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EMS CX³ – Modbus/EMS CX³ communication interface

Cat.No: 4 238 90

CONTENT **Page**

1. USE

This module is dedicated to Energy Management System (EMS CX³) use.
It connects the DPX³ S10 family switches to the EMS BUS system.

2. TECHNICAL CHARACTERISTICS

Insulation voltage (50/60Hz) Ui			400 V
Impulse withstand current Uimp	**EMS ports / Input terminals:**	**Wave 1.2 / 50 µs:**	6 kV
		Alternate current 50 Hz / 1 min.	3 kV
Pollution degree			2 according to IEC/EN 60898-1
Overvoltage category			3
Dielectric strength			2500 V
Plastic material			Self-extinguishing polycarbonate.
			Heat and fire resistant according to IEC/EN 60695-2-12, glow-wire test at 960°C
			Classification UL 94 / IECEN 60695-11-10: V1
Operating temperature			Min -25 °C Max +70 °C
Storage temperature			Min -40°C. Max +70°C
Protection Index:	**Terminals against direct contacts**		IP2X (IEC/EN 60529)
	Terminals against solid and liquid bodies (wired device)		IP20 (IEC/EN 60529)
	Front face against solid and liquid bodies		IP40 (IEC/EN 60529)
	Class		Class II, front panel with faceplate

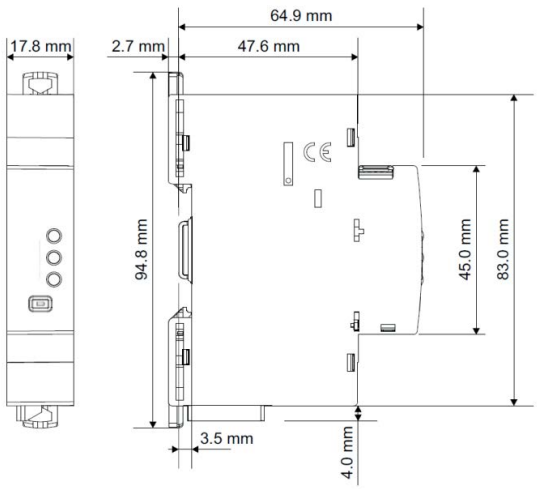
Consumption:

Values at 12 V⎓

Configuration	W	mA
Stand-by	0.258	21.5
All LED OFF	0.258	21.5
1 LED ON	0.298	24.8
2 LED ON	0.337	28.1
All LED ON	0.376	31.4

3. DIMENSIONS AND WEIGHT

Width
1 module. 17.8 mm width.



Average weight per device:

- 0.055 kg.

Volume when packed:

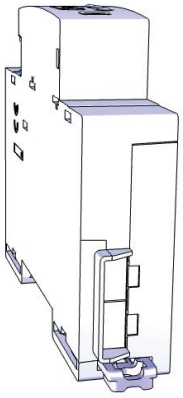
- 0.21 dm3.

4. POWER SUPPLY

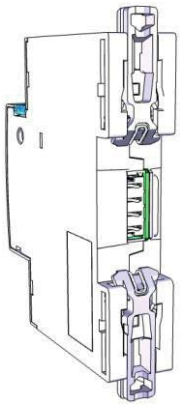
The power supply is required in 12 VDC using the dedicated power supply module, Cat. No. 4 149 45.

It is possible to use:

- specific communication patch cords (Cat.Nos 4 149 07/08/09) to connect at the downstream through dedicated ports



- a specific communication rail (Cat.Nos 4 149 01/02/03) to connect from the rear through dedicated connectors.



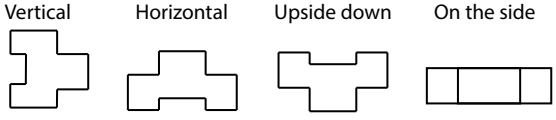
5. CONNECTION

The device can be mounted on symmetric rail EN/IEC 60715 or DIN 35 rail

■ 5.1 Recommended tools

For fixing: flat screwdriver 5.5 mm (6 mm maximum).

Operating positions:

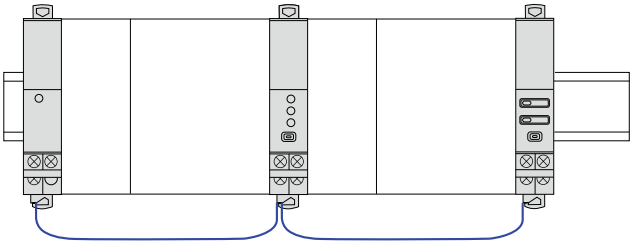


■ 5.2 Data connection (EMS CX³ modules inter-connection)

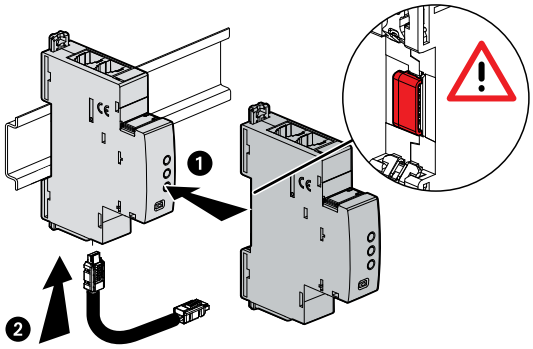
Data connection can be operated using :
- Specific communication patch cords (Cat. Nos 4 149 07/08/09)

It allows data transmission between the different EMS CX³ modules.

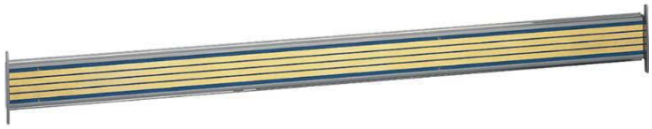
This type of connection is recommended when there are few EMS CX³ modules, distributed all over the enclosure.



Note: with this configuration, the plastic protection cover of the backside communication ports on the EMS CX³ module must be kept on.

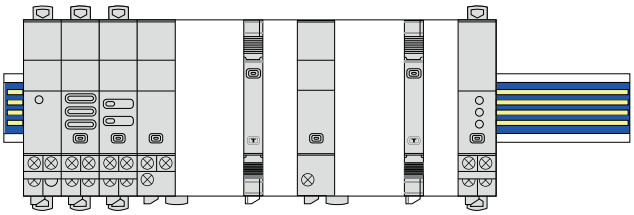


- Specific communication rail (Cat.Nos 4 149 01/02/03).

