

## EMS CX<sup>3</sup> – Modbus/EMS CX3 communication interface

Cat. n° : 4 23 890



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### 1. DESCRIPTION - UTILISATION

- . Module dedicated to EMS CX3 (Energy Management System)
- . It connects the DPX3 S10 family switches to the EMS BUS system.

#### Symbole :



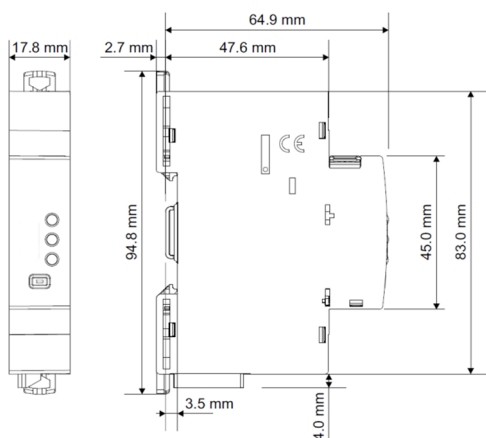
### 2. GAMME

- . Ref. No. 4 23 890: Modbus RS485/EMS CX3 communication interface

#### Width:

- . 1 module. 17,8 mm width.

### 3. OVERALL DIMENSIONS



#### Fixing:

- . On symmetric rail EN/IEC 60715 or DIN 35 rail

#### Operating positions:

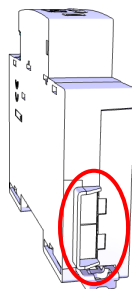
- . Vertical, Horizontal, Upside down, On the side



### 4. PREPARATION -CONNECTION

#### Power Supply:

- . Mandatory in 12 VDC via the specific Power supply module Cat n° 4 149 45
- . Two ways:  
via specific communication patch cords (cat. nos 4 149 07/08/09) to connect at the downstream through dedicated ports



- via specific communication rails (cat. nos 4 149 01/02/03) to connect at the rear through dedicated connectors.



#### Recommended tools:

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

#### Data connection (EMS CX<sup>3</sup> modules inter-connection):

- . Via specific communication patch cords (cat. nos 4 149 07/08/09)

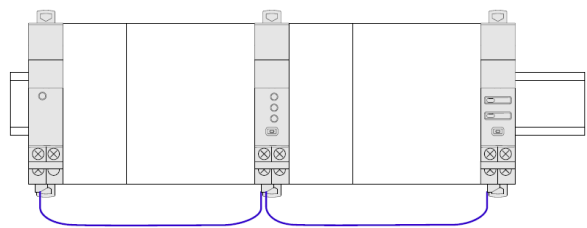


Allow data transmission between the different EMS CX<sup>3</sup> modules.  
This type of connection is recommended when there are few EMS CX<sup>3</sup> modules, distributed all over the enclosure.

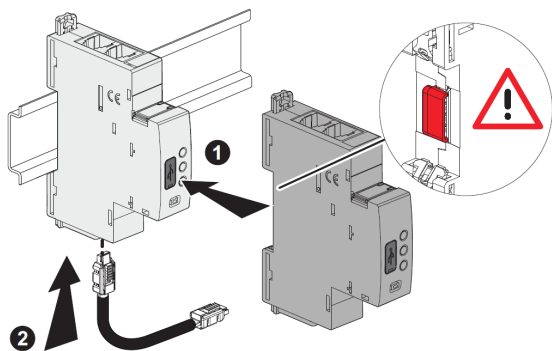
# EMS CX<sup>3</sup> – Modbus/EMS CX3 communication interface

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## 4. PREPARATION –CONNECTION (continued))

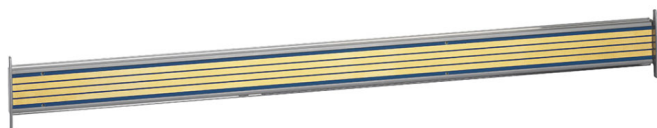


**Implementing:** with this configuration, the plastic protection cover of the backside communication ports on the EMS CX<sup>3</sup> module must be keep on.



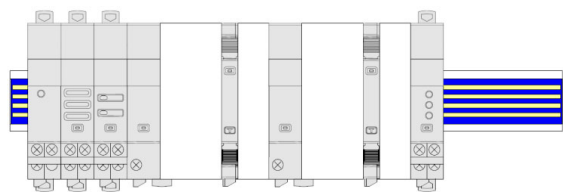
**Note:** Sliding the form to the right or left is prohibited.

. Via specific communication rails (cat. nos 4 149 01/02/03).



. Allow data transmission between the different EMS CX<sup>3</sup> modules.

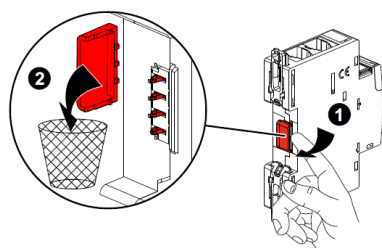
This type of connection is recommended when there are several EMS CX<sup>3</sup> modules on the same DIN row.



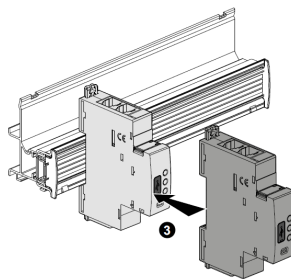
### Data connection (EMS CX<sup>3</sup> modules inter-connection)

(continued):

**Implementing:** with this configuration, the plastic protection cover of the backside communication ports on the EMS CX<sup>3</sup> module must be removed.



