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Acceptance conditions for plano-milling machines — Testing of the accuracy —

Part 1: Portal-type machines

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Conditions de réception des machines à fraiser à portique — Contrôle de la précision —

Partie 1: Machines à portique fixe

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Reference number
ISO 8636-1:1987 (E)

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 8636-1 was prepared by Technical Committee ISO/TC 39, *Machine tools*.

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.

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Acceptance conditions for plano-milling machines — Testing of the accuracy —

Part 1 : Portal-type machines

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1 Scope and field of application

This part of ISO 8636 specifies, with reference to ISO 230-1, preliminary tests, geometrical tests and practical tests for portal-type plano-milling machines which apply to general purpose, normal accuracy, machines and gives the corresponding permissible deviations.

This part of ISO 8636 is applicable to machines with moving tables and fixed double columns. It does not include single-column (open-sided) machines and those with fixed tables and moving columns.

This part of ISO 8636 deals only with checking the machine accuracy. It does not apply to the testing of the running of the machine (vibration, abnormal noise, stick-slip motion of components, etc.) nor to the machine characteristics (speeds, feeds etc.) which should generally be checked before testing the accuracy.

This part of ISO 8636 provides the nomenclature used for the principal parts of the machine and the designation of the axes.

NOTE — In addition to terms used in the three official ISO languages (English, French and Russian), this part of ISO 8636 gives the equivalent terms in the German and Italian languages in an annex; these have been included at the request of ISO Technical Committee ISO/TC 39 and are published under the responsibility of the member bodies for Germany, F.R. (DIN) and Italy (UNI). However, only terms given in the official languages can be considered as ISO terms.

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 observations

3.1 In this part of ISO 8636, all dimensions and deviations are expressed in millimetres and in inches.

3.2 To apply this part of ISO 8636, reference should be made to ISO 230-1, especially for the installation of the machine before testing, warming up of spindle and other moving parts, description of measuring methods and recommended accuracy of testing equipment.

3.3 The temperature conditions throughout the tests shall be specified by agreement between manufacturer and user.

3.4 The sequence in which geometrical tests are given is related to the sub-assemblies of the machine and in no way defines the practical order of testing. In particular, to make instrument mounting or gauging easier, tests may be applied in any order.

3.5 When inspecting a machine, it is not always necessary to carry out all the tests given in this part of ISO 8636. It is up to the user to choose, in agreement with the manufacturer, those tests relative to the properties which are of interest to him, but these tests are to be clearly stated when ordering a machine.

3.6 Practical tests shall be carried out with finishing cuts and not with roughing cuts which are liable to generate appreciable cutting forces.

3.7 When establishing the tolerance for a measuring range different from that given in this part of ISO 8636 (see subclause 2.311 of ISO 230-1), it should be taken into consideration that the minimum value of tolerance is 0,005 mm (0.000 2 in).

3.8 For reasons of simplicity, the diagrams in this part of ISO 8636 are based on a single machine type.

4 Definitions and description

4.1 Definitions of the machining processes that can be carried out

4.1.1 Milling operations

Milling is a machining operation which consists of removing material by means of a rotary tool called a "milling cutter" of which there are several different types. The usual operations of milling mostly involve face milling or end milling. The tools are mounted either in the spindle taper or on the spindle front face.

4.1.2 Boring operations

Boring consists of machining the diameters of cylindrical, conical, blind or through holes, to the required size.

4.1.3 Drilling and tapping operations

These operations consist of drilling and/or tapping blind or through holes.

4.2 Definition of plano-milling machines and main types

4.2.1 Definition

portal-type plano-milling machine: Double-column machine with one or more vertical spindle heads mounted on the cross-rail, above a table which has longitudinal traverse only.

Additional horizontal spindle heads may be mounted on the columns, of which the horizontal spindle axes may be inclinable.

4.2.2 Main types of machines

These machines are classified into two types depending upon construction :

- plano-milling machines with a movable height cross-rail and a bridge or tiepiece between the columns ;
- plano-milling machines with a fixed height cross-rail which may replace the bridge or tiepiece.

4.3 Description

See 5.1, in which the numbers are explained.

4.3.1 Bed and table

The bed (1) is the fixed base of the machine which may be constructed of several parts. It supports the table (3) which moves parallel to the major axis of the bed.

4.3.2 Column, cross-rail and tiepiece or bridge

The columns (4) and (5) provide the vertical frame of the machine and are fixed on either side of the bed.

