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# ISO

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

# ISO RECOMMENDATION

# R 1985

## TEST CONDITIONS FOR SURFACE GRINDING MACHINES WITH VERTICAL GRINDING WHEEL SPINDLE AND RECIPROCATING TABLE

## TESTING OF ACCURACY

1st EDITION

November 1971





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## BRIEF HISTORY

The ISO Recommendation R 1985, *Test conditions for surface grinding machines with vertical grinding wheel spindle and reciprocating table – 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. 1985, 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 | Italy | Spain |
| Chile | Japan | Sweden |
| Czechoslovakia | Korea, Rep. of | Thailand |
| France | Netherlands | U.A.R. |
| Greece | New Zealand | United Kingdom |
| Hungary | Portugal | U.S.A. |
| India | South Africa, Rep. of | |

The following Member Bodies opposed the approval of the Draft :

Germany
Switzerland

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

ISO Recommendation R 1985 November 1971

# TEST CONDITIONS FOR SURFACE GRINDING MACHINES WITH VERTICAL GRINDING WHEEL SPINDLE AND RECIPROCATING TABLE

## 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 surface grinding machines with reciprocating table and vertical grinding wheel spindle, and the corresponding permissible deviations which apply.

This ISO Recommendation is not applicable to surface grinding machines with fixed or rotating tables or to machines having longitudinal traverse of the wheelhead.*

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.

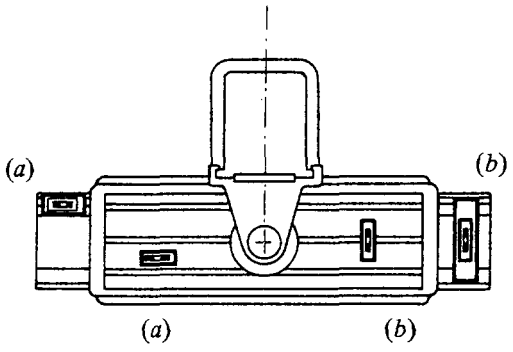
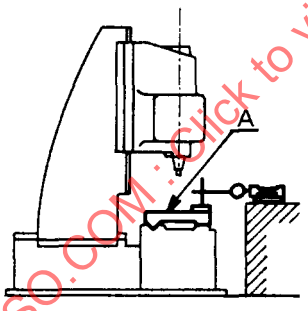
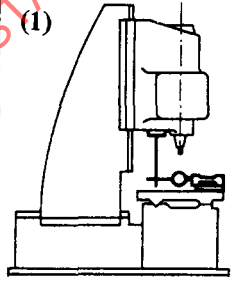
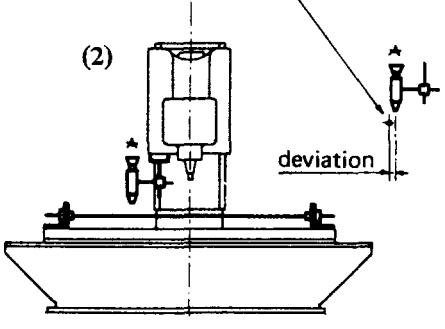
2.5 Practical tests should be made with finishing cuts.

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 0.001 mm (0.00004 in) for geometrical tests and practical tests.

