

GUIDE

XL³ CONFIGURABLE ASSEMBLIES

IEC 60439 >>> IEC 61439



GLOBAL SPECIALIST
IN ELECTRICAL AND DIGITAL BUILDING INFRASTRUCTURES



XL³ configurable assemblies

guide to migration

from IEC 60439 to IEC 61439

Summary of use

This document only deals with distribution enclosures for advanced users (authorised persons), i.e. parts 1 and 2 of the new standard.

Part 3 of standard IEC 61439 discusses DBO (Distribution Boards intended to be operated by Ordinary persons) only up to 250 A.

One of the new features of this standard is that the table in appendix D (checking the design) covered later in this document does not apply in 61439-3.

In addition in its new version, standard 61439-3 takes account of domestic normative references.



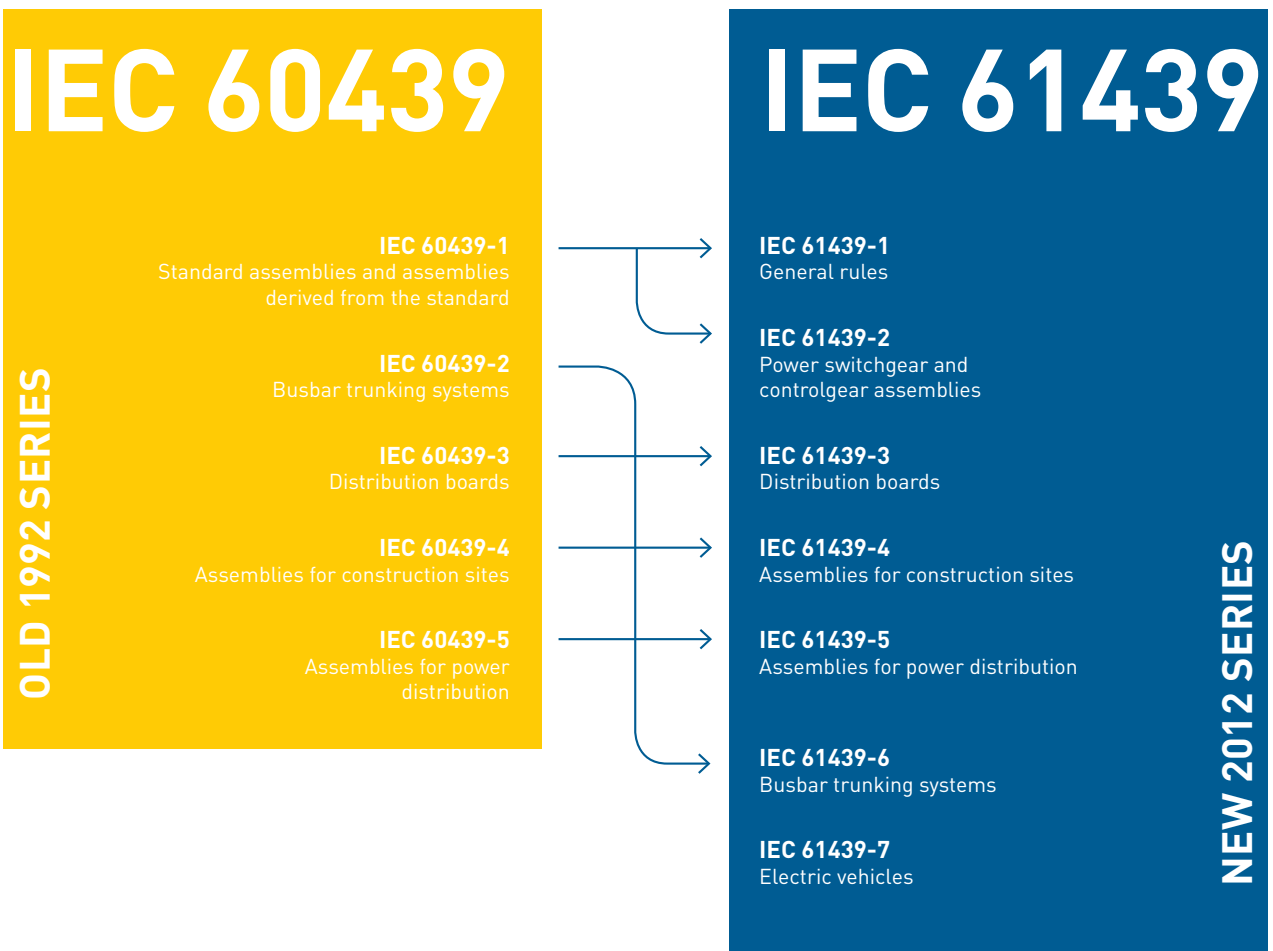
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Standard

