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INTERNATIONAL STANDARD

NORME INTERNATIONALE

Arc welding equipment – Part 5: Wire feeders

Matériel de soudage à l'arc – Partie 5: Dévidoirs

IEC 60974-5:2019-01(en-fr)

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Arc welding equipment – Part 5: Wire feeders

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ARC WELDING EQUIPMENT –

Part 5: Wire feeders

FOREWORD

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International Standard IEC 60974-5 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;
- addition of requirements for welding circuit connections in 6.9;
- clarification of requirements and conformity in 6.3.1;
- clarification of thermal requirements in Clause 9;
- addition of requirements in relation to abnormal operation in Clause 10.

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

FDIS	Report on voting
26/672/FDIS	26/677/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: in SMALL CAPITALS.

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

A list of all 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

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- withdrawn,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

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ARC WELDING EQUIPMENT –

Part 5: Wire feeders

1 Scope

This part of IEC 60974 specifies safety and performance requirements for industrial and professional equipment used in arc welding and allied processes to feed filler wire.

This document is applicable to WIRE FEEDERS and to WIRE-FEED CONTROLS that are stand-alone (separate from the welding equipment), housed together in a single enclosure or housed in a single enclosure with other welding equipment. The WIRE FEEDER can be suitable for manually or mechanically guided torches.

This document is not applicable to spool-on torches, which are covered by IEC 60974-7.

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

NOTE 2 This document does not include electromagnetic compatibility (EMC) requirements, which are given in IEC 60974-10.

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 60050-195, *International Electrotechnical Vocabulary (IEV) – Part 195: Earthing and protection against electric shock*

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

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

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*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-195, IEC 60974-1, 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/

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

3.1
drive roll
roll in contact with the filler wire and which transfers mechanical power to the filler wire

3.2
filler wire supply
source of filler wire and means for dispensing filler wire to the feeding mechanism

[SOURCE: IEC 60050-851:2008, 851-14-45]

3.3
liner
replaceable component that guides the filler wire

[SOURCE: IEC 60050-851:2008, 851-14-35, modified – The LINER is replaceable and is not required to be in the cable-hose assembly.]

3.4
maximum load
maximum value of the force required to feed the specified types and sizes of filler wires over the RATED SPEED RANGE

[SOURCE: IEC 60050-851:2008, 851-12-23, modified – Abbreviated wording and elimination of rated temperature condition.]

3.5
rated speed range
speed range of the filler wire assigned by the manufacturer for each specified size of filler wire

[SOURCE: IEC 60050-851:2008, 851-12-19, modified – The term "specified" is used instead of "rated".]

3.6
rated supply current
I_1
RMS value of an input current to the WIRE FEEDER at MAXIMUM LOAD

3.7
wire-feed control
electrical or mechanical apparatus, or both, which control(s) the speed of the filler wire, the sequence of operations and other services as required

Note 1 to entry: The wire feed control may be integral with the WIRE FEEDER or in a separate enclosure.

[SOURCE: IEC 60050-851:2008, 851-14-40]

3.8
wire feeder
equipment that delivers filler wire to the arc or weld zone which includes means to apply motion to the filler wire

Note 1 to entry: The WIRE FEEDER may also include the WIRE-FEED CONTROL, the FILLER WIRE SUPPLY, devices for gas control, indicators and remote connectors.

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[SOURCE: IEC 60050-851:2008, 851-14-39, modified – The definition includes optional equipment within the note and the WIRE-FEED CONTROL is not a mandatory part of the WIRE FEEDER.]

4 Environmental conditions

The environmental conditions are as specified in Clause 4 of IEC 60974-1:2017.

5 Tests

5.1 Test conditions

The test conditions are as specified in 5.1 of IEC 60974-1:2017.

5.2 Measuring instruments

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 measuring instruments is not specified, but shall be taken into account for the measurement;

b) thermometer: ±2 K;

c) tachometer: ±1 % of full-scale reading;

d) pressure measuring instruments: class 2,5 (±2,5 % of full-scale reading).

5.3 Conformity of components

The conformity of components is as specified in 5.3 of IEC 60974-1:2017/AMD1:2019.

5.4 Type tests

All type tests given below shall be carried out on the same WIRE FEEDER.

As a condition of conformity, the type tests given below shall be carried out in the following sequence:

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);

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).

The other tests included in this document and not listed here shall be carried out, but may be completed in any convenient sequence.

5.5 Routine tests

All routine tests given below shall be carried out on each WIRE FEEDER in the following sequence:

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a) visual inspection in accordance with manufacturer's specification;

b) continuity of the protective circuit, if applicable (as specified in 10.5.3 of IEC 60974-1:2017);

c) dielectric strength (as specified in 6.1.5 of IEC 60974-1:2017).

6 Protection against electric shock

6.1 Insulation

Subclause 6.1 of IEC 60974-1:2017 applies.

