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Specification for

Metric keys and keyways —

Part 1: Parallel and taper keys

Co-operating organizations

The Mechanical Engineering Industry Standards Committee, under whose supervision this British Standard was prepared, consists of representatives from the following Government departments and scientific and industrial organizations:

Associated Offices' Technical Committee	Engineering Equipment Users' Association*
Association of Consulting Engineers	Gas Council
Association of Mining Electrical and Mechanical Engineers	Institution of Civil Engineers
British Chemical Plant Manufacturers' Association	Institution of Gas Engineers
British Compressed Air Society	Institution of Heating and Ventilating Engineers
British Electrical and Allied Manufacturers' Association*	Institution of Mechanical Engineers*
British Gear Manufacturers' Association*	Institution of Mechanical Engineers (Automobile Division)
British Internal Combustion Engine Manufacturers' Association*	Institution of Plant Engineers
British Mechanical Engineering Confederation	Institution of Production Engineers*
British Pump Manufacturers' Association	Locomotive and Allied Manufacturers' Association of Great Britain*
British Steel Industry*	London Transport Executive
Crown Agents for Oversea Governments and Administrations	Machine Tool Trades Association
Department of Employment (H.M. Factory Inspectorate)	Ministry of Defence
Department of the Environment	Ministry of Defence, Army Department
Department of Trade and Industry*	National Coal Board
Electricity Council, the Central Electricity Generating Board and the Area Boards in England and Wales	National Physical Laboratory (Department of Trade and Industry)
	Royal Institute of British Architects.
	Telecommunication Engineering and Manufacturing Association
	Water Tube Boilermakers' Association.

The Government department and scientific and industrial organizations marked with an asterisk in the above list, together with the following, were directly represented on the committee entrusted with the preparation of this British Standard:

Association of Correspondence Colleges	Milling Cutter and Reamer Association
British Ship Research Association	Ministry of Defence, Navy Department
Cycle and Motor Association	Society of British Aerospace Companies
Gauge and Tool Makers' Association	Steel Works Plant Association
Institution of Engineers and Shipbuilders in Scotland	Taper Pin Manufacturers' Association

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The following BSI reference relates to the work on this standard:
Committee references MEE/4

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Foreword

In order to keep abreast of progress in the industries concerned, British Standards are subject to periodical review. Suggestions for improvements will be recorded and in due course brought to the notice of the committees charged with the revision of the standards to which they refer.

A complete list of British Standards, numbering over 9 000, fully indexed and with a note of the contents of each, will be found in the BSI Catalogue which may be purchased from BSI Sales Department. The Catalogue may be consulted in many public libraries and similar institutions.

This standard makes reference to the following British Standards:

BS 46, *Keys and keyways and taper pins. Part 1. Keys and keyways.*

BS 970, *Wrought steels in the form of blooms, billets, bars and forgings. Part 1. Carbon and carbon manganese steels, including free cutting steels.*

BS 4500, *ISO limits and fits.*

BS 4500-1, *General, tolerances and deviations.*

This British Standard is the first of a series for metric keys and keyways and has been prepared under the authority of the Mechanical Engineering Industry Standards Committee.

The essential data for this standard have been extracted from ISO Recommendations R 773¹⁾ and R 774²⁾.

Although similar in principle to BS 46-1, for inch keys and keyways, it provides for three classes of fit for square and rectangular parallel keys and keyways, namely, “free”, “normal” and “close”, and the provision of these three types of fit is in accordance with ISO practice.

In addition to the three classes of fit agreed by ISO as mentioned above, the United Kingdom has found it necessary to introduce an additional class, an interference fit. This is considered necessary to avoid the possibility of the rotation of the key which might occur in high torque, in reversing conditions, in applications where torsional vibration exists, or in precision applications.

The marked difference in dimensions between the inch and metric keys and keyways was, in the early days of metrication, the subject of considerable discussion and, quite naturally, fears were expressed that there would be problems due to the loading on the side faces of the key and keyway for any given shaft size.