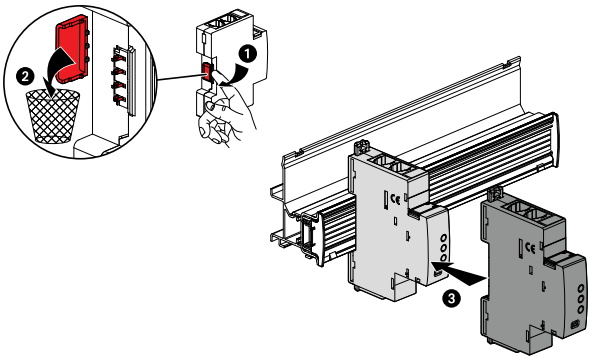


It allows data transmission between the different EMS CX³ modules.

This type of connection is recommended when there are several EMS CX³ modules on the same DIN row.



Note: with this configuration, the plastic protection cover of the backside communication ports on the EMS CX³ module must be removed.

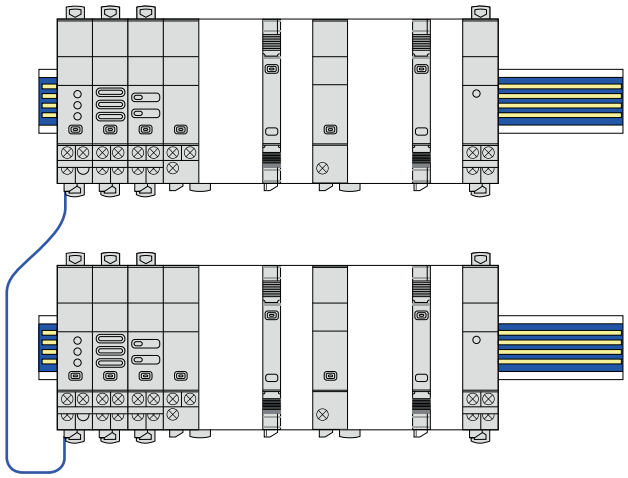


5. CONNECTION *(continued)*

■ 5.2 Data connection (EMS CX³ modules inter-connection) *(continued)*

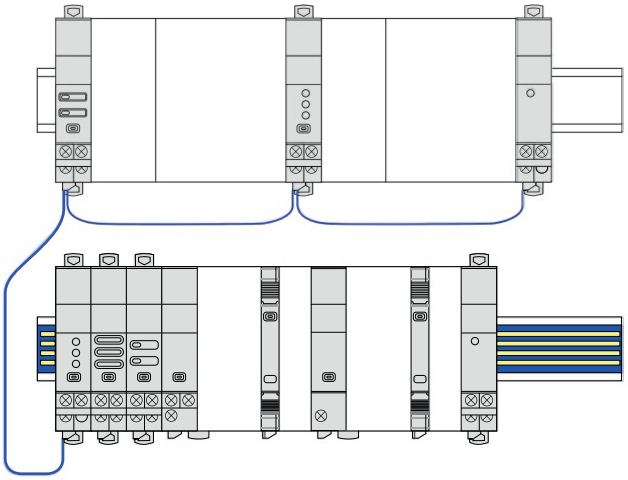
- A mix between specific communication patch cords and communication rails

When the devices are individually connected with communication rails. It is possible to use the communication patch cord in order to connect two rows together.



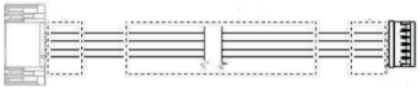
Individually connected with communication patch cords & communication rail.

The communication patch cords allow the connection of EMS CX³ modules on a row and the connection of two rows.

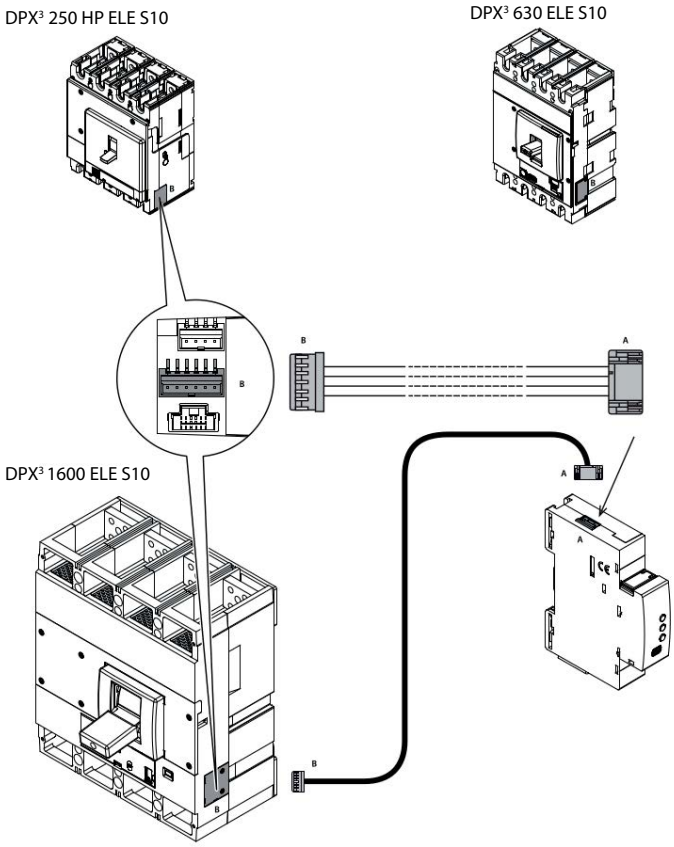


■ 5.3 Interconnection between interface and switches

Interconnection between interface and switches is possible by using specific connection cable, for which you can find on the market spare part LG-981243



Terminal A: connects to the interface
Terminal B: connects to the switch
Cable length: 2m



In the case of connection to a plug-in/draw-out device, the cable must be connected so that it can be removed together with the device. To achieve this, an appropriate terminal block may be used. For more information, contact Legrand.

