TECHNICAL GUIDE

ENERGY MANAGEMENT IN ELECTRICAL PANELS

from MEASUREMENT to SUPERVISION

CREATING AN E-COMMUNICATING STRUCTURE

THE GLOBAL SPECIALIST IN ELECTRICAL AND DIGITAL BUILDING INFRASTRUCTURES

legrand®

Measurement is the basis of all diagnostics.
By simply monitoring consumption,
between 8 and 12% savings can be made.
Computer equipment, temperature control and lighting
rank amongst the energy-intensive items.
These results can be improved by implementing specific initiatives.
Encouraged by new standards and directives, measurement is
increasingly used in both commercial and residential buildings
so that occupants can easily view their consumption (heating,
cooling, hot water production, power sockets, lighting, etc).
In addition to **energy meters**, **measurement control units**
and new protective devices incorporating measurement functions,
Legrand offers an **e.communicating infrastructure** that can
display data such as electricity consumption, reactive power, harmonic
distortion, etc, and also **control** different states, **remotely control**
circuits and program actions such as alarms, schedule **corrective**
actions using diagnostics, etc - in a word: "**supervise**".

To meet these needs,
Legrand offers a whole range of products

LEGRAND ENERGY EFFICIENCY

CONTENTS

STANDARDS AND REGULATIONS

THE BROAD OUTLINES

European Directive 2012/27/EU

The European Energy Efficiency Directive 2012/27/EU dated 25 October 2012 imposes an obligation on large companies to conduct an energy audit.

The **dates**

This directive requires all companies concerned to conduct an energy audit:

→ **before 6 December 2015**

→ **which must be repeated every 4 years**

Who

This directive concerns all companies which have:

→ **a workforce of more than 250 people**

→ **annual sales in excess of 50 million euros**

→ **or a balance sheet of more than 43 million euros**

Exception: companies certified ISO 50001 are exempt from this obligation.

The **requirements**

The scope of this energy audit must represent at least 80% of the company's energy bills, otherwise they may be liable to sanctions of up to 2% of their sales.

If the company is certified ISO 50001, this certification should cover 80% of its energy bill. If not, the company should conduct an additional audit on activities which are not covered.

Measurement

The energy audit should be conducted based on the energy performance of the building(s) concerned. To do this, all significant energy use should be identified in order to define opportunities for improvement. An energy inventory should be conducted based on an assessment of consumption and identification of usage. The aim is to collect and analyse the field data required for the energy review and construction of the energy management system.

ISO 50001 certification

Standard ISO 50001:2011 specifies the requirements on organisations to establish, implement, maintain and improve an Energy Management System (EnMS).

The **dates**

ISO 50001:2011 is an international voluntary standard drawn up by the ISO (International Organization for Standardization).

→ **since 2011**

→ **3-year certification cycle**

Who

This certification can apply to organisations of all shapes and sizes, regardless of their geographical location and cultural or social context.
A company which complies with standard ISO 50001:2011 will therefore be able to demonstrate the existence of a robust EnMS.

The **requirements**

General requirements relating to this certification:

→ a commitment to continuous improvement in terms of energy efficiency

→ appointment of a qualified energy management specialist

→ organisation of a management plan

→ an assessment of the main energy applications

→ the setting up of energy performance indicators and targets

→ the setting up of action plan(s)

→ all staff must undergo training in how best to improve energy efficiency

→ the results should be evaluated and sent out to all staff on a regular basis

Measurement

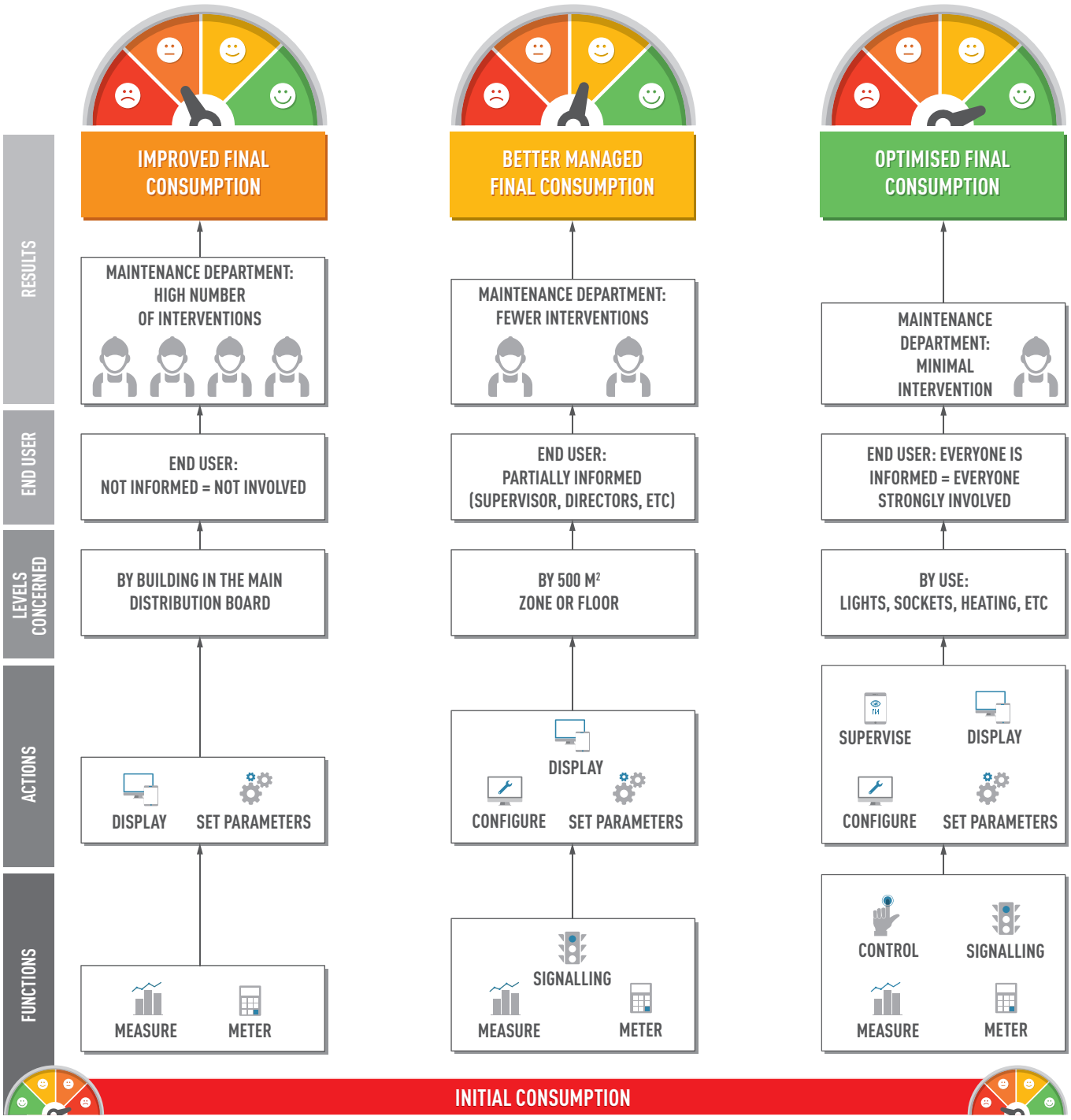
Like directive 2012/27, ISO 50001 does not require specific measurements by type of use or circuit.
However, in order to construct the energy management system for buildings, it is important to know which are the most energy-intensive items in order to identify potential sources of improvement.
Use of a measurement and supervision system ensures continuous improvement in the company's energy performance.

ENERGY MANAGEMENT

OVERVIEW

Maximum number of functions and actions = minimum number of interventions and consumption

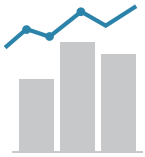
In an electrical infrastructure, having more functions and actions reduces the number of human interventions and makes a major contribution to optimising final consumption.



DEFINITIONS

METERING

Recording the electricity consumed by a circuit.
This is the basic function which is available on all metering devices.



MEASUREMENT

Measuring electrical values (current, voltage, power, harmonic distortion, etc) or analogue values (temperature) to check the installation is working properly.

SIGNALLING

Checking locally (LEDs, display unit, touch screen, etc) **or remotely** (LEDs, display unit, PLC, PC, tablet, smartphone, etc):
→ the on/off status of one or more devices and/or circuits
→ any faults such as circuit breaker tripping, min. or max. threshold overrun, etc

CONTROL

Managing control devices such as relays, contactors, circuit breaker motorised controls, load shedding/restoration, etc following a manual or automatic command, fault, etc.

DISPLAY

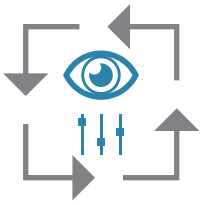
Viewing data, locally, on built-in, external, or remote screens, on PCs, smartphones or tablets with a web browser.

PARAMETER SETTING

A parameter is **an element in a computer program** which remains accessible for user modification. Most electronic devices need a minimum amount of parameter setting, such as the date and time, etc, as well as setting of an alarm set point, the level to be reached for a load-shedding operation, etc.
This data can be modified locally directly on the devices or remotely on a computer.

CONFIGURING

Designing instructions which can then be used to establish a set of **automatic operations**.



STANDALONE system

An installation is said to be "Standalone" when it does not need any external connection to the panel (via Modbus or IP) to configure and/or use it.
Nor is a computer required. It is therefore self-sufficient and can be used on its own. It can also be called **"self-contained"**.

SUPERVISION

Supervision is a computerised **control and monitoring technique** for processes.
In the measurement field, it is used as an umbrella term for all the aforementioned functions (display, monitor, control, set parameters, program). Supervision concerns acquisition of data (measurements, alarms, status feedback, etc) and process control (circuit breaker remote control, etc). A supervision system helps control and optimise energy consumption at any time on the whole of the electrical network. It monitors all the equipment with respect to safety, control, speed of intervention and continuity of service.
Data retrieved concerning the equipment operating status, distributed power measurements and consumption can be exploited in order to set up a technical energy management solution.

SOLUTIONS FOR ANY BUILDING

The Legrand measurement and supervision range can satisfy many varied customer needs:
- regardless of the type of building: residential, commercial or industrial
- regardless of the type of need:
  - "ACCESS", or simple standalone offers, where it is mainly possible to view information: "I am informed"
  - "PREMIUM", or interconnected offers, where it is also possible to make changes to the installation by controlling it: "I am informed and I take control"

Legrand **ACCESS** solution **"I am informed"**

PRIVATE HOUSING

Structure(s): private homes, apartment blocks, small offices, etc
Function(s): metering, measurement
Option(s): setting parameters locally or remotely
View: locally or remotely

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COLLECTIVE HOUSING

Structure(s): private homes, apartment blocks, small offices, etc
Function(s): metering, measurement
Option(s): setting parameters locally or remotely
View: locally or remotely

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COMMERCIAL/SERVICE SECTOR

Structure(s): commercial buildings, small industrial concerns, large offices, etc
Function(s): metering, measuring numerous circuits
Option(s): setting parameters locally
View: locally

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INDUSTRIAL/SERVICE SECTOR

Structure(s): office buildings, large industrial concerns, hospitals, data centres, etc
Function(s): metering, measuring numerous circuits in several buildings
Option(s): setting parameters locally
View: locally or remotely

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Legrand **PREMIUM** solution
“I am informed and I take control”

PRIVATE HOUSING

Structure(s): private homes, apartment blocks, small offices, etc
Function(s): all the functions in a “connected” home
Option(s): setting parameters, configuring locally or remotely
View: locally or remotely

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COLLECTIVE HOUSING

Structure(s): private homes, apartment blocks, small offices, etc
Function(s): measurement, standalone load shedding in each apartment or in communal areas
Option(s): setting parameters locally or remotely
View: locally or remotely

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COMMERCIAL/SERVICE SECTOR

Structure(s): commercial buildings, small industrial concerns, large offices, etc
Function(s): measurement, metering, monitoring, control, supervising all energy management
Option(s): setting parameters locally or remotely
View: locally or remotely

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INDUSTRIAL/SERVICE SECTOR

Structure(s): office buildings, large industrial concerns, hospitals, data centres, etc
Function(s): measurement, metering, monitoring, control, supervising all energy management and that of the whole building (lighting, fire, access control, etc)
Option(s): setting parameters, configuring, controlling locally or remotely
View: locally or remotely

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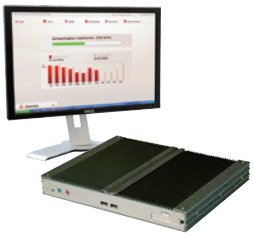


PRIVATE HOUSING

Legrand **ACCESS** solution **"I am informed"**

EMDX³ METERING OR ECOMETER

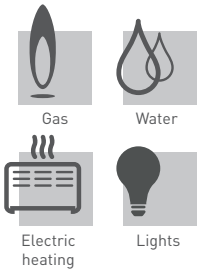
Direct display on device

Remote display on Web page with ecometer solution

Consumption displayed in euros, in kWh or in m³

Display electricity consumption with Modbus or EMDX³ pulse meters.

OR

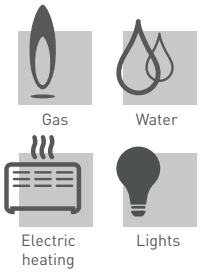


Display consumption with water, gas, electricity pulse EMDX³ meters.

+

Centralise consumption with the EDMX³ concentrator.

OR



Display all the information on a single device, the ecometer.

Customer need

Compliance with current regulations in the country of use or all other regulations for a new house. Measuring the most energy-using items. Displaying the result of these measurements, in order to gain awareness of the various items. Managing consumption.

With the EDMX^3 solution

Display consumption locally with EMDX^3 meters.
Centralise all electricity, water and gas consumption with the EDMX^3 concentrator.

With the Ecometer solution

Display consumption automatically on web pages (smartphone, tablet, PC, etc) for ease of analysis and ways to alter consumption.

Individual connection of the different apartments and communal areas to each ecometer makes it possible to:
→ **Display** the instantaneous power of each circuit in watts
→ **Display** consumption in euros and kWh, for the day, the month
A precise analysis can, through the decisions taken and corrective actions, lead to lower consumption.

PRIVATE HOUSING

Legrand **PREMIUM** solution **"I am informed and I take control"**

MyHOME domotique

MYHOME ENERGY MANAGEMENT
Measurement, metering, load shedding
Display, Looking up

MEASURE, METER

Pulse counter interfaces

Consumption indicators

Central control unit

Controllers with consumption measurement

MYHOME BUS

DISPLAY ON WIRING ACCESSORIES

Display units in the MyHome range

LOOK UP LOCALLY OR REMOTELY

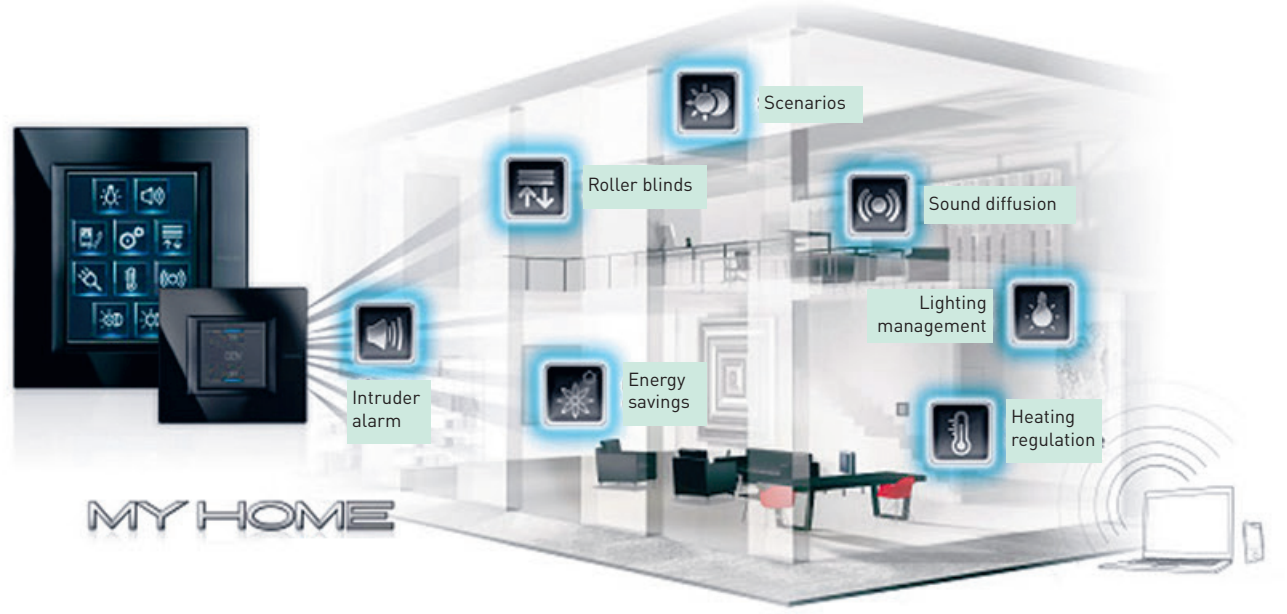
Web concentrator

Supervision software

Find technical information on www.legrand.com.sg/products/home-system/my-home.

Customer need

Integrating measurement and display of energy and fluid consumption in the MyHome home automation solution and, if necessary, complying with current regulations.
Optimising the subscribed demand of an energy supply contract by implementing a load-shedding solution based on priority mechanisms.



Display

consumption on the door entry system screen.

Control

by defining automated or manually-controlled load-shedding mechanisms.

Supervise consumption

in the flats in an apartment block while guaranteeing the thermal comfort and safety of people and property.

COLLECTIVE HOUSING

Legrand **ACCESS** solution **"I am informed"**

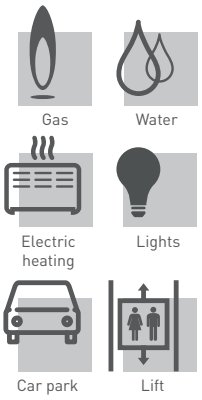
EMDX³ METERING OR ECOMETER

Direct display on device

Remote display on Web page with ecometer solution

Consumption displayed in euros, in kWh or in m³

COMMUNAL AREAS

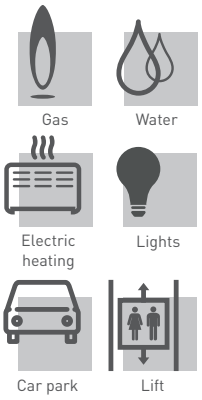


Display consumption of the communal areas with water, gas, electricity pulse EMDX³ meters.

+

Centralise consumption of the communal areas with the EDMX³ concentrator.

OR



Display on a single device, the ecometer, all the information from the communal areas.

PRIVATE AREAS

Display individual electricity consumption, one EMDX³ meter per apartment.

OR

Display individual electricity, water and gas consumption, one ecometer per apartment.

Customer need

Compliance with regulations in France or any other regulations for new apartment blocks.
Article 23 of RT2012 (French energy efficiency regulations) requires each home (apartment block or private house) to measure the consumption from heating, air conditioning, domestic hot water, power sockets and other types of consumption.
The intention is to provide each occupant with a minimum level of information by displaying the result of these measurements, so they gain awareness of the various energy-using items and manage their consumption better.

With the EDMX^3 solution

Display consumption locally with EMDX^3 meters.
Centralise electricity, water and gas consumption with the EDMX^3 concentrator.

With the Ecometer solution

Display consumption automatically on web pages (smartphone, tablet, PC, etc) for ease of analysis and ways to alter consumption.

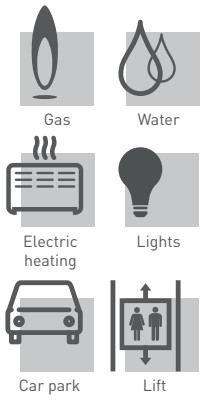
Individual connection of the different apartments and communal areas to each ecometer makes it possible to:
→ **Display** the instantaneous power of each circuit in watts
→ **Display** consumption in euros and kWh, for the day, the month
A precise analysis can, through the decisions taken and corrective actions, lead to lower consumption.

COLLECTIVE HOUSING

Legrand **PREMIUM** solution **"I am informed and I take control"**

EDMX³ METERING
Direct display on device
Remote display on Web page with ecometer solution
Consumption displayed in euros, in kWh or in m³

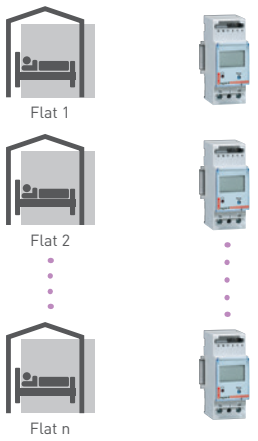
COMMUNAL AREAS



Display consumption of the communal areas with water, gas, electricity EMDX³ pulse meters.

Centralise consumption of the communal areas with the EDMX³ concentrator.

PRIVATE AREAS



Display the individual electricity consumption, one EMDX³ meter per apartment.

VIEW DATA REMOTELY

RS 485/IP converter

EMDX³ measurement software for **local viewing**
or
Energy web server for **remote viewing**

Viewing data

CONTROL

EMDX³ measurement control units have 1 to 8 feedback contacts depending on the model.
It is therefore possible to have:
- signalling feedback
- load shedding control
- data transmission to an email or GSM phone

Customer need

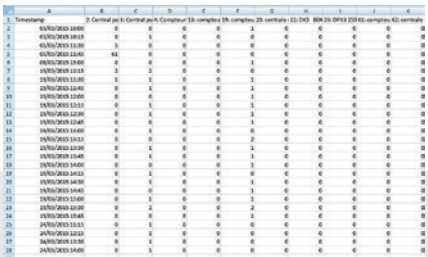
Compliance with current regulations in the country of use or all other regulations for a new apartment block.
Measuring the most energy-using items.
Displaying the result of these measurements, in order to gain awareness of the various items.
Managing consumption.

View private and communal areas:

Read the instantaneous power of each circuit in watts and consumption in euros and kWh, for the day, month, year, etc. Connection, on the same Energy web server, for all flats and communal areas, allows accurate analysis and decisions to be taken which lead to an immediate reduction in consumption.

View private areas:

→ automatic display of consumption on web pages (smartphone, tablet, PC, etc)
→ ease of analysis and ways to alter consumption



Display log:

Possibility of extracting CSV file in order to study consumption by means of a spreadsheet.

COMMERCIAL/SERVICE SECTOR

Legrand **ACCESS** solution **"I am informed"**

EDMX³ METERING AND MEASUREMENT

Direct display on device
Local display
Consumption displayed in euros, in kWh or in m³

METER, MEASURE AND DISPLAY LOCALLY

Gas

Electric heating

Lights

Water

Air conditioning

Centralised local viewing is possible with a concentrator connected to the water, gas meters and EMDX³ electricity pulse meters (up to 12 connected devices).

Viewing on the front of each meter and EMDX³ electricity pulse measurement control unit.

Customer need

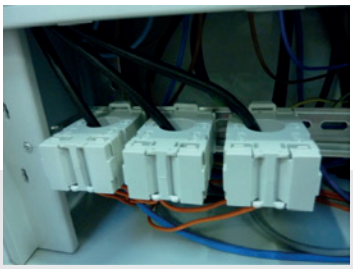
Compliance with current regulations in the country of use or any other regulations for new apartment blocks.
Measuring the most energy-using items.
Displaying the result of these measurements.
Sending automatic load-shedding commands.
Managing consumption.

View:

consumption monitoring.

Display locally:

very accurate information easily:
electrical values such as harmonics, power, cos φ, etc.



Measure:

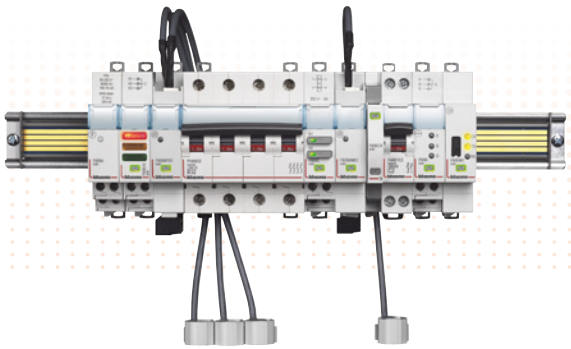
the range of current transformers, opening and closed from 50 to 4000 A.

Measure, meter:

the concentrator displays up to 12 water, gas or electricity pulse meters.

COMMERCIAL/SERVICE SECTOR

Legrand **PREMIUM** solution **"I am informed and I take control"**



ENERGY MANAGEMENT
EMS CX³ system

NEW

All functions available:
measurement, status feedback and control
No need for a screen in local mode

MEASURE

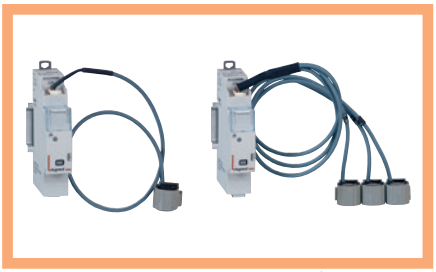
COMPACT offer: 1 module

Accuracy 0.5%

Measurement of complete data: voltage, current, powers, harmonics, etc.

2 catalogue numbers available, **single-phase or three-phase, up to 63 A.**

(Supplied with closed Rogowski coils).



SHED/ RESTORE LOADS

Modules communicate with one another:
2 modules can therefore be coupled.
For example: a measurement module + a control module
to program load shedding at a certain consumption threshold (kWh).

CONTROL

Universal control module: comprising 2 adjustable relays which can be used to define the desired type of operation: NO, NC, pulse, maintained function, dependent, interdependent.

Motorised control for modular protection

Motorised control for power protection

Joined by wiring

Other motorised controls or loads

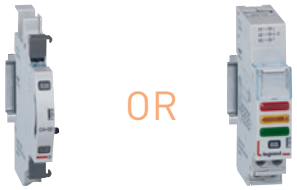
MONITOR

Very compact status feedback (ON/OFF/ fault): 1/2 module.

For DX³ modular catalogue numbers (MCBs, RCCBs and RCBOs, isolating switches with trip option.

Universal signalling module, compact: 1 module.

Remote feedback of any type of information: contact position, fault, MCCB plugged-in/drawn-out, etc which can be combined with any type of status or signalling auxiliary or contact auxiliary.



Joined mechanically

OR

Joined by wiring

Quick, smart connection!

Data I/O via communicating rail or cables

Customer need

Having a centralised technical management unit which is simple, efficient, and takes up little space to manage energy, from the simplest function (measurement) to the most high-tech (load shedding/restoration at a certain consumption threshold) in a secondary distribution board or main LV distribution board, whether **new or existing**.

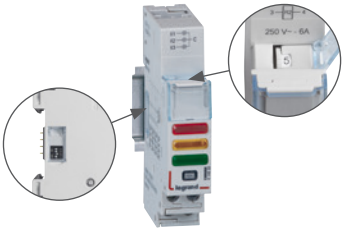
CONFIGURE AND ADDRESS

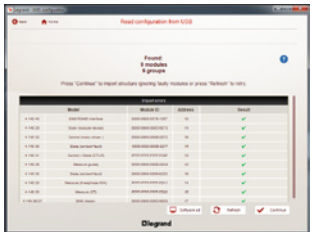
LOCALLY, it is possible to:

- **Configure devices easily**: via micro-switches on the side of some EMS CX³ devices to define the desired function.
- **Address devices simply**: local addressing is possible with the thumbwheel located on top of the modules.

REMOTELY, via the configuration software (can be downloaded free of charge from the online catalogue):

- Auto-detection of module functions.
- Auto-detection of addresses.
- Additional setting options: possibility of defining a consumption threshold for load shedding.





VIEW AND MANAGE

Supervision in Standalone mode

Optional

LOCALLY, without a computer or IP connection, **with the mini-configurator (1 per enclosure)** :

- **Set up**: configure, address and test the installation.
- Customise: the name of circuits, text on the home page, etc.

- **Use**: view information, receive alerts, control.
- **View alarm history**: the 20 last alarms.

REMOTELY:

For a remote solution Legrand offers:

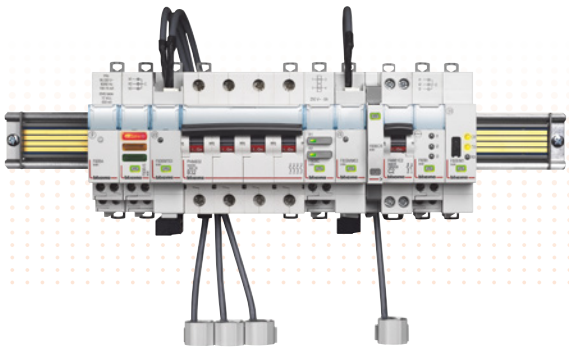
- Energy Manager software (licence key)
- Energy Web Server

(More details on the following pages)

OR

INDUSTRIAL/SERVICE SECTOR

Legrand **BASIC** solution **"I am informed"**



ENERGY MANAGEMENT

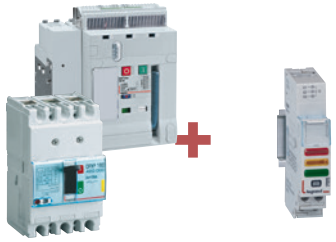
NEW

EMS CX³ system

All functions available for combination with **modular protective or power devices whatever their brand.**

Versatile offer to satisfy all requirements for energy management.

MB



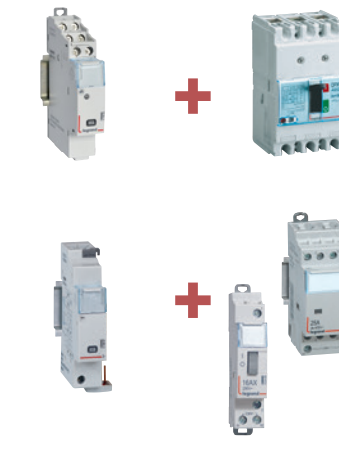
Any other type of protection

MONITOR

STATUS FEEDBACK: Universal signalling module, compact: 1 module.

Remote feedback of any type of information: contact position, fault, MCCB plugged-in/drawn-out, etc which can be combined with any type of status or signalling auxiliary or contact auxiliary.

Secondary distribution board



MEASURE

Compact offer: 1 module.
1 catalogue number **for single-phase or three-phase current transformer (CT).**
FOR use with all ferromagnetic current transformer types (open/closed), 5 A output.
Accuracy 0.5%.
Measurement of complete data: voltage, current, powers, harmonics, etc.

MONITOR/CONTROL

1 module.

Status feedback and control for pulse operated latching relays and modular contactors with 1 or 2 Legrand modules up to 25 A. To retain the specifications associated with these modules (serial wiring, control via several push-buttons, etc).

Quick, smart connection!

Data I/O via communicating rail or cables

Customer need

Having a coherent centralised technical energy management unit:

A common system regardless of the supervised device (modular or power) and the desired function (measurement, status monitoring or control).

While having "hierarchical" data management:

- **Locally: supervise everything** for data management directly in the enclosure.
- **Remotely: supervise everything** for data management outside the enclosure on a computer.

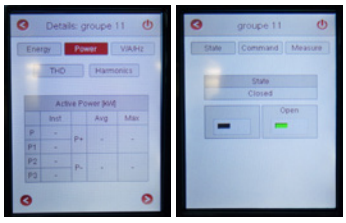
LOCALLY: VIEW AND CONTROL

Modular mini-configurator (1 per enclosure)

- **View**: all the measurement, status, alarm data
- **Control**: manage a circuit directly on screen

Touch screen on door or remotely located for:

- **Viewing**: measurement and status data of 9 circuits or devices
- **Controlling**: protection devices previously connected to an EMS CX³ control module



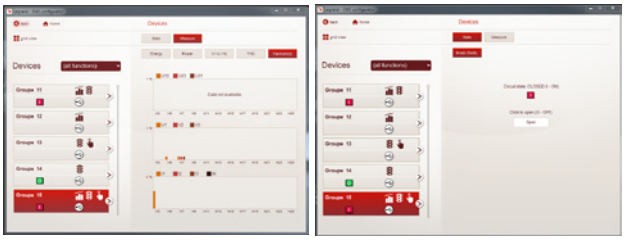
REMOTELY: VIEW AND CONTROL

Energy Manager software (licence key):

For viewing and controlling on **1 PC** (fixed or portable) (Including EMDX³ and EMS CX³ catalogue numbers).

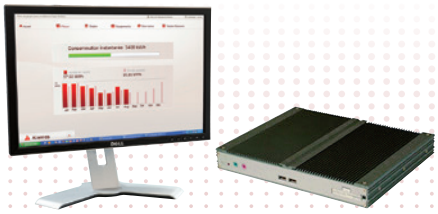
Energy Web Server:

For configuring, testing, controlling and viewing on a web browser, from a number of devices: PCs, smartphones, web screens, tablet computers, etc (including DPX³, BDMA, Green'up, EMDX³, EMS CX³, etc).



INDUSTRIAL/SERVICE SECTOR

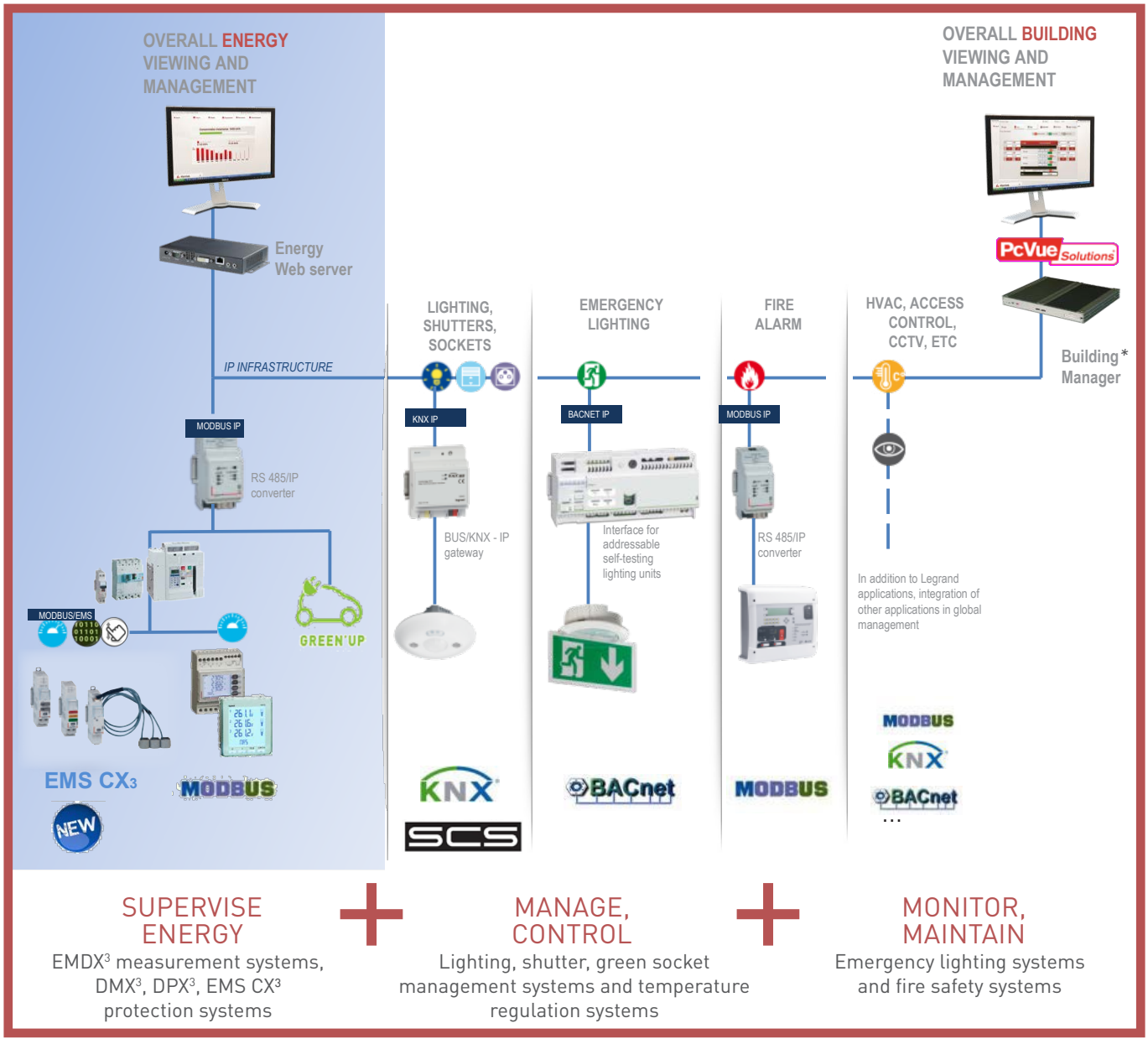
Legrand **PREMIUM** solution **"I am informed and I take control"**



SUPERVISE THE WHOLE BUILDING

Building Manager Viewer:
- View
- Manage
- Be alerted

Building Manager Controller:
- Interact
- Integrate



SUPERVISE ENERGY
EMDX³ measurement systems, DMX³, DPX³, EMS CX³ protection systems

MANAGE, CONTROL
Lighting, shutter, green socket management systems and temperature regulation systems

MONITOR, MAINTAIN
Emergency lighting systems and fire safety systems

** Pre-programmed "Ready to-supervise" solution for ease of setup with Legrand systems without the need for specific systems integration skills.*
Find more technical details on www.legrand.com, under the Building Manager heading.

Customer need

Compliance with current regulations in the country of use for buildings for non-residential use.
Measuring or calculating energy consumption by zone, by floor or by outgoing line of more than 80 A and by use: heating, cooling, hot water production, lighting, power sockets, ventilation control.
Displaying the result of these measurements.
Sending automatic load-shedding commands.
Managing consumption.

View the operating status and manage comfort and safety equipment:

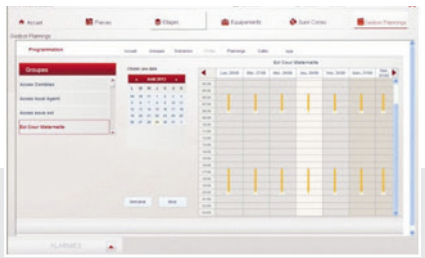
- lighting, green sockets and temperature regulation
- emergency lighting
- fire safety system

Manage energy:

energy consumption, characteristics of the distributed electrical signal

Manage alarms:

alerts, data logging, procedures to be followed, intervention comments

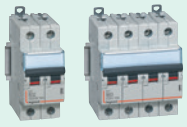
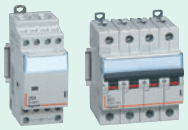
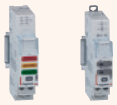


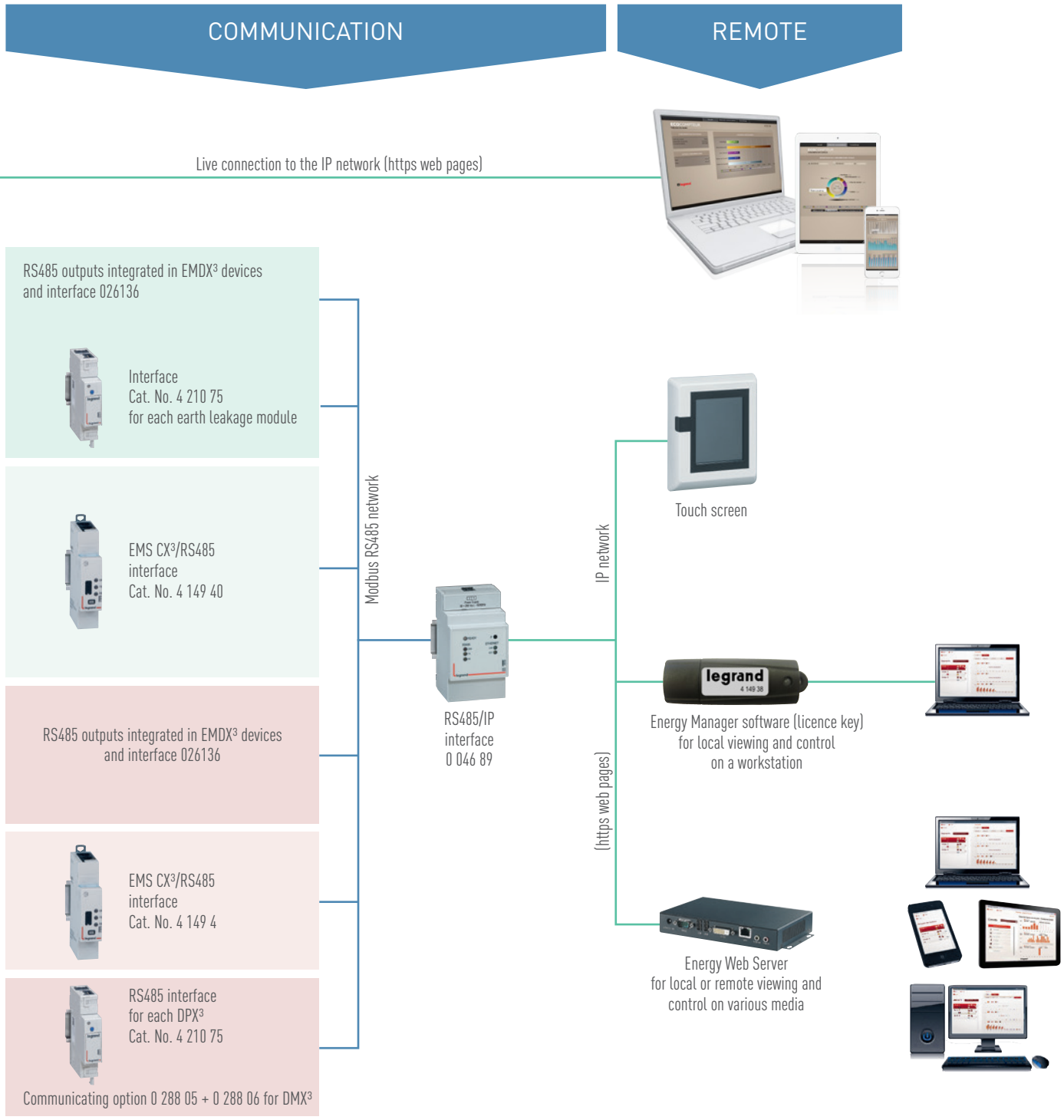
Program time slots:

groups of actuators, control scenarios

Fully customisable in project mode by a systems integrator for integration of third-party systems and/or customising graphic displays.

