

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Communication networks and systems for power utility automation –
Part 3: General requirements

Réseaux et systèmes de communication pour l'automatisation
des systèmes électriques –
Partie 3: Exigences générales



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IEC Central Office
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
info@iec.ch
www.iec.ch

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COMMISSION

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International Standard IEC 61850-3 has been prepared by IEC technical committee 57: Power systems management and associated information exchange system.

This second edition cancels and replaces the first edition published in 2002. This edition constitutes a technical revision.

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

- a) requirements are in line with those of other equipment used in the same environment (e.g. protection relays);
- b) product safety added based on IEC 60255-27;
- c) EMC requirements completed and in line with IEC 60255 series and IEC 61000-6-5.

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

FDIS	Report on voting
57/1391/FDIS	57/1416/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.

In this standard, the following print types are used:

- compliance statements: in italic type;
- markings: in bold type and caps.

A list of all parts in the IEC 61850 series, published under the general title *Communication networks and systems for power utility automation*, 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 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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COMMUNICATION NETWORKS AND SYSTEMS FOR POWER UTILITY AUTOMATION –

Part 3: General requirements

1 Scope

This part of IEC 61850 defines the general requirements, mainly regarding construction, design and environmental conditions for utility communication and automation IEDs and systems in power plant and substation environments. These general requirements are in line with requirements for IEDs used in similar environments, for example measuring relays and protection equipment.

When communication or automation IEDs are an integral part of another device in the power plant or substation, then the environmental requirements for the device itself apply to the communications equipment.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60068-2-1:2007, *Environmental testing – Part 2-1: Tests – Test A: Cold*

IEC 60068-2-2:2007, *Environmental testing – Part 2-2: Tests – Test B: Dry heat*

IEC 60068-2-14:2009, *Environmental testing – Part 2-14: Tests – Test N: Change of temperature*

IEC 60068-2-30:2005, *Environmental testing – Part 2-30: Tests – Test Db: Damp heat, cyclic (12 h + 12 h cycle)*

IEC 60068-2-78:2001, *Environmental testing – Part 2-78: Tests – Test Cab: Damp heat, steady state*

IEC 60255-21-1, *Electrical relays – Part 21: Vibration, shock, bump and seismic tests on measuring relays and protection equipment – Section 1: Vibration tests (sinusoidal)*

IEC 60255-21-2, *Electrical relays – Part 21: Vibration, shock, bump and seismic tests on measuring relays and protection equipment – Section 2: Shock and bump tests*

IEC 60255-21-3, *Electrical relays – Part 21: Vibration, shock, bump and seismic tests on measuring relays and protection equipment – Section 3: Seismic tests*

IEC 60255-27:2013, *Measuring relays and protection equipment – Part 27: Product safety requirements*

IEC 60417, *Graphical symbols for use on equipment*. Available from <<http://www.graphical-symbols.info/equipment>>

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

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

IEC 60695-11-10, *Fire hazard testing – Part 11-10: Test flames – 50 W horizontal and vertical flame test methods*

IEC 60825-1, *Safety of laser products – Part 1: Equipment classification and requirements*

IEC 60990:1999, *Methods of measurement of touch current and protective conductor current*

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

IEC 61000-4-3:2008, *Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test*

IEC 61000-4-4:2004, *Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test*

IEC 61000-4-5:2005, *Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test*

IEC 61000-4-6:2008, *Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields*

IEC 61000-4-8:2001, *Electromagnetic compatibility (EMC) – Part 4-8: Testing and measurement techniques – Power frequency magnetic field immunity test*

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 61000-4-16:2002, *Electromagnetic compatibility (EMC) – Part 4-16: Testing and measurement techniques – Test for immunity to conducted, common mode disturbances in the frequency range 0 Hz to 150 kHz*

IEC 61000-4-17:2009, *Electromagnetic compatibility (EMC) – Part 4-17: Testing and measurement techniques – Ripple on d.c. input power port immunity test*

IEC 61000-4-18:2006, *Electromagnetic compatibility (EMC) – Part 4-18: Testing and measurement techniques – Damped oscillatory wave immunity test*

IEC 61000-4-29:2000, *Electromagnetic compatibility (EMC) – Part 4-29: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations on d.c. input power port immunity tests*

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

IEC 61180-1:1992, *High-voltage test techniques for low voltage equipment – Part 1: Definitions, test and procedure requirements*

IEC 61180-2, *High-voltage test techniques for low-voltage equipment – Part 2: Test equipment*

