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Specification for

The accuracy of machine tools and methods of test —

**Part 23: Surface grinding machines
with two columns — slideway grinding
machines**

UDC 621.9.01 – 187.001.4:621.924.2

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Ball and Roller Bearing Manufacturers' Association	University of Aston in Birmingham
Department of the Environment (PSA)	University of Manchester Institute of Science and Technology
Machine Tool Industry Research Association	
National Federation of Engineers' Tool Manufacturers	

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Contents

	Page
Cooperating organizations	Inside front cover
Foreword	ii
1 Scope	1
2 References	1
3 Application of test methods	1
4 Abbreviations	1
5 Diagrams	1
6 Practical tests	1
Appendix A Terminology	15
Figure 1 — Surface grinding machine with two columns — slideway grinding machine	15
Table 1 — Geometrical tests for surface grinding machines with two columns — slideway grinding machines	2
Table 2 — Practical tests for surface grinding machines with two columns — slideway grinding machines	12
Publications referred to	Inside back cover

Foreword

This Part of this British Standard has been prepared under the direction of the Mechanical Engineering Standards Committee and implements, in part, agreements of the International Organization for Standardization (ISO).

This Part of BS 4656 contains information that is technically equivalent, except where stated below, to the information contained in ISO 4703 “*Test conditions for surface grinding machines with two columns — Machines for grinding slideways — Testing of accuracy*”, which the United Kingdom voted against. Consequently, those parts of ISO 4703 which the United Kingdom did not consider acceptable have not been incorporated in this British Standard.

This standard varies from ISO 4703 in the following respects.

Clauses. Clauses 1 and 3 of this Part of this Standard contain the same information that is given in ISO 4703 but they are presented in accordance with an accepted format which has been developed for the BS 4656 series. Clauses 4, 5 and 6 have been added.

Inch dimensions. In accordance with the UK policy of metrication, inch dimensions given in ISO 4703 have not been included in this British Standard.

Tables. In column 6 of Table 1 reference to ISO/R 230 “*Machine tool test code*” has been replaced by reference to BS 3800.

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 16, 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 surface grinding machines with two columns/machines for grinding slideways, and gives corresponding permissible deviations which apply.

It should be noted that the machines concerned in this standard are machines with rectilinear grinding movements and with a movable table. Machines with a fixed table or with a rotary table movement are outside the scope of this standard.

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.) or to its characteristics (speeds, feeds, etc.), which should generally be checked before testing accuracy.

2 References

The titles of the publications referred to in this standard are listed on the inside back cover.

3 Application of test methods

3.1 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, warming up of spindles and other moving parts, the description of measuring methods and the recommended accuracy of testing equipment.

3.2 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 sub-assemblies of the machine and it is not intended to impose the practical order in which the tests are to be done.

3.3 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.

3.4 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 0.001 mm for geometrical and practical tests.

4 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.

5 Diagrams

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

6 Practical tests

The practical tests in Table 2 may be replaced by other forms of practical tests, e.g. the grinding of the purchaser's component, subject to agreement between the manufacturer and the purchaser.

Table 1 — Geometrical tests for surface grinding machines with two columns — slideway grinding machines

All dimensions are in millimetres.

