

INTERNATIONAL STANDARD



Arc welding equipment – iTeh Standards
Part 10: Electromagnetic compatibility (EMC) requirements
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INTERNATIONAL ELECTROTECHNICAL COMMISSION

ARC WELDING EQUIPMENT –

Part 10: Electromagnetic compatibility (EMC) requirements

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International Standard IEC 60974-10 has been prepared by IEC technical committee 26: Electric welding.

This fourth edition cancels and replaces the third edition published in 2014 and its Amendment 1:2015. This edition constitutes a technical revision.

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

- a) updated normative references;
- b) requirements for battery powered equipment;
- c) requirements for equipment combined with radio transmitters/receivers.

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

FDIS	Report on voting
26/695/FDIS	26/697/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.

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

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- withdrawn,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 10: Electromagnetic compatibility (EMC) requirements

1 Scope

~~This part of IEC 60974 specifies~~

- ~~a) applicable standards and test methods for radio-frequency (RF) emissions;~~
- ~~b) applicable standards and test methods for harmonic current emission, voltage fluctuations and flicker;~~
- ~~c) immunity requirements and test methods for continuous and transient, conducted and radiated disturbances including electrostatic discharges.~~

This part of IEC 60974 is applicable to equipment for arc welding and allied processes, including power sources and ancillary equipment, for example wire feeders, liquid cooling systems, arc striking and stabilizing devices and chargers for battery powered equipment.

NOTE 1 Allied processes are, for example, plasma cutting and arc stud welding.

NOTE 2 This document does not specify basic safety requirements for arc welding equipment such as protection against electric shock, unsafe operation, insulation coordination and related dielectric tests.

Arc welding equipment containing a radio receiver or transmitter is within the scope of this document.

The radiated emission requirements in this document are not intended to be applicable to the intentional transmissions from a radio transmitter as defined by the ITU nor to any spurious emissions related to these intentional transmitters.

<https://standards.iteh.ai/catalog/standards/iec/85a138b6-8163-4d5e-9fa7-6133ba74f780/iec-60974-10-2020>

This document specifies

- a) applicable standards and test methods for radio-frequency (RF) emissions;
- a) applicable standards and test methods for harmonic current emission, voltage fluctuations and flicker;
- b) immunity requirements and test methods for continuous and transient, conducted and radiated disturbances including electrostatic discharges;
- c) additional requirements for equipment powered by internal or external batteries (Annex D);
- d) additional requirements for equipment containing radio frequency transmitters/receivers (Annex E).

Arc welding equipment type tested in accordance with, and which has met the requirements of set in, this document is considered to be in compliance for all applications.

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 (all parts), International Electrotechnical Vocabulary (available at <<http://www.electropedia.org>>)~~

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

IEC 60974-6:2015, *Arc welding equipment – Part 6: Limited duty equipment*

IEC 61000-3-2:2005/2018, *Electromagnetic compatibility (EMC) – Part 3-2: Limits – Limits for harmonic current emissions (equipment input current ≤ 16 A per phase)*

Amendment 1:2008

Amendment 2:2009

IEC 61000-3-3:2013, *Electromagnetic compatibility (EMC) – Part 3-3: Limits – Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current ≤ 16 A per phase and not subject to conditional connection*

IEC 61000-3-3:2013/AMD1:2017

IEC 61000-3-11:2000/2017, *Electromagnetic compatibility (EMC) – Part 3-11: Limits – Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems – Equipment with rated current ≤ 75 A and subject to conditional connection*

IEC 61000-3-12:2011, *Electromagnetic compatibility (EMC) – Part 3-12: Limits for harmonic currents produced by equipment connected to public low-voltage systems with input current > 16 A and $\rightarrow \leq 75$ A per phase*

IEC 61000-4-2:2008, *Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test*

IEC 61000-4-3:2006, *Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test*

IEC 61000-4-3:2006/AMD1:2007

IEC 61000-4-3:2006/AMD2:2010

IEC 61000-4-4:2012, *Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test*

IEC 61000-4-5:2014, *Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test*

IEC 61000-4-5:2014/AMD1:2017

IEC 61000-4-6:2013, *Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields*

IEC 61000-4-11:2004, *Electromagnetic compatibility (EMC) – Part 4-11: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations immunity tests*

IEC 61000-4-11:2004/AMD1:2017

IEC 61000-4-34:2005, *Electromagnetic compatibility (EMC) – Part 4-34: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations immunity tests for equipment with input current more than 16 A per phase*

IEC 61000-4-34:2005/AMD1:2009

IEC 61000-6-1:2016, *Electromagnetic compatibility (EMC) – Part 6-1: Generic standards – Immunity standard for residential, commercial and light-industrial environments*

