

TECHNICAL SPECIFICATION	TS95™	ISSUE 8
	Issued Revised	UNKNOWN 2004-06
Recommendations for Metallic Material Specifications and Standards to be Used for New Designs		

NOTE: The issue status of this document remains unchanged as there have been no changes to the technical content.

SAE INDUSTRY TECHNOLOGIES CONSORTIA AEROSPACE STANDARDS AND PART QUALIFICATION PROGRAM

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TECHNICAL SPECIFICATION

No. TS95

ADS RECOMMENDATIONS FOR METALLIC MATERIAL SPECIFICATIONS & STANDARDS TO BE USED FOR NEW DESIGNS

RATIONALE

Eighth issue of specification.

Revised to add and delete preferred specifications and to delete Appendix.

For full details of changes, refer to supplementary ADS Amendment Record document TS95-AR.

Issued by: **Technical Standards Committee
ADS Group Limited
Registered in England and Wales no. 7016635**

ADS Technical Specification No. TS95

ADS RECOMMENDATIONS FOR METALLIC MATERIAL SPECIFICATIONS & STANDARDS TO BE USED FOR NEW DESIGNS

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1. **SCOPE**

This document provides recommendations for preferred metallic material specifications and standards for new designs.

2. **REFERENCED DOCUMENTS**

2.1 **Informative References**

The following documents, in whole or in part, are informatively referenced in this standard. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

TS96	Similar Metallic Material Specifications & Standards.
TS260	Metallic Materials - List of Alternative Material Specifications & Standards Only Authorised for Use on ADS Standard Parts.
EN 2032-1	Metallic Materials - Part 1: Conventional Designation.
ESDU 00932	Metallic Materials Data Handbook.

2.2 **Listed Publication bodies**

EN	European Committee for Standardization (CEN). Available from National Standards Bodies e.g. British Standards Institution (BSI).
ESDU	IHS ESDU.
TS	ADS Group Limited.

3. **INTRODUCTION**

- 3.1 The data in the Tables have been compiled by the ADS Metallic Materials Special Interest Group (MMSIG).
- 3.2 Other materials to those listed in the Tables will be available to support existing designs and special applications, however, before considering them, designers should satisfy themselves that none of the preferred materials is capable of satisfying the requirements and ensure that a continuing supply of any non-preferred material will be available.
- 3.3 The preferred material standard system is that of ASD-STAN prEN and EN aerospace series and the preferred list of materials is based on these whenever possible.
- 3.4 Reference to any EN material standard means the National implementation of that standard e.g. BS EN.
- 3.5 Reference to any prEN material standard means an ASD-STAN Prestandard.
- 3.6 The designations used in the EN and prEN material standards are in accordance with EN 2032 -1.
- 3.7 For information relating to similar materials, reference should be made to TS96.

- 3.8 For a list of authorised alternative metallic material specifications and standards for withdrawn, obsolescent or partially superseded material specifications referenced on ADS Standard Parts drawings in the AGS and AS series, reference should be made to TS260.
- 3.9 Design properties for some of the materials included in this document are available in ESDU 00932.