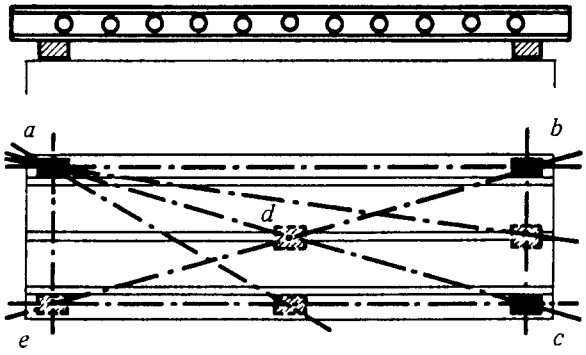
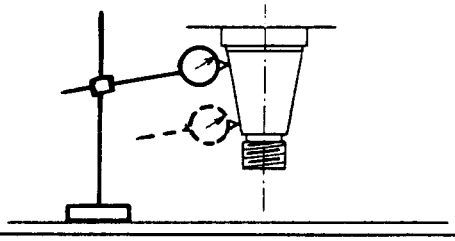
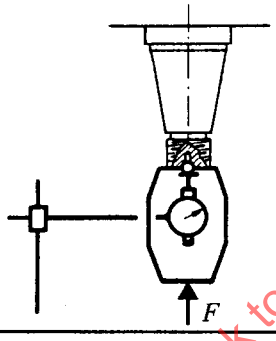
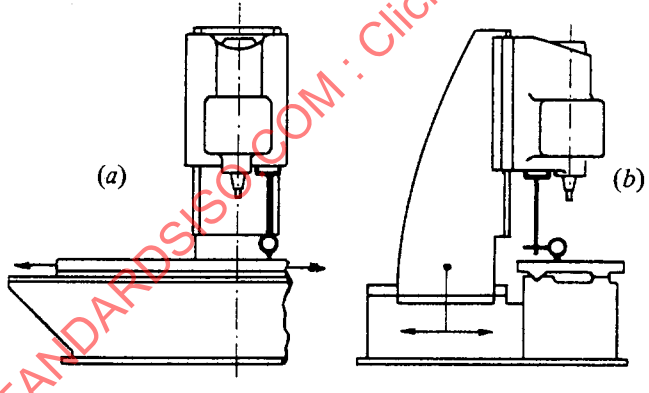
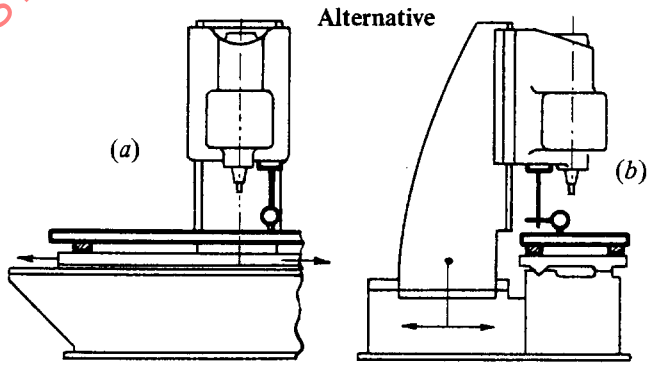
* For reasons of simplicity, the diagrams in this ISO Recommendation illustrate only one type of machine.

## 3. TEST CONDITIONS AND PERMISSIBLE DEVIATIONS

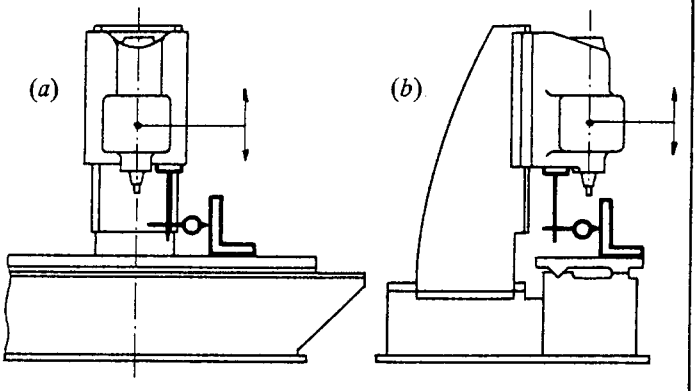
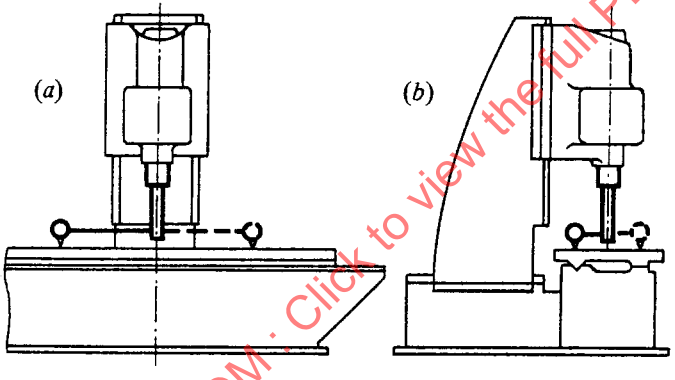
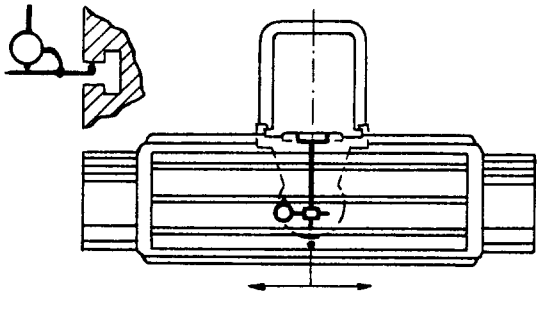
### 3.1 Geometrical tests

