

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Arc welding equipment –
Part 11: Electrode holders

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Partie 11: Porte-électrodes

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

ARC WELDING EQUIPMENT –

Part 11: Electrode holders

FOREWORD

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International Standard IEC 60974-11 has been prepared by IEC technical committee 26: Electric welding.

This third edition cancels and replaces the second edition published in 2004. This edition constitutes a technical revision.

The significant changes with respect to the previous edition are the following:

- change of the environmental condition in accordance with IEC 60974-1 (see Clause 4);
- change of electrical measuring instruments accuracy to Class 1 (see 5.1);
- correction of sphere diameter to 12,5 mm (see 8.1);
- alternative dielectric strength test (see 8.3).

This part of IEC 60974 is to be used in conjunction with IEC 60974-1.

The text of this standard is based on the following documents:

FDIS	Report on voting
26/421/FDIS	26/427/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts of the IEC 60974 series, published under the general title *Arc welding equipment*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
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ARC WELDING EQUIPMENT –

Part 11: Electrode holders

1 Scope

This part of IEC 60974 is applicable to electrode holders for manual metal arc welding with electrodes up to 10 mm in diameter.

It is not applicable to electrode holders for underwater welding.

This part of IEC 60974 specifies safety and performance requirements of electrode holders.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60050-151, *International Electrotechnical Vocabulary – Part 151: Electrical and magnetic devices*

IEC 60529, *Degrees of protection provided by enclosures (IP Code)*

IEC 60974-1, *Arc welding equipment – Part 1: Welding power sources*

3 Terms and definitions

For the purpose of this document, the terms and definitions contained in IEC 60050-151 and IEC 60974-1, as well as the following apply.

3.1

electrode holder

insulated tool for manual metal arc welding intended to clamp and guide the electrode and to ensure electrical connection to it 3.2

3.2

head

part of the electrode holder having cavities or jaws or equivalent for insertion, orientation, clamping and electrical connection of an electrode

3.3

handle

part of the electrode holder designed to be held in the operator's hand

3.4

lever

part which may be fitted to control the clamping device of an electrode holder

3.5

rated current

current assigned by the manufacturer that the electrode holders can accept at 60 % duty cycle without exceeding the permitted temperature rise

3.6

type A electrode holder

electrode holder in which no live part is accessible to the standard test finger as described in IEC 60529

3.7

type B electrode holder

electrode holder in which, deviating from type A, no live part is accessible at the head to a sphere with a diameter related to the maximum diameter of the electrode (see 8.1 b)

4 Environmental conditions

Electrode holders shall be capable of operation when the following environmental conditions prevail:

a) ambient air temperature:

– during welding: –10 °C to +40 °C;

b) relative humidity of the air: up to 50 % at 40 °C;

up to 90 % at 20 °C.

Electrode holders shall withstand storage and transport at an ambient air temperature of –20 °C to +55 °C without any damage to function and performance.

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5 Type tests

5.1 Test conditions

All type tests shall be carried out on the same new and completely assembled electrode holder.

All type tests shall be carried out at an ambient air temperature between 10 °C and 40 °C.

The accuracy of measuring instruments shall be:

a) electrical measuring instruments: class 1; (± 1 % of full-scale reading, except for the measurement of insulation resistance and dielectric strength, where the accuracy of the instruments is not specified but shall be taken into account for the measurement;

b) temperature measuring devices: ± 2 K.

5.2 Tests sequence

The type tests given below shall be carried out in the following sequence:

a) visual inspection;

b) temperature rise, see 9.1;

c) impact resistance, see 10.4;

d) insulation resistance, see 8.2;

e) dielectric strength, see 8.3.

The other type tests in this part of IEC 60974 not mentioned above may be carried out in any convenient sequence.

6 Designation

Electrode holders shall be designated by the value of the rated current at 60 % duty cycle and conform to the dimensional requirements given in Table 1.

Table 1 – Dimensional requirements for the electrode holder

Electrode holder rated current at 60 % duty cycle A	Minimum clamping range for electrodes core diameter mm	Minimum fitting range for welding cable cross- sectional area mm ²
125	1,6 to 2,5	10 to 16
150	2 to 3,2	16 to 25
200	2,5 to 4	25 to 35
250	3,2 to 5	35 to 50
300	4 to 6,3	50 to 70
400	5 to 8	70 to 95
500	6,3 to 10	95 to 120

NOTE If the electrode holder is intended to be used with a duty cycle of 35 % the current may be according to the next higher rated value of the cable, where the maximum current value is 600 A.