PRODUCT OVERVIEW

	PROTECTION	MEASUREMENT	CONTROL AND SIGNALLING
RESIDENTIAL	 DX³ Ph+N	 Ecometer	
COLLECTIVE HOUSING AND SMALL OFFICE BUILDINGS	 DX³	 EMDX³ measurement control units  EMDX³ meters  Earth leakage module with integrated measurement	 Status auxiliaries and motorised control +  I/O interface Cat. No. 0 261 36
	 Contactor	EMS CX³ modules:  Single-phase Cat. No. 4 149 19  Three-phase Cat. No. 4 149 20  Pulse concentrator Cat. No. 149 26	EMS CX³ signalling and control modules  4 149 29/4 149 30/4 149 32  EMS CX³ status feedback and control module Cat. No. 4 149 31
COMMERCIAL AND INDUSTRIAL	 DPX³  DMX³	 EMDX³ measurement control units  EMDX³ meters  EMS CX³ measurement module Cat. No. 4 149 23  DMX³ with electronic protection unit Electronic DPX³ with integrated measurement	 Status auxiliaries and motorised controls +  I/O interface Cat. No. 0 261 36  Status auxiliaries and motorised controls + EMS CX³ signalling and control modules  4 149 30/4 149 32


COMMUNICATION
REMOTE
Live connection to the IP network (https web pages)
RS485 outputs integrated in EMDX³ devices and interface 026136
Interface
Cat. No. 4 210 75
for each earth leakage module
EMS CX³/RS485
interface
Cat. No. 4 149 40
RS485 outputs integrated in EMDX³ devices and interface 026136
EMS CX³/RS485
interface
Cat. No. 4 149 4
RS485 interface
for each DPX³
Cat. No. 4 210 75
Communicating option 0 288 05 + 0 288 06 for DMX³
Modbus RS485 network
RS485/IP
interface
0 046 89
IP network
(https web pages)
Touch screen
legrand
Energy Manager software (licence key)
for local viewing and control
on a workstation
Energy Web Server
for local or remote viewing and
control on various media

EDMX^3 ELECTRICITY METERS

PRODUCT SPECIFICATIONS

Meters record the electricity consumed by a single-phase or three-phase circuit downstream of the electricity supply company's metering.
They display the electricity consumption of the measured circuit and other values (depending on the catalogue number) such as current, voltage, power, etc, and transmit this information to supervision or energy management systems.
There are 2 electricity meter families:
• Direct connection
• CT connection

CHARACTERISTICS

- Display: LCD
- Reference voltage Un:
  - Single-phase: 230 – 240 VAC
  - Three-phase: 230 (400) VAC – 240 (415) VAC
- Frequency: 50 – 60 Hz
- Conforming to standards:
  - IEC 62052-11
  - IEC 62053-21/23
  - IEC 61010-1
- Accuracy:
  - Active energy (EN 62053-21): class 1
  - Reactive energy (EN 62053-23): class 2
- Connection: Direct or with CT
- Device: non-MID or MID
- Output: pulse and/or RS485
- Mounting: on DIN rail
- Dimensions: 1 to 4 modules according to the device

PRODUCT SELECTION

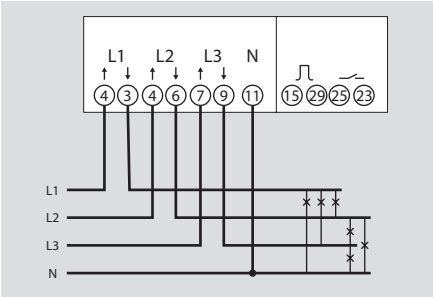
A meter should be selected according to the network (single-phase or three-phase) and its maximum current, required displayed values and communication type allowing it to be run by a supervision system.
MID certification, in some meters, ensures the accuracy of metering with a view to charging out the electricity used.

CAT. NO.		4 120 68	4 120 69	0 046 70	0 046 81	0 046 72	0 046 77	0 046 78	0 046 79	0 046 73	0 046 80	0 046 82	0 046 83	0 046 74	0 046 84	0 046 85	0 046 86
Type of mains supply		Single-phase								Three-phase							
Number of modules		1	1	1	2	2	2	2	2	4	4	4	4	4	4	4	4
Connection	**direct (max. current)**	45 A	45 A	32 A	36 A	63 A	63 A	63 A	63 A	63 A	63 A	63 A	63 A				
	via a current transformer													5 A	5 A	5 A	5 A
Metering and measuring	**Total active energy**			●	●	●	●	●	●	●	●	●	●	●	●	●	●
	Total reactive energy									●	●	●	●	●	●	●	●
	Partial active energy (reset)				●	●	●	●	●		●	●	●	●	●		
	Partial reactive energy (reset)										●	●	●	●	●		
	Active power	●				●	●	●	●	●	●	●	●	●	●	●	●
	Reactive power	●								●	●	●	●	●	●	●	●
	Apparent power	●								●	●	●	●	●	●	●	●
	Current + voltage	●				●	●	●	●	●	●	●	●	●	●	●	●
	Frequency					●	●			●	●	●	●	●	●	●	●
	Power factor	●				●	●			●	●	●	●	●	●	●	●
	Operating time (reset)					●	●										
	Average active power									●	●	●	●	●	●	●	●
	Max. average active power									●	●	●	●	●	●	●	●
	Dual tariff									●							
Communication	**Pulse output**		●	●	●	●		●		●		●		●	●	●	●
	RS485 interface	●					●		●		●		●		●		●
MID compliant			●					●	●			●	●			●	●

CONNECTION

■ **Direct connection meters:**

The meter is connected in series on the line to be metered. It is protected by the circuit breaker placed directly upstream. This must be calibrated to cope with the maximum current permitted by the meter.

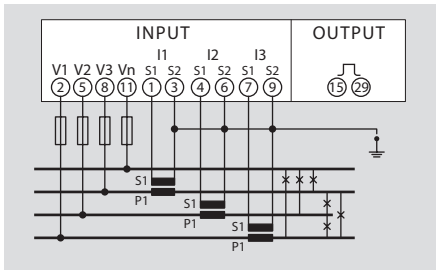


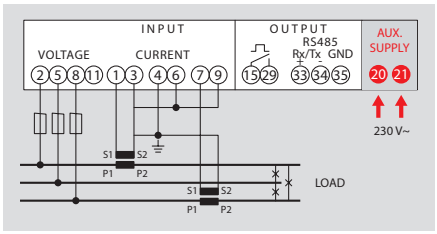
To protect the meters, refer to the information in the product manuals and technical data sheets.

■ **CT connection meters:**

Meters have 2 types of input: "current" and "voltage" inputs. Each current transformer secondary is connected to the corresponding meter inputs (terminals 1-3/4-6/7-9). This allows the current flowing through the CT to be measured.

To create the voltage tap, each conductor is connected to inputs 2/5/8 and 11 respectively. These connections are used to supply the meter with power.

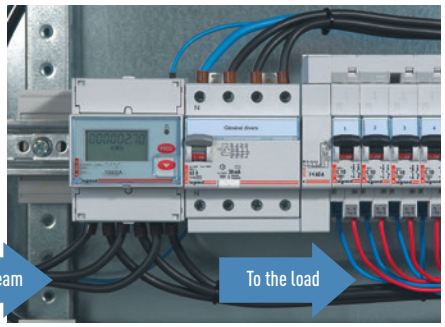




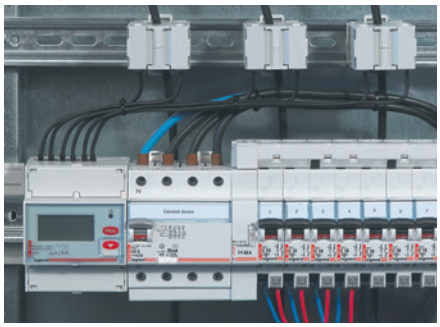
Some meters, such as MIDs, need an auxiliary power supply in order to work.

Some three-phase meters can be used to measure a single-phase mains supply, as can different wiring methods, but this is not true for all of them. Please refer to the manuals and technical data sheets.

DIRECT CONNECTION

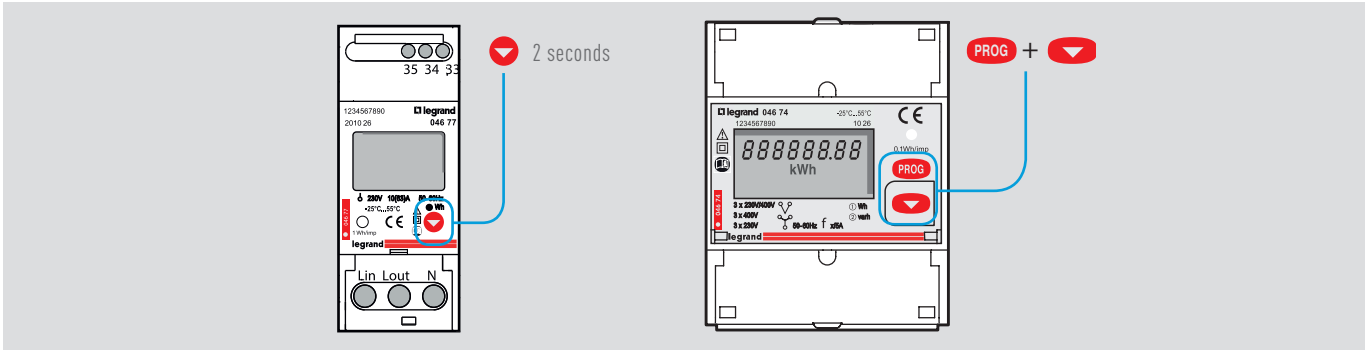


CONNECTION WITH A CT



PARAMETER SETTING

After connection, the electricity meter parameters may need to be changed so that it displays data consistent with the currents flowing through the measured circuits.



A button on the front of the meter is used to enter programming mode, confirm and go to the next step.
Access to the parameters is locked by a password which can be changed if necessary (factory code = 1000).

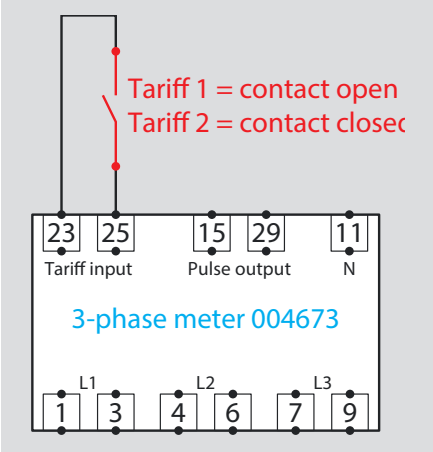
PARAMETER IDENTIFICATION

DISPLAY	PARAMETER
Cd, CodE	Password – default value 1000
Pu, PLSU	Pulse weight
Pd, PLSd	Pulse duration
PLSt Act	Pulse output = active energy
PLSt rEA	Pulse output = reactive energy
Ad, Addr	Modbus address
Br, bAUd	Modbus baud rate
PY, PAr	Modbus parity bit (nonE, EVEn, odd)
Mode ASY	Partial electricity metering always active
Mode SYn	Partial electricity metering activated when the contact closes (23/25)
Mode trF	Dual-tariff electricity metering switched by the contact action (23/25)
Time	Average power integration time
MD	Active average power
PMD	Maximum active average power
Mode A ou b	Meters with CT only, depends on the wiring - see product manual
Ct	CT current transformer ratio For example, if CT 100/5 then the value to be set on the meter is Ct = 20
VT	VT voltage transformer ratio For example, if VT 600/100 then the value to be set on the meter is VT = 6
SetP E, CaLd E	Fault message, refer to the product instructions
t. run	Timer start
PC, PASS	Password modification
SAU inG	Configuration backup
CrC	Software version

If the current and/or voltage transformation ratios are changed, the electricity meters are reset automatically.

DUAL TARIFF

Dual tariff is only possible with meter Cat. No. 0 046 73. Simply connect a volt-free contact to terminals 23 and 25 of meter 0 046 73.



DATA TRANSFER

Electricity meters have pulse or RS 485 type outputs which can send data to an operating system.

■ **Meters with pulse output:**

- Output: on optocoupler relay S0 according to EN 62053-31 volt-free.
- Voltage **U** imp: 115 VAC/DC max - except Cat. No. 0 046 70: 27 V max.
- Current **I** imp: 50 mA - except Cat. No. 0 046 70: 27 mA.
- Connection: on terminals 15 and 29 – except Cat. Nos. 0 046 70 and 0 046 81 terminals 4 and 6.
- Data type:
  Active energy Wh for Cat. Nos. 0 046 70/81/72/77/78/79/85/86
  Active energy Wh and reactive energy Varh for Cat. Nos. 0 046 73/80/82/74/84
- Pulse weight:
  Programmable with possible values: 1–10–100–1000 Wh/pulse
  Non-programmable, fixed value for 0 046 70 (2000 pulse/kWh), 0 046 81 (10 Wh/pulse)
- Pulse duration:
  Programmable with possible values: 50–100–150–200–300–400–500 ms
  Non-programmable, fixed value for 0 046 70 (40 ms), 0 046 81 (100 ms)

■ **Meters with Modbus output:**

- RTU mode Modbus protocol
- Baud rate 2400, 4800, 9600, 19,200 Bauds
- Address from 1 to 247
- Parity: even, odd, none
- Stop bit: 1
- Query response time < 200 ms
- 2-pair wiring RS485 standard (Belden 9842)

The wiring diagram for an RS485 BUS is illustrated in the "Communication protocols" section.

MODBUS ADDRESSING

To allow systems integrators to develop an energy management program, addressing tables are available in the E-catalogue on www.legrand.com in the manuals or in separate files depending on the device. All the information concerning available registers can be found in these documents.

If you need examples of how to read or write a register, you should refer to the "Help and definition" section.

EDMX³ MEASUREMENT CONTROL UNITS

PRODUCT SPECIFICATIONS

EMDX³ control units record the energy consumed by the various circuits, mesure the electrical values (current, voltage, power, etc) or analogue values (temperature) to check the installation is working properly; they monitor energy quality by analysing harmonics and measuring the reactive energy; they communicate the values measured to supervision or energy management systems, in order to optimise the consumption and energy quality of electrical circuits in commercial and industrial environments.

CHARACTERISTICS

- Display: LCD.
- Reference voltage Un:
  - Modular and ACCESS control units:
    Phase/Phase: 80 – 500 V
    Phase/Neutral: 50 – 290 V
  - PREMIUM control unit:
    Phase/Phase: 80 – 690 V
    Phase/Neutral: 50 – 400 V
- Frequency: 50 – 60 Hz
- Auxiliary power supply:
  - 80 – 265 VAC
  - 100 – 300 VDC
- Conforming to standards:
  - IEC 61557-12
  - IEC 62053-22/23
- Accuracy:
  - Active energy (EN 62053-21): class 0.5
  - Reactive energy (EN 62053-23): class 2
- Connection: with CT
- Mounting:
  - on DIN rail for modular control unit
  - on door for ACCESS and PREMIUM control units
- Dimensions:
  - 4 modules for modular control unit
  - 92 x 92 mm cut-out for ACCESS and PREMIUM control units

PRODUCT SELECTION

Measurement control units should be selected according to the mains supply, mounting in the enclosure, required displayed values and communication type which allows it to be run by a supervision system.

CAT. NO.		 4 120 51	 4 120 52	 4 120 53
Type		Modular 4 modules	ACCESS On door	PREMIUM On door
MEASUREMENT				
Currents	**Instantaneous: I1 – I2 – I3 – IN**	●	●	●
	Max. average: I1 – I2 – I3 – IN	●	●	●
	Average of 3: (I1 – I2 – I3)/3	●	●	●
Voltages and Frequencies	**Instantaneous: U1-U2-U3-U12-U23-U31-F**	●	●	●
	Min/max: U1-U2-U3-U12-U23-U31-F	●	●	●
Powers	**Instantaneous: P – Q - S**	●	●	●
	Average: P – Q - S	●	●	●
	Max. average: P – Q - S	●	●	●
Instantaneous power factor		●	●	●
METERING				
Energy	**Total/partial active**	●	●	●
	Total/partial reactive	●	●	●
Time		●	●	●
HARMONIC ANALYSIS				
Total harmonic distortion	**Numbers**	9[3] and 25[2]	9[3] and 25[2]	9[3][4] and 50[2][4]
	Currents	●	●	●
	Phase-to-neutral voltages	●	●	●
	Phase-to-phase voltages	●	●	●
OTHER				
Dual tariff		●		
Temperature				● [1]
Alarm on electrical values				● [1]
Communication	**RS485 MODBUS**	●	●	● [1]
	Pulse	●	●	● [1]
MODULES				
RS485 MODBUS communication				4 120 55
Function	**2 outputs: pulse or alarm feedback**			4 120 59
	Memory + RS485 MODBUS			4 120 56
	2I/2O: monitoring, remote control			4 120 57
	2 x 0/4-20 mA analogue outputs			4 120 60
	2 PT100 temperature			4 120 58
	Harmonic analyser			4 120 61[2]

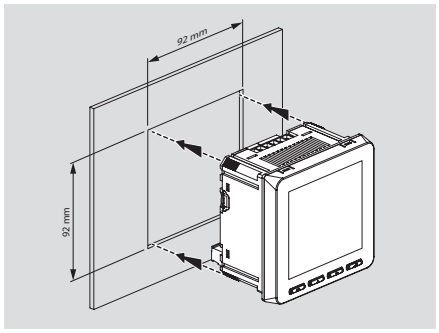
[1] with option module [2] available on RS485 COM [3] available on the display
[4] THD only available with module 4 120 61 + communication module 4 120 55 or 4 12056.

EMDX³ MEASUREMENT CONTROL UNITS

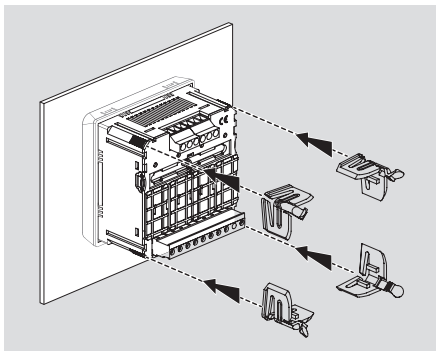
MOUNTING CONTROL UNITS

Modular control units are mounted on a DIN rail. Door-mounted control units require a 92 x 92 mm cut-out in the door or faceplate.

Making the cut-out with a punch.



After creating the cut-out, insert the control unit.



Control unit held in place with clips.

FUNCTION MODULES

2 inputs/2 outputs
Cat. No. 4 120 57

2 x 0/4-20 mA analogue outputs
Cat. No. 4 120 60

Temperature sensor
2 x PT100
Cat. No. 4 120 58

Harmonic analyser
Cat. No. 4 120 61

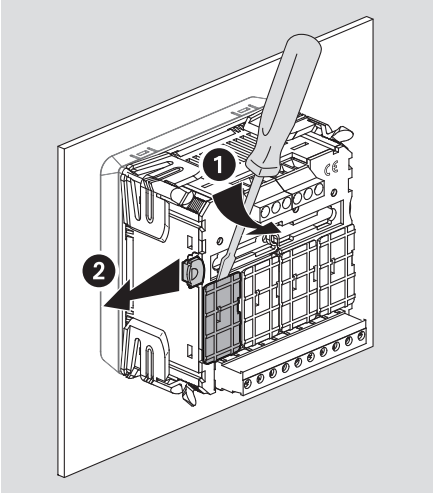
2 pulse or alarm outputs
Cat. No. 4 120 59

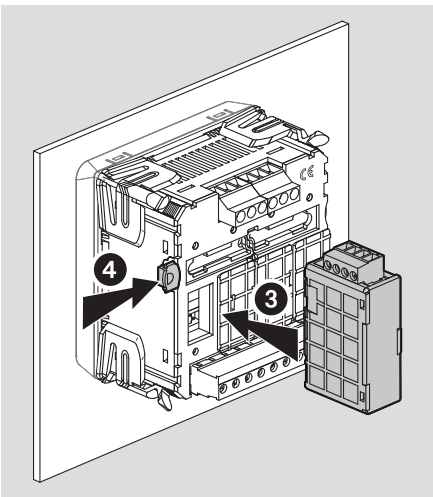
Function modules can only be adapted to fit on PREMIUM control units.

MOUNTING OPTION MODULES

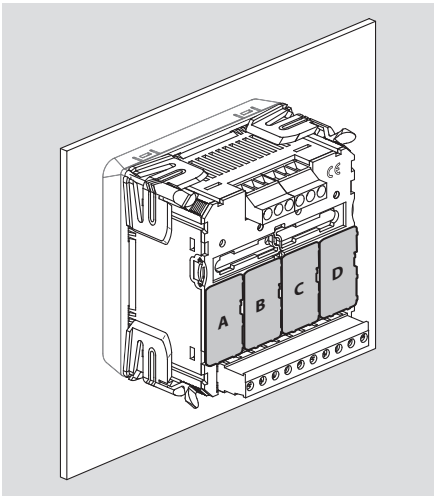
Option modules are fixed to the back of door-mounted control units.
You need to:

- remove the plastic cover
- slide the tab to the left
- place the module in the chosen slot
- slide the tab back





CAT. NO.	DESCRIPTION	NUMBER MAX.	POSITION			
			A	B	C	D
4 120 55	RS485 communication module	1	X	-	-	-
4 120 56	RS485 communication module + memory	1	X	-	-	-
4 120 57	Module with 2 inputs/2 outputs	2	-	-	X	X
4 120 58	Module with 2 PT100 inputs	1	-	-	-	X
4 120 59	2 pulse or alarm outputs	2	X	X	X	X
4 120 60	Module with 2 analogue outputs	2	-	-	X	X
4 120 61	Harmonic analyser module	1	-	X	-	-



Caution, some modules are mounted in specific slots. Their position is indicated in each manual.

Caution, the control unit must be switched off before working on the modules.

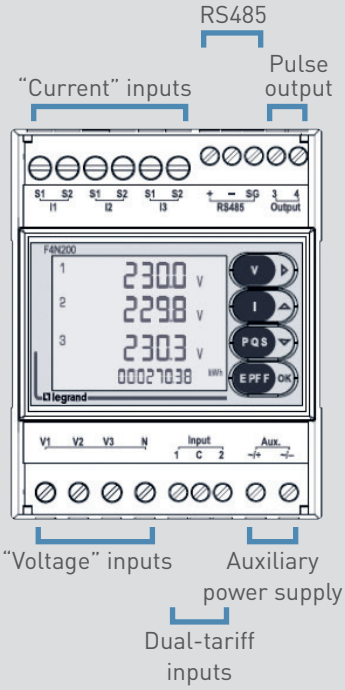
CONNECTION

Like meters connected by a CT, measurement control units have 2 types of input: "current" inputs and "voltage" inputs.
Each transformer secondary is connected to the inputs corresponding to the control unit. This allows the current flowing through the CT to be measured.
To create the voltage tap, each conductor is connected to the voltage inputs.

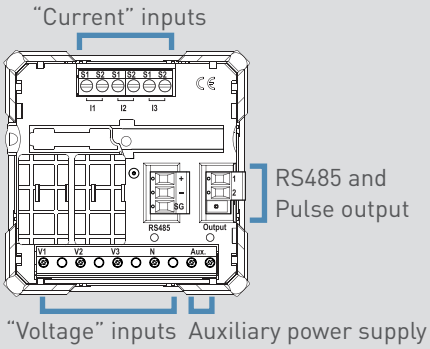
Control units need an auxiliary power supply in order to work.
Fuse protection is recommended for:

- the auxiliary power supply:
  - 1 A gG for door-mounted control units
  - 0.5 A gG for the modular control unit
- the voltage taps:
  - 0.5 A gG

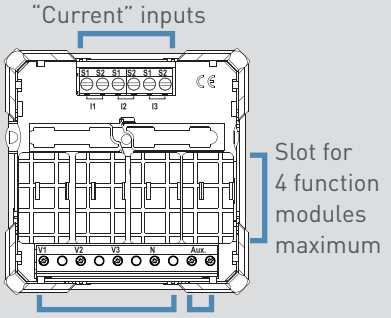
■ Modular control unit



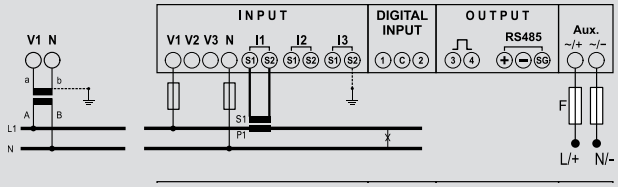
■ Access control unit



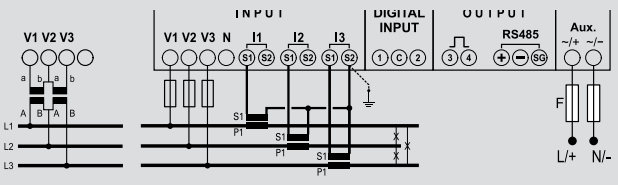
■ Premium control unit



■ Single-phase connection



■ Three-phase connection



PARAMETER SETTING

After connection, the measurement control unit parameters need to be changed so that it displays data consistent with the currents flowing through the measured circuits.

Modular control unit

- Programming mode is entered by pressing and holding down the "**OK**" button on the front.
- Access to the parameters is locked by 2 password levels which can be changed, level 1: "**1000**", level 2: "**2001**".
- The "↑↓" buttons change the value of the chosen parameter.
- The "→" button moves the cursor.
- Pressing the "**OK**" button briefly confirms the change.
- Pressing and holding down the "↑" button goes back to the previous page.
- Pressing and holding down the "**OK**" button exits programming mode.

ACCESS and PREMIUM control unit

- Programming mode is entered by simultaneously pressing both the "↑ + ↓" buttons on the front.
- Access to the parameters is locked by 2 password levels which can be changed, level 1: "**1000**", level 2: "**2001**".
- The "↑↓" buttons change the value of the chosen parameter.
- The "→" button is used to move the cursor.
- Pressing the "←" button briefly confirms the change.
- Simultaneously pressing both the "↓ + ←" buttons goes back to the previous page.
- In programming mode, pressing and holding down both the "↑ + ↓" buttons exits programming mode without saving.
- After the last parameter is set, pressing the "←" button exits programming mode and saves any data which has been changed.

PARAMETER IDENTIFICATION

DISPLAY	PARAMETER
PASSE	Password – default value 1000
SYS	Choice of supply type
bASE CUrr	Nominal current at the external CT secondary 1 A if external CT/1 A or 5 A if external CT/5 A
Ct	CT current transformer ratio For example, if CT 100/5 then the value to be set on the control unit is Ct = 100
Ut	VT voltage transformation ratio For example, if VT 600/100 then the value to be set on the control unit is Vt = 6
Fn 50-Hz	Nominal frequency (automatic recognition of the frequency)
rUn hOUr	Timer start with choice of voltage U or power P
rUn VAL	Timer setting with option P value of 0.....50% Pn
tiME	Integration time valid for current and average power
Cont	Screen contrast
HArM MAh	Choice of harmonic analysis number
Out	Choice of output type, pulse = iMP and alarm = ALrM
ALrM tYPE	Choice of alarm type, min or max
ALrM MEAS	Choice of alarm value type
ALrM rELE	Choice of relay output type, NO or NC
PULS tYPE	Output type, active or reactive
PULS VAL	Pulse weight
PULS dUr	Pulse duration
C485 Addr	Modbus communication address
C485 bAud	Modbus baud rate
C485 PAr	Modbus parity bit (nonE, EVEn, odd)
C485 tIME	Waiting time before response
bL it	Screen backlighting
SAUE	Save changed data

If the current and/or voltage transformation ratios are changed, the measurement control units are reset automatically.

MULTI-TARIFF ONLY ON MODULAR CONTROL UNIT

Multi-tariff operation, with up to 4 tariffs, is possible with modular control unit 4 120 51. Simply use **terminals 23/24/25**, EN 61131-2 type 2 inputs max. 27 VDC.

Depending on the modular control unit parameter settings, it is possible to select, for example, the following functions:

• "Partial metering", user reset option

• "Multi-tariff metering", option of selecting several tariffs such as Off-peak/Peak

DATA TRANSFER

Measurement control units have pulse or RS 485 type outputs which can send data to an operating system.

Measurement control units have:

• One output for modular or ACCESS control units

• Up to 8 outputs (and 4 inputs) for the PREMIUM control unit

■ **Wired outputs available:**

- Opto-relay output with SPST-NO volt-free contact.
  Pulse output compatible with S0 EN/IEC 62053-31
- Maximum voltage 27 V AC/DC
- Maximum current 50 mA
- Type of data:

Active energy Wh, Reactive energy Varh:

Pulse weight:
1 pulse/10 – 100 – 1000 Wh (VARh)
1 pulse/10 – 100 – 1000 kWh (kVARh)
1 pulse/10 MWh (MVARh)
Pulse duration:
50 – 100 – 200 – 300 – 400 - 500 ms

Alarm (only for the modular control unit):
Value: phase-to-neutral and phase-to-phase voltages, current, frequency, active and reactive powers
Configuration: Ht, Lt,
Hysteresis, time, relay

■ **Modbus output available:**

- RTU mode Modbus protocol
- Baud rate 4800, 9600, 19,200, 38,400 Bauds
- Address from 1 to 255
- Parity: even, odd, none
- Stop bit: 1
- 2-pair wiring RS485 standard (Belden 9842)
- Output galvanically isolated from the input and the auxiliary power supply

The wiring diagram for an RS485 BUS is illustrated in the "Communication protocols" section.

MODBUS ADDRESSING

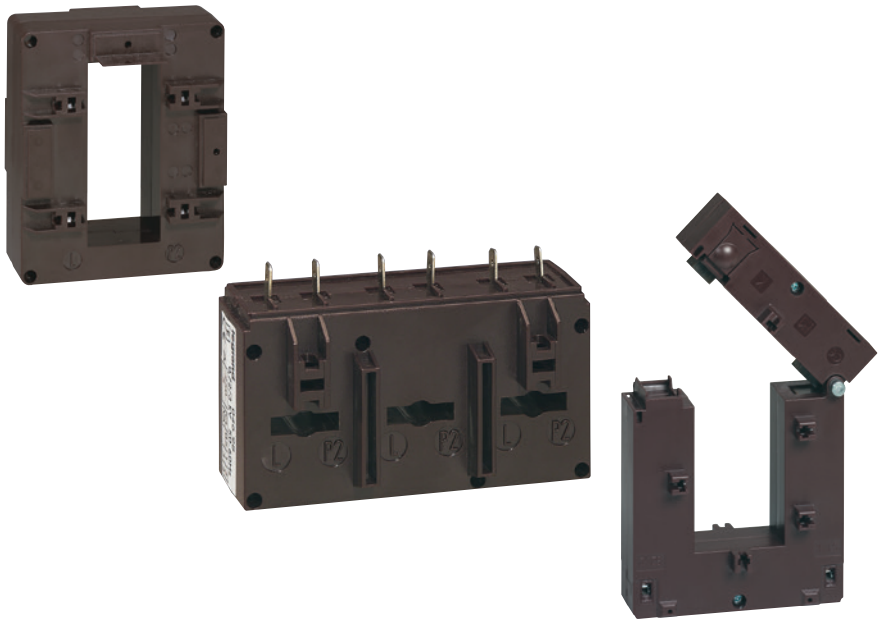
To allow systems integrators to develop an energy management program, addressing tables are available in the E-catalogue on www.legrand.com in the manuals or in separate files depending on the device. All the information concerning available registers can be found in these documents.

If you need examples of how to read or write a register, you should refer to the "Help and definition" section.

CURRENT TRANSFORMERS (CTS)

PRODUCT SPECIFICATIONS

Current transformers (CTs) are used to convert high current values circulating in cables or busbars to current values permitted by measuring devices, usually 5 A.



CHARACTERISTICS

- Primary current from 50 to 4000 A
- Secondary current: 5 A
- Frequency: 50/60 Hz
- Degree of protection: IP20
- Accuracy class: 0.5 or 1% depending on the model

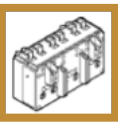
All elements used to take a measurement must be included when calculating the overall accuracy class, as they are part of the measurement circuit (details in the "Help and definition" section).

PRODUCT SELECTION

The current transformer rating is selected according to the conductor dimensions, but also according to the maximum prospective current in the circuit to be measured.
An open-type current transformer assembly is available to simplify installation and maintenance, which can be a delicate operation in some cases.
In order to minimise measurement errors, the closest possible rating to this value should be selected.

CURRENT TRANSFORMER	CAT. NO.	TRANSF RATIO	FOR CABLES MAX. Ø (MM)	FOR BUSBARS W X H (MM)	ACCURACY	FIXING ON RAIL	FIXING ON PLATE	DIRECT FIXING ON CABLES OR BUSBARS
Closed-type single-phase								
	4 121 01	50/5	21	16 x 12.5	1 %	•	•	
	4 121 02	75/5						
	4 121 03	100/5						
	4 121 04	125/5						
	4 121 05	160/5						
	4 121 06	200/5						
	4 121 07	250/5						
	4 121 12	400/5	27	32.5 x 10.5 25.5 x 15.5	0.5 %			•
	4 121 14	600/5						
	4 121 16	250/5	26	40.5 x 12.5 32.5 x 15.5				•
	4 121 17	400/5						
	4 121 19	700/5						
	4 121 23	250/5	32	40.5 x 10.5 32.5 x 20.5				•
	4 121 24	300/5						
	4 121 25	400/5						
	4 121 26	600/5						
	4 121 31	700/5	40	50.5 x 12.5 40.5 x 20.5				•
	4 121 32	800/5						
	4 121 33	1000/5						
	4 121 36	600/5		65 x 32				•
	4 121 38	800/5						
	4 121 39	1000/5						
	4 121 42	1250/5		84 x 34				•
	4 121 46	1600/5		127 x 38				•
	4 121 47	2000/5						
	4 121 49	3200/5						

PRODUCT SELECTION (CONTINUED)

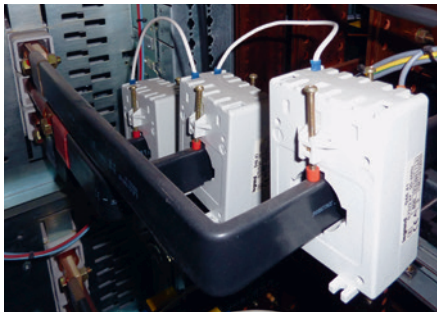
CURRENT TRANSFORMER	CAT. NO.	TRANSF RATIO	FOR CABLES MAX. Ø (MM)	FOR BUSBARS W X H (MM)	ACCURACY	FIXING ON RAIL	FIXING ON PLATE	DIRECT FIXING ON CABLES OR BUSBARS
Closed-type single-phase (continued)								
	4 121 50	1600/5		127 x 54				●
	4 121 51	2000/5						
	4 121 52	2500/5						
	4 121 53	3200/5						
	4 121 54	4000/5						
Open-type single-phase								
	4 121 62	400/5		50 x 80	0.5 %			●
	4 121 63	800/5						
	4 121 64	1000/5		80 x 120				●
	4 121 65	1500/5						
	4 121 66	2000/5		80 x 160				●
	4 121 67	2500/5						
	4 121 68	3000/5						
	4 121 69	4000/5						
Three-phase								
	4 121 57	250/5		20.5 x 5.5	0.5 %			●
	4 121 58	400/5		30.5 x 5.5				●

CTs cannot be used with DC supply.

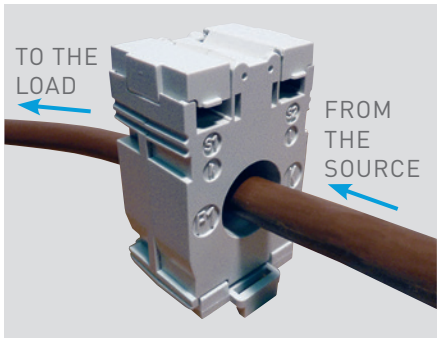
MOUNTING

Current transformers are available with several types of fixing. CTs taking cables can be clipped onto DIN rails. Others, which take busbars, should be fixed in place by tightening the dedicated screw. They can also be fixed on a plate using the fixing points on the bottom.

Current transformers for cables mounted on DIN rail



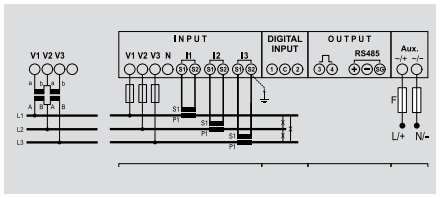
Current transformers mounted directly on flexible busbars



The value sent to the meter or measurement control unit depends on the direction of mounting on the busbar or cable. To avoid errors, it is essential to make sure that the CT is working properly.
The current flow must enter at P1 (coming from the source) and exit at P2 (going towards the load).

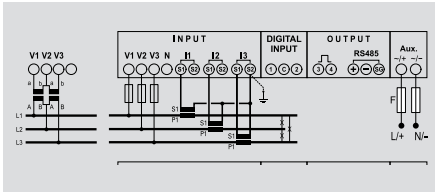
CONNECTION

The secondary terminals (S1 and S2) should be connected to the corresponding inputs on the measuring device (meter, measurement control unit).



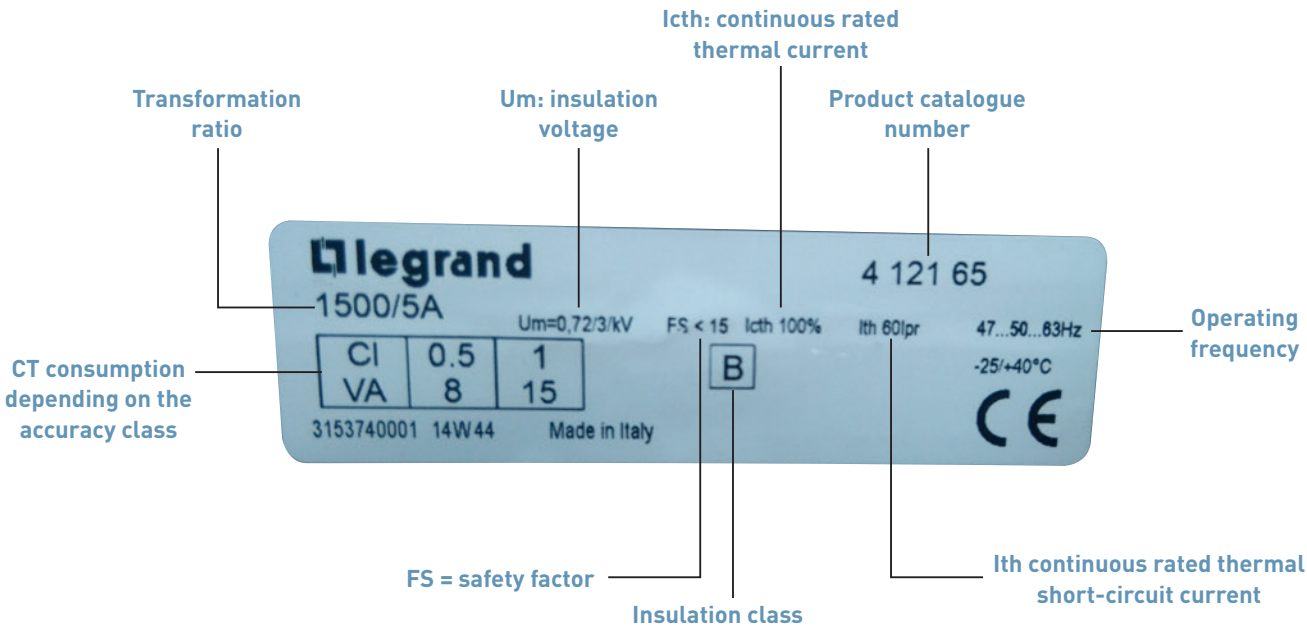
EARTHING THE CURRENT TRANSFORMER SECONDARY

To ensure the safety of the installation when the secondary is opened, we recommend that this is connected to earth in TT or TN systems.
To reduce the number of cables, the S2 outputs on the CT secondary can be grouped together.