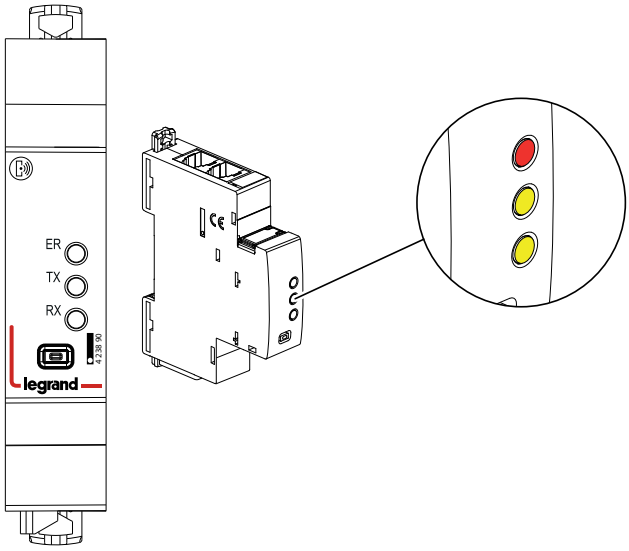
6. FEATURES

■ 6.1 Signalling LEDs:

Interface is equipped with 3 signalling LEDs:

"ER": Communication error led ® it blinks red if there is an error on the communicating bus

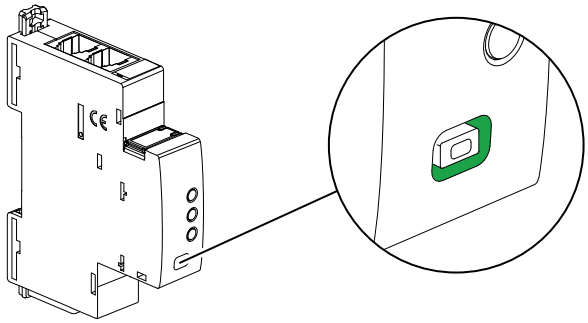
"TX" and "RX": frame transmission and reception signalling led® they blink yellow when there is communication activity on the switch



■ 6.2 Multi-Functions button

It gives information about the operating state on the module

Possible states:



LED colour	State	Meaning
Red	Slow blinking	Error (e.g. addressing error)
	Fast blinking	System alarm detected *(see Note)*
	Steady (pressing the multifunction button longer than 10 sec.)	Total reset (any firmware updates are preserved)
Green	Slow blinking	System process is running. Wait until the Led turns steady
	Fast blinking (pressing the multifunction button for 5 sec.)	Put in "Stand-by" the EMS CX³ module (no remote action and communication available)
	Steady	System OK, connection is running
Orange	Slow blinking	Link functionality is not active
	Fast blinking	Device's firmware update in progress
	Steady	Device's firmware update or link functionality is active

Note:

Possible system alarms detected by the Modbus/EMS Interface:

- Loss of communication with an EMS module

- Error in addressing procedure: possible mix between local and remote address (see p. 6)

- Duplicate function error: two EMS modules with the same function have the same address.

To turn off the system alarm:

- Solve the problem according to the indication of the alarm

- Push the Multifunction button on the Interface → the led become steady green

■ 6.3 Alarms

The 4 238 90 device periodically checks communication with the associated circuit breaker; in case of no communication, the relative alarm is generated on the EMS CX³ BUS.

When the firmware update is performed on the electronic display part of the associated switch, the 4 238 90 interface declares on the EMS CX³ BUS an alarm of no communication with the switch. The alarm is displayed via the EMS LED of the 4 149 40 and/or 4 149 36 devices.

The TX LED of interface 4 238 90 flashes while the RX LED remains off, because there is no communication between 4 238 90 and the associated switch. Therefore, in this phase, it will not be possible to supervise the circuit breaker in supervision.

■ 6.4 Link functionality

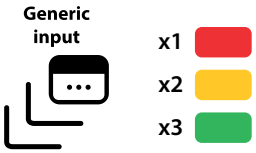
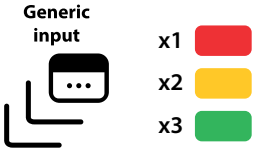
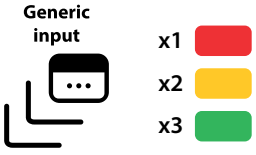
This function allows the linking of two EMS CX³ modules to create automatic actions that, once programmed, can run independently without a connection to a manager.
The basic rule is the link between an event (circuit breaker that trip, a threshold exceeded, etc.) and an action accordingly (signalling, opening of a circuit by motorized control or contactor, etc.).

Note:
- Association can only be of type 1 to 1 (1 event and 1 action).
- Modules already associated cannot be used for other associations.
- All the configuring procedure will be done with the configuration software (available online for free).
(For more details refer to the Installation Manual of EMS CX³ Configuration software)

6. FEATURES *(continued)*

■ 6.4 Link functionality *(continued)*

Possible associations are:

	Action module		
Event generator	**Command: 4 149 32**	**State + Command: 4 149 31**	**State: 4 149 30**
Measure: 4 149 18/19/20/21/ 22/23/24/25/27	✓	✓	✓ Only with the module configured as shown: 
State: 4 149 29/30	✓	✓	✗ It's enough to configure the module as "Replica"
State + Command: 4 149 21	✓	✓	✗ It's enough to configure the module as "Replica"
interface: 4 238 90	✓	✓	✓ Only with the module configured as shown: 
Circuit breakers S10	✓	✓	✓ Only with the module configured as shown: 

Note:

- Association can only be of type 1 to 1 (1 event and 1 action).
- Modules already associated cannot be used for other associations.
- All the configuring procedure will be done with the Configuration Software (available online for free).
(For more details refer to the Installation Manual of EMS CX³ Configuration software)

6. FEATURES *(continued)*

■ 6.4 Link functionality *(continued)*

Modules compatible with "Link functionality" feature: firmware versions and production date:

Cat.Nos	Firmware version	Production date indicated on the label affixed on the side of the module
4 149 18	all firmware versions	any production date
4 149 19	ver. ≥ 2.0.1	date ≥18W29
4 149 20	ver. ≥ 2.0.1	date ≥ 18W49
4 149 21	all firmware versions	any production date
4 149 22	all firmware versions	any production date
4 149 23	ver. ≥ 2.0.1	date ≥ 18W49
4 149 24	all firmware versions	any production date
4 149 25	all firmware versions	any production date
4 149 27	all firmware versions	any production date
4 149 29	ver. ≥ 2.0.1	date ≥18W49
4 149 30	ver. ≥ 2.0.2	date ≥18W32
4 149 31	ver. ≥ 2.0.6	date ≥18W45
4 149 32	ver. ≥ 3.0.2	date ≥18W39
4 149 36	ver. ≥ 2.0.4	date ≥18W38
4 149 37	ver. ≥ 2.0.4	date ≥ 18W43
4 238 90	ver. ≥ 3.0.8	date ≥ 18W34

