

IEC 61439-1 & 2 standard

# The reference for safe and reliable LV switchboards



# IEC 61439-1 & 2

## The power of a standard adapted to your needs

IEC standards are today legal or market references.

The new IEC 61439-1 & 2 is **the reference** for the construction of electrical LV switchboards.

IEC 61439 fully satisfies the requirements of designers and users of new generation LV switchboards: **safety of persons and equipment, electrical availability, long-term reliability and conformity.**

To guarantee these essential values, the standard sets a wide range of requirements.

These include designing a “system” compliant in all aspects, **checking interactions** and consistency between switchgear and equipment, providing protection against electrical, mechanical and structural hazards, and simplifying system maintenance and upgrading cycles.



### Schneider Electric/IEC Standard: a long success story

Ever since the construction of its first electrical switchboard, Schneider Electric has never ceased its commitment to Assembly Manufacturers to guarantee “fully compliant” systems, and so much more.

Schneider Electric has always considered that conformity of its solutions to IEC standards was a minimum, a springboard allowing it to go further still in its offer to users. And indeed, in its role as Original Manufacturer, Schneider Electric constantly proves on an everyday basis that it does so.



## 30 years

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

## 100%

of switchboard architectures are tested and conform to IEC standards.

## Full support

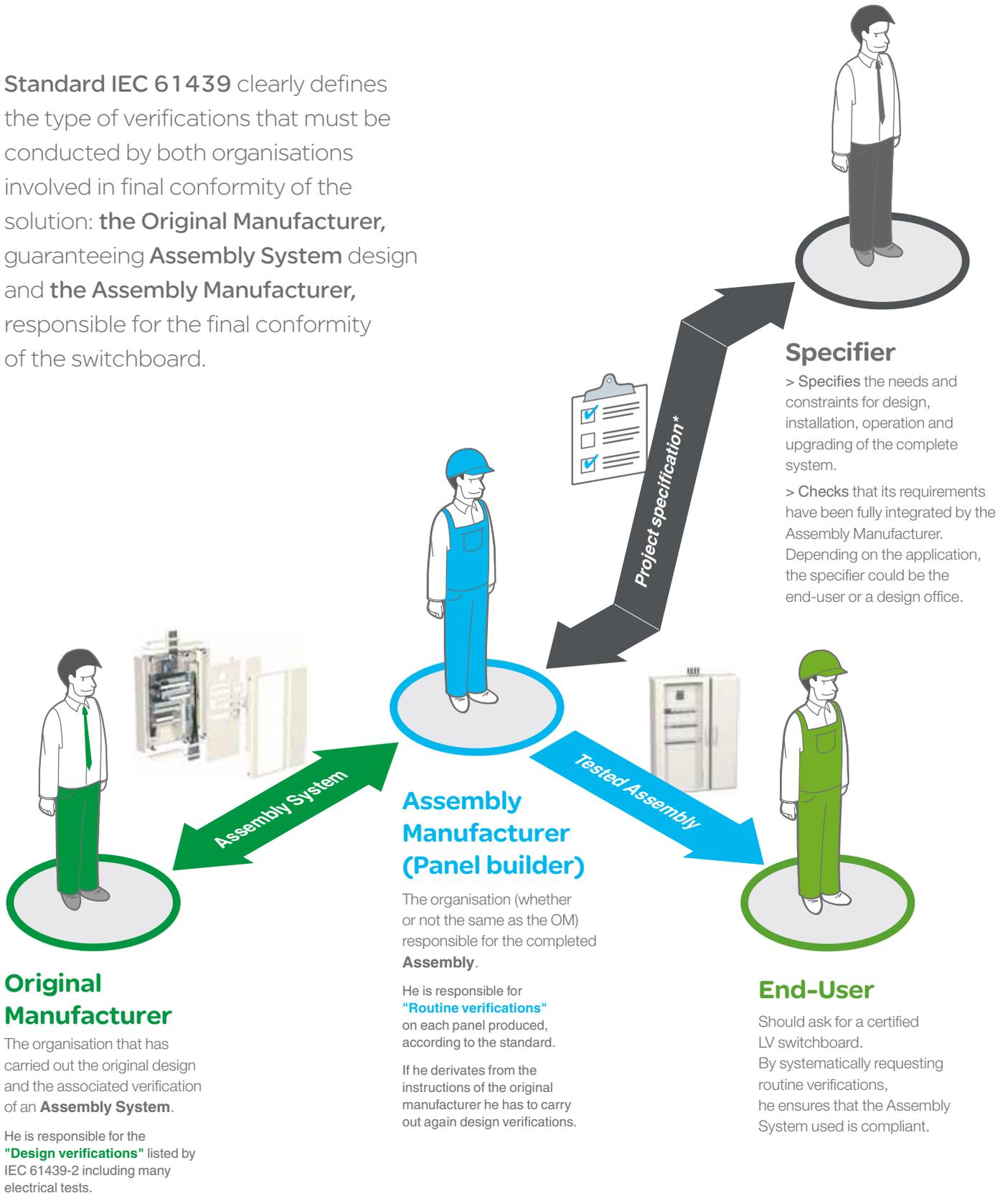
for panel-builders and contractors.

