

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Arc welding equipment –
Part 3: Arc striking and stabilizing devices

Matériel de soudage à l'arc –
Partie 3: Dispositifs d'amorçage et de stabilisation de l'arc

IEC 60974-3:2019
<https://standards.iteh.ai/catalog/standards/sist/5190d75f-2b51-44dc-9c34-c0d87d617c43/iec-60974-3-2019>



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IEC Central Office
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

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ARC WELDING EQUIPMENT –

Part 3: Arc striking and stabilizing devices

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International Standard IEC 60974-3 has been prepared by IEC technical committee 26: Electric welding.

This fourth edition cancels and replaces the third edition published in 2013 and constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- changes induced by the publication of IEC 60974-1:2017;
- reference to IEC 60974-1:2017/AMD1:2019 in Clause 2;
- Figure 2 is updated where a subtraction of the proportion of the no-load voltage is shown;
- requirement for safe operation of the arc striking and stabilising devices in the event of failure, in 11.5;
- requirements for the rating plate as in IEC 60974-1:2017, Clause 15.

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

FDIS	Report on voting
26/671/FDIS	26/676/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 document, the following print types are used:

- conformity statements: in *italic* type.
- terms used throughout this document which have been defined in Clause 3: SMALL CAPITALS.

This International Standard is to be read in conjunction with IEC 60974-1:2017.

A list of all the parts in 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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ARC WELDING EQUIPMENT –

Part 3: Arc striking and stabilizing devices

1 Scope

This part of IEC 60974 specifies safety requirements for industrial and professional ARC STRIKING and ARC STABILIZING DEVICES used in arc welding and allied processes.

This document is applicable to ARC STRIKING and STABILIZING DEVICES which are stand-alone (separate from the welding equipment) or built in (housed in a single enclosure with other arc welding equipment).

NOTE 1 Typical allied processes are, for example, plasma arc cutting and arc spraying.

NOTE 2 This document does not include electromagnetic compatibility (EMC) requirements.

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 60974-1:2017, *Arc welding equipment – Part 1: Welding power sources*

IEC 60974-1:2017/AMD1:2019
<http://standards.iteh.ai/catalog/standards/sist/3196f95f-2b51-44de-9c34-c0d87d617c43/iec-60974-3-2019>

IEC 60974-7:2013, *Arc welding equipment – Part 7: Torches*

IEC 61140, *Protection against electric shock – Common aspects for installation and equipment*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60974-1 and IEC 60974-7 and 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

arc striking device

device which superimposes a voltage on the welding circuit to ignite an arc

3.2

arc stabilizing device

device which superimposes a voltage on the welding circuit to maintain an arc

3.3

arc striking voltage

voltage superimposed on the no-load voltage to ignite an arc

3.4

arc stabilizing voltage

voltage superimposed on the arc voltage to maintain the arc

4 Environmental conditions

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

5 Tests

5.1 Test conditions

As specified in 5.1 of IEC 60974-1:2017.

5.2 Measuring instruments

The accuracy of measuring instruments shall be as follows:

- a) electrical measuring instruments: class 1 ($\pm 1\%$ of full scale reading), except for the measurement of insulation resistance and dielectric strength where the accuracy of the measuring instruments is not specified, but shall be taken into account for the measurement;
- b) thermometer: ± 2 K;
- c) high-voltage probe: $\pm 5\%$.

5.3 Conformity of components

As specified in 5.3 of IEC 60974-1:2017/AMD1:2019.

5.4 Type tests

As a condition of conformity, the type tests given below shall be carried out on stand-alone units in the following sequence with no drying time between f), g) and h):

- a) visual inspection, as defined in 3.1.7 of IEC 60974-1:2017;
- b) insulation resistance, as specified in 6.1.4 of IEC 60974-1:2017 (preliminary check);
- c) enclosure, as specified in 14.2 of IEC 60974-1:2017;
- d) handling means, as specified in 14.3 of IEC 60974-1:2017;
- e) drop withstand, as specified in 14.4 of IEC 60974-1:2017;
- f) protection provided by the enclosure, as specified in 6.2.1 of IEC 60974-1:2017;
- g) insulation resistance, as specified in 6.1.4 of IEC 60974-1:2017;
- h) dielectric strength, as specified in 6.1.5 of IEC 60974-1:2017;
- i) visual inspection, as defined in 3.1.7 of IEC 60974-1:2017.

Rated arc striking and stabilizing peak voltage shall be measured in accordance with 11.1 in any convenient sequence of type tests but before verifying mechanical provisions.

