IEC 61010-2-201

Edition 2.0 2017-03

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Safety requirements for electrical equipment for measurement, control, and laboratory use –
Part 2-201: Particular requirements for control equipment

Exigences de sécurité pour appareils électriques de mesurage, de régulation et de laboratoire –
Partie 2-201: Exigences particulières pour les équipements de commande

IEC 61010-2-201:2017-03(en-fr)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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SAFETY REQUIREMENTS FOR ELECTRICAL EQUIPMENT FOR MEASUREMENT, CONTROL, AND LABORATORY USE –

Part 2-201: Particular requirements for control equipment

FOREWORD

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International Standard IEC 61010-2-201 has been prepared by IEC technical committee 65: Industrial-process measurement, control and automation.

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

FDIS	Report on voting
65/652/FDIS	65/657/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 second edition cancels and replaces the first edition published in 2013. This edition constitutes a technical revision.

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

a) clarify, change, delete definitions which were causing confusion,
b) change and clarify the temperature testing methodology,
c) change documentation methodologies allowed,
d) change some TERMINAL markings,
e) add clarity to some of the informative annexes,
f) add Annex E with changes,
g) add Annexes AA – FF.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

This Part 2-201 is intended to be used in conjunction with IEC 61010-1. It was established on the basis of the third edition (2010) of that standard. Consideration may be given to future editions of, or amendments to, IEC 61010-1.

This Part 2-201 supplements or modifies the corresponding clauses in IEC 61010-1 so as to convert that publication into the IEC standard: *Particular requirements for control equipment*.

Where a particular subclause of Part 1 is not mentioned in this part 2, that subclause applies as far as is reasonable. Where this part states “addition”, “modification”, “replacement”, or “deletion”, the relevant requirement, test specification or NOTE in Part 1 should be adapted accordingly.

In this standard, the following print types are used:

– requirements and definitions: in roman type;
– NOTES: in smaller roman type;
– *conformity and tests: in italic type*;
– terms used throughout this standard which have been defined in Clause 3: SMALL ROMAN CAPITALS.

A list of all parts in the IEC 61010 series, published under the general title *Safety requirements for electrical equipment for measurement, control and laboratory use*, can be found 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 website 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.

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.

INTRODUCTION

IEC 61010-2-2xx documents are a series of standards on safety of industrial-process measurement, control and automation equipment.

This part specifies the complete safety related requirements and related tests for control equipment (e.g. programmable controller (PLC), the components of distributed control systems (DCS), I/O devices, human machine interface (HMI)).

Safety terms of general use are defined in IEC 61010-1. More specific terms are defined in each part of IEC 61010.

SAFETY REQUIREMENTS FOR ELECTRICAL EQUIPMENT FOR MEASUREMENT, CONTROL, AND LABORATORY USE –

Part 2-201: Particular requirements for control equipment

1 Scope and object

This clause of Part 1 is applicable, except as follows.

1.1.1 Equipment included in scope

Replacement:

- This part of IEC 61010 specifies safety requirements and related verification tests for any product performing the function of control equipment and/or their associated peripherals. In addition, these products have as their intended use the command and control of machines, automated manufacturing and industrial processes, e.g. discrete and continuous control. Some equipment examples are: programmable logic controller (PLC);
- programmable automation controller (PAC);
- distributed control systems (DCS);
- remote I/O;
- industrial PC (computers) and panel PC;
- programming and debugging tools (PADTs);
- displays and human-machine interfaces (HMI);
- positioners.

Components of the above named equipment and in the scope of this standard are:

- (auxiliary) stand-alone power supplies;
- peripherals such as digital and analogue I/O, remote-I/O;
- industrial network equipment.

Control equipment and their associated peripherals are intended to be used in an industrial environment and may be provided as OPEN or ENCLOSED EQUIPMENT.

NOTE 1 Control equipment intended also for use in other environments or for other purposes (example: for use in building installations to control light or other electrical installations, or for use on cars, trains or ships) can have additional conformity requirements defined by the safety standard(s) for these applications. These requirements can involve as example: insulation, spacings and power restrictions.

NOTE 2 Computing devices and similar equipment within the scope of IEC 60950 (planned to be replaced by IEC 62368) and conforming to its requirements are considered to be suitable for use with control equipment within the scope of this standard. However, some of the requirements of IEC 60950 for resistance to moisture and liquids are less stringent than those in IEC 61010-1:2010, 5.4.4 second paragraph.