IEC 61439-1

what's changed



PUBLICATION DATES

IEC 61439-1: 19/08/2011 (DOW⁽¹⁾ 2014)
 IEC 61439-2: 19/08/2011 (DOW⁽¹⁾ 2014)
 IEC 61439-3: 16/02/12 (DOW⁽¹⁾ 2015)
 IEC 61439-4: 2012-10
 IEC 61439-5: 29/11/10 (DOW⁽¹⁾ 2013)
 IEC 61439-6: 2012-05
 IEC 61439-7: 2013-03

DEFINITION OF AN ASSEMBLY

"Complete system of electrical and mechanical components (enclosures, busbars, functional units, etc) as defined by the Original Manufacturer and intended to be assembled in accordance with these instructions ..."

Example: pre-equipped distribution enclosure.

(1) Date of withdrawal

Extract from standard 61439-1

This edition of IEC 61439-1 includes the following technical modifications compared to the last edition of IEC 60439-1:

- The dual role of IEC 60439-1 as both a separate product standard and a general rules standard for assemblies covered by a subsidiary product part in the IEC 60439 series has been abandoned
- As a result, IEC 61439-1 is purely a "general rules" standard that should be invoked by subsidiary product parts in the IEC 60439 series
- The product standard replacing IEC 60439-1 is IEC 61439-2
- The distinction between standard assemblies (SA) and assemblies derived from the standard (ADS) has been eliminated by the verification approach
- Three different but equivalent types for verifying requirements have been introduced: verification by a test, verification by calculation/ measurement, or verification by satisfying design rules
- The requirements concerning temperature rise have been clarified
- The rated diversity factor (RDF) is been discussed more comprehensively
- The requirements for empty enclosures that will be made into assemblies (IEC 62208) have been incorporated
- The whole structure of the standard has been aligned with its new function as a "general rules" standard.



ORIGINAL MANUFACTURER

Entity responsible for the original design and associated checking that an assembly conforms to this standard (IEC 61439-1).

Example: Legrand.

ASSEMBLY MANUFACTURER

Entity responsible for assembly, wiring and ultimately responsible for the finished assembly.

Example: panel builder.

COMMENT

Unlike IEC 60439-1, conformity cannot be established simply on the basis of the general rules (IEC 61439-1). Assemblies must comply with the specific standards dedicated to them; in this case standards IEC 61439-2, IEC 61439-3, etc.

NOTE

The assembly manufacturer can be a different entity from the original manufacturer.

XL³ the range which can adapt to any requirement

Legrand offers ranges which comply with each part of standard IEC 61439: Zucchini busbars, pre-loaded/pre-wired consumer units, portable combined units, EV charging points, etc.

FOR SITES UP TO 160 A

FOR SITES UP TO 400 A

This document aims to focus on power distribution enclosures.



XL³ 160

“Ready to use” metal or plastic IP 30 enclosures, capacity of 24 modules per row.

- For various configurations, either surface-mounted or flush-mounted solutions. Supplied complete with rails and faceplates. Can be fitted with a metal or glass door (to be ordered separately).
- Surface mounting cabinets have an adjustable cable entry plate, removable side panels, and removable separable top and bottom for ease of wiring.
- The flush-mounting version is supplied with a metal flush-mounting box, removable chassis with rails fitted, terminal blocks for protective conductors, finishing frame and plastic faceplates.
- Take modular DPX³ 160 MCCBs, and Vistop devices up to 125 A in cabinets with dedicated space.

XL³ 400

Metal distribution cabinets and enclosures, IP 30 to IP 55, capacity of 24 modules per row.

- Reduced depth for optimum space saving
- Easy and reliable equipment installation thanks to the functional uprights integrated at the back of the cabinet
- Optimum use of wiring space: the cable ducts can take DPX³ and DPX power circuit-breakers
- Possibility of pairing (between 2 enclosures or between the enclosures and the cable ducts) for more wiring capacity
- Perfect finish and protection index IP 40 to IP 43 thanks to the metal or glass doors
- IP 55 distribution cabinets available on request

OUR PRODUCTS

Thanks to the XL³ range we can provide you with a solution adapted to meet your site power distribution needs by offering a range between 160 and 6300 A. Each enclosure model from the XL³ range offers a large selection of sizes, versions and equipment.

