



**SLOVENSKI STANDARD  
SIST EN ISO 14744-5:2001**

**01-maj-2001**

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Welding - Acceptance inspection of electron beam welding machines - Part 5:  
Measurement of run-out accuracy (ISO 14744-5:2000)

Schweißen - Abnahmeprüfung von Elektronenstrahl-Schweißmaschinen - Teil 5: Messen  
der Führungsgenauigkeit (ISO 14744-5:2000)

Soudage - Essais de réception des machines de soudage par faisceau d'électrons -  
Partie 5: Mesure de la précision géométrique (ISO 14744-5:2000)

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**Ta slovenski standard je istoveten z: EN ISO 14744-5:2000**

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**ICS:**

25.160.30      Varilna oprema      Welding equipment

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EUROPEAN STANDARD  
NORME EUROPÉENNE  
EUROPÄISCHE NORM

**EN ISO 14744-5**

April 2000

ICS 25.160.00

English version

**Welding - Acceptance inspection of electron beam welding machines - Part 5: Measurement of run-out accuracy (ISO 14744-5:2000)**

Soudage - Essais de réception des machines de soudage par faisceau d'électrons - Partie 5: Mesure de la précision géométrique (ISO 14744-5:2000)

Schweißen - Abnahmeprüfung von Elektronenstrahl-Schweißmaschinen - Teil 5: Messen der Führungsgenauigkeit (ISO 14744-5:2000)

This European Standard was approved by CEN on 3 January 2000.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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EUROPEAN COMMITTEE FOR STANDARDIZATION  
COMITÉ EUROPÉEN DE NORMALISATION  
EUROPÄISCHES KOMITEE FÜR NORMUNG

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## Foreword

The text of EN ISO 14744-5:2000 has been prepared by Technical Committee CEN/TC 121 "Welding", the secretariat of which is held by DS, in collaboration with Technical Committee ISO/TC 44 "Welding and allied processes".

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by October 2000, and conflicting national standards shall be withdrawn at the latest by October 2000.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

This draft European Standard is composed of the six following parts:

- Part 1: Principles and acceptance conditions;
- Part 2: Measurement of accelerating voltage characteristics;
- Part 3: Measurement of beam current characteristics;
- Part 4: Measurement of welding speed;
- Part 5: Measurement of run-out accuracy;
- Part 6: Measurement of stability of spot position.

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## 1 Scope

This standard is intended for use when the run-out accuracy of the moving parts of electron beam welding machines complying with EN ISO 14744-1 is to be measured in connection with an acceptance inspection. It provides information on the procedure and apparatus to be used for making the measurements. Given the great variety of electron beam welding machines, the scope of measurements required for acceptance inspection purposes should be specified separately for the machine concerned.

Run-out accuracy as defined here is a systematic error and thus counts as one of the parameters by which the performance of a machine tool can be characterized. Other factors influencing performance (e.g. dynamic forces, vacuum level, positioning accuracy of CNC machines) and methods of statistical evaluation are not covered in this standard.

Electron beam welding involves movement of the workpiece and/or of the electron gun. Successful welding presupposes that this movement is effected by the devices concerned (e.g. work table and rotating fixture) with a given degree of accuracy. The purpose of the measurement is thus to check whether and to what extent the required run-out accuracy is maintained.

## 2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN ISO 14744-1:2000

Welding – Acceptance inspection of electron beam welding machines – Part 1: Principles and acceptance conditions (ISO 14744-1 : 2000)

## 3 Terms and definitions

For the purposes of this European Standard, the following term and definition applies,

### 3.1

#### Run-out accuracy

maximum deviation measured within the work space used for welding at right angles to the direction of feed in the X, Y and Z directions, or, in the case of rotation of the workpiece, by the axial and radial run-out.

NOTE Run-out accuracy is also a function of the deviation of the actual spot position from the desired position in the beam axis, referred to the weld point on the workpiece surface, in so far as this deviation is due to the positioning devices.

The run-out of each individual axis shall be measured to provide a guide to the overall run-out accuracy of the beam relative to the joint axis.

In cases where a number of axes operate together during welding, special measurement procedures should be specified.

## 4 Test arrangement and procedures

### 4.1 General

Unless otherwise specified, acceptance testing of run-out accuracy is normally performed with a vented work chamber.

### 4.2 Scope of measurement

Measurements shall be made in all significant directions and axes under the loading conditions specified in 6.4 of EN ISO 14744-1:2000.

