



SLOVENSKI STANDARD SIST EN ISO 14744-6:2001

01-maj-2001

Varjenje - Prezemni preskusi strojev za varjenje z elektronskim snopom - 6. del: Merjenje stabilnosti položaja snopa (ISO 14744-6:2000)

Welding - Acceptance inspection of electron beam welding machines - Part 6:
Measurement of stability of spot position (ISO 14744-6:2000)

Schweißen - Abnahmeprüfung von Elektronenstrahl-Schweißmaschinen - Teil 6: Messen
der Flecklagekonstanz (ISO 14744-6:2000)

Soudage - Essais de réception des machines de soudage par faisceau d'électrons -
Partie 6: Mesure de la stabilité de la position de la tache focale (ISO 14744-6:2000)

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Ta slovenski standard je istoveten z: **EN ISO 14744-6:2000**

ICS:

25.160.30 Varilna oprema Welding equipment

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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN ISO 14744-6

April 2000

ICS 25.160.00

English version

Welding - Acceptance inspection of electron beam welding machines - Part 6: Measurement of stability of spot position (ISO 14744-6:2000)

Soudage - Essais de réception des machines de soudage par faisceau d'électrons - Partie 6: Mesure de la stabilité de la position de la tache focale (ISO 14744-6:2000)

Schweißen - Abnahmeprüfung von Elektronenstrahl-Schweißmaschinen - Teil 6: Messen der Flecklagekonstanz (ISO 14744-6:2000)

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
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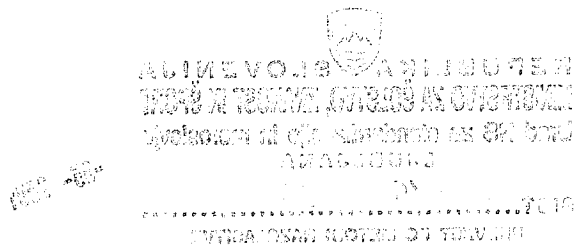
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Foreword

The text of EN ISO 14744-6:2000 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 stability of spot stability of welding machines complying with EN ISO 14744-1 is to be measured in connection with an acceptance inspection. It provides essential information to the procedure and apparatus to be used for making the measurements.

The stability of the spot position is a particularly significant parameter for prolonged welding applications and for electron beam welding with automatic devices positioning the workpiece. In such applications, the welding machine shall be able to reproduce, over prolonged periods and without additional correction of the position being required, a given beam-to-joint alignment. The purpose of measurement is to check whether and to what extent the electron beam generated by a welding machine keeps within the range of limit deviations specified for the spot position.

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)

EN ISO 14744-3

Welding – Acceptance inspection of electron beam welding machines – Part 3: Measurement of beam current (ISO 14744-3 : 2000)

ISO 1302

Technical drawings – Method of indicating surface texture

3 Terms and definitions

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

3.1

Spot position

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geometrical position of the electron beam when it impinges on the workpiece surface (weld point) with respect to a system of coordinates perpendicular to the axis of the beam.

4 Test arrangement

4.1 General

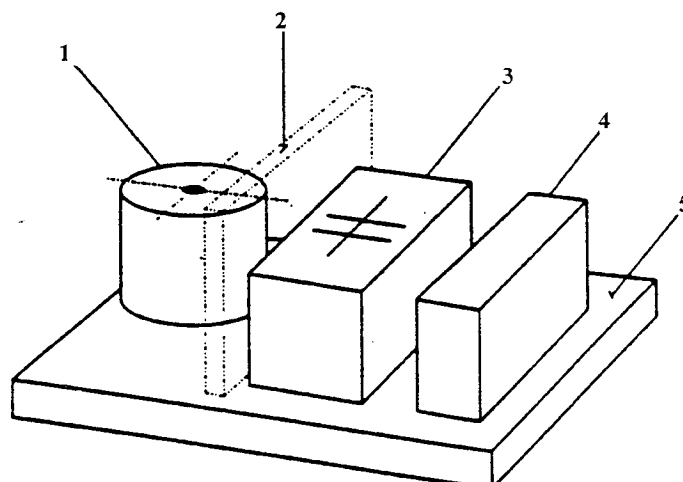
During the specified test period, the electron beam, at a given power, transmits its energy to a heatsink A or to a Faraday cup as described in EN ISO 14744-3 (see figure 1). For the actual measurement, a specially prepared workpiece, B, shall be positioned in the beam axis and the beam power adjusted to the welding task (small melt spots or melt runs).

The beam focal distance employed shall be the maximum practical in the work chamber.

The heatsink or the Faraday cup and the workpiece B shall be arranged relative to each other so as to prevent any thermal interaction.

To determine the beam current required for the measurement, as is normal in welding practice, a third workpiece, C, of the same height as workpiece B shall be provided (see figure 1).

To avoid beam deflection, the workpieces and devices used shall be made of non-magnetizable materials.

**Key**

- 1 Heatsink or Faraday cup
 2 Screen (to prevent possible thermal interaction)
 3 Workpiece B with coordinate axis, fixed to the work table
 4 Workpiece C
 5 Work table

Figure 1 - Test arrangement for measuring the stability of spot position

4.2 Workpiece preparation

The surface of workpiece B intended to be measured shall have a roughness value, R_a , equal to $1,6 \mu\text{m}$ as specified in ISO 1302.

5 Measurement procedure

5.1 Welding machine with optical viewing system

5.1.1 General

The measurement shall be carried out with the welding machine set as specified in 6.5 of EN ISO 14744-1:2000. No modifications, particularly no adjustments, shall be made to the welding machine between the steps described in the following subclauses.