The columns may be fitted with vertical slideways to accommodate a side milling head (9) with a horizontal or inclinable spindle axis.

The bridge or tiepiece (10) is a fixed piece connecting both columns at or near the top.

The cross-rail (7) has its major axis parallel to the table plane and is fitted with horizontal slideways on which one or more milling heads (8) with vertical or inclinable spindles can move.

The variable height cross-rail may be moved up and down the vertical slideways (6) on the columns.

In the case of machines with fixed height cross-rail, the latter is also fastened to the columns and may replace the bridge or tiepiece.

4.3.3 Milling head

These heads include the spindle and driving mechanism and the ways for mounting on the cross-rail or column. In some cases the spindle may be mounted in a ram or quill (12) with a feed motion for drilling or boring operations.

4.3.4 Cutting motion

Cutting motion is provided by the spindles and drive mechanisms of the milling heads.

4.3.5 Feed motion

The following feed movements may be provided with constant or variable feed rate :

- horizontal movement of the table ;
- horizontal or vertical movement of the cross-rail or column heads ;
- vertical movement of spindle rams or quills (if any) ;
- vertical movement of the cross-rail (if any).

NOTE — In general, rapid traverse is available in addition to feed movement.

5 Nomenclature and designation of axes

5.1 Nomenclature

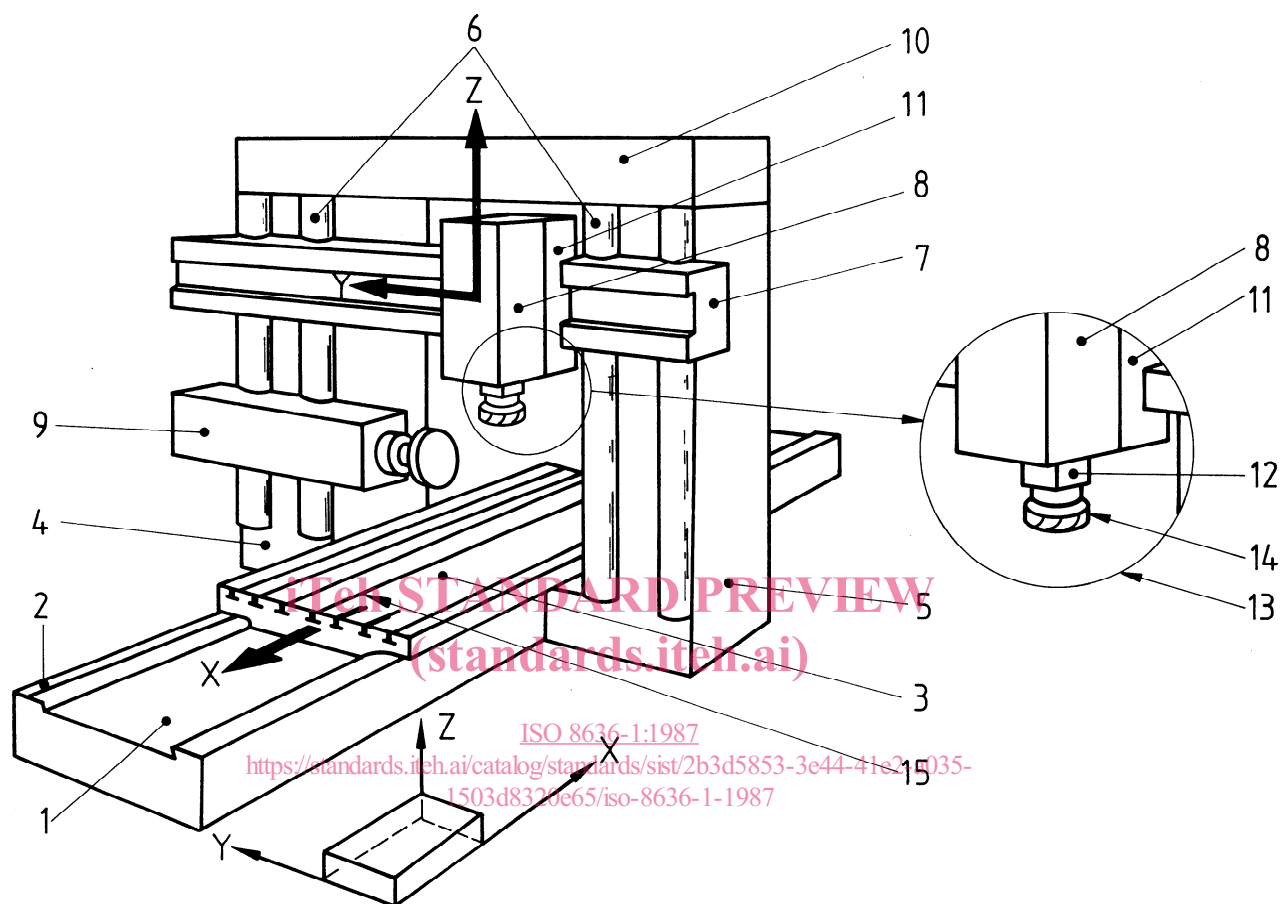
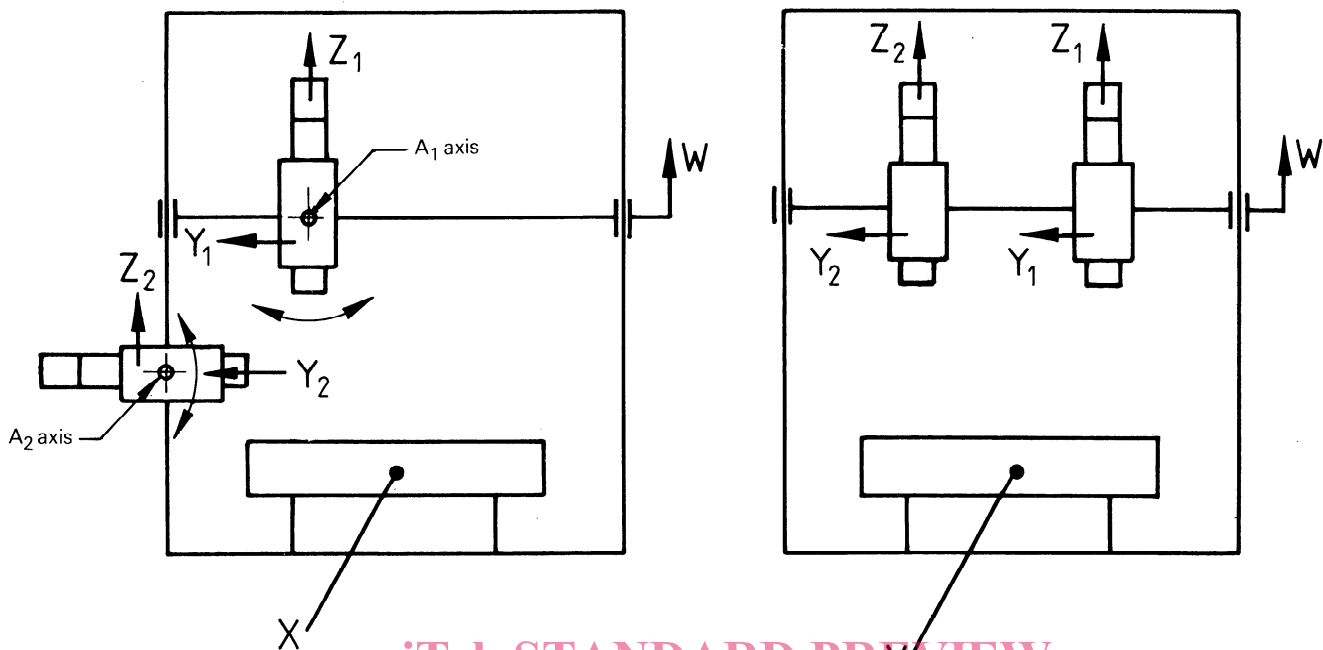


Figure 1 — Portal-type plano-milling machine with variable height cross-rail

Ref.	Designation		
	English	French	Russian
1	Bed	Banc	Станина
2	Slideway, bed	Glissière du banc	Направляющая станины
3	Table (clamping surface)	Table (surface de bridage)	Стол (рабочая поверхность)
4	Left-hand column	Montant gauche	Левая стойка
5	Right-hand column	Montant droit	Правая стойка
6	Slideway, right-hand and left-hand column	Glissière des montants droit et gauche	Направляющая левой и правой стоек
7	Cross-rail (movable, fixed)	Traverse (mobile, fixe)	Траверса (подвижная, неподвижная)
8	Vertical milling head	Tête de fraisage verticale	Головка вертикально-фрезерная
9	Horizontal milling head (side head)	Tête de fraisage horizontale	Головка горизонтально-фрезерная
10	Bridge (tiepiece)	Entretoise	Поперечная балка
11	Bottom slide (saddle)	Cuirasse	Каретка суппорта
12	Quill (ram)	Coullant (fourreau)	Ползун (втулка)
13	Milling spindle	Broche porte-fraise	Шпиндель фрезы
14	Tool (milling cutter)	Outil (fraise, tourneau)	Инструмент (фреза)
15	Reference T-slot	Rainure de référence	Базовый паз