Conformity shall be checked by measurement.

7 Operation

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The electrode holder shall permit:

- the safe and rapid fitting of electrodes and release of stub ends;
- welding until a stub of 50 mm length with electrodes clamped in any of the set positions provided;
- the clamping of all electrode diameters as specified by the manufacturer without pressure being exerted by the operator;
- the electrode to be pulled off the work piece in the event of unwanted sticking to the work piece.

Conformity shall be checked by operation of the clamping device, visual inspection and, in the case of item d), manual welding.

8 Protection against electric shock

8.1 Protection against direct contact

An electrode holder without an electrode, fitted with a welding supply cable of minimum cross-sectional area as specified by the manufacturer, shall be protected against unintentional contact with live parts.

In the case of type A electrode holders, this requirement is also valid for the part of the electrode inserted into the electrode holder. Electrodes having the minimum and maximum diameter as specified by the manufacturer shall be tested.

Conformity shall be checked by:

- a) a standard test finger according to IEC 60529 in the case of electrode holders of
 - 1) type A, and
 - 2) type B with the exception of the head;
- b) a sphere in the case of the head of type B electrode holders with
 - 1) a metal sphere of 12,5 mm diameter according to IEC 60529 for electrodes up to 6,3 mm diameter, or
 - 2) a metal sphere of $d_0^{+0,05}$ mm diameter for electrodes thicker than 6,3 mm diameter where the value of d is twice the maximum diameter of the electrode as specified by the manufacturer.

The sphere is to be applied to the opening with a force of $30 \text{ N} \pm 10 \%$.

The springs not designed for carrying the welding current shall be insulated from other metal parts of the electrode holder.

Conformity shall be checked by visual inspection.

8.2 Insulation resistance

The insulation resistance shall, after the humidity treatment, be not less than $1 \text{ M}\Omega$.

Conformity shall be checked by the following test:

- a) Humidity treatment

A humidity cabinet is maintained at a temperature t between $20 \text{ }^\circ\text{C}$ and $30 \text{ }^\circ\text{C}$ to within $\pm 1 \text{ K}$ and a relative humidity between 91 % and 95 %.

The electrode holder without a cable fitted is brought to a temperature between t and $(t + 4) \text{ }^\circ\text{C}$ and is then placed for 48 h in the humidity cabinet.

- b) Insulation resistance measurement

Immediately after the humidity treatment, the electrode holder is wiped clean and tightly wrapped in metal foil, covering the external surface of the insulation.

The insulation resistance is measured by application of a d.c. voltage of 500 V between the live parts and the metal foil, the reading being made after stabilization of the measurement.

8.3 Dielectric strength

The insulation shall withstand an a.c. test voltage of 1 000 V r.m.s. without flashover or breakdown. Any discharges unaccompanied by a voltage drop are disregarded.

Conformity shall be checked by the following test:

The a.c. test voltage shall be of an appropriate sine wave-form with a peak value not exceeding 1,45 times the r.m.s. value, having a frequency of 50 Hz or 60 Hz, applied for 1 min between the live parts and the metal foil.

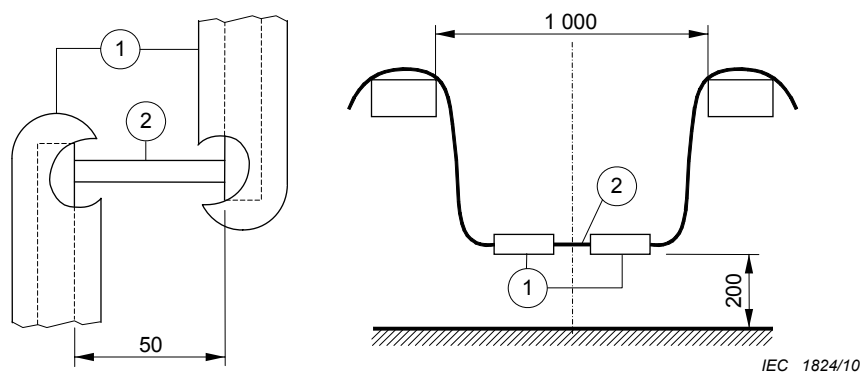
Alternative test: A d.c. test voltage of 1,4 times the r.m.s. test voltage may be used.

9 Thermal rating

9.1 Temperature rise

The temperature rise caused by the rated current passing through the electrode holder, fitted with an untinned copper welding cable or maximum cross-sectional area and a rod with the maximum electrode diameter as given in Table 1, shall not exceed 40 K at the hottest spot of the external surface of the handle.