## 3 million

Schneider Electric tested LV electrical distribution switchboards in operation world-wide.

# Original Manufacturer and Assembly Manufacturer: Both involved in tested assemblies

Standard IEC 61439 clearly defines the type of verifications that must be conducted by both organisations involved in final conformity of the solution: **the Original Manufacturer**, guaranteeing **Assembly System** design and **the Assembly Manufacturer**, responsible for the final conformity of the switchboard.



\* Schneider Electric has developed a specification guide.

# The main 10 functions of

All the verifications proposed by standard IEC 61439-1 for safety, continuity of service and compliance with end-user requirements



## Safety

### > Voltage stress withstand capability

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

### > Current-carrying capability

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

### > Short-circuit withstand capability

Needs & design requirements	Design verification	Routine verification
Withstand short-circuit thanks to short-circuit 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"> <li>&gt; Short-circuit tests (I<sub>cc</sub> and I<sub>cw</sub>) of the main circuit, including the neutral conductor, and of the protection circuit</li> <li>&gt; Or comparison with a tested reference design under restrictive conditions</li> </ul>	<ul style="list-style-type: none"> <li>&gt; Visual inspection</li> </ul>

### > Protection against electric shock

Needs & 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"> <li>&gt; IP XXB test and verification of insulating materials</li> <li>&gt; Mechanical operation tests</li> <li>&gt; Verification of dielectric properties</li> <li>&gt; Measurement of the resistance between each exposed conductive part and the PE terminal</li> <li>&gt; Short-circuit strength of the protection circuit</li> </ul>	<ul style="list-style-type: none"> <li>&gt; Visual inspection of basic and fault protection</li> <li>&gt; Random verification of tightness of the protective circuit connections</li> </ul>

### > Protection against fire or explosion hazard

Needs & 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"> <li>&gt; Glow wire test</li> <li>&gt; Special test according to IEC TR 61641, where specified</li> </ul>	<ul style="list-style-type: none"> <li>None</li> </ul>

# of standard IEC 61439

contribute to the achievement of 3 basic goals:  
 - user requirements



## Continuity of service

### > Maintenance and modification capability

Needs & 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"> <li>&gt; IP tests</li> <li>&gt; Mechanical operation tests (especially for removable parts)</li> </ul>	<ul style="list-style-type: none"> <li>&gt; Effectiveness of mechanical actuating elements</li> <li>&gt; Check protection of persons against electric shocks</li> </ul>

### > Electro-Magnetic Compatibility

Needs & 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"> <li>&gt; EMC tests according to product standards or generic EMC standards</li> </ul>	None



## Compliance with end-user requirements

### > Capability to operate the electrical installation

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

### > Capability to be installed on site

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

### > Protection of the Assembly against environmental conditions

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

# IEC 61439 and Schneider Electric

From small tertiary to large industrial sites, Schneider Electric requirements but also improving significantly safety, operating



## Small tertiary / buildings

Offers



### Safety

#### "Linergy" busbar



- Provides optimum performance in low withstand (1s short circuit) with a third of

the weight of equivalent rating copper busbar. Front access to all phase connections enables direct and safer maintenance approach.

- Some 3 times lighter than a standard copper busbar for equivalent short-circuit performances.

