

# ISO

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

## ISO RECOMMENDATION R 1984

TEST CONDITIONS  
FOR MILLING MACHINES WITH TABLE OF FIXED HEIGHT  
WITH HORIZONTAL OR VERTICAL SPINDLE

TESTING OF ACCURACY

1st EDITION

November 1971

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## BRIEF HISTORY

The ISO Recommendation R 1984, *Test conditions for milling machines with table of fixed height, with horizontal or vertical spindle – Testing of accuracy*, was drawn up by Technical Committee ISO/TC 39, *Machine tools*, the Secretariat of which is held by the Association Française de Normalisation (AFNOR).

Work on this question led to the adoption of Draft ISO Recommendation No. 1984, which was circulated to all the ISO Member Bodies for enquiry in June 1970. It was approved, subject to a few modifications of an editorial nature, by the following Member Bodies :

|                |                |                       |
|----------------|----------------|-----------------------|
| Belgium        | India          | South Africa, Rep. of |
| Chile          | Italy          | Spain                 |
| Czechoslovakia | Japan          | Switzerland           |
| France         | Korea, Rep. of | Thailand              |
| Germany        | Netherlands    | U.A.R.                |
| Greece         | New Zealand    | United Kingdom        |
| Hungary        | Portugal       | U.S.A.                |

The following Member Body opposed the approval of the Draft :

Sweden

This Draft ISO Recommendation was then submitted by correspondence to the ISO Council, which decided to accept it as an ISO RECOMMENDATION.

## TEST CONDITIONS FOR MILLING MACHINES WITH TABLE OF FIXED HEIGHT WITH HORIZONTAL OR VERTICAL SPINDLE

### TESTING OF ACCURACY

#### 1. SCOPE

This ISO Recommendation describes, with reference to ISO Recommendation R 230, *Machine tool test code*, both geometrical and practical tests on general purpose and normal accuracy milling machines with table of fixed height, with horizontal or vertical spindle, and the corresponding permissible deviations which apply.

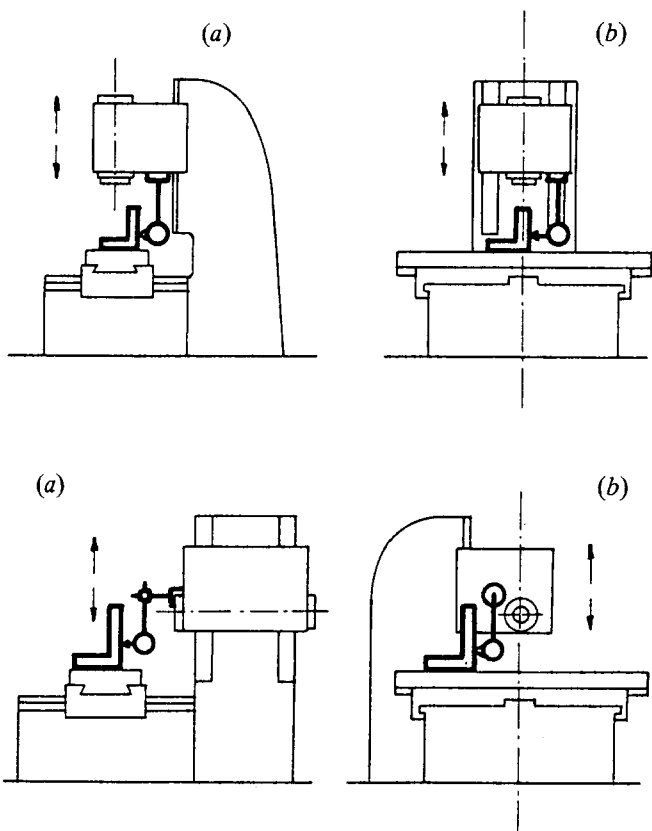
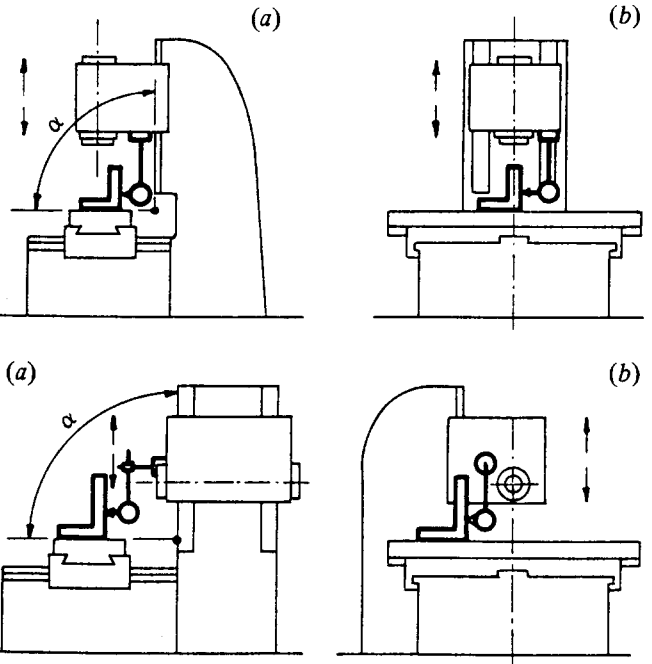
It deals only with the verification of accuracy of the machine. It does not apply to the testing of the running of the machine (vibrations, abnormal noises, stick-slip motion of components, etc.), or to machine characteristics (speeds, feeds, etc.), which should generally be checked before testing accuracy.

