INTERNATIONAL STANDARD

ISO 11090-2

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Machine tools — Test conditions for die sinking electro-discharge machines (EDM) — Terminology and testing of accuracy —

Part 2: Two column machines (slide-head type and cross-slide table type)

Machines outils — Conditions d'essai des machines d'électroérosion en plongée — Terminologie et contrôle de la précision —

Partie 2: Machines à deux montants (type à tête mobile et type à bancs en croix)

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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. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 11090-2 was prepared by Technical Committee ISO/TC 39, *Machine tools,* Subcommittee SC 2, *Test conditions for metal cutting machine tools.*

ISO 11090 consists of the following parts, under the general title *Machine tools — Test conditions for die sinking electro-discharge machines (EDM) — Terminology and testing of accuracy*:

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— *Part 1: Single column machines (cross slide table type and fixed table type)*

— *Part 2: Two column machines (slide-head type and cross-slide table type)*

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Annexes A and B of this International Standard are for information only.

Introduction

The purpose of ISO 11090 is to standardize methods of testing the accuracy of die sinking electro-discharge machines (EDM).

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Machine tools — Test conditions for die sinking electro-discharge machines (EDM) — Terminology and testing of accuracy —

Part 2:
Two column machines (slide-head type and cross-slide table type)

1 Scope

This part of ISO 11090 specifies, with reference to ISO 230-1 and ISO 230-2, geometric and machining tests and tests for checking accuracy and repeatability of numerically controlled positioning axes for general purpose and normal accuracy die sinking electro-discharge machines (EDM). It also specifies the applicable tolerances, corresponding to the above-mentioned tests.

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This part of ISO 11090 is applicable to two column machines of slide-head type and cross-slide table type.

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This part of ISO 11090 deals only with the verification of accuracy of the machine. It does not apply to the testing of the machine operation (vibrations, abnormal noises, stick-slip motion of components, etc.), nor to the checking of its characteristics (such as speeds, feeds, etc.), which should generally be checked before the testing of the accuracy.

This part of ISO 11090 provides the terminology used for the principal components of the machine and the designation of the axes with reference to ISO 841[1].

NOTE — In addition to the terms used in the three official ISO languages (English, French and Russian), annex A of this part of ISO 11090 gives, for information, the equivalent terms in the Dutch, German, Italian and Swedish languages; these are published under the responsibility of the national member bodies for Belgium (IBN), Germany (DIN), Italy (UNI) and Sweden (SIS). However, only the terms given in the official languages can be considered as ISO terms.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 11090. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 11090 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 230-1:1996, *Test code for machine tools — Part 1: Geometric accuracy of machines operating under no-load or finishing conditions*.

ISO 230-2:1997, *Test code for machine tools — Part 2: Determination of accuracy and repeatability of positioning of numerically controlled axes*.

3 Terminology and designation of axes

3.1 Slide-head type

See figure 1 and table 1.

NOTE — It is recognized that figure 1 does not comply with the second and third paragraphs of 4.4.2 of ISO 841:—[1]. But X and Y designations may be interchanged to suit axes lengths and/or the operator position. Selection is at the discretion of the manufacturer.

