SAE ITC
An SAE International Affiliate

TECHNICAL SPECIFICATION

TS109™	ISSUE 5
Issued	UNKNOWN
Revised	2004-12

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

FOREWORD

On the 1st January 2015 the SAE Industry Technologies Consortia (SAE ITC) acquired the ADS Aerospace Standards, previously known as the Society of British Aerospace Companies (SBAC) Aerospace Standards. The SAE ITC established in 2003 operates as a trade association as part of the SAE International Enterprise providing a unique framework serving the automotive, aerospace, and commercial vehicle sectors. Clients include private companies, government agencies, individuals, and trade associations. Building consensus and breakthrough barriers to achieve solutions, and the ways by which those solutions take shape, are tailored to each client's individual needs.

The legal obligations and copyright authority of all Aerospace Standards that were issued by the ADS Group Limited are therefore assigned / transferred to the SAE ITC.

These Standards are produced by the SAE ITC with the assistance of, and for the benefit of the Aerospace Industry, as part of a continuous programme of Standardisation for Aerospace application under the control of the Technical Standards Committee (TSC) of the SAE ITC.

SAE ITC Standards are published as part of the series of SAE ITC Aerospace Industry Standards, and where appropriate, additional manufacturing and inspection requirements are issued as Reference Sheets (RS) or Technical Specifications (TS). It is the responsibility of those using or specifying a Standard to ensure the product, process, or manufacturer so used or specified, is appropriate for the task or role in question. The SAE ITC wishes to draw special attention to the fact Technical Specifications (TS) include testing and procedures by which a user or Design Authority can establish whether a particular manufacturer, prima facie, has the capability to produce hardware in accordance with the appropriate standards and related specifications.

The SAE ITC, its servants, or representatives accept no responsibility for the continued quality of hardware items produced against the relevant drawings and specifications; this responsibility remains with the user.

Whilst the SAE ITC takes all reasonable care in the preparation of its Standards, neither the SAE ITC, its officers, employees, servants, agents, or representatives, shall have any responsibility or liability whatsoever with respect to any act or omission (whether negligent or not) of whatsoever nature, or in connection with the preparation of the Standards or any part thereof. These responsibilities are those of the user or Design Authority. Users of SAE ITC Standards agree that any such liability on the part of the SAE ITC is excluded to the maximum extent permitted by law. SAE ITC Standards may be changed from time to time, and both users and manufacturers of these parts should ensure they are in possession of the latest issue of the Standards and supporting documentation before adoption or the commencement of production.

It is recommended that Technical Specification TS260, Metallic Materials List of Alternative Material Standards, be consulted prior to manufacture of SAE ITC products.

Each Standard is a facsimile or electronic reproduction of a master drawing and, therefore, any outline view scales stated are not necessarily reproduced accurately. A Master Index of all SAE ITC Aerospace Standards is published separately on the SAE ITC website.

All references to Standards include reference to RS and TS publications.

Details of this and any further information can be obtained from the SAE ITC.

SAE Industry Technologies Consortia provides that "This standard is published by SAE ITC to advance the state of technical and engineering sciences. The use of this standard is entirely voluntary and its applicability and suitability for any particular use, including any patent infringement arising therefrom, is the sole responsibility of the user."

Copyright © 2015 SAE ITC.

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without prior written permission of SAE ITC.

TO PLACE A DOCUMENT ORDER:
Tel: 877-606-7323 (inside USA and Canada)
Tel: +1 724-772-7545 (outside USA)
Fax: 724-776-0790
Email: CustomerService@sae.org
http://itc.sae.org/

AVA Documents
Document Sharing Hub

Full document details: SAE TS109-5

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)

Issued by: Technical Standards Group
The Society of British Aerospace Companies Ltd
Registered in England and Wales no. 143447

© 2000

Issue 5 December 2004

Documents
Document Sharing Hub

Full document details: SAE TS109-5

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)

CONTENTS

1. Scope.
2. Associated Specifications.
3. Definitions
4. Quality Assurance.
5. Manufacturing and Test Requirements.

The Society of British Aerospace Companies Limited
Registered in England and Wales No. 143447

Documents
Document Sharing Hub

Full document details: SAE TS109-5

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)

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/in²) 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.

Documents
Document Sharing Hub
Full document details: SAE TS109-5

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.

Documents
Document Sharing Hub
Full document details: SAE TS109-5

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.

Documents
Document Sharing Hub
Full document details: SAE TS109-5