IEC 60974-11

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INTERNATIONAL STANDARD

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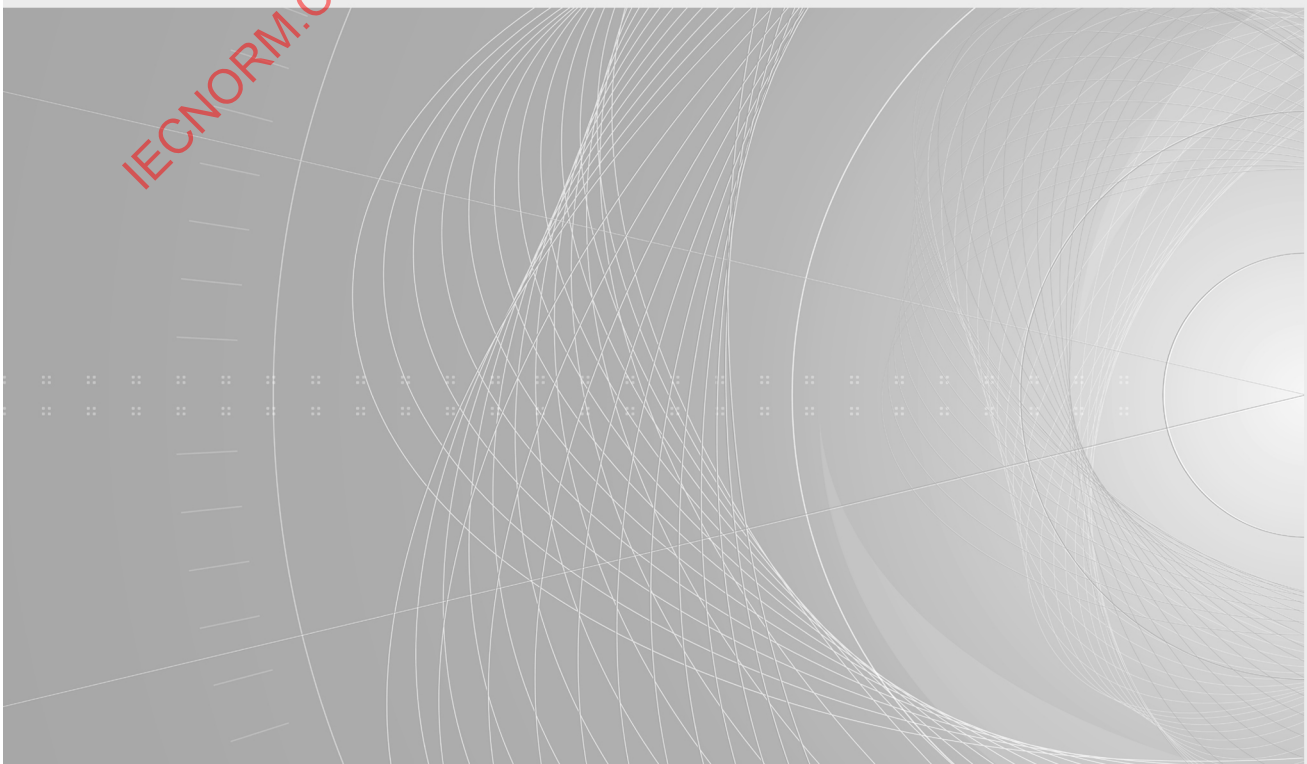
Arc welding equipment – Part 11: Electrode holders



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INTERNATIONAL STANDARD

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Arc welding equipment – Part 11: Electrode holders

INTERNATIONAL ELECTROTECHNICAL COMMISSION

ICS 25.160.30

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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ARC WELDING EQUIPMENT –

Part 11: Electrode holders

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition IEC 60974-11:2010. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

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

This fourth edition cancels and replaces the third edition, published in 2010. This edition constitutes a technical revision.

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

– Modify 3.6 type A to category A;
– Modify 3.7 type B to category B;
– Modify 8.1 to clarify reference to IEC 60529;
– Modification of 10.1 for clarification purposes;
– Added Bibliography.

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

The text of this International Standard is based on the following documents:

FDIS	Report on voting
26/716/FDIS	26/721/RVD

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

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

In this standard, the following print types are used:

– conformity statements: in *italic type*.
– terms defined in Clause 3: in SMALL ROMAN CAPITALS.