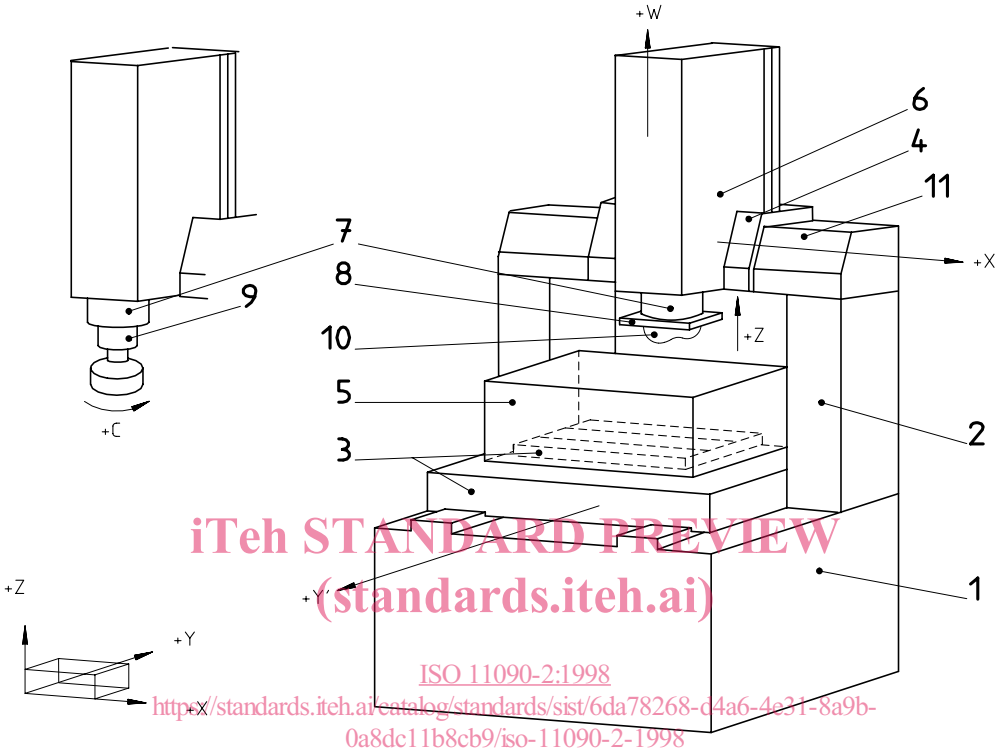

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Figure 1 — Two column machine with a slide-head

Table 1 — Terminology

1	Bed	Banc	Станина
2	Column	Montant	Стойка
3	Table (Y′-axis)	Table (axe Y′)	Стол (ось Y′)
4	Saddle (X-axis)	Chariot transversal (axe X)	Салазки (ось X)
5	Work tank	Réservoir de travail	Рабочая ванна
6	Head (W-axis)	Tête de travail (axe W)	Головка, рабочая (ось W)
7	Quill (Z-axis)	Coulisse (axe Z)	Пиноль (ось Z)
8	Electrode platen	Porte-électrode	Электрододержатель
9	Spindle (C-axis)	Broche (axe C)	Шпиндель (ось C)
10	Electrode	Électrode	Электрод
11	Beam	Traverse	Траверса

1) To be published.

3.2 Cross-slide table type

See figure 2 and table 2.

