IEC 60974-6

Edition 3.0 2015-09

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Arc welding equipment –
Part 6: Limited duty equipment

Matériel de soudage à l'arc –
Partie 6: Matériel à service limité

IEC 60974-6:2015-09(en-fr)

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FOREWORD

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International Standard IEC 60974-6 has been prepared by IEC technical committee 26: Electric welding.

This third edition cancels and replaces the second edition published in 2010. It constitutes a technical revision.

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

– modified measurement conditions (see 7.3.1);
– improved values for temperature limits according to the class of insulation (see Table 1);
– improved maximum temperature limits (see Table 2);
– deleted overload test.

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

FDIS	Report on voting
26/572/FDIS	26/581/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.

This standard is to be used in conjunction with IEC 60974-1:2012.

In this standard, the following print types are used:

– *conformity statements: in italic type.*

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 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- withdrawn,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
- amended.

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ARC WELDING EQUIPMENT –

Part 6: Limited duty equipment

1 Scope

This part of IEC 60974 specifies safety and performance requirements applicable to limited duty arc welding and cutting power sources and auxiliaries designed for use by laymen. Electrically powered equipment is intended to be connected to the single phase public low-voltage supply system. Engine driven power sources cannot exceed output power of 7,5 kVA.

NOTE 1 This equipment is typically used by non-professionals in residential areas.

This part of IEC 60974 is not applicable to arc welding and cutting power sources that require for operation:

- arc striking and stabilizing devices;
- liquid cooling systems;
- gas consoles;
- three-phase input supply;

and which are intended for industrial and professional use only.

This part of IEC 60974 is not applicable to arc welding and cutting power sources and ancillary equipment used in:

- mechanically guided applications;
- submerged arc welding process;
- plasma gouging process;
- plasma welding process;

that are covered by other parts of IEC 60974.

NOTE 2 Power sources, wire feeders, torches and electrode holders designed for industrial and professional use are respectively covered by IEC 60974-1, IEC 60974-5, IEC 60974-7 and IEC 60974-11.

NOTE 3 This part of IEC 60974 does not specify electromagnetic compatibility (EMC) requirements that are given in IEC 60974-10.

2 Normative references

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

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

IEC 60974-1:2012, *Arc welding equipment – Part 1: Welding power sources*

IEC 60974-5:2013, *Arc welding equipment – Part 5: Wire feeders*

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

IEC 60974-10, *Arc welding equipment – Part 10: Electromagnetic compatibility (EMC) requirements*

IEC 60974-11, *Arc welding equipment – Part 11: Electrode holders*

IEC 61032:1997, *Protection of persons and equipment by enclosure – Probes for verification*

ISO 2503, *Gas welding equipment – Pressure regulators and pressure regulators with flow-metering devices for gas cylinders used in welding, cutting and allied processes up to 300 bar (30 MPa)*

3 Terms and definitions

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

3.1
touch current
electric current passing through a human body or through an animal body when it touches one or more accessible parts of an installation or equipment

[SOURCE: IEC 60050-195:1990/AMD 1:1999, 195-05-21]

3.2
limited duty welding power source
power source intended for use by a layman

3.3
layman
operator who does not weld in the performance of his profession and has little or no formal instruction in arc welding

3.4
effective supply current
I_{1eff}
value of the effective input current, calculated from the rated maximum supply current (I_{1max} in A), the supply current at no-load (I_0 in A) and the rated maximum welding time in intermittent mode ($\sum t_{ON}$ in s) at the rated maximum welding current during an uninterrupted time of one hour by the formula:

$$I_{1eff} = \sqrt{I_{1max}^2 \times \frac{\sum t_{ON}}{3\,600} + I_0^2 \times \left(1 - \frac{\sum t_{ON}}{3\,600}\right)}$$

3.5
ON time
t_{ON}
period of welding operation as allowed by the thermal control device of the welding power source

3.6
OFF time
t_{OFF}
period of non-welding operation as imposed by the thermal control device of the welding power source

3.7
rated welding time in 1 h
$\sum t_{ON}$
summation of the ON times (t_{ON}) at the rated maximum welding current in a 60 min period following the first OFF time (t_{OFF})

3.8
rated continuous welding time
$t_{ON}(\text{max})$
ON time (t_{ON}) at the rated maximum welding current before the first OFF time (t_{OFF})

4 Environmental conditions

Welding power sources and auxiliaries shall be capable of operating when the following environmental conditions prevail:

a) range of ambient air temperature:
   during operation: –10 °C to +40 °C;
b) relative humidity of the air:
   up to 50 % at 40 °C;
   up to 90 % at 20 °C;
c) ambient air, free from abnormal amounts of dust, acids, corrosive gases or substances etc. other than those generated by the welding process;
d) altitude above sea level up to 1 000 m;
e) base of the welding power source inclined up to 10°.

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

Welding power source and auxiliaries shall be capable of delivering the rated continuous welding time and the rated welding time in 1 h at an ambient temperature of 20 °C.

5 Tests

5.1 Test conditions

The thermal tests shall be carried out at an ambient temperature of 20 °C, see tolerances in 7.2.2 e).