| No. | Diagram | Object |
|---|---|---|
| G 1 |  | Verification of levelling of slideways<br>(a) longitudinal verification :<br>– straightness of slideways in the vertical plane.<br>(b) transverse verification :<br>– slideways should be in the same plane. |
| G 2 |  | Verification of straightness of slideways in a horizontal plane.<br>(Only for machines with cross movement of the table or the wheelhead.) |
| | Alternatives<br>(1)<br>  <br>(2)<br>  | (These alternatives are for small machines where the table is not to be dismantled.)<br>Verification of the straightness of the longitudinal movement of the table. |

| Permissible deviation | | Measuring instruments | Observations and references to the test code ISO/R 230 |
|---|---|---|---|
| mm | in | | |
| (*a*) 0.02 up to 1000<br>For each 1000 mm increase in length, add<br>0.015<br>Maximum permissible deviation :<br>0.05 | (*a*) 0.0008 up to 40<br>For each 40 in increase in length, add<br>0.0006<br>Maximum permissible deviation :<br>0.002 | Precision levels, optical or other methods | (*a*) Clauses 3.11, 3.21, 5.212.21 and 5.212.22<br>Measurements should be made at a number of positions equally spaced along the length of the slideways. For machines standing on three support points or having a table travel less than 1500 mm (60 in) the table need not be removed. In this case the level should be placed successively on the exposed portions of the slideways and on the table. The table should be in its central position. |
| (*b*) variation of level :<br>0.02/1000 | (*b*) variation of level :<br>0.0008/40 | | (*b*) Clause 5.412.7<br>A level should be placed transversely on the slideways, and measurements should be taken at a number of positions equally spaced along the length of the slideway. The variation of level measured at any position should not exceed the permissible deviation. |
| 0.02 up to 1000<br>For each 1000 mm increase in length, add<br>0.02<br>Maximum permissible deviation :<br>0.05<br>Local tolerance :<br>0.01<br>over any measuring length of 300 | 0.0008 up to 40<br>For each 40 in increase in length, add<br>0.0008<br>Maximum permissible deviation :<br>0.002<br>Local tolerance :<br>0.0004<br>over any measuring length of 12 | Straightedge, support and dial gauge, or taut wire and microscope | Clause 5.232.1<br>The dial gauge should be fixed on a support A of a suitable form such that it can slide in the slideways with the stylus touching a straightedge laid parallel to the slideways. |
| 0.01 up to 1000<br>For each 1000 mm increase in length, add<br>0.01<br>Maximum permissible deviation :<br>0.025 | 0.0004 up to 40<br>For each 40 in increase in length, add<br>0.0004<br>Maximum permissible deviation :<br>0.001 | | Clauses 5.232.1 or 5.212.3 – 5.232.2<br>**Alternative (1)**<br>The dial gauge support should be placed on a fixed part of the machine, the stylus touching a straightedge laid parallel to the general direction of the longitudinal movement of the table. |