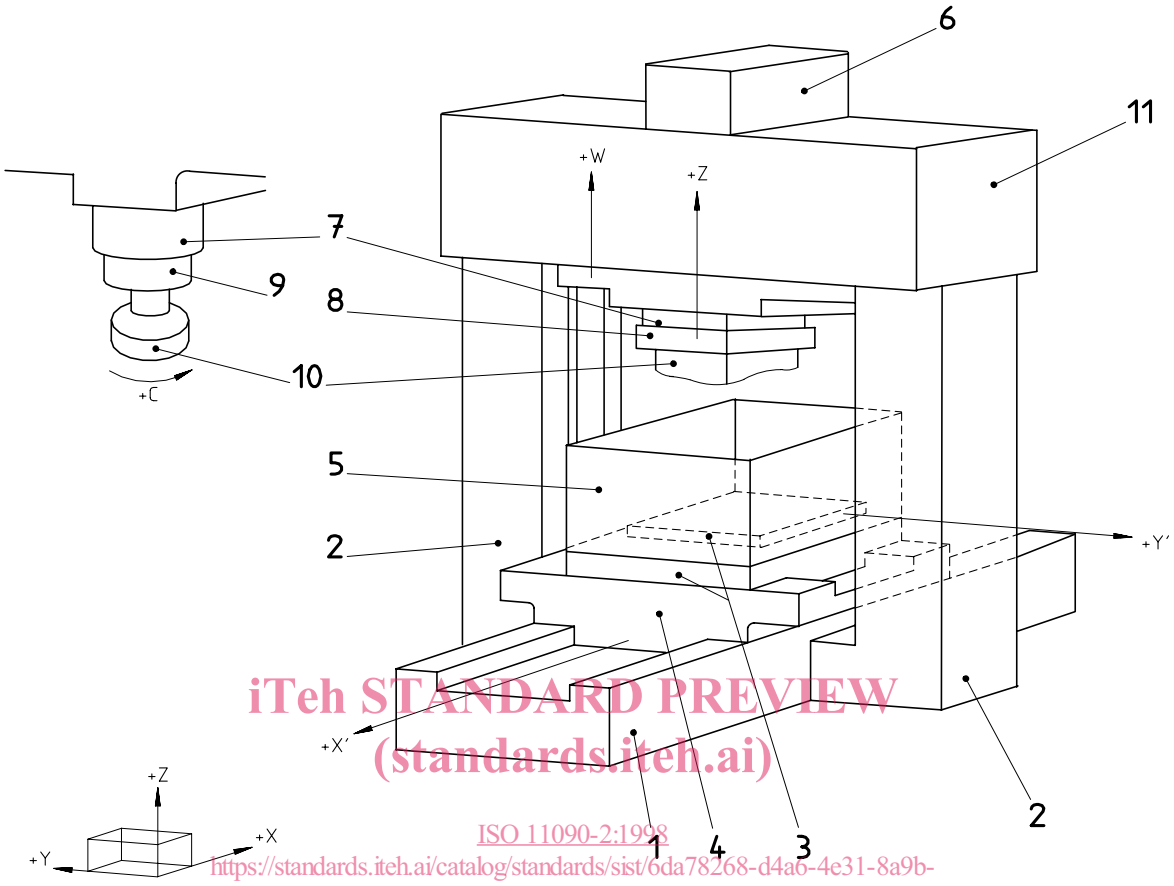

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Figure 2 — Two column machine with cross-slide table

Table 2 — Terminology

Ref.	English	French	Russian
1	Bed	Banc	Станина
2	Column	Montant	Стойка
3	Table (Y′-axis)	Table (axe Y′)	Стол (ось Y′)
4	Saddle (X′-axis)	Chariot longitudinal (axe X′)	Салазки (ось X′)
5	Work tank	Réservoir de travail	Рабочая ванна
6	Head (W-axis)	Tête de travail (axe W)	Головка, рабочая (ось W)
7	Quill (Z-axis)	Coulisse (axe Z)	Пиноль (ось Z)
8	Electrode platen	Porte-électrode	Электрододержатель
9	Spindle (C-axis)	Broche (axe C)	Шпиндель (ось C)
10	Electrode	Électrode	Электрод
11	Beam	Traverse	Траверса

4 Preliminary remarks

4.1 Measuring units

In this part of ISO 11090, all linear dimensions, deviations and corresponding tolerances are expressed in millimetres; angular dimensions are expressed in degrees, and angular deviations and the corresponding tolerances are primarily expressed in ratios, but in some cases, microradians or arcseconds may be used for clarification purposes. The equivalence of the following expressions should be kept in mind:

0,010/1 000 = 10 µrad ≈ 2″

4.2 Reference to ISO 230-1

To apply this part of ISO 11090, reference shall be made to ISO 230-1, especially for the installation of the machine before testing, warming up of the spindle and other moving components, description of measuring methods and recommended accuracy of testing equipment.

In the «Observations» block of the tests described in clauses 5, 6 and 7, the instructions are followed by a reference to the corresponding clause in ISO 230-1 in cases where the test concerned is in compliance with the specifications of that part of ISO 230.

4.3 Testing sequence

The sequence in which the tests are presented in this part of ISO 11090 does not define the practical order of testing. In order to make the mounting of instruments or gauging easier, tests may be performed in any order.

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4.4 Tests to be performed

When testing a machine, it is not always necessary or possible to carry out all the tests described in this part of ISO 11090. When the tests are required for acceptance purposes, it is up to the user to choose, in agreement with the supplier/manufacturer, those tests relating to the components and/or the properties of the machine which are of interest. These tests are to be clearly stated when ordering a machine. Mere reference to this part of ISO 11090 for the acceptance tests, without specifying the tests to be carried out, and without agreement on the relevant expenses, cannot be considered as binding for any contracting party.

4.5 Measuring instruments

The measuring instruments indicated in the tests described in the clauses 5, 6 and 7 are examples only. Other instruments measuring the same quantities and having at least the same accuracy may be used. Dial gauges shall have a resolution of 0,001 mm or better.