These metric sections of keys have been in satisfactory use in most European countries for many years. It was, however, still desirable that there should be the satisfaction of more positive assurance that no design limitation exists in the application of the thinner metric key sections. At the request of technical committee MEE/4, the National Engineering Laboratory explored some of the questions which had been raised. The results of these investigations have been published and they demonstrate the effects of both static and dynamic tests, and include comparisons of the stresses and deformations of the two key forms at very high loadings. For the benefit of designers who are concerned with high static or dynamic torque loadings in keyed shafting systems, the reports are:

NEL Report No. 489 “Static torsion tests on shrink-fit and keyed components” by D M Macdonald

NEL Report No. 526 “A comparison of inch and metric keys in static torsion” by D M Macdonald

¹⁾ ISO Recommendation R 773, “Rectangular or square parallel keys and their corresponding keyways (dimensions in millimetres)”.

²⁾ ISO Recommendation R 774, “Taper keys and their corresponding keyways (with or without gib head) (dimensions in millimetres)”.

NOTE The titles of the British Standards referred to in this standard are listed on page 2.

NEL Report No. 606 “Loaded key reaction and stresses” by D M Macdonald
NEL Report No. 635 “Key length and its effect on the static torsional strength
of a keyed joint” by D M Macdonald

The above reports are obtainable from the Reports Unit, National Engineering Laboratory, East Kilbride, Glasgow, to which enquirers should apply direct.’

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 to iv, pages 1 to 18 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.

1 Scope

This British Standard relates to the following types of keys and keyways with dimensions in millimetres:

- 1) square parallel,
- 2) rectangular parallel,
- 3) square taper, gib-head and plain,
- 4) rectangular taper, gib-head and plain.

In addition, a fourth class of fit is provided in this British Standard to give an interference fit.

Three classes of fit are provided for the square and rectangular parallel keys and keyways, namely “free”, “normal” and “close”, and the dimensions and tolerances specified are in accordance with ISO Recommendations R 773³⁾ and R 774⁴⁾.

2 Fits

The three classes of fit dealt with in this standard are intended to meet varying requirements as follows:

- 1) *Free*, where the hub is required to slide over the key when in use.
- 2) *Normal*, where the key is to be inserted in the keyway with minimum fitting, as is required for mass production assembly.
- 3) *Close*, where an accurate fit of key is required. In this class, fitting will be required under maximum material conditions, and if it is required to obtain these conditions some selection of components may be necessary.
- 4) *Interference*, where a fit is required such that there is no possibility of play between the key and keyway in the shaft and hub. In this class of fit, hand fitting will be necessary.

NOTE This class of fit is described in ISO Recommendations R 773, “Rectangular or square parallel keys and their corresponding keyways (dimensions in millimetres)”, and R 774, “Taper keys and their corresponding keyways (with or without gib head) (dimensions in millimetres)”, as “fitted”.

3 Material

Unless otherwise specified, keys complying with the requirements of this British Standard shall be manufactured from steel complying with BS 970 having a tensile strength of not less than 550 MN/m^2 in the finished condition. Keybar to the tolerances on width (*b*) and thickness (*h*) specified for the finished keys will not necessarily be commercially available.

NOTE The following steels specified in BS 970-1, will meet the above requirement to the maximum sizes indicated:

	mm
070M20	25×14
070M26	36×20
080M30	90×45
080M40	100×50

4 Dimensions and tolerances

4.1 The dimensions and tolerances of metric keys and keyways shall be as given in Table 1 to Table 8.

The dimensions and tolerances of interference fit keys shall be given in Table 10 and Table 11.

Recommended standard lengths are given in Table 9.

4.2 The standard does not deal with misalignment or offset greater than can be accommodated within the dimensional tolerances. In heavily stressed applications, a check should be made to ensure that the cumulative effect of misalignment and/or offset does not prevent a good bearing on the key.

4.3 Keys, as supplied, are not normally chamfered or radiused but these operations may be carried out during manufacture by agreement between the purchaser and the manufacturer.

4.4 Taper keys fitted in a keyway with tolerance P9, providing there is no excessive side interference, will be regarded as complying with the requirements of this British Standard.

³⁾ ISO Recommendation R 773, “Rectangular or square parallel keys and their corresponding keyways (dimensions in millimetres)”.

⁴⁾ ISO Recommendation R 774, “Taper keys and their corresponding keyways (with or without gib head) (dimensions in millimetres)”.

Table 1 — Dimensions and tolerances of keyways for square parallel keys

