INTERNATIONAL STANDARD

ISO 14372

First edition
2000-09-15

Welding consumables — Determination of moisture resistance of manual metal arc welding electrodes by measurement of diffusible hydrogen

Produits consommables pour le soudage — Détermination de la reprise d'humidité des électrodes utilisées en soudage manuel à l'arc avec électrode enrobée, par mesurage de l'hydrogène diffusible

Reference number
ISO 14372:2000(E)

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Printed in Switzerland

Foreword

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International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

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.

Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 14372 was prepared in collaboration with the International Institute of Welding which has been approved by the ISO Council as an international standardizing body in the field of welding.

Introduction

This test method is based on procedures originally put forward within Sub-Commission IIA of the IIW by the delegation from Argentina. It has subsequently been evaluated in a round robin exercise within Subcommission IIA, and the present document, developed by the United Kingdom delegation, takes into account the results of that work.

Welding consumables — Determination of moisture resistance of manual metal arc welding electrodes by measurement of diffusible hydrogen

1 Scope

This test method is intended to enable reliable classification, by 24 h exposure to humid air and subsequent diffusible hydrogen testing, of manual metal arc electrode coatings as standard (ST) or moisture resistant (MR).

2 Normative reference

The following normative document contains provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent edition of the normative document indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 3690:—[1], *Welding and allied processes — Determination of hydrogen content in ferritic steel arc weld metal*.

3 Principle

Weld deposit hydrogen analysis using standard techniques on samples deposited using electrodes exposed to a moist atmosphere [27 °C, 80 % RH[2]]. It is the exposure of the electrodes which is the main subject of this International Standard. After drying (if applicable) the electrodes are exposed to an air atmosphere of controlled temperature and humidity by enclosing them in a box containing a saturated solution of ammonium sulfate.

4 Equipment

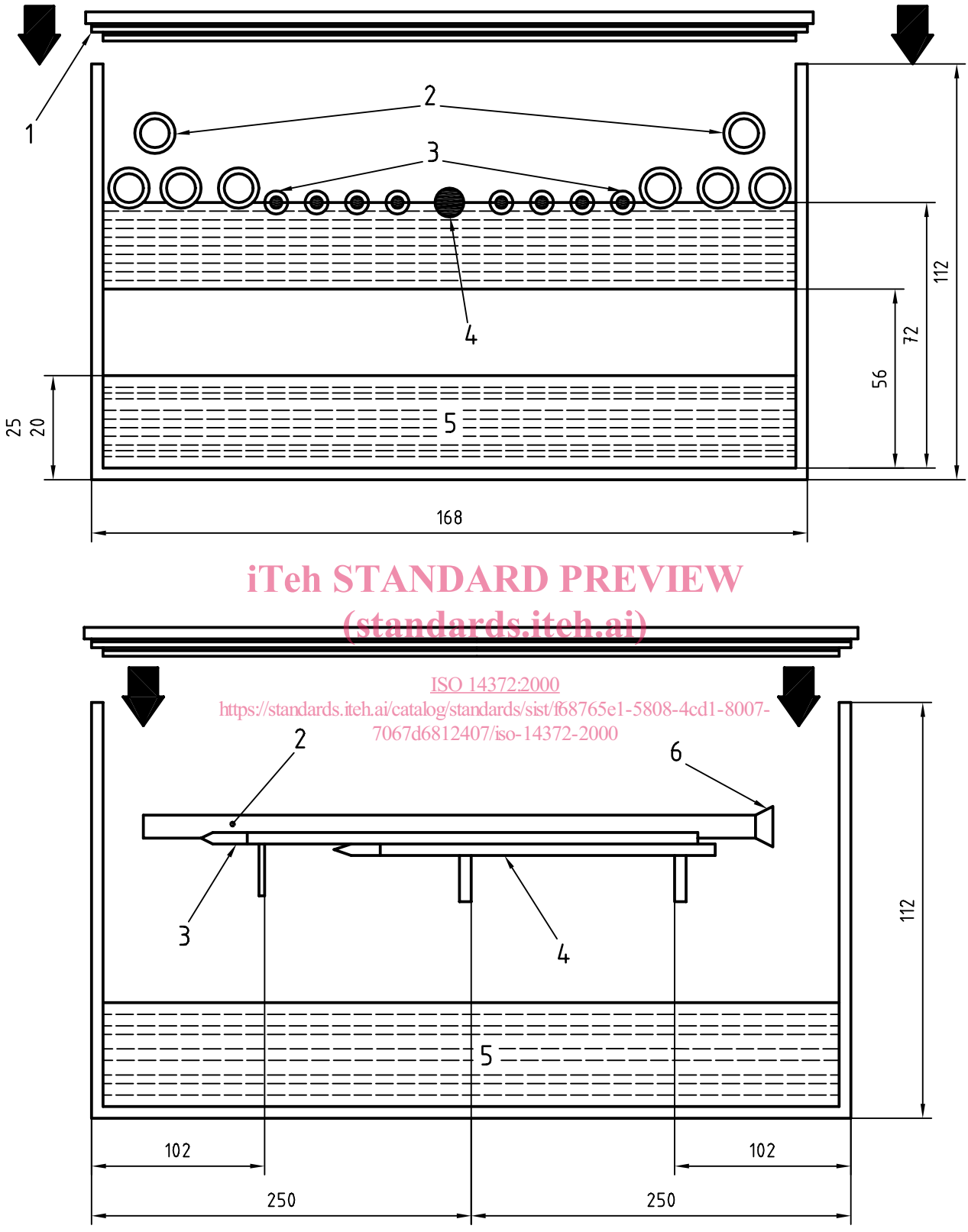
4.1 Humidity box, of acrylic, or similar inert material. It consists of a box within which test electrodes, a thermometer and protecting tubes (maximum ~1,5 × the overall diameter of the electrode, and appropriate length to fit) for holding the electrodes after exposure, can be suspended over a saturated solution of ammonium sulfate. See Figure 1.