4. INDEX OF MATERIAL SPECIFICATIONS & STANDARDS

MATERIAL SPEC REFERENCED	FORM	TABLE	MATERIAL SPEC REFERENCED	FORM	TABLE
BS B 23	Rod, Section & Forging	7	BS L 119	Castings	1F
BS B 24	Rod & Section	7	BS L 128	Castings	2
BS B 25	Rod, Section & Forging	7	BS L 160	Extruded Bar & Section	1C
BS B 26	Rod & Section	7	BS L 164	Sheet & Strip	1A
BS B 27	Tube	7	BS L 165	Sheet & Strip	1A
BS B 28	Strip & Foil	7	BS L 168	Extruded Bar & Section	1C
BS B 29	Strip & Foil	7	BS L 169	Castings	1F
BS B 30	Strip & Foil	7	BS L 170	Extruded Bar & Section	1C
BS B 31	Strip & Foil	7	BS L 173	Castings	1F
BS B 32	Rod & Section	7	BS L 174	Castings	1F
BS B 33	Rod, Section & Wire	7			
BS HC 205	Castings	5B	BS S 82	Bar	3A
BS HC 207	Castings	5B	BS S 82	Forgings	3B
BS HC 211	Castings	5B	BS S 99	Bar	3A
BS HC 301	Castings	5B	BS S 99	Forgings	3B
BS HR 5	Bar	5A	BS S 106	Bar	3A
BS HR 5	Forgings	5B	BS S 106	Forgings	3B
BS HR 5	FWR Stock	5B	BS S 129	Bar	4A
BS HR 6	Bar	5A	BS S 130	Bar	4A
BS HR 6	Forgings	5B	BS S 132	Bar	3A
BS HR 6	FWR Stock	5B	BS S 132	Forgings	3B
BS HR 10	Bar	5A	BS S 136	Bar	3A
BS HR 10	Forgings	5B	BS S 136	Forgings	3B
BS HR 10	FWR Stock	5B	BS S 140	Bar	3A
BS HR 40	Bar	5A	BS S 140	Forgings	3B
BS HR 40	Forgings	5B	BS S 142	Bar	3A
BS HR 40	FWR Stock	5B	BS S 142	Forgings	3B
BS HR 203	Sheet & Strip	5A	BS S 146	Bar	3A
BS HR 203	Plate	5A	BS S 146	Forgings	3B
BS HR 204	Sheet & Strip	5A	BS S 151	Bar	4A
BS HR 204	Plate	5A	BS S 151	Forgings	4B
BS HR 206	Sheet & Strip	5A	BS S 154	Bar	3A
BS HR 206	Plate	5A	BS S 154	Forgings	3B
BS HR 240	Sheet & Strip	5A	BS S 155	Bar	3A
BS HR 404	Tube	5B	BS S 155	Forgings	3B
BS HR 502	Wire	5B	BS S 156	Bar	3A
BS HR 504	Wire	5B	BS S 156	Forgings	3B
BS HR 650	Bar	4A	BS S 162	Bar	3A
			BS S 162	Forgings	3B
BS L 37	Wire	1G	BS S 164	Bar	3A
BS L 56	Tube	1E	BS S 164	Forgings	3B
BS L 63	Tube	1E	BS S 205	Wire	4B
BS L 77	Forgings	1D	BS S 513	Strip	3A
BS L 93	Plate	1B	BS S 526	Sheet & Strip	4A
BS L 99	Castings	1F	BS S 527	Sheet & Strip	4A
BS L 102	Extruded Bar & Section	1C	BS S 534	Sheet & Strip	3A
BS L 103	Forgings	1D	BS S 535	Sheet & Strip	3A
BS L 105	Tube	1E			
BS L 117	Tube	1E	BS T 60	Tube	3B
BS L 118	Tube	1E	BS T 66	Tube	4B
			BS T 73	Tube	4B
			BS T 77	Tube	3B

MATERIAL SPEC REFERENCED	FORM	TABLE	MATERIAL SPEC REFERENCED	FORM	TABLE
BS TA 2	Sheet & Strip	6	EN 2422	Plate	1B
BS TA 6	Sheet & Strip	6	EN 2469	Wire	4B
BS TA 7	Bar & Extrusion	6	EN 2494	Forgings	4B
BS TA 11	Bar & Extrusion	6	EN 2511	Plate	1B
BS TA 28	Forging Stock & Wire	6	EN 2540	Sheet & Strip	4A
BS TA 45	Bar & Extrusion	6	EN 2541	Wire	4B
BS TA 46	Bar & Extrusion	6	EN 2573	Wire	4B
BS TA 49	Bar & Extrusion	6	EN 2631	Extruded Bar & Section	1C
BS TA 56	Plate	6	EN 2632	Extruded Bar & Section	1C
BS TA 59	Sheet & Strip	6	EN 2633	Extruded Bar & Section	1C
			EN 2634	Extruded Bar & Section	1C
EN 2087	Sheet & Strip	1A	EN 2635	Extruded Bar & Section	1C
EN 2088	Sheet & Strip	1A	EN 2662	Sheet & Strip	5A
EN 2089	Sheet & Strip	1A	EN 2681	Forgings	1D
EN 2090	Sheet & Strip	1A	EN 2682	Forgings	1D
EN 2115	Wire	1G	EN 2684	Plate	1B
EN 2116	Wire	1G	EN 2685	Forgings	1D
EN 2124	Plate	1B	EN 2687	Plate	1B
EN 2127	Extruded Bar & Section	1C	EN 2688	Forgings	1D
EN 2161	Castings	5B	EN 2690	Forgings	1D
EN 2172	Forgings	4B	EN 2694	Sheet & Strip	1A
EN 2174	Forgings	4B	EN 2702	Extruded Bar & Section	1C
EN 2183	Forgings	5B	EN 2703	Sheet & Strip	1A
EN 2184	Bar	5A	EN 2725	Castings	1F
EN 2185	Sheet, Strip & Plate	5A	EN 2726	Castings	1F
EN 2194	Forgings	5B	EN 2727	Castings	1F
EN 2199	Bar	5A	EN 2728	Castings	1F
EN 2201	FWR Stock	5B	EN 2729	Castings	1F
EN 2202	Tube	5B	EN 2759	Forgings	3B
EN 2203	Sheet & Strip	5A	EN 2760	Bar	3A
EN 2204	Castings	5B	EN 2761	Forgings	3B
EN 2205	Bar	3A	EN 2763	Bar	3A
EN 2207	Forgings	3B	EN 2764	Forgings	3B
EN 2209	Sheet, Strip & Plate	3A	EN 2767	Bar	3A
EN 2211	Tube	3B	EN 2768	Forgings	3B
EN 2225	Forgings	3B	EN 2802	Sheet & Strip	1A
EN 2227	Forgings	4B	EN 2803	Sheet & Strip	1A
EN 2247	Tube	3B	EN 2813	Tube	1E
EN 2278	Bar	4A	EN 2815	Bar	4A
EN 2279	Forgings	4B	EN 2816	Forgings	4B
EN 2302	Sheet & Strip	5A	EN 2817	Bar	4A
EN 2306	Bar	5A	EN 2818	Forgings	4B
EN 2382	Forgings	1D	EN 2952	Bar	5A
EN 2383	Forgings	1D	EN 2959	Bar	5A
EN 2386	Forgings	1D	EN 2960	Bar	5A
EN 2387	Tube	1E	EN 2961	Bar	5A
EN 2391	Tube	1E	EN 3120	Tube	6
EN 2392	Tube	1E	EN 3122	Castings	1F
EN 2394	Extruded Bar & Section	1C	EN 3123	Castings	1F
EN 2395	Sheet & Strip	1A	EN 3124	Castings	1F
EN 2399	Bar	4A	EN 3125	Castings	1F
EN 2401	Wire	5B	EN 3161	Bar	4A
EN 2402	Wire	5B	EN 3219	Bar	5A
EN 2403	Castings	5B	EN 3220	Bar	5A
EN 2405	Forgings	5B	EN 3311	Bar & Extrusion	6
EN 2407	Sheet & Strip	5A	EN 3312	Forgings	6