4.6 Machining tests

Machining tests shall be made with finishing cuts only, not with roughing cuts which are liable to generate appreciable cutting forces.

4.7 Minimum tolerance

When establishing the tolerance for a measuring length different from that given in this part of ISO 11090 (see 2.311 of ISO 230-1:1996), it shall be taken into consideration that the minimum value of tolerance is 0,005 mm.

4.8 Positioning tests and reference to ISO 230-2

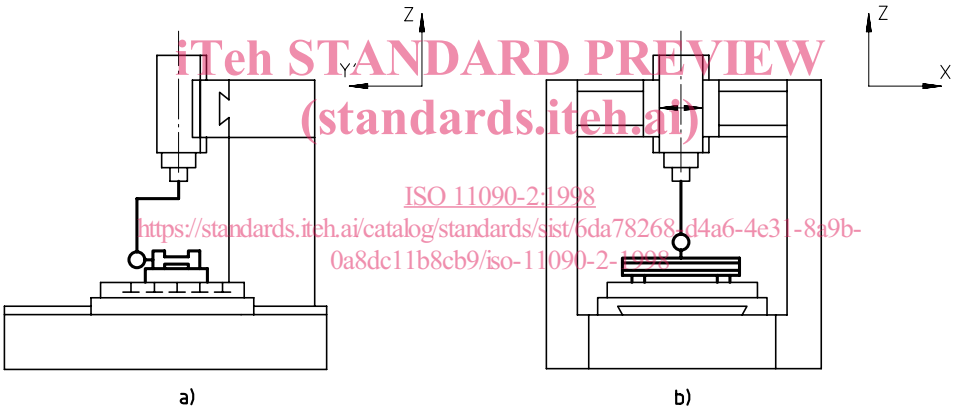
Tests P2 to P5 are only applied to numerically controlled electro-discharge machines.

To apply these tests, reference shall be made to ISO 230-2, especially for the environmental conditions, warming up of the machine, description of measuring methods, and evaluation and interpretation of the results.

Checking of the W-axis is not included because the W movement is used for adjusting the head position. When required, it shall be done in the same way as the checking of the Z-axis.

5 Geometric tests

5.1 Linear axes of motion

Object	**G1**
Checking of straightness of the X-axis motion: a) in the horizontal XY plane; b) in the vertical ZX plane.	
Diagram  	
Tolerance for a) and b) 0,015 for any measuring length of 500	**Measured deviation** a) b)
Observations and references to ISO 230-1 5.232.11 Mount the dial gauge on the head. a) Set the straightedge parallel to the X-axis in the XY plane, and set the dial gauge against it. Move the X-axis motion through the measuring length, and note the readings. b) Repeat the check in the same way in the ZX plane.	

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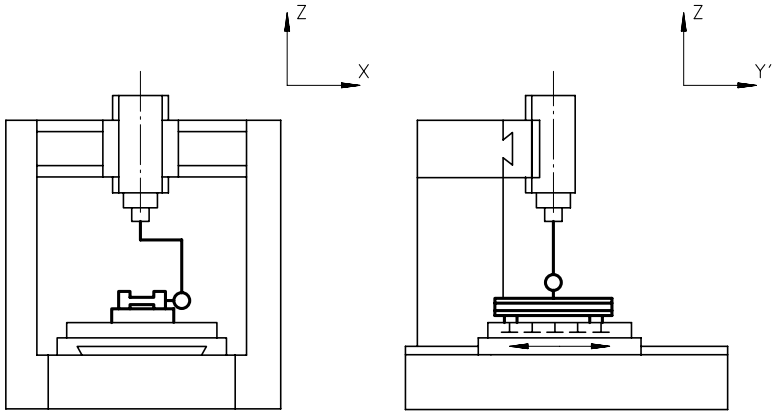
Object **G2**

Checking of straightness of the Y-axis motion:
a) in the horizontal XY plane;
b) in the vertical YZ plane.

Diagram



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Tolerance	**Measured deviation**
for a) and b) 0,015 for any measuring length of 500	a) b)

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Observations and references to ISO 230-1 5.232.11

Mount the dial gauge on the head.