| No. | Diagram | Object |
|---|---|---|
| G 3 |  | Verification of flatness of the table surface. |
| G 4 |  | Measurement of run-out of the wheel spindle nose. |
| G 5 |  | Measurement of periodical axial slip of the wheel spindle. |
| G 6 |  <br>Alternative<br>  | Verification of parallelism of the table surface :<br>(*a*) to its longitudinal movement;<br>(*b*) to the transverse movement of the table or wheel spindle.<br>(only for machines having this movement). |

| Permissible deviation | | Measuring instruments | Observations and references to the test code ISO/R 230 |
|---|---|---|---|
| mm | in | | |
| 0.01 up to 1000<br>For each 1000 mm increase in length, add<br>0.01<br>Maximum permissible deviation :<br>0.04<br>Local tolerance :<br>0.005<br>over any measuring length of 300 | 0.0004 up to 40<br>For each 40 in increase in length, add<br>0.0004<br>Maximum permissible deviation :<br>0.0016<br>Local tolerance :<br>0.0002<br>over any measuring length of 12 | Straightedge and slip gauges or precision level | Clauses 5.322 and 5.323<br>The table should be positioned at the centre of travel.<br>The table should not be locked. |
| 0.01 | 0.0004 | Dial gauge | Clauses 5.612.1 and 5.612.2<br>The stylus of the dial gauge should be set normal to the surface which is to be checked. Checking should be carried out at each extremity of the taper. This is not stated in the test code ISO/R 230. |
| 0.01 | 0.0004 | Dial gauge | Clauses 5.622.1 and 5.622.2<br>A force $F$, specified by the manufacturer of the machine, should be exerted co-axially with the spindle.<br>The line of action of the stylus of the dial gauge should be co-axial with the spindle. |
| (*a*) 0.015 up to 1000<br>For each 1000 mm increase in length, add<br>0.01<br>Maximum permissible deviation :<br>0.05<br>Local tolerance :<br>0.008<br>over any measuring length of 300<br>(*b*) 0.01 up to 1000 | (*a*) 0.0006 up to 40<br>For each 40 in increase in length, add<br>0.0004<br>Maximum permissible deviation :<br>0.002<br>Local tolerance :<br>0.0003<br>over any measuring length of 12<br>(*b*) 0.0004 up to 40 | Dial gauge | Clause 5.422.21<br>1. Checking by direct contact with the table.<br>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 a fixed part of the machine.<br>The stylus to be placed approximately in the wheel spindle axis. |
| (*a*) 0.01 up to 1000<br>For each 1000 mm increase in length, add<br>0.005<br>Maximum permissible deviation :<br>0.035<br>(*b*) 0.01 up to 1000 | (*a*) 0.0004 up to 40<br>For each 40 in increase in length, add<br>0.0002<br>Maximum permissible deviation :<br>0.0014<br>(*b*) 0.0004 up to 40 | Dial gauge and precision straightedge | 2. Checking with a straightedge.<br>It is unnecessary to follow the test code ISO/R 230. The checking should be made on a straightedge laid parallel to the table surface and placed in the direction of the movement concerned. |

| No. | Diagram | Object |
|---|---|---|
| G 7 |  | Verification of squareness and straightness of the vertical movement of the wheelhead to the table surface :<br>(*a*) in a longitudinal vertical plane;<br>(*b*) in a transverse vertical plane. |
| G 8 |  | Verification of squareness of the axis of the wheel spindle to the table surface :<br>(*a*) in a longitudinal plane;<br>(*b*) in a transverse plane.<br>(For machines which have no wheel spindle regulation in that plane.) |
| G 9 |  | Verification of parallelism of the median or reference tee slot to the longitudinal movement of the table.<br>(Only for machines having transverse movement of the wheelhead or the table.) |