IEC 61850 (all parts), *Communication networks and systems in substations*

IEC/TS 61850-2:2003, *Communication networks and systems in substations – Part 2: Glossary*

IEC 62271-1, *High-voltage switchgear and controlgear – Part 1: Common specifications*

CISPR 22:2008, *Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement*

CISPR 24:2010, *Information technology equipment – Immunity characteristics – Limits and methods of measurement*

ISO 780:1997, *Packaging – Pictorial marking for handling of goods*

ISO 7000, *Graphical symbols for use on equipment – Registered symbols*. Available from <http://www.graphical-symbols.info/equipment>

ISO 9772, *Cellular plastics – Determination of horizontal burning characteristics of small specimens subjected to a small flame*

IEEE 1613:2009, *IEEE standard environmental and testing requirements for communications networking devices installed in electric power substations*

3 Terms, definitions and abbreviations

3.1 Terms and definitions

IEC 61850-3:2013

For the purposes of this document, the terms and definitions given in IEC 61850-2, as well as the following, apply.

3.1.1

accessible part

part which can be touched in normal operational use with a standard rigid or jointed test finger as specified in IEC 60529

Note 1 to entry: Accessible in normal operational use applies mainly to the front of the equipment only, for the purposes of this standard.

Note 2 to entry: A communication circuit/network, which may be connected and taken outside of the cubicle housing, the equipment, or on the front of the panel without the need to open a cover or flap to access it, should be considered to be accessible, i.e. should be PEB, PELV, SELV or equivalent.

[SOURCE: IEC 60050-442:1998, 442-01-15, modified — Notes 1 and 2 to entry have been added.]

3.1.2

adjacent circuits

electric circuits which are separated from the considered circuit by the necessary basic or double/reinforced insulation

Note 1 to entry: Circuits which are separated by far more than double or reinforced insulation are not considered to be adjacent.

[SOURCE: IEC 60255-27:2013, 3.2]

3.1.3

ambient air temperature

temperature, determined under prescribed conditions, of the air surrounding the complete equipment

Note 1 to entry: For equipment installed inside an enclosure, it is the temperature of the air outside the enclosure.

Note 2 to entry: The ambient temperature is measured at half the distance from any neighbouring equipment, but not more than 300 mm distance from the equipment case, at middle height of the equipment, protected from direct heat radiation from the equipment.

[SOURCE: IEC 60255-27:2013, 3.3]

3.1.4

automation

automation system

use of control systems and information technologies to reduce the need for human work in the production, transportation and distribution of energy

3.1.5

barrier

electrically protective barrier

part providing protection against direct contact from any usual direction of access

Note 1 to entry: Barriers may provide protection against the spread of fire (see Clause 7).

[SOURCE: IEC 60050-826:2004, 826-12-23, modified — Note 1 to entry has been added.]

3.1.6

basic insulation

insulation of hazardous live parts which provides basic protection

Note 1 to entry: This concept does not apply to insulation used exclusively for functional purposes.

[SOURCE: IEC 60050-826:2004, 826-12-14]

3.1.7

bounding surface

outer surface of the equipment case, considered as though metal foil were pressed into contact with accessible surfaces of insulating material

[SOURCE: IEC 60255-27:2013, 3.6]

3.1.8

class I equipment

equipment with basic insulation as provision for basic protection against electric shock and protective bonding as provision for fault protection, such that conductive parts on the outside of the equipment case, cannot become live in the event of a failure of the basic insulation

[SOURCE: IEC 60255-27:2013, 3.7]

3.1.9

class II equipment

equipment with

- basic insulation as provision for basic protection against electric shock, and
- supplementary insulation as provision for fault protection; or
- in which basic protection and fault protection are provided by reinforced insulation

Note 1 to entry: There should be no provision for a protective conductor or reliance upon installation conditions for safety purposes. It is, however, permissible to connect an earth/ground conductor to Class II equipment for functional (for example, EMC) purposes.

[SOURCE: IEC 60255-27:2013, 3.8]

3.1.10

class III equipment

equipment, or parts of an equipment, in which protection against electric shock relies upon supply from SELV or PELV circuits and in which hazardous voltages are not generated

[SOURCE: IEC 60255-27:2013, 3.9]

3.1.11

clearance

shortest distance, measured in air, between two conductive parts, or between a conductive part and the outer bounding surface of the equipment, whether conductive or not

[SOURCE: IEC 60255-27:2013, 3.10]

3.1.12

comparative tracking index

CTI

numerical value of the maximum voltage in volts which a material can withstand without tracking under specified test conditions

[SOURCE: IEC 60050-212:2010, 212-11-59]

3.1.13

communication circuit communication network

circuit/network for receiving and/or transmitting, digital or analogue signals

Note 1 to entry: It may communicate with other circuits via optical, magnetic or electromagnetic radiation means, or metallic connections.

