PRACTICAL GUIDE

Implementation of standard IEC 61439

POWER CONTROL & SAFETY

socomec
Innovative Power Solutions

The benefits of a standard-compliant assembly

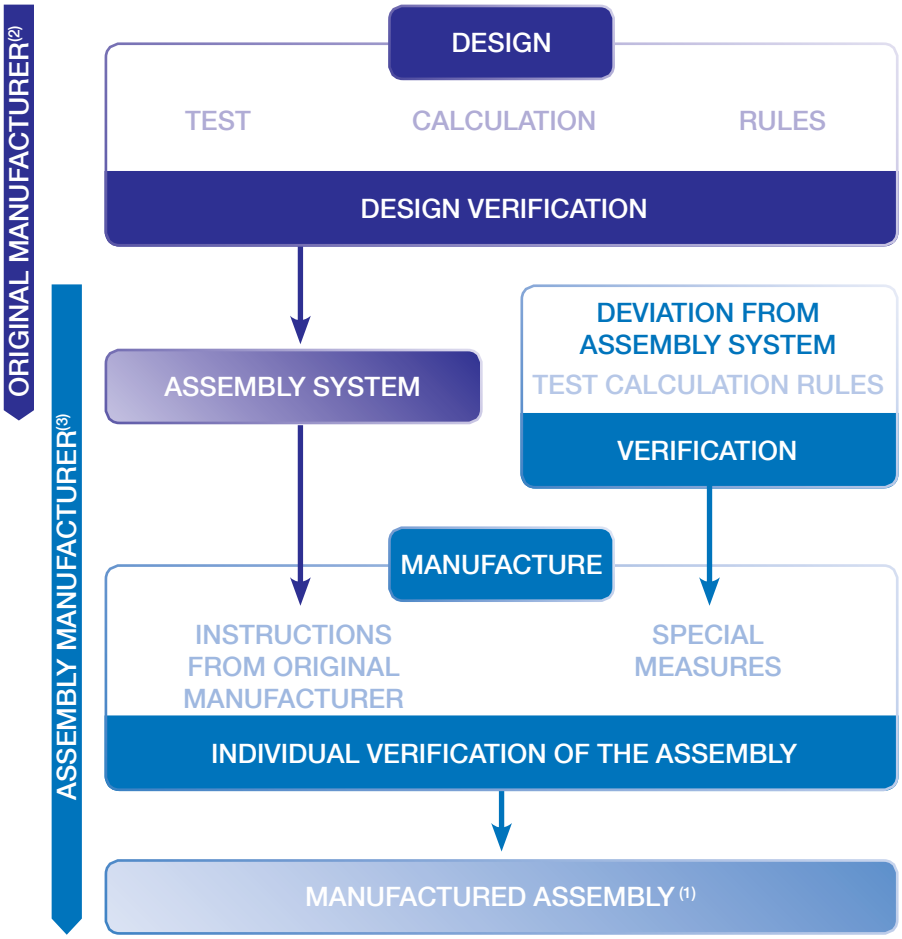
The IEC 61439 series of standards sets out the regulations for power distribution boards as well as assemblies for power distribution in public networks, construction sites, and for prefabricated busbar trunking and cabling systems. The main objectives of the standard cover the safety of persons, the protection of equipment and property, and also the quality, reliability and durability of the investment. IEC 61439-1 defines the general rules and details the verifications to be performed to ensure compliance of the manufactured assembly.

The electrical panel not only distributes power and controls the process; it also ensures the protection of persons and property. This is why it is vital that the quality and performance of this equipment is able to deal effectively with the consequences of a defect, malfunction or total destruction could have for the operator.

IEC 61439 very precisely defines what elements are comprised in **"Low voltage switchgear assemblies"** as well as the procedures for ensuring the achievement of specified levels of performance. The inclusion of this standard ensures that the purchaser will receive equipment that complies to the stated requirement.

Key points:

The standard pays particular attention to:
- systematic verification of each assembly,
- documentary traceability,
- clarification of the specification requirements,
- clarification of the responsibilities and commitments of each project participant.



