

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Resistance welding equipment –
Part 2: Electromagnetic compatibility (EMC) requirements**

**Matériels de soudage par résistance –
Partie 2: Exigences de compatibilité électromagnétique (CEM)**

IEC 62135-2:2007

<https://standards.iteh.ai/en/standards/iec/9/1a4ba61-527f-462e-b2c5-a2267f5e018d/iec-62135-2-2007>



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CONTENTS

FOREWORD.....	4
1 Scope.....	6
2 Normative references	6
3 Terms and definitions	8
4 General test requirements	8
4.1 Test conditions	8
4.2 Measuring instruments	8
4.3 Artificial mains network	9
4.4 Voltage probe.....	9
4.5 Antennas.....	9
5 Test set-up for emission and immunity.....	9
5.1 General requirements.....	9
5.2 Ancillary equipment.....	10
6 Emission tests.....	10
6.1 Classification of equipment.....	10
6.1.1 Class A equipment	10
6.1.2 Class B equipment	10
6.2 Test conditions.....	10
6.2.1 Test conditions for r.f. tests	10
6.2.2 Test conditions for low-frequency tests.....	10
6.3 Emission limits	11
6.3.1 Mains terminal disturbance voltage.....	11
6.3.2 Electromagnetic radiation disturbance	11
6.3.3 Low-frequency emission limits	12
7 Immunity tests.....	12
7.1 Tests applicability.....	12
7.2 Test conditions.....	12
7.3 Immunity performance criteria	12
7.3.1 Performance criteria A.....	12
7.3.2 Performance criteria B.....	13
7.3.3 Performance criteria C.....	13
7.4 Immunity levels	13
8 Documentation for the purchaser/user	13
Annex A (informative) Limits	16
Bibliography.....	21
Table 1 – Immunity levels – Enclosure.....	15
Table 2 – Immunity levels – AC input power port.....	15
Table 3 – Immunity levels – Ports for process measurement and control lines.....	15
Table A.1 – Mains terminal disturbance voltage limits, idle state	16
Table A.2 – Mains terminal disturbance voltage limits, load conditions.....	16
Table A.3 – Electromagnetic radiation disturbance limits, idle state	17

Table A.4 – Electromagnetic radiation disturbance limits, load conditions	17
Table A.5 – Maximum permissible harmonic current for equipment with input current $I_{1cc} \leq 16$ A	18
Table A.6 – Current emission limits for equipment with 16 A $< I_{1cc} \leq 75$ A other than balanced three-phase equipment	18
Table A.7 – Current emission limits for balanced three-phase equipment with input current 16 A $< I_{1cc} \leq 75$ A	19
Table A.8 – Current emission limits for balanced three-phase equipment with input current 16 A $< I_{1cc} \leq 75$ A under specified conditions	19
Table A.9 – Limits for resistance welding equipment $I_{1cc} \leq 75$ A	20

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RESISTANCE WELDING EQUIPMENT –

Part 2: Electromagnetic compatibility (EMC) requirements

FOREWORD

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International Standard IEC 62135-2 has been prepared by IEC technical committee 26: Electric Welding.

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

CDV	Report on voting
26/342/CDV	26/357/RVC

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.

The list of all the parts of the IEC 62135 series, under the general title *Resistance welding equipment*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result 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

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RESISTANCE WELDING EQUIPMENT –

Part 2: Electromagnetic compatibility (EMC) requirements

1 Scope

This part of IEC 62135 is applicable to equipment for resistance welding and allied processes which are connected to mains supplies with rated voltages up to 1 000 V a.c. r.m.s. This standard does not define safety requirements.

Resistance welding equipment type tested in accordance with, and which has met the requirements of, this standard, shall be deemed to be in compliance for all applications.

The frequency range covered is from 0 Hz to 400 GHz.

This product EMC standard for resistance welding equipment takes precedence over all aspects of the generic standards and no additional EMC tests are required or necessary.

NOTE 1 Typical allied processes are resistance hard and soft soldering or resistance heating achieved by means comparable to resistance welding equipment.

NOTE 2 Limit values are specified for only part of the frequency range.

Resistance welding equipment are classified as Class A and Class B equipment.

This part of IEC 62135 specifies

- a) test methods to be used in conjunction with CISPR 11 to determine radiofrequency (r.f.) emission;
- b) relevant standards and test methods for harmonic current emission, voltage fluctuation and flicker.

NOTE 3 The limits in this standard may not, however, provide full protection against interference to radio and television reception when the resistance welding equipment is used closer than 30 m to the receiving antenna(e).

NOTE 4 In special cases, when highly susceptible apparatus is being used in close proximity, additional mitigation measures may have to be employed to further reduce the electromagnetic emissions.

This part of IEC 62135 also defines immunity requirements and test methods for continuous and transient, conducted and radiated disturbances including electrostatic discharges.

NOTE 5 These requirements do not, however, cover extreme cases which are extremely rare.

2 Normative references

The following referenced documents are indispensable for the application 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 60050-161, *International Electrotechnical Vocabulary – Chapter 161: Electromagnetic compatibility*

IEC 60050-851, *International Electrotechnical Vocabulary – Chapter 851: Electric welding*

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

IEC 61000-3-3:1994, *Electromagnetic compatibility (EMC) – Part 3: Limits – Limitation of 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*¹

Amendment 1 (2001)

Amendment 2 (2005)

IEC 61000-3-11:2000, *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 61000-3-12:2004, *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 ≤ 75 A per phase*

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

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

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

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

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

IEC 61000-4-7, *Electromagnetic compatibility (EMC) – Part 4-7: Testing and measurement techniques; General guide on harmonics and interharmonics measurements and instrumentation, for power supply systems and equipment connected thereto*

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

IEC 61000-4-15, *Electromagnetic compatibility (EMC) – Part 4-15: Testing and measurement techniques – Flicker meter - Functional and design specifications*

IEC 62135-1, *Resistance welding equipment – Part 1: Safety requirements*

CISPR 11:2003, *Industrial, scientific and medical (ISM) radio-frequency equipment – Electromagnetic disturbance characteristics – Limits and methods of measurement*

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

CISPR 16-1-1, *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, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-2: Radio disturbance and immunity measuring apparatus – Ancillary equipment – Conducted disturbances*

¹ There exists a consolidated edition 1.2 (2005) that includes edition 1 and its amendments 1 and 2.