If an on-load CT has its secondary open, a high voltage may appear. It is therefore vital to short-circuit the CT secondary when the rating is changed, for example, or to intervene by cutting the power supply to the load.

READING AN IDENTIFICATION LABEL



Um: Maximum reference insulation voltage, in this example 0.72 kV rms value, 3 kV being the rated insulation voltage level.

FS: Safety factor.
Ratio between the maximum primary rated current and the primary rated current.

B: Insulation class.
This should be noted if it is not Class A.
Class A corresponds to a reference temperature of 40°C.
Class B corresponds to an increase in permitted temperature to 80°C.

Icth: Continuous rated thermal current.
Value of the current which can circulate indefinitely in the primary winding without the temperature rise exceeding the specified limits, with the secondary winding connected to the rated load. In this example: Icth < 100% Ipr, therefore 100% of the primary rated current.

Ith: Rated thermal short-circuit current.
Maximum value of the primary current which a transformer can withstand without being damaged for a short specified period, with the secondary winding short-circuited. In this example: Ith < 60 Ipr, therefore 60 times the primary rated current.

DETERMINATION OF THE MAX. CABLE LENGTH

It is important to keep the current transformers and measuring devices as far apart as possible. The table below indicates both the cable length and cross-section for compliance with the stated accuracy class.

Details of how to calculate the maximum cable length: "Help and definition" section.

RATING (A)	CAT. NO.	MAX. CT POWER		MAX. CABLE LENGTH BETWEEN CT/MEASURING DEVICE (M)		
		CLASS 0.5 (VA)	CLASS 1 (VA)	CABLE 1.5 MM²	CABLE 2.5 MM²	CABLE 6 MM²
50	4 121 01		1.25	1.1	1.8	4.4
75	4 121 02		1.5	1.5	2.4	5.9
100	4 121 03	2		2.2	3.7	8.9
125	4 121 04	2.5		2.9	4.9	11.8
160	4 121 05	3		3.7	6.1	14.8
200	4 121 06	4		5.1	8.5	20.7
250	4 121 07	5		6.6	11.0	26.6
400	4 121 12	10		13.9	23.2	56.2
600	4 121 14	12		16.8	28.1	68.1
250	4 121 16	3		3.7	6.1	14.8
400	4 121 17	6		8.0	13.4	32.6
700	4 121 19	8		11.0	18.3	44.4
250	4 121 23	3		3.7	6.1	14.8
300	4 121 24	5		6.6	11.0	26.6
400	4 121 25	8		11.0	18.3	44.4
600	4 121 26	12		16.8	28.1	68.1
700	4 121 31	8		11.0	18.3	44.4
800	4 121 32	8		11.0	18.3	44.4
1000	4 121 33	10		13.9	23.2	56.2
600	4 121 36	8		11.0	18.3	44.4
800	4 121 38	12		16.8	28.1	68.1
1000	4 121 39	15		21.2	35.4	85.8
1250	4 121 42	12		16.8	28.1	68.1
1600	4 121 46	10		13.9	23.2	56.2
2000	4 121 47	15		21.2	35.4	85.8
3200	4 121 49	25		35.8	59.8	145.0
1600	4 121 50	20		28.5	47.6	115.4
2000	4 121 51	25		35.8	59.8	145.0
2500	4 121 52	30		43.1	72.0	174.6
3200	4 121 53	30		43.1	72.0	174.6
4000	4 121 54	30		43.1	72.0	174.6
3 x 250	4 121 57		3	3.7	6.1	14.8
3 x 400	4 121 58		4	5.1	8.5	20.7
400	4 121 62	1.5		1.5	2.4	5.9
800	4 121 63	3		3.7	6.1	14.8
1000	4 121 64	5		6.6	11.0	26.6
1500	4 121 65	8		11.0	18.3	44.4
2000	4 121 66	15		21.2	35.4	85.8
2500	4 121 67	15		21.2	35.4	85.8
3000	4 121 68	20		28.5	47.6	115.4
4000	4 121 69	20		28.5	47.6	115.4

EDMX^3

CONCENTRATOR

PRODUCT SPECIFICATIONS

The EMDX^3 concentrator Cat. No. 4 120 65 is used to collect pulses sent by the electricity, gas, water, oil meters, etc and transmit this information, via its RS485 output, to a supervision or energy management system.

The concentrator can collect data from up to 12 Legrand or non-Legrand water, gas or electricity pulse meters at the same time.

CHARACTERISTICS

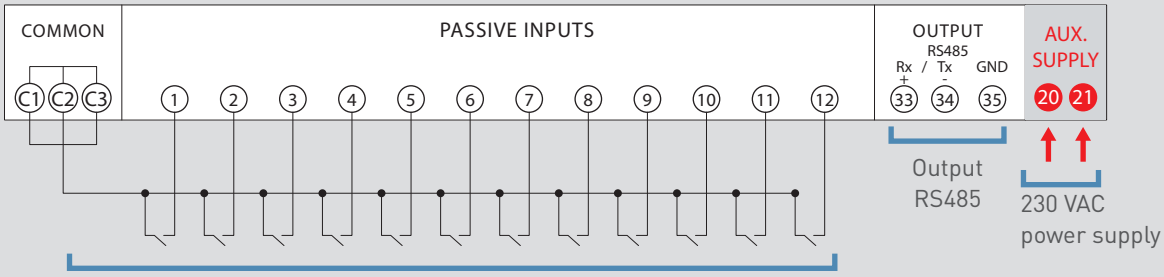
- Display: LCD.
- Power supply voltage: Single-phase 230 VAC.
- Frequency: 50 – 60 Hz.
- Consumption: 5 VA max.
- Connection: 12 digital inputs with volt-free contact
- Output: Modbus RS485
- Mounting: on DIN rail
- Dimensions: 4 modules

PRODUCT SELECTION

The EMDX³ concentrator Cat. No. 4 120 65, is used to:

- Display in a single place the consumption values of several electricity, gas or water pulse meters, up to 12 meters.
- Transmit this information on an RS485 BUS so it can be processed by an energy management system such as the Energy web server 0 261 78/0 261 79 or a building supervision system.

CONNECTION



Each meter pulse output is connected to one of the 12 concentrator inputs, and the common of these outputs should be connected to the C1/C2/C3 terminals. Make sure the polarity of the meter pulse outputs connected to the concentrator is correct.

Cable length between each meter and the concentrator: 1000 m max with min. 1 mm² cross-section.

Make sure the polarity of the meter pulse outputs connected to the concentrator is correct.

The concentrator needs an auxiliary power supply in order to work, and we recommend protecting it with 0.5 A gG fuses.

PARAMETER SETTING

After connection, the concentrator parameters need to be changed so that it displays data consistent with the associated meters.

- Programming mode is entered by simultaneously pressing both the "**PROG** and ↓" buttons on the front.
- Access to the parameters is locked by a password which can be changed if necessary (factory code = 1000).
- After simultaneously pressing both the "**PROG** and ↓" buttons with manual mode selected, the parameters scroll down on release.
- The parameters scroll down in succession if automatic mode is selected.
- The "**PROG**" button alone changes the value of the chosen parameter.
- The "↓" button alone moves the cursor.
- The "Rx Tx" LEDs identify RS485 dialogue.

PARAMETER IDENTIFICATION

DISPLAY	PARAMETER
PASSWORD	Password
PRG input	Setting the input type parameters: • Pot Free = 12 pulse inputs with volt-free contact • PotAFree = 12 pulse inputs with volt-free contact (the parameters of the 1st input are loaded on the next automatically) • Pot Live = not used • GME S0 = not used
1 PLS TYP	Pulse type setting (where 1 = input 1)
1 PLS VAL	Pulse weight setting (where 1 = input 1)
1KTA	Connected meter current transformer ratio (where 1 = input 1)
1KTV	Connected meter voltage transformer ratio (where 1 = input 1)
1TIM OFF	OFF time (where 1 = input 1)
Scroll	Automatic or manual parameter scrolling
Address	Modbus communication address
Baudrate	Modbus communication speed
Parity	Modbus parity bit (none, even, odd)
Contrast	Screen contrast setting
SAVING	Backup

DATA TRANSFER

The concentrator has an RS 485 output which can send data to an operating system.

- RTU mode Modbus protocol
- Address from 1 to 255
- Baud rate 9600, 19,200 Bauds
- Parity: even, odd, none
- 2-pair wiring RS485 standard (Belden 9842)

The wiring diagram for an RS485 BUS is illustrated in the "Communication protocols" section.

MODBUS ADDRESSING

To allow systems integrators to develop the energy management program, addressing tables are available in the E-catalogue on www.legrand.com in the manuals or in separate files depending on the device. All the information concerning available registers can be found in these documents.

If you need examples of how to read or write a register, you should refer to the "Help and definition" section.

THE ECOMETER

PRODUCT SPECIFICATIONS

The ecometer is used to measure or calculate the consumption of various energy-using items: heating, cooling, hot water production, power sockets, water and gas circuits.

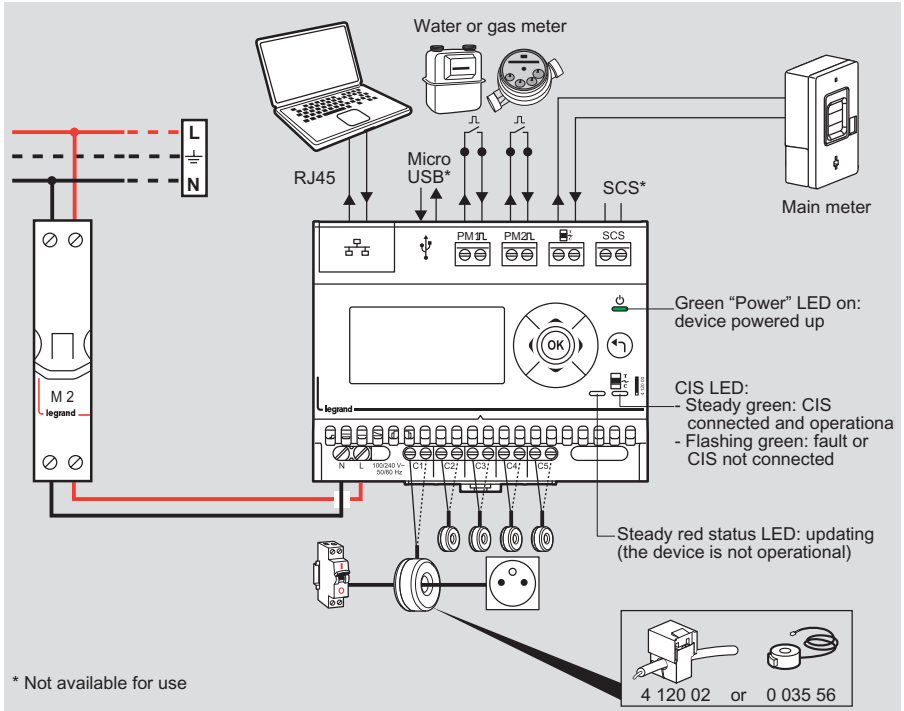
CHARACTERISTICS

- Display: LCD
- Power supply voltage: 100 to 240 VAC
- No-load power consumption: 2 W
- Frequency: 50 – 60 Hz
- Inputs:
  - 5 x 0 - 90 mA current transformer inputs
  - 2 digital inputs with volt-free contact
  - 1 CIS input for electronic meter or Linky
- Outputs:
  - SCS BUS compatible with MYHOME screens, door entry systems BTicino
  - 1 RJ 45 output in Ethernet format
- Mounting: on DIN rail
- Dimensions: 6 modules
- Configuration: local or remote

PRODUCT SELECTION

The ecometer is available for use in private homes and/or apartment blocks. It is ideally designed to comply with regulations such as RT2012.

CONNECTION



* Not available for use

** Compatible with version V2.0.6 (from July 2015)
To check the Ecometer version and/or update it, see the "Updating the Ecometer software and displaying web pages" section

It comprises:

- An IP output in Ethernet format for displaying consumption on web pages via the router. The data can be viewed on a smartphone, tablet, PC etc, at home or remotely.
- 5 inputs for measuring electrical circuits, used to connect up to 2 current transformers per input (Cat. No. 4 120 02 or 0 035 56).
- 2 wired pulse inputs for metering gas and water, etc
- 1 CIS (customer information system) input for CBE (French electricity tariff) or Linky meter, for managing tariff periods.
- A BUS/SCS output for displaying consumption on a Bticino door entry system or MyHome home automation screens.

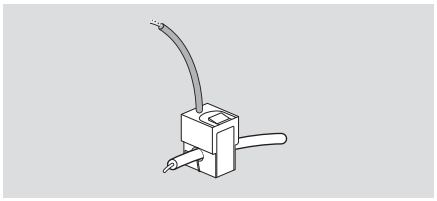
Open CT: Cat. No. 4 120 02
Closed CT: Cat. No. 0 035 56

Ready to install solution: kit Cat. No. 4 120 10 including an ecometer Cat. No. 4 120 00 + 3 CTs Cat. No. 4 120 02.

■ **Accuracy of connecting current transformers (CTs):**

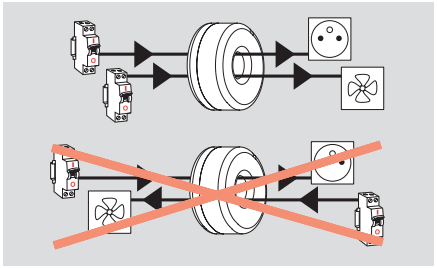
For either CT Cat. No. (4 120 02 or 0 035 56):

Several wires can be passed through each toroid, in accordance with the conditions below:

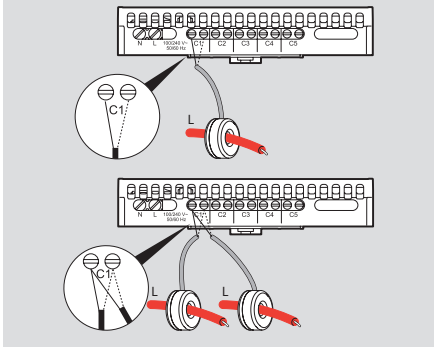


Max. number of wires per toroid: - 10 x 1.5 mm²
- 7 x 2.5 mm²
- 4 x 6 mm²
- 1 x 10/16/25 mm²

The direction of current flow must be identical.



Maximum of 2 toroids used per input.



Take care not to exceed the maximum amount of toroid data: 90 A

PARAMETER SETTING

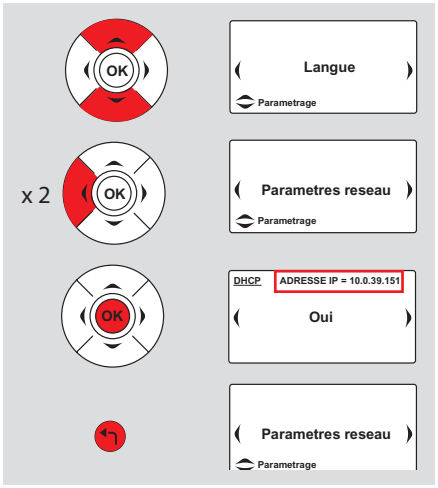
The parameters of ecometer Cat. No. 4 120 00 can be set in 2 different ways:

- **Option 1: setting parameters on the device (on the front):**

Access to the various parameters and data is via the "↑ ↓ → ← ok ←" buttons.
List of parameters:

- Language selection
- Date and time settings
- Currency selection
- Choice of toroidal core inputs
- Pulse input setting
- Mains supply parameter

- **Option 2: setting parameters remotely on a computer (connection via IP network):**



The ecometer must therefore be connected to the computer network.
To do this, you need to know the ecometer's automatic IP address given by the DHCP server (in private homes, the router for example).

The ecometer is factory-set with an automatically-assigned IP address. It is possible to fix its address as a static IP.

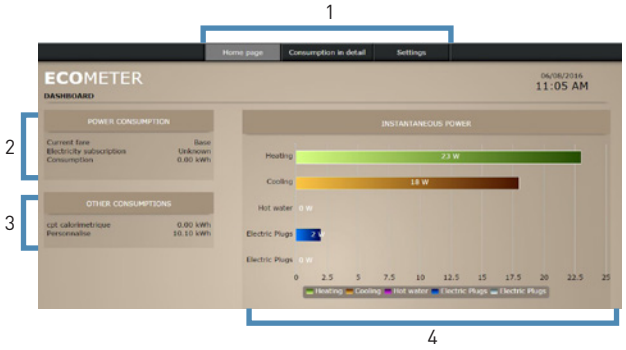
On a PC connected on the same IP network:

- Open an internet browser.
- Type in the ecometer IP address.
- Confirm by pressing Enter.

Like any device connected on a local area network (intranet), access to the ecometer is secure during a remote connection (internet). To obtain this authorisation, it is preferable to contact the network administrator (router subscription operator) who will do the necessary to open the port and redirect to the ecometer.

OVERVIEW OF MENUS

■ "Home" menu:



1: Access to menus.
2: Total power consumption (Information provided by the link to the electricity meter).
3: Consumption of water and gas meters.
4: Display of 5 instantaneous powers corresponding to toroidal core inputs.

■ "Detailed consumption" menu:

1: Access to menus.
2: Choice of display by date or period.
3: This page is used to view the detailed consumption of the various connected energy-using items.
4: Choice of display in kWh or in €.
5: Option to extract raw data into files by date and time.

The ecometer must have been connected for at least 24 hours before the first log will appear in the detailed consumption.

■ "Parameter" menu:

1: Access to menus.
2: Setting the language, time, date.

1: Choice of automatic or static IP address.

1: Assignment of circuits and tariffs: Electrical in the "Electricity" tab
Gas and water in the "Other" tab.

See more details in the "Communication protocols, IP addressing" section.

DMX³ COMMUNICATING CIRCUIT BREAKERS

PRODUCT SPECIFICATIONS

DMX³ air circuit breakers are used for the incoming protection and control of low voltage installations up to 6300 A. Assembled in the factory, they must always be ordered with a protection unit Cat. Nos. 0 288 00/01/02/03/04.

They become communicating by combining them with option Cat. No. 0 288 05, which must also be factory-fitted.

Depending on the type of unit chosen, the information appearing on the RS485 BUS differs.

It is still possible to combine measurement with non-communicating DMX³ circuit breakers by means of EMDX³ meters and measurement control units.

DMX³ made communicating with Cat. No. 0 288 05

Protection units
Cat. Nos. 0 288 00/01/02/03/04

CHARACTERISTICS

The characteristics of the various DMX³ circuit breakers are not detailed in this guide which is only concerned with measurement and supervision. Only those in option Cat. No. 0 288 05, specifically designed for communication, are described.
You can find all the necessary information in the various product-related documents such as the general catalogue, e-catalogue, instructions, technical data sheets, Power Guide, and DMX³ workshop specifications.

External power supply Cat. No. 0 288 06:

- This power supply is required when using the communicating DMX³ option Cat. No. 0 288 05.
- This module is itself be supplied with 24 VDC/AC.
- Use a power supply with double galvanic isolation or equivalent, Cat. No. 1 466 23 for example.
- Consumption 5 W, 250 mA.

RS485 communication port:

- Connected on the DMX³ terminal block
- Parameters set on the front of the DMX³

Each external power supply Cat. No. 0 288 06 is capable of powering:
- One MP6 touch screen protection unit
- Up to four MP4 LCD screen protection units
- It is not possible to power an MP4 and an MP6 touch screen protection unit with the same power supply.

It must be protected, like any electrical circuit.

PRODUCT SELECTION

Which DMX³ should be chosen is not specified in this guide, which is only concerned with measurement and supervision.
You can find all the necessary information in the various product-related documents such as the general catalogue, e-catalogue, instructions, technical data sheets, Power Guide, and DMX³ workshop specifications.

The table below indicates the data available on the RS485 BUS for different devices.

	DMX³ WITH PROTECTION UNIT 0 288 00	DMX³ WITH PROTECTION UNIT 0 288 01	DMX³ WITH PROTECTION UNIT 0 288 02	DMX³ WITH PROTECTION UNIT 0 288 03	DMX³ WITH PROTECTION UNIT 0 288 04
Current	X	X	X	X	X
Ph/N and Ph/Ph voltages				X	X
P, Q, A powers (total and per phase)				X	X
Frequency				X	X
Power factor (total and per phase)				X	X
Active and reactive energy				X	X
Total harmonic distortion				X	X
Position (open/closed/fault)	X	X	X	X	X
Date, time and cause of last trip	X	X	X	X	X

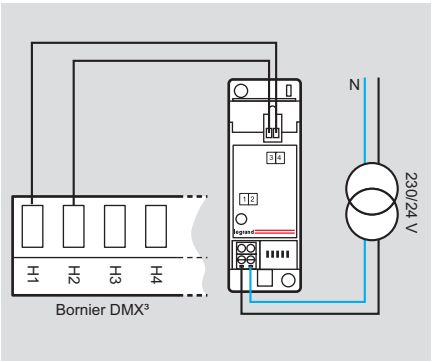
CONNECTION

■ **Power supply 0 288 06:**

Particular care must be taken when connecting the power supply 0 288 06 to the DMX³ terminal block. Reversing the wiring can damage the protection unit.

– Terminal H1 on the DMX³: terminal 4 of the power supply Cat. No. 0 288 06.

– Terminal H2 on the DMX³: terminal 3 of the power supply Cat. No. 0 288 06.



■ **RS485 BUS:**

RS485 BUS connected directly on the DMX³ terminal block on H5, H6, H7:

H5: RS485 BUS SG

H6: RS485 bus (-)

H7: RS485 BUS (+)

The wiring diagram for an RS485 BUS is illustrated in the section with that name.

PARAMETER SETTING

Which DMX³ parameters should be set is not specified in this guide, which is only concerned with measurement and supervision.

You can find all the necessary information in the various product-related documents such as the general catalogue, e-catalogue, instructions, technical data sheets, Power Guide, and DMX³ workshop specifications.

Modbus function parameter settings:

- Modbus RTU and ASCII protocol
- Baud rate 2400, 4800, 9600, 19,200, 38,400 bauds
- Address from 1 to 247
- Parity: even, odd, none
- Stop bit: 1
- Wait times between 2 transmissions: 50 ms
- 2-pair wiring RS485 standard (Belden 9842)

PARAMETER SETTING (CONTINUED)

■ **Modbus parameter-setting mode for MP4 protection units:**

The Modbus parameters can be set on the front of MP4 units using the 4 function keys with a display on the LCD screen:

MENU → Modules → Com. setting → Address
→ Speed
→ Mod. RTU/ASCII
→ Parity

■ **Modbus parameter-setting mode for MP6 measurement units:**

The Modbus parameters can be set on the front of MP6 units using the touch screen:

1 — for the address
9.600 bit/s — for the speed
ASCI — for the mode
EVEN — for the parity

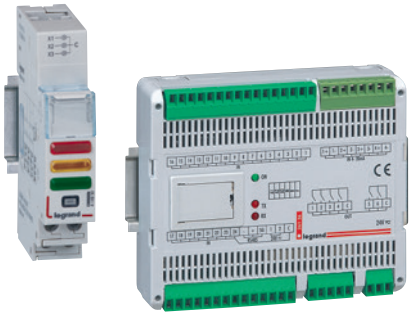
LE RENVOI DE DONNÉES

■ **Les DMX³ communicants :**

Toutes les informations gérées par la carte électronique du disjoncteur sont partagées sur le réseau Modbus via l'option 0 228 05.

■ **Les DMX³ non communicants :**

Certaines informations des disjoncteurs non communicants, telles que l'état du disjoncteur (ouvert, fermé, défaut), l'état du ressort (chargé, déchargé), la position du disjoncteur (embroché, débroché) peuvent être visualisées sur le réseau Modbus.
Cette option est rendue possible avec les deux types de produits suivants:
- le module de signalisation universel EMS CX³ référence 4 149 30,
- l'interface de signalisation et de commande référence 0 261 36.



Pour plus de détail sur ces produits, vous pouvez vous reporter au paragraphe «Fiche produit».

MODBUS ADDRESSING

To allow systems integrators to develop an energy management program, addressing tables are available in the E-catalogue on www.legrand.com in the manuals or in separate files depending on the device. All the information concerning available registers can be found in these documents by selecting the DMX³ catalogue number.

If you need examples of how to read or write a register, you should refer to the "Help and definition" section.

DPX³ COMMUNICATING CIRCUIT BREAKERS

PRODUCT SPECIFICATIONS

Legrand is bringing a new dimension to protection devices, with measurement via e.communication directly integrated in the new DPX³ electronic circuit breakers.
Depending on the type of DPX³ electronic circuit breaker chosen, the information appearing on the RS485 BUS differs.
It is still possible to combine measurement with other DMX³ circuit breakers by means of EMDX³ meters and measurement control units.
DPX³ can be made communicating with communication interface 4 210 75.

DPX³
E.communicating

Communication interface
Cat. No. 4 210 75

CHARACTERISTICS

The characteristics of the various DPX³ are not detailed in this guide, which is only concerned with measurement and supervision.

You can find all the necessary information in the various product-related documents such as the general catalogue, e-catalogue, instructions, technical data sheets, Power Guide, and DPX³ workshop specifications.

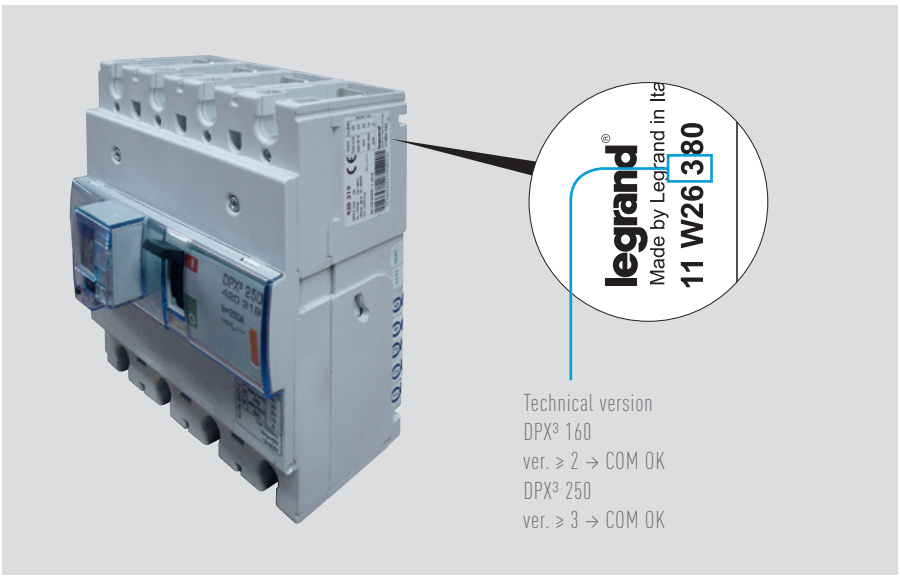
Communication interface Cat. No. 4 210 75 must be protected, like any electrical circuit.

PRODUCT SELECTION

Which DPX³ should be chosen is not specified in this guide, which is only concerned with measurement and supervision.
You can find all the necessary information in the various product-related documents such as the general catalogue, e-catalogue, instructions, technical data sheets, Power Guide, and DPX³ workshop specifications.
The table below indicates the data available on the RS485 BUS for different devices.

	ELECTRONIC DPX³ 250	ELECTRONIC DPX³ 250 WITH RCD	ELECTRONIC DPX³ 250 WITH MEASUREMENT	ELECTRONIC DPX³ 630	ELECTRONIC DPX³ 630 WITH MEASUREMENT	ELECTRONIC DPX³ 1600	ELECTRONIC DPX³ 1600 WITH MEASUREMENT
Currents	X	X	X	X	X	X	X
Voltages			X		X		X
Frequency			X		X		X
Active and reactive power			X		X		X
Power factor			X		X		X
Active and reactive energy			X		X		X
Total harmonic distortion			X		X		X
Position (open/closed/fault)	X	X	X	X	X	X	X
Date, time and cause of last trip	X	X	X	X	X	X	X

■ Identification of the technical version of compatible circuit breakers

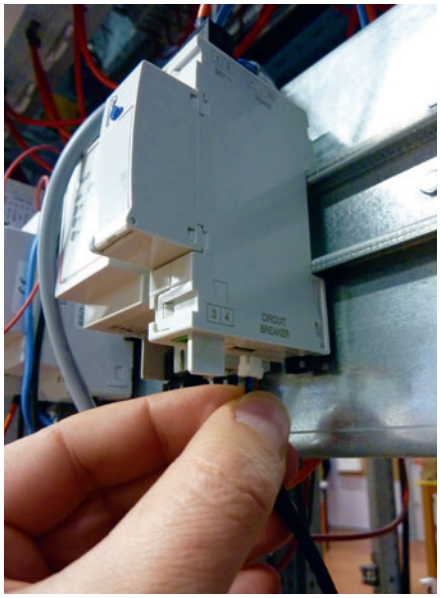


The oldest versions of DPX³ 160 and 250 are not compatible with Modbus connection.
All DPX³ 630 and 1600 units are compatible.
Remember that only thermal-magnetic DPX³ with residual current protection and electronic DPX³ can be made communicating by adding an interface 4 210 75.

Caution, residual thermal-magnetic DPX³s can no longer be made communicating since week 41 of 2014.

CONNECTION

■ **Link between the DPX³ and interface 4 210 75:**

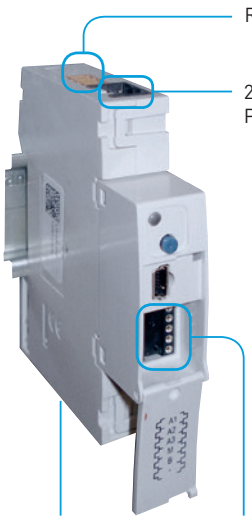


Connection under the communication interface. The connecting cable issupplied with the interface.

Connection on the left-hand side of the DPX³, under the label.

The cable supplied with interface Cat. No. 4 210 75 is 0.70 m long.

Interface 4 210 75 is used to transmit the data on the communicating DPX³ over the RS485 BUS.



DPX³ CONNECTION

CONFIGURATION OF MODBUS PARAMETERS
A1/A2/A3: Modbus address
M: communication mode RTU or ASCII
B: baud rate

The wiring diagram for an RS485 BUS is illustrated in the "Communication protocols" section.

PARAMETER SETTING

■ **DPX³:**

Which DPX³ parameters should be set is not specified in this guide, which is only concerned with measurement and supervision.
You can find all the necessary information in the various product-related documents such as the general catalogue, e-catalogue, instructions, technical data sheets, Power Guide, and DPX³ workshop specifications.

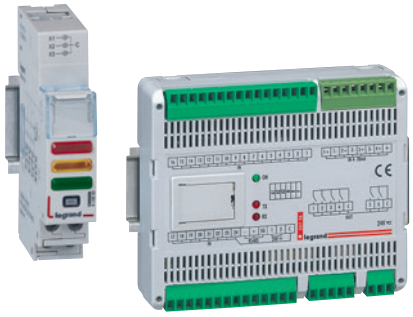
■ **RS485/IP interfaces:**

The parameters of interface 4 210 75 are set using a configurator.
You should refer to the section: "Product specifications, interface 4 210 75".

DATA TRANSFER

■ **Communicating DPX³s:**
All the information managed by the circuit breaker's circuit board is shared on the Modbus network via interface 4 210 75.

■ **Non-communicating DPX³s:**
Some information about non-communicating circuit breakers, such as the circuit breaker status (open, closed, fault) can be viewed over the Modbus network. This option is made possible with the two following types of product:
- EMS CX³ universal signalling module Cat. No. 4 149 30
- signalling and control interface Cat. No. 0 261 36



For more details about these products, please refer to the "Product data sheet" section.

MODBUS ADDRESSING

To allow systems integrators to develop an energy management program, addressing tables are available in the E-catalogue on www.legrand.com in the manuals or in separate files depending on the device. All the information concerning available registers can be found in these documents by selecting the DPX³ catalogue number.

If you need examples of how to read or write a register, you should refer to the "Help and definition" section.

METERING OR MEASUREMENT ADD-ON MODULES FOR DX^3

PRODUCT SPECIFICATIONS

Add-on modules with integrated electricity meter or measurement control unit combined with DX^3(*) modular circuit breakers protect people from direct and indirect contact and protect installations from insulation faults.
They can also be used to measure the main electrical values depending on the choice of catalogue number.
They can be made communicating with communication interface 4 210 75.
(*) 1.5 modules per pole

Communication interface Cat. No. 4 210 75 is also used with communicating DPX^{3}s.

Add-on module with integrated electricity meter

Add-on module with integrated measurement control unit

Communication interface Cat. No. 4 210 75

CHARACTERISTICS

The characteristics of the various DPX^3 circuit breakers are not detailed in this guide, which is only concerned with measurement and supervision.

You can find all the necessary information in the various product-related documents such as the general catalogue, e-catalogue, instructions, technical data sheets, and Power Guide.

Communication interface Cat. No. 4 210 75 must be protected, like any electrical circuit.

PRODUCT SELECTION

Legrand offers 3 different DX³ add-on modules.

4-pole 400 V~ - Metering

LCD display
For displaying active energy consumption, instantaneous power and current per phase (A)

Hpi type with integrated electricity meter

	Screw	Sensitivity (mA)	Current (A)	No. of modules
1	4 106 57	30 to 3000	63	7.5
1	4 106 58	30 to 3000	125	7.5

4-pole 400 V~ - Measurement

LCD display
For displaying energy consumption, power, frequency, voltage, current and harmonics

Hpi type with integrated measurement control unit

	Screw	Sensitivity (mA)	Current (A)	No. of modules
1	4 106 59	30 to 3000	125	7.5

The add-on module can be used with DX³ circuit breakers with 1.5 modules per pole.

The table below indicates the data available on the RS485 BUS for the different devices.

	ADD-ON MODULE WITH INTEGRATED ELECTRICITY METER 4 106 57/4 106 58	ADD-ON MODULE WITH INTEGRATED MEASUREMENT CONTROL UNIT 4 106 59
Instantaneous value of currents I1, I2, I3, IN	X	X
Instantaneous value of residual current	X	X
Phase-to-neutral voltages V1, V2, V3 and phase-to-phase voltages U12, U23, U31		X
Frequency		X
Active power	X	X
Reactive power		X
Power factor		X
Active energy	X	X
Reactive energy		X
THD V1, V2, V3		X
THD I1, I2,I3, IN		X
Value of last trip on residual current fault:	X	X
Value of last trip due to overheating	X	X
Value of last trip caused by pressing test button	X	X
No trip memory	X	X

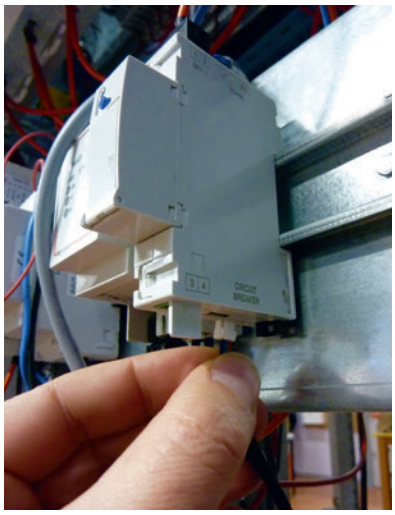
CONNECTION

■ **Link between interface 4 210 75 and the installation**

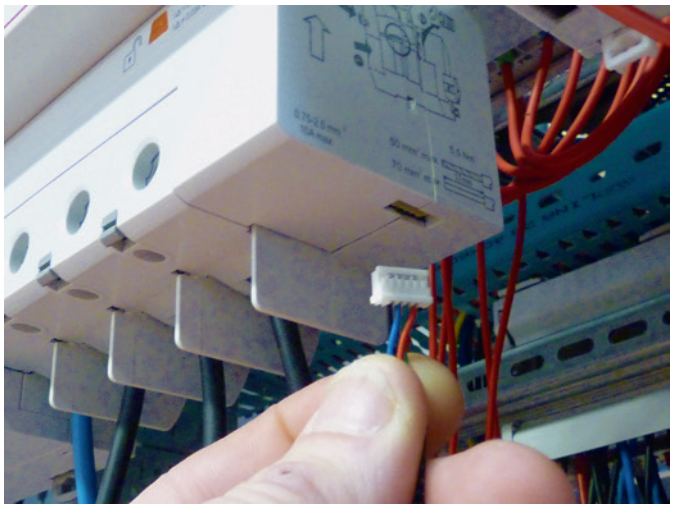
Interface 4 210 75 is used to transmit the data on the communicating add-on module over the RS485 BUS.

The wiring diagram of an RS485 BUS is illustrated in the "Communication protocols" section.

■ **Link between the add-on module and interface 4 210 75:**



Connection under the communication interface.
The connecting cable is supplied with the interface.



The communication interface is connected under the add-on module.

The cable supplied with interface Cat. No. 4 210 75 is 0.70 m long.

PARAMETER SETTING

■ **Add-on modules:**

Which add-on module parameters should be set is not specified in this guide, which is only concerned with measurement and supervision.
You can find all the necessary information in the various product-related documents such as the general catalogue, e-catalogue, instructions, technical data sheets, and Power Guide.

■ **RS485/IP interfaces:**

The parameters of interface 4 210 75 are set using a configurator.
You should refer to the section: "Product specifications, interface 4 210 75".

DATA TRANSFER

All the information managed by the add-on module is shared on the Modbus network via interface 4 210 75.

MODBUS ADDRESSING

To allow systems integrators to develop an energy management program, addressing tables are available in the E-catalogue on www.legrand.com in the manuals or in separate files depending on the device. All the information concerning available registers can be found in these documents by selecting the add-on module catalogue number.

If you need examples of how to read or write a register, you should refer to the "Help and definition" section.

COMMUNICATION
INTERFACE 4 210 75

PRODUCT SPECIFICATIONS

Interface 4 210 75 is used to connect certain Legrand products such as DPX³, add-on modules, on an RS485 MODBUS communication network.

It has a contact which signals when the associated circuit breaker has tripped.

CHARACTERISTICS

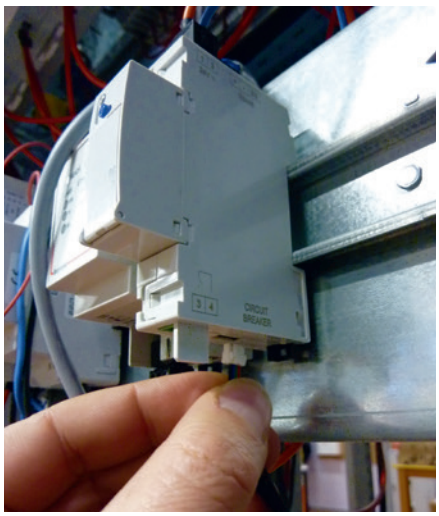
- RS485 communication interface for DPX³ and add-on module Cat. No. 4 210 75
- 24 V DC/AC power supply. Use a power supply with double galvanic isolation or equivalent, Cat. No. 1 466 23 for example
- Consumption 90 mA
- RS485 serial communication port
- Modbus parameters set using configurators
- Volt-free contact for circuit breaker tripped status information max. 220 V 0.2 A

PRODUCT SELECTION

Communication interface 4 210 75 should be used with communicating DPX³s and add-on modules.

CONNECTION

■ **Link between interface 4 210 75 and the Legrand device**



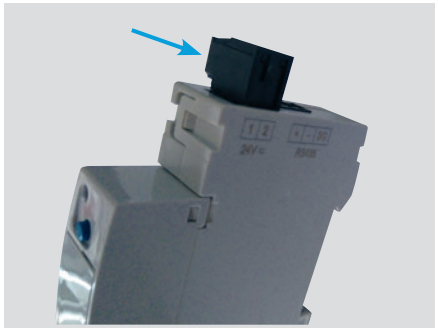
Connection under the communication interface. The connecting cable is supplied with the interface.

The cable supplied with interface Cat. No. 4 210 75 is 0.70 m long.

■ **Interface power supply**

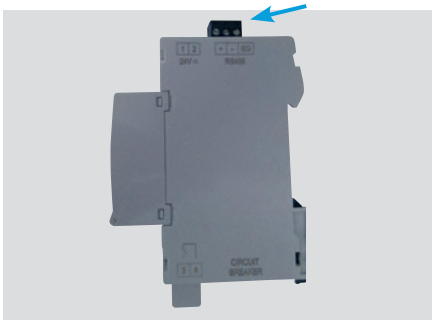
- 24 V DC/AC power supply
- Use a power supply with double galvanic isolation or equivalent
- Connected with a connector

Communication interface Cat. No. 4 210 75 must be protected, like any electrical circuit.



