



BSI Standards Publication

AEROSPACE SERIES

Specification for bolts, double hexagonal heads, optional locking wire holes, unified threads, alloy steel, cadmium plated

Classification: $R_m \geq 1241 \text{ MPa}$ (180 000 lbf/in²) at ambient temp | +190°C

Publishing and copyright information

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Summary of pages

This document comprises a front cover, an inside front cover, pages i to ii, pages 1 to 18, an inside back cover and a back cover.

Foreword

Publishing information

This British Standard is published by BSI Standards Limited, under licence from The British Standards Institution, and came into effect 30 September 2019. It was prepared by Technical Committee ACE/12, *Aerospace Fasteners & Fastening Systems*. A list of organizations represented on this committee can be obtained on request to its secretary.

Supersession

BS 5A 228:2019 supersedes BS 4A 228:1997 which is withdrawn.

Presentational conventions

The provisions of this standard are presented in roman (i.e. upright) type. Its requirements are expressed in sentences in which the principal auxiliary verb is “shall”.

Commentary, explanation and general informative material is presented in smaller italic type, and does not constitute a normative element.

Where words have alternative spellings, the preferred spelling of the Shorter Oxford English Dictionary is used (e.g. “organization” rather than “organisation”).

Contractual and legal considerations

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

1 Scope

This British Standard specifies the materials, dimensions, finish and inspection requirements for steel bolts of high metallurgical quality with double hexagon head and unified screw threads of 'UNJF' basic profile, with optional locking wire holes for aircraft use.

CAUTION. This British Standard features parts that have cadmium as a plating material which has been restricted and/or banned for use in many countries owing to environmental and health concerns; they should not be used in new product designs. Local officials should be consulted about any concerns on the use of cadmium-plated parts.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes provisions of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE The latest edition of an Aerospace Series standard is indicated by a prefix number.

BS A 241, *General requirements for steel protruding-head bolts of tensile strength 1250 MPa (180000 lbf/in²) or greater*

BS A 346, *UNJ threads – General requirements and limit dimensions*

BS S 147, *Specification for 0.5% nickel-chromium-molybdenum steel bars for the manufacture of forged bolts and forged nuts*

BS S 149, *Specification for 1.75% nickel-chromium-molybdenum steel bars for the manufacture of forged bolts and forged nuts*

BS EN 2133, *Aerospace series – Cadmium plating of steels with specified tensile strength ≤ 1450 MPa, copper, copper alloys and nickel alloys*

BS ISO 866, *Centre drills for centre holes without protecting chamfers – Type A*

SAE ITC RS680, *Wrenching configuration, double hexagon threaded fasteners (available from SAE ITC)*

SAE AMS03-19, *Electro-Deposition of Cadmium*

SAE AMS6322, *Steel Bars, Forgings, and Rings, 0.50Cr – 0.55Ni – 0.25Mo (0.38 – 0.43C) (SAE 8740)*

SAE AMS6415, *Steel, Bars, Forgings, and Tubing 0.80Cr – 1.8Ni – 0.25Mo (0.38 – 0.43C) (SAE 4340)*

SAE AMS6484, *Steel, Bars, Forgings, and Tubing 0.80Cr – 1.8Ni – 0.25Mo (0.38 – 0.43C) (SAE 4340) Normalized and Tempered*

SAE AS8879, *Screw Threads – UNJ Profile, Inch Controlled Radius Root with Increased Minor Diameter*

NOTE Available from SAE International.

3 Terms and definitions

No terms and definitions are listed in this document.

4 Materials, manufacture, inspection and testing

4.1 Material

The bolts shall be manufactured from steel bars conforming to the requirements of BS S 147 (or SAE AMS6322) or BS S 149 (or SAE AMS6415, or SAE AMS6484), according to the discretion of the manufacturer.

4.2 Manufacture, inspection and testing

The bolts shall be manufactured, inspected and tested in accordance with the requirements of BS A 241.

5 Screw threads

The screw threads shall conform to the class 3A requirements of BS A 346 or SAE AS8879.