The other type tests included in this document and not listed here shall be carried out in any convenient sequence.

5.5 Routine tests

5.5.1 Stand-alone unit

All routine tests shall be carried out on each stand-alone unit in the following sequence:

- a) visual inspection (as defined in 3.1.7 of IEC 60974-1:2017);
- b) continuity of the protective circuit (as specified in Clause 10 and, if applicable, 10.5.1 of IEC 60974-1:2017);
- c) dielectric strength (as specified in 6.1.5 of IEC 60974-1:2017);
- d) high-voltage circuit test: working voltage shall be applied to high-voltage circuits to establish insulation integrity as specified by the manufacturer;

NOTE No-load voltage and connection of the return cable, either to the ground circuit or isolated, affects working voltage.

- e) visual inspection (as defined in 3.1.7 of IEC 60974-1:2017).

5.5.2 Built-in unit

The following routine test shall be carried out on each built-in unit in any convenient sequence for the power source (as specified in 5.5 of IEC 60974-1:2017):

High-voltage circuit test: working voltage shall be applied to high-voltage circuits to establish insulation integrity as specified by the manufacturer.

NOTE No-load voltage and connection of the return cable, either to the ground circuit or isolated, affects working voltage.

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6 Protection against electric shock

IEC 60974-3:2019

6.1 Insulation <https://standards.itech.ai/catalog/standards/sist/3196f95f-2b51-44de-9c34-c0d87d617c43/iec-60974-3-2019>

6.1.1 General

Subclause 6.1.1 of IEC 60974-1:2017 applies.

6.1.2 Clearances

The minimum clearances for high-voltage components shall be in accordance with Table 1. The minimum clearance for other components shall be in accordance with 6.1.2 of IEC 60974-1:2017.

Conformity shall be checked by measurement and visual inspection.

6.1.3 Creepage distances

The minimum creepage distances for arc striking and stabilizing circuits shall be in accordance with Table 1. The minimum creepage distances for other components shall be in accordance with 6.1.3 of IEC 60974-1:2017.

Conformity shall be checked by measurement and visual inspection.

**Table 1 – Minimum clearances and creepage distances
for arc striking and stabilizing circuits**

Rated peak voltage ^a kV	Clearance ^b mm	Creepage distance ^b mm
3	3	6,3
6	5,5	10
8	8	12,5
10	11	16
12	14	20
15	18	25
18	25	30
20	30	35
NOTE These values apply to circuits which are designed in accordance with 11.3.		
^a Rated peak voltage shall be measured in accordance with 11.1.		
^b Interpolation is allowed.		

6.1.4 Insulation resistance

Subclause 6.1.4 of IEC 60974-1:2017 applies.

6.1.5 Dielectric strength (standards.iteh.ai)

The output circuit of ARC STRIKING AND STABILIZING DEVICES and the insulation of coupling components (for example, coupling transformers or coupling capacitors) shall withstand an arc striking test voltage 20 % higher than the rated peak ARC STRIKING VOLTAGE at the maximum pulse repetition rate of the device.

Alternatively, an AC test voltage with the same peak value of approximately sine waveform at 50 Hz or 60 Hz may be used for coupling components only. The maximum permissible setting of the tripping current shall be 100 mA. The high voltage transformer shall deliver the prescribed voltage up to the tripping current. Tripping is regarded as a flashover or a breakdown.

NOTE 1 For the operator's safety, the lowest setting of the tripping current (less than or equal to 10 mA) is typical.

Conformity shall be checked by the following test.

Coupling components intended for use with ARC STRIKING AND STABILIZING VOLTAGES shall be subjected to the arc striking test voltage or the AC test voltage for 60 s.

NOTE 2 Interference suppression capacitors are not coupling devices.

The output circuit shall be subjected to the arc striking test voltage for 60 s applied between the point of connection to the welding electrode and

- a) exposed conductive parts;
- b) other isolated circuits.

Flashover or breakdown shall not occur. Any discharges unaccompanied by a voltage drop (corona) are disregarded.

NOTE 3 Interference suppression capacitors are subjected to the test of the output circuit.

6.2 Protection against electric shock in normal service (direct contact)

Subclause 6.2 of IEC 60974-1:2017 applies.

6.3 Protection against electric shock in case of a fault condition (indirect contact)

Stand-alone ARC STRIKING and STABILIZING DEVICES shall be class I or class II equipment in accordance with IEC 61140, with the exception of the welding circuit.