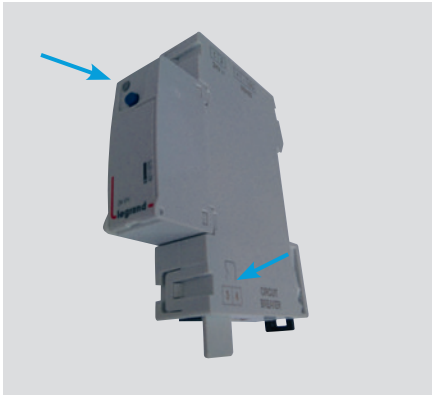
■ **Connection to the RS485 BUS**

- Connect the interface to the RS485 BUS
- The wiring diagram for an RS485 BUS is illustrated in the "Communication protocols" section
- Connected with a connector



■ **Use of the status contact**

- The circuit breaker tripped status information appears on a volt-free contact.
- NC = circuit breaker tripped
- Pushbutton function, relay test, press = NC
- Connected with a connector



COMMUNICATION INTERFACE 4 210 75

PARAMETER SETTING

The parameters of communication interface 4 210 75 are set using configurators.

- A1/A2/A3: Modbus address
- M: Modbus transmission method (RTU/ASCII, parity, stop bit)
- B: Baud rate
- Configurator 6: not used

Parameter setting is described in the technical data sheet.

Configurators are available under the following catalogue numbers:

- Complete set from 0 to 9:
  Cat. No. 3501K (10 of each configurator)
- Pack of 10 individual configurators:
  Cat. No. 3501/X (for example
  Cat. No. 3501/1 = a pack of 10 no.
  1 configurators)

DATA TRANSFER AND MODBUS ADDRESSING

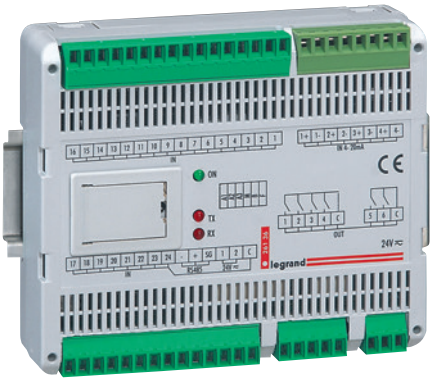
Cat. No. 4 210 75 is still a communication interface for transcribing information on Legrand circuit breakers in RS485 Modbus protocol.
The various register tables are available in the DPX³ and add-on module product specifications.

CONTROL AND SIGNALLING
INTERFACE 0 261 36

PRODUCT SPECIFICATIONS

Control and signalling interface Cat. No. 0 261 36 should be mounted as close as possible to the electrical devices and can be used to:

- Read information such as the status of a circuit breaker, contactor or any other non-communicating electrical device, by simply connecting a status contact, in order to transcribe it in Modbus protocol.
- Control actuators such as circuit breaker motors or any electrical device by simply relaying the command via the RS485 BUS.



It has:
- 24 digital inputs (one common for all 24)
- 4 x 4 – 20 mA analogue inputs
- 6 relay digital outputs – NO contact max. 230 V, 2 A (one common for 4 and one for 2 relays)
- An RS485 link

It is used to:
- Read the status of each digital input, activate an alarm, activate an output in the event of an alarm on the input, and transmit data over RS485
- Read the status of the analogue input, activate an alarm according to an adjustable threshold, and transmit data over RS485
- Control each output individually
- Check the output status
- Modify their configuration individually (timed output, flashing with frequency setting, NC or NO)

CHARACTERISTICS

- Control and signalling interface Cat. No. 0 261 36
- 24 V DC/AC power supply. Use a power supply with double galvanic isolation or equivalent, Cat. No. 1 466 23 for example
- Consumption 3 W
- RS485 serial communication port
- Modbus parameters set using configurators

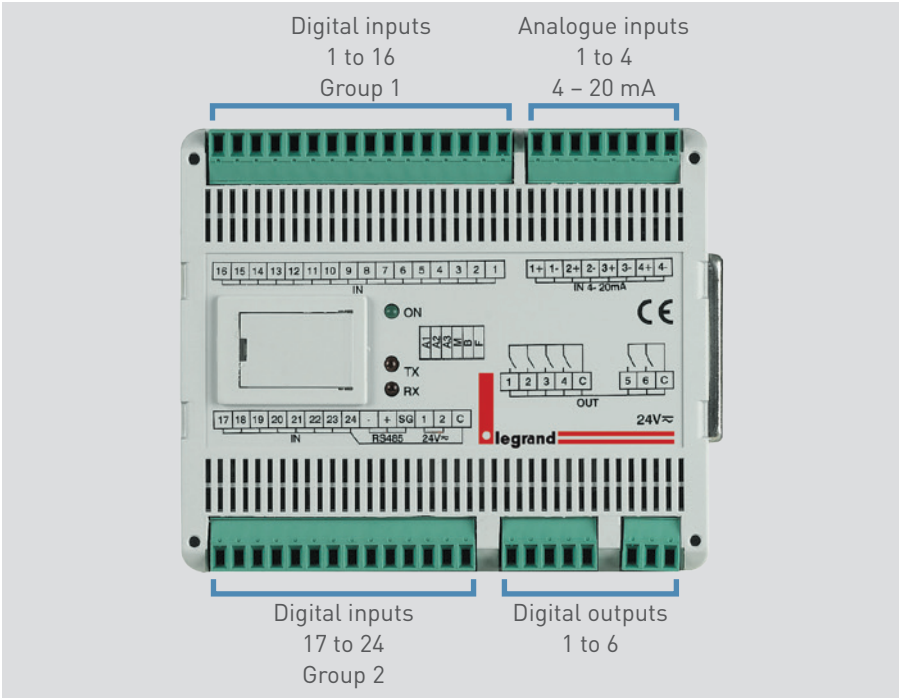
Control and signalling interface Cat. No. 0 261 36 must be protected, like any electrical circuit.

PRODUCT SELECTION

Control and signalling interface Cat. No. 0 261 36 is used with devices which do not have a control and/or signalling function via a communication BUS.

CONNECTION

- **Inputs/outputs:**



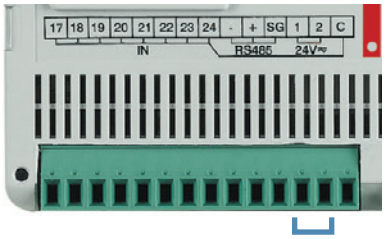
CONNECTION (CONTINUED)

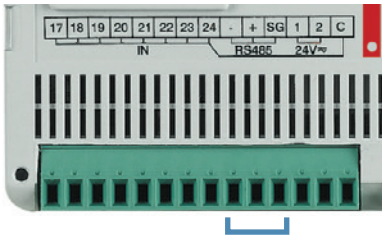
■ **Interface power supply**

- 24 V DC/AC power supply
- Use a power supply with double galvanic isolation or equivalent

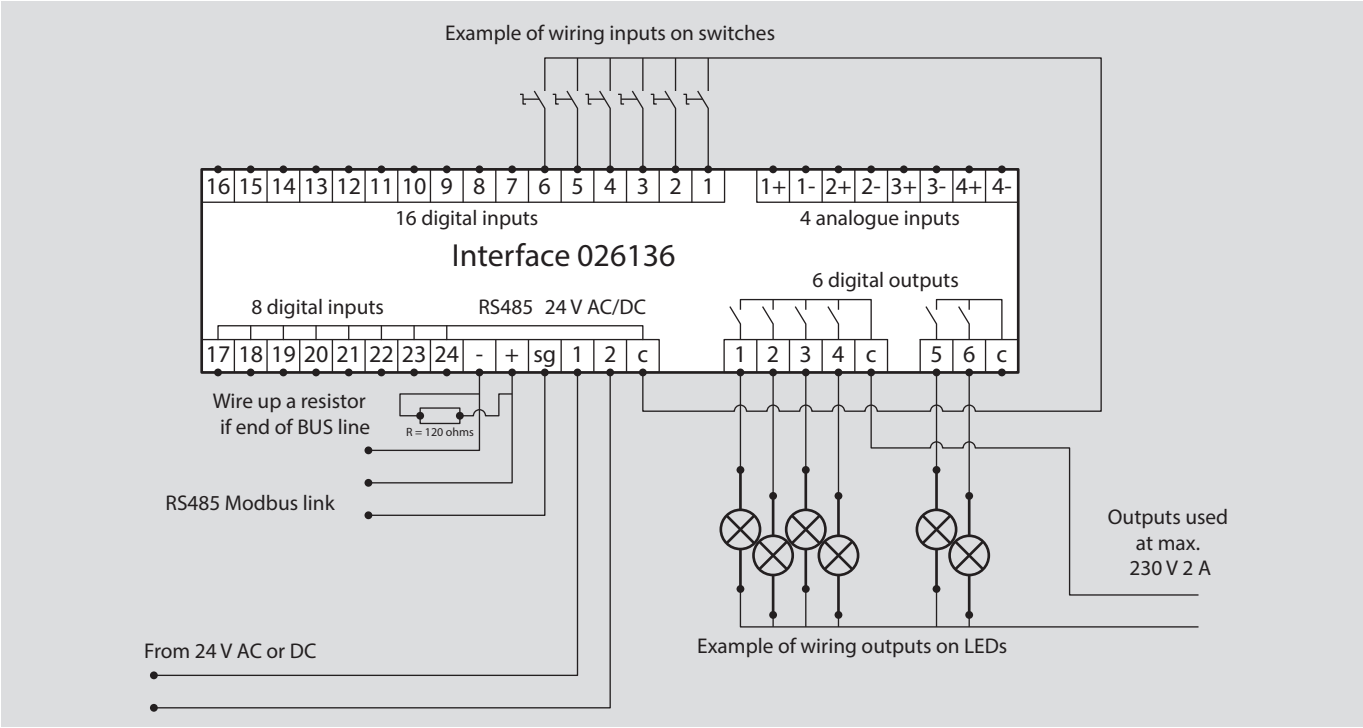
■ **Connection to the RS485 BUS**

- Connect the interface to the RS485 BUS
- The wiring diagram for an RS485 BUS is illustrated in the "Communication protocols" section





■ **Wiring example**

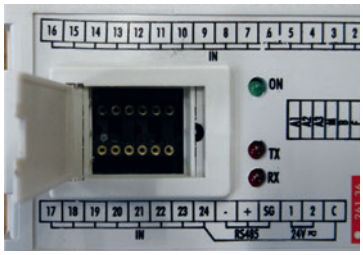


PARAMETER SETTING

The parameters of control and signalling interface 0 261 36 are set using configurators.

- A1/A2/A3: Modbus address from 1 to 247
- M: RTU/ASCII mode
- B: Baud rate, 1200, 2400, 4800, 9600, 19,200, 38,400 bauds
- Configurator 6: not used

Parameter setting is described in the technical data sheet.



Configurators are available under the following catalogue numbers:

- Complete set from 0 to 9: Cat. No. 3501K (10 of each configurator)
- Pack of 10 individual configurators: Cat. No. 3501/X (for example Cat. No. 3501/1 = a pack of 10 no. 1 configurators)

DATA TRANSFER

All the information managed by control and signalling interface 0 261 36 is shared on the Modbus network.

MODBUS ADDRESSING

To allow systems integrators to develop an energy management program, addressing tables are available in the E-catalogue on www.legrand.com in the manuals or in separate files depending on the device. All the information concerning available registers can be found in these documents by selecting catalogue number 0 261 36.

If you need examples of how to read or write a register, you should refer to the "Help and definition" section.

EMS CX³ MEASUREMENT MODULES

PRODUCT DATA SHEET

Measurement modules are integrated in the EMS CX³ system for monitoring energy in electrical panels.

Offering the same performance as conventional measurement control units, these record the electricity consumed by a single-phase or three-phase circuit and measure the electrical values (current, voltage, power, frequency, harmonics, etc).

There are 2 measurement module families:

- measurement up to 63 A
- high current measurements

CHARACTERISTICS

- Display:
  No display on the module itself, however data can be displayed locally (on mini-configurator Cat. No. 4 149 36), or remotely (on a PC, tablet or smartphone screen).
- Reference voltage Un:
  Single-phase: 65 to 290 VAC
  Three-phase: 110 to 500 VAC
- Consumption:
  4 149 19: 34.1 mA - 0.409 W
  4 149 20: 34.8 mA - 0.418 W
  4 149 23: 32.6 mA - 0.391 W
- Supply voltage:
  12 VDC via EMS CX³ power supply module Cat. No. 4 149 45.
- Frequency: 50 – 60 Hz
- Conforming to standards:
  IEC/EN 61557-12
  IEC/EN 61131-2
  (PLC)
- Accuracy:
  Active energy
  (IEC/EN 61557-12): class 0.5
  Reactive energy
  (IEC/EN 61557-12): class 1
- Connection with a CT:
  Supplied for Cat. Nos. 4 149 19/20.
  Not supplied for Cat. No. 4 419 23.
- Output:
  Via communicating rail or cable on the EMS CX³ bus. Modbus RS485 output option via interface Cat. No. 4 149 40.
- Mounting: on DIN rail.
- Dimensions: 1 module.

PRODUCT SELECTION

The measurement module should be chosen according to the supply (single-phase or three-phase) and its maximum current, from the preference on the choice of Current transformers.

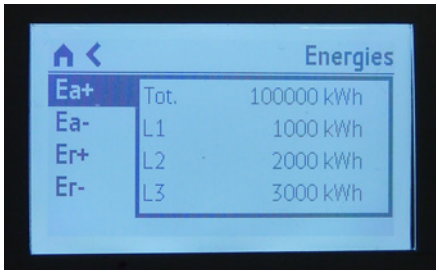
		 4 149 19	 4 149 20	 4 149 23
Supply type	Single-phase	OK	/	OK
	Three-phase	/	OK	OK
Number of modules		1	1	1
Connection	Direct (max. current)	Up to 63 A	Up to 63 A	/
	Via a current transformer	/	/	5 A at the secondary
Metering and measurement	Total active energy	OK	OK	OK
	Total reactive energy	OK	OK	OK
	Partial active energy (reset)	OK	OK	OK
	Partial reactive energy (reset)	OK	OK	OK
	Active power	OK	OK	OK
	Reactive power	OK	OK	OK
	Apparent power	OK	OK	OK
	Current + voltage	OK	OK	OK
	Frequency	OK	OK	OK
	Power factor	OK	OK	OK
	THD phase-to-neutral voltages	OK	OK	OK
	THD phase-to-phase voltages	OK	OK	OK
	THD currents	OK	OK	OK
	THD Odd-order harmonics	Up to 15th order	Up to 15th order	Up to 15th order
Communication	EMS CX³ protocol:	OK	OK	OK
Load shedding	Load shedding according to a measurement threshold that has been reached	OK	OK	OK

EMS CX³ MEASUREMENT MODULES

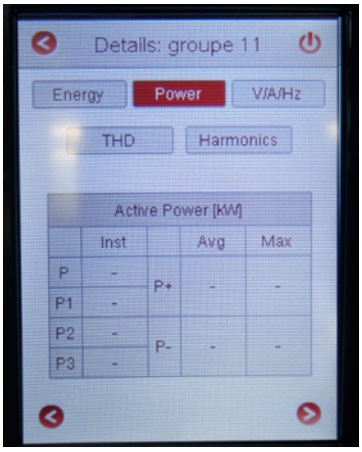
VIEWING DATA

To minimise the dimensions, measurement modules do not have a data display. Nonetheless various display modes are possible :

Locally, in the enclosure, on mini-configurator Cat. No. 4 149 36:



Remotely, on a PC, tablet or smartphone screen. The EMS CX³/ RS485/IP interfaces should then be used in order to access tools such as the touch screen, the Energy Manager software, the Energy Web Server.



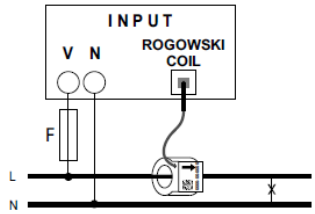
CONNECTION

Measurement modules have 2 types of input: “current” and “voltage” inputs. Each current transformer secondary is connected to the corresponding inputs and thus allows the current flowing through the CT to be measured. To measure the voltage, each conductor is connected to the respective voltage tap terminals.

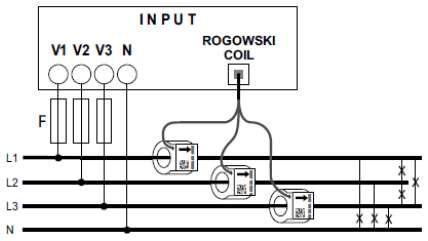
■ **Current measurement for measurement modules to be connected by CT up to 63 A:**

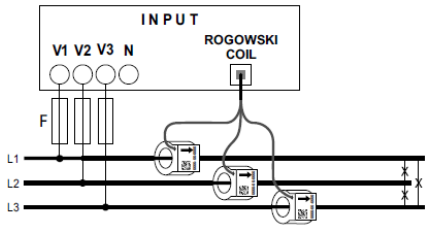
2 measurement modules are available for measurement up to 63 A. They are supplied with Rogowski coil(s) for single-phase or three-phase measurement.

Cat. No. 4 149 19 for single-phase measurement:

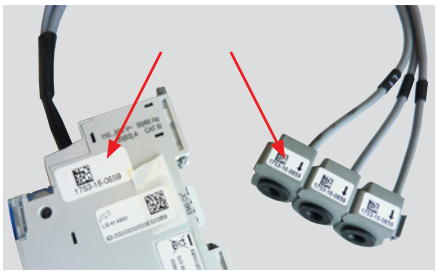


Cat. No. 4 149 20 for three-phase measurement:





Each coil is supplied with a flexible internal guide which ensures the cable is centred in the coil. Depending on the cable cross-section, the guide can be removed or retained.



The coil(s) on a measurement module can be disconnected. The coils are calibrated in the factory for use in conjunction with the measurement modules.
If several modules are used in the same installation, it is important to check, before mounting, that the serial number are identical on the coil and module identification labels.

The coils can be separated for better integration in existing installations.

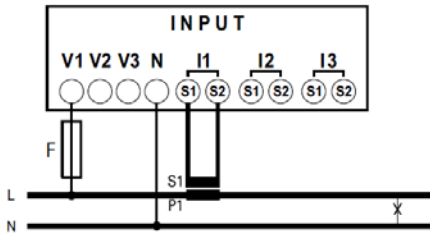
The coils are marked L1 . L2 . L3. Wiring must be done in this order, so that the data is displayed correctly.

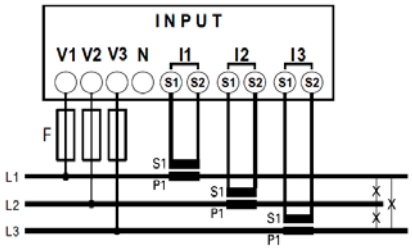
CONNECTION (CONTINUED)

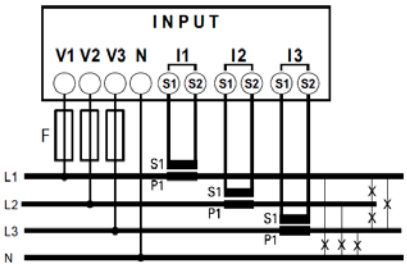
■ **Current measurement for measurement modules to be connected by CT for high current measurement:**

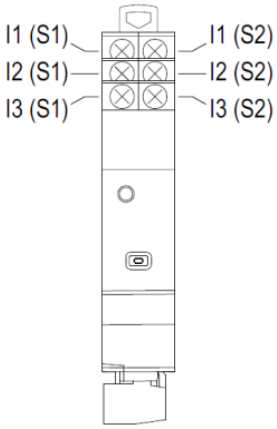
One measurement module is available for high current measurement. It is supplied without a CT and can be wired to any type of ferromagnetic coil, open or closed, 5 A at the secondary.

This measurement module Cat. No. 4 149 23 provides the option of measuring a single-phase or three-phase supply.



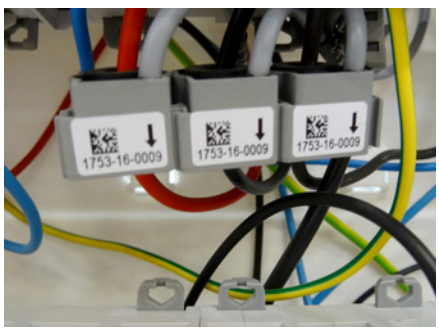






How to determine the maximum possible length between the CTs and the measurement module is explained in the "Current transformers" section.

MEASUREMENT UP TO 63 A

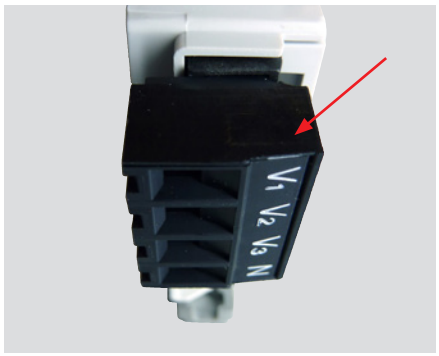


HIGH CURRENT MEASUREMENT

CONNECTION (CONTINUED)

■ Voltage measurement:

The voltage is measured in the same way as on all 3 measurement module catalogue numbers.



To protect the measurement control units, refer to the information in the product manuals and technical data sheets.

■ The EMS CX³ bus:

There are 2 possible solutions for connection to the bus:

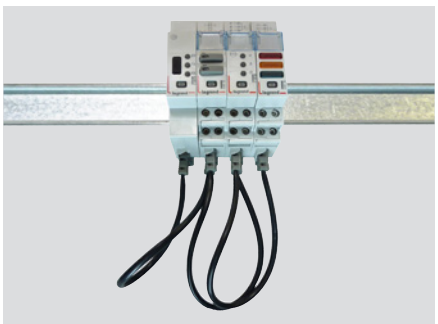
At the back of the modules via communicating rail Cat. Nos. 4 149 01/02/03

Downstream of the modules via communicating cables Cat. Nos. 4 149 07/08/09

The specifications for connection to the EMS CX³ bus are common to all EMS CX³ devices and are described in the "EMS CX³ communication protocol" section as well as the product technical data sheets.

RAIL CONNECTION

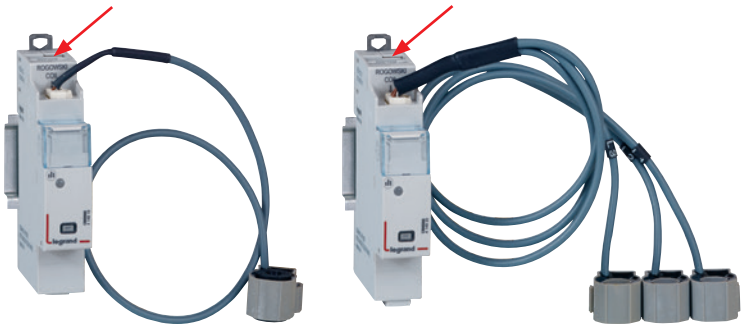
CABLE CONNECTION



CONNECTION (CONTINUED)

■ **Integration in optimised distribution:**

Measurement modules Cat. Nos. 4 419 19 and 4 419 20 have been designed to allow single-phase and three-phase supply busbars to pass through upstream. They therefore incorporate HX³ optimised distribution; making it possible to have a mixture of functions in the enclosure. The energy efficiency modules are then as close as possible to the protection modules.



OPTIMISED DISTRIBUTION POSSIBLE

PARAMETER SETTING

The measurement module parameters can be set:

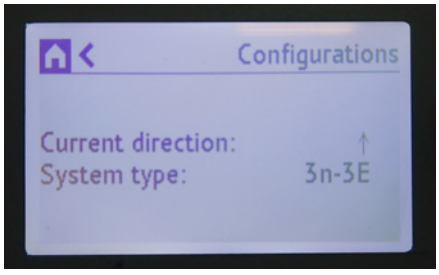
- Remotely: via the EMS CX³ configuration software.
- Locally: with mini-configurator Cat. No. 4 149 36.

■ **Possible parameter settings depending on the measurement modules:**

- Single-phase measurement module Cat. No. 4 149 19:

If the current has been wired in the wrong direction in the Rogowski coil, it is possible to change it, simply by altering the settings.

Parameter setting on the mini-configurator:



This function avoids having to alter the wiring if a mistake is made.

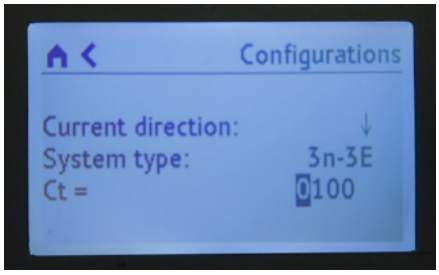
The configuration software can be downloaded free of charge from the online catalogue.

- Three-phase measurement module Cat. No. 4 149 20:

Like the single-phase measurement module, it is possible to change the current direction in the Rogowski coil, simply by altering the settings.

The three-phase measurement module can be used in three-phase or three-phase + neutral.

Parameter setting on the mini-configurator:



Parameter setting is identical and easily done on both devices.

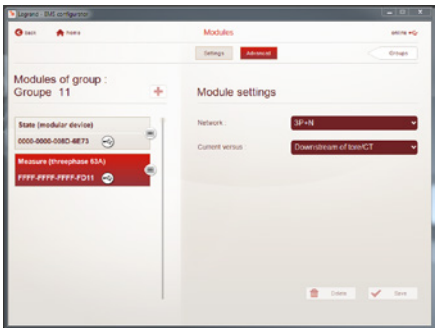
- High current measurement module Cat. No. 4 149 23:

Like the previous measurement modules, it is possible to change the current direction in the CT, simply by altering the settings.

The high current measurement module can be used in single-phase, three-phase or three-phase + neutral.

The last modifiable setting is the result obtained by dividing the primary current and the secondary current (5 A) of the associated current transformer(s).

Parameter setting on the EMS configuration software:



DATA TRANSFER

The measurement modules transfer information directly over the EMS CX³ bus and can thus be used to transfer data to an operating system.

As previously seen ("Viewing data" section), the information is available on the mini-configurator, the touch screen, the measurement software and the Energy Web Server.

The Modbus register tables are made available for use by a systems integrator.

In this case, an EMS CX³/Modbus RS485 interface is needed.

The load shedding function is possible with integration of the universal control module Cat. No. 4 419 32 (see section of the same name).

ADDRESSING

Addressing can be done:

- Locally on the product
  - addressing from 1 to 9 using a thumbwheel.
- Via software
  – addressing from 1 to 247
  – the thumbwheel then stays on 0.

The specifications for connection to the EMS CX³ bus are common to all EMS CX³ devices and are described in the "EMS CX³ communication protocol" section as well as the product technical data sheets.

Local setting using the thumbwheel takes priority over software parameter setting. In the event of malfunction, check that the thumbwheel is definitely on zero.

EMS CX³ PULSE CONCENTRATOR MODULE

PRODUCT DATA SHEET

Pulse concentrator module Cat. No. 4 149 26 is integrated in the EMS CX³ system for monitoring energy in electrical panels.

It collects pulses emitted by electricity, gas, water, oil meters, etc and transmits this information over the EMS CX³ bus to an operating system.

CHARACTERISTICS

- Display:
  No display on the module itself, data can be displayed locally (on mini-configurator Cat. No. 4 149 36), or remotely (on a PC, tablet or smartphone screen).
- Supply voltage:
  12 VDC via EMS CX³ power supply module Cat. No. 4 149 45.
- Consumption: 24 mA - 0.288 W
- Conforming to standards:
  IEC/EN 61131-2 (PLC).
- Output:
  Via communicating rail or cable on the EMS CX³ bus.
  Modbus RS485 output option via interface Cat. No. 4 149 40.
- Connection:
  3 digital inputs with NO volt-free contact.
- Mounting: on DIN rail.
- Dimensions: 1 module.

PRODUCT SELECTION

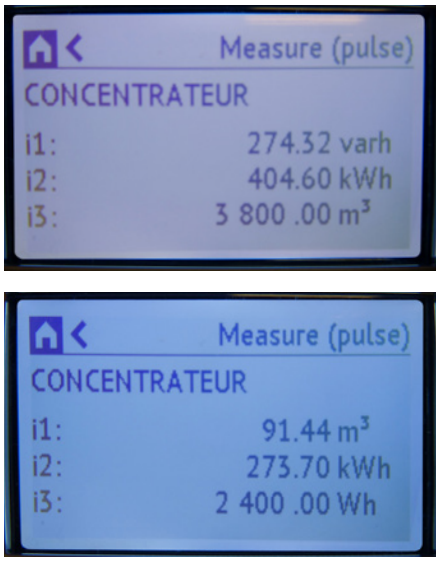
Pulse concentrator module Cat. No. 4 149 26 is used to:

- Display, at a single point, the consumption values on up to 3 pulse meters (electricity, gas, water, etc).
- Transmit this information over the EMS CX³ bus so it can be processed by an energy management system.

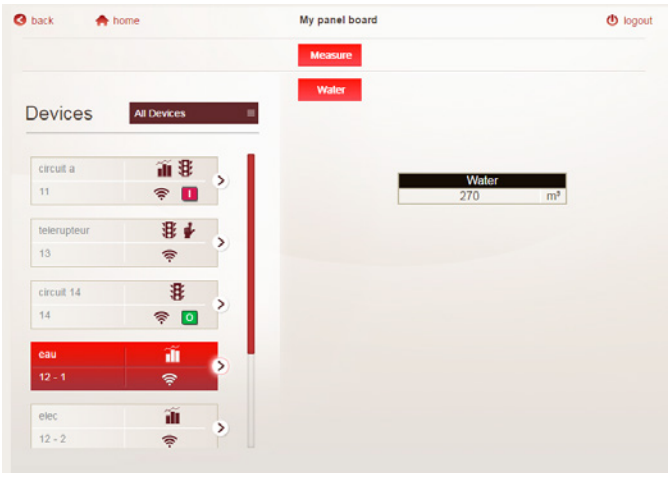
VIEWING DATA

To minimise the dimensions, measurement modules do not have a data display. Nonetheless various display modes are possible:

Locally, in the enclosure, on mini-configurator Cat. No. 4 149 36:



Remotely, on a PC, tablet or smartphone screen. The EMS CX³/RS485/IP interfaces should then be used in order to access tools such as the touch screen, the measurement software, the Energy Web Server.



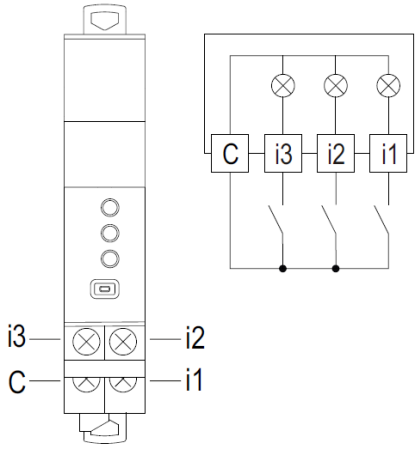
EMS CX³ PULSE CONCENTRATOR MODULE

CONNECTION

■ **Meters on the concentrator module:**

Each pulse meter output is connected on the meter side to one of the 3 concentrator inputs, and the common of these outputs should be connected to a single terminal.

Length of cable between each meter and the concentrator: 1000 m max - circuit resistance 125 Ohms or less at 25°C.



Ensure correct polarity of the pulse outputs on the meters connected to the module.

■ **The EMS CX³ bus:**

There are 2 possible solutions for connection to the bus:

At the back of the modules via communicating rail Cat. Nos. 4 149 01/02/03

Downstream of the modules via communicating cables Cat. Nos. 4 149 07/08/09

The specifications for connection to the EMS CX³ bus are common to all EMS CX³ devices and are described in the "EMS CX³ communication protocol" section as well as the product technical data sheets.

■ **Integration in optimised distribution:**

The pulse concentrator module allows the supply busbar to pass through by integration in HX³ optimised distribution without altering the parity of the teeth.

PARAMETER SETTING

To minimise the dimensions, like for viewing data, the pulse concentrator module parameters can only be set by the:

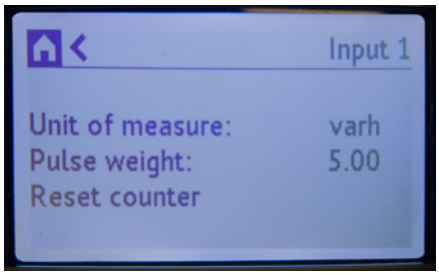
- EMS CX³ configuration software

- Mini-configurator Cat. No. 4 149 36

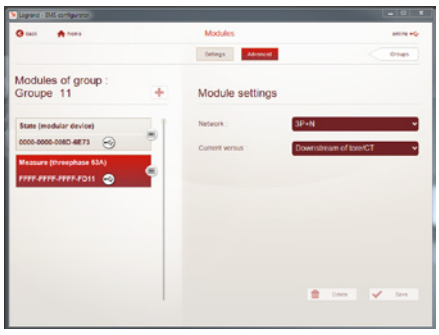
- Possible parameter settings for the pulse concentrator module:

For each of the 3 pulse inputs, the pulse weight can be modified as well as the measurement unit.

Parameter setting on the mini-configurator:



Parameter setting on the EMS configuration software:



Parameter setting is identical and easily done using either method.

DATA TRANSFER

The measurement module transfers information directly over the EMS CX³ bus and can thus be used to feed back data to an operating system.
As previously seen ("Viewing data" section), the information is available on the mini-configurator, the touch screen, the measurement software and the Energy Web Server.
The Modbus register tables are made available for use by an integrator. In this case, an EMS CX³/Modbus RS485 interface is needed.

MODBUS ADDRESSING

Addressing can be done:

- Locally on the product
  - addressing from 1 to 9 using a thumbwheel.
- Via software
  – addressing from 1 to 247,
  – the thumbwheel then stays on 0.

The specifications for connection to the EMS CX³ bus are common to all EMS CX³ devices and are described in the "EMS CX³ communication protocol" section as well as the product technical data sheets.

Local setting using the thumbwheel takes priority over software parameter setting. In the event of malfunction, check that the thumbwheel is definitely on zero.

EMS CX³ UNIVERSAL SIGNALLING MODULE

PRODUCT DATA SHEET

Universal signalling module Cat. No. 4 149 30 is integrated in the EMS CX³ system for monitoring energy in electrical panels.

Information such as "on/off/fault", "plugged-in/drawn-out", etc are signalled by 3 LEDs directly on the module and sent remotely over the EMS CX³ bus.

The information type parameters can be set by microswitch directly on the device.

CHARACTERISTICS

- Display:
  Via 3 LEDs on the front of the module. Data can be displayed locally (on mini-configurator Cat. No. 4 149 36), or remotely (on a PC, tablet or smartphone screen).
- Supply voltage:
  12 VDC via EMS CX³ power supply module Cat. No. 4 149 45
- Control:
  Via volt-free contacts.
- Maximum consumption:
  31.4 mA - 0.377 W.
- Conforming to standards:
  IEC/EN 61131-2 (PLC).
- Connection:
  - power supply via communicating rail or cables on the EMS CX³ bus
  - control via screw terminals
- Mounting: on DIN rail.
- Dimensions: 1 module.

PRODUCT SELECTION

Only one catalogue number to remember: 4 149 30. The various information type parameters are set by 4 microswitches on the side of the module and/or by software programming.

MICROSWITCH POSITION	 X 1	X 2	X 3	DETAILS			
1 2 3 4				**Software programming**–default configuration In this case, information from the 3 inputs is generic: "active" or "inactive" input For the configurations below, place the microswitches as shown.			
1 2 3 4	●	☼	●	**x 1** steady **x 2** flashing **x 3** steady	**ON** = red = contact closed **OFF** = orange = open on fault **OFF** = green = contact open		
1 2 3 4	●	☼	●		**ON** = red = contact closed **OFF** = orange = open on fault **OFF** = green = contact open		SLAVE = duplicate function
1 2 3 4	○	○	○	**x 1** not used **x 2** not used **x 3** not used	**Image of hard-wired contacts**, only the bus information is enabled		
1 2 3 4	●	○	●	**x 1** steady **x 2** not used **x 3** steady	Associated with a contactor or relay, **image of hard-wired contacts**		
1 2 3 4	●	○	●		Associated with a contactor or relay, **image of hard-wired contacts**		SLAVE = duplicate function
1 2 3 4	●	●	●	**x 1** steady **x 2** steady **x 3** steady	**Image of hard-wired contacts**		
1 2 3 4	○	☼	○	**x 1** not used **x 2** flashing **x 3** not used	**Associated with several fault contacts**		
1 2 3 4	●	●	●	**x 1** steady **x 2** steady **x 3** steady	**Possible only on DMX³**	**Plugged-in** position **Test** position **Drawn-out** position	
1 2 3 4	●	●	●			**Plugged-in** position **Test** position **Drawn-out** position	SLAVE = duplicate function
1 2 3 4	●	●	●			Spring **loaded** **Ready to load** Spring **not loaded**	
1 2 3 4	●	●	●			Spring **loaded** **Ready to load** Spring **not loaded**	SLAVE = duplicate function

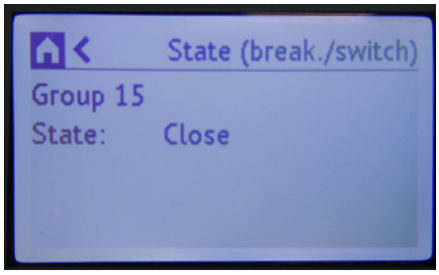
on / off **Microswitch on OFF**

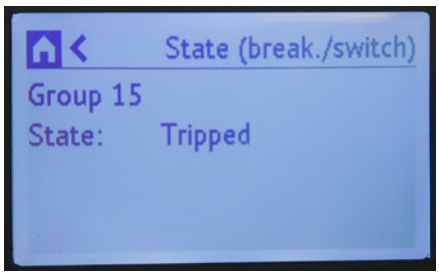
on / off **Microswitch on ON**

VIEWING DATA

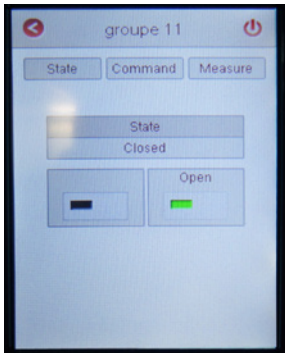
The universal signalling module is used to transfer information fed back over the EMS CX³ bus to the IP computer network, passing via the Modbus RS485 network. Various display modes are therefore possible:

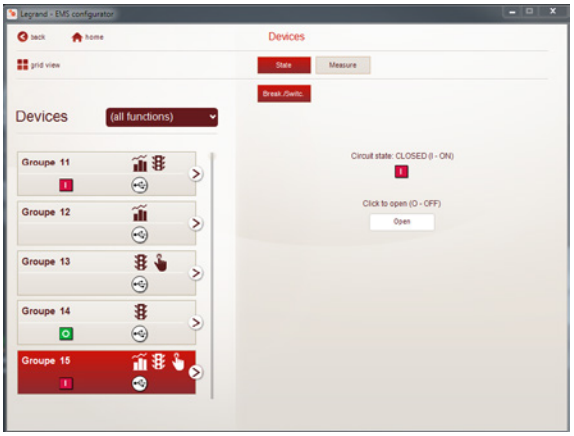
Locally, in the enclosure, on mini-configurator Cat. No. 4 149 36:





Remotely, on a PC, tablet or smartphone screen. The EMS CX³/RS485/IP interfaces then need to be used in order to access tools such as the touch screen, the measurement software, the Energy Web Server.



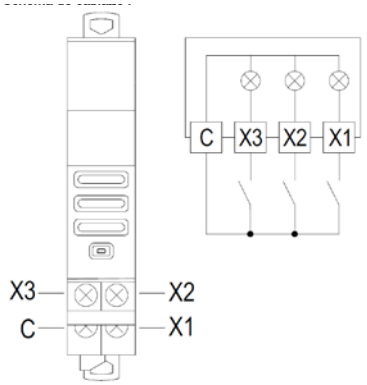


For example: The tripped circuit breaker status appears on both the LED module (flashing orange) and on the mini-configurator screen.

CONNECTION

■ Control contacts:

These are supplied to the module by volt-free contacts.



You will find possible wiring examples on the module technical data sheet 4 149 30.