FOR SITES UP TO 800 A



FOR SITES UP TO 6300 A



XL³ 800

Metal distribution cabinets and enclosures, IP 30 to IP 55, 24 or 36 module capacity per row.

- Easy and reliable equipment installation thanks to the functional uprights integrated at the back of the cabinet
- Optimum use of wiring space: the cable ducts can take DPX³ and DPX power circuit-breakers
- Enclosures with width for 36 modules can integrate an internal cable duct (by changing to 24 modules per row)
- Possibility of pairing (between 2 enclosures or between the enclosures and the cable ducts) for more wiring capacity
- Perfect finish and protection index IP 40 to IP 43 thanks to the metal or glass doors
- IP 55 distribution cabinets available on request
- All versions can be fitted with a busbar at the side or at the back of the enclosure

XL³ 4000 AND 6300

Configurable metal distribution enclosures, IP 30 to IP 55 (with door and waterproof seal only for XL³ 4000 enclosures).

- Can take all Legrand protection equipment up to 6300 A and multiple distribution solutions
- Numerous configurations capable of meeting highly diverse requirements. The enclosures are available in different configurations according to each range: 2 heights, 3 widths and 3 depths for XL³ 4000 and 1 height, 1 width and 3 depths for XL³ 6300
- Reliable assembly using the mounting devices and the sectioned uprights
- Remarkable strength thanks to the specially designed structural elements for maximum stability
- Perfect finish: metal or glass doors (only for XL³ 4000 enclosures)

Safety guaranteed by the certification

of pre-equipped
XL³ enclosures

The principles



THE STANDARD

The certification of distribution enclosures is defined by international standards IEC 61439-1 and IEC 61439-2. This formulates the definitions, operating conditions, structural provisions, technical characteristics and the tests for low-voltage wiring accessory assemblies.

OBLIGATIONS

The construction of assemblies of representative configurations using products that have themselves been tested and comply with their own specific standards; these are the type tests carried out based on our enclosures with Legrand equipment.

Compliance with the rules for selection and use of these products in accordance with the procedures defined by the standards, regulations, and good practice.

The carrying out of individual tests (insulation, continuity of exposed conductive parts) and of a final inspection, are recorded in a simplified individual report (see example in the appendix).

THE 13 TESTS

FOR CERTIFICATION OF PRE-EQUIPPED ENCLOSURES

The 13 tests described overleaf are an additional guarantee of the operation of pre-equipped enclosures in safe conditions, as well as of the safety of individuals and of the equipment installed downstream of the panel. This is the case for the entire period of service of the electrical panel.



DIFFERENT PEOPLE'S ROLES

The original manufacturer produces the various elements that make up a distribution panel: the protection devices, enclosures, distribution system, etc. All these elements have been granted product certificates of conformity.

The assembly manufacturer assembles the electric cabinet, installs the equipment, completes the wiring and should certify the finished assembly.

CONFORMITY

Total compliance with this process can then be certified by a declaration of conformity (see example in the appendix) and the assembly can be marked accordingly. Compliance with standard IEC 61439-2 also enables the CE mark to be affixed, if required.

The 13

Check performed on a sample of an assembly or on parts of assemblies to demonstrate that the design satisfies the requirements of the applicable assembly standard.

standards-based tests

NO.	CHARACTERISTIC TO BE CHECKED	ITEMS	VERIFICATION OPTION		
			TESTS	COMPARISON	EVALUATION
1	Strength of materials and parts	10.2	YES	NO	-
2	Degree of protection (IP)	10.3	YES	NO	YES
3	Clearance	10.4	YES	NO	NO
4	Creepage distance	10.4	YES	NO	NO
5	Electric shock protection and integrity of protection circuits	10.5	YES	-	NO
6	Integration of connection devices and components	10.6	NO	NO	YES
7	Internal electrical circuits and connections	10.7	NO	NO	YES
8	Terminals for external conductors	10.8	NO	NO	YES
9	Dielectric properties	10.9	YES	NO	-
10	Temperature rise	10.10	YES	YES	YES
11	Short-circuit resistance	10.11	YES	YES	NO
12	Electromagnetic compatibility	10.12	YES	NO	YES
13	Mechanical operation	10.13	YES	NO	NO

3 OPTIONS

TESTING THE CHECK (3.9.1.1)

Test performed on a sample of an assembly or on parts of assemblies to check that the design satisfies the requirements of the applicable assembly standard (performed by Legrand).