6 Dimensions

- 6.1 Dimension values shall be in inches unless otherwise stated.
 - 6.2 All finished bolts, after the application of the protective finish, shall conform to the dimensions and tolerances given in Table 2 for Figure 1 and Table 3 for Figure 2.
 - 6.3 The wrenching profile of the bolts shall conform to the dimensions and tolerances given in SAE ITC RS680.
 - 6.4 Oversize bolts are designated X and Y for the first and second oversize respectively. Dimensions for oversize bolts shall be given in accordance with Annex A.
 - 6.5 With reference to Figure 1 and Table 2, the following conditions shall apply.
 - a) Dimensions *A*, *B* and *G* shall be concentric to each other within values specified for *K*.
 - b) Dimensions *W* and *G* shall be concentric to each other within values specified for *M*.
 - c) Dimensions *A* and the effective thread diameter shall be concentric to each other within values specified for *N*.
-

7 Protective finish

All finished bolts shall be coated with cadmium in accordance with SAE AMS03-19 or BS EN 2133.

8 Identification and marking

- 8.1 The bolts shall be identified as the British Standard Part No. This is constructed as follows:
 - a) the number of this specification (A228) suffixed with the applicable Part No. code from Table 3;
 - b) if a drilled head is required, add an H suffix;
 - c) if oversize bolts are required, an additional oversize code from Annex A is added.

NOTE See examples in Table 1.
- 8.2 The bolts shall be marked on the top face of the head with the full applicable British Standard Part No. (see examples in Table 1). The bolts shall be marked in accordance with the requirements of BS A 241.

NOTE Marking A228 on or in relation to a product represents a manufacturer's declaration of conformity, i.e. a claim by or on behalf of the manufacturer that the product meets the requirements of the standard. The accuracy of the claim is solely the claimant's responsibility. Such a declaration is not to be confused with third-party certification of conformity.

8.3 Unallocated part numbers shall not be used.

Table 1 — Examples of bolt BS part numbers for ordering and marking purposes

Standard size	A228E6
Standard size – drilled head	A228E6H
First oversize	A228E6X
First oversize – drilled head	A228E6HX
Second oversize	A228E6Y
Second oversize – drilled head	A228E6HY