■ The EMS CX³ bus:

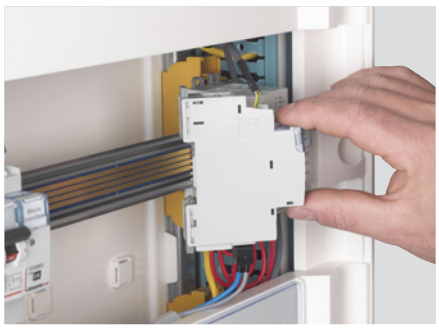
There are 2 possible solutions for connection to the bus:

At the back of the modules via communicating rail Cat. Nos. 4 149 01/02/03

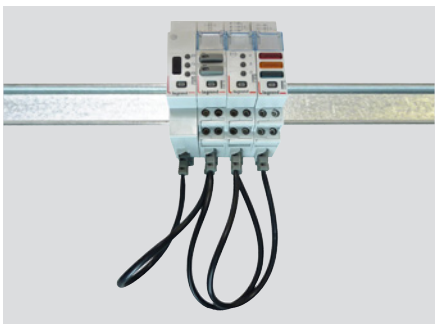
Downstream of the modules via communicating cables Cat. Nos. 4 149 07/08/09

The specifications for connection to the EMS CX³ bus are common to all EMS CX³ devices and are described in the "EMS CX³ communication protocol" section as well as the product technical data sheets.

RAIL CONNECTION



CABLE CONNECTION



EMS CX³ UNIVERSAL SIGNALLING MODULE

CONNECTION (CONTINUED)

■ **Integration in optimised distribution:**

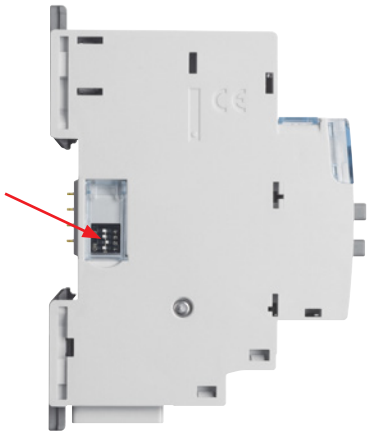
Universal signalling module Cat. No. 4 149 30 has been designed to allow single-phase and three-phase supply busbars to pass through upstream. It therefore incorporates HX³ optimised distribution. This makes it possible to have a mixture of functions in the enclosure. The module is then as close as possible to the protection modules.

OPTIMISED DISTRIBUTION POSSIBLE

PARAMETER SETTING

- Choice of type of use:

As indicated in the "Product selection" section, all 4 microswitches can be used to select the desired function for the module.

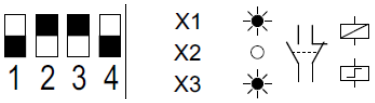


The main parameter settings are recorded on the module, and for the others you can refer to the technical data sheet or to this guide.

- Additional parameter settings:

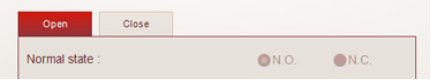
Some universal signalling module applications require additional parameter setting.

This is the case for the module associated with a contactor or a relay.



The additional settings linked to this function can be accessed by the EMS CX³ configuration software.

It is possible to modify the number of associated contacts, name them, and change their NO, NC status.



You can refer to the EMS CX³ configuration software user's guide to find out all the options.

- Additional parameter setting by software programming

The universal signalling module is supplied, in its default configuration, with the 4 switches on zero.

They can be left in this configuration, and all the settings can then be accessed by the EMS configuration software.

For the configurations mentioned in the table below, place the microswitches as shown.

In this case, the software allows access to other settings, such as:

- the name and active status of each input

- enabling and setting an alarm time delay on the input.

PARAMETER SETTING (CONTINUED)

- SLAVE function:

Some configurations are available in SLAVE mode (slave = duplicate function).

This SLAVE mode is a solution for transferring information over the same bus, **avoiding** the need to hard-wire information.

A universal signalling module in SLAVE mode must always be associated with a universal signalling module in "hard-wired" mode or a signalling auxiliary module.

DATA TRANSFER

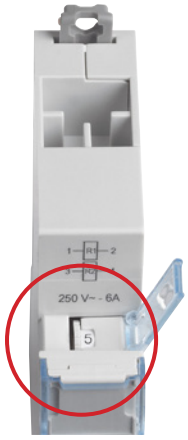
The universal signalling module transfers information directly over the EMS CX³ bus and can thus be used to feed back data to an operating system.
As previously seen ("Viewing data" section), the information is available on the mini-configurator, the touch screen, the measurement software and the Energy Web Server.
The Modbus register tables are made available for use by an integrator.
In this case, an EMS CX³/Modbus RS485 interface is needed.

For more details, you can refer to the technical data sheet.

ADDRESSING

Addressing can be done:

- Locally on the product
  - addressing from 1 to 9 using a thumbwheel.
- Via software
  - addressing from 1 to 247
  - the thumbwheel then stays on 0.



The specifications for connection to the EMS CX³ bus are common to all EMS CX³ devices and are described in the "EMS CX³ communication protocol" section as well as the product technical data sheets.

Local setting using the thumbwheel takes priority over software parameter setting. In the event of malfunction, check that the thumbwheel is definitely on zero.

EMS CX³ AC + FS SIGNALLING AUXILIARY MODULE

PRODUCT DATA SHEET

AC + FS signalling auxiliary module Cat. No. 4 149 29 is integrated in the EMS CX³ system for monitoring energy in electrical panels.

It signals the position status of the "AC" contacts and "FS" fault contact in the associated modular product. This information is sent remotely over the EMS CX³ bus. It is installed on the left of Legrand modular circuit breakers, RCBOs, RCDs, isolating switches with trip option.

CHARACTERISTICS

- Display:
  No display on the module itself, data can be displayed locally (on mini-configurator Cat. No. 4 149 36), or remotely (on a PC, tablet or smartphone screen).
- Supply voltage:
  12 VDC via EMS CX³ power supply module Cat. No. 4 149 45
- Consumption: 19.7 mA - 0.236 W.
- Conforming to standards:
  IEC/EN 61131-2 (PLC).
- Connection:
  Power supply via communicating rail or cables on the EMS CX³ bus.
- Mounting: on DIN rail.
- Dimensions: 1/2 module.

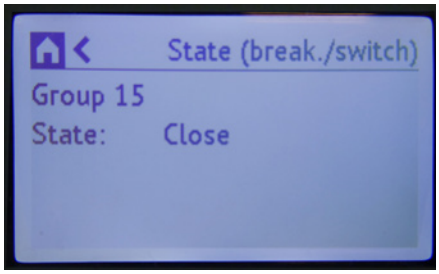
PRODUCT SELECTION

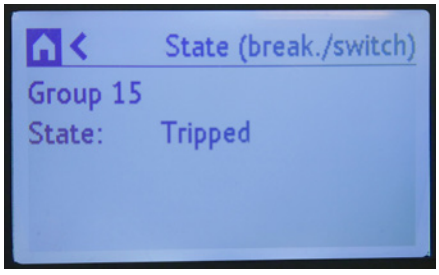
AC + FS signalling auxiliary module Cat. No. 4 149 29 is used if the "on/off/fault" status information of a DX³ modular product such as MCBs, RCBOs, etc are fed back to a management system.

VIEWING DATA

The AC + FS signalling auxiliary module is used to transfer status information fed back over the EMS CX³ bus to the IP computer network, passing via the Modbus RS485 network. Various display modes are therefore possible:

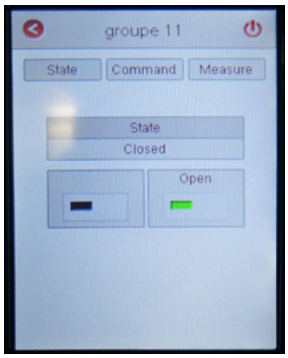
- Locally, in the enclosure, on mini-configurator Cat. No. 4 149 36:

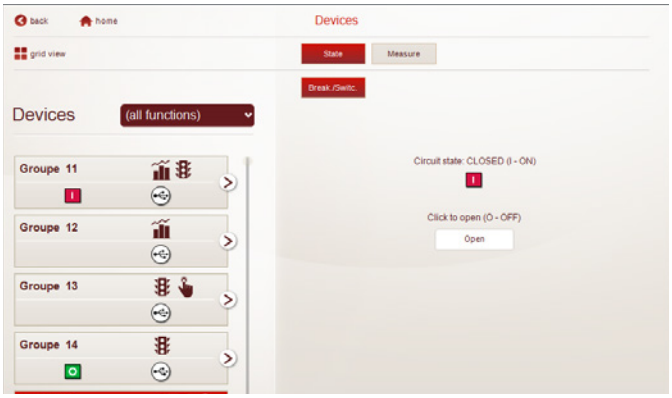




VIEWING DATA (CONTINUED)

- Remotely, on a PC, tablet or smartphone screen. The EMS CX³/ RS485/IP interfaces then need to be used in order to access tools such as the touch screen, the measurement software, the Energy Web Server.



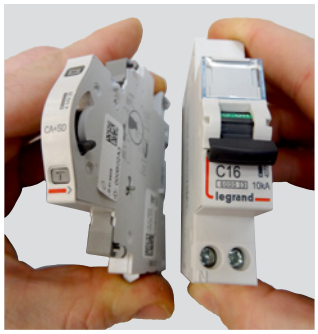


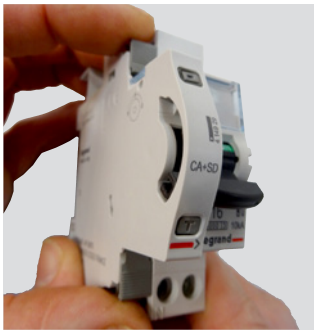
EMS CX³ AC + FS SIGNALLING AUXILIARY MODULE

MOUNTING

The AC + FS signalling auxiliary module is installed on the left of Legrand modular circuit breakers, RCBOs, RCDs, isolating switches with trip option.

Be careful to follow certain installation rules described in the product manuals and technical data sheets.





The module is mounted on the associated modular product in exactly the same way as other DX³ signalling auxiliaries.

The table showing combinations with the various modular protection devices is available on the EMS CX³ AC + FS auxiliary module technical data sheet.

■ **The EMS CX³ bus:**

There are 2 possible solutions for connection to the bus:

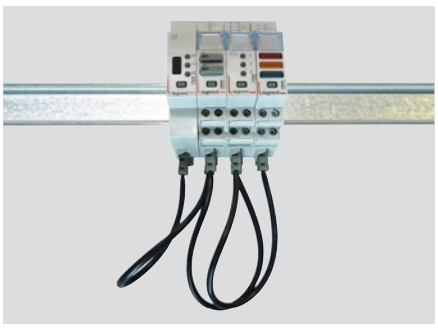
At the back of the modules via communicating rail Cat. Nos. 4 149 01/02/03

Downstream of the modules via communicating cables Cat. Nos. 4 149 07/08/09

The specifications for connection to the EMS CX³ bus are common to all EMS CX³ devices and are described in the "EMS CX³ communication protocol" section as well as the product technical data sheets.

RAIL CONNECTION

CABLE CONNECTION



EMS CX³ AC + FS SIGNALLING AUXILIARY MODULE

PARAMETER SETTING

Does not need any additional parameter setting.

DATA TRANSFER

The AC + FS signalling auxiliary module transfers information directly over the EMS CX³ bus and can be used to feed back data to an operating system.

As previously seen ("Viewing data" section), the information is available on the mini-configurator, the touch screen, the measurement software and the Energy Web Server.

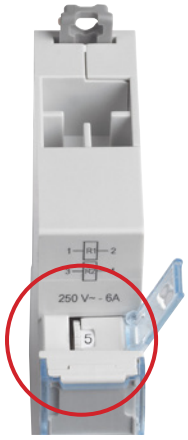
The Modbus register tables are made available for use by an integrator.

In this case, an EMS CX³/Modbus RS485 interface is needed.

ADDRESSING

Addressing can be done:

- Locally on the product
  - addressing from 1 to 9 using a thumbwheel.
- Via software
  – addressing from 1 to 247
  – the thumbwheel then stays on 0.



The specifications for connection to the EMS CX³ bus are common to all EMS CX³ devices and are described in the "EMS CX³ communication protocol" section as well as the product technical data sheets.

Local setting using the thumbwheel takes priority over software parameter setting. In the event of malfunction, check that the thumbwheel is definitely on zero.

EMS CX³ UNIVERSAL CONTROL MODULE

PRODUCT DATA SHEET

Universal control module Cat. No. 4 149 32 is integrated in the EMS CX³ system for monitoring energy in electrical panels.

It can be used to control various loads such as relays, contactors, as well as motorised controls for MCBs and MCCBs, regardless of brand.

Commands can be issued locally or sent remotely over the EMS CX³ bus.

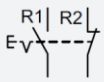
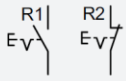
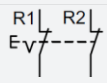
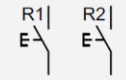
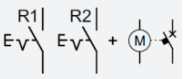
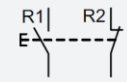
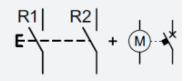
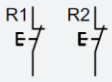
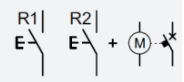
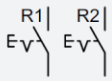
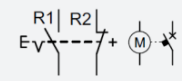
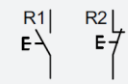
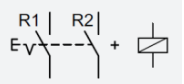
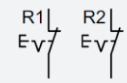
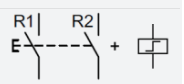
The control type parameters can be set by microswitch directly on the product.

CHARACTERISTICS

- Display:
  2 LEDs indicate the control unit ON/OFF status. Data can be displayed locally (on mini-configurator Cat. No. 4 149 36), or remotely (on a PC, tablet or smartphone screen).
- Supply voltage:
  12 VDC via EMS CX³ power supply module Cat. No. 4 149 45
- Control:
  Via volt-free contacts 250 VAC – 6 A.
- Maximum consumption:
  38 mA - 0.456 W.
- Conforming to standards:
  IEC/EN 61131-2 (PLC).
- Connection:
  - power supply via communicating rail or cables on the EMS CX³ bus
  - control via screw terminals
- Mounting: on DIN rail.
- Dimensions: 1 module.

PRODUCT SELECTION

Only one catalogue number to remember: 4 149 32. The various information type parameters are set by 4 microswitches on the side of the module or by software programming.

SWITCH POSITION	R1 R2 CONTACT STATUS	DETAILS	SWITCH POSITION	R1 R2 CONTACT STATUS	DETAILS
1 2 3 4		Software programming. Default configuration. In this case, the outputs are generic. 2 x 2NO relays. For the configurations below, place the microswitches as shown.	1 2 3 4		2 switch type linked controls R1 NO contact and R2 NC contact
1 2 3 4		2 switch type separate controls R1 NO contact and R2 NC contact	1 2 3 4		2 switch type linked controls R1 NC contact and R2 NC contact
1 2 3 4		2 push-button type separate controls R1 NO contact and R2 NO contact	1 2 3 4		2 switch type separate controls R1 NO contact and R2 NO contact Combined with a motorised circuit breaker
1 2 3 4		2 push-button type linked controls R1 NO contact and R2 NC contact	1 2 3 4		2 push-button type linked controls R1 NO contact and R2 NO contact Combined with a motorised circuit breaker
1 2 3 4		2 push-button type separate controls R1 NC contact and R2 NC contact	1 2 3 4		2 push-button type separate controls R1 NO contact and R2 NO contact Combined with a motorised circuit breaker
1 2 3 4		2 switch type separate controls R1 NO contact and R2 NO contact	1 2 3 4		2 switch type linked controls R1 NO contact and R2 NC contact Combined with a motorised circuit breaker
1 2 3 4		2 push-button type separate controls R1 NO contact and R2 NC contact	1 2 3 4		2 switch type linked controls R1 NO contact and R2 NO contact Combined with a contactor
1 2 3 4		2 switch type separate controls R1 NC contact and R2 NC contact	1 2 3 4		2 push button type linked controls R1 NO contact and R2 NO contact Combined with a contactor

on / off **Microswitch on OFF**

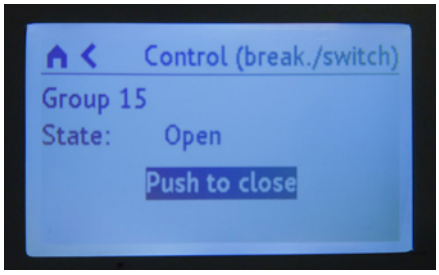
on / off **Microswitch on ON**

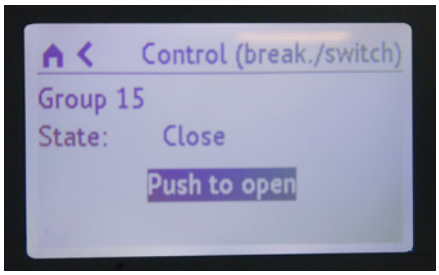
EMS CX³ UNIVERSAL CONTROL MODULE

VIEWING DATA

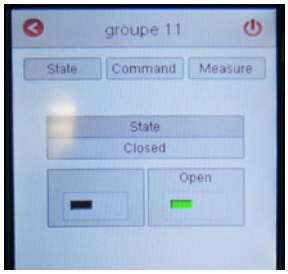
The universal control module is used to control various loads remotely via the EMS CX³ bus to the IP computer network, passing via the Modbus RS485 network. Various control modes are therefore possible:

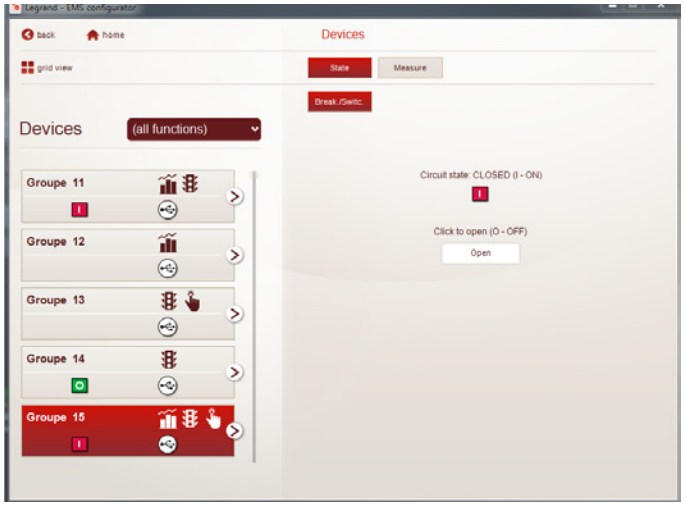
Locally, in the enclosure, on mini-configurator Cat. No. 4 149 36:



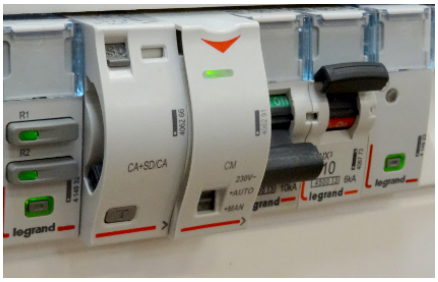


Remotely, on a PC, tablet or smartphone screen. The EMS CX³/RS485/IP interfaces then need to be used in order to access tools such as the touch screen, the measurement software, the Energy Web Server.





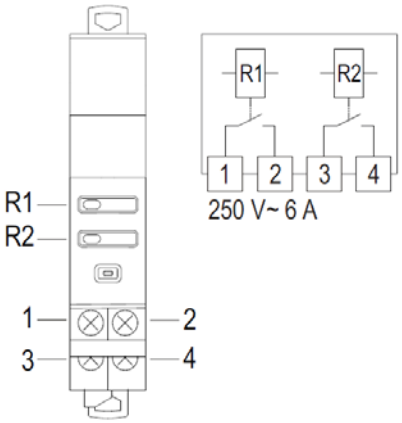
Locally, it is also possible to issue controls by pressing directly on the EMS CX³ control module buttons.



CONNECTION

■ Control contacts:

The module provides 2 volt-free contacts max 250 VAC - 6 A.



■ The EMS CX³ bus:

There are 2 possible solutions for connection to the bus:

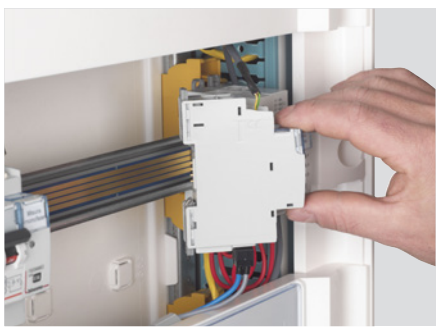
At the back of the modules via communicating rail Cat. Nos. 4 149 01/02/03

Downstream of the modules via communicating cables Cat. Nos. 4 149 07/08/09

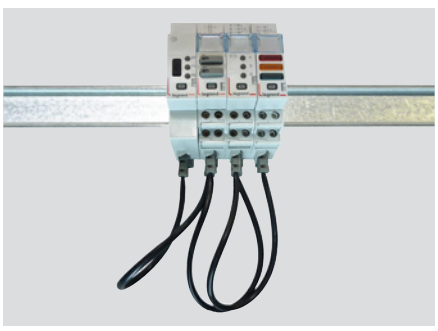
The specifications for connection to the EMS CX³ bus are common to all EMS CX³ devices and are described in the "EMS CX³ communication protocol" section as well as the product technical data sheets.

You will find possible wiring examples on the module technical data sheet 4 149 32.

RAIL CONNECTION



CABLE CONNECTION



EMS CX³ UNIVERSAL CONTROL MODULE

CONNECTION (CONTINUED)

■ **Integration in optimised distribution:**

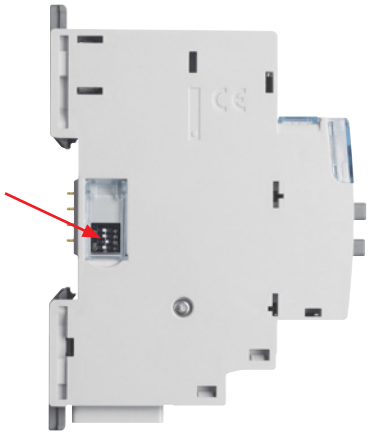
Universal control module Cat. No. 4 419 19 has been designed to allow single-phase and three-phase supply busbars to pass through upstream. It therefore incorporates HX³ optimised distribution. This makes it possible to have a mixture of functions in the enclosure. The module is then as close as possible to the protection modules.

OPTIMISED DISTRIBUTION POSSIBLE

PARAMETER SETTING

- Choice of type of use:

As indicated in the "Product selection" section, all 4 switches are used to select the desired function for the module.

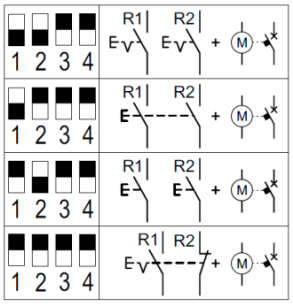


The main parameter settings are recorded on the module, and for the others you can refer to the technical data sheet or to this guide.

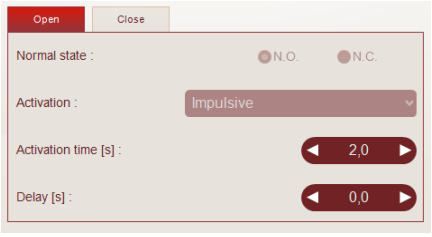
- Additional parameter settings:

Some universal control module applications require additional parameter setting.

This is the case for circuit breaker motorised controls.



The additional settings linked to this function can be accessed by the EMS CX³ configuration software. Depending on the modes, it is possible to modify elements such as the time and activation delay, type of control, pulse or maintained, etc.



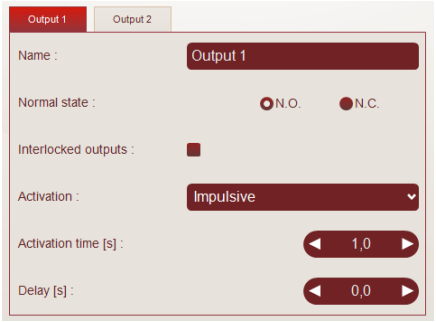
You can refer to the EMS CX³ configuration software user's guide to find out all the options.

- Full parameter setting by software programming

The universal control module is supplied, in its default configuration, with all 4 switches on zero.

They can be left in this configuration, and all the settings can then be accessed by the EMS CX³ configuration software. In this case, the software allows access to other settings, such as:

- the name and active status of the R1 and R2 relays
- locking of the 2 outputs
- etc.



EMS CX³ UNIVERSAL CONTROL MODULE

DATA TRANSFER

The universal control module transfers information directly over the EMS CX³ bus and can be used to feed back data to an operating system.

As previously seen ("Viewing data" section), the information is available on the mini-configurator, the touch screen, the measurement software and the Energy Web Server.

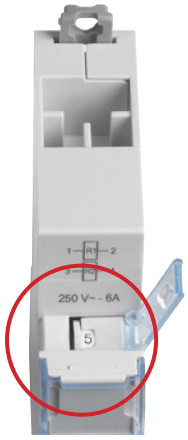
The Modbus register tables are made available for use by an integrator.

In this case, an EMS CX³/Modbus RS485 interface is needed.

ADDRESSING

Addressing can be done:

- Locally on the product
  - addressing from 1 to 9 using a thumbwheel.
- Via software
  – addressing from 1 to 247
  – the thumbwheel then stays on 0.



The specifications for connection to the EMS CX³ bus are common to all EMS CX³ devices and are described in the "EMS CX³ communication protocol" section as well as the product technical data sheets.

Local setting using the thumbwheel takes priority over software parameter setting. In the event of malfunction, check that the thumbwheel is definitely on zero.

EMS CX³ STATUS FEEDBACK AND CONTROL MODULE

PRODUCT DATA SHEET

Status feedback and control module Cat. No. 4 149 31 is integrated in the EMS CX³ system for monitoring energy in electrical panels.

It can be used to control and view the status, remotely, of contactors with 1 and 2 modules up to 25 A, and also Legrand pulse operated latching relays. Commands can be issued locally or sent remotely over the EMS CX³ bus.

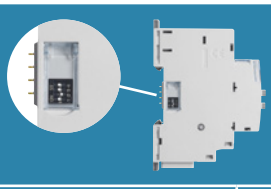
The control type parameters can be set by switches directly on the product.

CHARACTERISTICS

- Display:
  Data can be displayed locally (on mini-configurator Cat. No. 4 149 36), or remotely (on a PC, tablet or smartphone screen).
- Supply voltage:
  12 VDC via EMS CX³ power supply module Cat. No. 4 149 45
- Control:
  Via EMS CX³ bus.
- Consumption: 31 mA - 0.372 W.
- Conforming to standards:
  IEC/EN 61131-2 (PLC).
- Connection:
  - power supply via communicating rail or cables on the EMS CX³ bus
  - control via screw terminals
- Mounting: on DIN rail.
- Dimensions: 1 module.

PRODUCT SELECTION

Only one catalogue number to remember: 4 149 31. The various information type parameters are set by 4 microswitches on the side of the module.



SWITCH POSITION	CAN BE USED WITH	DETAILS	COMPATIBLE CATALOGUE NUMBERS
1 2 3 4		Default configuration	The parameters of this module are only set by the 4 switches - the system will not be able to take this default configuration into account.
1 2 3 4	1 module	**Pulse operated latching relay** 1 module	4 124 04 – 4 124 05 – 4 124 08 – 4 124 10 – 4 124 11 – 4 124 12 – 4 124 20
1 2 3 4	2 modules	**Pulse operated latching relay** 2 modules	4 124 14 – 4 124 16
1 2 3 4	1 module	**Contactor** **With** switch handle – 1 module	4 125 14 – 4 125 58 – 4 125 44
1 2 3 4	2 modules	**Contactor** **With** switch handle – 2 modules	4 125 17 – 4 125 51 – 4 125 61
1 2 3 4	1 module	**Contactor** **Without** switch handle – 1 module	4 125 03 – 4 125 05 – 4 125 21 – 4 125 23 – 4 125 24
1 2 3 4	2 modules	**Contactor** **Without** switch handle – 2 modules	4 125 09 – 4 125 10 – 4 125 33 – 4 125 35 – 4 125 36
1 2 3 4	1 module	**Peak hours/Off-peak hours contactor** 1 module	4 125 00 – 4 125 01 Only for the status feedback
1 2 3 4	2 modules	**Peak hours/Off-peak hours contactor** 2 modules	4 125 02 Only for the status feedback

on / off **Microswitch on OFF**

on / off **Microswitch on ON**

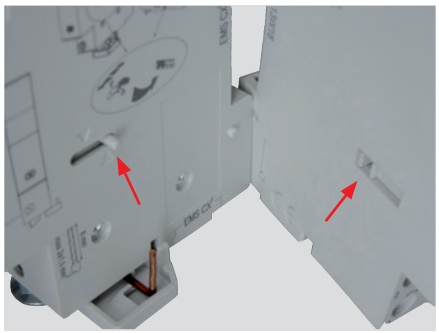
EMS CX³ STATUSFEEDBACK AND CONTROL MODULE

MOUNTING:

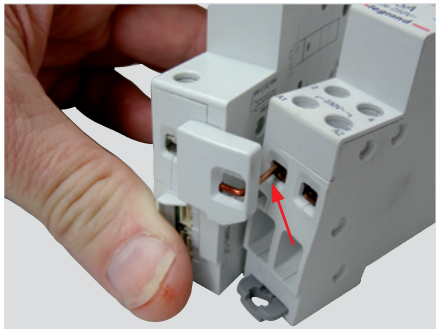
No tool is needed for mounting. EMS CX³ status feedback and control module Cat. No. is mounted on the left side of the CX³ products listed previously.

This must be done when the CX³ product is in the rest position.

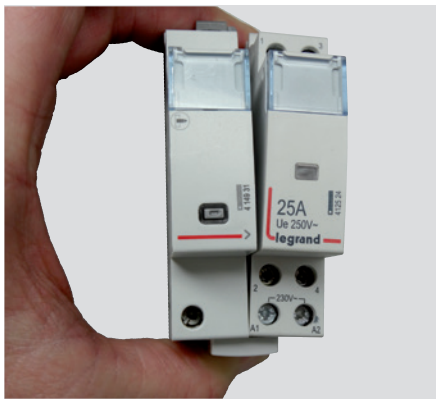
Be careful to follow certain installation rules described in the product manuals and technical data sheet.



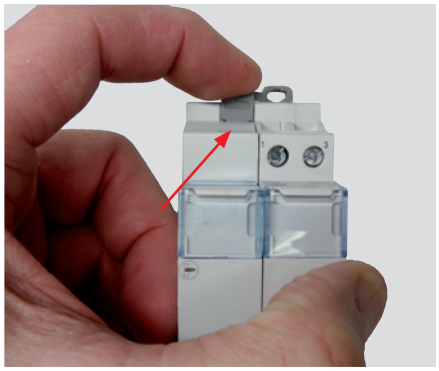
Make sure you correctly position the plastic ferrule on the EMS CX³ module towards the back, facing the notch in the product to be joined to it.



Take care to insert the electrical connection before mechanically assembling the modules.



Continue with mechanical assembly.

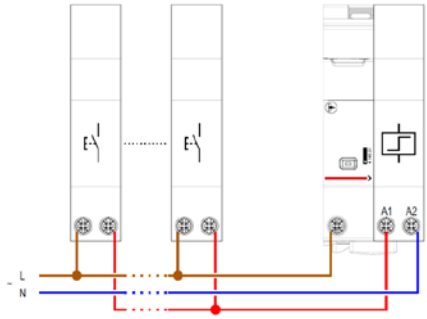


Lock the assembly.

Don't forget to tighten the connection electrically linking the 2 products.

The assembly is then ready to be wired up.

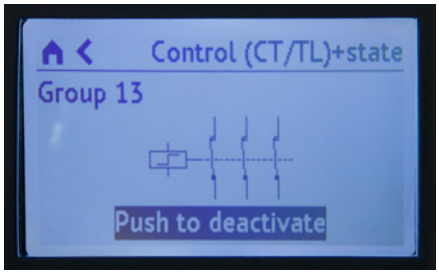
Example of use: remote control of a push-button/pulse operated latching relay assembly.

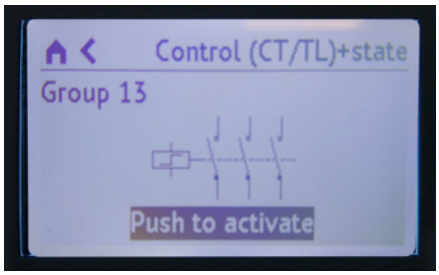


VIEWING DATA:

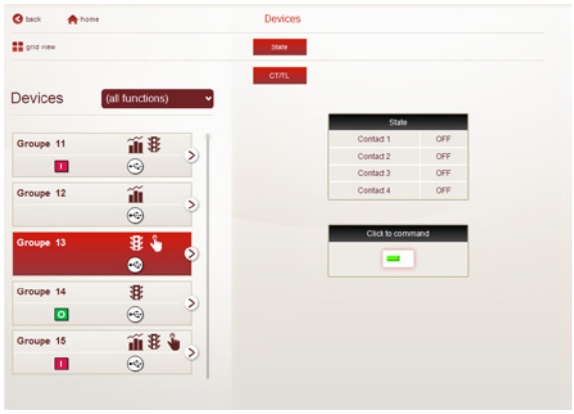
The status feedback and control module is used to transfer information and a command fed back over the EMS CX³ bus to the IP computer network, passing via the Modbus RS485 network. Various display and control modes are therefore possible:

Locally, in the enclosure, on mini-configurator Cat. No. 4 149 36:

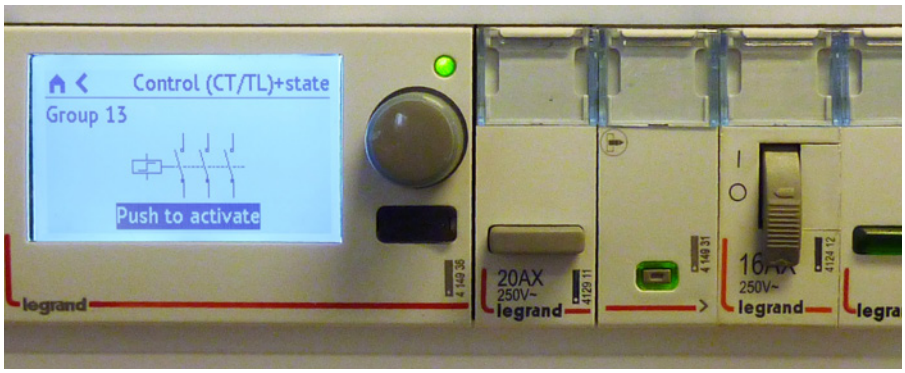




Remotely, on a PC, tablet or smartphone screen. The EMS CX³/RS485/IP interfaces then need to be used in order to access tools such as the touch screen, the measurement software, the Energy Web Server.



For example: The pulse operated latching relay status appears on the mini-configurator screen and remote control is possible.



CONNECTION

■ Control:

The pulse operated latching relay or contactor is controlled via the EMS CX³ bus; simply bring the phase back to the terminal as shown below.

Phase connection terminal

You will find possible wiring examples on the module technical data sheet 4 149 31.

■ The EMS CX³ bus:

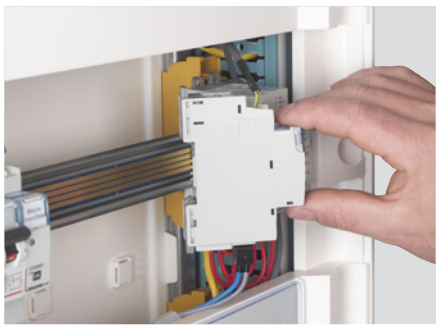
There are 2 possible solutions for connection to the bus:

At the back of the modules via communicating rail Cat. Nos. 4 149 01/02/03

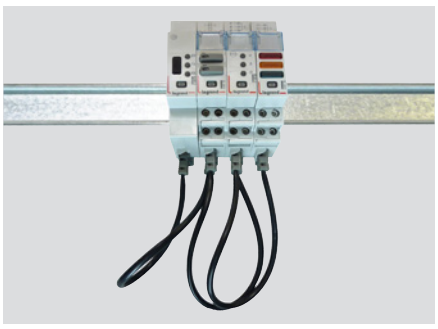
Downstream of the modules via communicating cables Cat. Nos. 4 149 07/08/09

The specifications for connection to the EMS CX³ bus are common to all EMS CX³ devices and are described in the "EMS CX³ communication protocol" section as well as the product technical data sheets.

RAIL CONNECTION



CABLE CONNECTION



CONNECTION (CONTINUED)

■ **Integration in optimised distribution:**

The status feedback and control module has been designed to allow single-phase and three-phase supply busbars to pass through upstream. It therefore incorporates HX³ optimised distribution. This makes it possible to have a mixture of functions in the enclosure. The module is then as close as possible to the protection modules.

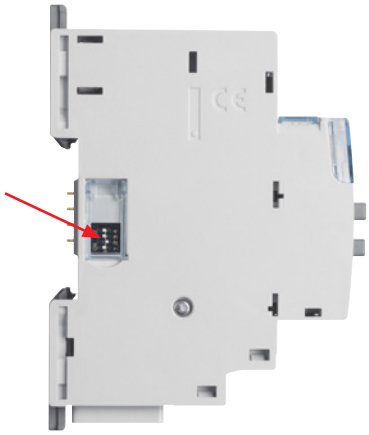
OPTIMISED DISTRIBUTION POSSIBLE

EMS CX³ STATUS FEEDBACK AND CONTROL MODULE

PARAMETER SETTING

- Choice of type of use:

As indicated in the "Product selection" section, all 4 switches are used to select the desired function for the module.

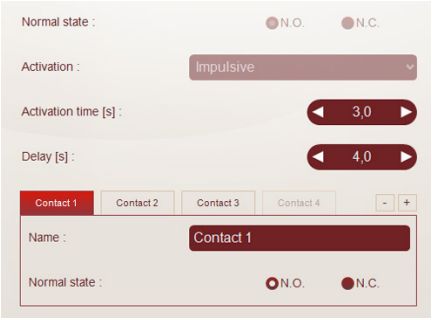


The main parameter settings are recorded on the module, and for the others you can refer to the technical data sheet or to this guide.

- Additional parameter settings:

All the status feedback and control module applications have additional settings. They can be accessed via the EMS CX³ configuration software.

It is possible to modify the number of associated contacts, name them, change their NO, NC status, and add a time delay.



You can refer to the EMS CX³ configuration software user's guide to find out all the options.

- Full parameter setting by software programming

The status feedback and control module is supplied, in its default configuration, with all 4 switches on zero.

Unlike the other modules, the status feedback and control module MUST be set with the 4 switches.

Parameter setting via the EMS configuration software only takes account of the additional settings.
Do not therefore leave the 4 switches in position zero.

DATA TRANSFER

The status feedback and control module transfers the status of the pulse operated latching relay or associated CX³ contactor directly over the EMS CX³ bus and can thus be used to feed back data to an operating system.

The associated CX³ coil can therefore be controlled remotely by the same operating system.

As previously seen ("Viewing data" section), the information is available on the mini-configurator, the touch screen, the measurement software and the Energy Web Server.

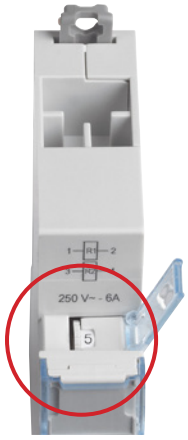
The Modbus register tables are made available for use by an integrator.

In this case, an EMS CX³/Modbus RS485 interface is needed.

ADDRESSING

Addressing can be done:

- Locally on the product
  - addressing from 1 to 9 using a thumbwheel.
- Via software
  – addressing from 1 to 247
  – the thumbwheel then stays on 0.



The specifications for connection to the EMS CX³ bus are common to all EMS CX³ devices and are described in the "EMS CX³ communication protocol" section as well as the product technical data sheets.

Local setting using the thumbwheel takes priority over software parameter setting. In the event of malfunction, check that the thumbwheel is definitely on zero.

EMS CX³ POWER SUPPLY MODULE

PRODUCT DATA SHEET

Power supply module Cat. No. 4 149 45 incorporates the EMS CX³ modular system for monitoring energy in electrical panels.

Only this power supply dedicated to the EMS CX³ system can be used.

This module distributes power by means of the communicating rail and/or cables.

CHARACTERISTICS

- Display: none
- Power supply: primary 95 to 250 VAC secondary 12 VDC 0.5 A
- Parameter setting: none
- Addressing: none
- Connection:
  - power supply via screw terminals
  - power supply distribution via cables or dedicated rail.
- Mounting: on DIN rail.
- Dimensions: 1 module.
- Supplied with a white cable for galvanic isolation.

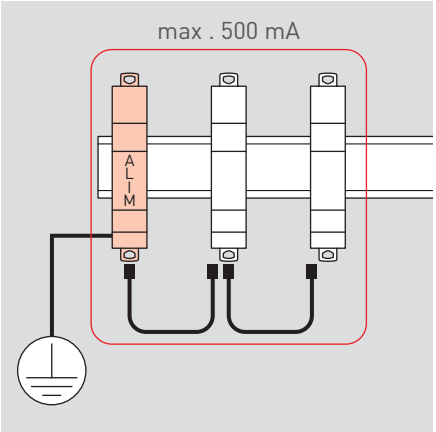
PRODUCT SELECTION

The number of power supplies 4 149 45 in an EMS CX³ system depends on how much power is needed for the modules to work correctly.