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 document will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific document. At this date, the document will be

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- withdrawn,
- replaced by a revised edition, or
- amended.

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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 document specifies safety and performance requirements of ELECTRODE HOLDERS.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 60050-151:2001, *International Electrotechnical Vocabulary (IEV) – Part 151: Electrical and magnetic devices*
IEC 60050-151:2001/AMD1:2013
IEC 60050-151:2001/AMD2:2014
IEC 60050-151:2001/AMD3:2019
IEC 60050-151:2001/AMD4:2020

IEC 60529:1989, *Degrees of protection provided by enclosures (IP Code)*
IEC 60529:1989/AMD1:1999
IEC 60529:1989/AMD2:2013

IEC 60974-1:2017, *Arc welding equipment – Part 1: Welding power sources*
IEC 60974-1:2017/AMD1:2019

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

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

[SOURCE: IEC 60050-851:2008, 851-14-04]

3.2
head
part of the ELECTRODE HOLDER having cavities or jaws or equivalent for insertion, orientation, clamping and electrical connection of an electrode

[SOURCE: IEC 60050-851:2008, 851-14-30]

3.3
handle
part of the ELECTRODE HOLDER designed to be held in the operator's hand

[SOURCE: IEC 60050-851:2008, 851-14-28]

3.4
lever
part which may be fitted to control the clamping device of an ELECTRODE HOLDER

[SOURCE: IEC 60050-851:2008, 851-14-31]

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~~ **category A electrode holder**
ELECTRODE HOLDER in which no live part is accessible to the standard test finger as described in IEC 60529

[SOURCE: IEC 60050-851:2008, 851-14-05]

3.7
~~type~~ **category B electrode holder**
ELECTRODE HOLDER in which, deviating from ~~type~~ CATEGORY A, no live part is accessible at the HEAD to a sphere with a diameter related to the maximum diameter of the electrode (see 8.1b)

[SOURCE: IEC 60050-851:2008, 851-14-06]

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.~~

As specified in Clause 4 of IEC 60974-1:2017.

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 Measuring instruments

As specified in 5.2 of IEC 60974-1:2017.

5.3 Conformity of components

As specified in 5.3 of IEC 60974-1:2017.

5.4 ~~Tests sequence~~ Type tests

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 document 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

The ELECTRODE HOLDER shall permit:

a) the safe and rapid fitting of electrodes and release of stub ends;

b) welding until a stub of 50 mm length with electrodes clamped in any of the set positions is provided;

c) the clamping of all electrode diameters as specified by the manufacturer without pressure being exerted by the operator.

~~d) 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~~,~~ and 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~~ CATEGORY 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~~ an access probe according to Table 6 of IEC 60529:1989 in the case of ELECTRODE HOLDERS of:

   1) ~~type~~ CATEGORY A, and

   2) ~~type~~ CATEGORY B with the exception of the HEAD;

b) a sphere in the case of the HEAD of ~~type~~ CATEGORY 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 N ± 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 MΩ.

Conformity shall be checked by the following test:

a) Humidity treatment

A humidity cabinet is maintained at a temperature t between 20 °C and 30 °C to within ±1 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) °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 DC 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 AC 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:

A dry and clean ELECTRODE HOLDER is tightly wrapped in metal foil, covering the external surface of the insulation.

The AC 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 DC test voltage of 1,4 times the r.m.s. test voltage may be used.

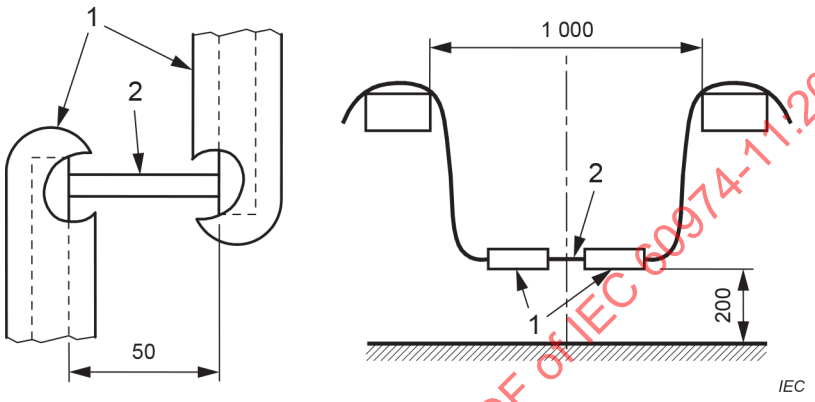
9 Thermal rating

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).