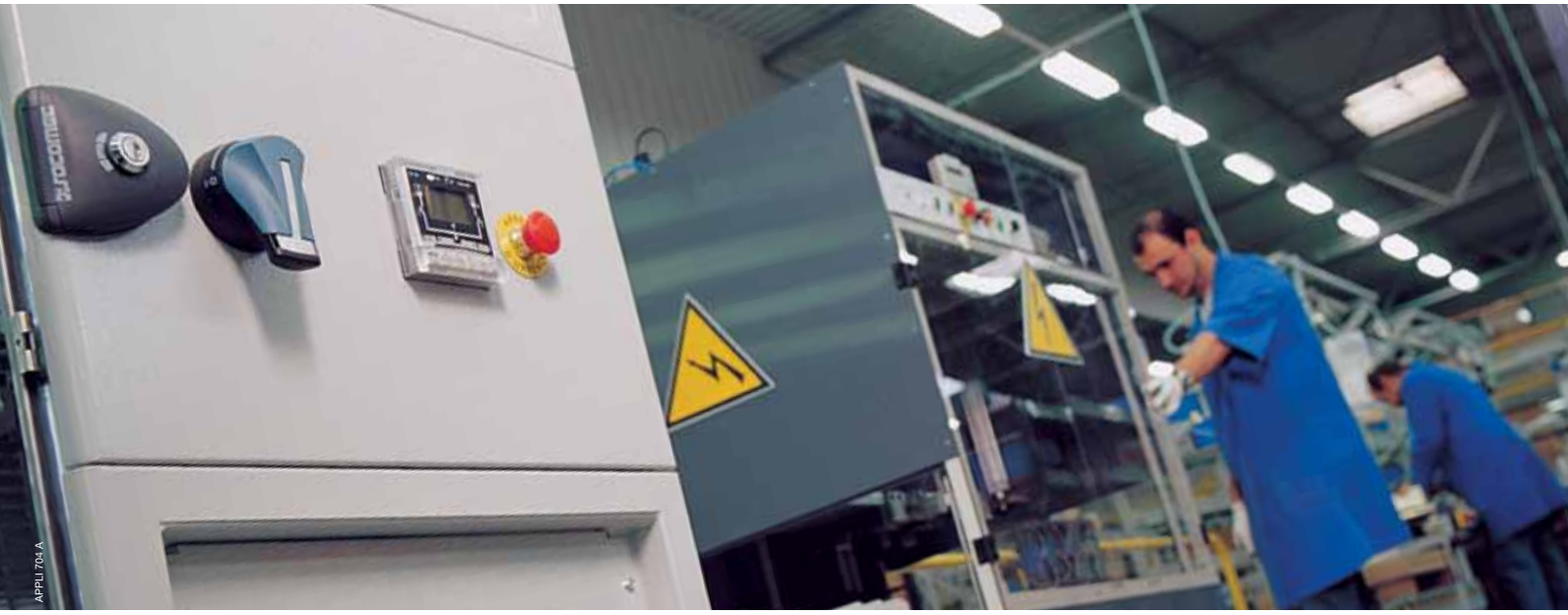
(1) ***Assembly:*** *a complete system (or combination) of electrical and mechanical elements such as enclosures, busbars, functional units, etc.*

(2) ***Original manufacturer:*** *the organisation that has carried out the original design and associated verification of an assembly in accordance with the IEC 61439 standard.*

(3) ***Assembly manufacturer:*** *the organisation taking the responsibility for the completed assembly. This may be a different company than the original manufacturer.*

Socomec, a specialist manufacturer

Our range of products and services allows professionals working in the electricity sector to implement distribution and control gear assemblies that meet market requirements.



Electrical switchgear manufacturer

Backed by over 90 years of experience and expertise in industrial switchgear and protection, we provide **manufacturers of electrical assemblies** with a wide range of fully qualified and documented products and solutions that exactly meet user requirements.