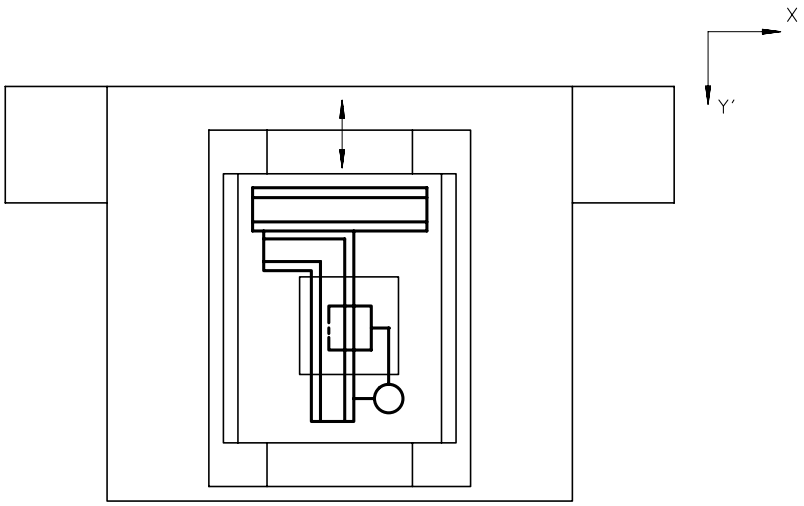
a) Set the straightedge parallel to the Y-axis in the XY plane, and set the dial gauge against it. Move the Y-axis motion through the measuring length, and note the readings.

b) Repeat the check in the same way in the YZ plane.

Object **G3**

Checking of squareness between the X-axis motion and the Y-axis motion.

Diagram



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Tolerance

0,02 for any measuring length of 500

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Measured deviation

Measuring instruments

Straightedge, square and dial gauge

Observations and references to ISO 230-1 5.522.4

Align the straightedge on the table so as to be parallel to the X-axis motion, and press the square against it.

Mount the dial gauge on the head, and set it against the square. Move the Y-axis motion through the measuring length, and note the reading.

Using the square only is also possible. In this case,

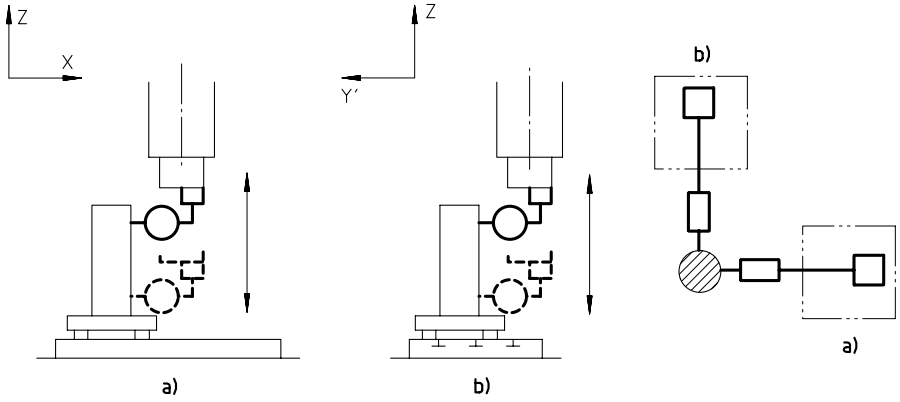
a) set the square so that the long arm is parallel to the X-axis motion,

b) check the parallelism of the Y-axis motion with the short arm.

Object **G4**

Checking of squareness between the vertical movement of the quill (Z-axis) and
a) the X-axis motion;
b) the Y-axis motion.

Diagram



Tolerance	**Measured deviation**
for a) and b) 0,02 for any measuring length of 300	a) b)

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Measuring instruments

Cylindrical square, surface plate, adjustable blocks and dial gauge

Observations and references to ISO 230-1 5.522.4

Mount the surface plate on the table and adjust it so that the surface is parallel to both the X and Y axes. Place the cylindrical square on the surface plate. Mount the dial gauge on the head.

a) Set the dial gauge against the cylindrical square in the X-direction. Move the quill in the Z-direction through the measuring length, and note the readings at several positions. The maximum difference of the readings shall not exceed the tolerance.

b) Repeat the check in the same way in the Y-direction.