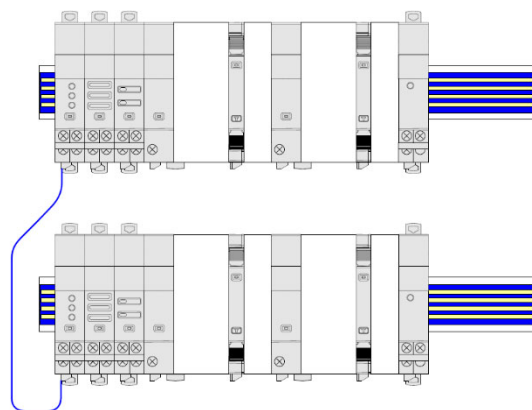
## 4. PREPARATION –CONNECTION (continued)



. Via a mix between specific communication patch cords and communication rails in order to create a link between several rows

Two situations:

- Individually connected with communication rails.  
The communication patch cord allows to connect two rows.

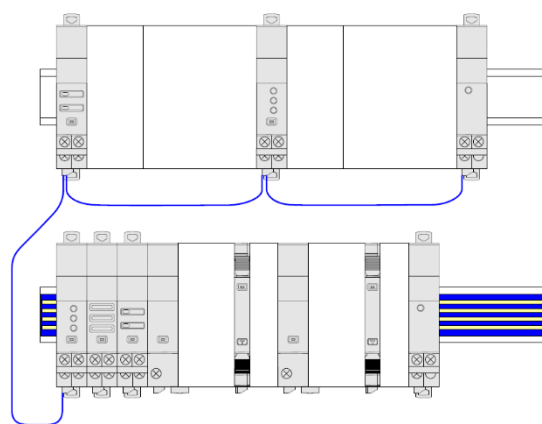


- Individually connected with communication patch cords & communication rail.

### Data connection (EMS CX<sup>3</sup> modules inter-connection)

(continued):

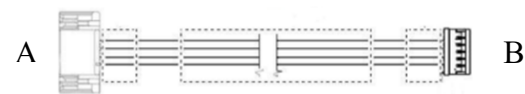
The communication patch cords allow to connect EMS CX<sup>3</sup> module on a row and to connect two rows.



4. PREPARATION –CONNECTION (continued)

Interconnection between interface module and switches

. By means of a specific pre-wired connection cable, for which it is possible to find a spare part on the art market. LG-981243

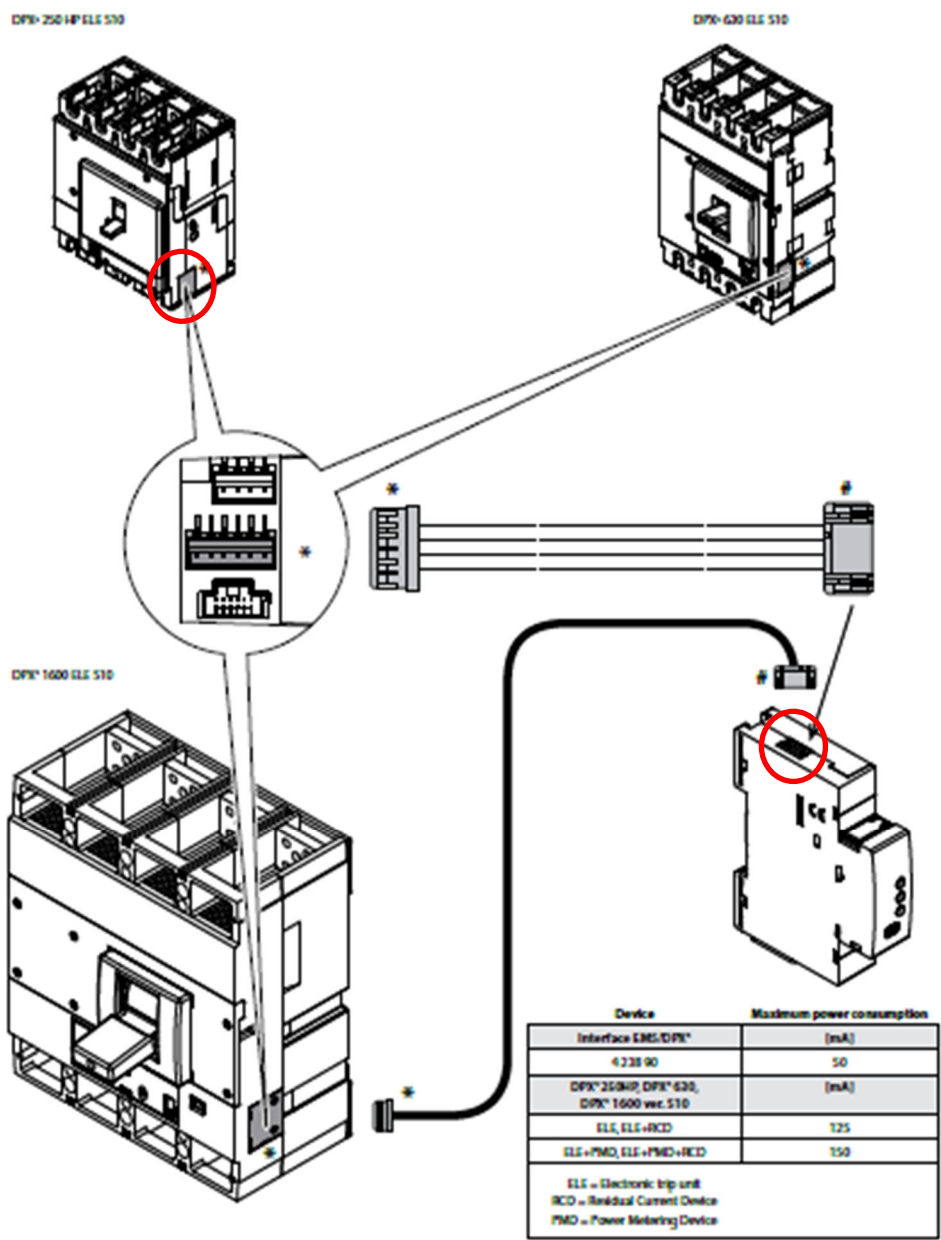


Features:

Terminal A: Connects to the interface

Terminal B: Connects to the switch

Cable length: 2 m



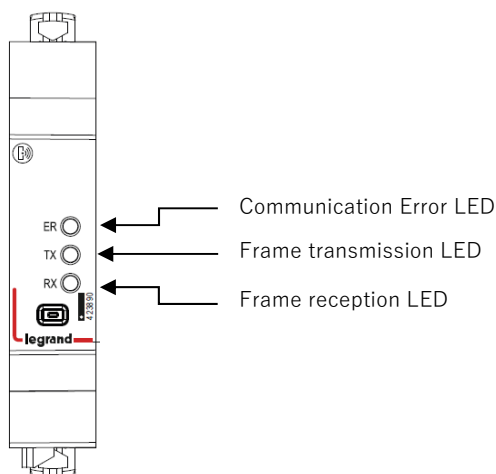
# EMS CX<sup>3</sup> – Modbus/EMS CX3 communication interface

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## GENERAL CHARACTERISTICS

### Front face marking:

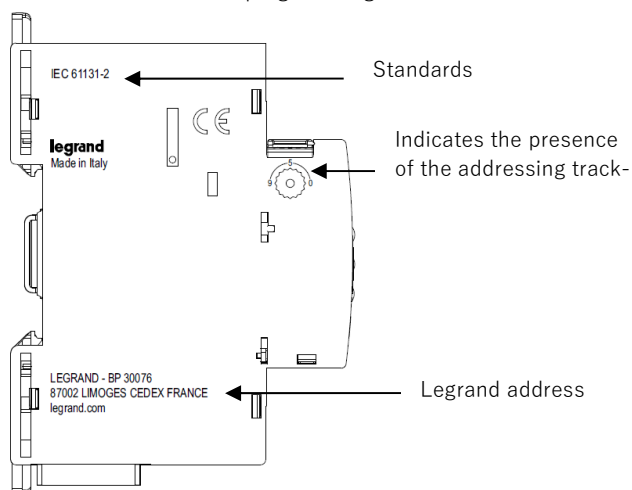
. By permanent ink pad printing (red line) and laser marking



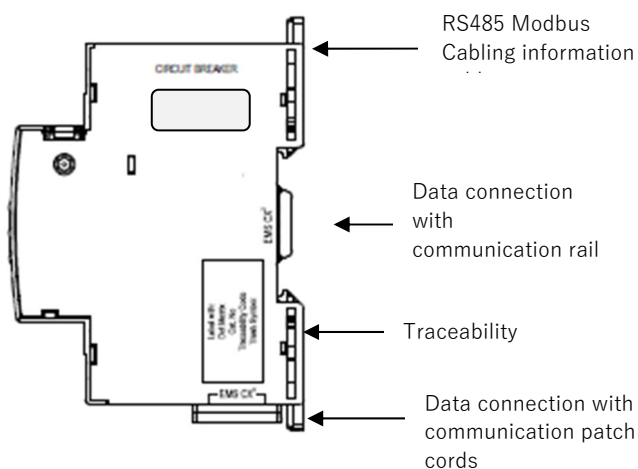
### Lateral side marking:

. By laser.

left side: Standard and programming information



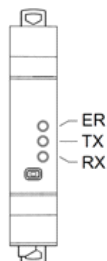
right side: cabling and traceability information



## 5. GENERAL CHARACTERISTICS (continued)

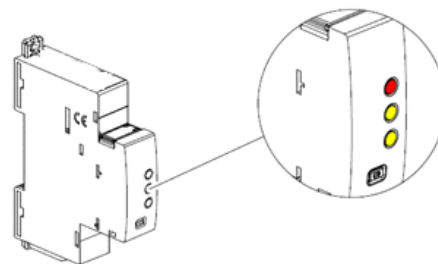
### Signalling LEDs:

- . 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 bus



### Multi-Functions button:

. Front face button as several functions:



### Alarms

The device 4 23 890 periodically checks communication with the associated switch; in the event of a communication fault, the corresponding alarm is generated on the EMS CX3 Bus.




When the FW update is carried out on the electronic display part of the associated circuit breaker, interface 4 23 890 declares a communication failure with the circuit breaker alarm on the EMS CX3 Bus. The alarm is displayed via the EMS LED of devices 4 14 940 and/or 4 14 936, which must be reset manually.

The TX LED of interface 4 23 890 flashes while the RX LED remains off, because there is no communication between 4 23 890 and the associated switch. Therefore, in this phase, it will not be possible to supervise the circuit breaker in supervision.