Figure 1 — Outline and dimensions

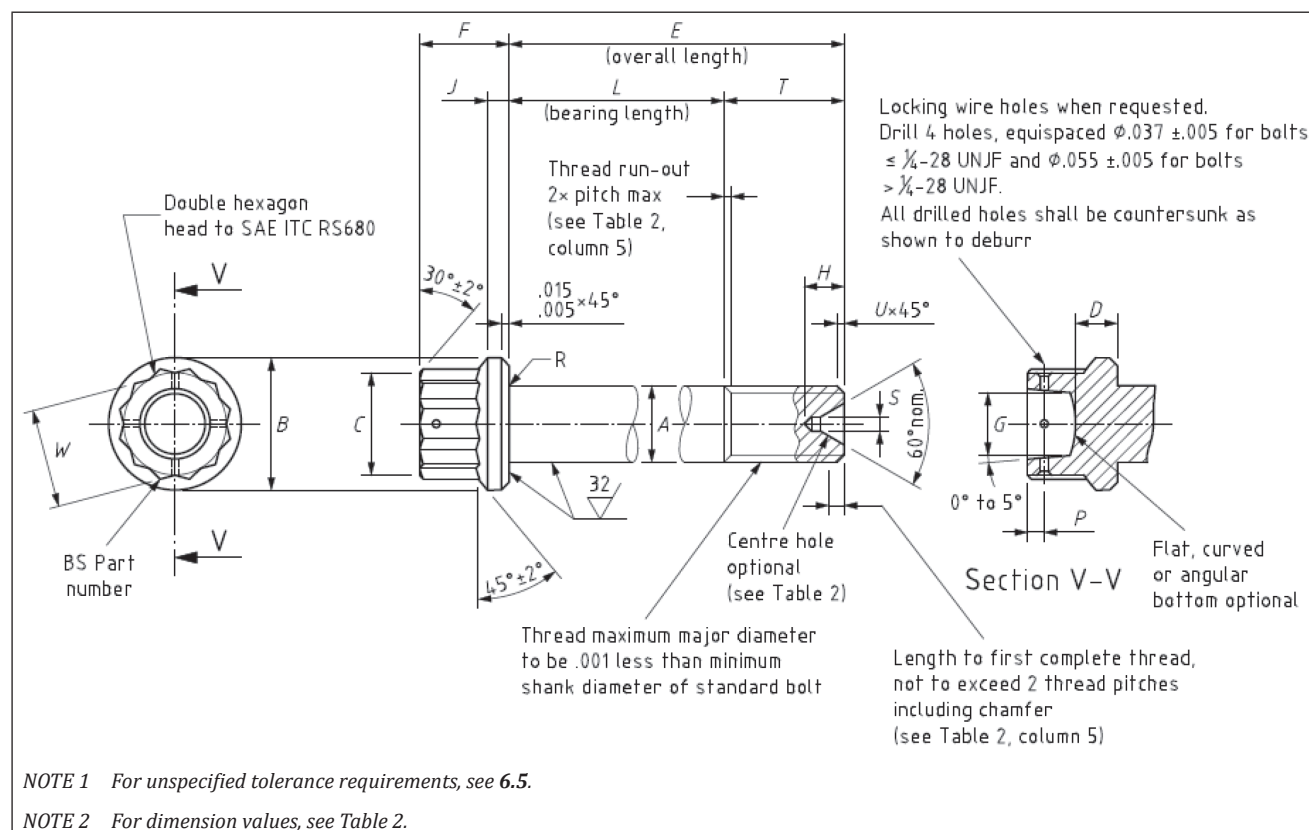


Table 2 — Dimensions

All dimensions are in inches																							
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Thread	UNJF size	A Dia		Thread runout (2 x pitch)	B dia		C dia cham		D	F	G dia	H (2)	J	P	R rad		S (2) dia	T	U cham	W (AF)	K	M	N
		min	max		min	max	min	max															
Class 3A	nom	min	max	max	min	max	min	max	min	± .010	+ .010 − .030	max	± .010	± .010	min	max	max	ref (1)	± .016	nom	Concentricity tol (see 6.5)		
10 - 32	.190	.1885	.1895	.063	.340	.350	.235	.250	.092	.265	.125	—	.055	.062	.031	.041	—	.420	.031	.250	.004	.003	.0045
1 1/4 - 28	.250	.2485	.2495	.071	.428	.438	.297	.312	.135	.300	.180	-	.069	.062	.031	.041	—	.492	.031	.3125	.005	.004	.0045
5/16 - 24	.3125	.3110	.3120	.083	.521	.531	.360	.375	.162	.348	.215	—	.082	.070	.031	.041	—	.579	.047	.375	.006	.005	.0045
3/8 - 24	.375	.3735	.3745	.083	.639	.649	.422	.437	.197	.388	.260	—	.091	.070	.047	.057	—	.625	.047	.4375	.008	.006	.0045
7/16 - 20	.4375	.4360	.4370	.100	.740	.750	.485	.500	.228	.435	.320	—	.099	.070	.047	.057	—	.721	.047	.500	.009	.008	.006
1/2 - 20	.500	.4985	.4995	.100	.818	.828	.547	.562	.254	.504	.380	—	.123	.094	.047	.057	—	.768	.047	.5625	.010	.008	.006
9/16 - 18	.5625	.5605	.5615	.111	.928	.938	.610	.625	.287	.557	.440	—	.133	.094	.047	.057	—	.852	.062	.625	.011	.009	.006
5/8 - 18	.625	.6230	.6240	.111	1.040	1.050	.672	.687	.327	.618	.500	—	.150	.094	.063	.073	—	.899	.062	.6875	.012	.010	.006
3/4 - 16	.750	.7480	.7490	.125	1.220	1.230	.797	.812	.380	.711	.570	.200	.178	.094	.063	.073	.187	1.036	.062	.8125	.015	.012	.006
7/8 - 14	.875	.8730	.8740	.143	1.428	1.438	.922	.937	.438	.808	.650	.260	.198	.125	.063	.073	.187	1.244	.078	.9375	.018	.014	.009
1 1/8 - 12	1.000	.9980	.9990	.167	1.615	1.625	1.047	1.062	.493	.923	.740	.260	.222	.125	.063	.073	.250	1.479	.078	1.0625	.020	.016	.009
1 1/2 - 12	1.125	1.1225	1.1240	.167	1.865	1.875	1.235	1.250	.556	1.051	.840	.320	.258	.125	.063	.073	.250	1.650	.094	1.250	.022	.019	.009

(1) Reference dimensions are for design purposes only and are not an inspection or manufacturing requirement.

(2) On bolts with threads .750 in. or larger, centre drilling of the thread end and to the limits of H and S, is optional for manufacture. Centre hole shall conform to BS ISO 866 (Type A).