSPHOR BRONZE TO SAE660
19	UPDATED TO LATEST TEMPLATE & COMPANY BRANDING – ADDED SUB-PARAS. TO SECTION 3 ADDED NEW WSM6112 AS ALT. TO WSM6100 (AISI430FR) WITH DIFFERENT HEAT TREATMENT UPDATED WSM6100 TO STATE THAT IT SHOULD NOT BE USED ON ANY NEW DESIGNS UPDATED WSM4080 NOTE TO INCLUDE BS 5S80D AS ALT. SPECIFICATION FOR ≤ 12.7mm