5.1.2 Welding machine with a CNC work table

Measurements shall be carried out in the following way:

1) before starting the measurements, the settings necessary to obtain a small melt spot shall be determined for the selected focal distance on workpiece C, see figure 1;

2) then the first spot P_1 shall be melted on workpiece B by programming in the CNC-position:

$$x_1 = 0,000 \text{ mm};$$

$$y_1 = 0,000 \text{ mm};$$

3) The next spots P_2 and P_3 shall be melted at the coordinates:

$$x_2 = 5,000 \text{ mm};$$

$$y_2 = 0,000 \text{ mm}; \text{ and}$$

$$x_3 = 0,000 \text{ mm};$$

$$y_3 = 5,000 \text{ mm}; \text{ see figure 2.}$$

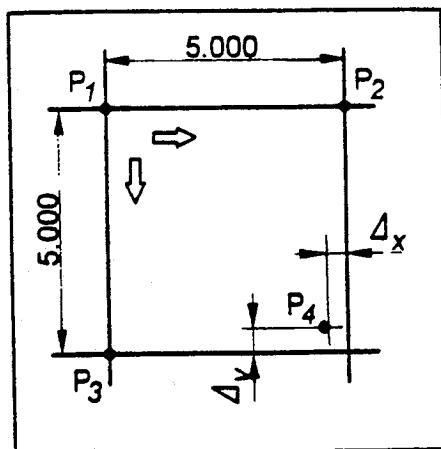


Figure 2 - Spot welds arrangement with CNC work table

To avoid backlash it is important to move the work table only in the same X- or Y-direction to reach the ($\Rightarrow \Downarrow$) positions.

4) heatsink A or Faraday cup shall be positioned in the beam axis. The welding machine shall be switched on, interrupted and be set and maintained at the power and operating time specified in EN ISO 14744-1:2000 in 6.5;

5) workpiece B shall be positioned with table coordinates:

$$x_4 = 5,000 \text{ mm};$$

$$y_4 = 5,000 \text{ mm};$$

and the fourth spot shall be melted.

6) using the reference spots P_1 , P_2 and P_3 workpiece B shall be positioned in the X- and Y-direction of a workshop travelling microscope. The coordinates x_4' and y_4' of the spot center P_4 shall be measured.

The deviation from the correct position x_4, y_4 shall be calculated as follows:

$$\Delta r' = \sqrt{\Delta x^2 + \Delta y^2}$$

$$\text{where } \Delta x = x_4' - x_4$$

$$\Delta y = y_4' - y_4$$

If a focal distance other than 300 mm has been used for melting the spots, the value $\Delta r'$ thus obtained shall be converted proportionally on Δr to $A_f = 300 \text{ mm}$.

5.1.3 Welding machine without a CNC work table

5.1.3.1 Workpiece B

Using a marking tool and a set square rule, engrave a system of axes (Y, X_A and X_B) on the surface of workpiece B as shown in figure 3, in such a way that values can be read to an accuracy of $\pm 0,02 \text{ mm}$ under a workshop travelling microscope.

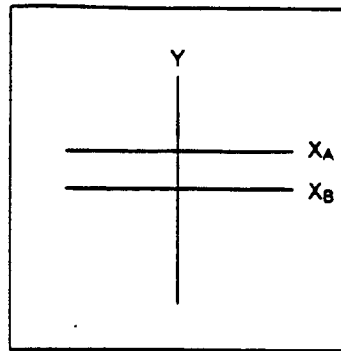


Figure 3 - Coordinate axes on workpiece B

5.1.3.2 Measurements

Measurements shall be carried out in the following way:

- 1) before starting the measurements, the settings necessary to obtain a small melt spot shall be determined for the selected focal distance on workpiece C, see figure 1. It shall be ensured by a slight adjustment that the melt spot is not at the centre of the coordinate system viewed through the viewing system;
- 2) then, workpiece B, having the same focal distance as workpiece C, shall be positioned under the optical viewing system so that axes Y and X_A coincide with axes Y' and X' of the viewing system (see figure 4). Following that, spot P_A shall be melted, using the values previously determined (see figure 4);

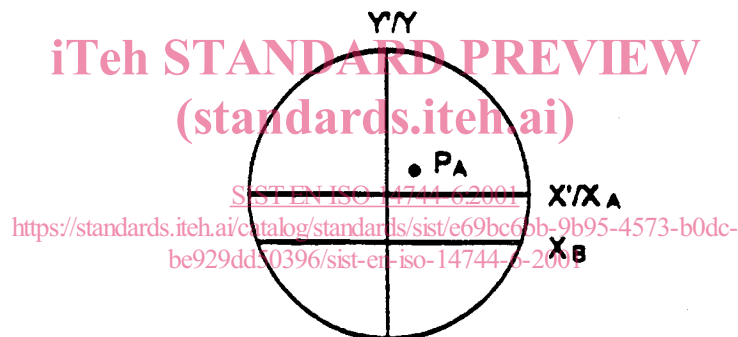


Figure 4 - Axes as seen through optical viewing system

3) heatsink A or the Faraday cup, as appropriate, shall be positioned on the beam axis. The welding machine shall be switched on, interrupted and be set and maintained at the power and operating time specified in EN ISO 14744-1;

4) workpiece B shall be positioned under the optical viewing system so that axes Y and X_B coincide with axes Y' and X' of the viewing system (see figure 5). Following that, spot P_B shall be melted, using the same settings, see figure 5;

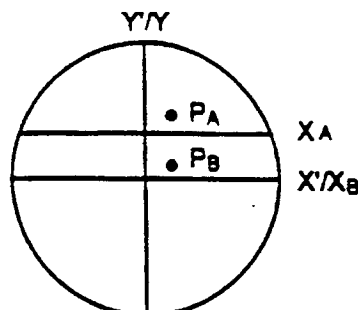


Figure 5 - Melt spots as seen through optical viewing system