

OBSOLESCENT
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Specification for

Screwed studs —

**Part 2: Recommendations for high
grade studs**

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British Cycle & Motor Cycle Industries Association Limited	Rolled Thread Screw Association
British Institute of Cold Formed and Turned Parts Manufacturers	Society of Motor Manufacturers and Traders Ltd.
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	Individual manufacturers

This British Standard, having been approved by the Mechanical Engineering Industry Standards Committee and endorsed by the Chairman of the Engineering Divisional Council, was published under the authority of the General Council on 19 August 1964

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Committee references MEE/60 and MEE/60/8

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Contents

	Page
Co-operating organizations	Inside front cover
Foreword	ii
Introduction	1
Section 1. General	
1 Scope	4
2 Material	4
3 Tables	4
4 Extension of the standard	4
Section 2. Recommended conditions of use and inspection	
5 Studs	6
6 Holes	6
7 Pitch and angle variables	6
8 Lubrication	6
9 Driving speed	6
10 Relation of driving torque to length of engagement	6
11 Breakloose torques after reapplication	6
12 Assembly torques for reapplication	7
Figure 1	3
Table 1 — External dimensions for Class 5 standard threads	8
Table 2 — Internal dimensions for Class 5 standard threads	9
Table 3 — Interferences, engagement lengths and torques for Class 5 standard threads	10

Foreword

This standard makes reference to the following British Standard:

BS 1768, *Unified precision hexagon bolts, screws and nuts (UNC and UNF threads). Normal series.*

When Part 1 of BS 2693 was issued several years ago it was recognized that the one grade of stud for which it provided would not meet the requirements of all users. The thread tolerances specified could result in clearance or interference fits and in the former case, locking depended on the run-out threads. Some users, however, felt that true interference fits were essential for their needs and it was agreed to prepare a further part of the standard giving limits and tolerances for a higher grade of stud.

This proved to be a very difficult task and in spite of exhaustive discussions and some experimental work, no wholly satisfactory conclusions could be reached. While the subject was still under discussion a trial American Standard for Class 5 interference fit threads was published. This standard was based on years of research and study similar to that which the British Committee had proposed to undertake and it was suggested that it would be pointless to duplicate this work when the results were already available for use in the Trial American Standard ASA B1.12.

It has accordingly been decided to issue this information in the form of a British Standard Recommendation. In doing so, it is emphasized that ASA B1.12 does not claim to be the last word on the subject; although the absence of adverse comment and reception of favourable reports have now led the Committee responsible to confirm it, without technical change, as an American Standard, users in the U.S.A. are still urged to report on the results, whether good or bad, of applying its requirements. Information gained from such experience will be taken into account when considering any future amendment or revision of the standard.

These Recommendations are issued on the same basis and users are most strongly requested to advise the British Standards Institution of the results they obtain. In this way it is hoped ultimately to be able to specify a series of stud fits which have been proved by practical experience.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 10 and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

Introduction

(From the introduction to American standard ASA B1.12)

Interference fit threads are threads in which the externally threaded member is larger than the internally threaded member when both members are in a free state and which, when assembled, become the same size and develop a holding torque through elastic compression, plastic movement of material, or both. By custom, these threads are designated Class 5.

Handbook H28, "Screw thread standards for Federal Services" has for several editions published specifications for tentative Class 5 and alternate Class 5 fits. These standards were helpful in stabilizing design; however, in spite of restrictive tolerances, loosening or breakage of externally threaded members has been all too frequent. Handbook H28 has also established minimum and maximum torque values, the validity of which has been generally accepted in service for the past twenty years.

The present standard, which is based on ten years of research testing and field study, represents the first attempt to establish an American standard for interference fit threads. A comprehensive survey of design, production and driving practices in the automotive, implement, railroad, and fastener industries begun in 1947 showed that all were experiencing difficulty. Typical problems were:

- i) The variety of materials and heat treatment used for externally threaded members;
- ii) Variations resulting from rolling, cutting or grinding external threads;
- iii) The huge variety of analyses and physical and mechanical properties encountered in the forged, cast, die cast and rolled materials into which the externally threaded members are driven;
- iv) The widely varying effects of chemical coatings, platings and lubricants; and
- v) The inability to control closely sizes of tapped holes in various materials.

It was impossible to establish a standard when the results of this survey were first available, but it was agreed that interference fit threads could not be eliminated in design of equipment and that a workable standard was essential.

In 1951 a research sub-group was established and conducted extensive tests under a variety of conditions. The work of this research sub-group and a report of subsequent research and field experience is described in the article "New Class 5 Interference Fit Thread", by W. C. Waltermire, which appeared in the September 6, 1956, issue of "Machine Design".

The standard is based on the following conclusions which have been drawn from the research and field experience:

- i) Materials of the external and internal interference fit threads compress elastically during assembly and when assembled.
- ii) During driving, plastic flow of materials occurs, resulting in either an increase of the external thread major diameter or a decrease in the internal thread minor diameter or both.
- iii) Relieving the external thread major diameter and the internal thread minor diameter to make allowance for plastic flow eliminates the main causes of seizing, galling and abnormally high and erratic driving torques.
- iv) Relieving the major diameter of external threads and minor diameter of internal threads requires an increase in the effective diameter interference in order to obtain driving torques within the range established by Handbook H28. (In driving studs, it was found that the minimum driving torque should be about 50 per cent of the torque required to break loose a properly tightened nut.)
- v) Lubricating only the internal thread results in more uniform torques than lubricating only the external thread and is almost as beneficial as lubricating both external and internal threads.
- vi) For threads having truncated profile, torques increase directly as the effective diameter interference for low interferences but torques soon become practically constant and increase little, if at all, with increases of interference. Obviously, for uniformity of driving torques, it is desirable to work with greater interference.
- vii) Comparatively large effective diameter interference can be tolerated provided the external thread major diameter and internal thread minor diameter are adequately relieved and proper lubrication is used during assembly.
- viii) Driving torque increases directly with turns of engagement. (For thin wall applications, it may be desirable to use longer engagement rather than large effective diameter interference to obtain desired driving torque.)