Dimensions in millimetres



Key

1 ELECTRODE HOLDER

2 round rod

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 DC 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 DC 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.

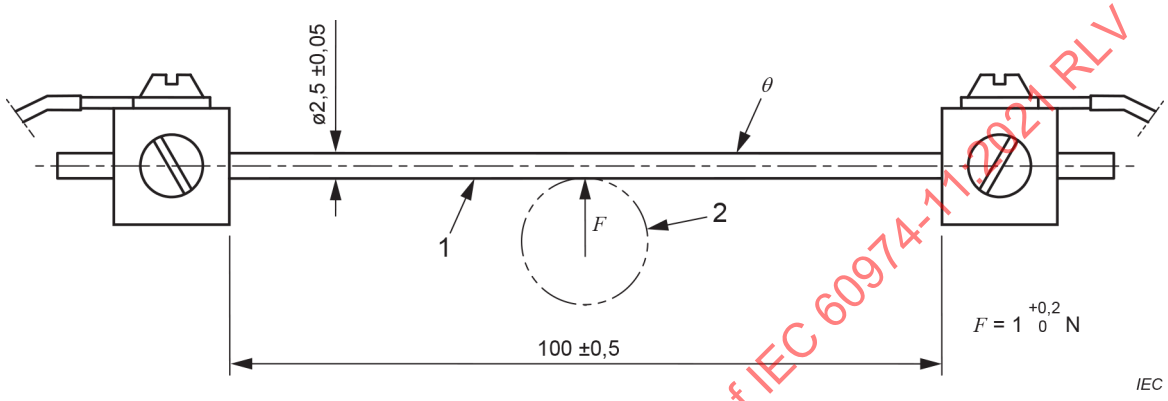
9.3 Resistance to hot objects

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.

Dimensions in millimetres



Key

1 18/8 chrome-nickel steel

2 HANDLE of the ELECTRODE HOLDER

θ test temperature

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~~ have a smoothly rounded edge 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.

Conformity shall be checked by measurement according to a welding cable of the maximum cross-sectional area as specified by the manufacturer.

10.3 Welding cable connection

The design of the ELECTRODE HOLDER shall be such that welding cables with a cross-sectional area within the range as specified by the manufacturer can be replaced. The connection shall withstand the mechanical stress of the tensile test without separation.

Conformity shall be checked by visual inspection and the following test:

The ELECTRODE HOLDER is fitted in accordance with the manufacturer as per the instructions with a welding cable of maximum cross-sectional area. The connection is subjected to 10 pulls with a force of 40 N per mm^2 of the cross-sectional area with a maximum of 2 000 N, applied to the welding cable. The force of each pull is gradually increased from zero to the specified value in 1 s and maintained for a further second.

After the test, the conductor shall not have been ~~noticeably~~ displaced by more than 2 mm. This test shall be repeated with a welding cable having the minimum cross-sectional area as specified by the manufacturer.

If more than one method of cable fixing is provided, all methods shall be tested.

10.4 Impact resistance

ELECTRODE HOLDERS shall withstand the mechanical stress of the impact tests without visible or functional alterations of the electrode clamping device or of the control of this device.

There shall be no breakages or cracks in the insulation. Small splinters or superficial marks are admissible.

Conformity shall be checked by the following tests:

a) Vertical fall

The ELECTRODE HOLDER is fitted with the largest diameter cable in accordance with Table 1. It is suspended by its welding cable, with the end of the HEAD 1 m above the impact plane. The impact plane is a sheet of mild steel, having a thickness of at least 9 mm, in contact with the ground.

The ELECTRODE HOLDER is released with its cable in free fall. The test is made three times with the same ELECTRODE HOLDER.

b) Pendulum swing

For this test, a device according to Figure 3 is used. The ELECTRODE HOLDER suspended by its welding cable is removed from the vertical in a plane normal to the wall.

Released without initial velocity, it strikes a shock piece under the following conditions:

- the shock piece is a mild steel angle bar 40 mm × 40 mm × 5 mm, having an outer radius of 5 mm;

- the suspension point of the welding supply cable is adjusted 1 m above the angle of the steel bar so that the part of the ELECTRODE HOLDER which has to undergo the shock is just in contact with the angle of the steel bar when the ELECTRODE HOLDER is hanging freely;
- during the test, the ELECTRODE HOLDER is displaced from the vertical so that the swing height is 400 mm.