Control equipment covered in this standard is intended for use in OVERVOLTAGE CATEGORY II, III and IV (IEC 60664-1) in low-voltage installations, where the RATED equipment supply voltage does not exceed AC. 1 000 V r.m.s. (50/60 Hz), or DC 1 000 V.

The requirements of ISO/IEC Guide 51 and IEC Guide 104, as they relate to this part of IEC 61010, are incorporated herein.

1.1.2 Equipment excluded from scope

Replacement:

This standard does not deal with aspects of the overall automated system, e.g. a complete assembly line. Control equipment (e.g. DCS and PLC), their application program and their associated peripherals are considered as components (components in this context are items which perform no useful function by themselves) of an overall automated system.

Since control equipment (e.g. DCS and PLC) are component devices, safety considerations for the overall automated system including installation and application are beyond the scope of this standard. Refer to IEC 60364 series of standards or applicable national/local regulations for electrical installation and guidelines.

1.2.1 Aspects included in scope

Replacement:

The purpose of the requirements of this standard is to ensure that all HAZARDS to the OPERATOR, SERVICE PERSONNEL and the surrounding area are reduced to a tolerable level.

NOTE 1 By using the terms "OPERATOR" and "SERVICE PERSONNEL" this standard considers the perception of HAZARDS depending on training and skills. Annex AA gives a general approach in this regard.

Requirements for protection against particular types of HAZARD are given in Clauses 6 to 17, as follows:

a) electric shock or burn (see Clause 6);
b) mechanical HAZARDS (see Clauses 7 and 8);
c) spread of fire from the control equipment (see Clause 9);
d) excessive temperature (see Clause 10);
e) effects of fluids and fluid pressure (see Clause 11);
f) effects of radiation, including lasers sources, and sonic and ultrasonic pressure (see Clause 12);
g) liberated gases, explosion and implosion (see Clause 13);
h) arising from REASONABLY FORESEEABLE MISUSE and ergonomic factors are specified in (see Clause 16);
i) RISK assessment for HAZARDS or environments not fully covered above (see Clause 17).

NOTE 2 Attention is drawn to the existence of additional requirements regarding the health and safety of labour forces.

1.2.2 Aspects excluded from scope

Replacement:

This standard does not cover:

a) reliability, functionality, performance, or other properties of the control equipment not related to safety;
b) mechanical or climatic requirements for operation, transport or storage;
c) EMC requirements (see e.g. IEC 61326 or IEC 61131-2);
d) protective measures for explosive atmospheres (see e.g. IEC 60079 series);
e) functional safety (see e.g. IEC 61508, IEC 61131-6).

2 Normative references

This clause of Part 1 is applicable, except as follows.

Addition:

IEC 60384-14, *Fixed capacitors for use in electronic equipment – Part 14: Sectional specification: Fixed capacitors for electromagnetic interference suppression and connection to the supply mains*

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

IEC 60695-2-11, *Fire hazard testing – Part 2-11: Glowing/hot-wire based test methods – Glow-wire flammability test method for end-products (GWEPT)*

IEC 60695-11-3, *Fire hazard testing – Part 11-3: Test flames – 500 W flames – Apparatus and confirmational test methods*

IEC 60947-5-1, *Low-voltage switchgear and controlgear – Part 5-1: Control circuit devices and switching elements – Electromechanical control circuit devices*

IEC 61010-1:2010, *Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 1: General requirements*

IEC 61010-2-030, *Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 2-030: Particular requirements for testing and measuring circuits*

IEC 61051-2, *Varistors for use in electronic equipment – Part 2: Sectional specification for surge suppression varistors*

IEC 61643-21, *Low voltage surge protective devices – Part 21: Surge protective devices connected to telecommunications and signalling networks – Performance requirements and testing methods*

IEC 61643-311, *Components for low-voltage surge protective devices – Part 311: Performance requirements and test circuits for gas discharge tubes (GDT)*

IEC 61643-321, *Components for low-voltage surge protective devices – Part 321: Specifications for avalanche breakdown diode (ABD)*

IEC 61643-331, *Components for low-voltage surge protective devices – Part 331: Specification for metal oxide varistors (MOV)*

3 Terms and definitions

This clause of Part 1 is applicable, except as follows.

3.2.3
PROTECTIVE CONDUCTOR TERMINAL

Modification:

In this part "PROTECTIVE CONDUCTOR TERMINAL" is replaced by "PROTECTIVE EARTH TERMINAL".

Note 1 to entry: PROTECTIVE EARTH TERMINAL is most familiar to industrial users, manufacturers, etc. Therefore since this part is targeted towards industrial use, the most familiar term is utilized.

