



Your reference guide to safe and reliable LV switchboards

IEC 61439-1 & -2 standard

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IEC 61439-1 & -2

The power of the IEC standard adapted to your needs.

The International Electrotechnical Commission (IEC) standards are legal requirements and market references for all electrical, electronic, and related technologies.

The IEC 61439-1 & -2 is the reference for low-voltage switchgear and control-gear assemblies for electrical LV switchboard construction.

The IEC 61439 standard highlights all the requirements for designers and users of new generation LV switchboards, namely: **people and equipment safety, electrical availability, long-term reliability, and conformity.**

The IEC61439 includes designing a “system” that is compliant in all aspects, and one that tests interactions and consistencies between switchgear and equipment, provides protection against electrical, mechanical, and structural hazards, and simplifies system maintenance and upgrade cycles.

We hope this quick reference guide to the IEC 61439 standard will be a valuable resource and assist you in your next low voltage switchboard design, build, or upgrade. As always, Schneider Electric is here to help. Don't hesitate to visit our website or reach out to your Schneider Electric representative for more details about this or any other product or service.

Schneider Electric and IEC Standards: a long success story

Ever since the construction of its very first electrical switchboard, Schneider Electric has demonstrated its full commitment to assembly manufacturers, in terms of guaranteeing “fully compliant” systems, and much more!

Schneider Electric's position has always been that conformity of its solutions to IEC standards is a minimum requirement — a springboard that enables it to offer its users increased reliability, continuity of service, and compliance. In fact, as an Original Manufacturer, Schneider Electric demonstrates this value-add on a daily basis.

30 years

experience in the construction of tested switchboards (with associated standards).

100%

of switchboard architectures are tested and conform to IEC standards.

Full support

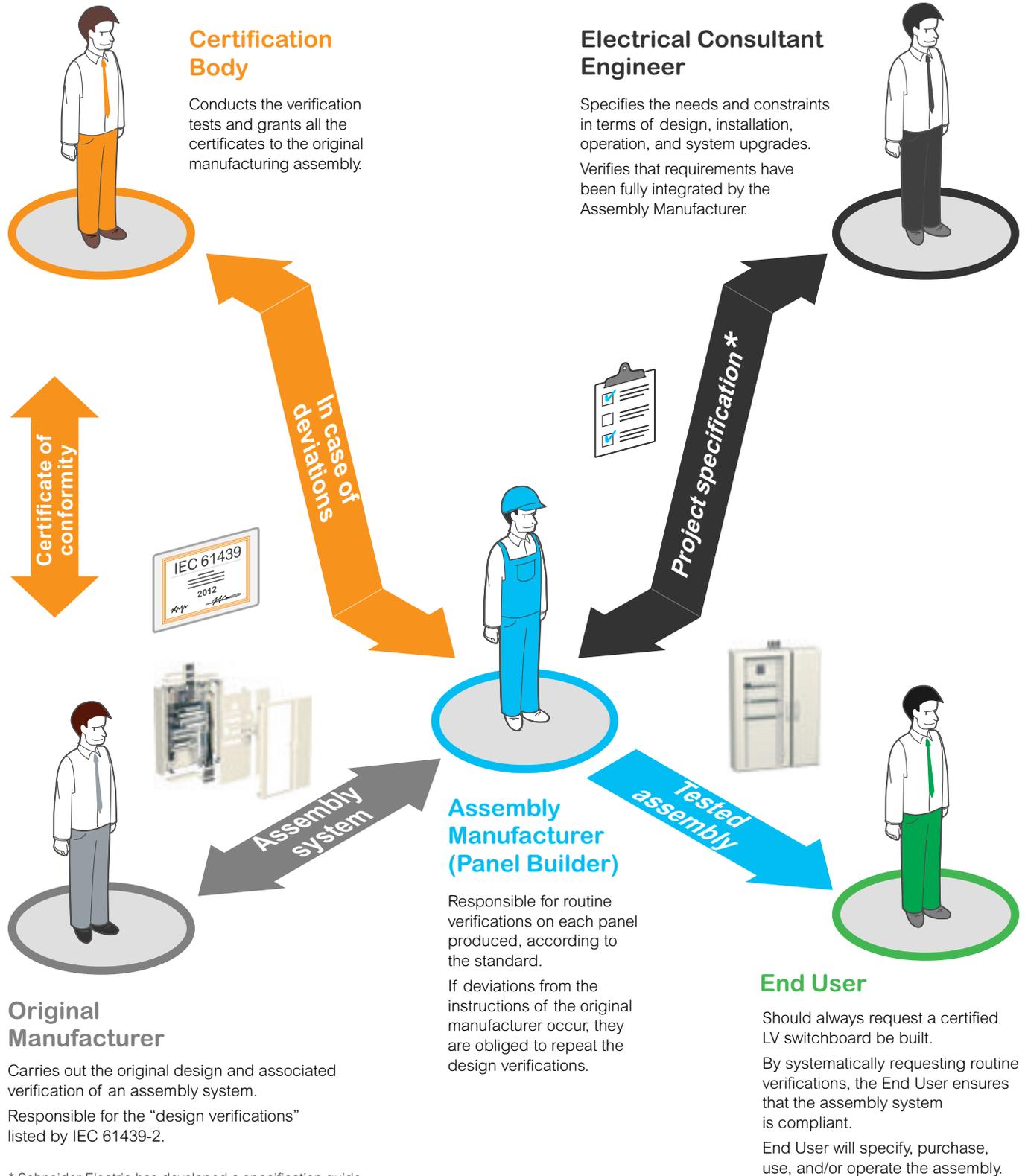
for designers, assemblers, panel builders, and contractors.