RS485 communication port's characteristics:

- Programmable addresses: from 1 to 247
- Galvanically isolated respect to auxiliary supply
- Standard RS485 3 wires, half-duplex (+, -, Signal ground); for the RJ45 connector, pin 4 (-), pin 5 (+) and pin 8 (SG)
- Protocol Modbus® RTU
- EMS CX³/RS485 interface automatically detects the Modbus parameters of other devices in the system and automatically sets its Modbus parameters.
- Possible values:
  Baud rate: 1,2 - 2,4 - 4,8 - 9,6 - 19,2 - 38,4 - 57,6 - 115,2 kbps
  Parity bit: none, even, odd
  stop bit = 1 or 2

7. SYSTEM ARCHITECTURES

The EMS CX³ is a polyvalent system and, according to the needs of the customer, it can be set up and/or used as "stand-alone" or "supervised" system. Based on this choice, the configuration and addressing methods are different.

Four possible architectures are provided:

- Stand-alone system

- with local addressing (through the track wheel)
- with remote addressing (through a computer)

- Supervised (Computer Supervisory System)

- with local addressing
- with remote addressing

■ 7.1 Stand-alone system

A stand-alone system is an autonomous system used by the end-user if it is not necessary to have a computer for the supervision outside the envelope. Everything can be managed on site.

Stand-alone system with local addressing (through the track wheel)
Local addressing advantages:

- No configuration software needed to set-up the installation
- No necessity to use a computer to manage settings (configurations, test, ...) and to use the system (visualize and be alerted, ...). Everything can be done through the mini configuration module (local display, Cat. No 4 149 36/37). (Refer to the technical sheet dedicated to this module for details).
- No communication interfaces or gateways are required.
- Installation can be done without the intervention of a system integrator

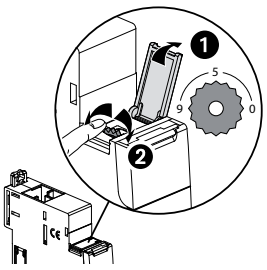
Programming procedure:

For EMS CX³ modules that need programming procedure, it has to be operated through the EMS CX³ configurator (see "Module configuration").

Addressing procedure:

The addressing procedure is mandatory for all EMS CX³ modules. It has to be operated through the track wheel located on the top upper face of each EMS CX³ modules

Each device is marked from 0 to 9 in order to locally define the Modbus address of the EMS CX³ modules



Note for measure module "3x single phase":

This module is to be considered as 3 modules with 3 different Modbus addresses. The module takes automatically the two addresses immediately following the setting one (e.g. address set = 2, addresses of the module 2, 3, 4)

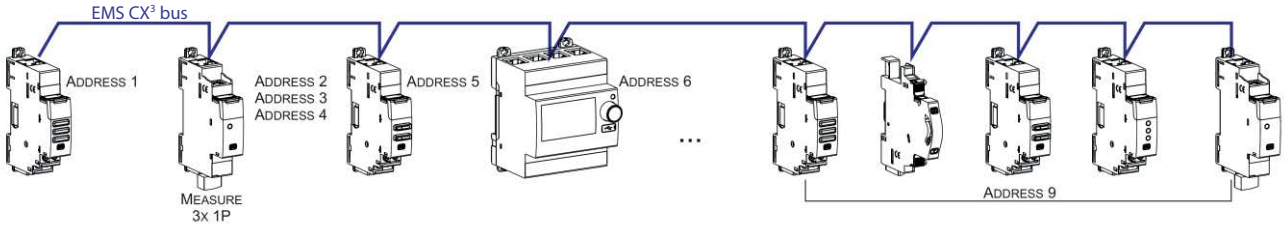
Requirements of the local addressing mode (through the track wheel):

- Each device of the system must be addressed.
- Addresses available: from 1 to 9
- Address 0 not permitted
- It is possible to assign to several devices the same address with the purpose of grouping different functions, **because they are related to the same electrical circuit.**

7. SYSTEM ARCHITECTURES *(continued)*

■ 7.1 Stand-alone system *(continued)*

For example, it is possible to assign the same address to a signalling auxiliary module (Cat. No 4 149 29), a universal control module (Cat. No 4 149 32), a measuring module, and so on. In this way on the EMS CX³ mini configuration module (local display) the grouped function will be displayed as a unique "device" with all grouped functions. (Refer to the schemes below)



Note for the mini configuration module (local display)

It is necessary to assign the mini configurator a different address from all the other EMS CX³ modules through the device programming menu.
The mini configuration module can be placed everywhere in the EMS CX³ bus

Stand-alone system with remote addressing (through a computer)

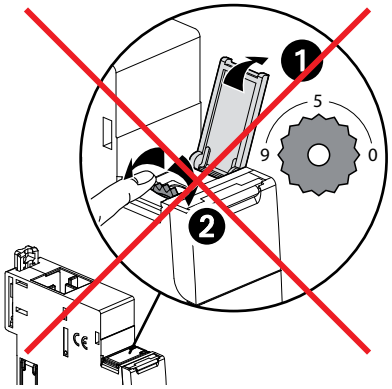
Remote addressing advantages:

- Whole configuration (addresses and functions) can be set up through the EMS Configuration software (see 'Module configuration')
- Configuration software is available for free
- Automatic detection of the EMS CX³ modules is installed in the system (characteristics, functions, configuration...)
- Increased settings possibilities: load shedding function
- Increased addressing: **up to 30 Modbus addresses in a system**

Programming procedure:

The programming procedure for EMS CX³ modules that need some is operated via the configuration software

Addressing procedure:



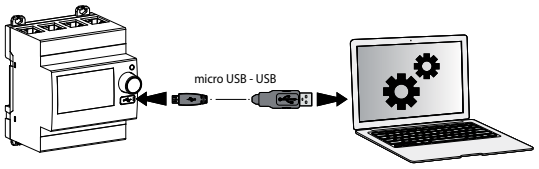
It is not necessary to assign an address via rotary; the track wheel must be left in default position "0".
All the addressing/configuring procedure can be done with the configuration software (available online for free)