MATERIAL SPEC REFERENCED	FORM	TABLE
EN 3332	Sheet & Strip	1A
EN 3333	Sheet & Strip	1A
EN 3335	Sheet	1A
EN 3336	Plate	1B
EN 3337	Extruded Bar & Section	1C
EN 3338	Extruded Bar & Section	1C
EN 3339	Forgings	1D
EN 3340	Forgings	1D
EN 3341	Sheet & Strip	1A
EN 3342	Extruded Bar & Section	1C
EN 3343	Extruded Bar & Section	1C
EN 3344	Extruded Bar & Section	1C
EN 3345	Extruded Bar & Section	1C
EN 3346	Tube	1E
EN 3347	Extruded Bar & Section	1C
EN 3351	Forgings	6
EN 3352	Castings	6
EN 3354	Sheet	6
EN 3355	Bar & Extrusion	6
EN 3357	Bar	4A
EN 3358	Bar	4A
EN 3363	Castings	4B
EN 3367	Wire	3B
EN 3442	Sheet & Strip	6
EN 3443	Sheet & Strip	6
EN 3456	Sheet & Strip	6
EN 3461	Bar & Extrusion	6
EN 3464	Plate	6
EN 3466	Bar & Extrusion	6
EN 3469	Forgings	4B
EN 3470	Forgings	4B
EN 3471	Strip	4A
EN 3474	Sheet & Strip	1A
EN 3479	Plate	4A
EN 3486	Forgings	4B
EN 3487	Bar	4A
EN 3488	Sheet & Strip	4A
EN 3492	Bar	4A
EN 3498	Sheet & Strip	6
EN 3499	Sheet & Strip	6
EN 3508	Bar	3A
EN 3509	Bar	3A
EN 3510	Bar	4A
EN 3511	Bar	3A
EN 3517	Bar	3A
EN 3519	Bar	3A
EN 3528	Bar	3A
EN 3529	Forgings	3B
EN 3557	Tube	1E
EN 3639	Wire	4B
EN 3668	FWR Stock	5B
EN 3678	Forgings	4B
EN 3679	Plate	4A
EN 3680	Tube	4B

MATERIAL SPEC REFERENCED	FORM	TABLE
EN 3735	Bar & Extrusion	6
EN 3736	Forgings	6
EN 3813	Bar	6
EN 3880	Forgings	1D
EN 3881	Forgings	1D
EN 3973	Castings	4B
EN 3982	Plate	1B
EN 3983	Plate	1B
EN 3993	Castings	4B
EN 3997	Sheet & Strip	1A
EN 4095	Castings	5B
EN 4097	Castings	5B
EN 4100	Sheet & Strip	1A
EN 4244	Bar	4A
EN 4246	FWR Stock	5B
EN 4247	Plate	1B
EN 4318	Bar	4A
EN 4376	Bar	5A
EN 4377	FWR Stock	5B
EN 4381	Tube	5B
EN 4448	Forgings	1D
EN 4449	Sheet	1A
EN 4450	Sheet	1A
EN 4457	Plate	1B
EN 4566	Forgings	5B
EN 4567	Bar	5A
EN 4568	Sheet & Strip	5A