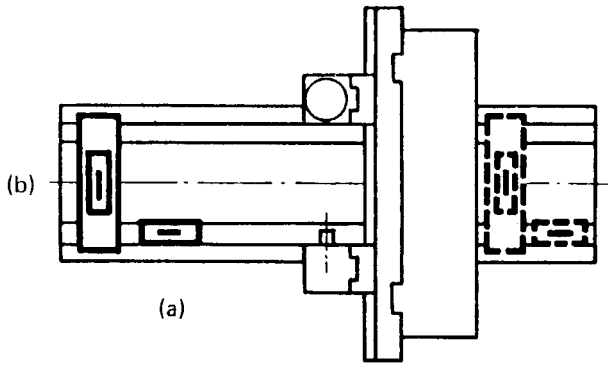
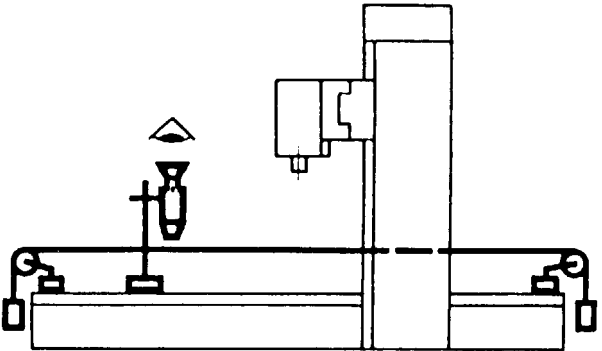
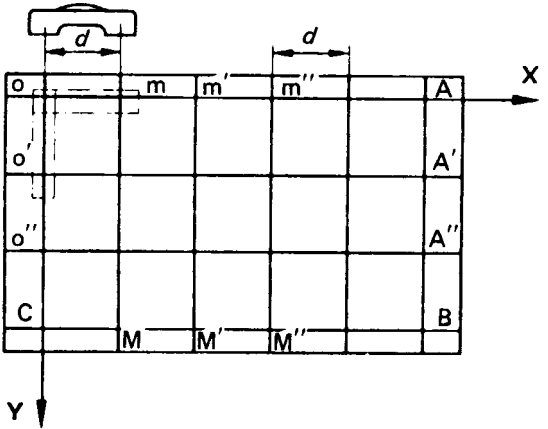
1	2	3	4	5	6
No.	Diagram	Object	Permissible deviation	Measuring instruments	Observations and references to test code BS 3800
G01	 The diagram shows a side view of a grinding machine's slideway assembly. A horizontal line with arrows at both ends is labeled (a), indicating longitudinal verification. A vertical line with arrows at both ends is labeled (b), indicating transverse verification. The diagram shows the grinding wheel, the slideway, and the machine's frame.	Verification of levelling and of the bed slideways (see column 6): a) longitudinal verification: testing of straightness of the slideways in a vertical plane; b) transverse verification	a) 0.01 for any measuring length of 1 000 b) 0.02/1 000	Precision levels or optical methods	3.11, 3.21, 5.212.21, 5.212.22 and 5.412.7 Table dismantled. a) Measurements shall be made at positions equally distributed along the length of the bed. b) A level shall be placed transversely on the slideways and measurements taken at a number of positions equally spaced along the length of the slideways. The variation of level measured at any position shall not exceed the permissible deviation. These tests shall be carried out when assembling the machine, Levelling. The characteristics of the basic form of the bed from which the permissible deviation is measured shall be specified by the manufacturer.

Table 1 — Geometrical tests for surface grinding machines with two columns — slideway grinding machines

All dimensions are in millimetres.

1	2	3	4	5	6
No.	Diagram	Object	Permissible deviation	Measuring instruments	Observations and references to test code BS 3800
G02		a) Verification of straightness of the bed slideways in a horizontal plane; b) in the case of two V slideway machines, verification of parallelism	a) 0.01 for any measuring length of 1 000 b) 0.02	Microscope and taut wire or other optical measuring methods, special support	5.212.3 and 5.232.2 Table dismantled. Wire shall be set at the ends of the slideway, made taut and positioned. The special support and the microscope shall be positioned on the slideways. Measurements shall be made at positions equally distributed throughout the length of the bed. This test shall only be carried out when instructions on levelling have not been provided by the manufacturer.
G1		Verification of flatness of the table surface within the grinding area	up to 1 000 0.01 over 1 000 up to 2 000 0.02 over 2 000 up to 5 000 0.03 over 5 000 up to 10 000 0.04 over 10 000 0.05 Local tolerance: 0.005 for any measuring length of 500	Straightedge and gauge blocks or precision levels or other methods	5.322, 5.323 and 5.324 Table not locked in mid-travel