3.5.11
OPERATOR

Addition:

Note 1 to entry: See definition in Part 1 and Annex AA.

Add the following terms and definitions:

3.101
AMBIENT TEMPERATURE
temperature, determined under prescribed conditions, of the air surrounding the equipment

3.102
ENCLOSED EQUIPMENT
equipment which includes an ENCLOSURE, having safety capability, or combination of an ENCLOSURE, having safety capability, and installation provisions enclosing on all sides, with the possible exception of its mounting surface, to prevent personnel from accidentally touching HAZARDOUS LIVE, hot or moving parts contained therein and meeting requirements of mechanical strength, flammability, and stability (where applicable)

Note 1 to entry: Examples are portable and HAND-HELD EQUIPMENT.

Note 2 to entry: This definition is related to IEC 60050-441:2000, 441-12-02.

3.103
ENCLOSURE
housing affording the type and degree of protection suitable for the intended application

Note 1 to entry: An ENCLOSURE, in general, may or may not have any safety capabilities, which depend on its application and construction.

Note 2 to entry: In this standard an ENCLOSURE is assumed to have safety capability, unless specifically stated otherwise.

[SOURCE: IEC 60050-195:1998, 195-02-35, modified – the notes to entry have been added]

3.104
EXTERNAL CIRCUIT
circuit connected by FIELD WIRING of the control equipment

3.105
FIELD WIRING
wiring of the control equipment, which is not installed in the control equipment manufacturer's facility

Note 1 to entry: Examples of FIELD WIRING are power supply, digital and analogue input and output wiring.

Note 2 to entry: Control equipment manufacturer’s, e.g. pre-assembled or molded cabling is not considered FIELD WIRING.

3.106
MODULAR EQUIPMENT
equipment consisting of different modules such as a Rack, CPU, different I/O-modules, network modules etc.

Note 1 to entry: MODULAR EQUIPMENT can:

a) be OPEN EQUIPMENT or ENCLOSED EQUIPMENT;

b) consist of modules that cannot operate alone or of a basic module that is operational alone and can be enhanced in functions by additional modules;

c) vary in size and functionality depending on the combination and the number of modules;

d) be combined with operational equipment or enhanced in function by the addition of modules by the customer.

3.107
OPEN EQUIPMENT
equipment which does not protect personnel from accidentally touching HAZARDOUS LIVE or moving parts contained therein nor meet requirements of mechanical strength, flammability and stability (where applicable)

Note 1 to entry: See Annex AA.

3.108
OPERATOR

Addition:

Note 1 to entry: See definition in Part 1 and Annex AA of this document.

3.109
PANEL MOUNTED EQUIPMENT
equipment where a portion of the equipment may form part of the ENCLOSURE

Note 1 to entry: See Figure 103.

3.110
PORTABLE EQUIPMENT
equipment intended to be carried by hand and not fixed during NORMAL USE

3.111
PROTECTIVE EXTRA-LOW VOLTAGE CIRCUIT
PELV CIRCUIT

protective earth referenced electrical circuit in which the voltage cannot exceed the following:

NORMAL CONDITION and SINGLE FAULT CONDITION: The AC voltage levels are 30 V r.m.s., 42,4 V peak and the DC voltage level is 60 V. For equipment intended for use in WET LOCATIONS, the AC voltage levels are 16 V r.m.s., 22,6 V peak and the DC voltage level is 35 V.

[SOURCE: IEC 60050-826-12-32:2004, modified – clarified and more fully described]

3.112
SAFETY EXTRA-LOW VOLTAGE CIRCUIT
SELV CIRCUIT
non-protective earth referenced electrical circuit in which the voltage cannot exceed the following:

NORMAL CONDITION and SINGLE FAULT CONDITION: The AC voltage levels are 30 V r.m.s., 42,4 V peak and the DC voltage level is 60 V. For equipment intended for use in WET LOCATIONS, the AC voltage levels are 16 V r.m.s., 22,6 V peak and the DC voltage level is 35 V.

[SOURCE: IEC 60050-826-12-31:2004, modified – clarified and more fully described]

3.113
SERVICE PERSONNEL
person, with the appropriate technical training, experience and awareness of HAZARDS and of measures to minimize danger to themselves, other persons or to the control equipment, in an industrial environment, changing or repairing the control equipment

Note 1 to entry: SERVICE PERSONNEL are persons having the appropriate technical training and experiences necessary to be aware of HAZARDS – e.g. electrical HAZARDS, temperature HAZARDS, fire HAZARDS – to which they are exposed in performing a task and of measures to minimize danger to themselves or to other persons or to the control equipment, in an industrial environment.