5. TABLES OF MATERIALS & SPECIFICATIONS / STANDARDS

TABLE 1A – ALUMINIUM ALLOYS – SHEET & STRIP

REMARKS	ASD-STAN		RELATED BS SPECIFICATION
	prEN / EN	DESIGNATION	
Good fatigue crack tolerance.	3997	AL-P2024- T3	-
Good fatigue crack tolerance, use where forming is required.	2395	AL-P2014A T4/T42	-
Good fatigue crack tolerance and good corrosion resistance.	2088	Clad AL-P2014A T4/T42	BS L 164
	2090	Clad AL-P2024- T3	-
	2703	Clad AL-P2024- T4/T42	-
Medium strength materials.	2089	AL-P2014A T6/T62	-
	3474	AL-P2024- T81	-
Medium strength and good corrosion resistance.	2087	Clad AL-P2014A T6/T62	BS L 165
Weldable - medium strength materials.	3341	AL-P6061- T4/T42	-
	2694	AL-P6061- T6/T62	-
Weldable - suitable for cryogenic application. Good creep performance at relatively high temperatures.	4100	AL-P2219- T6/T62	-
Use where very high strength and resistance to exfoliation corrosion is required, and where fatigue is not a major consideration.	4450	AL-P7050- T762	-
	4449	AL-P7050- T76	-
High strength and good toughness and crack tolerance.	2802	AL-P7475- T761	-
	3333	AL-P7475- T762	-
Suitable for super-plastic forming (SPF) applications.	3335	AL-P7475- T763	-
Medium to high strength and good toughness together with good corrosion resistance.	2803	Clad AL-P7475- T761	-
	3332	Clad AL-P7475- T762	-

TABLE 1B – ALUMINIUM ALLOYS – PLATE

REMARKS	ASD-STAN		RELATED BS SPECIFICATION
	prEN / EN	DESIGNATION	
Good fatigue crack tolerance is susceptible to exfoliation corrosion and in thick sections to stress corrosion.	2422	AL-P2124- T351	-
As for EN 2422, for use in special applications requiring limited formability.	4247	AL-P2024- T42	-
General purpose medium strength material for use where fatigue is not a major consideration.	2124	AL-P2214- T651	BS L 93
General purpose material for use where good resistance to stress corrosion and exfoliation corrosion is required.	2511	AL-P7075- T7351	-
Both materials offer good toughness with high resistance to stress corrosion and exfoliation corrosion.	4457	AL-P7475- T7351	-
Medium strength materials with good toughness and good resistance to stress corrosion and exfoliation corrosion.	2687	AL-P7010- T7451	-
	3982	AL-P7050- T7451	-
High strength materials with resistance to stress corrosion and exfoliation corrosion.	2684	AL-P7010- T7651	-
	3983	AL-P7050- T7651	-
Very high strength material, is susceptible to exfoliation corrosion, and in thick sections is susceptible to stress corrosion.	3336	AL-P7150- T651	-

Note: 7010, 7050 and 7150 materials exhibit good retention of strength in thick sections.

TABLE 1C – ALUMINIUM ALLOYS – EXTRUDED BAR & SECTION

REMARKS	ASD-STAN		RELATED BS SPECIFICATION
	prEN / EN	DESIGNATION	
Good fatigue crack tolerance, susceptible to exfoliation corrosion.	PCGC	AL-P2014A T4511	BS L 102
	-	AL-P2024- T3511	-
General purpose medium strength material for use where fatigue is not a major consideration.	PCGC	AL-P2014A T6511	BS L 168
	-	AL-P2024- T8511	-
Weldable - medium strength materials.	-	AL-P6061- T4/42	-
	-	AL-P6061- T6/62	-
General purpose material for use where good resistance to stress corrosion and exfoliation corrosion is required.	PCGC	AL-P7075- T73511	BS L 160
	-	-	-
High strength material, susceptible to exfoliation corrosion.	-	AL-P7075- T6511	BS L 170
	PCGC	-	-
Medium strength materials with good toughness and good resistance to stress corrosion and exfoliation corrosion.	PCGC	AL-P7010- T74511	-
	PCGC	AL-P7050- T74511	-
High strength materials with resistance to stress corrosion and exfoliation corrosion.	PCGC	AL-P7010- T76511	-
	PCGC	AL-P7050- T76511	-
Very high strength material susceptible to stress corrosion and exfoliation corrosion.	PCGC	AL-P7150- T6511	-

PCGC = Peripheral coarse grain control.
 Note: 7010, 7050 and 7150 materials exhibit good retention of strength in thick sections.