One power supply module can provide up to **500 mA**. If the installation needs a higher power rating, another power supply module must be provided. A single EMS CX³ bus must not exceed 1.5 A: i.e. **3 power supply modules maximum.**

The total number of modules permitted with one power supply depends on their total consumption.

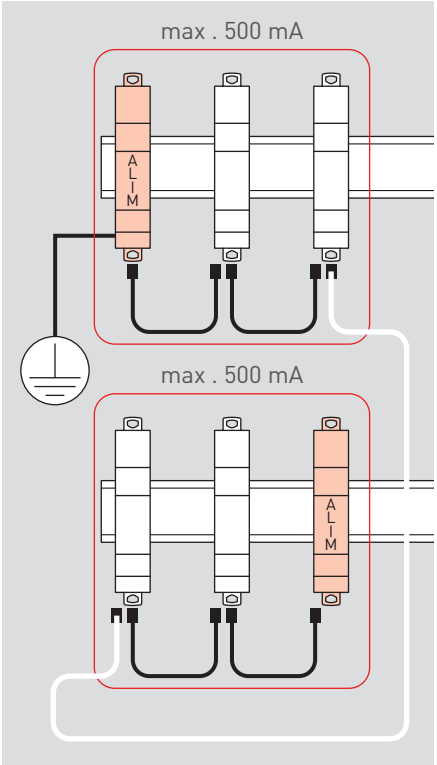
1 EMS CX³ system
1 power supply module



If there are 1 or 2 power supplies, they should be installed at each end of the EMS CX³ system.
If there are 3 power supplies, 2 should be installed at each end of the EMS CX³ system, and the 3rd in the middle.
Caution, each set must be separated with a white cable.

2 power supplies cannot be installed on the same communicating rail.

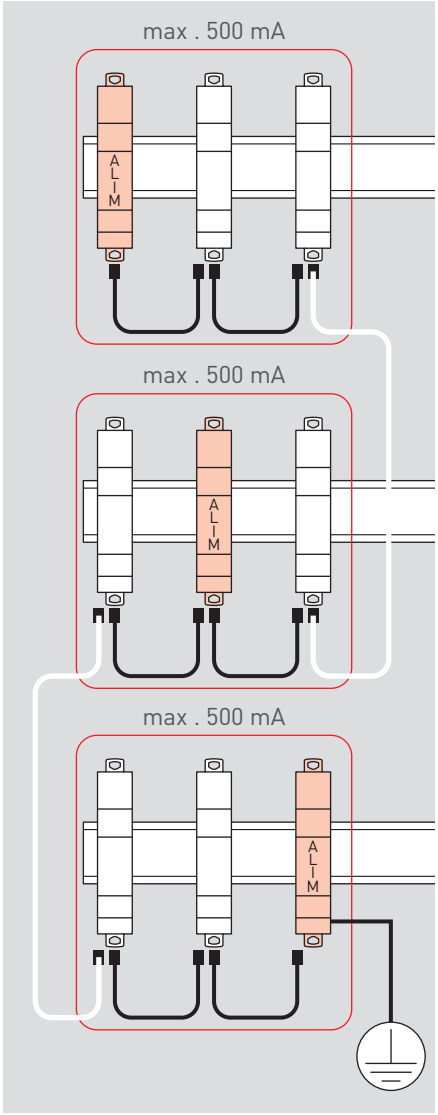
1 EMS CX³ system
2 power supply modules



Each set consisting of "one power supply module and its EMS CX³ modules" should be separated with a special link which must include a white cable (supplied with every power supply module).

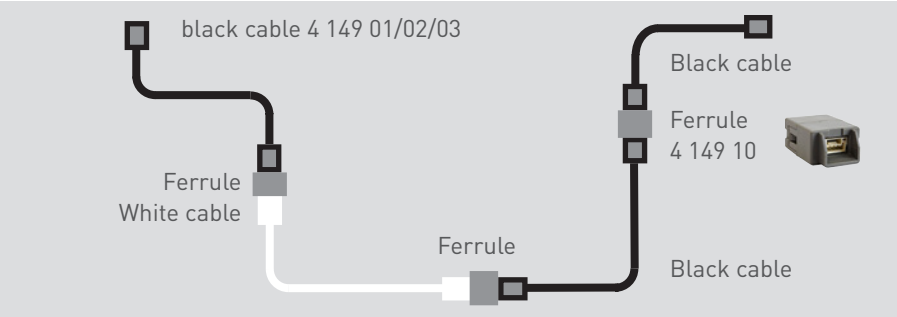
If there are a number of power supply modules in the same system, only one power supply module should be earthed.

1 EMS CX³ system
2 power supply modules



PRODUCT SELECTION (CONTINUED)

The white cable supplied with the power supply module measures 250 mm. If a longer cable is needed, an extension can be created using "conventional" (black) EMS CX³ cables and extension ferrules. Maximum length of assembly: 3 m.



One power supply module can provide up to 500 mA, so consumption must be calculated in order for the installation to work correctly.

Table of EMS CX³ module power consumption

CAT. NO.	DESCRIPTION	MAXIMUM CONSUMPTION
4 149 19	Single-phase measurement module with digital input up to 63 A	34.1 mA
4 149 20	Three-phase measurement module with digital input up to 63 A	34.8 mA
4 149 23	High current measurement module	32.6 mA
4 149 26	Pulse concentrator module	24.0 mA
4 149 29	AC + FS signalling auxiliary module	19.7 mA
4 149 30	Universal signalling module	31.4 mA
4 149 31	Status feedback and control module	31.0 mA
4 149 32	Universal control module	38.0 mA
4 149 36	Local mini-configurator	36.5 mA
4 149 40	EMS CX³/RS485 interface	28.7 mA

CONNECTION

■ **Module power supply:**

Screw connection on the underside of the module

To protect the power supply module, refer to the information in the product technical data sheet.

■ **The EMS CX³ bus:**

There are 2 possible solutions for connection to the bus:

At the back of the modules via communicating rail Cat. Nos. 4 149 01/02/03

Downstream of the modules via communicating cables Cat. Nos. 4 149 07/08/09

The specifications for connection to the EMS CX³ bus are common to all EMS CX³ devices and are described in the "EMS CX³ communication protocol" section as well as the product technical data sheets.

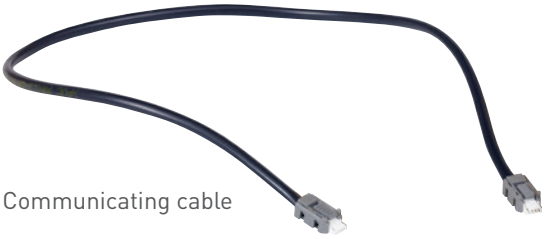
EMS CX³ ACCESSORIES AND CONNECTIONS

PRODUCT DATA SHEET

Data can be connected via the EMS CX³ bus with the communicating rails and/or cables.

Accessories such as extension ferrules and protective rail covers are available, making the EMS CX³ communication system easy to use.

Communicating rail



Communicating cable

Protective rail cover

Extension ferrule

CHARACTERISTICS

- Rail
  communicating rail equipped with 4 printed circuits
- Cable
  communicating cable equipped with 2 JST ferrules
- Cover
  plastic cover
- Extension ferrule
  ferrule fitted with 2 JST "female" connectors

PRODUCT SELECTION

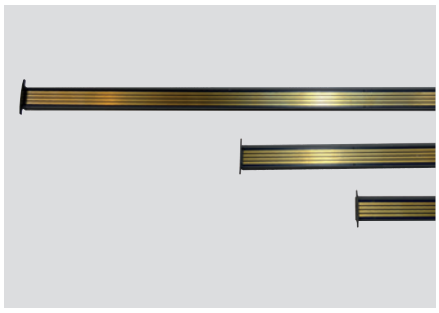
	CAT. NO.	DETAILS
Communicating rail 	4 149 01	1 rail for 18 DIN modules – 315 mm long
	4 149 02	1 rail for 24 DIN modules – 420 mm long
	4 149 03	1 rail for 36 DIN modules – 630 mm long
Communicating cable 	4 149 07	1 pack of 10 cables – 250 mm long
	4 149 08	1 pack of 10 cables – 500 mm long
	4 149 09	1 pack of 5 cables – 1000 mm long
Extension ferrule 	4 149 10	1 pack of 5 extension ferrules
Protective rail cover 	4 149 14	1 plastic protective cover for rail - 630 mm long

3 rail lengths are included in the catalogue, however it is possible to obtain different lengths by selecting the bespoke version. Please discuss this with your Legrand contact.

MOUNTING

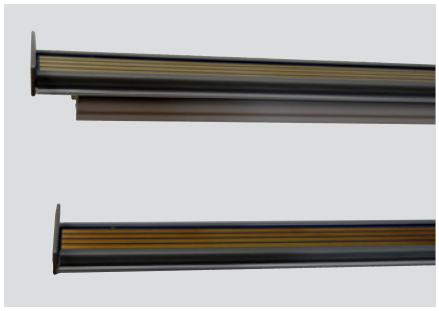
EMS CX³ communicating rail

The communicating rail is available in 3 lengths (18, 24, 36 modules) so it can be clipped onto any DIN rail.

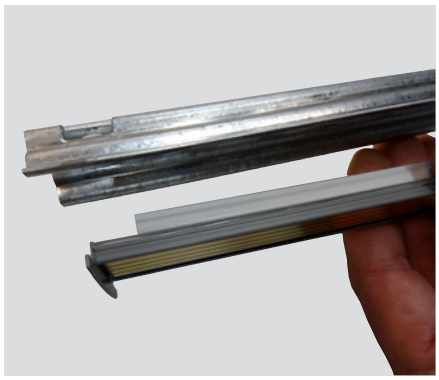


No cutting or sawing required.

The communicating rail clips onto 2 DIN rail models: 7.5 or 15 mm thick.



Simply clip the communicating rail onto a 15 mm thick DIN rail.



Clip the communicating rail onto a 7.5 mm thick DIN rail. This involves removing one of the tabs; slide the spacer to remove it, and replace the end.

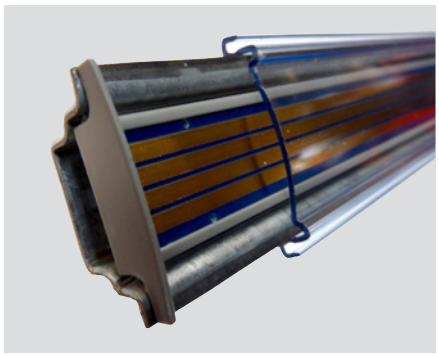
The tabs should then be replaced.

The communicating rail should be clipped onto DIN rails of the same length.

MOUNTING (CONTINUED)

EMS CX³ communicating rail protection

The unused part of the communicating rail must be protected by the plastic cover.

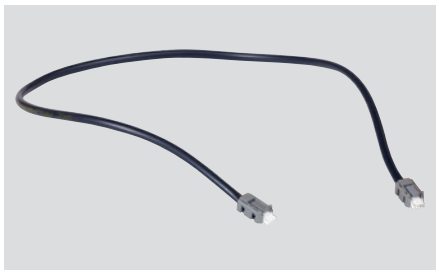


The cover can be cut to the required length.

A visible rail which is not protected against direct contact can be responsible for a short-circuit on the EMS CX³ bus.

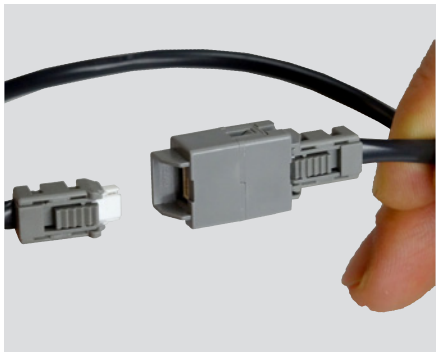
EMS CX³ communicating cables

Communicating cables are available in 3 lengths: 250, 500, 1000 mm.



You can make your own cable. We cannot guarantee it will work.

We offer an extension ferrule which can be used to extend the cable length.



Cables link the EMS CX³ modules.

Cables link 2 communicating rails by linking 2 EMS CX³ modules.

The maximum length of a cable or "cables + ferrules" must be less than 3 m.

CONNECTION

There are 2 ways to connect EMS CX³ modules:

- Via the communicating rail. To do this, you need to remove the plastic protection from the rear communication ports.

To avoid damaging the rail or connections, the module should not be moved along the communicating rail once fitted.

- Via cables which connect to the bottom of each module.

Each EMS CX³ module has 2 bus connectors.

2 types of connection can be combined in the same enclosure.

A module whose protection has been removed can be used on a single DIN rail. We recommend protecting the module against any contact by adding insulation of your choice on the DIN rail.

EMS CX³/RS485 INTERFACE

PRODUCT DATA SHEET

The EMS CX³/RS 485 communication interface Cat. No. 4 149 40 is used to convert data from the EMS CX³ network to the MODBUS RS 485 network, so the data can be displayed and used outside the enclosure.

CHARACTERISTICS

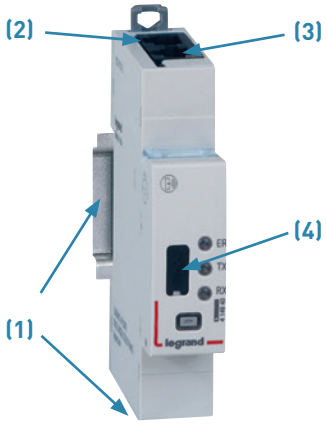
- EMS CX³/RS485 interface Cat. No. 4 149 40.
- Supply voltage: 12 VDC via EMS CX³ power supply module Cat. No. 4 149 45.
- Maximum consumption: 28.7 mA - 0.344 W.
- Output: Via communicating rail or cable on the EMS CX³ bus. Via RJ45 on Modbus RS485.
- Equipped with 3 LEDs: ER = error TX = Transmission RX = Reception
- Mounting: on DIN rail.
- Dimensions: 1 module.

PRODUCT SELECTION

The EMS CX³/RS485 interface can be used with any RS485 product which needs a MODBUS connection.

CONNECTION

- 12 VDC power supply created by the EMS CX³ bus via communicating rail or cable. **(1)**
- Connection to the EMS CX³ bus via communicating rail or cable **(1)**
- Connection to the RS485 bus via 2 RJ45 connectors for easier connection. **(2)** If the interface is at the end of the RS485 bus, consider swapping the 120 ohm line termination resistor on the side of the RJ45 connections. **(3)**
- The USB port on the front **(4)** is used to connect a PC in order to configure the EMS CX³ modules.



CONNECTION (CONTINUED)

■ **The EMS CX³ bus:**

There are 2 possible solutions for connection to the bus:

At the back of the modules via communicating rail Cat. Nos. 4 149 01/02/03

Downstream of the modules via communicating cables Cat. Nos. 4 149 07/08/09

The specifications for connection to the EMS CX³ bus are common to all EMS CX³ devices and are described in the "EMS CX³ communication protocol" section as well as the product technical data sheets.

Use of the configuration software is described in the "EMS CX³ configuration software" section.

The wiring principle for EMS CX³ and RS485 buses is described in the "Communication protocols" section.

EMS CX³/RS485 INTERFACE

PARAMETER SETTING

On the EMS CX³/RS485 interface, the Modbus communication parameters are not necessarily set manually.

The EMS CX³/RS485 interface automatically takes the same Modbus settings as the RS485/IP interface connected on the same bus.

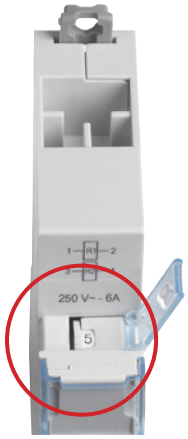
Characteristics:

- Connection: RJ45, pin 4 (-), pin 5 (+), pin 8 (SG)
- Bit rate: 1.2/2.4/4.8/9.6/19.2/38.4/57.6/115 kbps
- Parity: even, odd, none
- Mode: RTU
- Stop bit: 1/2

ADDRESSING

Addressing can be done:

- Locally on the product
  - addressing from 1 to 9 using a thumbwheel.
- Via software
  – addressing from 1 to 247
  – the thumbwheel then stays on 0.



The specifications for connection to the EMS CX³ bus are common to all EMS CX³ devices and are described in the "EMS CX³ communication protocol" section as well as the product technical data sheets.

Local setting using the thumbwheel takes priority over software parameter setting. In the event of malfunction, check that the thumbwheel is definitely on zero.

EMS CX³
MINI-CONFIGURATOR

PRODUCT DATA SHEET

The mini-configurator is integrated in the EMS CX³ system for monitoring energy in electrical panels.

Locally, in the enclosure, it is used to view all the energy monitoring data such as measurement, status and alarms, and also to control a circuit. It is an optional extra, but is ideal for installations where there is a need for viewing and control at a single point, directly in the enclosure.

CHARACTERISTICS

- Display:
  - 2 inch backlit LCD screen
  - Resolution 240x128 pixels
  - Backlight fades automatically after 20 seconds' inactivity
- Configurable:
  - Brightness
  - Backlight time
- Safety:
  A code can be set up (0000 by default) to access the settings.
- Supply voltage: 12 VDC via EMS CX³ power supply module Cat. No. 4 149 45.
- Maximum consumption:
  36.5 mA - 0.438 W.
- Output:
  Via communicating rail or cable on the EMS CX³ bus.
- Mounting: on DIN rail.
- Dimensions: 4 modules.
- Equipped with a type B Micro USB port to connect 1 PC.

PRODUCT SELECTION

The EMS CX³ mini-configurator Cat. No. 4 149 36 should be chosen for local viewing in the enclosure.

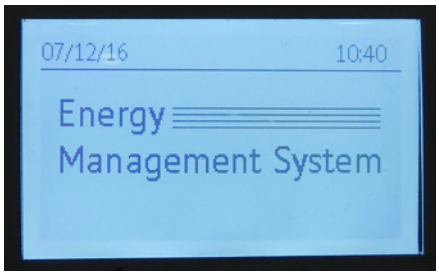
It is used to view all the energy monitoring data such as measurement, status, control and alarms.

It is not essential in order for the EMS CX³ system to work correctly. It can be offered as an option.

OVERVIEW OF MENUS

■ "Home" menu

In the original configuration, the screen below is proposed, but this can be changed in the settings.



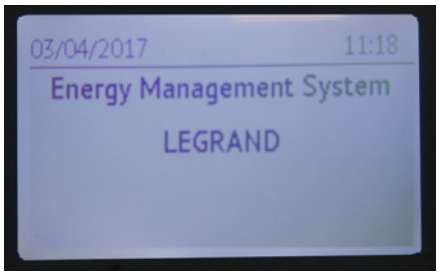
The mini-configurator is used by pressing or rotating the button on the front of the device.

OVERVIEW OF MENUS (CONTINUED)

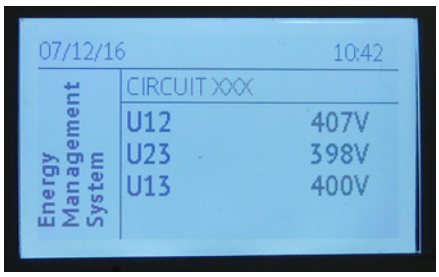
■ "Home" menu (continued)

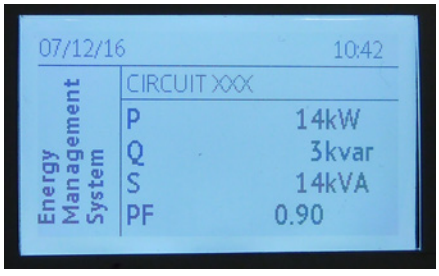
Here are some examples of home page configuration

-→ 2 lines of text to be configured:



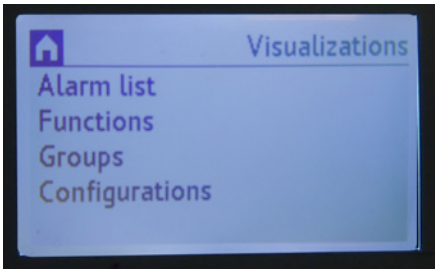
-→ Cyclic display of measurements from a chosen circuit:





■ "View" menu

This provides access to the various menus:

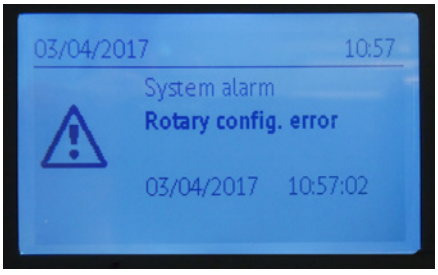


"Alarm list" menu

The EMS CX³ mini-configurator remembers the last 20 alarms. It shows the name of the group, type of fault, date and time.

Example of a circuit breaker trip:

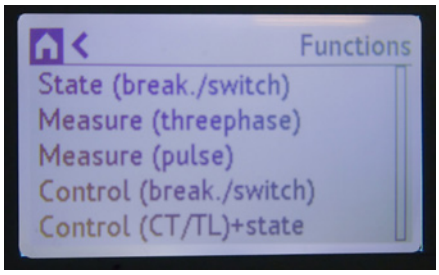
Example of a configuration error:



OVERVIEW OF MENUS (CONTINUED)

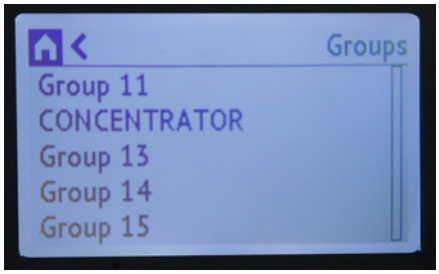
■ **"Function" menu**

Provides a list of the various modules in the installation categorised by function.



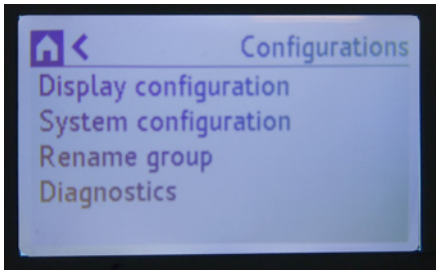
■ **"Group" menu**

Provides a list of the various modules in the installation categorised by group.



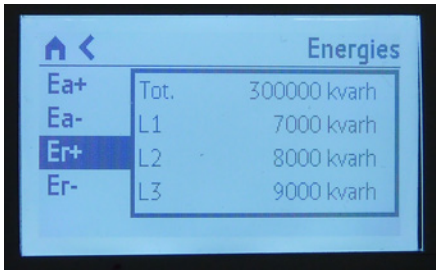
■ **"Configuration" menu**

Provides access to the various possible configurations.

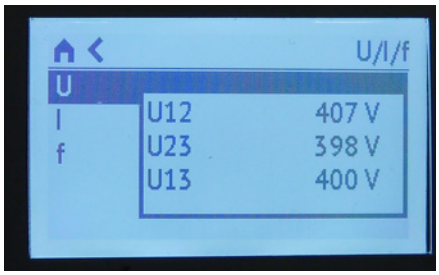


■ **Examples of display**

Display of energies:

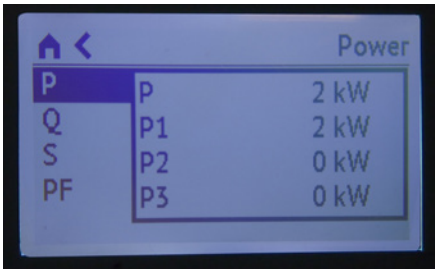


Display of voltages:

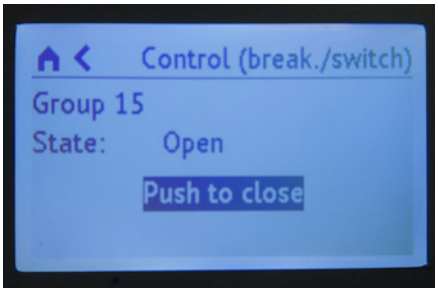


Display of currents:

Display of powers:

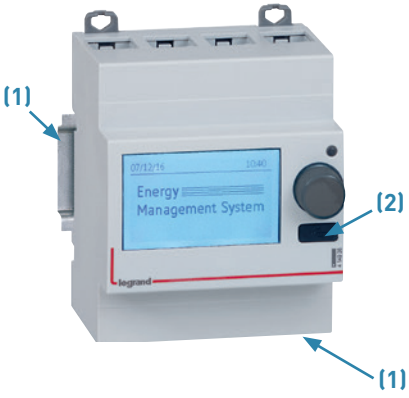


Display of a status feedback and circuit breaker command:



CONNECTION

- 12 VDC power supply created by the EMS CX³ bus via communicating rail or cable. **(1)**
- Connection to the EMS CX³ bus via communicating rail or cable. **(1)**
- The USB port on the front **(2)** is used to connect a PC in order to configure the EMS CX³ modules.



CONNECTION (CONTINUED)

■ **The EMS CX³ bus:**

There are 2 possible solutions for connection to the bus:

At the back of the modules via communicating rail Cat. Nos. 4 149 01/02/03

Downstream of the modules via communicating cables Cat. Nos. 4 149 07/08/09

The specifications for connection to the EMS CX³ bus are common to all EMS CX³ devices and are described in the "EMS CX³ communication protocol" section as well as the product technical data sheets.

Use of the configuration software is described in the "EMS CX³ configuration software" section.

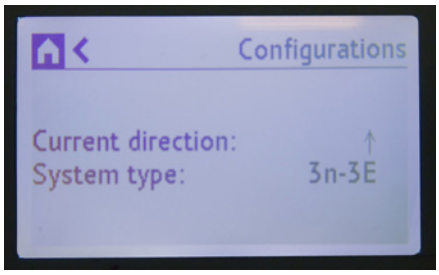
EMS CX³ MINI-CONFIGURATOR

PARAMETER SETTING

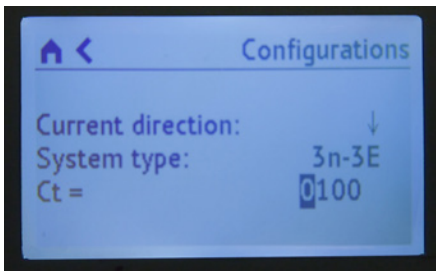
Various parameters can be set on the EMS CX³ mini-configurator, such as:

- Settings: date, time, password, contrast, backlighting, thumbwheel address, language, definition of home page.
- Option of renaming groups
- Module-specific settings

For example, changing the current direction for measurement:



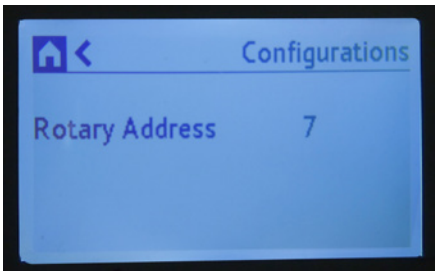
For example, changing the type of circuit for measurement:



ADDRESSING

Addressing can be done:

- Locally on the product
  - addressing from 1 to 9 using a "virtual thumbwheel" from the mini-configurator screen.
- Via software
  – addressing from 1 to 247
  – the "virtual thumbwheel" then stays on 0.



The specifications for connection to the EMS CX³ bus are common to all EMS CX³ devices and are described in the "EMS CX³ communication protocol" section, as well as the product technical data sheets.

Local setting using the thumbwheel takes priority over software parameter setting. In the event of malfunction, check that the thumbwheel is definitely on zero.

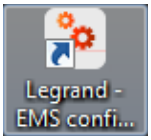
EMS CX³ CONFIGURATION SOFTWARE

PRODUCT DATA SHEET

The EMS CX³ configuration software can be downloaded free of charge from the online catalogue.

It can be used to configure, address and test the EMS CX³ system in your installation.

It also contains a free 30-day trial of the Energy Manager software. Thereafter, licence key Cat. Nos. 4 149 38/4 149 39 should be used.



CHARACTERISTICS

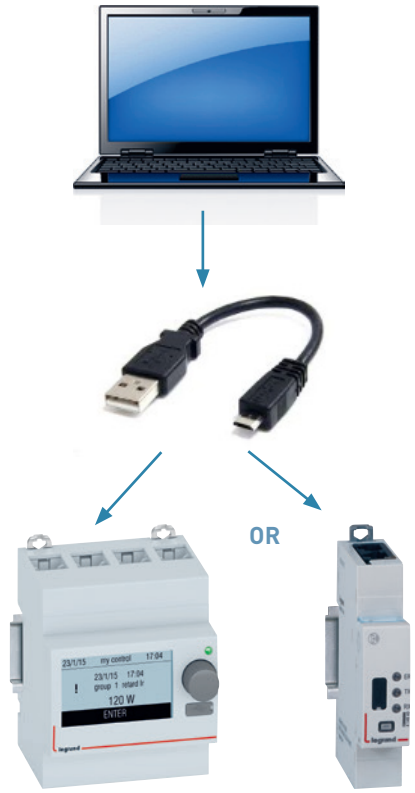
- Display and use on a computer.
- Transfers configurations to the EMS CX³ system by means of a physical connection to interface 4 149 40 or mini-configurator 4 149 36, via a type B USB/micro USB cable.

PARAMETER SETTING

The EMS CX³ configuration software can easily be downloaded from the online catalogue. The software icon then appears on the computer desktop.

We do however recommend using a laptop computer, to make it easier to transfer data to the EMS CX³ system in the enclosure.

When the PC is first connected to the EMS CX³ system, the drivers are installed automatically.



PRODUCT SELECTION

The EMS CX³ configuration software can be used in the following scenarios:

- addressing modules
- accessing certain module-specific settings
- testing the installation
- displaying alarms
- viewing the project
- importing/exporting a project

A complete project configuration which has already been created can be exported so it can be reused later exactly as it is, or modified for use in another project.

EMS CX³ CONFIGURATION SOFTWARE

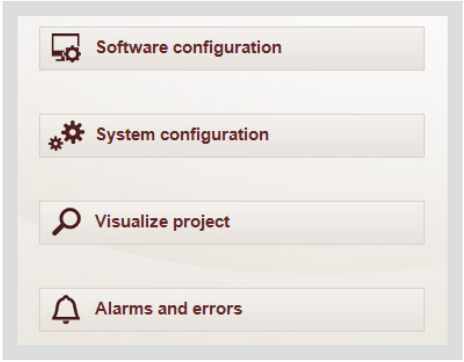
OVERVIEW OF MENUS

■ **"Home" menu:**

The display takes the form of 4 menus providing access to various sub-menus.

Access to software settings such as: version, language, communication port.

Access to the project view as it will appear for the end user



Access to the system settings.

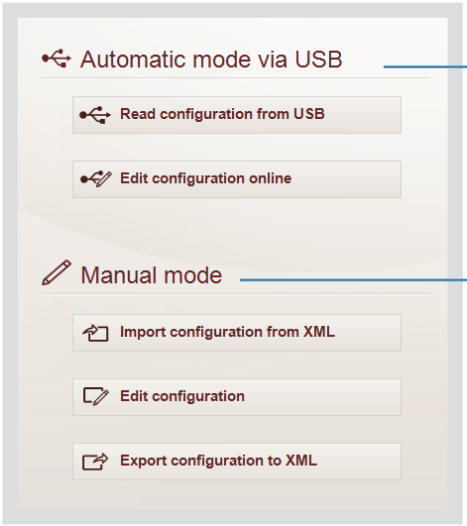
Access to the alarm and error lists in the configuration.

■ **"Configure the system" menu:**

Access to viewing and modifying the system when the PC is directly connected to the system via the USB cable.

To retrieve a configuration which has already been created.

Save a configuration in XML format directly to your computer.



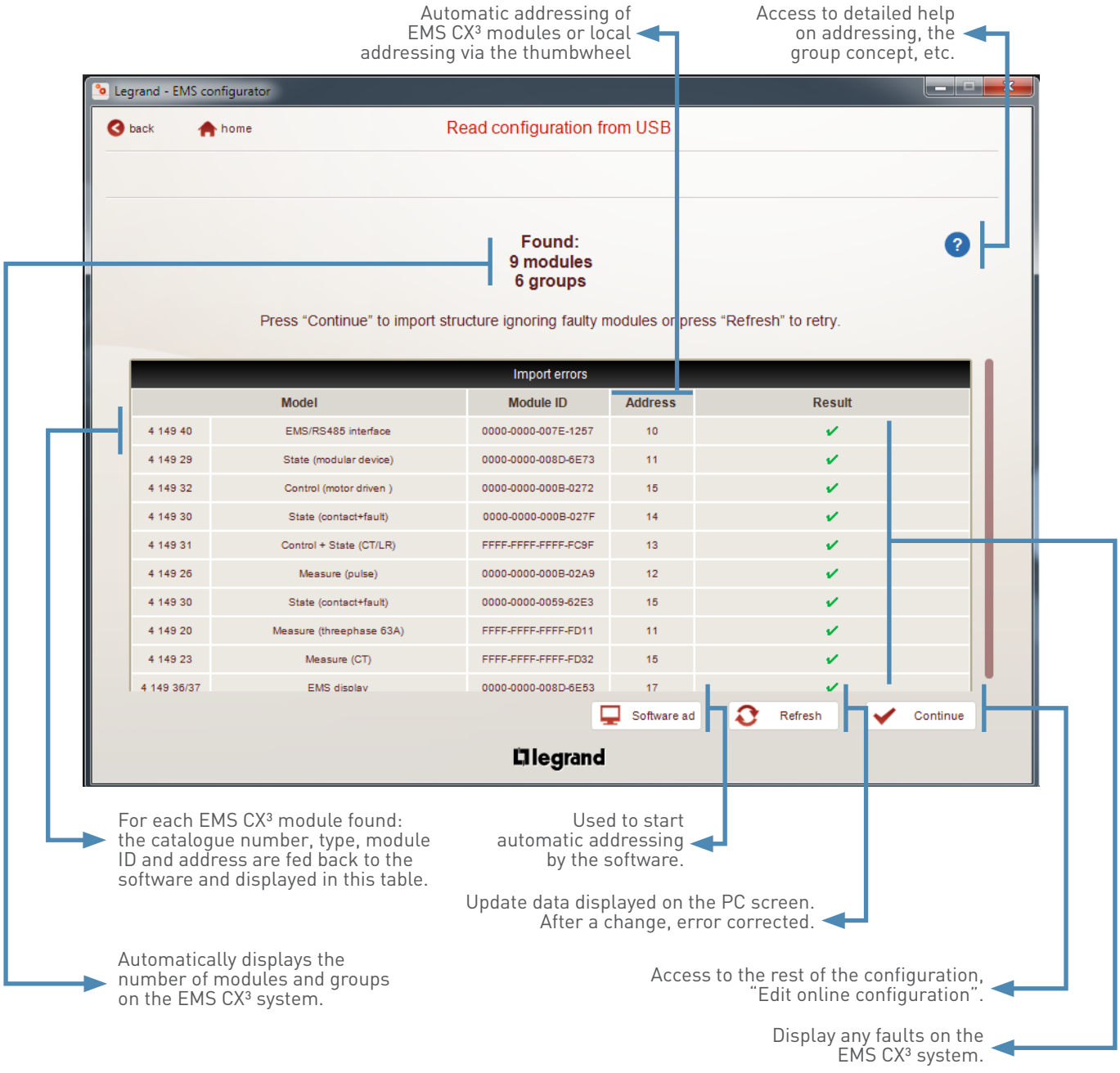
PC connected to the system.

Start configuring the system.

PC not connected to the system.

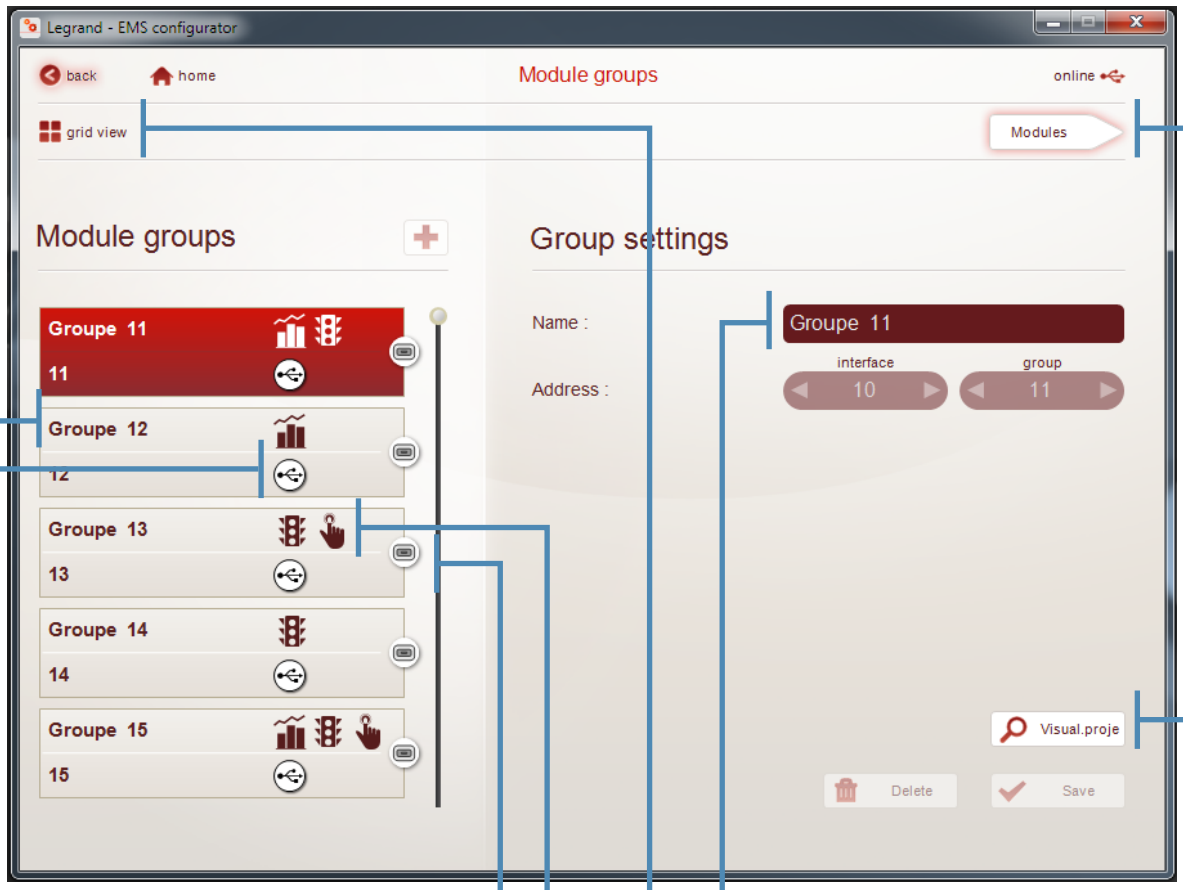
Start configuring the system.

■ **“Read configuration via USB” menu:**



EMS CX³ CONFIGURATION SOFTWARE

■ **"Edit online configuration" menu, "Module group" page**



Detection of an error.

Quick identification of the EMS CX³ module(s): on pressing this icon, the relevant EMS module(s) flash.

Display groups on the EMS CX³ system.

Display logos identifying accessible functions in the group.

= Measurement module

= Status module

= Control module

The name can be customised.

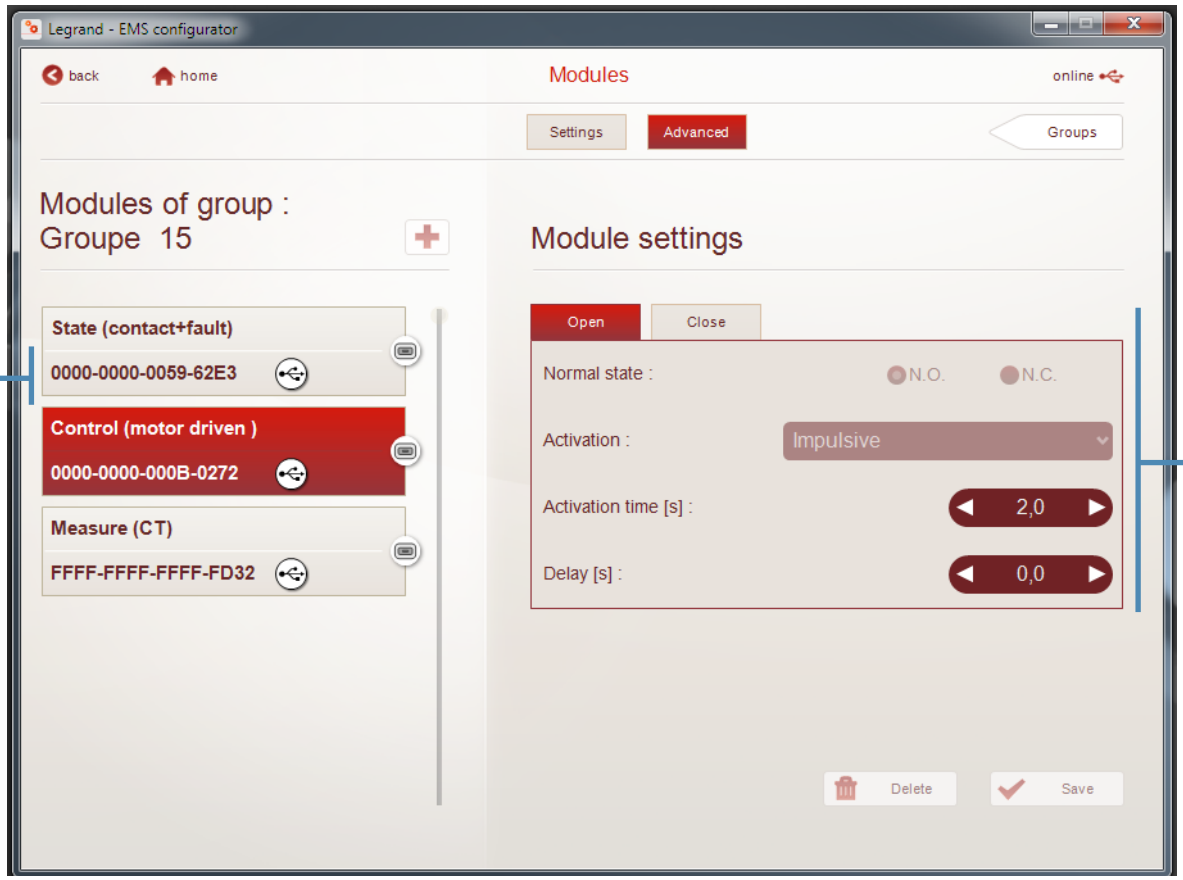
Direct access to the project view as it appears for the end user.