The ELECTRODE HOLDER is allowed to swing on the angle bar six times: twice on the HEAD, twice on the middle part of the HANDLE and twice on the control LEVER; if the ELECTRODE HOLDER does not have a LEVER, twice on parts which are likely to be weak.

Dimensions in millimetres

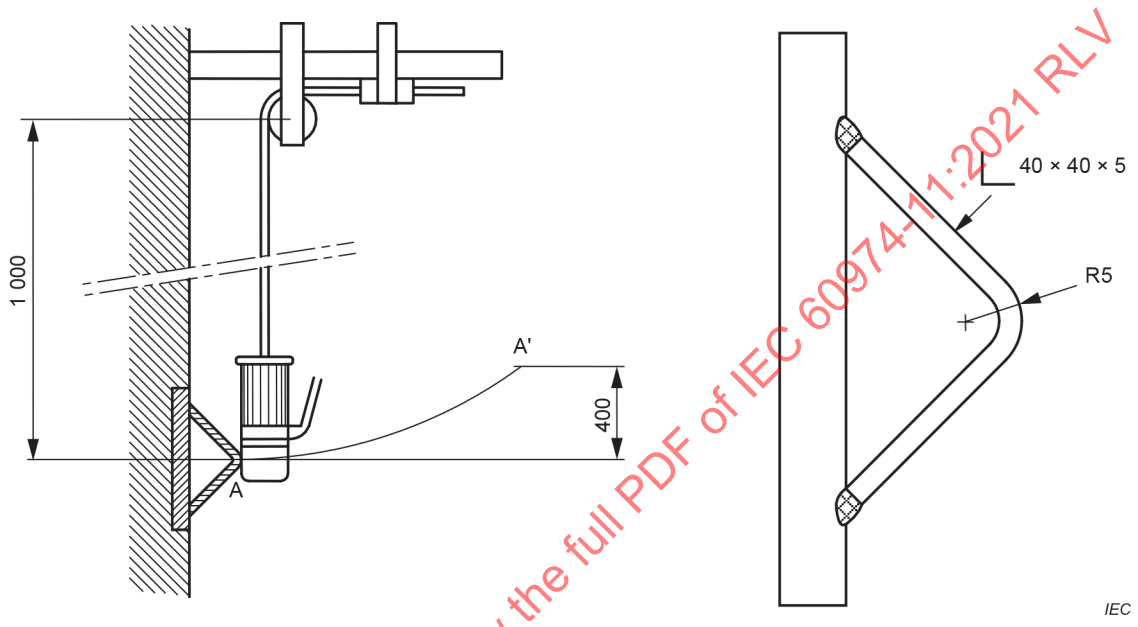


Figure 3 – Device for the pendulum swing test

11 Marking

The following information shall be legibly and indelibly marked on each ELECTRODE HOLDER:

a) name of the manufacturer, distributor, importer or the registered trade mark;

b) type (identification) as given by the manufacturer;

c) RATED CURRENT;

d) reference to this document, confirming that the ELECTRODE HOLDER complies with the requirements.

EXAMPLE:

~~STAR~~

~~B 200 / IEC 60974-11~~

~~This example is for an electrode holder with the trade mark STAR being of type B, having a rated current of 200 A and complying with this part of IEC 60974.~~

Manufacturer – type – current – standard,

XXX – YYY – ZZZ- IEC 60974-11

Conformity shall be checked by ~~reading the marking~~ visual inspection.

12 Instructions for use

Each ELECTRODE HOLDER shall be delivered with an instruction sheet which includes the following information:

a) category of electrode holder, A or B;
b) clamping range for electrodes;
c) correct connection of the welding cable;
d) choice of welding cable, type and size;
e) relation of permissible current and duty cycle;
f) list of essential spare parts.

Conformity shall be checked by ~~reading the instructions~~ visual inspection.

