

INTERNATIONAL STANDARD

IEC 60439-1

Edition 4.1
2004-04

Edition 4:1999 consolidated with amendment 1:2004

Low-voltage switchgear and controlgear assemblies –

Part 1: Type-tested and partially type-tested assemblies

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CONTENTS

FOREWORD.....	9
1 General.....	13
1.1 Scope and object.....	13
1.2 Normative references	13
2 Definitions.....	21
2.1 General.....	21
2.2 Constructional units of ASSEMBLIES	25
2.3 External design of ASSEMBLIES.....	27
2.4 Structural parts of ASSEMBLIES	29
2.5 Conditions of installation of ASSEMBLIES.....	33
2.6 Protective measures with regard to electric shock	33
2.7 Gangways within ASSEMBLIES.....	35
2.8 Electronic functions.....	37
2.9 Insulation co-ordination	37
2.10 Short-circuit currents	41
3 Classification of ASSEMBLIES	43
4 Electrical characteristics of ASSEMBLIES	43
4.1 Rated voltages	43
4.2 Rated current (I_n) (of a circuit of an ASSEMBLY).....	45
4.3 Rated short-time withstand current (I_{cw}) (of a circuit of an ASSEMBLY).....	45
4.4 Rated peak withstand current (I_{pk}) (of a circuit of an ASSEMBLY)	45
4.5 Rated conditional short-circuit current (I_{cc}) (of a circuit of an ASSEMBLY).....	45
4.6 Rated fused short-circuit current (I_{cf}) (of a circuit of an ASSEMBLY).....	47
4.7 Rated diversity factor	47
4.8 Rated frequency.....	47
5 Information to be given regarding the ASSEMBLY	47
5.1 Nameplates.....	47
5.2 Markings	49
5.3 Instructions for installation, operation and maintenance	49
6 Service conditions	51
6.1 Normal service conditions	51
6.2 Special service conditions	55
6.3 Conditions during transport, storage and erection.....	57
7 Design and construction	57
7.1 Mechanical design.....	57
7.2 Enclosure and degree of protection	65
7.3 Temperature rise.....	67
7.4 Protection against electric shock	71
7.5 Short-circuit protection and short-circuit withstand strength.....	87
7.6 Switching devices and components installed in ASSEMBLIES.....	95
7.7 Internal separation of ASSEMBLIES by barriers or partitions	105

7.8	Electrical connections inside an ASSEMBLY: bars and insulated conductors	107
7.9	Requirements for electronic equipment supply circuits	109
7.10	Electromagnetic compatibility (EMC)	113
7.11	Description of the types of electrical connections of functional units	117
8	Test specifications.....	119
8.1	Classification of tests	119
8.2	Type tests	121
8.3	Routine tests.....	153
Annex A (normative) Minimum and maximum cross-sections of copper conductors suitable for connection.....		
		163
Annex B (normative) Method of calculating the cross-sectional area of protective conductors with regard to thermal stresses due to currents of short duration.....		
		165
Annex C (<i>deleted</i>).....		
		167
Annex D (informative) Forms of internal separations		
		169
Annex E (informative) Items subject to agreement between manufacturer and user		
		175
Annex F (normative) Measurement of creepage distances and clearances.....		
		177
Annex G (normative) Correlation between the nominal voltage of the supply system and the rated impulse withstand voltage of the equipment		
		187
Annex H (normative) Electromagnetic compatibility (EMC).....		
		191
Bibliography.....		
		203
Figure 1	– Ratio $\frac{\hat{U}_i + \Delta u}{\hat{U}_i}$ as a function of time	111
Figure 2	– Maximum permitted harmonic component of the nominal system voltage	113
Figure D.1	– Symbols used in figures D.2.....	169
Figure D.2	– Forms 1 and 2	171
Figure D.2	– Forms 3 and 4	173
Figure F.1	– Measurement of ribs	177
Figure H.1	– Examples of ports	191
Table 1	– Values of rated diversity factor	47
Table 2	– Temperature-rise limits.....	69
Table 3	– Cross-sectional area of protective conductors (PE, PEN)	79
Table 3A	– Cross-sectional area of a copper bonding conductor	81
Table 4	– Standard values for the factor n	91
Table 5	– Conductor selection and installation requirements.....	93
Table 6	– Electrical conditions for the different positions of withdrawable parts.....	103
Table 6A	– Forms of internal separation.....	107
Table 7	– List of verifications and tests to be performed on TTA and PTTA.....	123