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

6.2.1 Protection provided by the enclosure

WIRE FEEDERS shall have a minimum degree of protection in accordance with Table 1 using IEC 60529 test procedures and conditions.

Table 1 – Minimum degree of protection

Component	Designed for indoor use	Designed for outdoor use
Motor and control supplied by a voltage ≤ SELV	IP2X	IP23S
Motor and control supplied by a voltage > SELV	IP21S	IP23S
Live parts at welding potential for WIRE FEEDERS used with manually guided torches (for example, filler wire, wire spool, DRIVE ROLLS)	IPXX	IPX3
Live parts at welding potential for WIRE FEEDERS used with mechanically guided torches (for example, filler wire, wire spool, DRIVE ROLLS)	IPXX	IPXX

WIRE FEEDERS with degree of protection IP23S may be stored but are not intended to be used outside during precipitation unless sheltered.

Adequate drainage shall be provided by the enclosure. Retained water shall not interfere with the correct operation of the equipment or impair safety. The quantity of water that may enter the enclosure during the following test is not limited.

Conformity shall be checked by the following test:

The filler wire shall be fed into the drive system and all external connectors shall be connected or covered.

The WIRE FEEDER shall be subjected to the appropriate water test without being energized. Immediately after the test, the WIRE FEEDER shall be moved to a safe environment and subjected to the insulation resistance test, listed in 5.4 g) and to the dielectric strength test, listed in 5.4 h).

When live parts at welding potential are protected against precipitation, the filler wire shall show no visual wetness after the test.

6.2.2 Capacitors

Subclause 6.2.2 of IEC 60974-1:2017 applies.

6.2.3 Automatic discharge of supply circuit capacitors

Subclause 6.2.3 of IEC 60974-1:2017 applies.

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6.2.4 Isolation of the welding circuit

Subclause 6.2.4 of IEC 60974-1:2017 applies.

6.2.5 Welding circuit touch current

For class I stand-alone WIRE FEEDERS, 6.2.5 of IEC 60974-1:2017 applies.

6.2.6 Touch current in normal condition

Subclause 6.2.6 of IEC 60974-1:2017 applies.

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

6.3.1 Protective provisions

WIRE FEEDERS shall be class I, class II or class III equipment in accordance with IEC 61140, with the exception of the welding circuit.

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

Connection of exposed conductive parts to the protective conductor is required if the WIRE FEEDER is rated for supply voltages above SELV. The protective conductor connection shall be secured to the frame or enclosure by a screw or fastening that shall not require removal during any servicing operation. Solder alone shall not be used for securing the protective conductor terminals. This terminal shall not be used for any other purpose (such as for clamping two parts of the casing together).

The welding circuit and conductive parts connected to the welding circuit shall not be connected to the protective conductor.

Where a protective conductor is used, it shall be protected against damage by stray welding currents, for example, by:

a) a device to sense welding current in the protective earth conductor under a fault condition and to de-energize the welding circuit or
b) insulation of the relevant metal parts, for example, by an enclosure.

Conformity of designs in line with example a) shall be tested by:

1) testing that a current not greater than the rated current value of the protective conductor does de-energize the welding circuit;
2) passing the maximum rated welding current through the protective conductor until the welding circuit is de-energized without damage.

Conformity of designs in line with example b) shall be checked by visual inspection.

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

Subclause 6.3.2 of IEC 60974-1:2017 applies.

6.3.3 Internal conductors and connections

Subclause 6.3.3 of IEC 60974-1:2017 applies.

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6.3.4 Isolation of the welding circuit from the frame

Live parts at welding potential (for example, filler wire, wire spool, DRIVE ROLLS) shall be isolated from the WIRE FEEDER frame or other structure to which they are attached by basic insulation (minimum clearances are specified in Table 1 of IEC 60974-1:2017 and minimum creepage distances are specified in Table 2 of IEC 60974-1:2017).

Conformity shall be checked as specified in 6.1.2 and 6.1.3 of IEC 60974-1:2017.

6.3.5 Touch current in fault condition

For class I stand-alone WIRE FEEDERS, 6.3.6 of IEC 60974-1:2017 applies.

6.4 Power supply to external devices connected to the welding circuit

The supply voltage shall be supplied from the supply network provided that the requirements of 6.3.1 are met or be supplied from a welding power source as specified in 11.5 of IEC 60974-1:2017.

6.5 Overcurrent protection of the supply circuit

Internal wiring shall be protected by an overcurrent protective device such as a fuse or circuit-breaker.

If a WIRE FEEDER is designed for use with a specific welding power source, the overcurrent protective device may be within the welding power source.

Conformity shall be checked by visual inspection.

6.6 Cable anchorage

The supply cable anchorage of WIRE FEEDERS which are supplied by a voltage in excess of safety extra-low voltage (SELV) shall meet the requirements of 10.6 of IEC 60974-1:2017, except for those powered from the welding circuit.