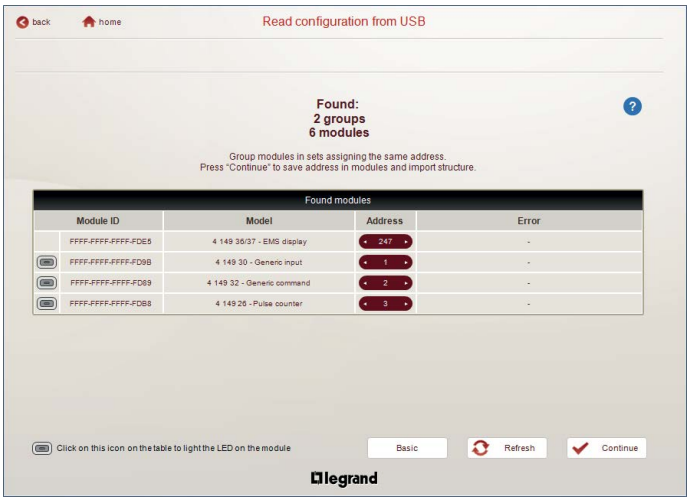
With remote addressing, the software does the automatic detection of modules installed in the system, but the supervision is not possible until the users assign the remote address and all the characteristics to each module.

Note: it is mandatory to connect the computer to the mini configuration module with an USB-micro USB cable. (For more details, refer to the technical data sheet of the Mini configuration module EMS CX³)

7. SYSTEM ARCHITECTURES *(continued)*

■ 7.1 Stand-alone system *(continued)*



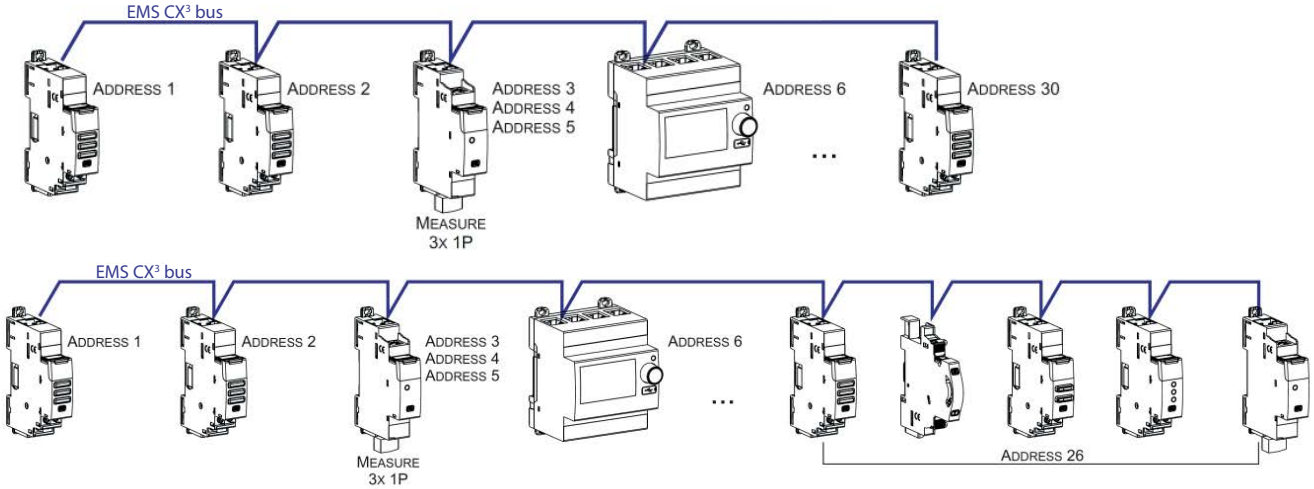


Note for measure module "3x single phase":

This module is to be considered as 3 modules with 3 different Modbus address. The module takes automatically the two addresses immediately following to the programmed one (e.g. Programmed address = 12, addresses of the module 12, 13, 14)

Characteristics of the system architecture:
For 1 mini configuration module (Cat.No 4 149 36/37)
- up to **30 EMS CX³ modules** (e.g. 30 devices grouped per functions with addresses from1 to 30)

It is possible to assign to several devices the same address with the purpose of grouping different functions, because they are related to the same electrical circuit. For example, it is possible to assign the same address to a signalling auxiliary module (Cat.No 4 149 29), a universal control module (Cat. No 4 149 32), a measuring module, and so on. In this way on the EMS CX³ display or in a supervision system, the grouped function will be displayed as a unique "device" with all grouped functions. (Refer to the schemes below)



Note for the mini configuration module (local display)

- It is necessary to assign the mini configurator a different address from all the other EMS CX³ modules through the device programming menu.
- The mini configuration module can be placed everywhere in the EMS CX³ bus

■ 7.2 Supervised system (Computer Supervisory System)

A supervised system is a system operated through a computer. It allows to remotely read data from the EMS CX³ devices and/or do operations on these devices (e.g. commands of a motor driven or contactor ...).

Supervised system with local addressing (through the track wheel)

Local addressing advantages:

- No configuration software needed to set-up the installation
- Installation can be done without the intervention of a system integrator

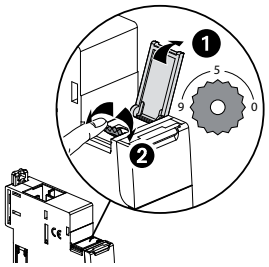
7. SYSTEM ARCHITECTURES *(continued)*

7.2 Supervised system (Computer Supervisory System) *(continued)*

Programming procedure:

Programming procedure for EMS CX³ modules that need some is operated via the configuration software (see "Module configuration")

Addressing procedure:



The addressing procedure is mandatory for all EMS CX³ modules. It has to be operated through the track wheel located on the top upper face of each EMS CX³ modules.
Each device is marked from 0 to 9 in order to locally define the Modbus address to EMS CX³ modules

In this system, the Modbus address of an EMS CX³ device or group of modules is determined by combining the Modbus/EMS CX³ interface address as the tens digit and the device or function group address as the units digit (e.g., Interface address 1 = 10 → module No. 5 = Modbus address 15).