Bibiliography

IEC 60050-851:2008, *International Electrotechnical Vocabulary (IEV) – Part 851: Electric welding*
IEC 60050-851:2008/AMD1:2014

IEC Guide 116, *Guidelines for safety related risk assessment and risk reduction for low voltage equipment*

EN 50565-1:2014, *Electric cables – Guide to use for cables with a rated voltage not exceeding 450/750 V (U0/U) – Part 1: General guidance*

CENELEC Guide 32, *Guidelines for Safety Related Risk Assessment and Risk Reduction for Low Voltage Equipment*

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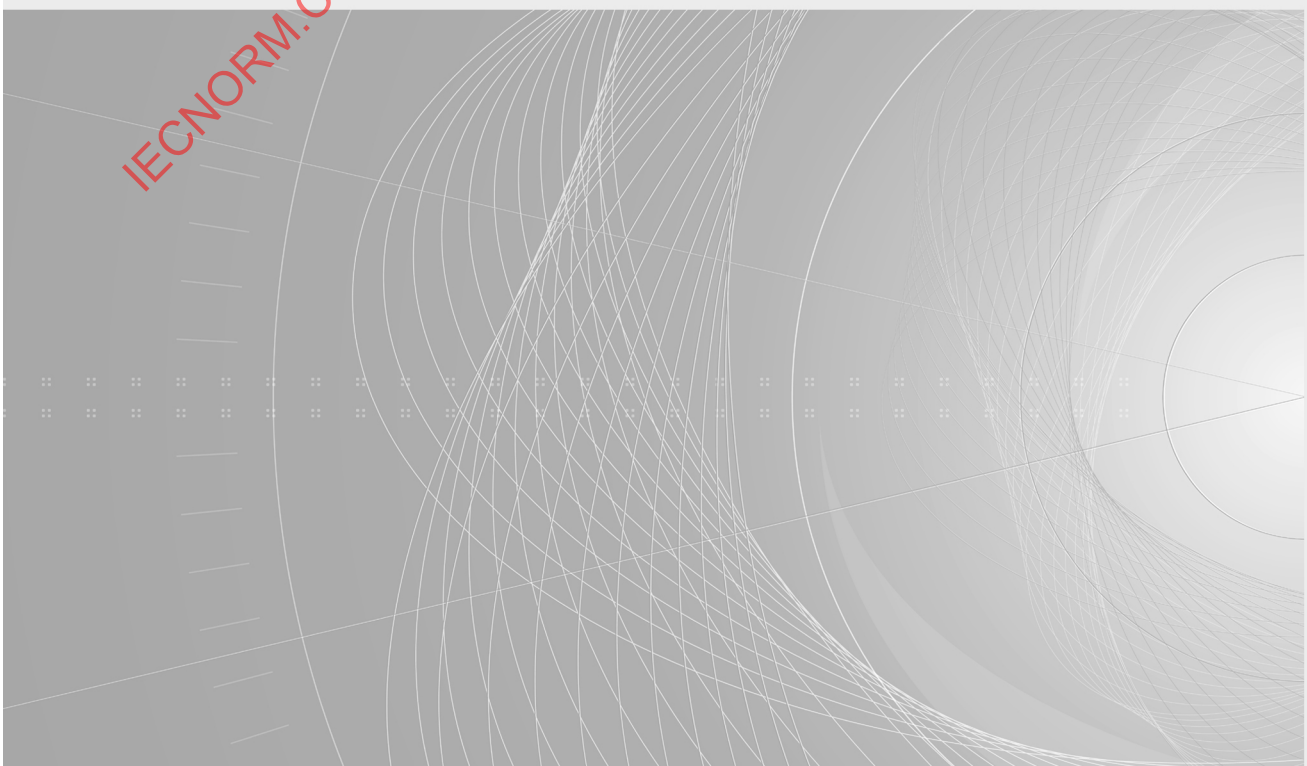

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International Standard IEC 60974-11 has been prepared by IEC technical committee 26: Electric welding.

This fourth edition cancels and replaces the third edition, published in 2010. This edition constitutes a technical revision.

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

– Modify 3.6 type A to category A;
– Modify 3.7 type B to category B;
– Modify 8.1 to clarify reference to IEC 60529;
– Modification of 10.1 for clarification purposes;
– Added Bibliography.

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

The text of this International Standard is based on the following documents:

FDIS	Report on voting
26/716/FDIS	26/721/RVD

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

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

In this standard, the following print types are used:

– conformity statements: in *italic type*.
– terms defined in Clause 3: in SMALL ROMAN CAPITALS.

