

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Arc welding equipment –
Part 1: Welding power sources**

**Matériel de soudage à l'arc –
Partie 1: Sources de courant de soudage**

<https://standards.iteh.ai/catalog/standards/sist/5541e35e-6340-4561-a014-ebfc7d00061e/iec-60974-1-2012>



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INTERNATIONAL ELECTROTECHNICAL COMMISSION

ARC WELDING EQUIPMENT –**Part 1: Welding power sources**

FOREWORD

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International Standard IEC 60974-1 has been prepared by IEC technical committee 26: Electric welding.

This fourth edition cancels and replaces the third edition published in 2005 and constitutes a technical revision.

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

- the heating test shall be carried out at ambient temperature of 40 °C (see 5.1);
- new Figure 1 summarizes example of insulation requirements;
- creepage distances for pollution degree 4 are no longer valid (see Table 2);
- insulation requirements for Class II equipment are defined (see Table 3);
- dielectric test voltage interpolation restriction lower limit is changed to 220 V and interpolation for control and welding circuit is clarified (see Table 4);
- water test is clarified by suppression of visual inspection (see 6.2.1);

- isolation requirements of the supply circuit and the welding circuit are moved in protection against electric shock in normal service (see 6.2.4);
- touch current in normal service and in single fault condition requirements are changed (see 6.2.5, 6.2.6 and 6.3.6);
- maximum temperature for insulation systems are reviewed in accordance with current edition of IEC 60085 (see Table 6);
- limits of temperature rise for external surfaces are updated depending of unintentional contact period as defined in ISO 13732-1 (see Table 7);
- loading test is completed by a dielectric test (see 7.4);
- conformity test for tolerance to supply voltage fluctuation is clarified (see 10.1);
- marking of terminals is limited to external protective conductor and three-phase equipment terminals (see 10.4);
- usage of hazard reducing device is clarified (see 11.1);
- requirements for control circuits are changed (see Clause 12);
- impact test is clarified (see 14.2.2);
- environmental parameters are completed (see Annex M).

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

FDIS	Report on voting
26/472/FDIS	26/479/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.

In this standard, the following print types are used:

- *conformity statements*: in italic type.

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

ARC WELDING EQUIPMENT –

Part 1: Welding power sources

1 Scope

This part of IEC 60974 is applicable to power sources for arc welding and allied processes designed for industrial and professional use, and supplied by a voltage not exceeding 1 000 V, or driven by mechanical means.

This part of IEC 60974 specifies safety and performance requirements of welding power sources and plasma cutting systems.

This part of IEC 60974 is not applicable to welding power sources for manual metal arc welding with limited duty operation which are designed mainly for use by laymen and designed in accordance with IEC 60974-6.

This part of IEC 60974 is not applicable to testing of power sources during periodic maintenance or after repair.

NOTE 1 Typical allied processes are electric arc cutting and arc spraying.

NOTE 2 AC systems having a nominal voltage between 100 V and 1 000 V are given in Table 1 of IEC 60038:2009.

NOTE 3 This part of IEC 60974 does not include electromagnetic compatibility (EMC) requirements.

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 60050-151:2001, *International Electrotechnical Vocabulary (IEV) – Part 151: Electrical and magnetic devices*

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

IEC 60245-6, *Rubber insulated cables – Rated voltages up to and including 450/750 V – Part 6: Arc welding electrode cables*

IEC 60417-DB:20111, *Graphical symbols for use on equipment*

IEC 60445, *Basic and safety principles for man-machine interface, marking and identification – Identification of equipment terminals, conductor terminations and conductors*

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

¹ “DB” refers to the IEC on-line database.

IEC 60664-1:2007, *Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests*

IEC 60664-3, *Insulation coordination for equipment within low-voltage systems – Part 3: Use of coating, potting or moulding for protection against pollution*

IEC 60695-11-10, *Fire hazard testing – Part 11-10: Test flames – 50 W horizontal and vertical flame test methods*

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

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

IEC 61558-2-4, *Safety of transformers, reactors, power supply units and similar products for supply voltages up to 1 100 V – Part 2-4: Particular requirements and tests for isolating transformers and power supply units incorporating isolating transformers*

IEC 61558-2-6, *Safety of transformers, reactors, power supply units and similar products for supply voltages up to 1 100 V – Part 2-6: Particular requirements and tests for safety isolating transformers and power supply units incorporating safety isolating transformers*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-151, IEC 60050-851 and IEC 60664-1, as well as the following, apply.

3.1

arc welding power source

equipment for supplying current and voltage and having the required characteristics suitable for arc welding and allied processes

Note 1 to entry An arc welding power source can also supply services to other equipment and auxiliaries for example auxiliary power, cooling liquid, consumable arc welding electrode and gas to shield the arc and the welding area.

Note 2 to entry In the following text, the term "welding power source" is used.