TABLE 1D – ALUMINIUM ALLOYS – FORGINGS

REMARKS	ASD-STAN		RELATED BS SPECIFICATION
	prEN / EN	DESIGNATION	
For use where fatigue is of major concern (for special applications).	2383	AL-P2214- T4	-
General purpose medium strength material for use where fatigue is not a major consideration.	2382	AL-P2214- T6	BS L 77
General purpose material for use where good resistance to stress corrosion is required.	3880	AL-P7075- T73	-
	3881		-
Material for use where good resistance to stress corrosion is required. Stress relieved by cold compression (for special applications).	2386	AL-P7075- T7353	-
Medium strength materials with good toughness and good resistance to stress corrosion.	2681	AL-P7010- T74	-
	2688	AL-P7050- T74	-
Medium strength materials with good toughness and resistance to stress corrosion. Stress relieved by cold compression in finishing die (for special applications).	2682	AL-P7010- T7452	-
	2690 4448	AL-P7050- T7452	- -
High strength materials with limited resistance to stress corrosion.	3339	AL-P7010- T76	-
	3340	AL-P7050- T76	-
High strength materials with limited resistance to stress corrosion. Stress relieved by cold compression in special die (for special applications).	2685	AL-P7010- T7652	-

Note: 7010 and 7050 materials exhibit good retention of strength in thick sections.

TABLE 1E – ALUMINIUM ALLOYS – TUBE

REMARKS	ASD-STAN		RELATED BS SPECIFICATION
	prEN / EN	DESIGNATION	
Structural applications.	3346	AL-P2014A T3	BS L 105
	2387	AL-P2014A T6	BS L 63
Weldable structural tube.	2391	AL-P6061- T4	-
	2392	AL-P6061- T6	BS L 117
Hydraulic applications.	-	AL-P5251- O	BS L 56
	3557	AL-P6061- T4	-
	2813	AL-P6061- T6	BS L 118

TABLE 1F – ALUMINIUM ALLOYS – CASTINGS

DESCRIPTION	REMARKS	ASD-STAN		RELATED BS SPECIFICATION
		prEN / EN	DESIGNATION	
Al-Cu5 Mn Ni Zr Co Sb	Sand castings for use in engines at elevated temperatures.	2725	AL-C21201 T6	BS L 119
		2726	AL-C42201 T6	BS L 169 (sand)
Al-Si7-Mg 0.55	High strength sand castings.	2727	AL-C42201 T6	BS L 169 (chill)
	High strength chill castings.	3124	AL-C42201 T6 ¹	-
	High strength structural precision castings.	3125	AL-C42201 T6	-
Al-Si7-Mg 0.3	Structural precision castings.	2728	AL-C42101 T6	BS L 99 (sand)
	General purpose sand casting alloy.	2729	AL-C42101 T6	BS L 99 (chill)
	General purpose chill casting alloy.	3122	AL-C42101 T6 ¹	-
	High strength structural precision castings.	3123	AL-C42101 T6	-
	Structural precision castings.	-	-	BS L 173
	General purpose sand and chill casting alloy for use where stability is more important than strength (T7 condition).	-	-	BS L 174

¹ Premium material. Use only where extra cost is justified.

TABLE 1G – ALUMINIUM ALLOYS – WIRE (FOR FASTENERS)

REMARKS	ASD-STAN		RELATED BS SPECIFICATION
	prEN / EN	DESIGNATION	
Wire for solid rivets.	-	AL-P2014A T42	BS L 37
Wire for solid rivets. Rivets are supplied in the T4 temper and must be heat treated. These rivets must be driven within 20 minutes after quenching or refrigerated at or below 0°C to delay the aging time for 24 hours.	2116	AL-P2017A T42	-
Wire for solid rivets.	2115	AL-P2117- T42	-

TABLE 2 – MAGNESIUM ALLOYS – CASTINGS

DESCRIPTION	REMARKS	ASD-STAN		RELATED BS SPECIFICATION
		prEN / EN	DESIGNATION	
Mg-Zn-RE1.3-Zr0.7	Weldable, pressure tight with useful strength at elevated temperatures (200 MPa).	-	-	BS L 128 (sand)
		-	-	BS L 128 (chill)

TABLE 3A – NON-CORROSION RESISTING STEELS – SHEET, STRIP, PLATE & BAR

FORM	DESCRIPTION	REMARKS	ASD-STAN		RELATED BS SPECIFICATION
			pEN / EN	DESIGNATION	
Strip	0.8% carbon	Spring steel.	-	-	BS S 513
Sheet, strip & plate	AISI 4130	900 MPa tensile strength. Weldable.	2209	FE-PL1502	BS S 534 ²
		1150 MPa tensile strength. Weldable.	-	-	BS S 535 ²
Bar	2.5% Ni Cr Mo	Structural.	3519	FE-PL2105	BS S 154
			2205	FE-PL1502	BS S 142
	2.5% Ni Cr Mo	3517	FE-PL2105	BS S 140	
	AISI 4130	-	-	BS S 164	
	2.5% Ni Cr Mo	-	-	BS S 99	
	18% Ni Maraging	VAR ¹ , 1750 MPa tensile strength.	3528	FE-PM2701 ³	BS S 162
	4% Ni Cr Mo	VAR ¹ , 1760 MPa tensile strength.	2760	FE-PL2109 ³	BS S 146
	300M™	VAR ¹ , 1900 MPa tensile strength.	-	-	BS S 155
	4% Ni Cr Mo	Carburizing.	2767	FE-PL2110 ³	BS S 82
	3% Cr Mo	Nitriding.	-	-	BS S 156
		930 MPa tensile strength.	-	-	BS S 106
		930 MPa tensile strength.	3508	FE-PL1501	-
		1050 MPa tensile strength.	3509	FE-PL1501	-
		1200 MPa tensile strength.	2763	FE-PL1504	-
		1320 MPa tensile strength.	-	-	BS S 132
	SAE 52100	Bearing.	3511	FE-PL1801 ³	BS S 136

