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Manufacturing Specification for Studs, Bolts and Screws in BS HR650, EN2398, EN2399 and EN3639 Material 900 MPa (130,000 lbf/in²) Tensile at Room Temperature (for which Forging is Optional and Qualification not a Requirement)

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. 109

MANUFACTURING SPECIFICATION
FOR
STUDS, BOLTS AND SCREWS IN BS HR650, EN2398, EN2399 AND EN3639 MATERIAL

900 MPa (130,000 lbf/in^2) TENSILE AT ROOM TEMPERATURE

(FOR WHICH FORGING IS OPTIONAL AND QUALIFICATION NOT A REQUIREMENT)

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S.B.A.C. MANUFACTURING SPECIFICATION TS109

FOR STUDS, BOLTS AND SCREWS IN BS HR650, EN2398, EN2399 & EN3639 MATERIAL

900 MPa (130,000 lbf/in^2) TENSILE AT ROOM TEMPERATURE (FOR WHICH FORGING IS OPTIONAL AND QUALIFICATION NOT A REQUIREMENT)

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FOR STUDS, BOLTS AND SCREWS IN BS HR650, EN2398, EN2399 & EN3639 MATERIAL 900 MPa (130,000 lbf/in^2) TENSILE AT ROOM TEMPERATURE (FOR WHICH FORGING IS OPTIONAL AND QUALIFICATION NOT A REQUIREMENT)

1. Scope

1.1 This specification covers the requirements for studs, bolts and screws in BS HR650, EN2398, EN2399 & EN3639 material (for which forging is optional and qualification not a requirement). The parts will develop a minimum tensile strength of 900 MPa (130,000 lbf/in^2) at room temperature and are suitable for use up to a temperature of 550°C.

2. Associated specifications

BS HR650	- High expansion heat resisting steel.
BS A4	- Test pieces and methods for aircraft materials.
BS M39	- Penetrant inspection of aerospace materials and components.
BS 1134	- Surface texture.
BS 4084	- Unified screw threads of 'UNJ' basic profile.
BS EN 10003	- Method for Brinell hardness test
BS EN 10109	- Method for Rockwell hardness test
BS EN ISO 6507	- Method for Vickers hardness test
EN2398	-
EN2399	- Heat resisting steel FE-PA92-HT bar for forged parts
EN3639	- Heat resisting alloy FE-PA2601 softened bar for forged parts
RS 610	- Identification marking of parts and assemblies
S 678	- Rolled fastener threads, lead and run-out threads.

3. Definitions

3.1 Authorities

3.1.1 Design Authority

The Design Authority is the SBAC Technical Standards Group (TSG).

3.1.2 Quality Assurance Authority

The quality assurance authority will be as agreed by the TSG. Generally the quality assurance authority will be that of the design activity.

3.2 Production Batch

A batch shall consist of parts which are of the same type and diameter, fabricated by the same process from material of the same cast, heat-treated as one lot, and produced as one continuous run free from any interruptions or changes such as might be expected to result in a significant variation in the quality of the finished product.

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3.3 Inspection Lot

An inspection lot consists of parts from a single production batch of the same part number which completely defines the lot.

3.4 Discontinuities

3.4.1 Crack: Rupture in the material which may extend in any direction and which may be intercrystalline or transcrystalline in character.

3.4.2 Seam: Open surface defect.

3.4.3 Lap: Surface defect caused by folding over metal fins or sharp corners and then rolling or forging them into the surface.

3.4.4 Inclusion: Non-metallic particles originating from the material making process. They may exist as discrete particles or strings of particles extending longitudinally.

3.5 Test Temperature: Ambient temperature, unless otherwise specified.

3.6 Simple Random Sampling: The taking of n items from a population of N items in such a way that all possible combinations of n items have the same probability of being chosen.

3.7 Critical Defect: A defect that according to judgement and experience, is likely to result in hazardous or unsafe conditions for individuals using, maintaining, or depending upon the considered product, or that is likely to prevent performance of the function of a major end item.

3.8 Major Defect: A defect other than critical, that is likely to result in a failure or to reduce materially the usability of the considered product for its intended purpose.

3.9 Minor Defect: A defect that is not likely to reduce materially the useability of the considered product for its intended purpose, or that is a departure from established specification having little bearing on the effective use or operation of this product.

3.10 Sampling Plan: A plan according to which one or more samples are taken in order to obtain information and possibly to reach a decision.

3.11 Limiting Quality LQ_{10}: In a sampling plan, a quality level which corresponds to a specified and relatively low probability of acceptance - in this case 10% probability of acceptance. It is the limiting lot quality characteristic that a lot of this quality would occur.

When expressed as a percent defective, it may be referred to as a lot tolerance percent defective.

3.12 Acceptable Quality Level: A quality level which in a sampling plan corresponds to a specified but relatively high probability of acceptance.

It is the maximum percent defective (or the maximum number of defects per hundred units) that, for purposes of sampling inspection, can be considered satisfactory as a process average.

3.13 Finished Part: A part ready for use, inclusive of any possible treatments and/or surface coatings, as specified on the relevant part drawing.

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4. Quality Assurance

4.1 General

4.1.1 Material and Surface Treatment

4.1.1.1 The part manufacturer shall provide evidence to the quality assurance authority that the controls for the part material and surface treatment process complies with the relevant specifications, and shall also show that the identity of the part material has been maintained throughout all stages of manufacture.

4.1.2 Records

4.1.2.1 The manufacturer shall establish a batch record chart (or card) to the satisfaction of the quality assurance authority. The record shall show the batch quantity and the serial numbers of certificates covering approval of the material. The results of the inspections and tests made to the requirements of this specification shall be recorded and correlated with the batch numbers, and the batch chart (or card) shall show the serial numbers of those records to the satisfaction of the quality assurance authority.

4.1.3 Dimensional Control during Manufacture

4.1.3.1 The manufacturer shall satisfy the quality assurance authority that the frequency and results of inspections made at each operation during manufacture of each part are adequate.

4.1.4 Dimensions and Gauging

4.1.4.1 All dimensions shall be controlled by a system of gauging which, with the type and quality of all gauges, projection apparatus, diagrams and inspection techniques, shall be to the satisfaction of the quality assurance authority. In cases of dispute :-

a) The full threads shall be checked with fixed limit gauges.

b) Notwithstanding the reaction of the threads to the gauges, the overall profile must be acceptable when checked with an optical projector and line limit diagrams.

4.1.4.2 Each gauge and projection diagram shall be marked with its reference number (serial number) and in the case of non-adjustable gauges, marked with the gauging dimensions. Each gauge shall further be certified initially, and thereafter the standard of accuracy of each gauge shall be maintained by regular certification, either at an approved gauge test house or, if agreed with the quality assurance authority, at the manufacturers own test room. The accuracy of each projection diagram shall be to the satisfaction of the quality assurance authority.

4.1.4.3 A record card shall be maintained for each gauge showing the initial dimensions of each gauging element, the frequency of the maintenance checks and the gauge dimensions resulting therefrom, to the satisfaction of the quality assurance authority.

4.2 Acceptance

4.2.1 The purpose of acceptance inspections and tests is to check, as simply as possible, using a method representative of actual conditions of use, with the uncertainty inherent in statistical sampling, that the bolts satisfy the requirements of TS109.

4.2.2 Acceptance inspections and tests are specified in Table 1. They shall be carried out on each production batch or inspection lot. Sampling shall meet the requirements of Tables 2, 3 and 4 unless more stringent requirements are agreed between the manufacturer and the purchaser. Parts from the batch to be tested shall be selected by simple random sampling.

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