3.2

industrial and professional use

use intended only for experts or instructed persons

3.3

expert

competent person

skilled person

a person who can judge the work assigned and recognize possible hazards on the basis of professional training, knowledge, experience and knowledge of the relevant equipment

Note 1 to entry Several years of practice in the relevant technical field can be taken into consideration in assessment of professional training.

3.4

instructed person

person informed about the tasks assigned and about the possible hazards involved in neglectful behaviour

Note 1 to entry If necessary, the person has undergone some training.

3.5**type test**

test of one or more devices made to a given design to check if these devices comply with the requirements of the standard concerned

3.6**routine test**

test made on each individual device during or after manufacture to check if it complies with the requirements of the standard concerned or the criteria specified

3.7**visual inspection**

inspection by eye to verify that there are no apparent discrepancies with respect to provisions of the standard concerned

3.8**drooping characteristic**

external static characteristic of a welding power source which, in its normal welding range, is such that the negative slope is greater than or equal to 7 V/100 A

3.9**flat characteristic**

external static characteristic of a welding power source which, in its normal welding range, is such that, as the current increases, the voltage either decreases by less than 7 V/100 A or increases by less than 10 V/100 A

3.10**static characteristic**

relationship between the voltage and the current at the output terminals of a welding power source when connected to a conventional load

3.11**welding circuit**

conductive material through which the welding current is intended to flow

Note 1 to entry In arc welding, the arc is a part of the welding circuit.

Note 1 to entry In certain arc welding processes, the welding arc can be established between two electrodes. In such a case, the workpiece is not necessarily a part of the welding circuit.

3.12**control circuit**

internal or external circuit for the operational control of the equipment or for protection of the power circuits, or both

EXAMPLE 1 Control circuits intended for interface between the welding power source and external equipment designed by the manufacturer.

EXAMPLE 2 Control circuits intended for interface between the welding power source and other types of ancillary equipment.

3.13**welding current**

current delivered by a welding power source during welding

3.14**load voltage**

voltage between the output terminals when the welding power source is delivering welding current

3.15**no-load voltage**

voltage, exclusive of any arc striking or arc stabilizing voltage, between the accessible output terminals of a welding power source when the welding circuit is open but energized

3.16**conventional value**

standardized value that is used as a measure of a parameter for the purposes of comparison, calibration, testing etc.

NOTE Conventional values do not necessarily apply during the actual welding process.

3.17**conventional welding condition**

condition of the welding power source in the energized and thermally stabilized state defined by a conventional welding current driven by the corresponding conventional load voltage through a conventional load at rated supply voltage and frequency or speed of rotation

3.18**conventional load**

practically non-inductive constant resistive load having a power factor not less than 0,99

3.19**conventional welding current** I_2

current delivered by a welding power source to a conventional load at the corresponding conventional load voltage

Note 1 to entry The values of I_2 are given as r.m.s. values for a.c. and arithmetic mean values for d.c.

3.20**conventional load voltage** U_2

load voltage of a welding power source having a specified linear relationship to the conventional welding current

Note 1 to entry The values for U_2 are given as r.m.s. values for a.c. and arithmetic mean values for d.c.

Note 1 to entry The specified linear relationship varies in accordance with the process (see 11.2).

3.21**rated value**

assigned value, generally by the manufacturer, for a specified operating condition of a component, device or equipment

3.22**rating plate****name plate**

plate, permanently affixed on an electric device, which indelibly states the rating and other information as required by the relevant standard

[SOURCE: IEC 60050-151:2001, 151-16-12]

3.23**rated output**

rated values of the output of the equipment

**3.24
rated maximum welding current** I_{2max}

maximum value of the conventional welding current that can be obtained at the conventional welding condition from a welding power source at its maximum setting

**3.25
rated minimum welding current** I_{2min}

minimum value of the conventional welding current that can be obtained at the conventional welding condition from a welding power source at its minimum setting

**3.26
rated no-load voltage** U_0

no-load voltage at rated supply voltage and frequency or rated no-load speed of rotation

Note 1 to entry If a welding power source is fitted with a hazard reducing device, this is the voltage measured before the hazard reducing device has performed its function.

**3.27
rated reduced no-load voltage** U_r

no-load voltage of a welding power source, fitted with a voltage reducing device immediately after the device acts to effect a reduction in the voltage

**3.28
rated switched no-load voltage** U_s

d.c. no-load voltage of a welding power source, fitted with an a.c. to d.c. switching device

**3.29
rated supply voltage** U_1

r.m.s. value of supply voltage for which the equipment is designed

**3.30
rated supply current** I_1

r.m.s. value of supply current to the welding power source at a rated conventional welding condition

**3.31
rated no-load supply current** I_0

r.m.s. value of supply current to the welding power source at rated no-load voltage

**3.32
rated maximum supply current** I_{1max}

maximum value of the rated supply current