COMPARING THE CHECK (3.9.1.2)

Structured comparison of a design proposal for an assembly, or parts of an assembly, with a benchmark design that has been subjected to the test (performed by Legrand).

EVALUATING THE CHECK (3.9.1.3)

Design check of the design rules or strict calculations applied to a sample of an assembly or to assembly parts to demonstrate that the design satisfies the requirements of the applicable assembly standard (performed by the assembly manufacturer or the original manufacturer).

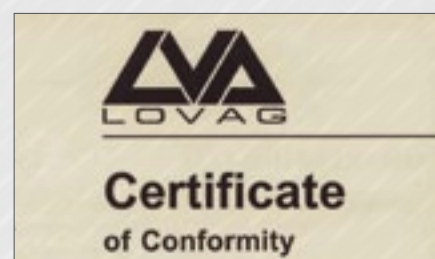
Response to the tests

certificates, documentation

CHARACTERISTIC TO BE CHECKED	ORIGINAL MANUFACTURER (LEGRAND)	ASSEMBLY MANUFACTURER (PANEL BUILDER)
Resistance of materials and parts	LOVAG 10.2 certificate	
Degree of protection (IP)	LOVAG 10.3 certificate	Visual check 11.2
Clearance	LOVAG 10.4 certificate	Visual check 11.3
Creepage distance	LOVAG 10.4 certificate	Visual check 11.3
Electric shock protection and integrity of protection circuits	LOVAG 10.5 certificate	Check by survey 11.4
Integration of connection devices and components	Checked on tested configurations Legrand 10.6	Visual check 11.5
Internal electrical circuits and connections	Checked on tested configurations Legrand 10.7	Check by survey 11.6
Terminals for external conductors	Checked on tested configurations Legrand 10.8	Visual check 11.7
Dielectric properties	LOVAG 10.9 certificate(time 5 s)	Test to be performed 11.9 (time 1 s)
Temperature rise	LOVAG 10.10 certificate	
Short-circuit resistance	LOVAG 10.11 certificate	
Electromagnetic compatibility	LOVAG 10.12 certificate	
Mechanical operation	LOVAG 10.13 certificate	Visual check 11.8
Wiring, functional performance and operation		Functionality test or visual check 11.10

**LEGRAND IS
COMMITTED TO
CARRYING OUT
THE 10 TYPE TESTS
ON THESE XL³
ENCLOSURES**

The type tests defined by standard IEC 61439-1 are carried out officially by neutral organisations on assemblies representative of the usual wiring and device configurations. These assemblies are called "Standard assemblies".



An additional action on top of the simple visual check.

The type tests in detail



TEST 1

RESISTANCE OF MATERIALS AND PARTS

The mechanical, electrical and thermal capacities of construction materials and parts of the assemblies must be proved by checking the construction and performance characteristics. Tests are therefore conducted to check withstand to: heat, ultraviolet, lifting, mechanical impacts.

TEST 3

CLEARANCES AND CREEPAGE DISTANCES

The measurement procedures for clearances and creepage distances are accurately covered in appendix F of standard IEC 61439-1 derived from standard IEC 60664-1. The clearances and distances are measured between live parts with different polarities, and also between live parts and exposed conductive parts (example in the appendix).

TEST 2

VERIFICATION OF THE DEGREE OF PROTECTION (IP)

The IP defines the ability to protect people against current-carrying hazardous parts and to prevent entry of solid bodies (first number) and liquids (second number). The additional letter indicates the protection against access to current-carrying hazardous parts. Legrand offers a solution that is perfectly suited to all environments.

TEST 4

FITTING DEVICES AND EQUIPMENT

When installed in accordance with the specified conditions, Legrand guarantees that clearance distances are observed for the insulation voltages of these devices. Experience has shown that the greatest risk is in the wiring. Connections, bundles of conductors and busbars must be meticulously checked. Unsuitable connectors, bolted connections, joints and metal supports can reduce the insulation values initially envisaged.



TEST 5

EFFECTIVENESS OF THE PROTECTIVE CIRCUIT

The continuity of the protective circuit is a decisive factor for safety. It is checked: firstly in accordance with standard IEC 61439-1 at a test current of 25 A between the terminal connecting the protective conductors and all the exposed conductive parts; secondly in accordance with an additional Legrand test, at a high fault current that could occur following accidental detachment of a conductor.

