

# International Standard



# 5734

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION • МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ • ORGANISATION INTERNATIONALE DE NORMALISATION

## Acceptance conditions of mechanical dividing heads for machine tools — Testing of accuracy

*Conditions de réception des appareils diviseurs, à commande mécanique, pour machines-outils — Contrôle de la précision*

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**Descriptors** : machine tools, dividing apparatus, tests, testing conditions, dimensional measurements, accuracy.

## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 5734 was prepared by Technical Committee ISO/TC 39, *Machine tools*.

This second edition cancels and replaces the first edition (ISO 5734-1978), the geometrical tests G4, G5 and G6 of which have been technically revised.

Users should note that all International Standards undergo revision from time to time and that any reference made herein to any other International Standard implies its latest edition, unless otherwise stated.

# Acceptance conditions of mechanical dividing heads for machine tools — Testing of accuracy

## 1 Scope and field of application

This International Standard specifies, with reference to ISO 230/1, geometrical tests on general purpose and normal accuracy mechanical dividing heads for use on machine tools, and the corresponding permissible deviations that apply.

It deals only with the verification of the accuracy of the device. It does not apply to the running of the device, which should generally be checked before the accuracy is tested.

## 2 Reference

ISO 230/1, *Acceptance code for machine tools — Part 1: Geometric accuracy of machines operating under no-load or finishing conditions*.

## 3 Preliminary remarks

**3.1** In this International Standard, dimensions and deviations are expressed in millimetres and in inches.

**3.2** To apply this International Standard, reference should be made to ISO 230/1, especially for the description of measuring methods and the recommended accuracy of testing equipment.

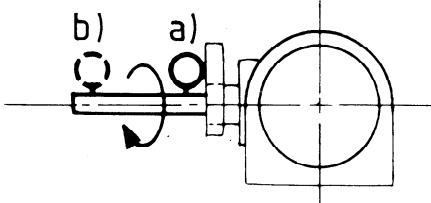
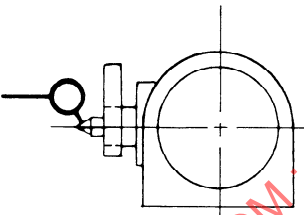
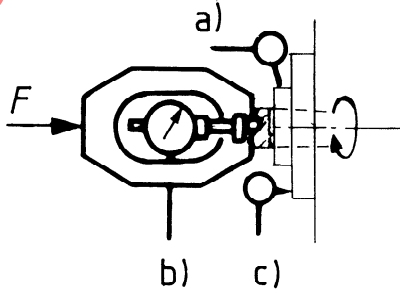
**3.3** The sequence in which the geometrical tests are given is related to the sub-assemblies of the device, and this in no way defines the practical order of testing. In order to make the mounting of instruments or gauging easier, tests may be applied in any order.

**3.4** When inspecting a device, it is not always necessary to carry out all the tests given in this International Standard. It is up to the user to choose, in agreement with the manufacturer, those relating to the properties which are of interest to him, but these tests are to be clearly stated when ordering a device.

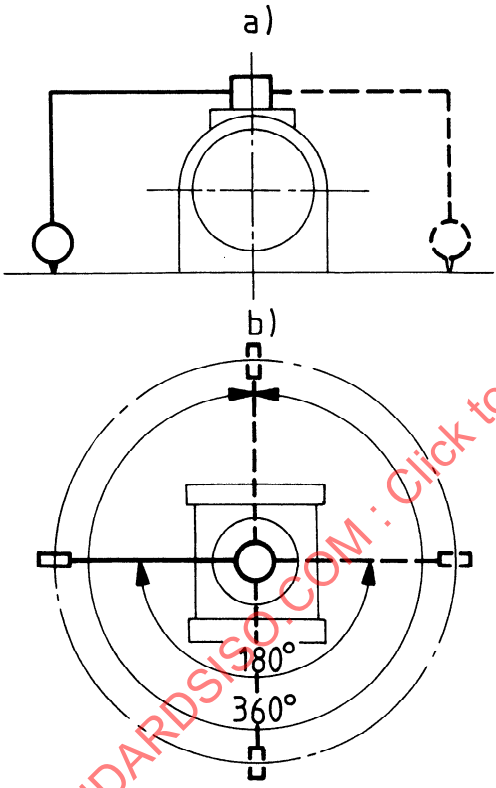
**3.5** When establishing the tolerance for a measuring range different from that given in this International Standard (see 2.311 in ISO 230/1), it should be taken into consideration that the minimum tolerance value is 0,01 mm (0.000 4 in).