5.2 Designation of axes



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a) one tilting spindle milling head on the A_1 axis, placed on the cross-rail, and one tilting spindle milling head on the A_2 axis, placed on the right- or left-hand column

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Figure 2 — Type 1: Machine with two milling heads

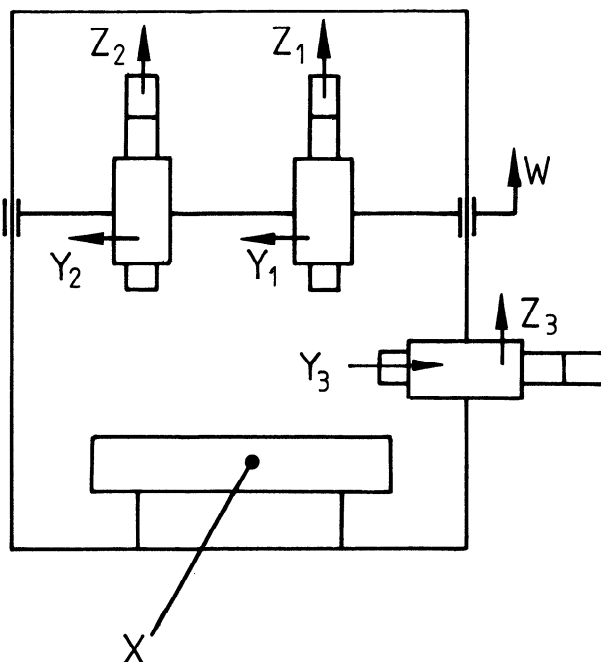


Figure 3 — Type 2: Machine with three milling heads

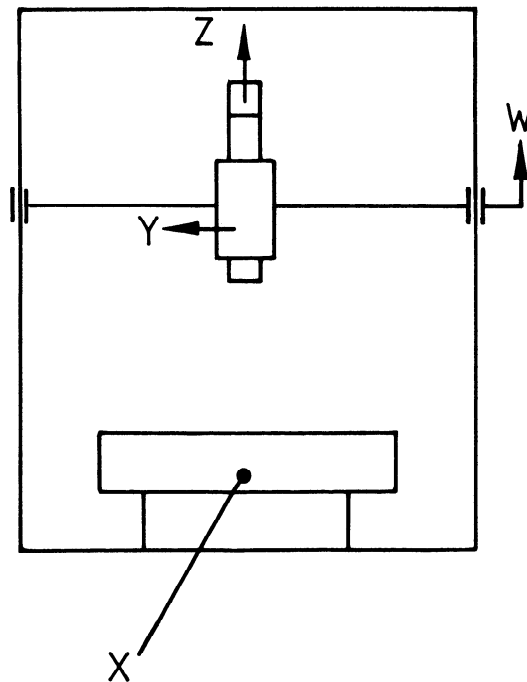


Figure 4 — Type 3: Machine with one milling head on the cross-rail

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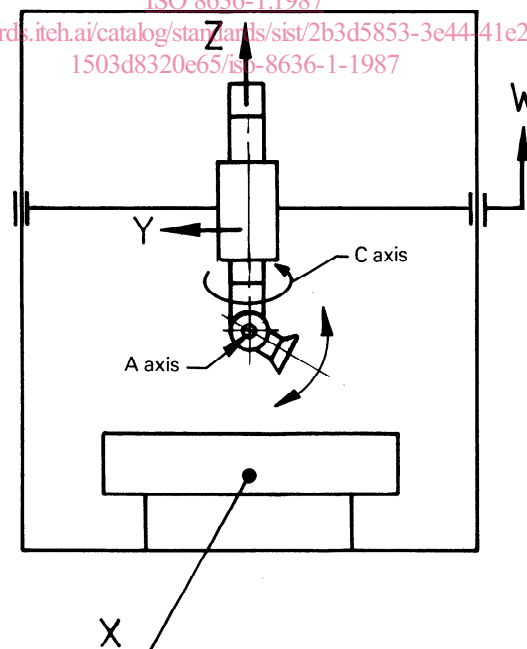