[SOURCE: IEC 60255-27:2013, 3.12]

3.1.14

creepage distance

shortest distance along the surface of a solid insulating material between two conductive parts, or between a conductive part and the bounding surface (accessible part) of the equipment, measured along the surface of insulation

[SOURCE: IEC 60050-151:2001, 151-15-50, modified — "or between a conductive part and the bounding surface (accessible part) of the equipment, measured along the surface of insulation" has been added.]

3.1.15

direct contact

electrical contact of persons with live parts

[SOURCE: IEC 60050-826:2004, 826-03-05, modified — "or animals" has been deleted.]

3.1.16

double insulation

insulation comprising both basic insulation and supplementary insulation

Note 1 to entry: Basic and supplementary insulation are separate, each designed for basic protection against electric shock.

[SOURCE: IEC 60050-195:1998, 195-06-08, modified — Note 1 to entry has been added.]

3.1.17

ELV

extra low voltage

non-primary circuits complying with the following under normal operational conditions:

- not exceeding 33 V r.m.s. a.c. or 70 V d.c. i.e. ELV voltage limits, and
- separated from HLV by at least basic insulation

EXAMPLE 1 Non-primary circuits.

EXAMPLE 2 Analogue/digital inputs and outputs, complying with ELV voltage limits.

EXAMPLE 3 Connections to ELV terminations of other products.

Note 1 to entry: ELV circuits should not be accessible under normal operational conditions.

[SOURCE: IEC 60255-27:2013, Table A.1]

3.1.18

enclosure

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

[SOURCE: IEC 60050-195:1998, 195-02-35]

3.1.19

equipment

single apparatus or set of devices or apparatuses, or a set of main devices of an installation, or all devices necessary to perform a specific task

Note 1 to entry: Examples of equipment are a power transformer, the equipment of a substation, measuring equipment.

Note 2 to entry: For the purpose of this standard, equipment is utility communication and automation equipment.

[SOURCE: IEC 60050-151:2001, 151-11-25, modified — Note 2 to entry has been added.]

3.1.20

equipment under test

EUT

equipment submitted to a test, including any accessories, unless otherwise specified

3.1.21

exposed conductive part

conductive part of electrical equipment, which is accessible and which is not normally live, but which may become live under a single-fault condition

Note 1 to entry: For equipment which is not enclosed, the frame, the fixing devices, etc., may form the exposed conductive parts.

Note 2 to entry: For equipment which is enclosed, the conductive parts which are accessible when the equipment is mounted in its normal position of use, including those of its fixing surface, form the exposed conductive parts.

[SOURCE: IEC 60050-826:2004, 826-12-10, modified — Notes 1 and 2 to entry have been added.]

3.1.22**fire enclosure**

part of the equipment intended to minimize the spread of fire or flames from within

[SOURCE: IEC 60255-27:2013, 3.19]

3.1.23**functional earthing****functional grounding**, en US

earthing a point or points in a system or in an installation or in equipment, for purposes other than electrical safety

[SOURCE: IEC 60050-195, Amendment 1:2001, 195-01-13]

3.1.24**functional insulation**

insulation between conductive parts, necessary for the proper functioning of the equipment

[SOURCE: IEC 60050-195:1998, 195-02-41]

3.1.25**hazardous energy level**

available power level of 240 VA or more, having a duration of 60 s or more, or a stored energy level of 20 J or more (for example, from one or more capacitors), at a potential of 2 V or more

[SOURCE: IEC 60255-27:2013, 3.22]

3.1.26**hazardous live part**

live part at a voltage exceeding 33 V a.c. or 70 V d.c.

[SOURCE: IEC 60050-826:2004, 826-12-13, modified — The voltage values have been provided.]

3.1.27**HLV****hazardous live voltage**

normal operational condition voltage which exceeds 33 V a.c. or 70 V d.c.

[SOURCE: IEC 60255-27:2013, 3.23]

3.1.28**HBf class foamed material**

foamed material tested in the thinnest significant thickness used and classified HBf according to ISO 9772

[SOURCE: IEC 60255-27:2005, 3.27]

3.1.29**HB40 class material**

material tested in the thinnest significant thickness used and classified HB40 according to IEC 60695-11-10

[SOURCE: IEC 60255-27:2013, 3.25]