#### 2. PRELIMINARY REMARKS

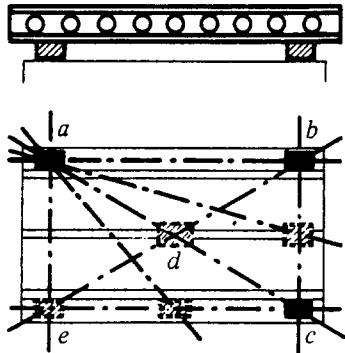
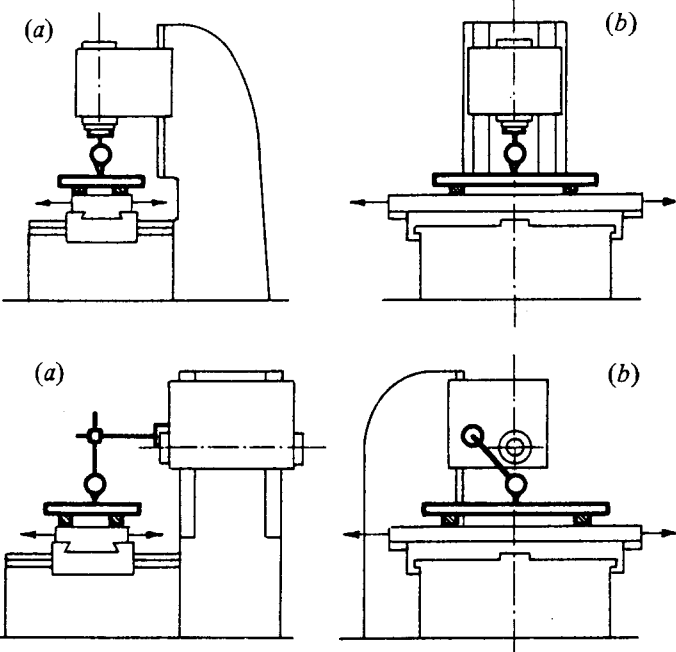
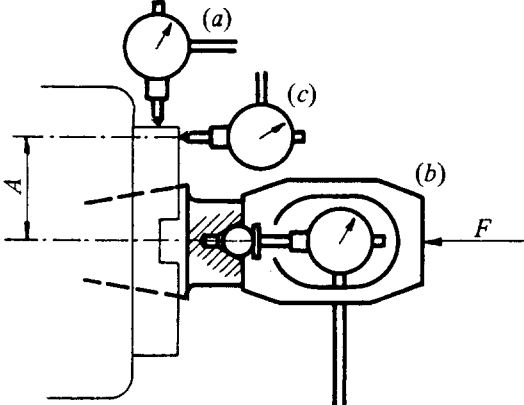
- 2.1 In this ISO Recommendation, all the dimensions are expressed in millimetres and in inches.
- 2.2 To apply this ISO Recommendation, reference should be made to ISO Recommendation R 230, especially for the installation of the machine before testing, warming up of spindles and other moving parts, description of measuring methods and recommended accuracy of testing equipment.
- 2.3 The sequence in which the geometrical tests are given is related to the sub-assemblies of the machine and this in no way defines the practical order of testing. In order to make the mounting of instruments or gauging easier, tests may be applied in any order.
- 2.4 When inspecting a machine, it is not always necessary to carry out all the tests described in this ISO Recommendation. It is up to the user to choose, in agreement with the manufacturer, those tests relating to the properties which are of interest to him, but these tests are to be clearly stated when ordering a machine.
- 2.5 Practical tests should be made with finishing cuts – for example : depth = 0.1 mm (0.004 in), feed per tooth = 0.1 mm (0.004 in) – and not with roughing cuts which are liable to generate appreciable cutting forces.
- 2.6 When the tolerance is established for a measuring range different from that given in this ISO Recommendation (see clause 2.311 in ISO Recommendation R 230), it should be taken into consideration that the minimum value of tolerance is 0.01 mm (0.0004 in).
- 2.7 For reasons of simplicity, the diagrams in this ISO Recommendation illustrate only one type of machine.