An original manufacturer according to standard IEC 61439

Socomec offers a wide range of **original manufacturer** solutions conforming to standard IEC 61439:

- the Flexys and Cadrys cabinet systems designed for distribution panel applications,
- local switching and equipment cabinets covering requirements in power availability and safety,
- components for integration.

The COFRAC-accredited Pierre Siat testing centre

With its world-class testing centre, Socomec can perform all the **test verifications** required by standard IEC 61439 for assemblies up to 6000 A, 100 kA rms, 690 VAC or 1200 VDC. We can therefore help you to:

- define a verification programme,
- perform conformity tests,
- obtain certified conformity via independent testing bodies (ASEFA, ASTA, DEKRA, etc.).

Socomec, your best asset

Socomec is an independent manufacturing company specialising in the availability, control and safety of low voltage electrical energy. Socomec has complete control of the design, manufacture and marketing of its products and systems. Socomec subscribes to the RESOTABLO initiative launched by the Gimélec trade association*. The approach aims at promoting respect for standards compliance and professionalism throughout the value-added chain that leads to the implementation of a high quality electrical panel.

** An association of electrical equipment and control gear manufacturers and associated services.*

RÉSOTABLO
Distribution & contrôle-commande performants

Find out more about the Pierre Siat testing laboratory.

FLCD-URL 125 A

One process, four phases

Each phase of the proposed process is based on the technical framework set out in IEC 61439-2. In this way, user requirements are properly taken into account as well as ensuring that the implemented assembly meets all requirements in terms of functionality and safety.

Specification phase

The purchaser should precisely specify the main characteristics of the electrical panel in its environment as soon as possible. In addition to the **functional and technical specifications** of the equipment, the operating context should also be specified in terms of external constraints relating to its environment, storage conditions and transport.

Design phase

When designing an assembly system, the original manufacturer should at all times comply with the requirements of IEC standard 61439-2. In this way, the manufacturer develops a fully referenced assembly system that is verified by tests, calculation / measurement or design rules. There are no fewer than **12 steps in the verification process governing the manufacture and levels of performance** that should be performed during the production of an electrical panel.

Manufacturing phase

The assembly manufacturer translates and materialises the purchaser's requirement in the form of a suitable technical solution.
The assembly manufacturer is responsible for the selection and assembly of components, and also for performing 10 routine verifications on each assembly that is produced. Finally, the manufacturer draws up the **declaration of conformity** report, with reference to test certificates and provides documentary traceability.

Delivery phase

An on-site verification of the essential points allows the end user to have an assembly in keeping with their requirements. An **inspection report** may be issued to formalise this procedure.

SPECIFIER

ORIGINAL MANUFACTURER

ASSEMBLY MANUFACTURER

INSTALLER

INSPECTOR

USER

The verifications to be performed

	Original manufacturer	Assembly manufacturer	Inspector
1 **Strength of materials and parts** IEC 61439-1 § 10.2	Verify that the assembly meets the following criteria: • resistance to corrosion, • thermal stability and resistance to abnormal heat and fire of insulating materials, • resistance to ultra-violet (UV) radiation, • resistance to mechanical impact, • durability of marking, • lifting and transport.	Verify that the components meet purchaser requirements and the implementation and operating constraints to come.	Verify that the panel conforms to the environment in which it is to be installed: • flatness of the mounting base or bracket, • sufficient space for operation, ventilation, • ambient temperature, • level of pollution, • dust, salt air and spray, UV, • impacts and vibrations.
2 **Degree of protection of enclosures** IEC 61439-1 § 10.3	Validate protection against direct contact with live parts, as well as protection against ingress of solid foreign objects and liquids, in accordance with IEC 60529.	Visually check that there is no access to live parts (minimum IPxxB) and that the specified IP is respected: the presence of protective covers on sensitive parts, presence of gland plates, etc.	Verify that the degree of protection (IP) is appropriate for the environment in accordance with customer specifications, and that this will be maintained following on-site implementation.
3 **Clearances and creepage distances** IEC 61439-1 § 10.4	Verify that the clearance and creepage distance enable the assembly to withstand the following: • exceptional, transient overvoltage (lightning, HV operations), • operating voltage and temporary overvoltage.	Make sure that the minimum air clearance is higher than or equal to the values indicated in the following table: Rated impulse voltage withstand Uimp (kV) / Minimum clearance (mm) up to 2000 m ≤ 2.5 / 1.5 4 / 3 6 / 5.5 8 / 8 12 / 14 If this is not the case, perform a voltage impulse withstand test (dielectric properties test).	Verify that the clearance and creepage lines defined during the design phase are respected. These should correspond to the operating and overvoltages as well as the environment.
4 **Protection against electrical shock and integrity of protective circuits** IEC 61439-1 § 10.5	Verify: • the effective continuity between the exposed conductive parts of the assembly and the protective circuit, • the short-circuit withstand strength of the protective circuit.	Make sure: • that there are protective screens covering access to dangerous parts (IPxxB), • that the removal of such screens requires the use of an appropriate tool, • of the continuity of the PE (protective conductor) and the correct tightening of connections.	Verify: • the continuity and correct interconnections of protective conductors (or braids), • the correct dimensioning of protective conductors above 10 kA rms.