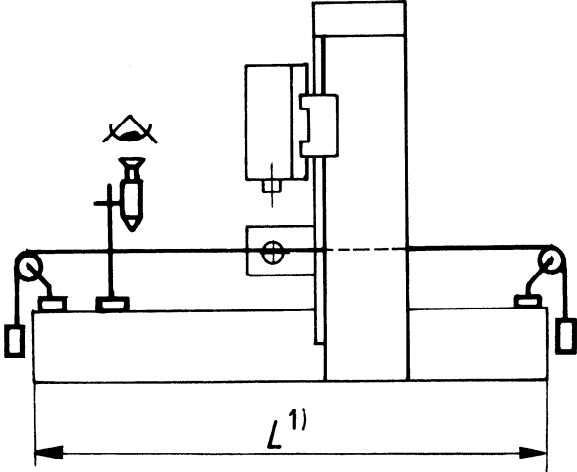
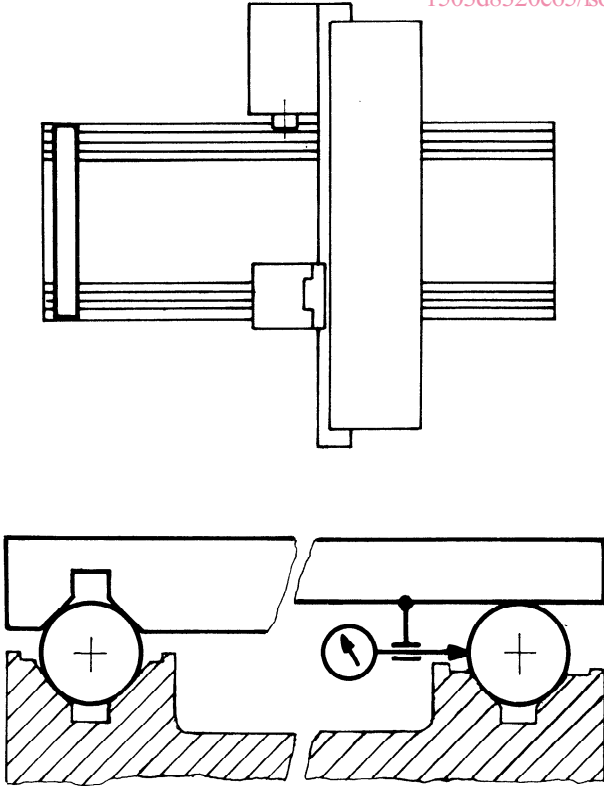
Figure 5 — Type 4: Machine with one milling head on the cross-rail and an additional milling head swivelling on axes C and A

6 Test conditions and permissible deviations

6.1 Preliminary tests

No.	Diagram	Object
G01	<p>Particular bed shape indicated by the manufacturer</p>	<p>A – Bed</p> <p>Verification of levelling of bed slideways¹⁾:</p> <p>a) Longitudinal verification: checking of accuracy of slideways in a vertical plane.</p> <p>b) Transverse verification: checking of position of slideways with respect to one another.</p>