Note for Measure Module "3x single phase":

This module is to be considered as 3 modules with 3 different Modbus address. The module takes automatically the two addresses immediately following to the programmed one (e.g. Programmed address = 12, addresses of the module 12, 13, 14)

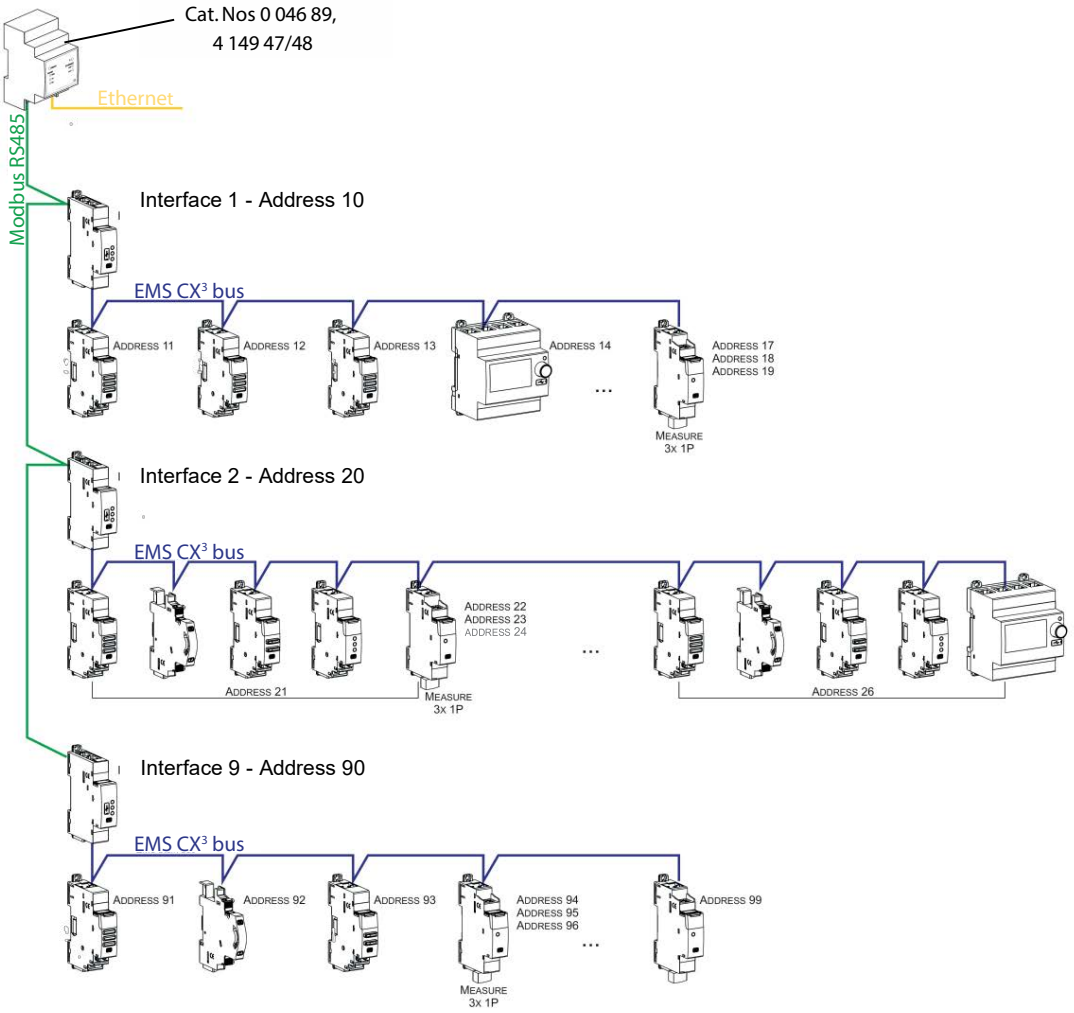
Requirements of the local addressing mode (through the track wheel):

- Each device of the system must be addressed.
- Rotary available: from 1 to 9
- Rotary 0 not permitted

It is possible to assign the same address to several devices with the purpose of grouping different functions, because they are related to the same electrical circuit.

For example, it is possible to assign the same address to a signalling auxiliary module (Cat. No 4 149 29), a universal control module (Cat. No 4 149 32), a measuring module, and so on. In this way on the EMS CX³ display or in a supervision system the grouped function will be displayed as a unique "device" with all grouped functions. (Refer to the scheme hereunder)

Note: In this configuration, the Modbus address of an EMS CX³ module or group of modules is defined by taking the Modbus/EMS CX³ interface address as the tens digit and the device or function group address as the units digit. For example: Interface rotary = 1 (tens → 10) and device = 5 (units), so Modbus address = 15.



7. SYSTEM ARCHITECTURES *(continued)*

■ 7.2 Supervised system (Computer Supervisory System) *(continued)*

Characteristics of the system architecture:

For 1 IP/Modbus gateway (Cat. No 0 046 89):
- Up to **81 Modbus addresses**
- Mandatory limit of max. 9 Modbus/EMS CX³ interfaces or max. 1000 m of Modbus cable (cable Belden 9842, Belden 3106A or equivalent) or max. 50 m of Category 6 cable (FTP or UTP).

For 1 Modbus/EMS CX³ Interface (Cat. No 4 149 40):
- Up to 30 EMS CX³ modules (ex. 30 devices grouped per functions with rotary from1 to 9)

Note: with local addressing, the Modbus/EMS CX³ interface, does the automatic detection of modules (characteristics, functions, configuration...)

Supervised system with remote addressing (through a computer)

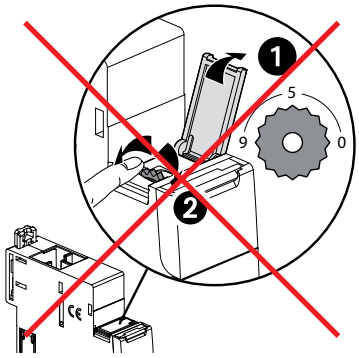
Remote addressing advantages:

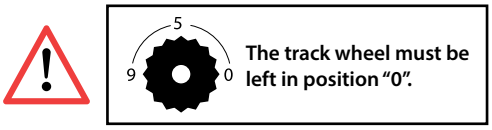
- The whole configuration (addresses and functions) can be done remotely through the EMS configuration software
- Configuration software available for free
- Automatic detection of the EMS CX³ modules installed in the system (characteristics, functions, configuration...)
- Increased settings possibilities: load shedding function
- Increased addressing: **up to 32 Modbus/EMS CX³ interfaces**
- Increased addressing: **up to 247 Modbus addresses in a system**