## 5. GENERAL CHARACTERISTICS *(continued)*

### Multifunction button *(continued)*:

- . Gives information about the operating status of the module
- . Different states & colors possible:

| Led colour  | State  | Meaning   |
|---|--|---|
| <br>red      | Slow blinking  | Error (e.g. addressing error)   |
|   | Fast blinking  | System alarm detected <i>(see Note*)</i>  |
|   | Steady<br><i>(pressing the multifunction button longer than 10 sec.)</i> | Total reset<br>[any firmware updates are preserved]   |
| <br>green    | Slow blinking  | System process is running.<br>Wait until the Led turns steady                                   |
|   | Fast blinking<br><i>(pressing the multifunction button for 5 sec.)</i>   | put in "Stand-by" the EMS CX <sup>3</sup> module (no remote action and communication available) |
|   | Steady   | System OK, connection is running  |
| <br>orange | Slow blinking  | Creation of a link with "Link Functionality" procedure (see next §)                             |
|   | Fast blinking  | Device's firmware update in progress  |
|   | Steady   | Start of FW update or active Link functionality (see next §)                                    |

### \* 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 § 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


## 5. . GENERAL CHARACTERISTICS *(continued)*

### Link Functionality:

. This function allows you to link two EMS CX<sup>3</sup> modules to create automatic actions that, once programmed, can run independently without a connection to a manager is needed.

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.).

Possible associations are:

| Event generator                                  | Action module        |                              |  |
|--|----------------------|------------------------------|--|
|  | Command:<br>4 149 32 | State + Command:<br>4 149 31 | State:<br>4 149 30   |
| Measure:<br>4 149 18/19/20/21/<br>22/23/24/25/27 | ✓                    | ✓                            | <p>✓</p> <p>Only with the module configured remotely as shown:</p>    |
| State:<br>4 149 29/30                            | ✓                    | ✓                            | <p>✗</p> <p>It's enough to configure the module remotely as "Replica"</p>  |
| State + Command:<br>4 149 31                     | ✓                    | ✓                            | <p>✗</p> <p>It's enough to configure the module remotely as "Replica"</p>  |
| Interface:<br>4 238 90                           | ✓                    | ✓                            | <p>✓</p> <p>Only with the module configured remotely as shown:</p>  |
| Circuits breaker S10                             | ✓                    | ✓                            | <p>✓</p> <p>Only with the module configured remotely as shown:</p>  |

### 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 CX<sup>3</sup> Configuration software]*

## 5. CARACTERISTIQUES GENERALES *(suite)*

### Fonction Relier *(suite)* :

Modules compatibles avec la fonctionnalité "Fonction Relier" : versions firmware et date de fabrication :

| Réf.     | Version firmware       | Date de fabrication indiquée sur l'étiquette collée à côté du module |
|----------|------------------------|--|
| 4 149 18 | toute version firmware | toute date de production   |
| 4 149 19 | ver. ≥ 2.0.1           | date ≥ 18W29   |
| 4 149 20 | ver. ≥ 2.0.1           | date ≥ 18W49   |
| 4 149 21 | toute version firmware | toute date de production   |
| 4 149 22 | toute version firmware | toute date de production   |
| 4 149 23 | ver. ≥ 2.0.1           | date ≥ 18W49   |
| 4 149 24 | toute version firmware | toute date de production   |
| 4 149 25 | toute version firmware | toute date de production   |
| 4 149 27 | toute version firmware | toute date de production   |
| 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 23 890 | 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 CX<sup>3</sup>/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

### Insulation voltage:

- . U<sub>i</sub> = 400 V

### Pollution degree:

- . 2 according to IEC/EN 60898-1.

### Overvoltage category:

- . III

### 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

# EMS CX<sup>3</sup> – Modbus/EMS CX3 communication interface

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## 5. GENERAL CHARACTERISTICS *(continued)*

### Ambient operating temperature:

. Min. = -25° C. Max. = +70° C

### Ambient storage temperature:

. Min. = -40° C. Max. = +70° C

### Protection Index:

. Protection index of terminals against direct contacts:

IP2X (IEC/EN 60529).

. Protection index of terminals against solid and liquid bodies (wired device): IP 20 (IEC/EN 60529).

. Protection index of the front face against solid and liquid bodies: IP 40 (IEC/EN 60529).

. Class II, front panel with faceplate.

### Average weight per device:

. 0,050 kg.

### Volume when packed:

. 0,21 dm<sup>3</sup>.

### Consumption:

. Values at 12 VDC

| Configuration | W     | mA   |
|---------------|-------|------|
| Stand-by      | 0,316 | 26,3 |
| Communication | 0,344 | 28,7 |



## 6. SYSTEM ARCHITECTURES

The EMS CX<sup>3</sup> is a polyvalent system and, according to the needs of the customer, 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:

### 6.1 Stand-alone system

#### 6.1.1 with local addressing (through the track wheel)

#### 6.1.2 with remote addressing (through a computer)

### 6.2 Supervised (Computer Supervisory System)

#### 6.2.1 with local addressing

#### 6.2.2 with remote addressing

### 6.1 Stand-alone system

. **Stand-alone** = autonomous system. To be 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.

#### 6.1.1 Stand-alone system with local addressing (through the track wheel)

Local addressing advantages:

- No configuration software needed to set-up the installation
- **It is not necessary 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

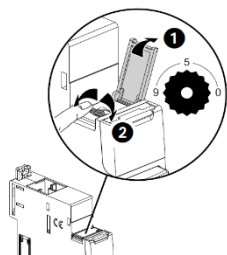
#### Programming procedure:

. For EMS CX<sup>3</sup> modules which need some: mandatory through the EMS CX<sup>3</sup> configurator (see § “Module configuration”)

#### Addressing procedure:

. For all EMS CX<sup>3</sup> modules: mandatory through the track wheel located on the top upper face of each EMS CX<sup>3</sup> modules

. Marked from 0 to 9 in order to locally define the Modbus address of the EMS CX<sup>3</sup> modules