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

5.2 Measuring instruments

See 5.2 of IEC 60974-1:2012.

5.3 Conformity of components

See 5.3 of IEC 60974-1:2012.

5.4 Type tests

Unless otherwise specified, the tests in this standard are type tests.

The welding power source shall be tested with any ancillary equipment fitted that could affect the test results.

All type tests shall be carried out on the same welding power source except where it is specified that a test may be carried out on another welding power source.

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

a) general visual inspection, see 3.7 of IEC 60974-1:2012;
b) insulation resistance, see 6.1.4 (preliminary check);
c) enclosure, see 15.2;
d) handling means, see 15.3;
e) drop withstand, see 15.4;
f) protection provided by the enclosure, see 6.2.1;
g) insulation resistance, see 6.1.4;
h) dielectric strength, see 6.1.5;
i) visual inspection, see 3.7 of IEC 60974-1:2012.

The other tests included in this standard and not listed in 5.4 shall be carried out in any convenient sequence.

5.5 Routine tests

All routine tests shall be carried out on each welding power source. The following sequence is recommended:

a) visual inspection, see 3.7 of IEC 60974-1:2012;
b) continuity of the protective circuit, see 10.5.1 of IEC 60974-1:2012;
c) dielectric strength, see 6.1.5;
d) no-load voltage
   1) rated no-load voltage, see 12.1; or
   2) for plasma cutting power source, rated reduced no-load voltage, see 13.2.1 of IEC 60974-1:2012;
e) test to ensure rated minimum and maximum output values in accordance with 15.4 b) and 15.4 c) of IEC 60974-1:2012. The manufacturer may select conventional load, short circuit load or other test conditions.

NOTE In short circuit and other test condition, the output values can differ from conventional load values.

6 Protection against electric shock

6.1 Insulation

6.1.1 General

See 6.1.1 of IEC 60974-1:2012.

6.1.2 Clearances

See 6.1.2 of IEC 60974-1:2012.

6.1.3 Creepage distances

See 6.1.3 of IEC 60974-1:2012.

6.1.4 Insulation resistance

See 6.1.4 of IEC 60974-1:2012.

6.1.5 Dielectric strength

See 6.1.5 of IEC 60974-1:2012.

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

6.2.1 Protection provided by the enclosure

6.2.1.1 General

Welding power sources shall have a minimum degree of protection of IP21S using IEC 60529 test procedures and conditions.

Remote controls for welding power sources shall have a minimum degree of protection of IP2X using IEC 60529 test procedures and conditions.

6.2.1.2 Protection against ingress of water

Adequate drainage shall be provided by the enclosure. Retained water shall not interfere with the correct operation of the equipment or impair safety.

Conformity shall be checked as follows:

A welding power source shall be subjected to the appropriate water test without being energized. Immediately after the test, the welding power source shall be moved to a safe environment and subjected to the insulation resistance and dielectric strength tests.

Adequate drainage of the enclosure shall be checked by visual inspection.

6.2.1.3 Side and top enclosure openings

The enclosure shall be such that a 50 mm long test pin cannot be inserted from all sides except the underside to touch:

a) live parts of the input circuit or

b) in the case of Class II welding power sources, any metal part which is separated from live parts of the input circuit by basic insulation.

Conformity shall be checked with test probe 12 of IEC 61032:1997 (see Figure A.1).

6.2.1.4 Bottom enclosure openings

The enclosure shall be such that a 15 mm long test pin cannot be inserted from the underside to touch:

a) live parts of the input circuit and

b) in the case of Class II welding power sources, any metal part which is separated from live parts of the input circuit by basic insulation.

Conformity shall be checked with test probe 13 of IEC 61032:1997 (see Figure A.2).

6.2.2 Capacitors

See 6.2.2 of IEC 60974-1:2012.

6.2.3 Automatic discharge of supply circuit capacitors

See 6.2.3 of IEC 60974-1:2012.

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

6.3.1 Protective provisions

See 6.3.1 of IEC 60974-1:2012.

6.3.2 Isolation between windings of the supply circuit and the welding circuit

See 6.3.2 of IEC 60974-1:2012.

6.3.3 Internal conductors and connections

See 6.3.3 of IEC 60974-1:2012.

6.3.4 Additional requirements for plasma cutting systems

See 6.3.4 of IEC 60974-1:2012.

6.3.5 Movable coils and cores

See 6.3.5 of IEC 60974-1:2012.

6.3.6 Touch current in fault condition

The weighted touch current shall not exceed 7 mA peak in the case of external protective conductor failure or disconnection.

Conformity shall be checked using the measuring circuit as shown in Figure 1 and Figure 2 under the following conditions:

a) the welding power source is:
- *isolated from the ground plane;*
- *supplied by the highest rated supply voltage;*
- *not connected to the protective earth except through measurement components;*

b) the output circuit is in the no-load condition;

c) interference suppression capacitors shall not be disconnected.

NOTE Caution! A qualified person performs this test. The protective conductor is disabled for this test.