Table 8 – Test copper conductors for rated currents up to 400 A inclusive	127
Table 9 – Standard cross-sections of copper conductors corresponding to the rated current	129
Table 10	135
Table 11	135
Table 12 – Relationship between prospective fault current and diameter of copper wire	141
Table 13 – Dielectric withstand voltages for impulse, power frequency and d.c. tests.....	157
Table 14 – Minimum clearances in air	157
Table 15 – Test voltages across the open contacts of equipment suitable for isolation.....	159
Table 16 – Minimum creepage distances	161
Table A.1	163
Table B.1 – Values of k for insulated protective conductors not incorporated in cables, or bare protective conductors in contact with cable covering	165
Table G.1 – Correspondence between the nominal voltage of the supply system and the equipment rated impulse withstand voltage, in the case of overvoltage protection by surge-arresters according to IEC 60099-1.....	189
Table H.1 – Emission limits for Environment A.....	195
Table H.2 – Emission limits for Environment B.....	195
Table H.3 – Tests for EMC immunity for Environment A.....	197
Table H.4 – Tests for EMC immunity for Environment B	199
Table H.5 – Acceptance criteria when electromagnetic disturbances are present.....	201

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<https://standards.iteh.ai/en/standards/iec/5caf2fd-631e-4e58-95e8-4ce3cf57db83/iec-60439-1-1999>

INTERNATIONAL ELECTROTECHNICAL COMMISSION

LOW-VOLTAGE SWITCHGEAR AND CONTROLGEAR ASSEMBLIES –**Part 1: Type-tested and partially type-tested assemblies**

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International Standard IEC 60439-1 has been prepared by subcommittee 17D: Low-voltage switchgear and controlgear assemblies, of IEC technical committee 17: Switchgear and controlgear.

This consolidated version of IEC 60439-1 consists of the fourth edition (1999) [documents 17D/214A/FDIS and 17D/221/RVD], its amendment 1 (2004) [documents 17D/294/FDIS and 17D/296/RVD] and its corrigendum of November 2004.

The technical content is therefore identical to the base edition and its amendment and has been prepared for user convenience.

It bears the edition number 4.1.

A vertical line in the margin shows where the base publication has been modified by amendment 1.

LOW-VOLTAGE SWITCHGEAR AND CONTROLGEAR ASSEMBLIES –

Part 1: Type-tested and partially type-tested assemblies

1 General

1.1 Scope and object

This International Standard applies to low-voltage switchgear and controlgear ASSEMBLIES (type-tested ASSEMBLIES (TTA) and partially type-tested ASSEMBLIES (PTTA)), the rated voltage of which does not exceed 1 000 V a.c. at frequencies not exceeding 1 000 Hz, or 1 500 V d.c.

This standard also applies to ASSEMBLIES incorporating control and/or power equipment, the frequencies of which are higher. In this case, appropriate additional requirements will apply.

This standard applies to stationary or movable ASSEMBLIES with or without enclosure.

NOTE Additional requirements for certain specific types of assemblies are given in supplementary IEC standards.

This standard applies to ASSEMBLIES intended for use in connection with the generation, transmission, distribution and conversion of electric energy, and for the control of electric energy consuming equipment.

It also applies to ASSEMBLIES designed for use under special service conditions, for example in ships, in rail vehicles, for hoisting equipment or in explosive atmospheres, and for domestic (operated by unskilled persons) applications, provided that the relevant specific requirements are complied with.

This standard applies also to ASSEMBLIES designed for electrical equipment of machines. However, where applicable the additional requirements of IEC 60204-1 have to be fulfilled.

This standard does not apply to individual devices and self-contained components, such as motor starters, fuse switches, electronic equipment, etc. complying with their relevant standards.

The object of this standard is to lay down the definitions and to state the service conditions, construction requirements, technical characteristics and tests for low-voltage switchgear and controlgear ASSEMBLIES.

1.2 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 60038:1983, *IEC standard voltages*

IEC 60050(441):1984, *International Electrotechnical Vocabulary (IEV) – Chapter 441: Switchgear, controlgear and fuses*

IEC 60050(471):1984, *International Electrotechnical Vocabulary (IEV) – Chapter 471: Insulators*

IEC 60050(604):1987, *International Electrotechnical Vocabulary (IEV) – Chapter 604: Generation, transmission and distribution of electricity – Operation*

IEC 60060, *High-voltage test techniques*

IEC 60071-1:1976, *Insulation co-ordination – Part 1: Terms, definitions, principles and rules*

IEC 60073:1996, *Basic and safety principles for man-machine interface, marking and identification – Coding principles for indication devices and actuators*

IEC 60099-1:1991, *Surge arresters – Part 1: Non-linear resistor type gapped surge arresters for a.c. systems*

IEC 60112:1979, *Method for determining the comparative and the proof-tracking indices of solid insulating materials under moist conditions*

IEC 60146-2:1974, *Semiconductor convertors – Part 2: Semiconductor self-commutated convertors*

