IEC 60974-1

Edition 6.0 2021-06

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Arc welding equipment –
Part 1: Welding power sources

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

IEC 60974-1:2021-06(en-fr)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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Part 1: Welding power sources

FOREWORD

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

This sixth edition cancels and replaces the fifth edition published in 2017 and Amendment 1:2019. This edition constitutes a technical revision.

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

a) Table 1 with an alphabetical cross-reference listing of terms added;
b) CLEARANCE and CREEPAGE DISTANCE reference document changed to IEC 60664-1:2020;
c) 6.1.2 and 6.1.3 modified to follow IEC 60664-1 BASIC INSULATION dimensioning for mains supply with rationalized voltages;
d) abnormal capacitor test of 6.2.2 moved to new Subclause 9.5;
e) 6.2.5 and 6.3.6 modified to use TOUCH CURRENT measuring network weighted for letgo-immobilization and supply voltage tolerance requirement added;
f) 16.3 new structure and accuracy requirement for displayed voltage value ;

g) Annex A changed to normative and Table A.2 and Table A.3 added;

h) Annex L editorial update to standardized symbols;

i) redraft of efficiency and IDLE STATE power measurement in Annex M based on IEC 62301:2011;

j) Annex N measurement network weighted for letgo-immobilization added.

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

FDIS	Report on voting
26/724/FDIS	26/727/RVD

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

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

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 ROMAN CAPITALS.

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 document will remain unchanged until the stability date indicated on the IEC website under 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.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

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, BATTERY supplied or driven by mechanical means.

This document specifies safety and performance requirements of WELDING POWER SOURCES and PLASMA CUTTING SYSTEMS.

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

This document includes requirements for battery-powered WELDING POWER SOURCES and BATTERY packs, which are given in Annex O.

This document 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 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 60050-151, *International Electrotechnical Vocabulary (IEV) – Part 151: Electrical and magnetic devices* (available at: http://www.electropedia.org)

IEC 60050-851, *International Electrotechnical Vocabulary (IEV) – Part 851: Electric welding* (available at: http://www.electropedia.org)

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

IEC 60417, *Graphical symbols for use on equipment* (available at: http://www.graphical-symbols.info/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)*

IEC 60664-1:2020, *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 60974-10, *Arc welding equipment – Part 10: Electromagnetic compatibility (EMC) requirements*

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*

IEC 62133-1:2017, *Secondary cells and batteries containing alkaline or other non-acid electrolytes – Safety requirements for portable sealed secondary cells, and for batteries made from them, for use in portable applications – Part 1: Nickel systems*

IEC 62133-2:2017, *Secondary cells and batteries containing alkaline or other non-acid electrolytes – Safety requirements for portable sealed secondary lithium cells, and for batteries made from them, for use in portable applications – Part 2: Lithium systems*

IEC 62301:2011, *Household electrical appliances – Measurement of standby power*

ISO 7010:2019, *Graphical symbols – Safety colours and safety signs – Registered safety signs*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-151, IEC 60050-851, IEC 60664-1 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

Table 1 provides an alphabetical cross-reference listing of terms.