### 3. TEST CONDITIONS AND PERMISSIBLE DEVIATIONS

#### 3.1 Geometrical tests

| No. | Diagram                                                                             | Object                                                                                                                                                                                                                                                           |
|-----|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| G 1 |   | <p>Verification of straightness of the vertical movement of the spindle head slide :</p> <p>(a) in the vertical plane of symmetry of the machine;</p> <p>(b) in the plane perpendicular to the vertical plane of symmetry of the machine.</p>                    |
| G 2 |  | <p>Verification of squareness of the table surface to the vertical movement of the spindle head slide :</p> <p>(a) in the vertical plane of symmetry of the machine;</p> <p>(b) in the plane perpendicular to the vertical plane of symmetry of the machine.</p> |

| Permissible deviation                                                                                         |                                                                                                             | Measuring instruments | Observations<br>and references to the test code ISO/R 230                                                                                                                                                                                                                                                                                                                       |
|---------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| mm                                                                                                            | in                                                                                                          |                       |                                                                                                                                                                                                                                                                                                                                                                                 |
| <p>(a) 0.025<br/>for a measuring length<br/>of 300</p> <p>(b) 0.025<br/>for a measuring length<br/>of 300</p> | <p>(a) 0.001<br/>for a measuring length<br/>of 12</p> <p>(b) 0.001<br/>for a measuring length<br/>of 12</p> | Dial gauge and square | <p>Clause 5.232.1</p> <p>Instead of the straightedge specified in the test code ISO/R 230, use the vertical arm of a square.</p> <p>Table in central position, table and cross slide locked.</p> <p>If the spindle can be locked, the dial gauge may be mounted on it. If the spindle cannot be locked, the dial gauge should be placed on the spindle head of the machine.</p> |
| <p>(a) 0.025/300<br/>with <math>\alpha \leq 90^\circ</math></p> <p>(b) 0.025/300</p>                          | <p>(a) 0.001/12<br/>with <math>\alpha \leq 90^\circ</math></p> <p>(b) 0.001/12</p>                          | Dial gauge and square | <p>Clause 5.522.2</p> <p>Table in central position, cross slide and table locked.</p> <p>Spindle head slide locked when taking measurements.</p> <p>If the spindle can be locked, the dial gauge may be mounted on it. If the spindle cannot be locked, the dial gauge should be placed on the spindle head of the machine.</p>                                                 |

| No. | Diagram                                                                             | Object                                                                                                                                                                                                                                                                       |
|-----|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| G 3 |    | Verification of flatness of the table surface.                                                                                                                                                                                                                               |
| G 4 |   | <p>(a) Verification of parallelism of the table surface to the transverse movement of the table (or spindle);</p> <p>(b) Verification of parallelism of the table surface to the longitudinal movement of the table.</p>                                                     |
| G 5 |  | <p>(a) Measurement of run-out of the external centring surface on the spindle nose (for machines having this feature).</p> <p>(b) Measurement of periodic axial slip.</p> <p>(c) Measurement of camming of the face of the spindle nose (including periodic axial slip).</p> |