IEC 60158-2:1982, *Low-voltage controlgear – Part 2: Semiconductor contactors (solid state contactors)*

IEC 60204-1:1997, *Safety of machinery – Electrical equipment of machines – Part 1: General requirements*

IEC 60227-3:1993, *Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V – Part 3: Non-sheathed cables for fixed wiring*

IEC 60227-4:1992, *Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V – Part 4: Sheathed cables for fixed wiring*

IEC 60245-3:1994, *Rubber insulated cables of rated voltages up to and including 450/750 V – Part 3: Heat resistant silicone insulated cables*

IEC 60245-4:1994, *Rubber insulated cables of rated voltages up to and including 450/750 V – Part 4: Cords and flexible cables*

IEC 60269, *Low-voltage fuses*

IEC 60364-3:1993, *Electrical installations of buildings – Part 3: Assessment of general characteristics*

IEC 60364-4-41:1992, *Electrical installations of buildings – Part 4: Protection for safety – Chapter 41: Protection against electric shock*

IEC 60364-4-443:1995, *Electrical installations of buildings – Part 4: Protection for safety – Chapter 44: Protection against overvoltages – Section 443: Protection against overvoltages of atmospheric origin or due to switching* *

IEC 60364-4-46:1981, *Electrical installations of buildings – Part 4: Protection for safety – Chapter 46: Isolation and switches*

IEC 60364-5-54:1980, *Electrical installations of buildings – Part 5: Selection and erection of electrical equipment – Chapter 54: Earthing arrangements and protective conductors*

IEC 60417 (all parts), *Graphical symbols for use on equipment. Index, survey and compilation of the single sheets*

IEC 60445:1988, *Identification of equipment terminals and of terminations of certain designated conductors, including general rules for an alphanumeric system*

IEC 60446:1989, *Identification of conductors by colours or numerals*

IEC 60447:1993, *Man-machine interface (MMI) – Actuating principles*

IEC 60502:1994, *Extruded solid dielectric insulated power cables for rated voltages from 1 kV to 30 kV*

IEC 60529:1989, *Degrees of protection provided by enclosures (IP Code)*

IEC 60664-1:1992, *Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests*

IEC 60695-2-10:2000, *Fire hazard testing - Part 2-10: Glowing/hot-wire based test methods – Glow-wire apparatus and common test procedure*

IEC 60695-2-11:2000, *Fire hazard testing - Part 2-11: Glowing/hot-wire based test methods – Glow-wire flammability test method for end-products*

IEC 60865 (all parts), *Short-circuit currents – Calculation of effects*

IEC 60890:1987, *A method of temperature-rise assessment by extrapolation for partially type-tested assemblies (PTTA) of low-voltage switchgear and controlgear*

IEC 60947-1:1988, *Low-voltage switchgear and controlgear – Part 1: General rules*

IEC 60947-3:1999, *Low-voltage switchgear and controlgear – Part 3: Switches, disconnectors, switch-disconnectors and fuse-combination units*

IEC 60947-4-1:1990, *Low-voltage switchgear and controlgear – Part 4: Contactors and motor-starters – Section 1: Electromechanical contactors and motor-starters*

* There is a consolidated edition 2.1 (1999) that includes IEC 60364-4-443 (1995) and its amendment 1 (1998).

IEC 61000-3-2:2000, *Electromagnetic compatibility (EMC) – Part 3-2: Limits – Limits for harmonic current emissions (equipment input current ≤ 16 A per phase)*

IEC 61000-4-2:1995, *Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques – Section 2: Electrostatic discharge immunity test – Basic EMC Publication*

IEC 61000-4-3:2002, *Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test*

IEC 61000-4-4:1995, *Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques – Section 4: Electrical fast transient burst immunity test – Basic EMC Publication*

IEC 61000-4-5:1995, *Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques – Section 5: Surge immunity tests*

IEC 61000-4-6:2003, *Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields*

IEC 61000-4-8:1993, *Electromagnetic compatibility (EMC) – Part 4-8: Testing and measurement techniques – Power frequency magnetic field immunity test*

IEC 61000-4-11:1994, *Electromagnetic compatibility (EMC) – Part 4-11: Testing and measurement techniques – Voltage dips, short interruptions and voltage variation immunity tests*

IEC 61000-4-13:2002, *Electromagnetic compatibility (EMC) – Part 4-13: Testing and measurement techniques – Harmonics and interharmonics including mains signalling at a.c. power port, low-frequency immunity tests*

IEC 61000-6-3:1996, *Electromagnetic compatibility (EMC) – Part 6-3: Generic standards – Emission standard for residential, commercial and light-industrial environments*

IEC 61000-6-4:1997, *Electromagnetic compatibility (EMC) – Part 6-4: Generic standards – Emission standard for industrial environments*

IEC 61082 (all parts), *Preparation of documents used in electrotechnology*

IEC 61117:1992, *A method for assessing the short-circuit withstand strength of partially type-tested assemblies (PTTA)*

IEC 61346-1:1996, *Industrial systems, installation and equipment and industrial products – Structuring principles and reference designations – Part 1: Basic rules*

CISPR 11:1997, *Industrial, scientific and medical (ISM) radio-frequency equipment – Electromagnetic disturbance characteristics – Limits and methods of measurement Amendment 1 (1999)*

2 Definitions

For the purpose of this International Standard, the following definitions apply.