IEC 61000-6-2:2016, *Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity standard for industrial environments*

IEC 61000-6-3:2006, *Electromagnetic compatibility (EMC) – Part 6-3: Generic standards – Emission standard for residential, commercial and light-industrial environments*
IEC 61000-6-3:2006/AMD1:2010

IEC 61000-6-4:2018, *Electromagnetic compatibility (EMC) – Part 6-4: Generic standards – Emission standard for industrial environments*

CISPR 11:~~2009~~2015, *Industrial, scientific and medical equipment – Radio-frequency disturbance characteristics – Limits and methods of measurement*⁴–
~~Amendment 1:2010~~

CISPR 11:2015/AMD1:2016
CISPR 11:2015/AMD2:2019

CISPR 14-1:2016, *Electromagnetic compatibility – Requirements for household appliances, electric tools and similar apparatus – Part 1: Emission*

CISPR 16-1-1:2019, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-1: Radio disturbance and immunity measuring apparatus – Measuring apparatus*

CISPR 16-1-2:2014, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-2: Radio disturbance and immunity measuring apparatus – ~~Ancillary equipment – Conducted disturbances~~ Coupling devices for conducted disturbance measurements*
CISPR 16-1-2:2014/AMD1:2017

CISPR 16-1-4:2019, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-4: Radio disturbance and immunity measuring apparatus – Antennas and test sites for radiated disturbance measurements*

3 Terms and definitions

IEC 60974-10:2020

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For the purposes of this document, terms and definitions ~~given in IEC 60050-161 concerning EMC and the relevant phenomena, given in IEC 60050-851 on arc welding equipment and in IEC 60974-1 as well as 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

click

disturbance which exceeds the limit of continuous disturbance no longer than 200 ms and which is separated from a subsequent disturbance by at least 200 ms

Note 1 to entry: Both intervals are related to the level of the limit of continuous disturbance.

Note 2 to entry: A click may contain a number of impulses, in which case the relevant time is that from the beginning of the first to the end of the last impulse.

[SOURCE: IEC 60050-851:2008, 851-15-13]

⁴–~~There exists a consolidated edition 5.1 (2010) that includes Edition 5 and its Amendment 1.~~

3.2 coupling network

electrical circuit for transferring energy from one circuit to another with a defined impedance

Note 1 to entry: Coupling and decoupling devices can be integrated into one box (coupling and decoupling network (CDN)) or they can be in separate networks.

[SOURCE:IEC 61000-4-6:2013, 3.7]

~~3.3 EUT equipment under test~~

3.3 CDN coupling/decoupling network

electrical circuit incorporating the functions of both the coupling and decoupling networks

[SOURCE:IEC 61000-4-6:2013, 3.8]

3.4 decoupling network decoupling device

electrical circuit for preventing test signals applied to the equipment under test (EUT) from affecting other devices, equipment or systems that are not under test

[SOURCE:IEC 61000-4-6:2013, 3.9]

~~3.4 idle state operating state in which the power is switched on and the welding circuit is not energized~~

Note 1 to entry:— For some types of equipment there is no idle state, but an operating state preceding arc striking, when the welding circuit is energized.

Note 2 to entry:— Idle state is different from standby mode, when the power is switched off.

3.5 FAR fully-anechoic room

shielded enclosure, the internal surfaces of which are lined with radio-frequency-energy absorbing material (i.e. RF absorber) that absorbs electromagnetic energy in the frequency range of interest

[SOURCE: CISPR 11:2015/AMD1:2016, 3.20]

3.6 OATS open-area test site

facility used for measurements of electromagnetic fields the intention for which is to simulate a semi-free-space environment over a specified frequency range that is used for radiated emission testing of products

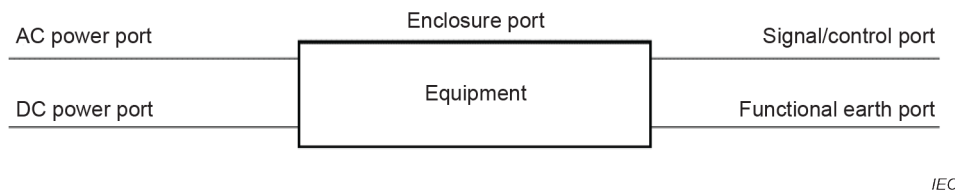
Note 1 to entry: An OATS typically is located outdoors in an open area, and has an electrically-conducting ground plane.