Conformity shall be checked by the following test (see Figure 1).



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Key

- 1 electrode holder
- 2 round rod

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Figure 1 – Arrangement for the temperature rise test

Two identical electrode holders are fitted each with a welding cable (at least 2 m long). The round rod of clean, unoxidized, low carbon steel is fully inserted and clamped in the two electrode holders set at 180° to each other with a distance of 50 mm between the metallic clamping devices. The angle between the rod and the electrode holder may vary.

The electrode holders (thus joined together) are suspended by their welding cables from two wooden laths 1 m apart, with the electrode holders in the horizontal plane. The clamped rod hangs between the two laths about 200 mm above the ground, in a draught-free area.

A d.c. current equal to 75 % of the rated current (equivalent to approximately 60 % duty cycle (duty factor)) is passed through the electrode holders until the rate of the temperature rise does not exceed 2 K/h. The average value resulting from both electrode holders shall be determined. During the total test time, the d.c. rated current shall be kept constant with a tolerance of ± 2 %.

This test is carried out five times. For each test, a pair of new electrode holders and a new rod are used.

9.2 Resistance to heat

After the heating test according to 9.1, the head of the electrode holder shall not show damage to the insulation, such as blisters or deep charring, simple or star cracks, particularly in the area where the electrode is gripped. Change in colour of the material or superficial blistering of the insulation in this area is acceptable.

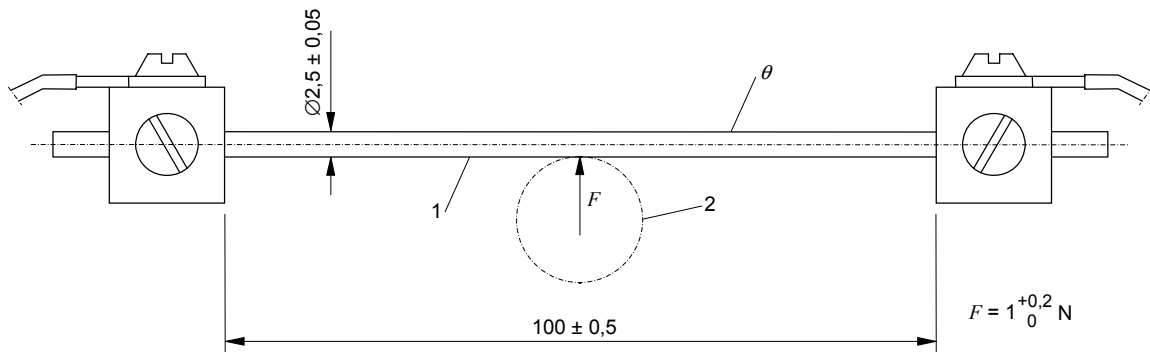
Conformity shall be checked by visual inspection.

9.3 Resistance to hot objects

The insulation of the handle shall be capable of withstanding hot objects and the effects of a normal amount of weld spatter without being ignited or becoming unsafe.

No component of the electrode holders shall, under normal operating conditions, create a risk of burning, i.e. self-extinguishing material shall be used.

Conformity shall be checked with a device according to Figure 2.



IEC 1825/10

Key

- 1 18/8 chrome-nickel steel
- 2 handle of the electrode holder

Dimensions in millimetres

Figure 2 – Device for testing the resistance to hot objects

An electric current (of approximately 25 A) is passed through the rod until a steady-state temperature θ of 300^{+5}_0 °C is reached. During the test, the temperature of the heated rod shall be maintained. This temperature will be measured by a contact thermometer or thermocouple.

The heated rod in a horizontal position is then applied for 2 min to the insulation at the weakest point (for example, minimum insulation thickness and closest distance to live parts). The heated rod shall not penetrate through the insulation and contact live parts. At the handle, the heated rod shall be applied at the portion with the minimum wall thickness and where internal live parts are closest to the handle surface.

An attempt is made to ignite any gases which may be emitted in the region of the contact point by means of an electric spark or small flame. If the gases are flammable, the burning shall stop as soon as the heated rod is removed.

10 Mechanical requirements

10.1 Welding cable entry

The welding cable entry of an electrode holder shall be designed so as to prevent damage to the cable due to flexing.

Conformity shall be checked by visual inspection.

10.2 Penetration of the welding cable insulation

The design of the electrode holder shall be such that the insulation of a welding cable can enter to a depth of at least twice the outer diameter of the welding cable with a minimum of 30 mm.