Access to the modules associated with the selected group.

Other possible view:
Tile view of the various groups in the EMS CX³ system.

■ **“Edit online configuration” menu, “Module” page**

Example of advanced parameter setting page for a motorised control.



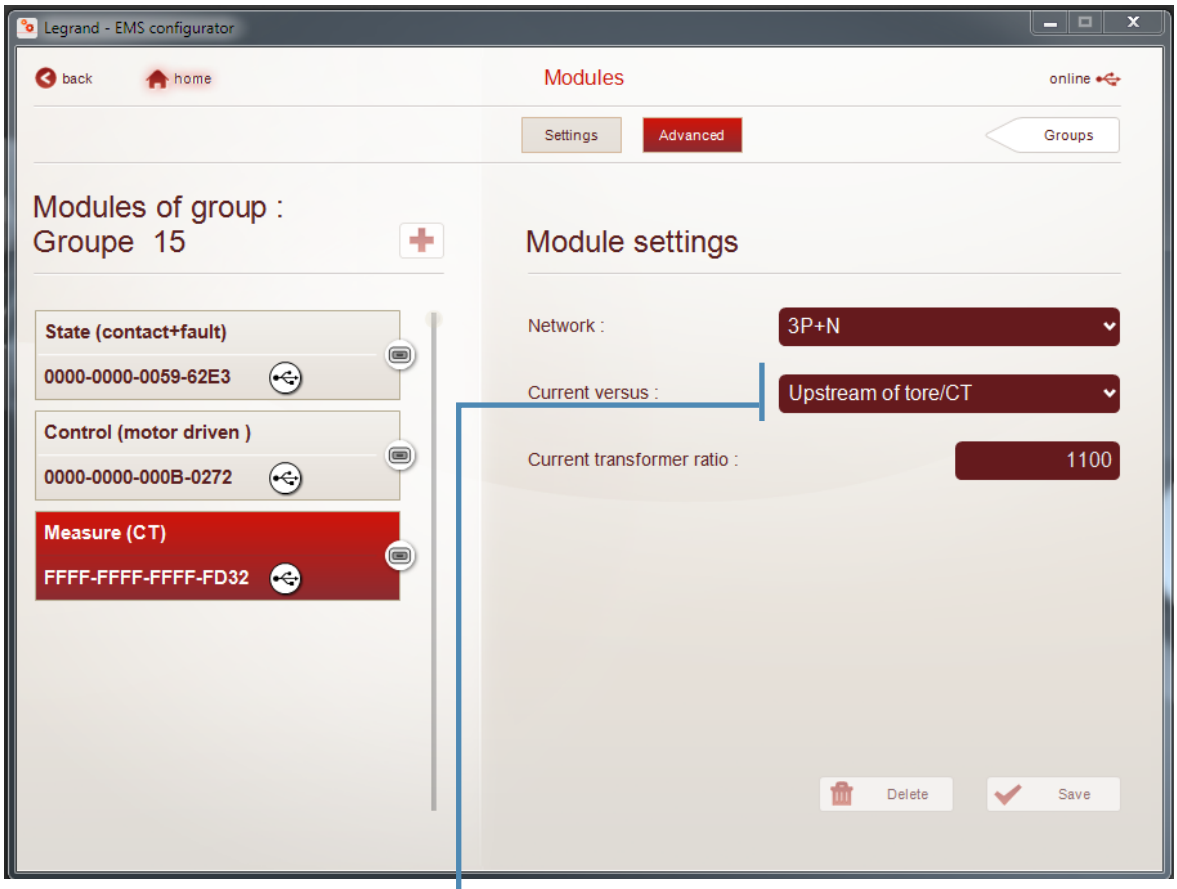
ID module
Unique number

Parameters can be set for this type of EMS CX³ module, which are only accessible via the software:

- Normal contact status: normally open or normally closed.
- Contact activation type: pulse, maintained.
- Activation time: adjustable time delay.
- Activation delay time: adjustable time delay.
- Etc.

■ **"Edit online configuration" menu, "Module" page**

All the measurement module parameters can be set via the configuration software.
Example of advanced parameter setting page for a three-phase measurement module.

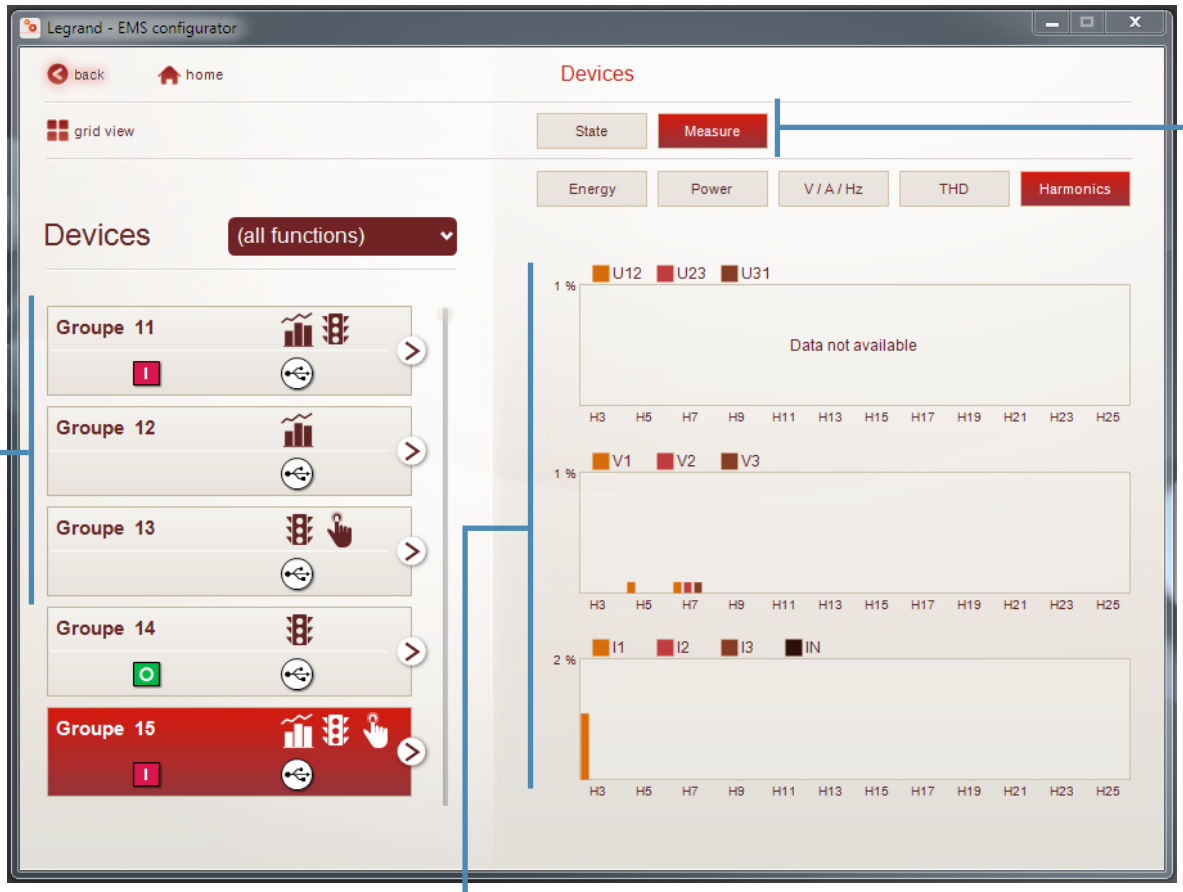


Parameters can be set for this type of EMS CX³ module:

- Supply type.
- Current direction in the coil/CT.

■ **“View project” “View measurement” menu**

Used to have an identical project view to that of the end user.



Display the status of each group and the logos of the associated functions:

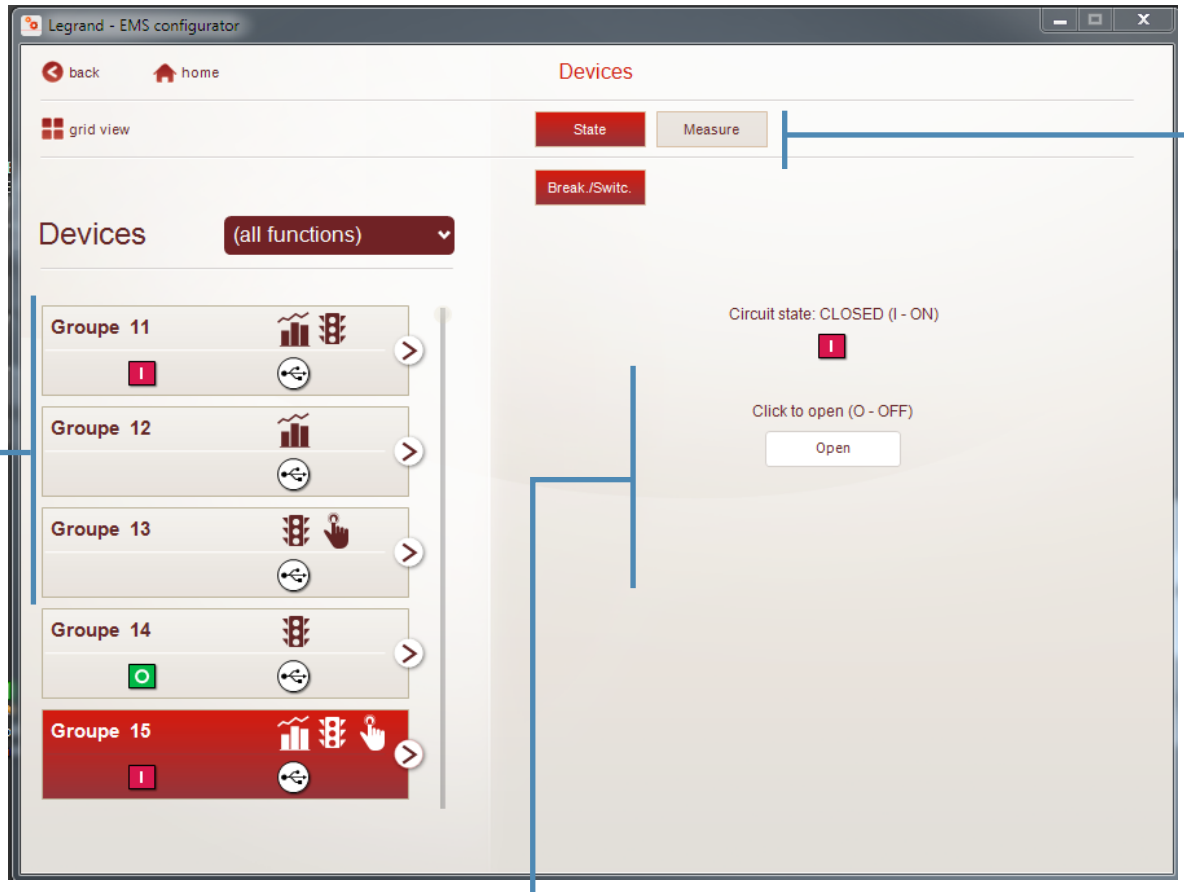
- ON/OFF/FLT status
- Functions: measurement view, control, etc.
- Connection fault
- Etc.

Example of displaying “measurement” data, in this case harmonics.

Access to choice of data to be displayed.

■ **“View project” “View status” menu**

Used to have an identical project view to that of the Energy Web Server.



Display the status of each group and the logos of the associated functions:

- ON/OFF/FLT status
- Functions: measurement view, control, etc.
- Connection fault
- Connection OK
- Etc.

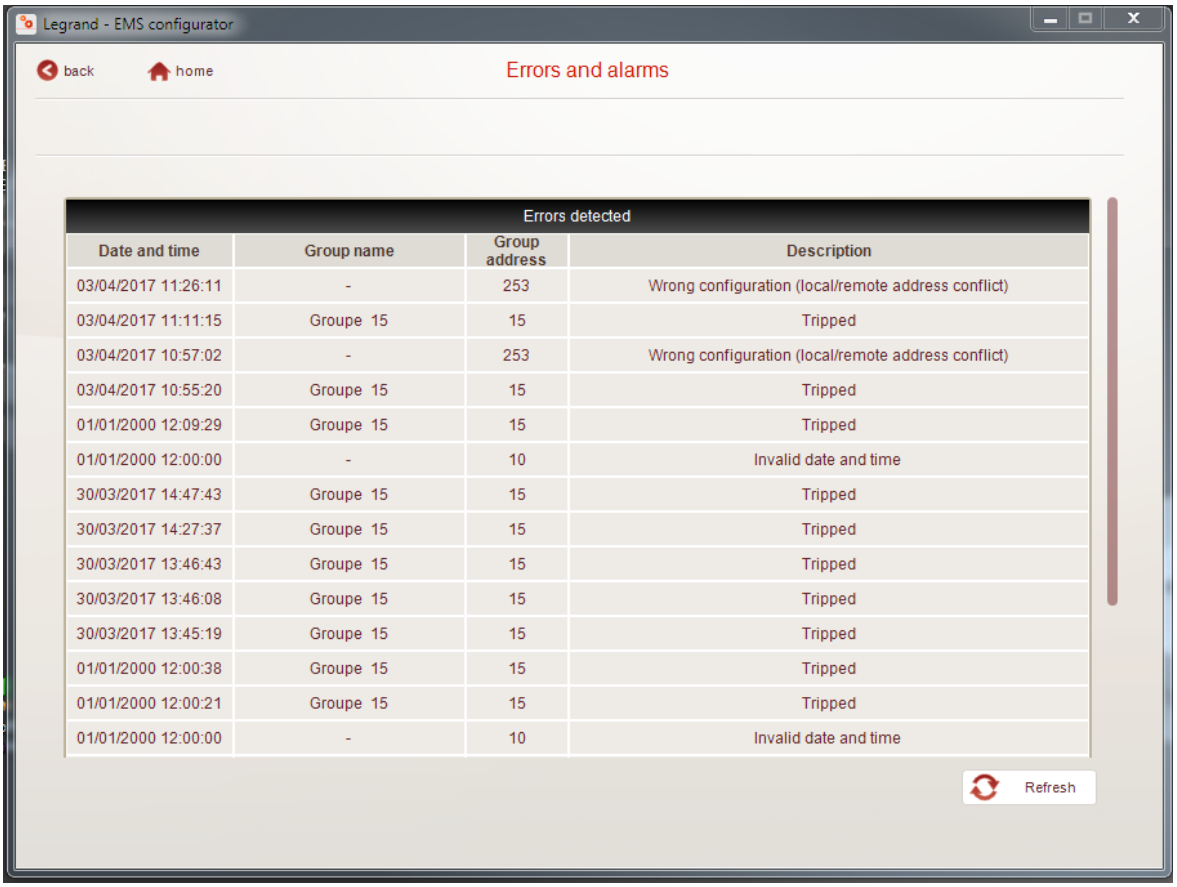
View group status and access control

Access to choice of data to be displayed

■ "Errors and alarms" menu

The EMS CX³ system remembers the last 20 errors and alarms which have appeared during configuration.

The table indicates the date, time, group name, address and type of error or alarm.



Date and time	Group name	Group address	Description
03/04/2017 11:26:11	-	253	Wrong configuration (local/remote address conflict)
03/04/2017 11:11:15	Groupe 15	15	Tripped
03/04/2017 10:57:02	-	253	Wrong configuration (local/remote address conflict)
03/04/2017 10:55:20	Groupe 15	15	Tripped
01/01/2000 12:09:29	Groupe 15	15	Tripped
01/01/2000 12:00:00	-	10	Invalid date and time
30/03/2017 14:47:43	Groupe 15	15	Tripped
30/03/2017 14:27:37	Groupe 15	15	Tripped
30/03/2017 13:46:43	Groupe 15	15	Tripped
30/03/2017 13:46:08	Groupe 15	15	Tripped
30/03/2017 13:45:19	Groupe 15	15	Tripped
01/01/2000 12:00:38	Groupe 15	15	Tripped
01/01/2000 12:00:21	Groupe 15	15	Tripped
01/01/2000 12:00:00	-	10	Invalid date and time

RS485/IP INTERFACE

PRODUCT SPECIFICATIONS

The RS485/IP interface Cat. No. 0 046 89 is used to convert data from the RS485 – MODBUS network to the Ethernet network (TCP/IP protocol), in order to display and exploit the data on a PC, via dedicated software or a web server.

CHARACTERISTICS

- RS485/IP interface Cat. No. 0 046 89
- Power supply: 90 to 260 VAC, 50/60 Hz
- Consumption: 2.94 VA – 12.8 mA at 230 VAC
- Conforming to the following standards and specifications:
  - EN 61000-6-1/EN 61000-6-2
  - EN 61000-6-3/EN 61000-6-4
  - EN 50428 (HBES)
  - IEE 802.3, EIA RS485
- Ethernet interface: RJ45; 10/100 MB
- RS485 interface:
  - 2 wires (+/-) and ground
  - RTU/ASCII mode
  - no. of devices which can be connected, 32 max.
  - length of RS485BUS, 1200 m max.
- 3 modules, mounted on DIN rail

Interface Cat. No. 0 046 89 must be protected, like any electrical circuit.

PRODUCT SELECTION

The RS485/IP interface can be used with any RS485 device which needs a connection to an IP network.

CONNECTION

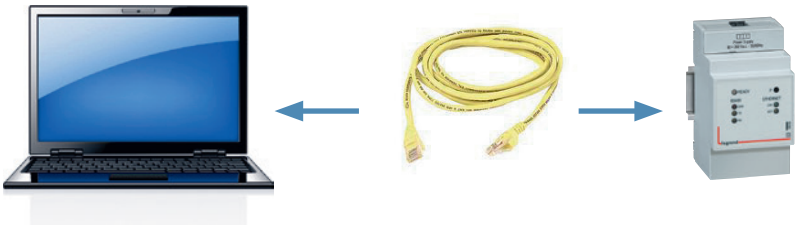
- **Power supply (1):**
  - Power supply: 90 to 260 VAC
  - Connected with a connector
- **RS485 BUS connection (2):**
  - Interface connection to the RS485 BUS
  - The wiring diagram for an RS485 BUS is illustrated in the "Communication protocols" section
  - Connected with a connector
- **Ethernet connection (3):**
  - Connection to the local IP network
  - Connected with an RJ45 connector

The switch on the underside of the Modbus connection is used to activate the 120 Ω termination resistor.

PARAMETER SETTING

The IP interface parameters must be modified to ensure they are part of the same networks, RS485 at one end and Ethernet at the other end, as all the devices in the same installation.

- **Connection for parameter modification:**



Once the interface is connected and powered:

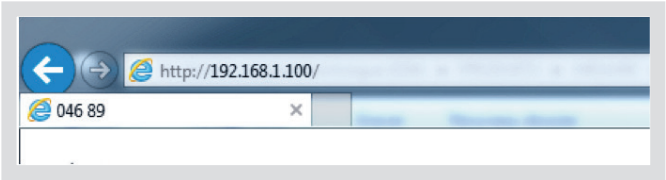
- Connect a PC directly to the converter with a straight RJ45 network cable.
- Modify the PC's network settings by changing to a static IP address, using the procedure described in this guide in the "Communication protocol → IP addressing → Procedure for modifying a computer's IP address" section.
- Since the default static IP address for an interface is 192.168.1.100, simply follow the example given, setting the PC's static IP address to 192.168.1.99. Neither the mask nor the gateway can be the same as in this example.

This involves changing the static IP address for each interface. It is therefore essential to have first contacted the website IT department to obtain a list of static IP addresses you can use.

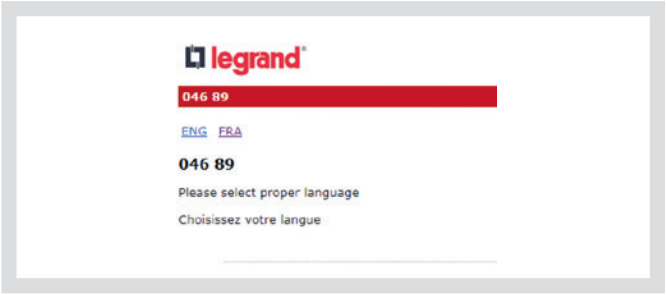
PARAMETER SETTING (CONTINUED)

■ **Connection to the IP interface:**

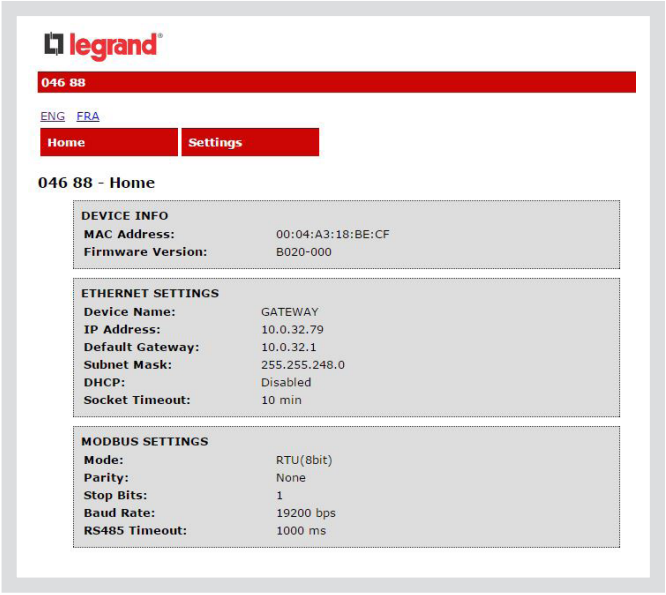
Open your web browser and enter the interface default IP address (192.168.1.100).



The home page of an IP interface looks like this. Select your language.



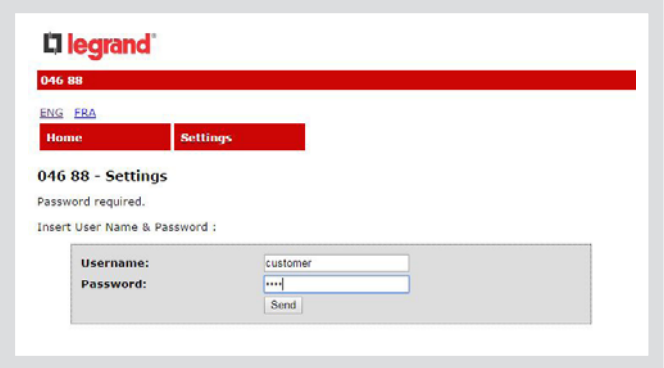
You can then access the view of the various interface parameters. You can click on each parameter to modify them.



Enter the username and password.

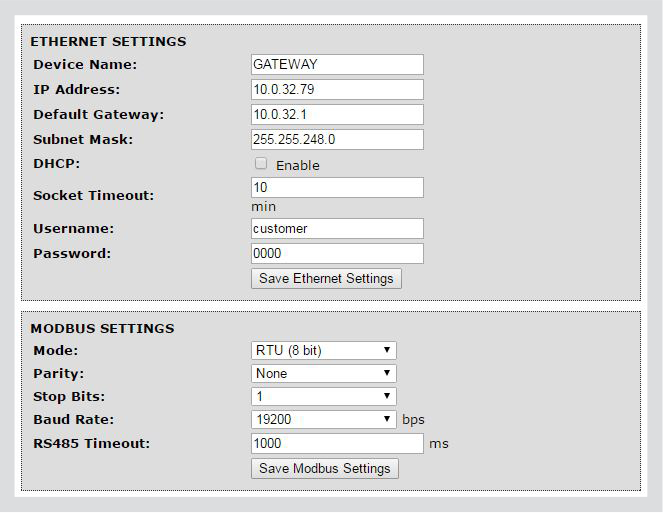
By default:

- username: customer
- password: 0000



PARAMETER SETTING (CONTINUED)

■ **Modifying the IP interface parameters:**
Enter the new parameters for the device below:



You can now modify the parameters:

- Of the RS485 Modbus network: make sure you have the same parameters on the same RS485 network.
- Of the Ethernet network: follow the instructions given by the website IT department.

Save.

Connect the IP interface to the Ethernet network.

When all the interfaces have been modified, you can switch back to automatic IP address on your PC.

Make sure you can still connect to each interface with its new IP address.

DATA TRANSFER AND MODBUS ADDRESSING

Interface Cat. No. 0 046 89 is a communication interface for transcribing RS485 Modbus protocol information into IP protocol.

Addressing tables are available in the E-catalogue on www.legrand.com in the manuals or in separate files depending on the device. All the information concerning available registers can be found in these documents.

If you need examples of how to read or write a register, you should refer to the "Help and definition" section.

TOUCH SCREEN DISPLAY

PRODUCT SPECIFICATIONS

The touch screen display makes it possible to relay different information from a number of devices such as: DX³, DPX³, DMX³ or EMDX³.

CHARACTERISTICS

- Display:
  - On screen Cat. No. 0 261 56 and/or on any other type of screen with a web browser
- Installation:
  - Connection to the communication network, firmware
- Number of measuring devices:
  - Can manage up to 8 metering or power devices
- Power supply:
  - Single-phase 18 to 30 VDC (for example Cat. No. E49)
- Consumption:
  - 2.2 W (80 mA at 27 VDC)
- Connection:
  - With screws for the power supply
- Output:
  - RJ45 for the IP network connection
- Mounting:
  - On door or faceplate
- Dimensions:
  - Casing 128 x 102 x 26 mm overall
  - Cut-out 92 x 92 mm
- Configuration:
  - Local or remote

PRODUCT SELECTION

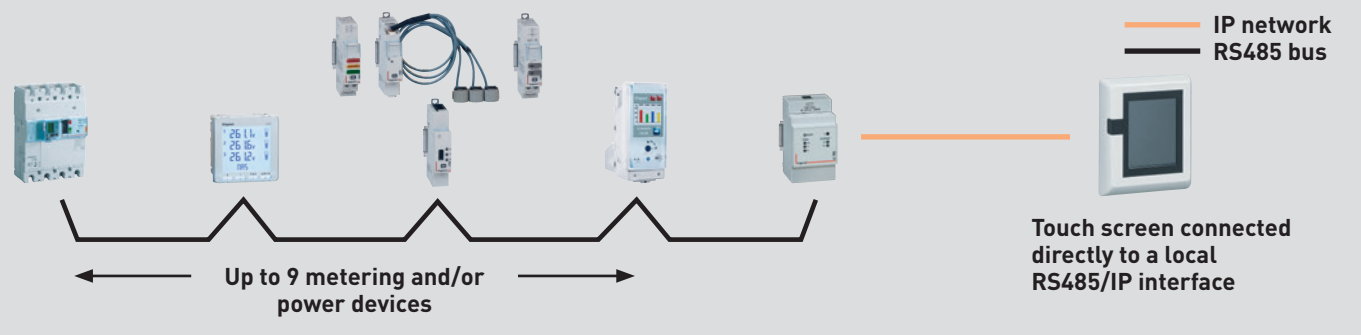
One or more screens Cat. No. 0 261 56 can be connected to an intranet in the same installation in order to relay information from 8 devices maximum per screen.

CONNECTION

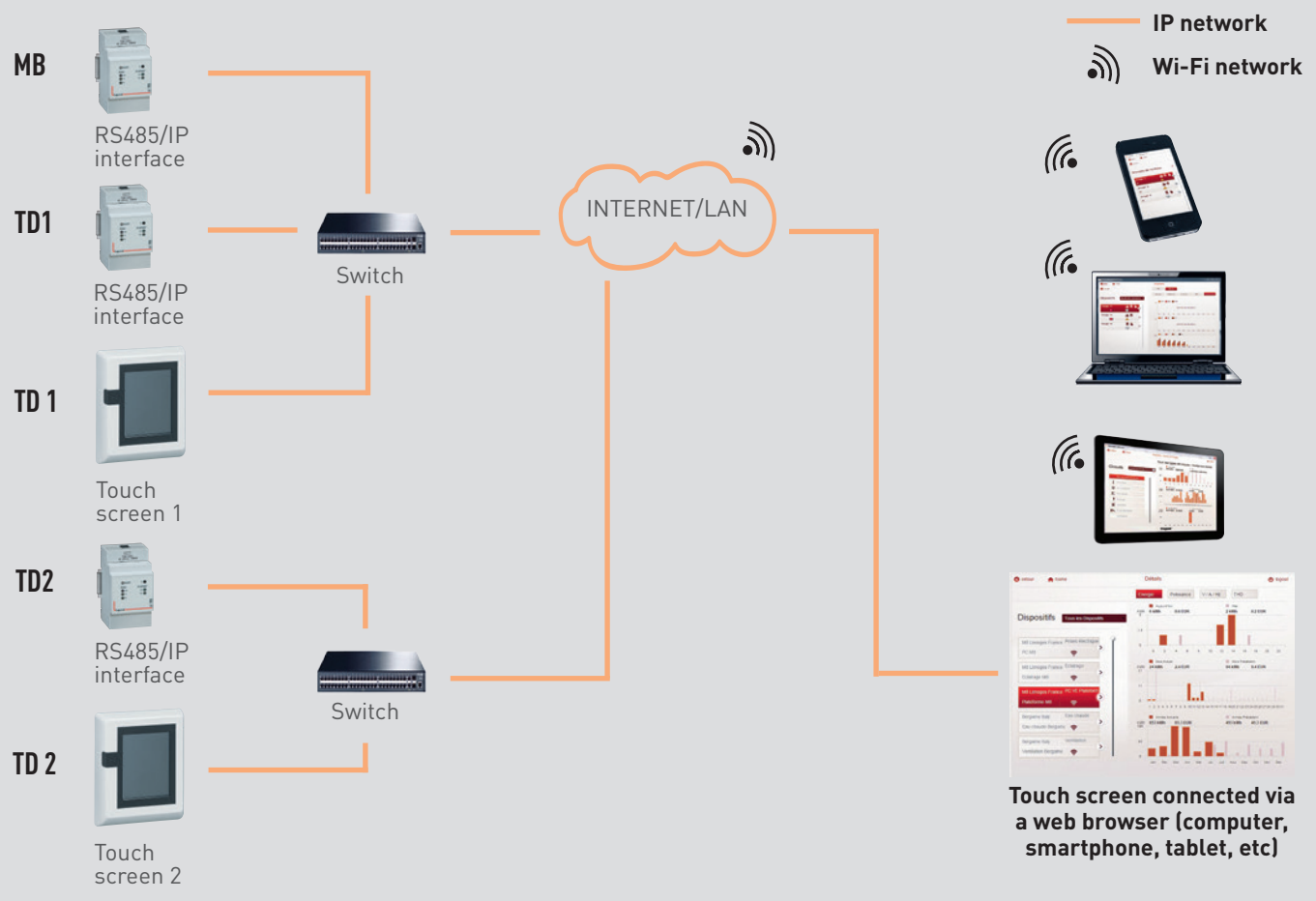
- **Back of the touch screen**

CONNECTION (CONTINUED)

■ **Example 1**



■ **Example 2**

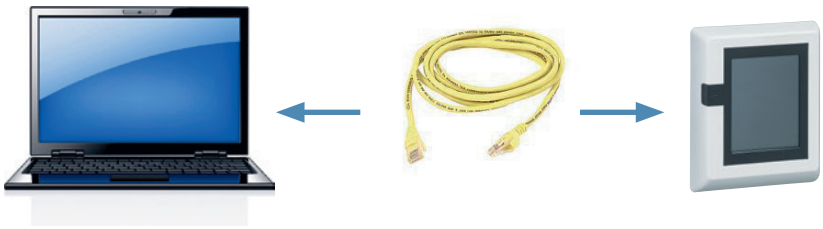


TOUCH SCREEN DISPLAY

PARAMETER SETTING

The screen settings must be modified to ensure they are part of the same network IP as all the IT devices.

- **Access to settings:**

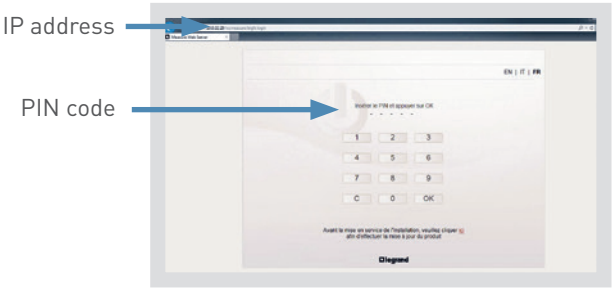


The first time you log in, connect your computer directly to the screen and change its configuration (network settings, date, time, etc). To do this, open your web browser and enter the web server default IP address (192.168.1.100); make sure you have changed your computer's static IP address first (for example 192.168.1.99).

Like any device connected on a local area network (intranet), access to a touch screen is secure during a remote connection (internet). To obtain this authorisation, you should ideally contact the network administrator who will do the necessary to open the ports and redirect them to the web server.

Make sure that the touch screen is powered up before making changes.

Enter the default PIN administrator codes to access the menu.
PIN: 99999



Changing a computer's IP address to automatic or static: help is available in the "Communication protocol → IP addressing" section.

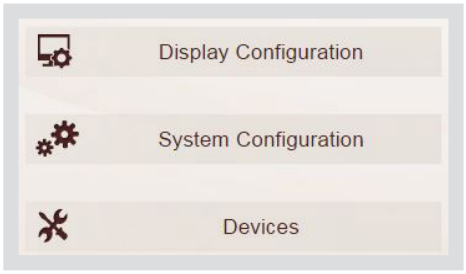
Access to data is protected by an ID code (PIN code).
There are 3 types of predefined user: Administrator, Installer, User.
Different access is offered depending on the ID selected.
It is possible to:
- add users
- change access codes

OVERVIEW OF MENUS

■ **"Home" menu:**

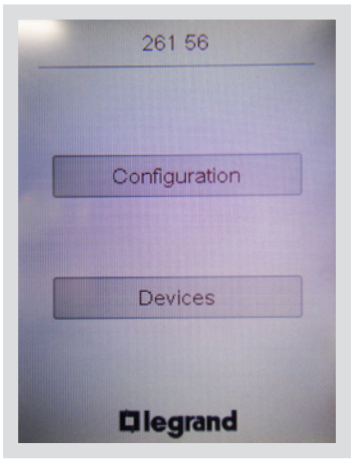
• On a computer

The display takes the form of 4 menus which can access various submenus.



• On the touch screen

The display takes the form of 2 menus which can access various submenus.



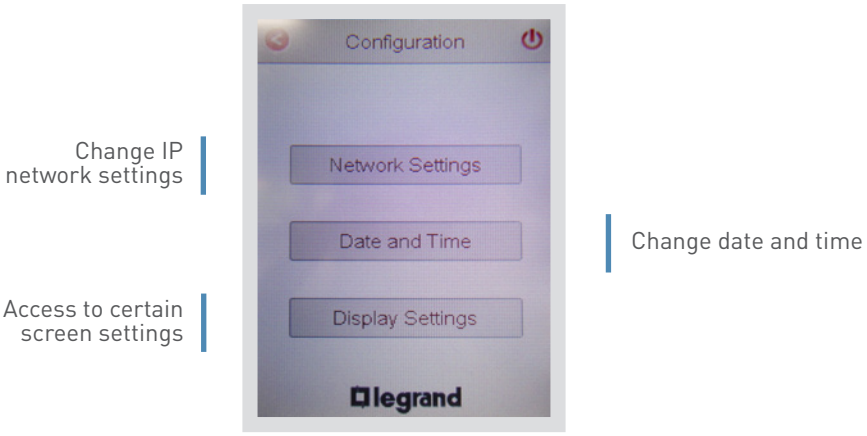
OVERVIEW OF MENUS (CONTINUED)

■ **"Screen settings" menu:**

• On a computer

• On the touch screen

Only some settings can be changed directly on the front of the screen. A password is requested to access them.

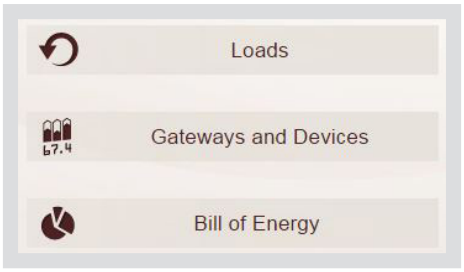


OVERVIEW OF MENUS (CONTINUED)

■ **"System configuration" menu:**

• On a computer

Create measuring circuits



Add and change the IP converters and related measuring equipment

Change currencies and the cost of energy (price per kWh)

• On the touch screen

The system can only be configured on a computer.

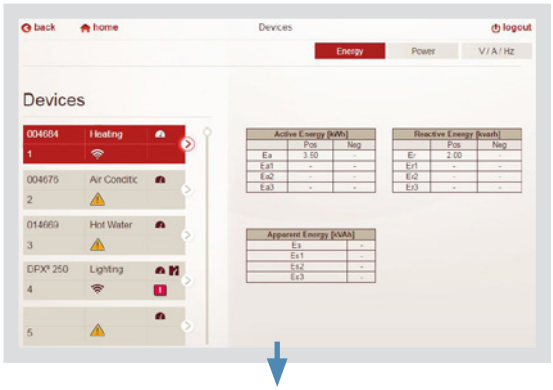
OVERVIEW OF MENUS (CONTINUED)

■ **"Devices" menu:**

View data fed back directly by devices declared on screen.

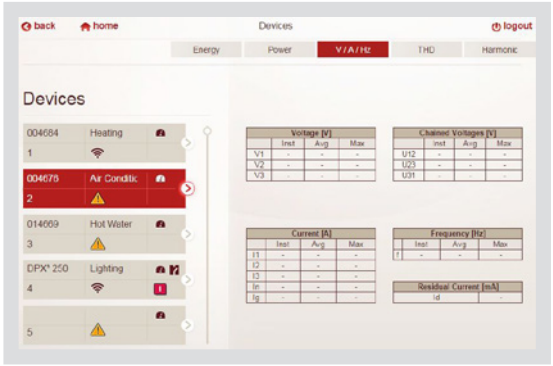
Dispositifs

On the computer
Energy by device



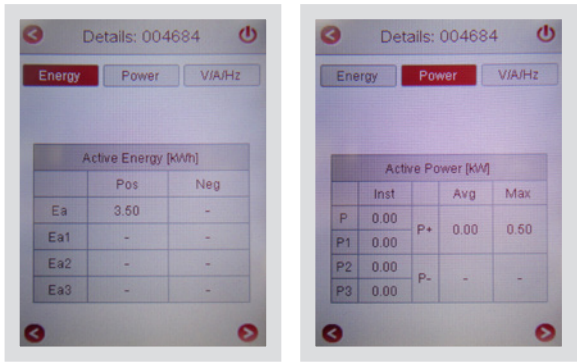
Power by device

Voltage, current, frequency, etc by device

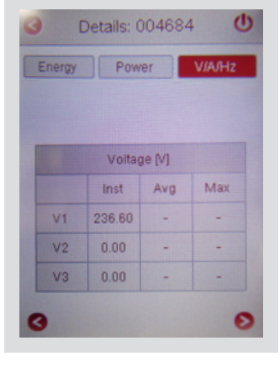


On the screen
Device status

Power and energy by device



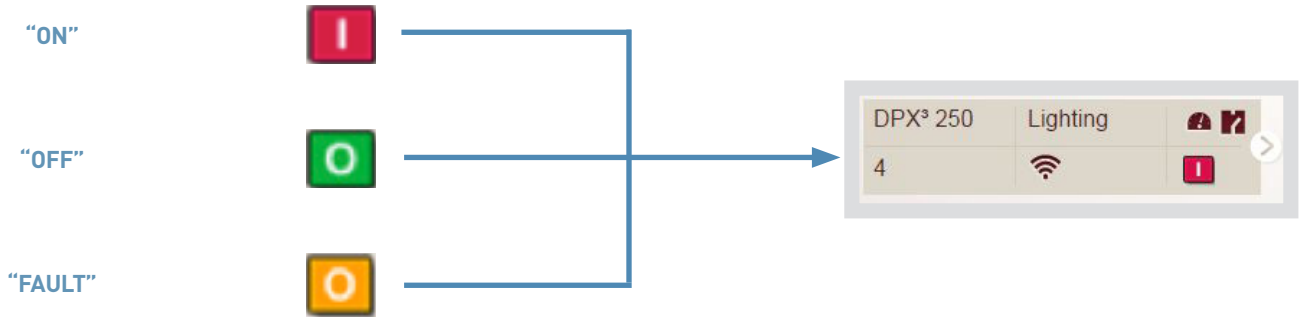
Voltage, current, frequency, etc by device



OVERVIEW OF MENUS (CONTINUED)

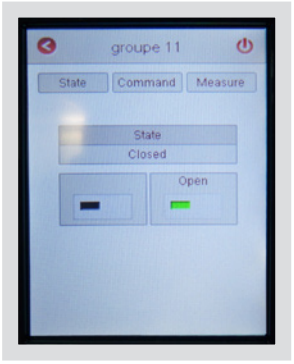
■ **Possibility of viewing the circuit breaker status:**

On the computer or on screen, communicating DMX³ and DPX³ circuit breakers indicate their status in real time.