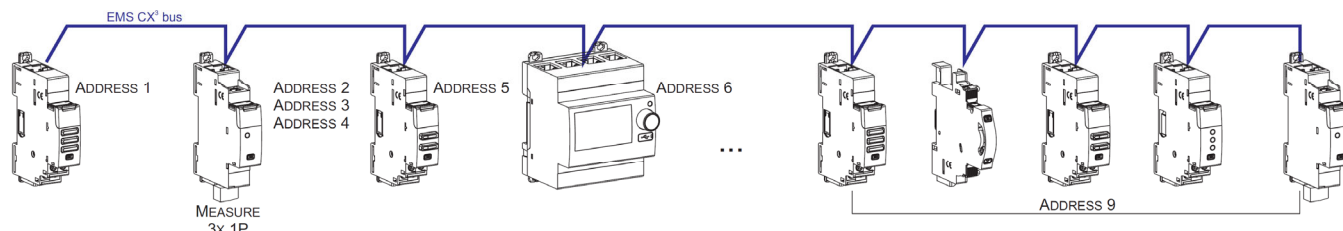


#### Note for Measure Module “3x single phase”:

This module is to be consider 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)

#### Consequences 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**. 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 CX<sup>3</sup> mini configuration module (local display) the grouped function will be displayed as a unique “device” with all grouped functions. [Refer to the schemes hereunder]



#### Note for the mini configuration module (local display)

- . It is necessary to assign the mini configurator a different address from all the other EMS CX<sup>3</sup> modules through the device programming menu.
- . The mini configuration module can be placed everywhere in the EMS CX<sup>3</sup> bus

## 6. SYSTEM ARCHITECTURES

### 6.1 Stand-alone system *(continued)*

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

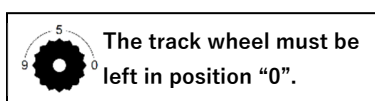
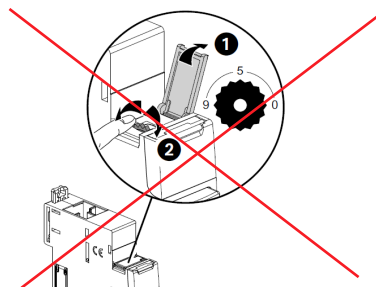
Remote addressing advantages:

- Whole configuration (addresses and functions) can be set up through the EMS Configuration software
- Configuration software available for free
- **Automatic detection of the EMS CX<sup>3</sup> modules** 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:

. For EMS CX<sup>3</sup> modules which need some: mandatory via the configuration software *(see § "Module configuration")*

#### Addressing procedure:

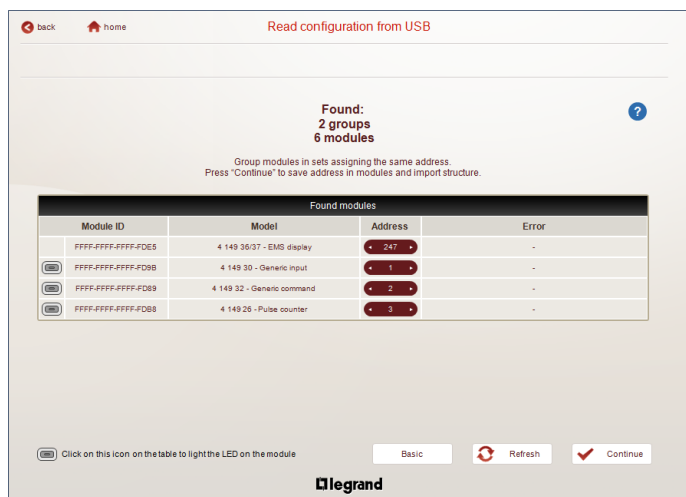
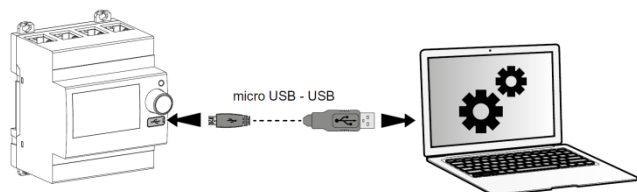


. It is not necessary to assign an address via rotary; **The track wheel must be left in default position "0"**.

. All the addressing/configuring procedure 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 Mini configuration module with an USB-micro USB cable.** *[For more details, refer to the technical data sheet of the Mini configuration module EMS CX<sup>3</sup>]*



#### Note for Measure Module "3x single phase":

This module is to be consider 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)

## 6. SYSTEM ARCHITECTURES

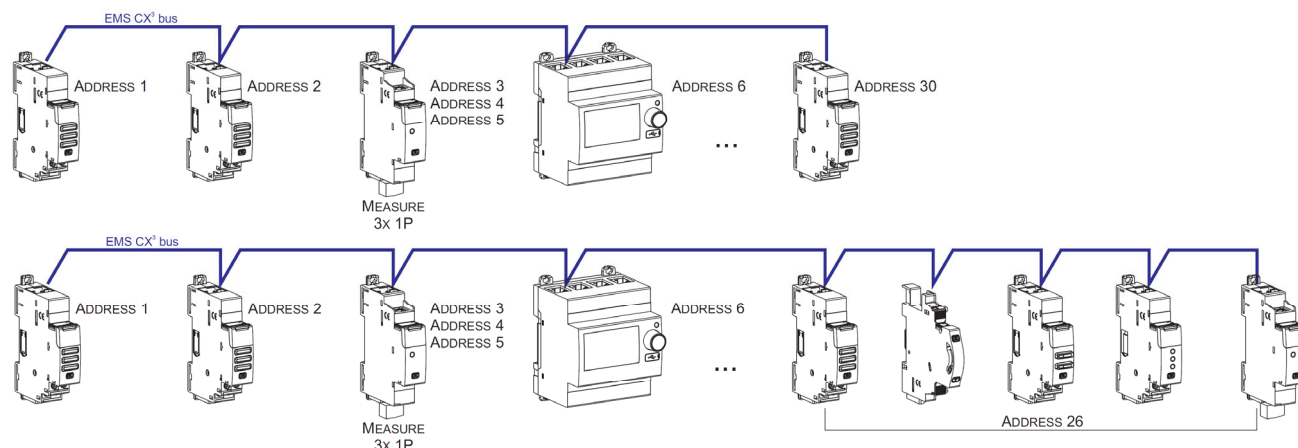
### 6.1 Stand-alone system *(continued)*