Table 1 – Alphabetical list of terms

Term	Term number	Term	Term number	Term	Term number
active power	3.3.3	explosion	3.2.23	rated reduced no-load voltage	3.1.27
apparent power	3.3.4	fixed installation	3.1.62	rated supply current	3.1.30
basic insulation	3.1.50	flat characteristic	3.1.9	rated supply frequency	3.3.1
basic protection	3.2.18	fully charged cell	3.2.10	rated supply voltage	3.1.29
battery	3.2.1	fully discharged cell	3.2.11	rated switched no-load voltage	3.1.28
battery system	3.2.5	functional insulation	3.1.65	rated value	3.1.21
battery voltage class A	3.2.19	general purpose batteries	3.2.12	rating plate	3.1.22
battery voltage class B	3.2.20	hazard reducing device	3.1.47	reinforced insulation	3.1.53
C_5 rate	3.2.6	idle state	3.1.66	remote control	3.1.60
cell	3.2.7	industrial and professional use	3.1.2	routine test	3.1.6
charger	3.2.8	instructed person	3.1.4	safety extra-low voltage	3.1.56
charging system	3.2.9	integral battery	3.2.2	separable battery pack	3.2.4
charring	3.2.21	load voltage	3.1.14	single-fault condition	3.1.61
class I equipment	3.1.48	material group	3.1.42	specified operating region	3.2.14
class II equipment	3.1.49	maximum charging current	3.2.13	specified operating region for charging	3.2.14.1
class of insulation	3.1.64	maximum effective supply current	3.1.33	static characteristic	3.1.10
clearance	3.1.38	micro-environment	3.1.41	supplementary insulation	3.1.51
consecutive operating cycle	3.2.22	no-load voltage	3.1.15	supply circuit	3.1.57
control circuit	3.1.12	plasma cutting power source	3.1.55	temperature rise	3.1.43
conventional load	3.1.18	plasma cutting system	3.1.54	thermal equilibrium	3.1.44
conventional load voltage	3.1.20	pollution degree	3.1.40	thermal protection	3.1.45
conventional value	3.1.16	power factor	3.3.5	total harmonic distortion	3.3.6
conventional welding condition	3.1.17	protective circuit	3.1.63	touch current	3.1.59
conventional welding current	3.1.19	rated idle speed	3.1.36	type test	3.1.5
creepage distance	3.1.39	rated load speed	3.1.34	upper limit charging voltage	3.2.15
detachable battery pack	3.2.3	rated maximum supply current	3.1.32	venting	3.2.16
double insulation	3.1.52	rated maximum welding current	3.1.24	visual inspection	3.1.7
drooping characteristic	3.1.8	rated minimum welding current	3.1.25	welding circuit	3.1.11

Term	Term number	Term	Term number	Term	Term number
duty cycle	3.1.37	rated no-load speed	3.1.35	welding current	3.1.13
electronic component	3.2.17	rated no-load supply current	3.1.31	welding power source	3.1.1
environment with increased risk of electric shock	3.1.46	rated no-load voltage	3.1.26	welding power source efficiency	3.3.2
expert	3.1.3	rated output	3.1.23	working voltage	3.1.58

3.1 General terms and definitions

3.1.1
welding power source
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: A 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: This entry revises IEC 60050-851:2008, 851-13-01, which will be updated.

3.1.2
industrial and professional use
use intended only for EXPERTS or INSTRUCTED PERSONS

[SOURCE: IEC 60050-851:2008, 851-11-12]

3.1.3
expert
competent person
skilled person
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.

[SOURCE: IEC 60050-851:2008, 851-11-10]

3.1.4
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.

[SOURCE: IEC 60050-851:2008, 851-11-13]

3.1.5
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

[SOURCE: IEC 60050-851:2008, 851-12-05]

3.1.6
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

[SOURCE: IEC 60050-851:2008, 851-12-06]

3.1.7
visual inspection
inspection by eye to verify that there are no apparent discrepancies with respect to provisions of the standard concerned

[SOURCE: IEC 60050-851:2008, 851-11-11]

3.1.8
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

Note 1 to entry: This entry revises IEC 60050-851:2008, 851-12-34, which will be updated.

3.1.9
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

[SOURCE: IEC 60050-851:2008, 851-12-35]

3.1.10
static characteristic
relationship between the voltage and the current at the output terminals of a WELDING POWER SOURCE when connected to a CONVENTIONAL LOAD

Note 1 to entry: This entry revises IEC 60050-851:2008, 851-12-32, which will be updated.

3.1.11
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 2 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.

[SOURCE: IEC 60050-851:2008, 851-14-10]

3.1.12
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.

Note 1 to entry: This entry revises IEC 60050-851:2008, 851-14-11, which will be updated.