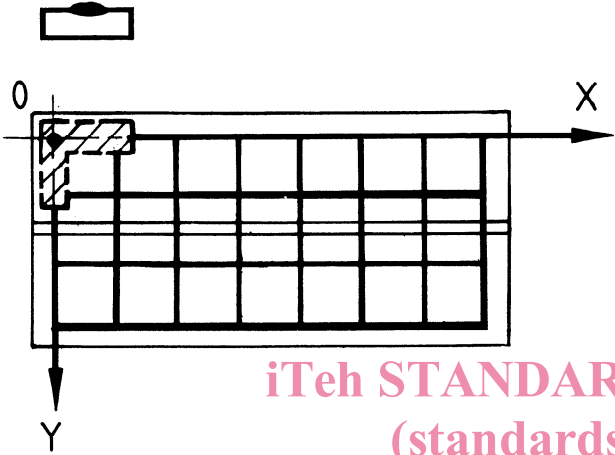
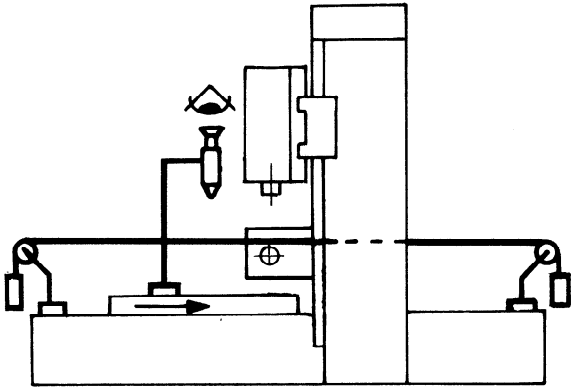
Permissible deviation		Measuring instruments	Observations and references to the ISO 230-1 acceptance code
mm	in		
Local tolerance :			Sub-clauses 3.1 and 3.2 Table dismantled.
0,02	0.000 8		a) Place level in the longitudinal direction on each slideway at a number of equally spaced positions along the bed length.
1 000	40	ISO 8636-1:1987	
over any measured length (flat or convex) of			
0,02/1 000	0.000 8/40	Straightedge, precision levels, special support	b) Place the special support and level in the transverse direction on each slideway. It shall not indicate slope variations exceeding the tolerance at any measuring point over the bed length. Such checks shall be carried out when mounting the machine.
			1) The shape characteristics of the bed basic plane from which the permissible deviation is measured shall be supplied graphically or described by the manufacturer.

No.	Diagram	Object
G02	 <p style="text-align: center;">iTeh STANDARD PREVIEW (standards.iteh.ai)</p>	<p>Checking of straightness of bed reference slideways in a horizontal plane.</p>
G03	<p style="text-align: center;">ISO 8636-1:1987 https://standards.iteh.ai/catalog/standards/sis/2b3d5853-3e44-41e2-a035-1503d8320e65/iso-8636-1-1987</p> 	<p>Checking of parallelism of bed reference slideways in a horizontal plane (for machines with two reference slideways).</p>

Permissible deviation		Measuring instruments	Observations and references to the ISO 230-1 acceptance code
mm	in		
<p>0,02 for $L^1 \leq 2\ 000$</p> <p>0,03 for $2\ 000 < L \leq 4\ 000$</p> <p>0,05 for $4\ 000 < L \leq 10\ 000$</p> <p>0,08 for $10\ 000 < L \leq 20\ 000$</p> <p>0,12 for $L > 20\ 000$</p> <p>Local tolerance : 0,01 over any measured length of 500</p>	<p>0.000 8 for $L^1 \leq 80$</p> <p>0.001 2 for $80 < L \leq 160$</p> <p>0.002 for $160 < L \leq 400$</p> <p>0.003 for $400 < L \leq 800$</p> <p>0.005 for $L > 800$</p> <p>0.000 4 20</p>	<p>Microscope and taut wire or any other optical instrument, special support or measuring carriage</p>	<p>Sub-clauses 5.212.3 and 5.222</p> <p>Dismounted table.</p> <p>Fix taut wire to each end of slideway, stretch and orientate it.</p> <p>Place and orientate special support and microscope on slideway.</p> <p>Move special support on slideway at different, equally spaced, positions and read the variation in the recorded value.</p> <p>In the case of machines with two V-shaped slideways, testing can be carried out by checking straightness for one slideway and parallelism for the other.</p> <p>1) L is the slideway length.</p>
<p>0,02 whichever is the distance between slideways in the horizontal plane</p>	<p>0.000 8</p>	<p>Special support or measuring carriage and dial gauge</p>	<p>Sub-clause 5.412.6</p> <p>Place the special support on one of the reference slideways and on the opposite slideway.</p> <p>Move the special support along the slideways through various, equally spaced, positions.</p> <p>Read the variation in the dial gauge indication.</p>

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6.2 Geometrical tests

No.	Diagram	Object
G1	 <p style="text-align: center;">iTeh STANDARD PREVIEW (standards.iteh.ai)</p> <p style="text-align: center;">ISO 8636-1:1987 https://standards.iteh.ai/catalog/standards/sist/2b3d5853-3e44-41e2-a035-1503d8320e65/iso-8636-1-1987</p>	<p style="text-align: center;">B — Table</p> <p>Checking of flatness of table surface.</p>
G2	 <p style="text-align: center;">iTeh STANDARD PREVIEW (standards.iteh.ai)</p>	<p>Checking of straightness of movement of table on bed in a horizontal plane.</p>