	Original manufacturer	Assembly manufacturer	Inspector
5 **Incorporation of switching devices and components** IEC 61439-1 § 10.6	Ensure the compliance of equipment implementation in accordance with the rules of manufacture and EMC regulations, if applicable.	Ensure implementation in accordance with the component manufacturer's specifications and instructions, including: • compliance with security perimeters, • compliance with rules for electrical connections, etc.	Verify: • the implementation of the cabling specified by the manufacturer of the equipment, • the agreed Service Index (SI), • the correct combination of components, • the correct equipment ratings, • the accessibility of component indicators and operating elements.
6 **Internal electrical circuits and connections** IEC 61439-1 § 10.7	Verify the conformity of implementation and dimensioning of internal circuits and connections. The following should be carefully checked: • short-circuit withstand strength, • temperature-rise withstand, • the section of the neutral conductor, • identification of the conductors.	Verify: • the compliance of the conductors to the original manufacturer's specifications, • the correct tightening of connections.	Verify: • the section and material of the neutral and other conductors, • the measures implemented to avoid short-circuits, • termination points, • compliance with tightening torques, especially the busbar connectors/fishplate.
7 **Terminals for external conductors** IEC 61439-1 § 10.8	Verify the compliance of implementation and dimensioning of the terminals for external conductors.	Verify that the number, type and identification of the terminals comply with the specifications of the assembly manufacturer. It is obligatory to indicate whether the terminals are suitable for copper or aluminium conductors, or both.	Verify: • that the connection terminals are compatible to the section and material of the conductors, • the recommended bend radiuses.
8 **Dielectric properties** IEC 61439-1 § 10.9	Test each type of circuit in the assembly to ensure: • power-frequency withstand voltage, • impulse withstand voltage.	Via dielectric test, verify that there is no puncture or flashover between phases and exposed conducting parts, and between phase-phase. Equipment not designed to withstand the test voltage indicated in Table 1 should be disconnected. For panels of < 250 A, the properties are validated if the insulation resistance between circuits and earth under 500 V is ≥ 1000 Ω/V.	Verify if there is a dielectric test report issued by the assembly manufacturer.
9 **Verification of temperature rise** IEC 61439-1 § 10.10	Ensure: • thermal stability of the loaded assembly, • that the temperatures are controlled on accessible parts, connections and equipment/devices.	Respect the recommendations of the original manufacturer.	Ensure that the recommendations of the original manufacturer are followed: available volumes, position and distribution of devices, diversity factors, ambient temperature, etc.