¹ VAR – Vacuum arc remelted.

² Plate is not covered by these specifications

³ Premium material - use only where extra cost is justified.

TABLE 3B – NON-CORROSION RESISTING STEELS – FORGINGS, TUBE & WIRE FOR SPRINGS

FORM	DESCRIPTION	REMARKS	ASD-STAN		RELATED BS SPECIFICATION
			prEN / EN	DESIGNATION	
Forgings	2.5% Ni Cr Mo	Structural.	-	-	BS S 154
	AISI 4130		2207	FE-PL1502	BS S 142
	2.5% Ni Cr Mo		-	-	BS S 140
	AISI 4130		-	-	BS S 164
	2.5% Ni Cr Mo		-	-	BS S 99
	18% Ni Maraging		3529	FE-PM2701 ²	BS S 162
	4% Ni Cr Mo		2761	FE-PL2109 ²	BS S 146
	300M™		2759	FE-PL2111 ²	BS S 155
	4% Ni Cr Mo	Carburizing.	2768	FE-PL2110	BS S 82
			-	-	BS S 156
Tube	3% Cr Mo	Nitriding.	-	-	BS S 106
	3% Cr Mo V		2764	FE-PL1504	-
			-	-	BS S 132
	SAE 52100	Bearing.	2225	FE-PL1801 ²	BS S 136
	AISI 4130	Structural.	2247	FE-PL1502	BS T 53
			2211	FE-PL1502	BS T 77
			-	-	BS T 60
Wire for springs	0.8% C steel	-	3367	FE-PL8701	-

¹ VAR – Vacuum arc remelted

² Premium material - use only where extra cost is justified.

TABLE 4A – CORROSION RESISTING STEELS – SHEET, STRIP, PLATE & BAR

FORM	DESCRIPTION	REMARKS	ASD-STAN		RELATED BS SPECIFICATION
			pEN / EN	DESIGNATION	
Sheet & strip	AISI 301 Full hard	Spring Strip.	3471	FE-PA3903	-
	AISI 347	Softened.	-	-	BS S 527
	AISI 321	Softened.	3488	FE-PA3601	BS S 526
Plate	17-7PH™ H1050	1240 MPa tensile strength.	2540	FE-PM3902	-
	15-5PH™ H1025	VAR ¹ , 1070 MPa tensile strength.	3479	FE-PA1802 ²	-
	17-7PH H1050	1240 MPa tensile strength.	3679	FE-PM3902	-
	AISI 347	Softened.	-	-	BS S 130
Bar	AISI 321	Softened.	3487	FE-PA3601	BS S 129
	A286™ H1325	VAR ¹ , 900 MPa tensile strength.	4318	FE-PA2601 ²	-
	A286™	For forged fasteners.	2399	FE-PA2601 ²	BS HR 650
	A286™ (low Ti) H1325	VAR ¹ , 850 MPa tensile strength. Weldable.	3510	FE-PA2602	-
	12% Cr Ni Mo V	900 MPa tensile strength.	2278	FE-PM1502	BS S 151
	FV535™	VAR ¹ , 1000 MPa tensile strength.	4244	FE-PM1708 ²	-
	AISI 440C	VAR ¹ , Bearing steel.	3492	FE-PM3502 ²	-
	17-4PH™ H1150	930 MPa tensile strength.	3161	FE-PM3801	-
	15-5PH™ H1025	VAR ¹ , 1070 MPa tensile strength.	2817	FE-PM1802 ²	-
	PH13-8Mo™ H1050	VAR ¹ , 1200 MPa tensile strength.	3357	FE-PM1503 ²	-
PH13-8Mo™ H1000	VAR ¹ , 1400 MPa tensile strength.	3358	FE-PM1503 ²	-	

¹ VAR – Vacuum arc remelted

² Premium material - use only where extra cost is justified.