4 million

Schneider Electric tested LV electrical distribution switchboards are in operation worldwide.

Roles & Responsibilities

The IEC 61439 standard clearly defines the verifications that must be conducted by all parties involved.



* Schneider Electric has developed a specification guide.

The 10 main functions of IEC 61439 standard

All the verifications proposed by the IEC 61439 standard contribute to the achievement of three basic goals: electrical safety, electrical availability, and compliance with end-user requirements.

The charts below identify the requirements and verifications associated with each goal.

Electrical safety

Voltage stress withstand capability		
Needs and design requirements	Design verification	Routine verification
Insulation to withstand long-term voltages, transient and temporary over voltages guaranteed through clearances, creepage distances, and solid insulation.	<ul style="list-style-type: none"> • Measurement of clearances and creepage distances • Power frequency dielectric test • Impulse withstand voltage test, when clearances are greater than specified values 	<ul style="list-style-type: none"> • Visual inspection of clearances (subject to design conditions and creepage distances) • Power frequency dielectric test

Current-carrying capability		
Needs and design requirements	Design verification	Routine verification
<p>Protect against burns by limiting excessive temperatures:</p> <ul style="list-style-type: none"> • when any single circuit is continuously loaded to its rated current • when any circuit is continuously loaded to its rated current multiplied by its rated diversity factor 	<ul style="list-style-type: none"> • Temperature rise tests • Or comparison with a tested reference design, under restrictive conditions • Or, under very restrictive conditions, calculations with safety margins (including 20% derating of devices) 	<ul style="list-style-type: none"> • Visual inspection • Random verification of tightness

Short-circuit withstand capability		
Needs and design requirements	Design verification	Routine verification
Withstand short-circuit through protection devices, short-circuit coordination, and capability to withstand the stresses resulting from short-circuit currents in all conductors.	<ul style="list-style-type: none"> • Short-circuit tests (I_{cc} and I_{cw}) of the main circuit, including the neutral conductor and of the protection circuit • Or comparison with a tested reference design under restrictive conditions 	<ul style="list-style-type: none"> • Visual inspection

Protection against electric shock

Needs and design requirements	Design verification	Routine verification
Hazardous live parts are not accessible (basic insulation protection) and accessible conductive parts are not hazardous for life (fault protection and continuity of protective equipotential bonding).	<ul style="list-style-type: none"> • IP XXB test and verification of insulating materials • Mechanical operation tests • Verification of dielectric properties • Measurement of the resistance between each exposed conductive part and the PE terminal • Short-circuit strength of the protection circuit 	<ul style="list-style-type: none"> • Visual inspection of basic and fault protection • Random verification of tightness of the protective • Circuit connections

Protection against fire or explosion hazard

Needs and design requirements	Design verification	Routine verification
Protect persons against the fire hazard: resistance to internal glowing faulty elements through selection of materials and design provisions.	<ul style="list-style-type: none"> • Glow wire test • Special test according to IEC TR 61641, where specified 	None

Electrical Availability

Maintenance and modification capability

Needs and design requirements	Design verification	Routine verification
Capability to preserve continuity of supply without impairing safety during assembly maintenance or modification through basic and fault protection and optional removable parts.	<ul style="list-style-type: none"> • IP tests • Mechanical operation tests (especially for removable parts) 	<ul style="list-style-type: none"> • Effectiveness of mechanical actuating elements • Check protection of persons against electric shocks

Electro-Magnetic compatibility

Needs and design requirements	Design verification	Routine verification
Properly function and avoid generation of EMC disturbances through incorporation of electronic devices complying with the relevant EMC standard, and their correct installation.	<ul style="list-style-type: none"> • EMC tests according to product standards or generic EMC standards 	None

Compliance with end-user requirements

Capability to operate the electrical installation		
Needs and design requirements	Design verification	Routine verification
<p>Properly function, according to:</p> <ul style="list-style-type: none"> the electrical diagram and the specifications (voltages, co-ordination, etc.) by selecting, installing, and wiring the appropriate switching devices the specified operating facilities (access to Human-Machine Interfaces, etc.) through accessibility and identification 	<ul style="list-style-type: none"> By inspection Impulse withstand voltage test of isolating distance for optional withdrawable units 	<ul style="list-style-type: none"> Visual inspection Effectiveness of mechanical actuating elements and function test (where relevant)