	Original manufacturer	Assembly manufacturer	Inspector
10 **Short-circuit withstand strength** IEC 61439-1 § 10.11	In comparison to a tested reference design or by testing, verify the level of withstand assigned to the reported short-circuit current (unless excluded).	Follow the recommendations of the original manufacturer.	Carefully verify each factor that helps to ensure that the short-circuit withstand strength keeps within the correct operating range (see Table 2).
11 **Electromagnetic compatibility** IEC 61439-1 § 10.12	Verify EMC requirements via tests, except if: • the incorporated devices and components comply with ECM requirements for the environment that has been specified; • their installation and cabling comply with the specifications of the manufacturers.	Follow the recommendations of the original manufacturer.	Verify via tests that the assembly does not generate or receive electromagnetic interference. In particular, verify the correct connection of exposed conducting parts, the earth connection, segregation of circuits and communication networks.
12 **Mechanical operation** IEC 61439-1 § 10.13	Verify via tests the mechanical operation of removable parts (including any insertion locking). Enclosures, partitions and fastenings should be able to withstand the wear-and-tear of normal use and under short-circuit condition.	Verify the correct operation of mechanical control elements, locks and locking devices, including those associated with removable parts.	Ensure the manoeuvrability of functional units and the presence of associated accessories. Verify that the technical file is to hand and that it is kept up-to-date.

Table 1: Power-frequency withstand for main circuits (see Point 8: Dielectric properties)

Rated insulation voltage Ui (in V)	Dielectric test voltage (in V)	
	AC (rms)	DC:
Ui ≤ 60	1000	1415
60 < Ui ≤ 300	1500	2120
300 < Ui ≤ 690	1890	2670
690 < Ui ≤ 800	2000	2830
800 < Ui ≤ 1000	2200	3110
1000 < Ui ≤ 1500		3820

Table 2 (see Point 10: short-circuit withstand strength)

Design comparison to be assessed/reference design	Yes	No
Icc lower or the same?	✓	C/T
Busbar and connections section higher or the same?	✓	C/T
Distance between busbar centres and connections higher or the same?	✓	C/T
Busbar supports: type, shape, identical materials and spacing (L)	✓	C/T
Identical materials (Cu, Al)	✓	C/T
• Protective device: manufacture, realisation, type, positioning and identical limiting characteristics • It2 and Ipk higher or the same	✓	T
Unprotected conductors: lower or the same	✓	C/T
Presence of an enclosure (if planned)	✓	T
Dimensions (H, L, D) at least the same	✓	T
Compartments: identical mechanical design and dimensions (H, L, D) at least the same	✓	T

C/T: additional verification can be performed either by calculation/measurement or by tests.
T: additional verification can only be performed by tests.

For more information

Please visit our website

FLCD-URL 126 A

Socomec worldwide

IN EUROPE

BELGIUM
Critical Power / Power Control & Safety / Energy Efficiency / Solar Power Power
Tel. +32 2 340 02 30
Fax +32 2 346 28 99
info.be@socomec.com

FRANCE
Critical Power / Power Control & Safety / Energy Efficiency / Solar Power
Tel. +33 1 45 14 63 00
Fax +33 1 48 67 31 12
dcm.ups.fr@socomec.com

GERMANY
Critical Power
Tel. +49 621 71 68 40
Fax +49 621 71 68 444
info.ups.de@socomec.com

Power Control & Safety / Energy Efficiency
Tel. +49 7243 65292 0
Fax +49 7243 65292 13
info.scp.de@socomec.com

ITALY
Critical Power
Tel.+39 02 98 242 942
Fax +39 02 98 240 723
info.ups.it@socomec.com

Power Control & Safety / Energy Efficiency
Tel.+39 02 98 49 821
Fax +39 02 98 24 33 10
info.scp.it@socomec.com

Solar Power
Tel. +39 0444 598611
Fax +39 0444 598627
info.solar.it@socomec.com

NETHERLANDS
Critical Power / Power Control & Safety / Energy Efficiency / Solar Power
Tel. +31 30 760 0900
Fax +31 30 637 2166
info.nl@socomec.com

POLAND
Critical Power / Solar Power
Tel. +48 22 825 73 60
Fax. +48 22 825 73 70
info.ups.pl@socomec.com