**3.6** For reasons of simplicity the diagrams in this International Standard illustrate only one type of machine.

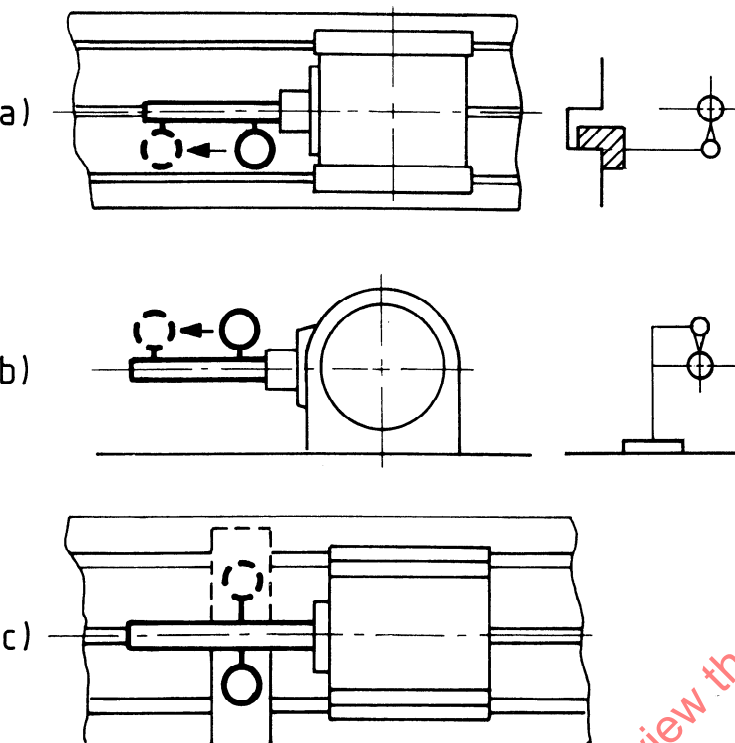
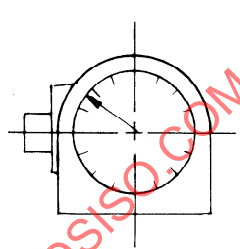
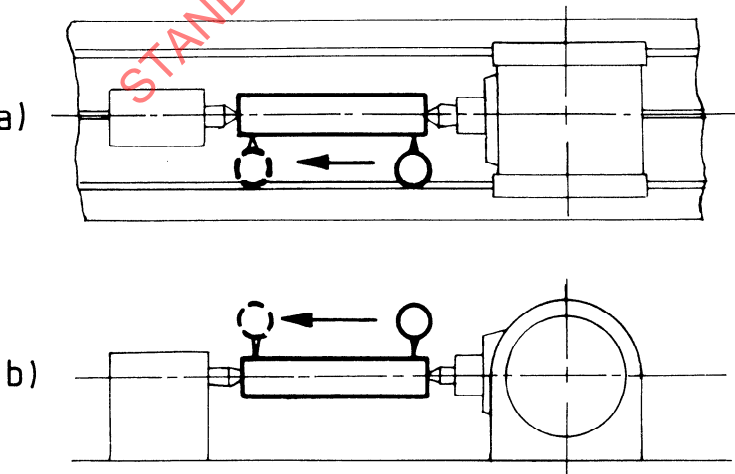
#### 4 Acceptance conditions and permissible deviations

| No. | Diagram                                                                             | Object                                                                                                                                                                                                                      |
|-----|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| G1  |    | <p>Measurement of run-out of the internal taper of the spindle:</p> <p>a) at the mouth of the taper;</p> <p>b) at a distance of 300 mm (12 in) from the face of the spindle nose.</p>                                       |
| G2  |  | <p>Measurement of run-out of the centre.</p>                                                                                                                                                                                |
| G3  |  | <p>a) Measurement of run-out of the spindle external register diameter.</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> |

| Permissible deviation         |                                        | Measuring instruments       | Observations and references to the ISO 230/1 acceptance code                                                                                                                                                                                                                                                                                                                                                          |
|-------------------------------|----------------------------------------|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| mm                            | in                                     |                             |                                                                                                                                                                                                                                                                                                                                                                                                                       |
| a) 0,01<br>b) 0,02            | a) 0.000 4<br>b) 0.000 8               | Dial gauge and test mandrel | Sub-clause 5.612.3                                                                                                                                                                                                                                                                                                                                                                                                    |
| 0,01                          | 0.000 4                                | Dial gauge                  | Sub-clause 5.612.2                                                                                                                                                                                                                                                                                                                                                                                                    |
| a) 0,01<br>b) 0,01<br>c) 0,02 | a) 0.000 4<br>b) 0.000 4<br>c) 0.000 8 | Dial gauge                  | a) Sub-clause 5.612.2<br>For a tapered spindle nose, the dial gauge shall be set perpendicular to the generatrix of the taper.<br>b) and c) Sub-clauses 5.62, 5.621.2, 5.622.1, 5.622.2 and 5.632<br>For the position of the dial gauge, see figures 59 to 64 and 67, sub-clauses 5.622 and 5.632.<br>The value of force $F$ to be applied when carrying out checks b) and c) shall be specified by the manufacturer. |