[SOURCE: CISPR 11:2015/AMD1:2016, 3.21]

3.7 port

particular interface of an equipment which couples this equipment with the external electromagnetic environment (IEC 60050-161:2018, 161-01-01) and through which the equipment is influenced by this environment

EXAMPLE Examples of ports of interest are shown in Figure 1. The enclosure port is the physical boundary of the apparatus (e.g. enclosure). The enclosure port provides for radiated and electrostatic discharge (IEC 60050-161:2018, 161-01-22) energy transfer, whereas the other ports provide for conducted energy transfer.



IEC

Figure 1 – Examples of ports

Note 1 to entry: Ports in the subject area of electromagnetic compatibility are specific cases of the port defined in IEC 60050-131:2002, 131-12-60.

[SOURCE: IEC Guide 107:2014, 3.1.12, modified – The presentation of the term and the wording of the definition have been revised for compatibility with IEC 60050 (all parts).]

3.8 portable, adj

capable to be carried by one person

Note 1 to entry: Portability is typically specified by the equipment manufacturer based on the intended use, the equipment design and/or local regulation.

[SOURCE: IEC 60050-151:2001, 151-16-47, modified – The note to entry has been entirely redrafted.]

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3.9 SAC

semi-anechoic chamber

shielded enclosure, in which five of the six internal surfaces are lined with radio-frequency energy absorbing material (i.e. RF absorber) that absorbs electromagnetic energy in the frequency range of interest, and the bottom horizontal surface is a conducting ground plane for use with OATS test set-ups

[SOURCE: CISPR 11:2015/AMD1:2016, 3.22]

3.10 small equipment

equipment, either positioned on a table top or standing on the floor which, including its cables fits in an imaginary cylindrical test volume of 1,2 m in diameter and 1,5 m height (above the ground plane)

[SOURCE: ~~CISPR 11:2009, Amendment 1:2010, 3.10~~ CISPR 11:2015, 3.17, modified – Replacement of the term "small size equipment" by "small equipment"]

3.11 wired network port

PORT for the connection of voice, data and signalling transfers intended to interconnect widely-dispersed systems by direct connection to a single-user or multi-user communication network

Note 1 to entry: Examples of these include CATV, PSTN, ISDN, xDSL, LAN and similar networks.

Note 2 to entry: These PORTS may support screened or unshielded cables and may also carry AC or DC power where this is an integral part of the telecommunication specification.

[SOURCE: CISPR 32:2015, 3.1.32]

4 General test requirements

4.1 Test conditions

Tests shall be carried out on completely assembled equipment representative of the series production. Tests shall be performed within the specified operating conditions given in IEC 60974-1:2017 and IEC 60974-1:2017/AMD1:2019 or IEC 60974-6:2015, and at the rated supply voltage and frequency. Results obtained for RF emission and immunity at 50 Hz are valid for the same model operating at 60 Hz and vice versa.

Where this document gives options for testing particular requirements with a choice of test methods, compliance can be shown against any of the test methods, using the specified limits with the restrictions provided in the relevant tables.

Identical units may be used for testing in parallel. In this case, this information shall be recorded in the test report.

4.2 Measuring instruments

The measuring equipment shall comply with the requirements of CISPR 16-1-1:2019 and the standards referred to in ~~Tables 1, 2 and 3~~ Table 6, Table 7 and Table 8 as applicable.

4.3 Artificial mains network

Measurement of the mains terminal disturbance voltage shall be made using an artificial mains network, if commercially available, consisting of $50 \Omega/50 \mu\text{H}$ or $50 \Omega/50 \mu\text{H} + 5 \Omega$ V-network as specified in CISPR 16-1-2:2014 and CISPR 16-1-2:2014/AMD1:2017. <https://www.tee.org.uk/standards/iec-60974-10-2020/>

The artificial network is required to provide a defined impedance at RF across the mains supply at the point of measurement and also to provide for isolation of the equipment under test from ambient noise on the power lines.

4.4 Voltage probe

A voltage probe as specified in CISPR 16-1-2:2014 and CISPR 16-1-2:2014/AMD1:2017 shall be used when the artificial mains network cannot be used. The probe is connected sequentially between each line and the reference earth. The probe shall consist of a blocking capacitor and a resistor such that the total resistance between the line and earth is at least $1\,500 \Omega$. The effect on the accuracy of measurement of the capacitor or any other device which may be used to protect the measuring receiver against dangerous currents shall be either less than 1 dB or allowed for in calibration.

4.5 Antennas

In the frequency range from 30 MHz to ~~4~~ 6 GHz, the antenna(s) used shall be as specified in CISPR 16-1-4:2019.

Measurements shall be made for both horizontal and vertical polarization. ~~The nearest point of the antenna(s) to the ground shall be not less than 0,2 m.~~

On an OATS or in a SAC, the nearest point of the antenna(s) to the ground shall be not less than 0,25 m.