NOTE Certain definitions in this clause are taken unchanged or modified from those of IEC 60050 (IEV) or from other IEC publications.

2.1 General

2.1.1

low-voltage switchgear and controlgear assembly (ASSEMBLY)

a combination of one or more low-voltage switching devices together with associated control, measuring, signalling, protective, regulating equipment, etc., completely assembled under the responsibility of the manufacturer with all the internal electrical and mechanical interconnections and structural parts (see 2.4)

NOTE 1 Throughout this standard, the abbreviation ASSEMBLY is used for a low-voltage switchgear and controlgear assembly.

NOTE 2 The components of the ASSEMBLY may be electromechanical or electronic.

NOTE 3 For various reasons, for example transport or production, certain steps of assembly may be made in a place outside the factory of the manufacturer.

2.1.1.1

type-tested low-voltage switchgear and controlgear assembly (TTA)

a low-voltage switchgear and controlgear ASSEMBLY conforming to an established type or system without deviations likely to significantly influence the performance, from the typical ASSEMBLY verified to be in accordance with this standard

NOTE 1 Throughout this standard, the abbreviation TTA is used for a type-tested low-voltage switchgear and controlgear assembly.

NOTE 2 For various reasons, for example transport or production, certain steps of assembly may take place outside the factory of the manufacturer of the TTA. Such an ASSEMBLY is considered as a TTA provided the assembly is performed in accordance with the manufacturer's instructions in such a manner that compliance of the established type or system with this standard is assured, including submission to applicable routine tests.

2.1.1.2

partially type-tested low-voltage switchgear and controlgear assembly (PTTA)

a low-voltage switchgear and controlgear ASSEMBLY, containing both type-tested and non-type-tested arrangements, provided that the latter are derived (e.g. by calculation) from type-tested arrangements which have complied with the relevant tests (see table 7).

NOTE Throughout this standard, the abbreviation PTTA is used for a partially type-tested switchgear and controlgear assembly.

2.1.2

main circuit (of an ASSEMBLY)

all the conductive parts of an ASSEMBLY included in a circuit which is intended to transmit electrical energy [IEV 441-13-02]

2.1.3

auxiliary circuit (of an ASSEMBLY)

all the conductive parts of an ASSEMBLY included in a circuit (other than the main circuit) intended to control, measure, signal, regulate, process data, etc. [IEV 441-13-03 modified]

NOTE The auxiliary circuits of an ASSEMBLY include the control and the auxiliary circuits of the switching devices.

2.1.4

busbar

a low-impedance conductor to which several electric circuits can be separately connected

NOTE The term "busbar" does not presuppose the geometrical shape, size or dimensions of the conductor.

2.1.4.1

main busbar

a busbar to which one or several distribution busbars and/or incoming and outgoing units can be connected

2.1.4.2

distribution busbar

a busbar within one section which is connected to a main busbar and from which outgoing units are supplied

2.1.5

functional unit

a part of an ASSEMBLY comprising all the electrical and mechanical elements that contribute to the fulfilment of the same function

NOTE Conductors which are connected to a functional unit but which are external to its compartment or enclosed protected space (e.g. auxiliary cables connected to a common compartment) are not considered to form part of the functional unit.

2.1.6

incoming unit

a functional unit through which electrical energy is normally fed into the ASSEMBLY

2.1.7

outgoing unit

a functional unit through which electrical energy is normally supplied to one or more outgoing circuits

2.1.8

functional group

a group of several functional units which are electrically interconnected for the fulfilment of their operational functions

2.1.9

test situation

condition of an ASSEMBLY or part of it in which the relevant main circuits are open on its supply side but not necessarily isolated whilst the associated auxiliary circuits are connected, allowing tests of the operation of incorporated devices

2.1.10

isolated situation

condition of an ASSEMBLY or part of it in which the relevant main circuits are isolated on their supply side and the associated auxiliary circuits are also isolated

2.1.11

connected situation

a condition of an ASSEMBLY or part of it in which the relevant main circuit and associated auxiliary circuits are connected for their normally intended function