#### "Acti9" circuit-breakers



Guarantee total safety during maintenance and absolute protection

against electric shocks, provide zero-risk lockdown, protect loads, etc.

#### Functional units and panel components

Guarantee electrical continuity of Prisma Plus switchboards thanks to scribe system.

#### Fastening grids



Attached to front plates, door hinges and panels, they guarantee

electrical continuity at the 1st assembly ¼ turn.



### Continuity of service

#### "Compact NSX" circuit-breakers



Total discrimination, remote indication of motor overloads and actuation of a contact switch (SDTAM module), direct access to maintenance indicators, etc.

#### "Polypact" row splitter blocks



For practical and reliable device rows: total insulation, reliable connection without maintenance.

#### "Distribloc" centralised splitter blocks



Modular quick-connection monobloc splitter blocks



### Compliance with end-user requirements

#### Specifier guide



A reference support designed by Schneider Electric to guarantee fully compliant specifications (end-users) and assemblies (Assembly Manufacturer).

\* Using only Schneider Electric devices guarantees the compliance with IEC as well as the reliability of installations.

# ic solutions: 100% compatible!

designed a plenty of solutions answering to IEC61439-1 & 2 availability and cost control...for a long time."



Schneider Electric  
Product  
inside\*



Large industrial sites  
Offers



## Safety

### Locking of live parts



High level of safety and protection, preventing all on-load operations: IP20

shields, connections protected by a plug-in outlet, access possible to switchgear only after opening the circuit-breaker and withdrawing the drawers, status indicators to prevent risk of error, etc.

### Thermal monitoring



Thermal monitoring of temperature rises using probes installed at the heart of the

sensitive areas (e.g. busbars, drawer contacts), thus reducing the likelihood of failure and shortening maintenance times.

### "PolyFast" system



The PolyFast partitioned terminals guarantee

perfect insulation of connection against electric shocks.

A Schneider Electric exclusivity!



## Continuity of service

### "Tesy U" motor feeder



- Modular concept offering excellent open-endedness, without uncabling the power base.
- Functional units replaced or added easily, without need for tools.
- 3 in 1 systems are available: simple, open-ended and compact.

### Modularity of functional switchboards

- Can be modified or upgraded easily.
- Free spaces are provided for "last minute" addition of motor feeders or new functions.

### "Masterpact" circuit-breakers



Designed to automatically monitor and manage the energy sources of the LV distribution network, thus guaranteeing installation reliability.



## Compliance with end-user requirements

### Specifier guide

A reference support designed by Schneider Electric to guarantee fully compliant specifications (end-users) and assemblies (Assembly Manufacturer).

### Withdrawable drawers



- All switchboard upgrades are possible with power on, without interruption of service and completely safely.
- 3 positions: connected, test and disconnected.
- Switchboard configurations and settings are made on the front face.

### Withstand to harsh environments

- Excellent mechanical strength for installations in seismic areas and for sensitive applications.
- Various degrees of protection (IP30, IP41 or IP54) for installations in corrosive atmospheres (e.g. cement works, iron and steel, etc.).

# Few upgrades for enhanced safety and durability

## IEC 61439 -1 & -2\* = Only "Tested Assemblies"

new

### General Rules

#### > IEC 61439-1

#### Power SC Assemblies\*\*

#### Distribution Boards

#### Construction Sites

#### Public networks

#### Busbar Trunking

#### > IEC 61439-2

#### > IEC 61439-3

#### > IEC 61439-4

#### > IEC 61439-5

#### > IEC 61439-6

\* IEC 61439-1 & -2 are published since January 2009, and IEC 61439-3 to -6 should be published in 2011.

\*\* Switchgear and Controlgear Assemblies.

## IEC 60439 -1 = "Type Tested" & "partially Type Tested"

old

### General Rules + Type Tested Assemblies / Partially Type Tested Assemblies

#### > IEC 60439-1

#### Distribution Boards

#### Construction Sites

#### Cable Distrib. Cab.

#### Busbar Trunking

#### > IEC 60439-3

#### > IEC 60439-4

#### > IEC 60439-5

#### > IEC 60439-2



## Overview of the main verification changes (IEC 61439 vs IEC 60439)

### > 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 4 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
  - Exemption of test (calculation) 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 condition
- 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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