TEST 7

INTERNAL ELECTRICAL CIRCUITS AND CONNECTIONS

This test consists of checking conformity with the design requirements for the power and control circuits. It includes correct sizing of the busbar and cables, earthing the control circuits, etc; it also includes identification of the various circuits by colour.

TEST 6

INTEGRATION OF CONNECTION DEVICES AND COMPONENTS

These are rules concerning the installation of devices included in the assembly, whether fixed or removable parts, or compliance with the customer's wiring requirements. This also includes accessibility to regulation and reset devices; and all types of indication (LEDs, dials, etc).

TEST 8

TERMINALS FOR EXTERNAL CONDUCTORS

This rule requires an indication of the terminal capacity and also whether aluminium or copper are possible options to be declared to the end user. It also includes checking all types of terminal that can be used for cable entries and outlets (Neutral, PEN, symbolic PE, etc).

The type tests in detail continued



TEST 9

DIELECTRIC PROPERTIES

The dielectric tests check the insulation performance levels for the maximum operating voltage. They are carried out at the industrial frequency of 50 Hz and in the form of voltage waves simulating a lightning strike.

TEST 10

TEMPERATURE RISE LIMITS

Temperature rise test on assemblies. This test checks that assemblies operate correctly under maximum operating conditions (current, number of devices, volume of enclosure). It is used to define the heat balance elements for an average temperature rise in the air in assemblies of less than 30°C and a temperature rise in the terminals of less than 70°C.

TEST 12

ELECTROMAGNETIC COMPATIBILITY

This test consists of checking the assembly's electromagnetic interference when operating in its environment, the aim being for it to produce no interference.

TEST 11

SHORT-CIRCUIT RESISTANCE

The tests carried out guarantee, in relation to thermal and electro dynamic stresses, the resistance of the busbars and their supports, the breaking devices (Vistop/DPX-IS) and protection devices (DMX³/DPX³/DX³), and the enclosures.

TEST 13

MECHANICAL OPERATION CHECK

In accordance with the provisions of the standard, tests are carried out on parts and devices that are not subject to any specific requirements. Correct mechanical operation is checked by 50 operating cycles on draw-out racks and faceplate fixings.



LOVAG CERTIFICATE

the panel builder's response documentation

Information to be provided by the assembly manufacturer

1 MARKING

The following information must be included on one or more of the designation labels:

- Name or trademark of the assembly manufacturer (responsible for the finished assembly),
eg: Company Panel builder's name
- Type designation or an identification number
ex : TD01-RDC or G18732
- Means of identifying the manufacturing date,
eg: 2012 or 2012-03 or 12W09
- IEC 61439-X (the specific part X must be identified).
eg: IEC 61439-2

Example of nameplate

Panel builder's name	TD01 - RDC
2012	IEC 61439-2

2 DOCUMENTATION

The following additional information must be included in the technical documentation supplied with the assembly (dossier or technical publication):

- Rated voltage for the assembly (U_n),
eg: $U_n = 400\text{ V}$
- Rated operating voltage for a circuit (U_e),
eg: $U_e = 230\text{ V}$ (if different from U_n)
- Rated impulse withstand voltage (U_{imp}),
eg: $U_{imp} = 6\text{ kV}$
- Rated insulation voltage (U_i),
eg: $U_i = 800\text{ V}$
- Rated current for the assembly (I_{na}),
eg: $I_{na} = 3100\text{ A}$
- Rated current for a circuit (I_{nc}),
eg: $I_{nc} = 250\text{ A}$
- Permissible rated peak current (I_{pk}),
eg: $I_{pk} = 140\text{ kA}$
- Permissible rated short-time withstand current (I_{cw}),
eg: $I_{cw} = 50\text{ kA } 1\text{ s}$
- Conditional rated short-circuit current (I_{sc}),
eg: $I_{sc} = 70\text{ kA}$
- Rated frequency (f_n),
eg: $f_n = 50\text{ Hz}$
- Rated diversity factor (RDF)
eg: $RDF = 0.7$

THE ADDITIONAL INFORMATION BELOW MUST BE PROVIDED WHERE NECESSARY

- Additional requirement depending on the specific operating conditions for an FU
- Degree of protection
- Assembly neutral earthing system type
- Installation inside and/or outside
- Fixed or mobile
- Degree of pollution
- Accreditation of personnel
- EMC classification