Programming procedure:

Programming procedure for EMS CX³ modules that need some is operated via the configuration software (see "Module configuration")

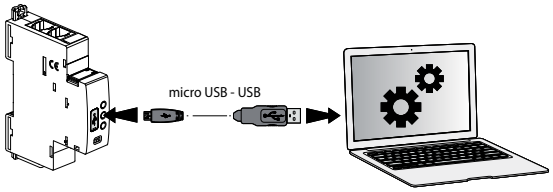
Addressing procedure:

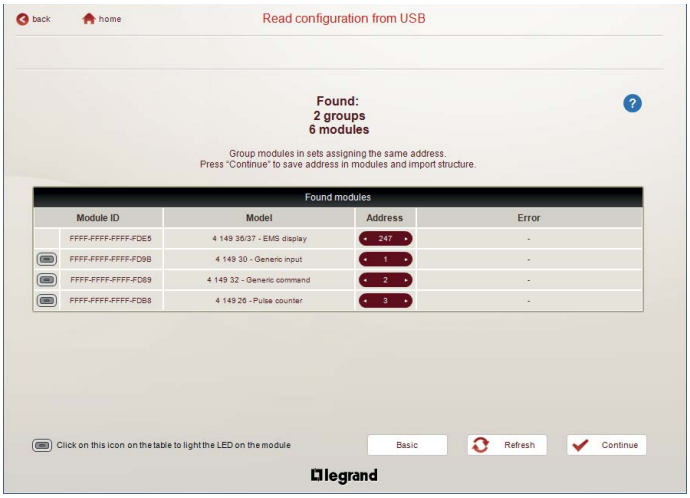




- It is not necessary to address the EMS CX³ modules. **The track wheel must be left in default position "0".**
- All the addressing/configuring procedure will be done with the configuration software (available online for free)
- With remote addressing, the software does the automatic detection of modules installed in the system, but the supervision is not possible until the user assigns the remote address and all the characteristics to each module.

Note: it is mandatory to connect the computer to the different Modbus/EMS CX³ interface with an USB-micro USB cable (one interface at a time). (For more details, refer to the technical data sheet of the Modbus/EMS CX³ interface)





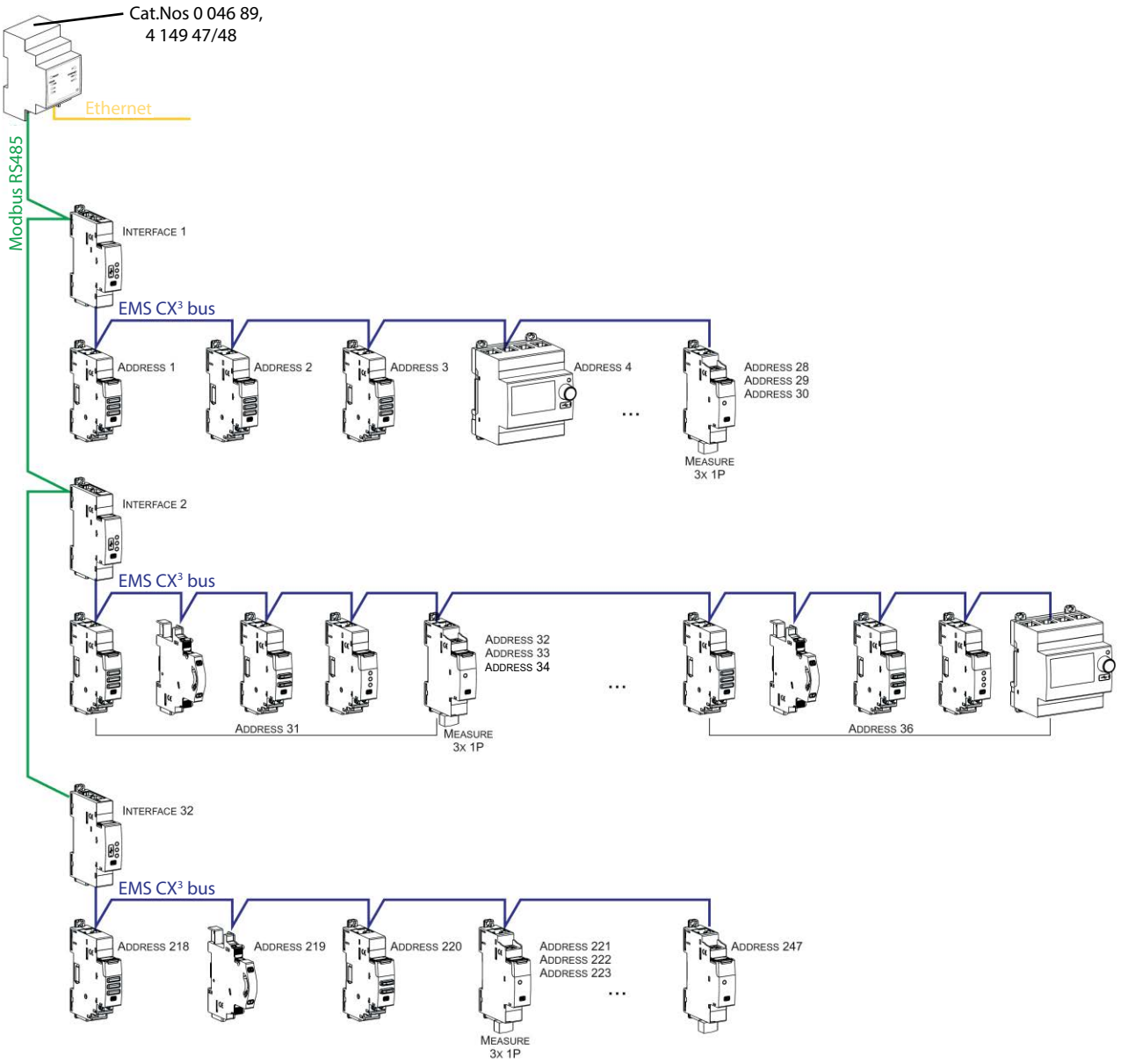
Note for Measure Module "3x single phase":

This module is to be considered as 3 modules with 3 different Modbus address. The module takes automatically the two addresses immediately following to the programmed one (e.g. Programmed address = 2, Addresses of the module 2, 3, 4)

7. SYSTEM ARCHITECTURES *(continued)*

■ 7.2 Supervised system (Computer Supervisory System)*(continued)*

Supervised system with remote addressing (through a computer)*(continued)*



Characteristics of the system architecture:

For 1 IP/Modbus gateway (Cat.No 0 046 89):

- up to 247 Modbus address
- Because of Modbus: mandatory limit of max. 32 Modbus/EMS CX³ interfaces or max. 1000 m of Modbus cable (cable Belden 9842, Belden 3106A or equivalent) or max. 50 m of Category 6 cable (FTP or UTP).