#### 6.1.2 Stand-alone system with remote addressing (through a computer) *(continued)*

#### Consequences for the system architecture:

- for 1 mini configuration module (cat. no 4 149 36/37)
  - o up to **30 EMS CX<sup>3</sup> modules** (e.g. 30 devices grouped per functions with addresses from 1 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 CX<sup>3</sup> display or in a supervision system the grouped function will be displayed as a unique “device” with all grouped functions. *[Refer to the schemes here under]*



#### Note for the mini configuration module (local display)

- . It is necessary to assign the mini configurator a different address from all the other EMS CX<sup>3</sup> modules through the device programming menu.
- . The mini configuration module can be placed everywhere in the EMS CX<sup>3</sup> bus

### 6.2 Supervised system (Computer Supervisory System)

. **Supervised system** = System to be used through a Computer Supervisory System to remotely read data from the EMS CX<sup>3</sup> devices and/or do operations on these devices (e.g. commands of a motor driven or contactor ...).

#### 6.2.1 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

#### Programming procedure:

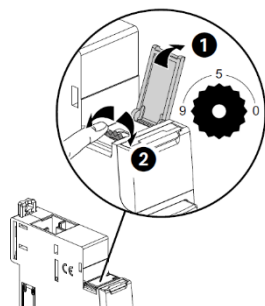
For EMS CX<sup>3</sup> modules which need some: mandatory via the configuration software (see § "Module configuration")

#### Addressing procedure:

. For all EMS CX<sup>3</sup> modules: mandatory through the track wheel located on the top upper face of each EMS CX<sup>3</sup> modules

. Marked from 0 to 9 in order to locally define the Modbus address to EMS CX<sup>3</sup> modules

In this system the Modbus address of an EMS CX<sup>3</sup> module device or group of modules (several functions) is obtained considering the address of the interface Modbus/EMS CX<sup>3</sup> Interface as tenth and the address of a device or group of function as unit (e.g. Interface address 1 = 10 → address of module n° 5 = Modbus address 15)



#### Note for Measure Module “3x single phase”:

This module is to be consider 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)

## 6. SYSTEM ARCHITECTURES *(continued)*

### 6.2 Supervised system (Computer Supervisory System) *(continued)*

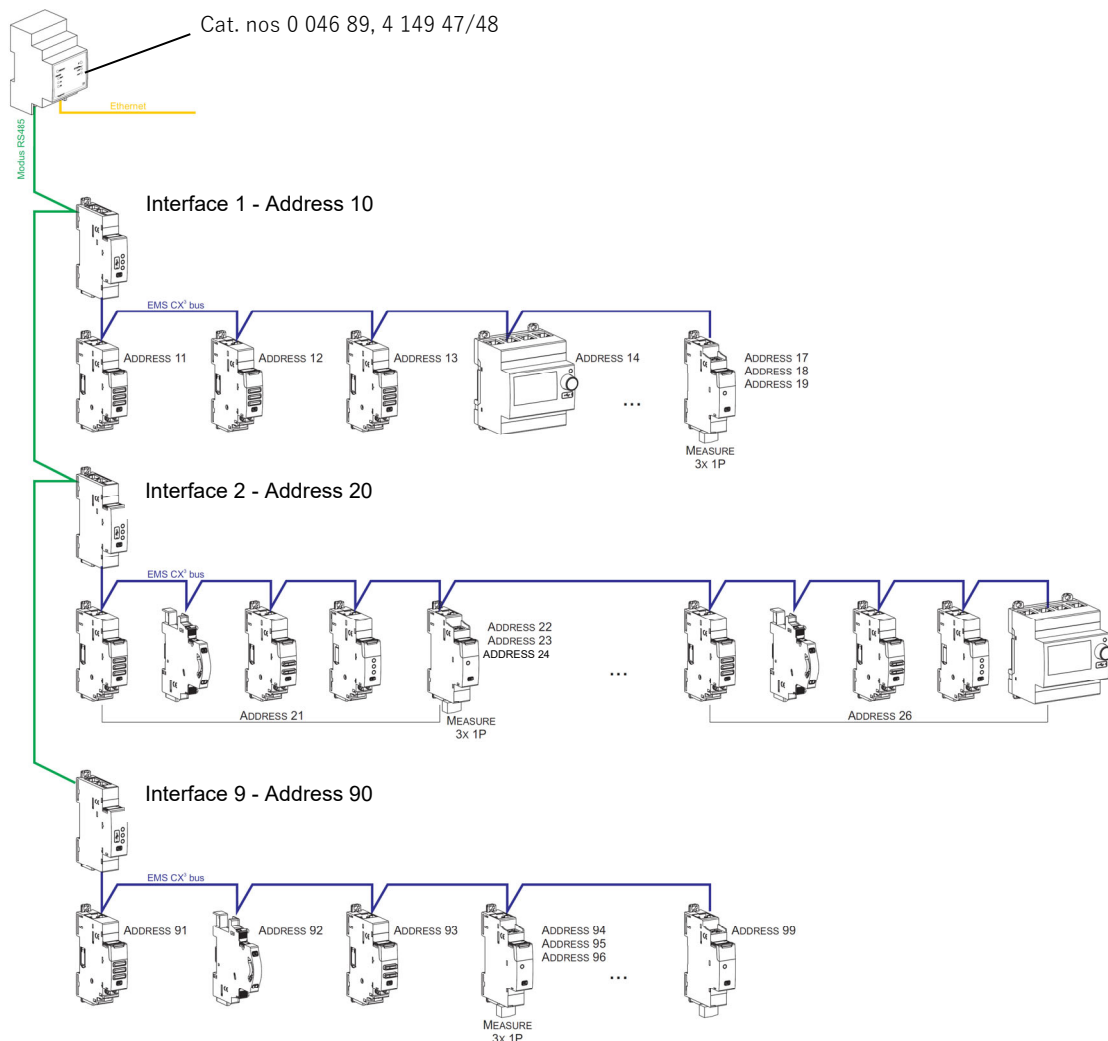
#### 6.2.1 Supervised system-with local addressing (through the track wheel) *(continued)*