TABLE 4B – CORROSION RESISTING STEELS – FORGINGS, TUBE, WIRE & CASTINGS

FORM	DESCRIPTION	REMARKS	ASD-STAN		RELATED BS SPECIFICATION	
			pEN / EN	DESIGNATION		
Forgings	A286™ H1325	VAR ¹ , 900 MPa tensile strength.	2172	FE-PA2601 ²	-	
	A286™ (low Ti) H1325	VAR ¹ , 850 MPa tensile strength. Weldable.	2174	FE-PA2602 ²	-	
	12% Cr Ni Mo V	900 MPa tensile strength.	2279	FE-PM1502	BS S 151	
	FV535™	VAR ¹ , 1000 MPa tensile strength.	2494	FE-PM1708 ²	-	
	AISI 440C	VAR ¹ , Bearing steel.	2227	FE-PM3502 ²	-	
	17-4PH™ H1150	930 MPa tensile strength.	3678	FE-PM3801	-	
	15-5PH™ H1100	VAR ¹ , 965 MPa tensile strength.	2816	FE-PM1802 ²	-	
	15-5PH™ H1025	VAR ¹ , 1070 MPa tensile strength.	2818	FE-PM1802 ²	-	
	15-5PH™ H900	VAR ¹ , 1310 MPa tensile strength.	3469	FE-PM1802 ²	-	
	PH13-8Mo™ H1000	VAR ¹ , 1400 MPa tensile strength.	3486	FE-PM1503 ²	-	
	PH13-8Mo™ H1050	VAR ¹ , 1200 MPa tensile strength.	3470	FE-PM1503 ²	-	
	Tube	AISI 321	Hydraulic Tube.	3680	FE-PA3601	BS T 73 ³
			Structural Tube	-	-	BS T 66
Wire	Low C 18/10 Stainless	Locking wire 450 MPa tensile strength.	2469	FE-PA3901	-	
	AISI 321	Locking wire 550 MPa tensile strength.	2573	FE-PA3601	-	
	A286™	For forged fasteners.	3639	FE-PA2601 ²	BS HR 650	
	AISI 302 Hard drawn	For springs.	2541	FE-PA3903	BS S 205	
Castings	17-4PH™ H1000	Investment Castings.	3973	FE-CM3801	-	
	AISI 347	Sand or Investment Castings.	3363	FE-CM3901	-	
	Jetihete M190™	925 MPa tensile strength. High temperature capability.	3993	FE-CM1501	-	

¹ VAR – Vacuum arc remelted.

² Premium material - use only where extra cost is justified.

³ EN 3680 (FE-PA3601) (AISI 321) is titanium stabilized whereas BS T 73 is niobium stabilized.

TABLE 5A – HEAT RESISTING ALLOYS – SHEET, STRIP, PLATE & BAR

FORM	DESCRIPTION	REMARKS	ASD-STAN		RELATED BS SPECIFICATION	
			prEN / EN	DESIGNATION		
Sheet & strip	Nimonic 75™	Low strength non-precipitation hardening alloys. Good oxidation resistance. Weldable.	2302	NI-PH1201	BS HR 203	
	Hastelloy X™		2185	NI-PH2301	BS HR 204	
	C-263™		2203	NI-PH1303	BS HR 206	
	Inconel 625™		2662	NI-PH3601	-	
	Haynes 25™		4568	CO-PH4101	BS HR 240	
	Inconel 718™		2407	NI-PH2601	-	
Plate	Nimonic 75™	Low strength non-precipitation hardening alloys. Good oxidation resistance. Weldable.	-	-	BS HR 203	
	Hastelloy X™		2185	NI-PH2301	BS HR 204	
	C-263™		-	-	BS HR 206	
Bar	Nimonic 75™	Low strength non-precipitation hardening alloys. Good oxidation resistance. Weldable.	2306	NI-PH1201	BS HR 5	
	Hastelloy X™		2184	NI-PH2301	BS HR 6	
	C-263™		2199	NI-PH1303	BS HR 10	
	Haynes 25™		4567	CO-PH4101	BS HR 40	
	Inconel 718™		High strength, lower temperature alloy. Weldable.	4376	NI-PH2601	-
				2961		-
				2952		-
	Waspaloy™		Bar and wire for forged or extruded fasteners.	3219	NI-PH1302 ¹	-
				2960		-
				2959		-
3220		-				

¹ Premium material - use only where extra cost is justified.