6.7 Auxiliary power supply

Subclause 11.6 of IEC 60974-1:2017 applies.

6.8 Inlet openings

Subclause 10.7 of IEC 60974-1:2017 applies.

6.9 Welding circuit connections

6.9.1 Protection against unintentional contact

Welding circuit output connections, with or without welding cables connected, and welding circuit input connections with welding cables connected, shall be protected against unintentional contact by persons or by metal objects, for example vehicles, crane hooks, etc.

The following are examples of how such protection can be afforded.

a) Any live part of a coupling device is recessed behind the plane of the access opening. Devices complying with IEC 60974-12 meet the requirement.

b) A hinged cover or a protective guard is provided.

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Conformity shall be checked by visual inspection.

6.9.2 Location of coupling devices

Uncovered output coupling devices shall be located so that their openings are not tilted upwards.

NOTE Coupling devices fitted with an automatic closing device can have their openings tilted upwards.

Conformity shall be checked by visual inspection.

6.9.3 Outlet openings

Where welding cables pass through metallic parts, the edges of the opening shall be smoothly rounded with a radius of at least 1,5 mm.

Conformity shall be checked by visual inspection.

6.9.4 Marking

Connections designed specifically for attachment to the workpiece or to the electrode shall be so identified.

For DC WIRE FEEDERS' welding power sources, the polarity shall be clearly marked, either on the welding output connections or on the polarity selector.

Conformity shall be checked by visual inspection.

6.10 Control circuits

Clause 12 of IEC 60974-1:2017 applies.

6.11 Isolation of hanging means

If an attachment is provided for hanging the WIRE FEEDER during welding, the attachment shall be electrically insulated from the WIRE FEEDER enclosure.

The instructions shall include a warning stating that if an alternative method of support is used, insulation shall be provided between the WIRE FEEDER enclosure and the support.

Conformity shall be checked by visual inspection.

7 Liquid cooling system

Component parts of WIRE FEEDERS through which cooling liquid flows shall be capable of operating at an inlet pressure up to 0,5 MPa (5 bar) and with a coolant temperature up to 70 °C without leaking.

Conformity shall be checked by visual inspection while applying 0,75 MPa (7,5 bar) for 120 s at test conditions specified in 5.1.

8 Shielding gas supply

Component parts of WIRE FEEDERS through which shielding gas flows and which are under pressure when the gas valve is closed, shall be capable of operating at an inlet pressure up

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to 0,5 MPa (5 bar) without leaking. In the case where multiple valves are used, they shall be tested independently.

Conformity shall be checked by visual inspection (e.g. liquid soap bubble test or pressure drop test) while blocking the gas valve and applying an inlet pressure of 0,75 MPa (7,5 bar) for 30 s.

9 Thermal requirements

The WIRE FEEDER motor shall be loaded to provide a current corresponding to the MAXIMUM LOAD in accordance with 11.7 for all tests.

WIRE FEEDERS designed for use with manual torches shall be capable of operating at rated welding current at 60 % duty cycle (6 min "on" and 4 min "off") without causing any component to exceed its rated temperature.

WIRE FEEDERS designed for use with mechanically guided torches shall be capable of operating at rated welding current at 100 % duty cycle without causing any component to exceed its rated temperature.

Where a WIRE FEEDER and a power source are housed in a single enclosure, the WIRE FEEDER shall be capable of operating at the duty cycle corresponding to the rated maximum welding current of the power source.

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

Additionally, the WIRE FEEDER shall meet the requirements specified in the first five paragraphs of Clause 9 when it is cycled for 4 s "on" and 2 s "off" during the 6 min "on" time of the duty cycle specified in the second paragraph of Clause 9.

Current-carrying components shall be capable of carrying the rated welding current without causing the external surface temperatures of the WIRE FEEDER specified in Table 7 of IEC 60974-1:2017 to be exceeded. External surface temperatures in restricted access areas, e.g. robotic applications, or covered areas in normal use, e.g. welding circuit, may exceed the limits of Table 7 of IEC 60974-1:2017 up to a rise of 60 K over ambient temperature, if marked with the following symbol IEC 60417-5041:2002-10:

Conformity shall be checked by measurement in accordance with 7.2 of IEC 60974-1:2017 with the WIRE FEEDER loaded to the MAXIMUM LOAD.

10 Abnormal operation

10.1 General requirements

A stand-alone WIRE FEEDER which relies on motor-driven fan(s) for conformity with the tests of Clause 9 shall neither breakdown nor increase the risk of electric shock or fire, under the conditions of operation of 10.2. These tests are conducted without regard to temperature attained on any part, or to the continued proper functioning of the WIRE FEEDER. The only criterion is that the WIRE FEEDER does not become unsafe. These tests may be conducted on any WIRE FEEDER that functions correctly.

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