#### Consequences of the local addressing mode (through the track wheel):

- . Each device of the system must be addressed.
- . Rotary position available: from 1 to 9
- . Rotary position in 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**. 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 CX<sup>3</sup> 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 CX<sup>3</sup> module device or group of modules (several functions) is obtained considering the address of the interface Modbus/EMS CX<sup>3</sup> Interface as tenth and the address of a device or group of function as unit (e.g. Interface rotary 1 = 10 and device rotary = 5 → Modbus address = 15)



#### Consequences for the system architecture:

- for 1 IP/Modbus gateway (cat. no 0 046 89):
  - o up to **81 Modbus address**
  - o mandatory limit of max. **9 Modbus/EMS CX<sup>3</sup> 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 CX<sup>3</sup> Interface (cat. no 4 149 40):
  - o up to **30 EMS CX<sup>3</sup> modules** (ex. 30 devices grouped per functions with addresses from 1 to 9)

**Note:** with local addressing, the Modbus/EMS CX<sup>3</sup> interface, does the automatic detection of modules (characteristics, functions, configuration...)

6. SYSTEM ARCHITECTURES *(continued)*

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

6.2.2 Supervised system-with remote addressing (through a computer)

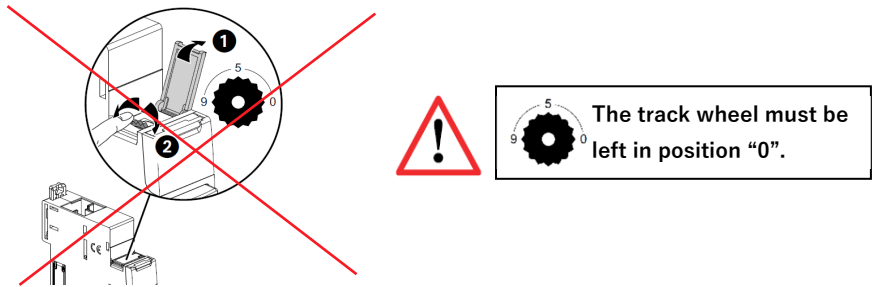
Remote addressing advantages:

- Whole of configuration (addresses and functions) can be done a remotely through the EMS Configuration software
- Configuration software available for free
- **Automatic detection of the EMS CX<sup>3</sup> modules** installed in the system (characteristics, functions, configuration...)
- **Increased settings possibilities: load shedding function**
- Increased addressing: **up to 32 Modbus/EMS CX<sup>3</sup> interfaces**
- Increased addressing: **up to 247 Modbus addresses in a system**

**Programming procedure:**

. For EMS CX<sup>3</sup> modules which need some: possible through the lateral DIP-switches of each EMS CX<sup>3</sup> module or via the configuration software (see § "Module configuration").

**Addressing procedure:**

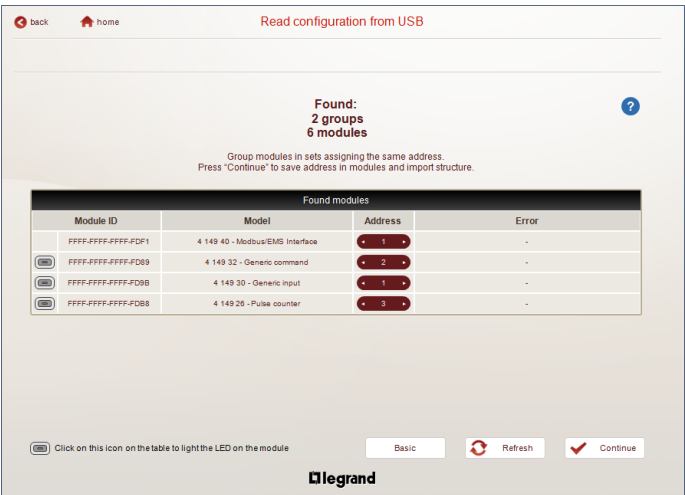
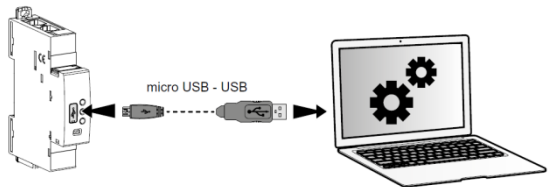


. It is not necessary to address the EMS CX<sup>3</sup> modules. **The track wheel must be left in default position "0".**