### 4.3 Instruments and instructions for their use

Measurements shall be made with instruments, such as mechanical instruments, optical instruments (laser instrument) or inductive displacement transducers, permitting measurements to be made with an accuracy corresponding to the limiting values specified in EN ISO 14744-1. The response time of the measurement instrument shall be compatible with the feed rate of the positioning device.

Table 1 provides recommendations of the apparatus and procedures which may be used when measuring the run-out accuracy of the work table or of the electron gun movement and the rotating fixture. In any case, the measurement procedures and limit deviations have to be agreed and specified.

In cases where the electron gun moves in both X and Y directions, measurements in the Z direction will also be necessary as these permit the parallelism between the XY-plane of the electron gun movement and the XY-plane of the work table to be checked.

In the case of rotating fixtures it should also be noted that, in cases where the rotational axis is horizontal, the run-out accuracy is not only influenced by the maximum permissible workpiece loading but also by the tilting moment and by any unequal distribution of the mass.

## 5 Evaluation of measurements

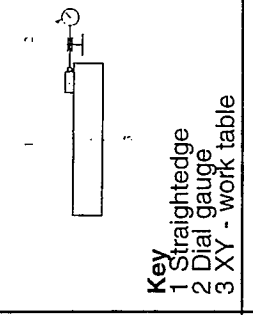
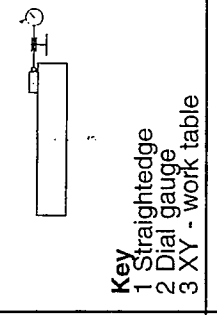
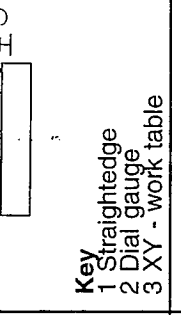
The deviations established by measurement shall be compared with the limiting values specified in EN ISO 14744-1.

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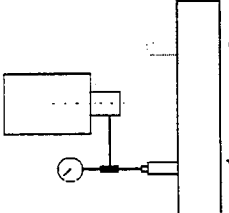
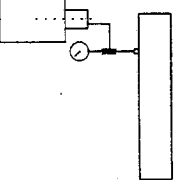
Table 1 - Examples of set-ups for measuring the run-out accuracy of the work table, electron gun, or rotating fixture

No	Object	Diagram	Equipment	Procedure
1	Straightness of the X(Y) direction of work table movement in Y(X) direction	 <p>Key 1 Straightedge 2 Dial gauge 3 XY - work table</p>	Straightedge Dial gauge	Position straightedge in X(Y) direction (e.g. by aligning it with the reference slot of table) and attach dial gauge. Traverse table through entire feed length in the X direction and measure deviations in Y direction, $a_y$ . Then traverse table through entire feed length in the Y direction and measure deviations in X direction, $a_x$ .
2	Straightness of the X(Y) direction of work table movement in Z direction	 <p>Key 1 Straightedge 2 Dial gauge 3 XY - work table</p>	Straightedge Dial gauge	Set straightedge at position 1 and mount dial gauge. Traverse table through entire feed length in the X(Y) direction and measure deviation in Z direction, $a_z$ . Repeat measurement with straightedge set at position 2.
3	Straightness of the X(Y) direction of electron gun movement in Y(X) direction	 <p>Key 1 Electron gun 2 Dial gauge 3 Straightedge 4 XY - work table</p>	Straightedge Dial gauge	Position straightedge in X(Y) direction (e.g. by aligning it with the reference slot of table) and attach dial gauge. Traverse electron gun through entire feed length in the X direction and measure deviations in Y direction, $a_y$ . Then traverse electron gun through entire feed length in the Y direction and measure deviations in X direction, $a_x$ .

(continued)



Table 1 (continued)

No	Object	Diagram	Equipment	Procedure
4	Straightness of the X(Y) direction of electron gun movement in Z direction		Straightedge Dial gauge	Set straightedge at position 1 and mount dial gauge. Traverse electron gun through entire feed length in the X(Y) direction and measure deviation in Z direction, $a_z$ . Repeat measurement with straightedge set at position 2.
5	Parallelism of the XY-plane of electron gun movement to the X(Y) direction of the work table movement		Dial gauge	Position electron gun at the 4 corner points and centre of the work table. Maintain electron gun in all positions on the same Z-coordinates and measure deviations in Z direction, $a_z$ .

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