

CONFIRMED
DECEMBER 2007

Specification for

Accuracy of machine tools and methods of test —

**Part 15: Drilling machines, turret and
single spindle co-ordinate types**

UDC 621.9.01 – 187:621.952.7

NO COPYING WITHOUT BSI PERMISSION EXCEPT AS PERMITTED BY COPYRIGHT LAW

BSI
Documents

AVA

Document Sharing Hub

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	Electricity Supply Industry in England and Wales
Association of Consulting Engineers	Engineering Equipment Users' Association
Association of Hydraulic Equipment Manufacturers Ltd.	Federation of Manufacturers of Construction Equipment and Cranes
Association of Mining Electrical and Mechanical Engineers	Health and Safety Executive (HM Factory Inspectorate)
British Compressed Air Society	Institution of Gas Engineers
British Electrical and Allied Manufacturers' Association	Institution of Heating and Ventilating Engineers
British Gas Corporation	Institution of Mechanical Engineers*
British Gear Manufacturers' Association	Institution of Plant Engineers
British Internal Combustion Engine Manufacturers' Association	Institution of Production Engineers
British Mechanical Engineering Confederation	London Transport Executive
British Pump Manufacturers' Association	Machine Tool Trades Association*
British Steel Corporation	Ministry of Defence*
British Steel Industry	National Coal Board
Crown Agents for Oversea Governments and Administrations	Process Plant Association
Department of the Environment*	Railway Industry Association of Great Britain
Department of Industry*	Royal Institute of British Architects
Department of Industry — National Engineering Laboratory	Society of Motor Manufacturers and Traders Ltd.*
Department of Trade	Telecommunications Engineering Manufacturing Association

The 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:

Ball and Roller Bearing Manufacturers' Association	University of Aston in Birmingham
Machine Tool Industry Research Association	University of Manchester Institute of Science and Technology
National Federation of Engineers' Tool Manufacturers	Individual experts

This British Standard, having been prepared under the direction of the Mechanical Engineering Industry Standards Committee, was published under the authority of the Executive Board on 30 April 1976

© BSI 10-1999

The following BSI references relate to the work on this standard:
Committee reference MEE/6
Draft for comment 71/38692 DC

ISBN 0 580 09262 3

Amendments issued since publication

Amd. No.	Date of issue	Comments

Contents

	Page
Co-operating organizations	Inside front cover
Foreword	ii
1 Scope	1
2 References	1
3 Abbreviations	1
4 Application of test methods	1
5 Diagrams	1
Appendix A Graph giving the axial force F as a function of the drilling capacity diameter of the machine	10
Table 1 — Geometrical tests for drilling machines of turret and single spindle co-ordinate types	2
Table 2 — Practical test for drilling machines of turret and single spindle co-ordinate types	9
Publication referred to	Inside back cover

Foreword

This Part of this British Standard has been prepared under the authority of the Mechanical Engineering Industry Standards Committee and implements agreements of the International Organization for Standardization (ISO). This Part of the standard is generally in accordance with ISO 3190 “*Test conditions for turret and single spindle co-ordinate drilling machines with vertical spindle — Testing of the accuracy*” but varies from ISO 3190 in the following respects.

- a) Clauses 1 and 4 contain the same information as is given in ISO 3190 but they are expressed in accordance with an accepted format that has been adopted for the BS 4656 series of standards and also are more in accordance with accepted English usage. Clauses 3 and 5 have been added.
- b) In accordance with the UK policy of metrication, inch dimensions given in ISO 3190 have not been included in this British Standard.
- c) In test G0 column 6 the note has been added. In test G3 column 5 reference to microscope and taut wire has been added, and in column 6 reference to **5.232** of the test code has been deleted as it is not applicable. The wording has been changed to comply with accepted English usage without altering its technical meaning in tests G0, G4, G6, G9, G10, G11 and G12.
- d) In column 6 of Table 1 and Table 2, reference to ISO/R 230 “*Machine tool test code*” has been replaced by reference to BS 3800 “*Methods for testing the accuracy of machine tools*”.

In certain parts of column 3 in Table 1, superfluous headings denoting subunits of the machine have been deleted. The headings concerned are “A-Table” (test G1), “B-Spindle” (test G7), “C-Spindle Head” (test G10) and “D-Multi-Spindle Turret Head” (test G12). The heading 4 “Test conditions and permissible deviations” has been deleted. The subheadings 4.1 and 4.2 have been deleted and replaced by the designations Table 1 and Table 2 respectively to conform with BSI editorial practice.

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, an inside back cover 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 Part of this British Standard specifies, with reference to BS 3800, both geometrical and practical tests for drilling machines of the turret and single spindle co-ordinate types and gives corresponding permissible deviations which apply.

This standard is applicable to machines of general purpose use and normal accuracy.

It deals only with the verification of accuracy of the machine. It does not apply to the testing of the running of the machine (vibrations, abnormal noises, stick-slip motion of components etc.) nor to its characteristics (speeds, feeds etc.), which should generally be checked before testing accuracy.

There is a wide variety of machine configurations covered by turret and single spindle co-ordinate drilling machines, all of which carry out the same basic functions to the same degree of accuracy. Therefore the accuracy tests contained in this standard should be selected to suit the particular machine configuration (see also 4.3).

Examples of the main co-ordinate single spindle or turret drilling machine configurations to which this standard is applicable are as follows:

- a) knee type;
- b) single column, bed type;
- c) double column, bridge type.

2 References

The title of the British Standard referred to in this standard is given on the inside back cover.

3 Abbreviations

For the purposes of this standard, various methods of expressing permissible deviations are employed, each having a particular type of application. The methods employed are as follows.

--- / ---	This type of expression applies to deviations of perpendicularity that are ratios.
--- for any length of ---	This type of expression applies to deviations of straightness and parallelism, and is used in fact for local permissible deviations, the measurement length being obligatory.

--- per ---	This type of expression applies to deviations of straightness and parallelism, and is used to recommend a measurement length, but in this case the proportionality rule comes into operation if the measurement length differs from that indicated.
-------------	---

4 Application of test methods

4.1 In applying the tests detailed in Table 1 and Table 2, reference should be made to BS 3800, especially concerning the installation of the machine before testing, the warming up of spindles and other moving parts, the description of measuring methods and the recommended accuracy of testing equipment.

4.2 The tests may be applied in any order that is practicable and that makes for ease of mounting of instruments or gauging. The sequence in which the geometrical tests are listed in Table 1 is related to the subassemblies of the machine and it is not intended to impose the practical order in which the tests are to be done.

4.3 It is not always necessary for all the tests specified in this standard to be carried out. The purchaser shall be at liberty to select, in agreement with the manufacturer, those tests relating to the properties that are of interest to him. The appropriate tests are to be clearly stated when the machine is ordered.

4.4 As far as turret head drilling machines are concerned, it is intended that all geometrical tests which concern the rotation of the spindle, i.e. tests G7, G8, G9 and G12, shall be carried out on all spindles.

4.5 When establishing the tolerance for a measuring range different from that given in this standard (see 2.311 of BS 3800:1964), it should be taken into consideration that the minimum value of tolerance is 0.01 mm for geometrical and practical tests.

5 Diagrams

For reasons of simplicity the diagrams in this standard illustrate only one type of machine.