CISPR 16-1-4, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-4: Radio disturbance and immunity measuring apparatus – Ancillary equipment – Radiated disturbances*

ISO 669, *Resistance welding – Resistance welding equipment – Mechanical and electrical requirements*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply. Terms and definitions relating to EMC may be found in IEC 60050-161 and in CISPR publications. In addition, the terms and definitions relating to resistance welding equipment may be found in IEC 60050-851, IEC 62135-1 and ISO 669.

3.1

cable port

point at which a conductor or a cable is connected to the apparatus

NOTE 1 Examples are signal, control and power ports.

NOTE 2 The secondary circuit of resistance welding equipment is not a cable port but is part of the enclosure port.

3.2

conventional load

load condition with the electrodes short-circuiting as defined in ISO 669:2000

3.3

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.

3.4

enclosure port

physical boundary of the apparatus through which electro-magnetic fields may radiate or impinge

3.5

idle state

operating mode in which the power is switched on, but the welding circuit is not energized

3.6

port

particular interface of the specified apparatus with the external electro-magnetic environment

4 General test requirements

4.1 Test conditions

Tests shall be carried out within the specified operating conditions for the apparatus at its rated supply voltage and frequency as given in IEC 62135-1. Results obtained for r.f. emission and immunity at 50 Hz are valid for the same model operating at 60 Hz and vice versa.

4.2 Measuring instruments

The measuring equipment shall comply with the requirements of CISPR 16-1-1 and the standards referred to in Tables 1, 2 and 3 as applicable.

The measuring equipment for low-frequency emission tests shall be in conformity with the requirements of IEC 61000-4-7 for harmonics and IEC 61000-4-15 for voltage fluctuation.

4.3 Artificial mains network

Measurement of the mains terminal disturbance voltage shall be made using an artificial mains network consisting of 50 Ω /50 μ H V-network as specified in CISPR 16-1-2.

The artificial network is required to provide a defined impedance at r.f. 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 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 Ω . 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 1 GHz the antenna(s) used shall be as specified in CISPR 16-1-4. 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.

5 Test set-up for emission and immunity

5.1 General requirements

Emission and immunity testing shall be carried out on a representative resistance welding installation as described below. Resistance welding equipment tested in such an installation shall be considered to have met the necessary requirements of this standard.

If the resistance welding equipment is part of an installation, or can be connected to auxiliary equipment, then the resistance welding equipment shall be tested whilst connected to the minimum configuration of auxiliary equipment necessary to exercise the ports. If the resistance welding equipment has a large number of similar ports or ports with many similar connections, then a sufficient number shall be selected to simulate actual operating conditions and to ensure that all the different types of termination are covered.

Measurements to determine compliance with the low-frequency emission limits shall be made in accordance with the test procedures of relevant basic and referenced standards.

Specific test set-up geometries for immunity tests are found in the basic standards referred to in Tables 1, 2 and 3.

The configuration of the resistance welding equipment under test shall be precisely noted in the test report.

Class A resistance welding equipment may be measured either on a test site or *in situ* as preferred by the manufacturer.

NOTE Due to size, complexity or operating conditions, some resistance welding equipment may have to be measured *in situ* in order to show compliance with the radiation disturbance limits specified herein.

Class B resistance welding equipment shall be measured on a test site.

5.2 Ancillary equipment

Ancillary equipment shall be tested in conjunction with the resistance welding equipment. It shall be connected and installed as recommended by the manufacturer.

6 Emission tests

6.1 Classification of equipment

6.1.1 Class A equipment

Class A equipment is intended for use in locations other than residential locations where the electrical power is provided by the public low-voltage supply system.

Class A equipment shall meet Class A limits in accordance with 6.3.

6.1.2 Class B equipment

Class B equipment is suitable for use in all locations, including residential locations where the electrical power is provided by the public low-voltage supply system.

Class B equipment shall meet Class B limits in accordance with 6.3.

6.2 Test conditions

6.2.1 Test conditions for r.f. tests

Measurements to determine compliance with the emission limits shall be made in accordance with the test procedures in CISPR 11 and as detailed below, using the test set-up given in Clause 5.

Resistance welding equipment is extremely diverse in its design and working conditions. It shall be tested under the following conditions:

a) idle state

b) loaded

- set up the welding circuit to minimize the impedance and to produce the highest flow of current (i.e., using minimum arms length and gap);
- set up the electrodes in short-circuit condition;
- adjust the current to obtain the highest emission, if means of adjustment is provided;

Example: for thyristor-controlled equipment, an ignition delay angle of 90° electric will give the highest emission value.

- select a duty cycle and a welding heat time appropriate for the tested resistance welding equipment and the requirements of the measuring instrumentation.

The test parameters chosen shall be fully documented.

6.2.2 Test conditions for low-frequency tests

Resistance welding equipment is extremely diverse in its design and working conditions. It shall be tested under the following conditions:

- set up the welding circuit to minimize the impedance and to produce the highest flow of current;
- set up the electrodes in short-circuit condition;
- adjust the current to obtain the highest emission, if means of adjustment is provided;