The output circuit of the ARC STRIKING AND STABILIZING DEVICE shall be electrically isolated from the public supply system by double or reinforced insulation in accordance with the maximum rated input voltage. Annex A, Figure A.1 shows examples of coupling systems for ARC STRIKING AND STABILIZING DEVICES.

Internal conductors and connections shall be secured or positioned as specified in 6.3.3 of IEC 60974-1:2017.

For class I stand-alone ARC STRIKING AND STABILIZING DEVICE, weighted touch current in the case of an external protective conductor failure or disconnection shall not exceed the value specified in 6.3.6 of IEC 60974-1:2017 when energized and not providing the ARC STRIKING AND STABILIZING VOLTAGE.

Conformity shall be checked by visual inspection and by measurement.

6.4 Protective provision

Connection of exposed conductive parts to the protective conductor is not required if the rated supply voltage is supplied by the welding circuit or safety extra-low voltage (SELV).

[IEC 60974-3:2019](https://standards.iteh.ai/catalog/standards/sist/3196f95f-2b51-44de-9c34-c0d87d617c43/iec-60974-3-2019)

7 Thermal requirements

Current-carrying components, incorporated in the ARC STRIKING AND STABILIZING DEVICE, shall be capable of carrying the rated welding current as specified by the manufacturer without:

- a) exceeding the temperature rating of the current-carrying components;
- b) causing the surface temperatures specified in Table 7 of IEC 60974-1:2017 to be exceeded.

For liquid-cooled apparatus, the test shall be carried out with the minimum flow and the maximum temperature of the coolant, as recommended by the manufacturer.

Conformity shall be checked by measurement in accordance with 7.2 of IEC 60974-1:2017.

8 Thermal protection

If the ARC STRIKING and STABILIZING DEVICE is designed for use with or built in a specific welding power source, the thermal protection tests shall be carried out with the welding power source.

9 Abnormal operation

In the case of a stand-alone ARC STRIKING and STABILIZING DEVICE, the abnormal operation tests defined in Clause 9 of IEC 60974-1:2017 shall be carried out as applicable.

If the ARC STRIKING and STABILIZING DEVICE is designed for use with a specific welding power source, the abnormal operation tests shall be conducted with the ARC STRIKING and STABILIZING DEVICE connected to that welding power source.

The ARC STABILIZING DEVICE shall be short circuited at the output, with neither a torch nor a return cable connected, until equilibrium is achieved.

ARC STRIKING AND STABILIZING DEVICES protected internally, for example by automatic shut-off, meet this requirement if the protection device operates before an unsafe condition occurs.

10 Connection to the supply network

Clause 10 of IEC 60974-1:2017 applies.

11 Output

11.1 Rated peak voltage

The rated peak voltage (U_p) is obtained by subtraction of the no-load voltage (U_0) from the measured peak voltage (see Figure 1). To determine the peak, the voltage shall be measured across a 220 pF capacitor with neither a torch nor a return cable connected.

When reported on the rating plate of ARC STRIKING AND STABILIZING DEVICES, the rated peak voltage (U_p) shall be equal to or greater than the measured peak voltage, but shall not exceed the maximum values given in Table 2.

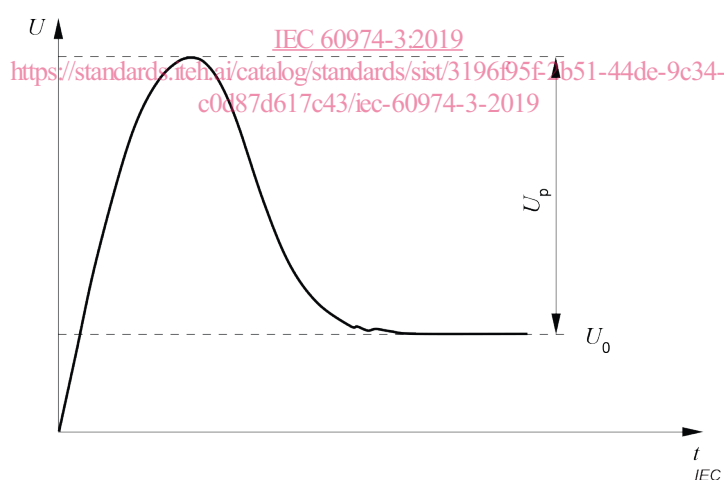


Figure 1 – Rated peak voltage

Table 2 – Maximum peak voltages

Type of torch	Peak voltage
Manually guided	15 kV
Mechanically guided or plasma cutting	20 kV

Conformity shall be checked by measurement with an oscilloscope and a high-voltage probe with sufficient bandwidth.