For 1 Modbus/EMS CX³ Interface (Cat. No 4 149 40):

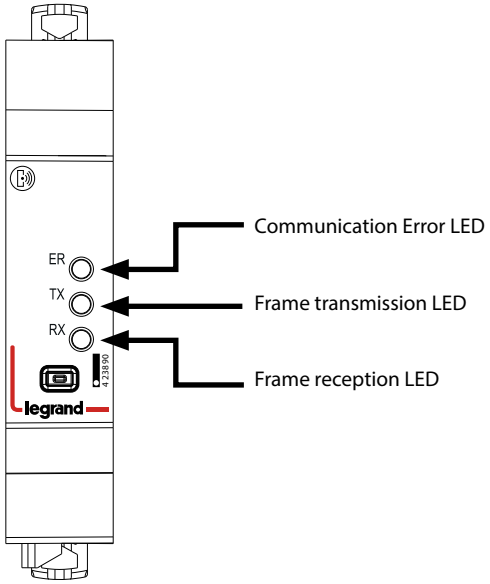
- up to 30 EMS CX³ modules (e.g. 30 devices grouped per functions with addresses from 1 to 30)

It is possible to assign the same address to several devices with the purpose of grouping different functions, because they are related to the same electrical circuit. For example, it is possible to assign the same address to a signalling auxiliary module (Cat. No 4 149 29), a universal control module (Cat. No 4 149 32), a measuring module, and so on. In this way on the EMS CX³ display or in a supervision system, the grouped function will be displayed as a unique "device" with all grouped functions. (Refer to the scheme above)

8. MARKING

Front face marking:

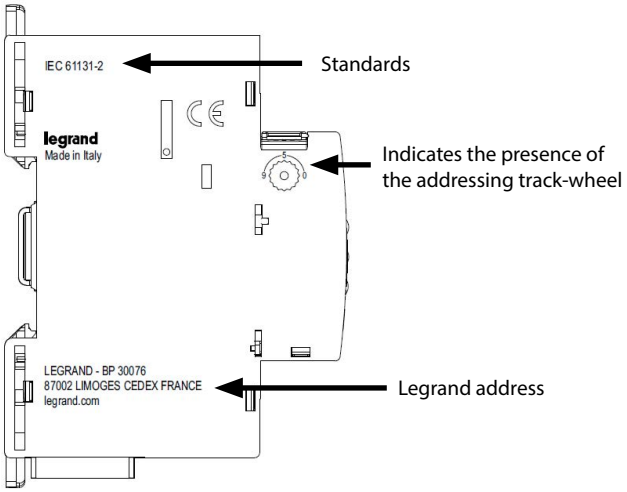
By permanent ink pad printing (red line) and laser marking



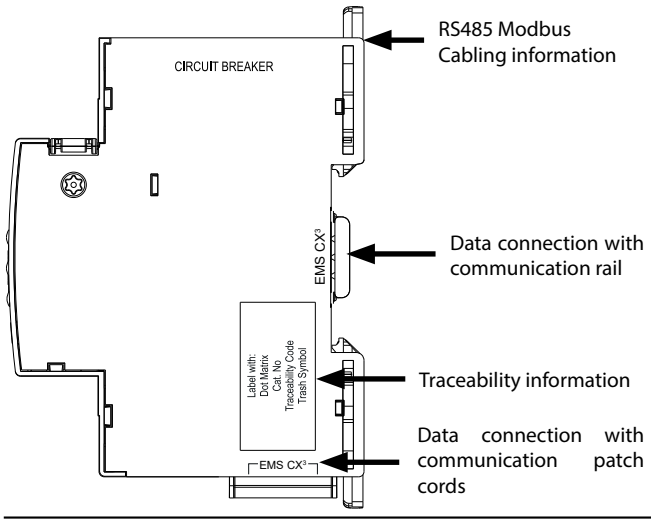
Lateral side marking:

By laser.

Left side: Standard and programming information



Right side: cabling and traceability information



9. STANDARDS AND REGULATIONS

Compliance to standards:

Compliance with Directive on electromagnetic compatibility (EMC) n° 2014/30/EU
Compliance with low voltage directive n° 2014/35/EU.
Electromagnetic Compatibility:
IEC/EN 61131-2

RoHS

Compliance with the 2011/65/EU Directive (RoHS), as modified by the 2015/863/EU Delegated Directive, on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

REACH

The substances identified as SVHC (Substances of Very High Concern) according to the REACH Regulation (1907/2006), if present in the products at a concentration above 0.1% weight by weight, are declared inside the European SCIP database. At the date of publication of this document none of the substance listed in the annex XIV is found in this product.

WEEE

WEEE Directive (2012/19/EU): the sale of this product includes a contribution to the appointed environmental bodies of each European country in charge of handling, at the end of their life, the products falling within the scope of the EU Directive on Electrical and Electronic Equipment Waste.

Plastic materials:

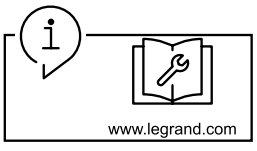
Halogens-free plastic materials.
Marking of parts according to ISO 11469 and ISO 1043.

Packaging:

Design and manufacture of packaging compliant with European Directive 94/62/CE.

10. OTHER INFORMATION

XLPro³ Panels: Distribution panel design software, addressed to panelbuilders and electrical panel designers.
Design of the electrical distribution of the panel, production of electrical diagrams, establishment of products and overall costing of the project.



Workshop book: mounting informations, equipments, accessories and spare parts available on e-catalog.

Instruction sheet: all mounting information, available on e-catalog.

For further technical information, please contact Legrand technical support.

Unless otherwise indicated, data reported in this document refers exclusively to test conditions according to product standards.

For different conditions of use of the product, inside electrical equipment or in any different installation context, refer to the regulatory requirements of the equipment, local regulations and design specifications of the system.