TABLE 5B – HEAT RESISTING ALLOYS – FORGINGS, FORGING STOCK FOR FLASH WELDED RINGS, TUBE, WIRE & CASTINGS

FORM	DESCRIPTION	REMARKS	ASD-STAN		RELATED BS SPECIFICATION
			prEN / EN	DESIGNATION	
Forgings & stock for flash welded rings (FWR)	Nimonic 75™	Low strength non-precipitation hardening alloys. Good oxidation resistance. Weldable.	-	-	BS HR 5
	Hastelloy™		2183	NI-PH2301	BS HR 6
C-263™		Medium strength precipitation hardening alloy. Weldable.	-	NI-PH1303	BS HR 10
			2201		
Haynes 25™		Good wear resistance.	4566	CO-PH4101	BS HR 40
			4246		
Inconel 718™		High strength, lower temperature alloy. Weldable.	2405	NI-PH2601	-
			4377		-
Waspaloy™		High strength, medium temperature capability.	2194	NI-PH1302 ¹	BS HR 6
C-263™		Medium strength precipitation hardening alloy. Weldable.	2202	NI-PH1303	BS HR 404
Inconel 625™		Lower strength alloy. Non-heat treatable.	4381	NI-PH3601	-
Nimonic 90™		Cold drawn and solution treated wire.	2401	NI-PH1801	BS HR 502
Nimonic 75™		Lower strength than Nimonic 90™.	2402	NI-PD1301	BS HR 504
C-263™		Low strength. Weldable.	2204	NI-CH1303	BS HC 205
Inconel 718™		High strength, medium temperature alloy. Difficult to weld.	2403	NI-CH2601	-
C-1023™		High strength, high temperature capability. Non-weldable.	4095	NI-CH1305	BS HC 211
MAR M002™		Higher strength than C-1023™.	4097	NI-CD1401 ¹	BS HC 207
Stellite 31™		Good wear resistance.	2161	CO-CH1301	BS HC 301

¹ Premium material - use only where extra cost is justified.

TABLE 6 – TITANIUM ALLOYS

FORM	DESCRIPTION	REMARKS	ASD-STAN		RELATED BS SPECIFICATION
			prEN / EN	DESIGNATION	
Sheet & strip	Commercially Pure (CP)	Low strength alloy. Cold rolled. Weldable.	3498	TI-P99002	BS TA 2
		Low strength alloy. Hot rolled. Weldable.	3442	TI-P99002	BS TA 2 ²
		Higher strength alloy. Cold rolled. Weldable.	3499	TI-P99003	BS TA 6
		Higher strength alloy. Hot rolled. Weldable.	3443	TI-P99003	BS TA 6 ²
		High strength alloy. Weldable.	3456	TI-P64001	BS TA 59
		High strength alloy. SPF quality sheet. Weldable.	3354	TI-P64001	-
Plate	6Al-4V Annealed	High strength alloy. Weldable.	3464	TI-P64001	BS TA 56
Bar, extrusion, forging stock & wire	Commercially Pure	Low strength alloy. Weldable.	3461	TI-P99003	BS TA 7
		High strength alloy bar. Weldable.	3311	TI-P64001	BS TA 11
		High strength alloy extruded sections. Weldable.	3355	TI-P64001	-
		For manufacture of fasteners.	3813	TI-P64001	BS TA 28
		Higher strength alloy. Non-weldable.	3466	TI-P63001 ¹	BS TA 45 / BS TA 46 / BS TA 49
		High temperature alloy.	3735	TI-P65002	-
Forgings	6Al-2Sn-4Zr-2Mo	Fatigue resistant alloy	3356	TI-P46001	-
		Higher strength alloy. Weldable.	3312	TI-P64001	-
		High temperature alloy.	3736	TI-P65002	-
		Higher strength alloy. Non-weldable.	3351	TI-P63001 ¹	-
Tubes	3Al-2.5V	Cold worked and stress relieved. Hydraulic tube.	3120	TI-P64003	-
		High strength alloy.	3352	TI-C64001	-

¹ Premium material. Use only when extra cost is justified.

² BS TA specification supplied cold rolled only.

TABLE 7 – COPPER ALLOYS

FORM	DESCRIPTION	REMARKS	ASD-STAN		RELATED BS SPECIFICATION
			pEN / EN	DESIGNATION	
Rod, section & forgings	CuAl10Fe5Ni5	High strength (650 MPa tensile strength) fatigue and heat resistance. Good corrosion resistance.	-	-	BS B 23
Rod & section	CuSn8	High strength (450 MPa tensile strength). Good wear resistance and bearing properties.	-	-	BS B 24
Rod, section & forgings	CuNi3Si	High strength (580 MPa tensile strength). Good wear resistance and corrosion resistance.	-	-	BS B 25
Rod & section		High strength (650 MPa tensile strength). Good wear resistance and corrosion resistance.	-	-	BS B 26
Tube	CuNi1Si1Al1	High strength (430 MPa tensile strength), ductility and corrosion resistance.	-	-	BS B 27
Strip, foil, rod, section & wire	CuBe1.9 NOTE: May be subject to special restrictions due to Beryllium content.	Strip and foil with high strength after age hardening.	-	-	BS B 28
		1/4 Hard (1210 MPa tensile strength).	-	-	BS B 29
		1/2 Hard (1270 MPa tensile strength).	-	-	BS B 30
		Full Hard (1310 MPa tensile strength).	-	-	BS B 31
		Rod and section with high strength after age hardening.	-	-	BS B 32
		Wire with high strength after age hardening.	-	-	BS B 33