Power Control & Safety / Energy Efficiency
Tel. +48 91 442 64 11
Fax +48 91 442 64 19
info.scp.pl@socomec.com

PORTUGAL
Critical Power / Power Control & Safety / Energy Efficiency / Solar Power
Tel.+351 261 812 599
Fax +351 261 812 570
info.ups.pt@socomec.com

ROMANIA
Critical Power / Power Control & Safety / Energy Efficiency / Solar Power
Tel. +40 21 319 36 88
Fax +40 21 319 36 89
info.ro@socomec.com

RUSSIA
Critical Power / Power Control & Safety / Energy Efficiency / Solar Power
Tel. +7 495 775 19 85
Fax +7 495 775 19 85
info.ru@socomec.com

SLOVENIA
Critical Power / Power Control & Safety / Energy Efficiency / Solar Power
Tel. +386 1 5807 860
Fax +386 1 561 11 73
info.si@socomec.com

SPAIN
Critical Power / Power Control & Safety / Energy Efficiency / Solar Power
Tel. +34 93 540 75 75
Fax +34 93 540 75 76
info.es@socomec.com

TURKEY
Critical Power / Power Control & Safety / Energy Efficiency / Solar Power
Tel. +90 216 540 71 20-21-22
Fax +90 216 540 71 27
info.tr@socomec.com

UNITED KINGDOM
Critical Power
Tel.+44 1285 863 300
Fax+44 1285 862 304
info.ups.uk@socomec.com

Power Control & Safety / Energy Efficiency
Tel. +44 1462 440 033
Fax +44 1462 431 143
info.scp.uk@socomec.com

IN ASIA PACIFIC

AUSTRALIA
Critical Power / Power Control & Safety
Tel. +61 2 9325 3900
Fax +61 2 9888 9544
info.ups.au@socomec.com

CHINA
Critical Power / Power Control & Safety / Energy Efficiency
Tel. +86 21 52 98 95 55
Fax +86 21 62 28 34 68
info.cn@socomec.com

INDIA
Critical Power / Power Control & Safety / Energy Efficiency / Solar Power
Tel. +91 44 39215400
Fax +91 44 39215450 & 51
info.in@socomec.com

SINGAPORE
Critical Power / Power Control & Safety / Energy Efficiency
Tel.+65 6506 7600
Fax +65 64 58 7377
info.sg@socomec.com

THAILAND
Critical Power
Tel. +66 2 941 1644 7
Fax +66 2 941 1650
info.ups.th@socomec.com

IN MIDDLE EAST

UNITED ARAB EMIRATES
Critical Power / Power Control & Safety / Energy Efficiency / Solar Power
Tel.+971 4 29 98 441
Fax +971 4 29 98 449
info.ae@socomec.com

IN AMERICA

USA, CANADA & MEXICO
Power Control & Safety / Energy Efficiency
Tel. +1 617 245 0447
Fax +1 617 245 0437
info.us@socomec.com

OTHER COUNTRIES

NORTH AFRICA
Algeria / Morocco / Tunisia
info.naf@socomec.com

AFRICA
Other countries
info.africa@socomec.com

SOUTH EUROPE
Cyprus / Greece / Israel / Malta
info.se@socomec.com

SOUTH AMERICA
Tel. +34 93 540 75 75
info.es@socomec.com

MORE DETAILS
www.socomec.com/worldwide

HEAD OFFICE

SOCOMEC GROUP
SAS SOCOMEC capital 10 772 740€
R.C.S. Strasbourg B 548 500 149
B.P. 60010 - 1, rue de Westhouse
F-67235 Benfeld Cedex - FRANCE
Tel. +33 3 88 57 41 41
Fax +33 3 88 74 08 00
info.scp.isd@socomec.com

YOUR DISTRIBUTOR

www.socomec.com

ENERGY SPECIALIST SINCE 1922

socomec
Innovative Power Solutions

DOC 218013 - 05/15 - Photo: Martin Bernhart - Illustrations: Gimelec - Produced by: Piano Forte - Imprimerie du Luxembourg