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 document will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

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 document specifies safety and performance requirements of ELECTRODE HOLDERS.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 60050-151:2001, *International Electrotechnical Vocabulary (IEV) – Part 151: Electrical and magnetic devices*
IEC 60050-151:2001/AMD1:2013
IEC 60050-151:2001/AMD2:2014
IEC 60050-151:2001/AMD3:2019
IEC 60050-151:2001/AMD4:2020

IEC 60529:1989, *Degrees of protection provided by enclosures (IP Code)*
IEC 60529:1989/AMD1:1999
IEC 60529:1989/AMD2:2013

IEC 60974-1:2017, *Arc welding equipment – Part 1: Welding power sources*
IEC 60974-1:2017/AMD1:2019

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

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

[SOURCE: IEC 60050-851:2008, 851-14-04]

3.2
head
part of the ELECTRODE HOLDER having cavities or jaws or equivalent for insertion, orientation, clamping and electrical connection of an electrode

[SOURCE: IEC 60050-851:2008, 851-14-30]

3.3
handle
part of the ELECTRODE HOLDER designed to be held in the operator's hand

[SOURCE: IEC 60050-851:2008, 851-14-28]

3.4
lever
part which may be fitted to control the clamping device of an ELECTRODE HOLDER

[SOURCE: IEC 60050-851:2008, 851-14-31]

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

[SOURCE: IEC 60050-851:2008, 851-14-05]

3.7
category B electrode holder
ELECTRODE HOLDER in which, deviating from CATEGORY A, no live part is accessible at the HEAD to a sphere with a diameter related to the maximum diameter of the electrode (see 8.1b)

[SOURCE: IEC 60050-851:2008, 851-14-06]

4 Environmental conditions

As specified in Clause 4 of IEC 60974-1:2017.

5 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.

5.2 Measuring instruments

As specified in 5.2 of IEC 60974-1:2017.

5.3 Conformity of components

As specified in 5.3 of IEC 60974-1:2017.

5.4 Type tests

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 document 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

The ELECTRODE HOLDER shall permit:

a) the safe and rapid fitting of electrodes and release of stub ends;
b) welding until a stub of 50 mm length with electrodes clamped in any of the set positions is provided;
c) the clamping of all electrode diameters as specified by the manufacturer without pressure being exerted by the operator.

Conformity shall be checked by operation of the clamping device and visual inspection.

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 CATEGORY 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) an access probe according to Table 6 of IEC 60529:1989 in the case of ELECTRODE HOLDERS of:
   1) CATEGORY A, and
   2) CATEGORY B with the exception of the HEAD;

b) a sphere in the case of the HEAD of CATEGORY 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 N ± 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 MΩ.

Conformity shall be checked by the following test:

a) Humidity treatment

A humidity cabinet is maintained at a temperature t between 20 °C and 30 °C to within ±1 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) °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 DC 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 AC 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:

A dry and clean ELECTRODE HOLDER is tightly wrapped in metal foil, covering the external surface of the insulation.

The AC 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 DC test voltage of 1,4 times the r.m.s. test voltage may be used.

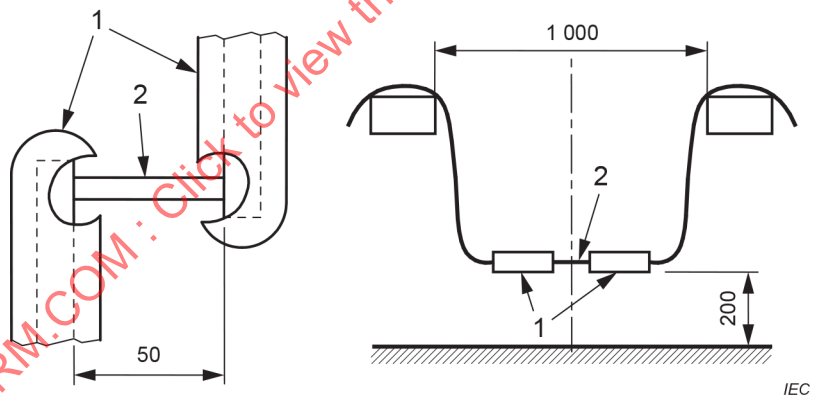
9 Thermal rating

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).

Dimensions in millimetres



Key

1 ELECTRODE HOLDER

2 round rod

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.