| No. | Diagram                                                                                                                                                                                                                                                                                                                                                                                                                                             | Object                                                                                                                                                                                                                                                                   |
|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| G4  |  <p>Diagram illustrating the checking of squareness of the spindle axis with the supporting surface of the dividing head.</p> <p>a) Side view showing the spindle axis and the supporting surface of the dividing head.</p> <p>b) Top view showing the spindle axis and the supporting surface of the dividing head, with a 180° and 360° rotation indicated.</p> | <p>Checking of squareness of the spindle axis with the supporting surface of the dividing head.</p> <p>NOTE — For dividing heads fitted with detent pins to retain the spindle in the vertical position, the location provided by the detent pin should be verified.</p> |

| Permissible deviation |             | Measuring instruments | Observations and references to the ISO 230/1 acceptance code                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-----------------------|-------------|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| mm                    | in          |                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 0,02/300*             | 0.000 8/12* | Dial gauge            | <p>Sub-clause 5.512.1</p> <p>Mount dial gauge on spindle.</p> <p>Set dividing head with spindle vertical by use of detent pin. Where there is no detent pin, set the dial gauge as shown in a) so that the dial gauge reads zero when swung through 180°.</p> <p>For all dividing heads, readings should then be taken through 360° of spindle rotation as shown in b).</p> <p>The deviation is the largest difference between the dial gauge readings.</p> <p>* Distance between the two points touched.</p> |

| No. | Diagram                                                                                                                                                                                                                                                                                                                                                                                                         | Object                                                                                                                                                                                                                                                                                                                                                                            |
|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| G5  |  <p>a) Checking of parallelism of the locating tenon to the spindle axis;</p> <p>b) Checking of parallelism of the spindle axis to the clamping surface.</p> <p>NOTE — Test b) is only necessary if location of spindle is by detent pin.</p> <p>c) Checking of lateral offset of spindle with respect to central T-slot.</p> |                                                                                                                                                                                                                                                                                                                                                                                   |
| G6  |                                                                                                                                                                                                                                                                                                                              | <p>Checking of maximum permissible dividing error:</p> <p>a) in the output shaft rotation for one complete revolution of the input shaft (i.e. for a normal 40/1 ratio dividing head, a <math>9^\circ</math> rotation is implied);</p> <p>b) for any chosen angles of the output shaft. This test should be carried out for one angle situated in each of the four quadrants.</p> |
| G7  |  <p>a) Checking of parallelism of the working axis with the median T-slot.</p> <p>b) Checking of parallelism of working axis with the clamping surface of the device.</p>                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                   |



| Permissible deviation                                                                                                                                                                                                                                       |    | Measuring instruments       | Observations and references to the ISO 230/1 acceptance code                                                                                                                                                                                                                                                                                                                                                                                               |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|-----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| mm                                                                                                                                                                                                                                                          | in |                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <p>a) and b)</p> <p>0,015                      0.000 6</p> <p>for any measuring length of :</p> <p>300                      12</p> <p>c)</p> <p>0,015                      0.000 6</p>                                                                      |    | Dial gauge and test mandrel | <p>Sub-clauses 5.412.1 and 5.412.4</p> <p>The measurement shall be carried out on two diametrically opposed generatrix of the mandrel, after the spindle has been rotated through 180°.</p> <p>The tolerance is equal to the algebraic mean of the measurements.</p> <p>Tenons adjusted, if necessary.</p> <p>Sub-clause 5.442</p> <p>Dial gauge is rotated through 180° to touch each side of the test mandrel.</p> <p>Tenons adjusted, if necessary.</p> |
| <p>a) <math>\pm 45''</math></p> <p>or maximum width of tolerance band of 1' 30'' of arc</p> <p>b) <math>\pm 1'</math></p> <p>or maximum width of tolerance band of 2' of arc</p>                                                                            |    | Reference plate             | <p>a) Sub-clause 6.111</p> <p>This test eliminates any error in the plate for the hole and pin type.</p> <p>b) Sub-clause 6.114</p> <p>The permissible deviation includes the transmission errors in any type of dividing head as well as errors in the plate for the hole and pin type.</p> <p>This test should be made for each direction of rotation to evaluate the reversal error.</p>                                                                |
| <p>a)</p> <p>0,02                      a) 0.000 8</p> <p>for any measuring length of :</p> <p>300                      12</p> <p>b)</p> <p>0,02                      b) 0.000 8</p> <p>for any measuring length of :</p> <p>300                      12</p> |    | Dial gauge and test mandrel | <p>Sub-clause 5.412.4</p> <p>Test mandrel held between centres :</p> <p>a) tenons adjusted, if necessary;</p> <p>b) height adjusted, if necessary.</p>                                                                                                                                                                                                                                                                                                     |