Note 2 to entry: SERVICE PERSONNEL change or repair the control equipment e.g. hardware configuration or installing software updates provided by the manufacturer.

4 Tests

This clause of Part 1 is applicable, except as follows.

4.1 General

Addition:

The product is verified to this standard in a test configuration, defined by the manufacturer, which represents the least favourable configuration. See 4.3.

It is likely or possible that there are different test configurations which yield least favourable test conditions. For example there may be a least favourable configuration for temperature test, and a different least favourable test configuration for voltage test. If this is the case then the appropriate least favourable test configuration(s) shall be used with regard to 4.3.2 and 4.4.

These least favourable test configurations and test conditions shall be practical and useful for the intended applications.

Conformity verification: The selected test configuration(s) and test conditions shall be documented with the rationale in the test report.

4.4.2 Application of fault conditions

Add the following subclause:

4.4.2.101 Switching devices tests

4.4.2.101.1 Overload test

Switching devices shall close and open a test circuit having the current, voltage, and power factor values given in Table 101. Fifty cycles, each consisting of 1 closing and 1 opening, shall be completed using a timing of 1 s ON, 9 s OFF. After completion of the 50 cycles, the equipment shall be subjected to the endurance test in 4.4.2.101.2, if required by 14.102.

Table 101 – Overload test circuit values

Intended load	Current	Voltage	Power factor
AC general use	1,5 × RATED	RATED	0,75 to 0,80
DC general use	1,5 × RATED	RATED	–
AC resistance	1,5 × RATED	RATED	1,0
DC resistance	1,5 × RATED	RATED	–
AC pilot duty [a]	RATED [a]	1,1 × RATED [b]	<0,35
DC pilot duty [a]	RATED [a]	1,1 × RATED [b]	–
NOTE 1 Source IEC 60947-5-1. NOTE 2 Pilot duty = RATING assigned to a relay or switch that controls the coil of another relay or switch.			
[a] Unless otherwise specified, the inrush current shall be 10 times the steady-state current. [b] Set up the EUT at its RATED voltage and current and then increase the voltage by 10 % without further adjustment of the load.			

Conformity, pass/fail, is determined by test completion without electrical/mechanical breakdown of the equipment and an additional dielectric voltage test.

4.4.2.101.2 Endurance test

After completion of the overload test in 4.4.2.101.1, the switching device is to close and open a test circuit having the current, voltage, and power factor values given in Table 102. A total of 6 000 cycles, consisting of 1 closing and 1 opening, shall be completed. The cycle timing shall be 1 s ON and 9 s OFF, except for the first 1 000 cycles of the pilot duty test. The first 1 000 cycles of the pilot duty test shall be at a rate of 1 cycle per second except that the first 10 to 12 cycles are to be as fast as possible.

The endurance test need not be conducted on solid-state output devices for general or resistive use.

Table 102 – Endurance test circuit values

Intended load	Current	Voltage	Power factor
AC general use	RATED	RATED	0,75 to 0,80
DC general use	RATED	RATED	–
AC resistance	RATED	RATED	1,0
DC resistance	RATED	RATED	–
AC pilot duty [a]	RATED	RATED	<0,35
DC pilot duty [a]	RATED	RATED	–
NOTE 1 Source IEC 60947-5-1.			
NOTE 2 Pilot duty = RATING assigned to a relay or switch that controls the coil of another relay or switch.			
[a] The test circuit is identical to the overload test circuit except that the voltage is the RATED voltage.			

Conformity, pass/fail, is determined by test completion without electrical/mechanical breakdown of the equipment and an additional dielectric voltage test.

5 Marking and documentation

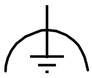
This clause of Part 1 is applicable, except as follows.

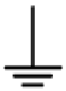
5.1.5.2 TERMINALS

Modification:

Replace item a) as follows:

a) FUNCTIONAL EARTH TERMINALS (i.e. used for non-safety purposes such as interference immunity improvement) shall be marked with one of the following symbols:

 IEC 60417-5018 (2002-10) or

 symbol 5 of Part 1, IEC 60417-5017 (2006-08).

Where a TERMINAL serves both as the PROTECTIVE CONDUCTOR TERMINAL and as a FUNCTIONAL EARTH TERMINAL, symbol 6 and other requirements for PROTECTIVE CONDUCTOR TERMINAL shall be applied. Where a TERMINAL serves both as an earth (bonding) TERMINAL