Capability to be installed on site		
Needs and design requirements	Design verification	Routine verification
<p>Withstand handling, transport, storage, and installation constraints, and be capable to construct and connect through selection or design of the enclosure and the external terminals, and by provisions and documentation.</p>	<ul style="list-style-type: none"> By inspection Lifting test, taken from IEC 62208 	<ul style="list-style-type: none"> Number, type, and identification of terminals for external conductors

Protection of the Assembly against environmental conditions		
Needs and design requirements	Design verification	Routine verification
<p>Protect the assembly against mechanical and atmospheric conditions through selection of materials and design provisions.</p>	<ul style="list-style-type: none"> IP test IK test Corrosion test UV test (outdoor only) 	<p>None</p>



Schneider Electric solutions: 100% IEC 61439 certified

Schneider Electric provides many solutions in accordance with IEC61439-1 and -2 for greater safety, reliability, and maintainability.

Panels



Prisma

Enhance your commercial and industrial low-voltage switchboard design (up to 4,000 A) with Schneider Electric's Prisma range.

- **Highly robust** thanks to new pillar and reinforced door
- **Simplified connectivity** thanks to FDM121 and Linergy TA connection technology
- **Performance** with its metallic trunking support and extension enclosures
- **Seismic 2G tested and certified** in accordance with the IEC 60068-3-3 standard



Okken

Reliable and durable low-voltage switchboards that deliver intelligent power distribution and motor control — up to 7300 A.

- **Industry-leading performance and smart grid-ready.** Seamless integration with energy management and control systems
- Designed to offer **safe operation and maintenance**, and feature comprehensive internal arc and short-circuit protection
- **All components and devices** are designed by Schneider Electric, and offer full switchboard compatibility as well as permanent thermal monitoring
- Designed to **operate in the harshest of environments**, including areas that are prone to seismic activity

Products



Masterpact MTZ

Future Ready Masterpact MTZ is a comprehensive range of air circuit breakers (ACB) designed to protect electrical systems from damage caused by overloads, short circuits, and equipment ground faults. It embeds advanced digital technologies and Micrologic X control units helping to contribute to safety and energy efficiency.



Compact NSX and NSXm

Full range of high performance molded case circuit breakers (MCCB) in three frame sizes designed to meet your needs from thermal-magnetic to advanced Micrologic trip units. This range also features integrated earth leakage protection.



TeSys U

The most compact motor starter. It covers main motor applications (direct on line, reversers, drive protection) from 0 to 15 kW (0 to 32 A) ensuring a breaking capacity of 50 kA with total coordination (according to IEC 60947-6-2).



Linergy

Complete range of power busbars for all switchboard architectures: centralized distribution, insulated system, staged distribution in duct. It is available for both copper or aluminum busbar systems and all IEC 61439 compliant.

Upgrades for enhanced safety and durability

Old

IEC 60439 for "Type Tested" and "Partially Type Tested"				
General Rules	Distribution Boards	Construction Sites	Cable Distribution Cables	Busbar Trunking
IEC 60439-1	IEC 60439-3	IEC 60439-4	IEC 60439-5	IEC 60439-2

VS.

New

IEC 61439 for only "Tested Assemblies" with Design Verification				
General Rules				
IEC 61439-1				
Power SC Assemblies**	Distribution Boards	Construction Sites	Cable Distribution Cables	Busbar Trunking
IEC 61439-2	IEC 60439-3	IEC 60439-4	IEC 60439-5	IEC 60439-6

* IEC 61439-1 & -2 published, January 2009. IEC 61439-3 to -6 published, 2011.

** Switchgear and control gear assemblies.

With the IEC 61439 standard, low voltage switchboard can no longer be Partially Type Tested and must comply with the full assembly tests.

Verification enhancements of the new IEC 61439 standard vs. the old IEC 60439 include the following:

Design verification

- Increased requirements for insulating materials and transient overvoltages withstand tests
- Temperature rise verification:
 - Verification by test of each functional unit loaded alone with its rated current
 - Clear methods for the selection of representative samples of an assembly system to be tested
 - Test done in four steps: individual functional units, main and distribution busbars, and complete assembly
 - Heating resistors only allowed to simulate circuits adjacent to a circuit under test
 - Possible verification by comparison with a tested design under strict conditions, including derating
 - Only allowed up to 1600 A instead of 3150 A under strict conditions, including a 20% derating
- Possible short-circuit withstand verification by comparison with a tested design under strict conditions
- 200 operating cycles instead of 50 for locking, interlocking, and withdrawable parts
- Lifting test (from IEC 62208)
- Corrosion resistance test for metallic parts (from IEC 62208)

Routine verification

- More detailed list of the verifications
- More severe requirements for clearances



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For more information about Schneider Electric's complete LV Switchboard solutions, visit our website or contact your Schneider Electric representative.

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