4.2 Temperature control cabinet, capable of maintaining the temperature at 27 °C ± 1 °C. Good results have been achieved using a draught-proof enclosure heated by low power (40 W) light bulbs, controlled by a calibrated thermostat, with a fan for circulating air to maintain uniform air temperature.

1) To be published. (Revision of ISO 3690:1977)

2) It is not necessary to measure relative humidity within the humidity box. The test conditions are the temperature and the presence of the saturated salt bath. Well-established physical principles relate the relative humidity to these two conditions. It is essential that any attempt to measure relative humidity, if used, does not cause air circulation within the box.

Dimensions in millimetres



Key

1	Packing	3	Electrodes	5	Saturated ammonium sulfate solution
2	Protecting tubes	4	Thermometer	6	Plugs

Figure 1 — Sketch of a humidity box

5 Procedure

5.1 Preparation of humidity box

5.1.1 Wash all tubes with distilled water.

5.1.2 Air dry tubes.

5.1.3 Seal one end of each tube with a plug.

5.1.4 Dissolve 1,3 kg anhydrous ammonium sulfate in 1 500 ml distilled water at 40 °C to 45 °C.

5.1.5 Fill the humidity box (4.1) with solution (see 5.1.4) to a depth of 20 mm to 25 mm[3)].

5.1.6 A finger moistened with silicone oil may be run around the box just above solution level. (This helps prevent crystals creeping up the walls.)

5.1.7 Allow solution to cool to 27 °C ± 1 °C.

5.1.8 Insert protecting tubes, second end plugs (not fitted in tubes) and thermometer, and close lid on box.

5.2 Preparation of temperature control cabinet

5.2.1 Set the temperature to 27 °C ± 1 °C.

5.2.2 Hold the temperature at 27 °C ± 1 °C for at least 90 min.

5.3 Pre-conditioning of humidity box

Keep the prepared and sealed box in the temperature control cabinet for at least 4 h, with the temperature maintained at 27 °C ± 1 °C.

5.4 Electrode preparation

5.4.1 Mark coatings near the stub end with a unique identity.

5.4.2 Predry (if appropriate) according to manufacturer's instructions.

5.4.3 If electrodes have been dried at elevated temperature, seal in glass tubes using tightly fitting rubber bungs or by melting the ends, or place in a desiccator to cool to room temperature.

5.5 Exposure of electrodes in humidity box

5.5.1 Open the temperature control cabinet (4.2) door.

5.5.2 Open humidity box lid.

5.5.3 Transfer electrodes from glass tubes, desiccator or manufacturer's packaging, as appropriate, to humidity box as indicated in Figure 1.

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3) If the height of solution drops, transfer solution to a mixing vessel, add further saturated solution or distilled water at 45 °C, mixing thoroughly. Refill the box to a depth of 25 mm, ensuring that undissolved ammonium sulfate is present but does not reduce the surface area of the liquid when restored to the operating temperature of 27 °C.

Items 5.5.1 to 5.5.3 shall be completed within 90 s.

5.5.4 Replace humidity box lid.

5.5.5 Close temperature control cabinet door.

Items 5.5.4 and 5.5.5 shall be completed within a further 30 s.

5.5.6 Expose electrodes at 27 °C ± 1 °C for 24 h.

5.6 Measurement of weld deposit hydrogen

5.6.1 Open temperature control cabinet door.

5.6.2 Open humidity box lid.

5.6.3 Insert electrodes into protection tubes, seal ends with plugs and remove from temperature control cabinet.

Items 5.6.2 and 5.6.3 shall be completed within 60 s.

5.6.4 Close humidity box and temperature control cabinet door.

5.6.5 Transfer electrodes in sealed tubes to welding station.

Electrodes shall be welded within 24 h of removal from the humidity box.

5.6.6 Weld and analyse for hydrogen in accordance with ISO 3690.

Welding shall take place within 2 min of removal of electrodes from the sealed tubes.

5.6.7 Record ambient room temperature and relative humidity (RH) at the time of welding.

6 Reporting of results

Weld deposit hydrogen levels shall be expressed as ml/100 g deposited metal, and shall be reported as measured.

The following information shall be presented with the results:

a) electrode name;

b) electrode designation;

c) electrode size;

d) electrode drying details (temperature and time at temperature);

e) date and time of completion of exposure;

f) date and time of beginning of test welding;

g) measured temperature range during exposure;

h) measured duration of exposure;

i) information required by ISO 3690;

j) temperature and relative humidity at time of welding.