- Specific operating conditions
- External design
- Protection against mechanical impact
- Construction type: fixed or partially removable
- Short-circuit resistance and nature of protection devices
- Electric shock protection method
- Weight of assembly if more than 30 kg
- Electrical diagrams including component identification



Example of letter of conformity

DECLARATION OF CONFORMITY

Company:
Address:

Addressee:

Document no:
Assembly no:

Date:
Date:

Standard IEC 61439-1

Standard IEC 61439-2

The assembly manufacturer certifies through this document that the low-voltage switchgear and controlgear assembly referred to above has been built in conformity with standard IEC 61439-1/ IEC 61439-2. Installation has been completed in accordance with the recommendations by the original manufacturer of the components used.

The following product ranges were used:

- DPX, DPX³ and DMX³ power circuit-breakers complying with standard IEC
- DX, DX³ secondary MCBs complying with standard IEC 60947-2
- Distribution blocks and busbar supports

with reference to the type tests conducted in accordance with IEC 61439-1:

- Verification of temperature rise limits
- Verification of the dielectric properties
- Verification of the short-circuit withstand strength
- Verification of the effectiveness of the protective circuit
- Verification of clearances and creepage distances
- Verification of mechanical operation
- Verification of the degree of protection
- Verification of the strength of materials and parts including:
 - verification of resistance to mechanical impact
 - verification of rust resistance
 - verification of resistance to heat and fire
 - verification of resistance to lifting

The individual tests form the subject of individual inspection report no. including, in conformity with the standard:

- Visual inspection of the assembly
- Verification of the insulation
- Checking of the continuity of the protective circuit

The declarant:

Signature:

List of operations to be performed by the assembly manufacturer

ITEM CONCERNED	OPERATIONS	COMPLETED	NOT APPLICABLE
1. VISUAL INSPECTION			
11.10	■ Wiring check	<input type="checkbox"/>	<input type="checkbox"/>
11.10	■ Compliance with the diagram	<input type="checkbox"/>	<input type="checkbox"/>
11.5	■ Wiring accessories check	<input type="checkbox"/>	<input type="checkbox"/>
11.5	■ Compliance with the specified wiring accessories	<input type="checkbox"/>	<input type="checkbox"/>
11.6	■ Busbar check	<input type="checkbox"/>	<input type="checkbox"/>
11.4	■ Verification of the effective connection of exposed conductive parts	<input type="checkbox"/>	<input type="checkbox"/>
11.4	■ Verification of the measurements associated with category II	<input type="checkbox"/>	<input type="checkbox"/>
11.10	■ Electrical operation (power)	<input type="checkbox"/>	<input type="checkbox"/>
11.10	■ Electrical operation (control)	<input type="checkbox"/>	<input type="checkbox"/>
11.10	■ Check of the measuring devices	<input type="checkbox"/>	<input type="checkbox"/>
11.10	■ Tests of residual current devices	<input type="checkbox"/>	<input type="checkbox"/>
11.8	■ Mechanical operation check	<input type="checkbox"/>	<input type="checkbox"/>
11.8	■ Compliance of the locking with specifications	<input type="checkbox"/>	<input type="checkbox"/>
11.4/11.6	■ Check of the tightening torques	<input type="checkbox"/>	<input type="checkbox"/>
11.10	■ Compliance of the handling devices	<input type="checkbox"/>	<input type="checkbox"/>
11.2	■ Verification that the degree of protection is maintained	<input type="checkbox"/>	<input type="checkbox"/>
2. INSULATION CHECK			
11.9	■ Dielectric test: voltage...	<input type="checkbox"/>	<input type="checkbox"/>
11.9	■ Insulation resistance below 500 V minimum value measured:	<input type="checkbox"/>	<input type="checkbox"/>
3. VERIFICATION OF CONTINUITY OF THE PROTECTIVE CIRCUIT			
11.4	■ Continuity measurement below 10 A	<input type="checkbox"/>	<input type="checkbox"/>
11.4	■ Check with signal controller	<input type="checkbox"/>	<input type="checkbox"/>
4. FINAL CHECK			
11.10	■ Nameplate present	<input type="checkbox"/>	<input type="checkbox"/>
11.10	■ Documentation present	<input type="checkbox"/>	<input type="checkbox"/>



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