. 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 CX<sup>3</sup> interface with an USB-micro USB cable (one interface at a time).** [For more details, refer to the § "Front USB port" of this document]



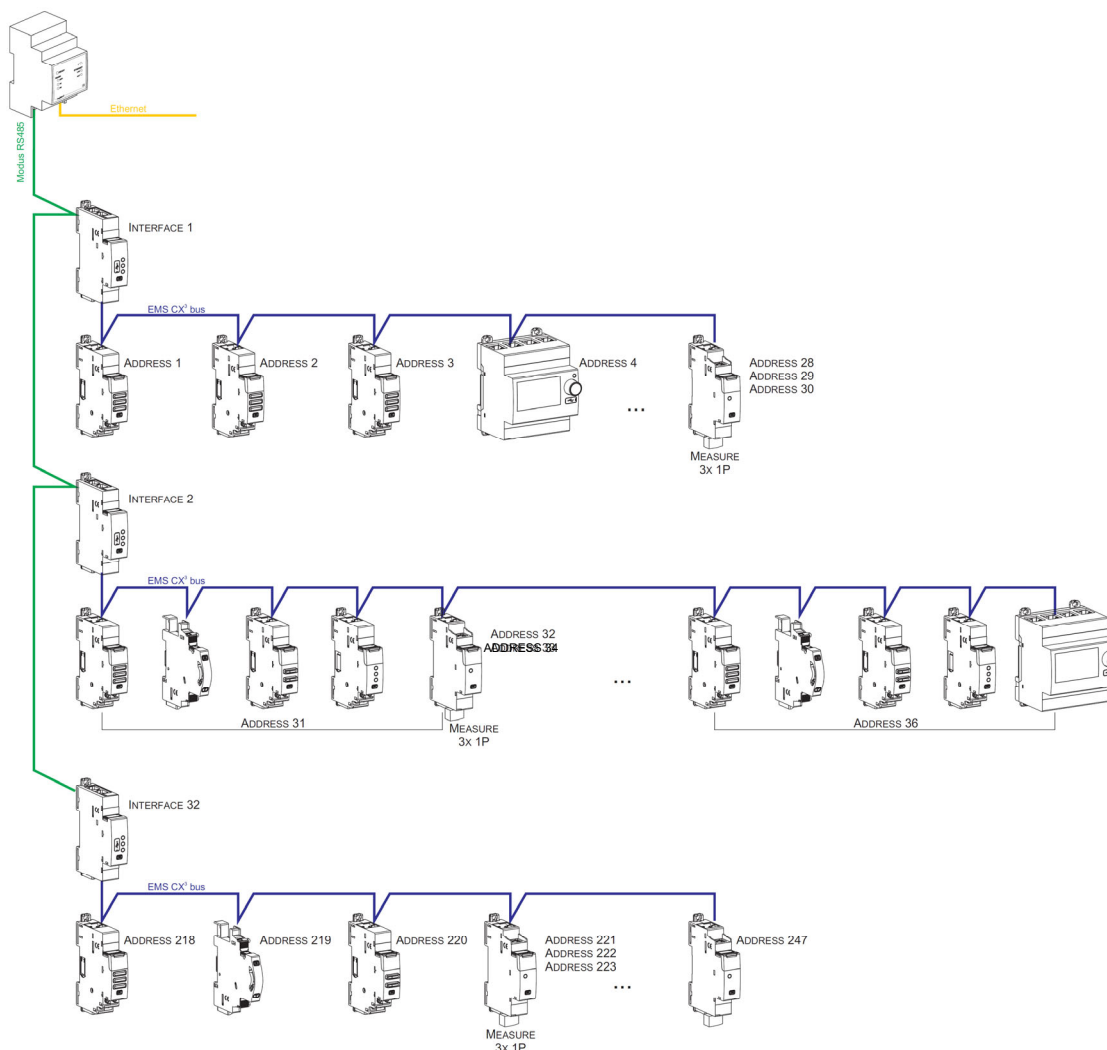
**Note for Measure Module "3x single phase":**

This module is to be consider 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)

## 6. SYSTEM ARCHITECTURES *(continued)*

### 6.2 Supervised system (Computer Supervisory System) *(continued)*

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



#### Consequences for the system architecture:

- for 1 IP/Modbus gateway (cat. no 0 046 89):
  - o up to **247 Modbus address**
  - o Because of Modbus: mandatory limit of max. **32 Modbus/EMS CX<sup>3</sup> 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 CX<sup>3</sup> Interface (cat. no 4 149 40):
  - o up to **30 EMS CX<sup>3</sup> modules or grouped modules** (e.g. 30 devices grouped per functions with addresses from 1 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 CX<sup>3</sup> display or in a supervision system the grouped function will be displayed as a unique “device” with all grouped functions. *[Refer to the scheme up here]*

## 7. COMPLIANCE AND APPROVALS

### 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

### Environment respect - Compliance with EU directives:

- . Compliance with Directive 2011/65/EU as amended by Directive 2015/863 (RoHS 2) on the restriction of the use of certain hazardous substances in electrical and electronic equipment.
- . Compliance with REACH regulation (1907/2006): at the date of the publication of this document no element of the SVHC substance list (updated on 27/06/2018) is present in these products.
- . WEEE directive (2012/19/EU): the sale of this product is subject to a contribution to eco-organisations in each country responsible for managing end-of-life products in the field of application of the European Waste Electronic and Electrical Equipment Directive.

### Plastic materials:

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

### Packaging:

- . Design and manufacture of packaging compliant to decree 98-638 of the 20/07/98 and also to directive 94/62/CE.

### Environmental profile:

- . PEP document available.

### Installation software:

- . XL PRO<sup>3</sup>