■ **Possibility of remote control on touch screen:**

With EMS CX³ system products



ENERGY WEB SERVER AND ENERGY MANAGER SOFTWARE CATALOGUE VERSION

PRODUCT DATA SHEET

The Energy Web Server or "catalogue version" of the Energy Manager software is used to:
- remotely view and save data from measurement devices
- control, monitor declared devices

The Energy Manager software should be installed on a dedicated PC on the local network. Data is saved onto the computer hard drive.

The Energy Web Server is accessible on any screen equipped with a web browser (computer, smartphone, digital tablet, etc). It has a hard drive for saving data.

CHARACTERISTICS

■ Energy Manager software:

■ Display and installation:
- On a dedicated PC.

■ Max. number of devices:
- Cat. No. 4 149 38: 32 Modbus addresses or pulse meter.
- Cat. No. 4 149 39: 255 Modbus addresses or pulse meter.

■ System requirements:
- Intel® Core™2 Duo or AMD Athlon X2RAM processor: 2 GB.
- 320 MB of available disk space.
- USB port for memory stick.

■ Operating system:
- Microsoft Windows XP (Professional) with Service Pack 3.
- Microsoft Windows Vista with Service Pack 2.
- Microsoft Windows 7, 8, 10.
- Not compatible with MAC systems.

■ Energy Web Server

■ Display:
- On any screen equipped with a browser.

■ Installation:
- Connection to the computer network, firmware.

■ Max. number of devices:
- Cat. No. 0 261 78: 32 Modbus addresses or pulse meter.
- Cat. No. 0 261 79: 255 Modbus addresses or pulse meter.

■ PC: (device, web browser)
- Firefox: version 50 or later (v50.0+)
- Chrome : v55.0+
- Safari: v10.0+

■ Power supply:
- Single-phase 230 VAC.

■ Connection:
- 230 VAC – 12 VDC power supply adaptor provided.

■ Output:
- RJ45 for the IP network connection.

■ Mounting:
- With screws on a plate.

■ Configuration:
- Local or remote.

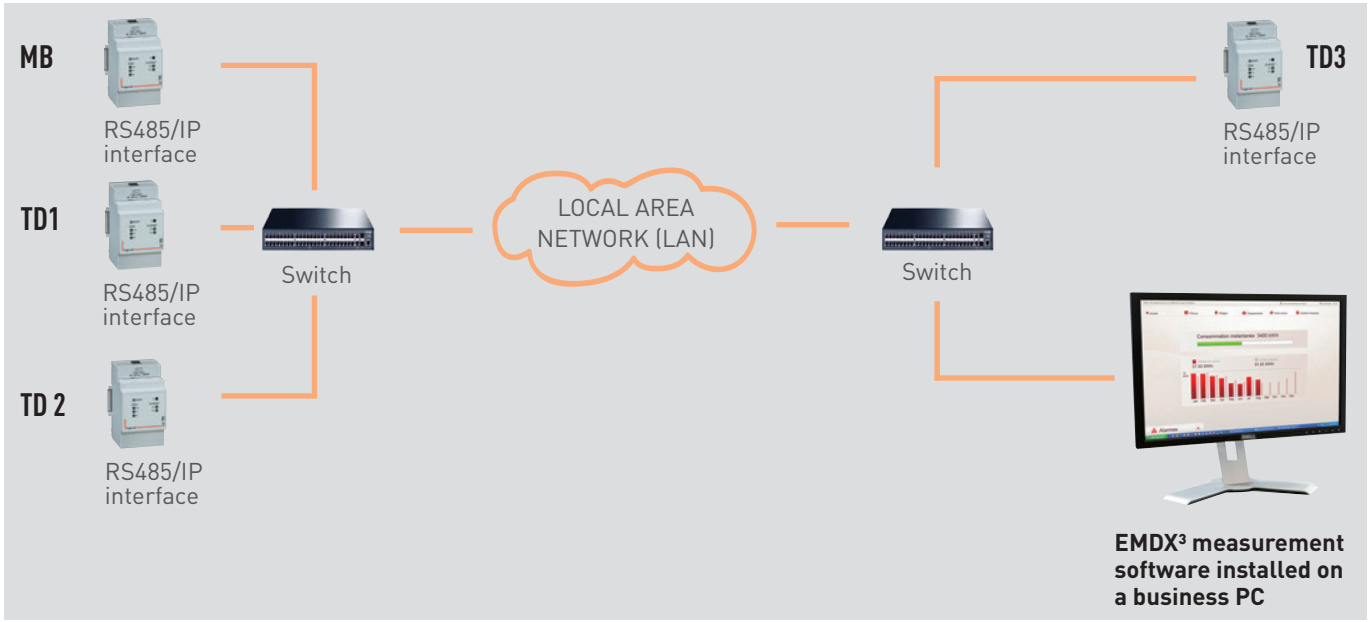
Bespoke version available. Please contact your Legrand sales office.

PRODUCT SELECTION

Energy Management software Cat. Nos. 4 149 38/39 should be chosen for viewing on a single local station, and Energy web server Cat. Nos. 0 261 78/79 should be chosen for remote viewing via a web browser. The latter can also be chosen for a multi-site installation sharing the same intranet.

CONNECTION

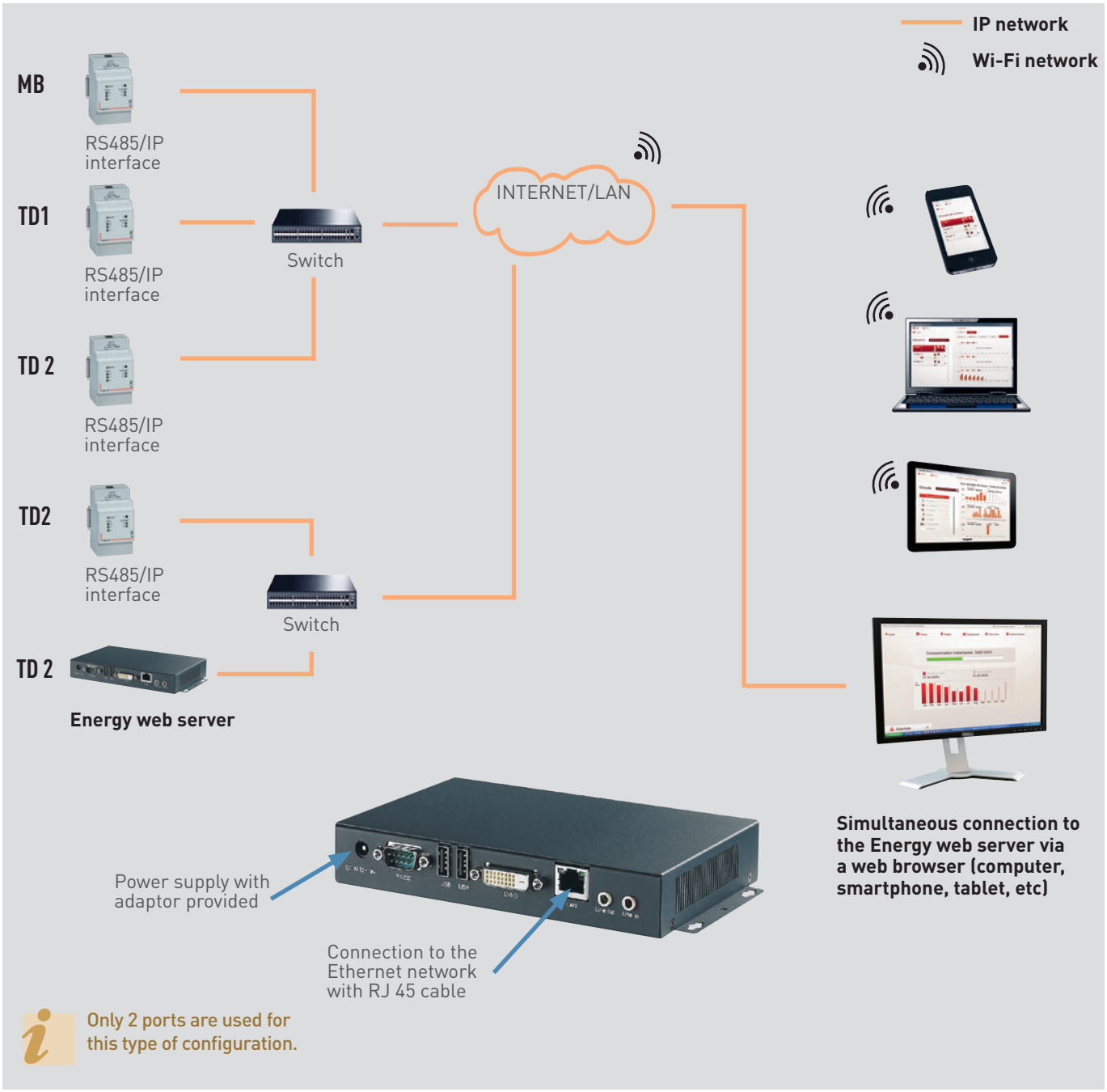
■ **measurement software EDMX³**



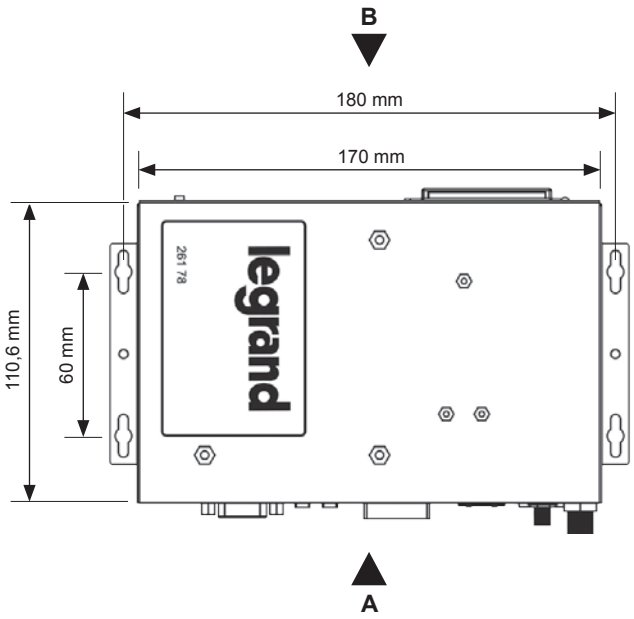
The computer on which the software is installed must be on permanently and the software must remain open.

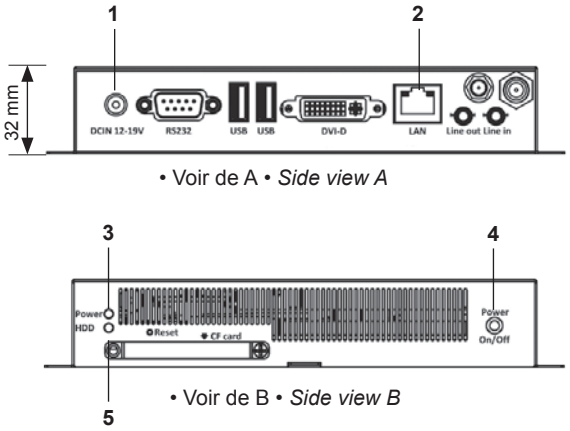
CONNECTION (CONTINUED)

■ **Energy web server**



ENERGY WEB SERVER DIMENSIONS





1. Connecteur pour alimentation
2. Connecteur RJ45
3. État du dispositif
4. Bouton d'allumage dispositif
5. Activité disque dur

1. Connector for power supply
2. RJ45 connector
3. Status device
4. Power On/Off button
5. Hard disk activity

PARAMETER SETTING

The Energy web server settings must be modified to ensure it is part of the same network IP as all the IT devices.

No parameters need to be set in the case of the EMDX³ measurement software, it just needs to be installed on a chosen station.

■ **Access to settings in the case of the Energy web server:**

The first time you log in, connect your computer directly to the Energy web server and change the server configuration (network settings, date, time, software update, etc). To do this, open your web browser and enter the Energy web server's default IP address (192.168.1.100); make sure you have changed your computer's static IP address first (for example 192.168.1.99).

Like any device connected on a local area network (intranet), access to the web server is secure during a remote connection (internet). To obtain this authorisation, you should ideally contact the network administrator who will do the necessary to open the ports and redirect them to the web server.

Changing a computer's IP address to automatic or static: help is available in the "Communication protocol → IP addressing" section.

Enter the default PIN then PUK administrator codes to access the menu.

PIN: 99999

PUK: 00000 9999 00000

Access to data is protected by 2 ID codes (PIN and PUK codes).
There are 4 types of predefined user: Administrator, Green Up, Installer, User.
Different access is offered depending on the ID selected.
It is possible to:
• add users
• change access codes

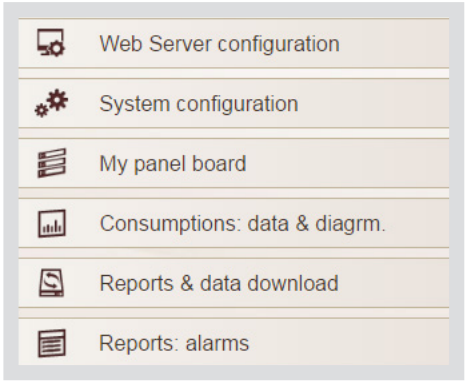
OVERVIEW OF MENUS

■ **"Home" menu:**

The display takes the form of 6 menus providing access to various sub-menus.

Access to the Energy Web Server settings

Access to the electrical values, status and control of devices.



Access to installation and configuration of measurement, status and control devices.

Access to downloading data and reports according to a selection list of devices and dates.

Access to the alarm reports for devices in the EMS CX³ system

■ **"Energy Web Server Setup" menu:**

Change user access as well as PIN and PUK codes

Change format of log files, language, name of Energy web server, etc

Install Energy web server updates

Change date and time

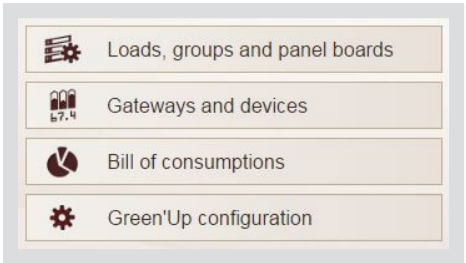
Change IP network settings

Back up and restore the database

■ **"Energy Web Server Setup" menu:**

Create panels, circuits and measurement zones

Change currencies and the cost of energy (price per kWh)



Add and change the IP converters and related measuring equipment

Configure management of GREEN UP electric vehicle charging stations

OVERVIEW OF MENUS (CONTINUED)

■ **"Devices" and "consumption" menu:**

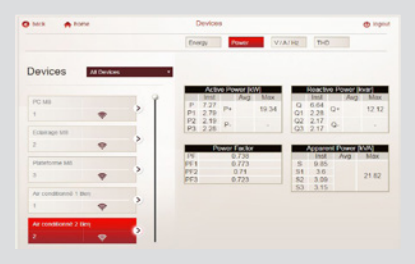
View data fed back directly by devices connected to the network

Devices

Consumptions

View of total and partial consumption

Power by device



Voltage, current, frequency by device

Harmonics by device

Total consumption

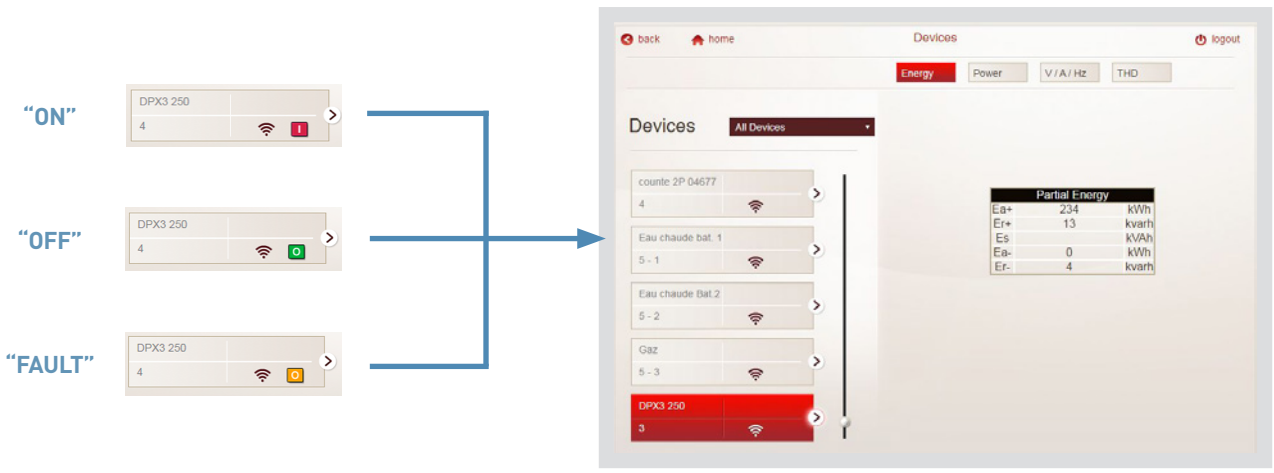
Partial consumption by circuit or zone

Partial consumption by device

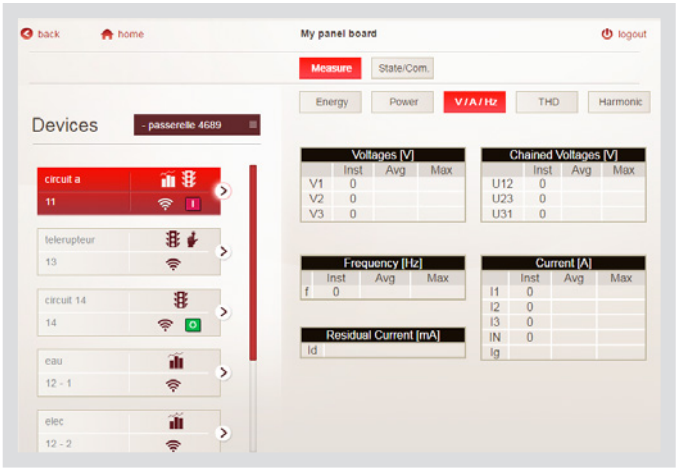
OVERVIEW OF MENUS (CONTINUED)

■ **Possibility of viewing the circuit breaker status:**

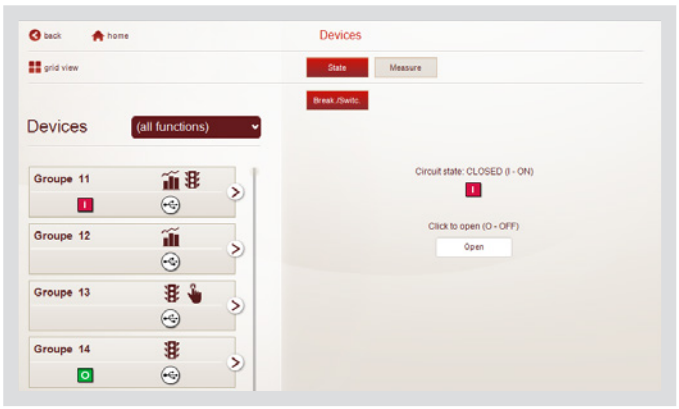
On the Energy web server and EMDX³ measurement software pages, communicating DMX³ and DPX³ circuit breakers indicate their status in real time.



■ **View of all available logos on each view**



■ **Viewing and remote control of EMS CX³ devices**



RETURNING THE ENERGY WEB SERVER TO FACTORY SETTINGS

If the saved IP address, PIN or PUK codes are lost, reverting to factory settings is possible:

- Power down the web server.
- Connect a screen and keyboard.
- Power up.
- Wait for the screen to settle on a list of options.
- Type in the code:
  - "3" to revert to IP address 192.168.1.100
  - "4" to revert to PIN and PUK factory code
- Confirm your choice with "Y".
- Wait for the screen to settle on the list of options again.
- The operation is complete.
- Power down the Energy web server.

HELP AND DEFINITION

METERING, MEASUREMENT, ETC

■ MID CERTIFICATION:

The MID (Measuring Instruments Directive) is a European directive from 2004. It applies to measuring equipment and systems with a view to charging out the electricity used.

In order to comply with this directive, **Legrand provides a range of MID meters.**

■ ACCURACY CLASS:

All measuring instruments must be characterised by an **accuracy class**. This gives the upper error limit due to the instrument alone, used in reference conditions.

A measuring instrument with an accuracy class of 0.5 is designed not to exceed 0.5% error of its highest indication when used in reference conditions. It is therefore very important to size the product correctly.

Accuracy classes are defined by very precise standards.
For example, measurement control units:

- IEC 62053-22 class 0.5S for active energy
- IEC 62053-23 class 2 for reactive energy

■ MEASURING CIRCUIT:

A measuring circuit takes account of all the components used to take the said measurement.
In this case we can consider, for example, a meter and the current transformer used.
These devices have a clearly defined accuracy class.
We should take account of all metering devices, in order to calculate the accuracy class to be taken into account in the final measurement result.
Calculating the accuracy class for 2 devices in combination [measuring instrument + current transformers]:

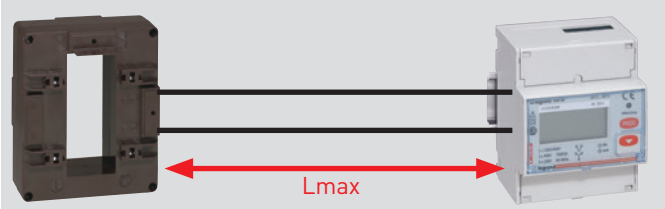
$$\text{Overall system uncertainty} = 1.15 \times \sqrt{(\text{PMD uncertainty of operation})^2 + \sum_{i=1}^{N} (\text{sensor uncertainty})^2}$$

Example:

- One class 1 three-phase meter
- Three class 1 current transformers
- Overall class = $1.15 \times \sqrt{1^2 + 3\,(1)^2} = 2.3\%$

■ CT/MEASURING INSTRUMENT CABLE LENGTH:

Here is the method for calculating the maximum length of the cable connecting the CT and the measuring instrument (meter, control unit, etc) in order to comply with the requested accuracy class.



Lmax = (Sr – Sinst) x k

Lmax Maximum length of connection wire (m).

Sr CT nominal load in the selected accuracy class (VA).

Sinst Device consumption, indicated on the CT nameplate (VA).

K Constant value as a function of the cable cross-section (see table) at an ambient temperature of 20°C.

Cu cable cross-section (mm²)	K
1	1
1.5	1.46
2.5	2.44
4	3.94
6	5.92

For each 10°C variation in the temperature, the maximum cable length Lmax must be reduced by 4%.

■ CURRENT DEFINITIONS:

The various publications available give different abbreviations for currents.
This is the definition:

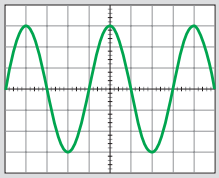
DISPLAY	PARAMETER
Ist starting current	Minimum current value at which the PMD* starts and continues to record (no accuracy)
Ib basic current	Current value according to which the performance of a PMD is set with a direct connection (PMD* Dx)
In nominal current	Current value according to which the performance of a PMD is set when operated by an external current sensor (PMD* Sx)
I min minimum current	Current at which the PMD ensures accuracy

*PMD: Performance measuring and monitoring device.

POWERS, ENERGY, POWER FACTOR CAPACITOR BANKS, ETC

■ ALTERNATING CURRENT:

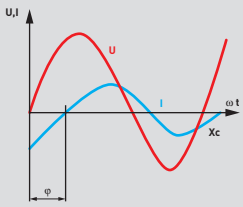
In an electrical installation, alternating current can be represented by a sine wave. Its frequency varies according to country (50 Hz in France, 60 Hz in the United States). Hence, in the case of France, there are 50 oscillations per second.



■ PHASE SHIFT:

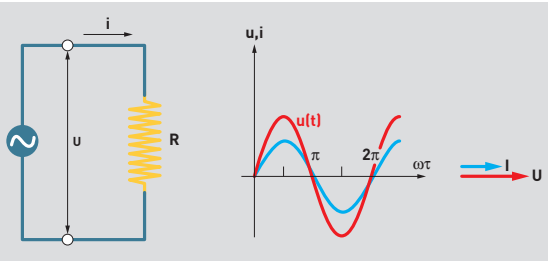
Depending on the type of electrical load (resistive, inductive, capacitive), phase shift occurs to a greater or lesser extent between the current and the voltage.

This phase shift is denoted "φ".



■ THE VARIOUS LOADS:

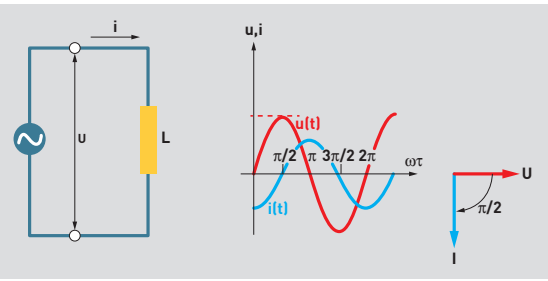
Resistive loads are made up of pure R resistances.
For this type of load, the current generated is always **in phase with the voltage.**



Inductive loads are made up of inductance, also called "inductive reactance".

They can be found in loads such as motor windings, fluorescent tube ballasts, etc.

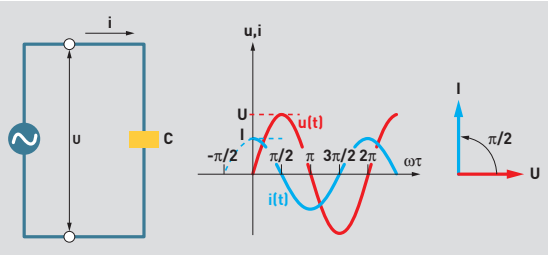
If we consider **a pure inductive load L,** the current generated always lags **behind the voltage phase by 90°.**



Capacitive loads are made up of capacitors, also called "capacitive reactance".

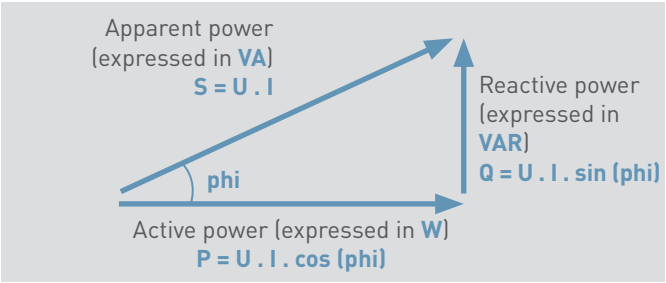
They can be considered as a reservoir of electrical loads.

If we consider **a pure capacitive load C**, the current generated always **leads the voltage phase by 90°.**



■ ACTIVE, REACTIVE AND APPARENT POWERS:

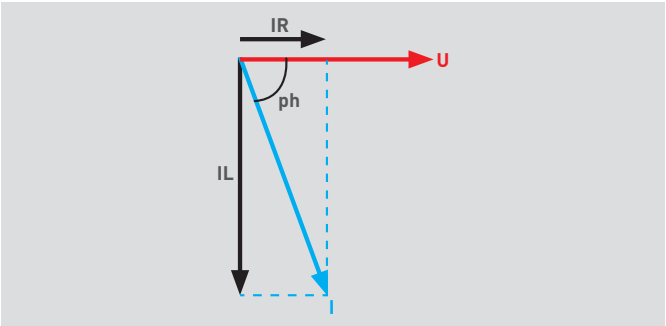
Electrical powers are made up as follows:



phi: voltage/current phase shift angle

Power factor: this corresponds to the **active power/apparent power ratio**, hence if we consider the current and the voltage to be totally sinusoidal without disturbance, it equals **PF = cos (phi).**

Active power: this is what causes, for example, a movement in the case of a motor, or release of heat in the case of a resistive load, and can be termed "useful" power. The unique property of active power is to make work. A load absorbs active power when the current is in phase with the current. Active power is expressed in watts (W).



IR: Purely resistive current component – in phase with the voltage.

IL: Purely inductive current component – 90° phase lag in relation to the voltage.

Reactive power: Strictly speaking this is not a power since no work can be gained from it as can happen with active power. Reactive power Q is defined by analogy to active power P.

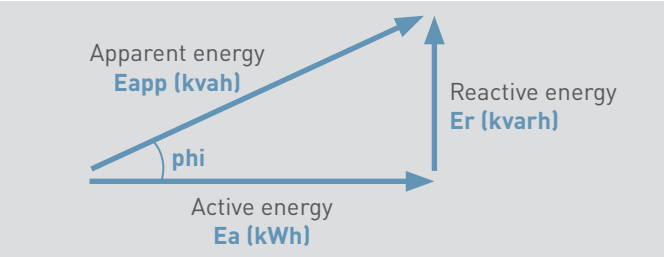
P = U . I . √3 . cos (phi)*
Q = U . I . √3 . sin (phi)*
* en réseau monophasé le √3 disparaît.

Purely resistive devices are the only ones which do not consume reactive energy. The advantage of reactive energy is that it can compensate for inductive loads.

Active energy: In physical terms, this represents the capacity of a system to produce work, which can result in a movement, light, heat or even electricity.
Energy is expressed in joules (international system of units), and often in kilowatts per hour (kWh).
Energy is therefore the consumption of a system producing work for one hour.
Active energy = Ea = consumption = active power x time

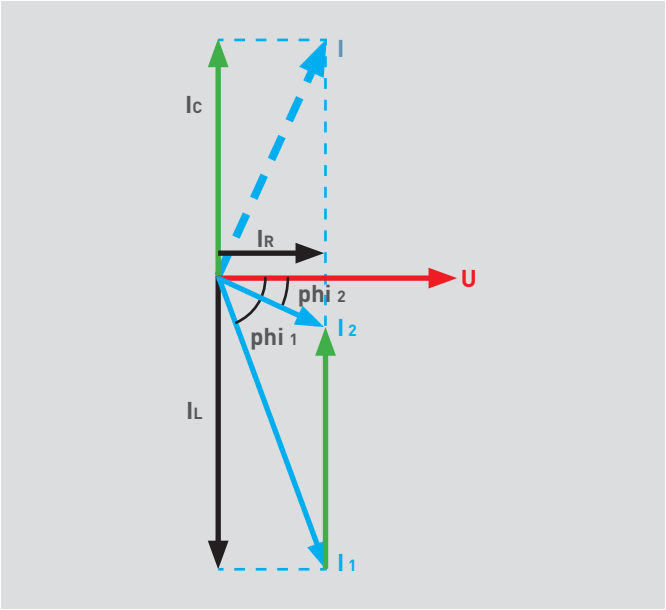
Reactive energy: This is used in particular in the windings of motors and transformers to create the magnetic field without which they would not be able to operate. It corresponds to the reactive power Q (kvar).
Energy is expressed in kilovar per hour (kVArh).
Unlike active energy, reactive energy is said to be "unproductive" for the user.
Reactive energy = Er = reactive power x time

Apparent energy: This is the resultant vector of active and reactive energy.



■ CAPACITOR BANKS:

Capacitors are **the main source of reactive power**, we therefore suggest you integrate capacitor banks on installations with high inductive loads.



IR: Current component purely **resistive - in phase with the voltage.**

IL: Current component purely **inductive - phase lags 90° behind the voltage.**

Ic: Current component purely **capacitive - phase leads the voltage by 90°.**

I1: Current **without** capacitor bank.

I2: Current **with** capacitor bank.

We can see that the capacitive current component is in opposition to the inductive current component, which allows **a lower current value.**

Correctly sizing the capacitor bank power can **reduce the energy consumed** by the installation and line losses.

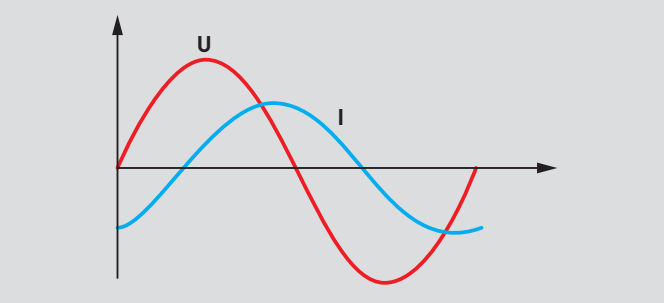
To define an energy compensation solution, please refer to the Alpes Technologies catalogue available on www.alpestechnologies.com.

■ HARMONICS:

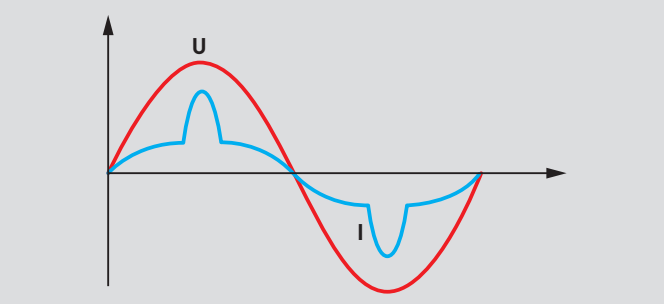
In recent years, the modernisation of industrial processes and the sophistication of electrical machines and equipment have led to major developments in power electronics.

These systems represent "non-linear" loads for electrical supplies.

Linear loads: A load is said to be "linear" if the current it consumes is sinusoidal when it is supplied with sinusoidal voltage.
This type of receiver does not generate harmonics.



Non-linear loads: A load is said to be "non-linear" if the current it consumes is not sinusoidal when it is supplied with sinusoidal voltage.
Non-linear loads distort the current and voltage electrical signals.
This type of receiver generates harmonic currents.



■ HARMONICS (CONTINUED):

Type of non-linear loads:

- Examples of single-phase loads:

Low-voltage or energy-saving bulbs, fluorescent tubes, high-frequency ballast, medical equipment, televisions, computers, printers, photocopiers, UPS, etc

- Examples of three-phase loads:

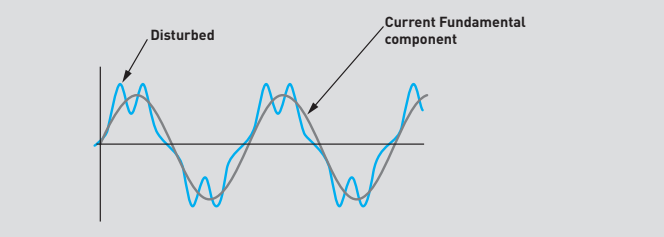
Variable speed drives for motors, rectifier (AC/DC converter), welding machine, arc furnace used in metallurgy, battery charger, PLC, UPS, etc

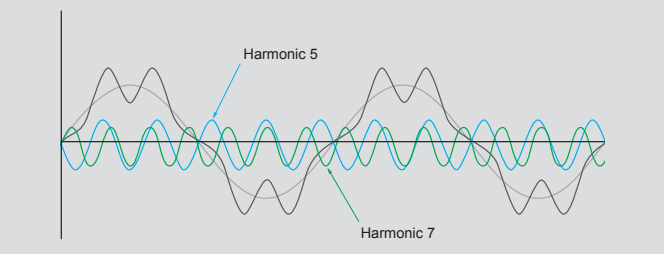
Harmonics: The Fourier decomposition (harmonic analysis) of the current consumption of a non-linear receiver shows:

- The fundamental, a sinusoidal term at the 50 Hz mains supply frequency
- The harmonics, sinusoidal terms whose frequencies are multiples of the fundamental frequency

Harmonic orders:

The Fundamental component corresponds to the frequency **50 Hz,** the **other components** are **multiples of 50 Hz.**





In the context of Fourier analysis of a periodic signal, n electric current consists of a sinusoidal signal at the mains supply frequency and the sum (usually infinite) of frequency sinusoidal signals n times the mains supply frequency.

■ Order 5: additional current of 250 Hz (5 x 50 Hz).

■ Order 7: additional current of 350 Hz (7 x 50 Hz).

- Etc.
- Order n: additional current of xxx Hz (n x 50 Hz)

■ HARMONICS (CONTINUED):

Harmonic effects:

- Immediate effects (losses through the Joule effect):
  - Deterioration of the power factor
  - Reduction in motor power
  - Cable, transformer, motor overloads
  - Increased motor noise
  - Recording error in the meters
  - Oversizing of the network capacity cables
  - Contactor malfunction
  - Disturbance of electronic systems
  - Etc
- Medium and long-term effects:
  - Reduction in motor, transformer life
  - Deterioration of the capacitor banks
  - Accelerated ageing of the insulation and dielectrics
  - Derating of transformers and motors
  - Etc

Solutions to harmonics:

In the case of a **mains supply with a high level of harmonic interference**, the user may be faced with a dual requirement:

- Compensating the reactive energy
- Reducing the harmonic distortion of the voltage to values that are acceptable and compatible with correct operation of most sensitive receivers (PLCs, industrial computers, capacitors, etc)

The solution is to install harmonic filters.

To determine these harmonic filters, please consult www.alpestechnologies.com, a brand in the LEGRAND group.

IT AND NETWORK TERMINOLOGY

■ IP ADDRESS:

An IP (Internet Protocol) address is **an identification number** which is assigned permanently (static IP address) or temporarily (automatic IP address) **to any device connected to a computer network** which uses internet communication protocol.
You can refer to the "Communication protocols, IP addressing" section at the end of this guide.

■ PROTOCOL:

A communication protocol is a specification of a number of rules designed to simplify communication between different components. It can be used to **communicate using the same language.**

■ INTERNET:

The Internet is an international computer network consisting of a set of public or private networks. It is accessible to the public. Communication via these networks is made possible by the standardisation of data transfer protocols.
The Internet is used to:

- **correspond by email**
- **access web pages and sites**
- **exchange files via FTP** (File Transfer Protocol)

■ INTRANET:

An intranet is a computer network which is only accessible to people **in the same organisation.** An **intranet** can be **local** in the case of a small structure (small firm or family network in the case of residential homes) but can also link several sites in the same entity (large firms).
An intranet can be used to publish company-specific **information to the workforce.**

■ EXTRANET:

An extranet is an extension of the information system of an **intranet** which authorises external access (often secured with a password). It can be used for a company and its subsidiaries.

■ FTP:

FTP (File Transfer Protocol) is a communication protocol used to transfer data via the internet between a number of computers. **An FTP server is software** which responds to requests from clients. It can be installed on a terminal (computer, web server, etc), and allows authorised users to read, copy, modify or delete files installed on the said FTP server.

■ WEB BROWSER:

A web browser is **IT software** which can be used to **look up and display web pages**, the most commonly-used being Internet Explorer, Firefox, Google Chrome, etc.

■ HTML PAGE:

HTML (Hyper Text Markup Language) is a computer language **which is used to create web pages.** It is used to **format the page contents.** As the name implies, it is a markup language. An HTML page is therefore a web page created using this language.

■ HTTP PROTOCOL:

HTTP (Hyper Text Transfer Protocol) is used to **transfer data over the internet in HTML format** between a client and an internet server.

■ TCP/IP PROTOCOL:

TCP/IP (Transmission Control Protocol/Internet Protocol) is a set of protocols for exchanging data over the internet. The TCP protocol handles **the transmission of information** from one computer to another over the internet. This data is divided into packets and sent on the network. The IP address **routes data packets**.

■ COMPUTER SERVER:

It is used to **store data**, and can be a simple desktop computer, a set of computer racks in a computer cabinet, or a set of computer racks in a fairly large room.

It **shares data in a network** (home, office or international) such as:

- The operator mailbox interface
- E-commerce
- Simple data storage
- Online games
- Etc

A computer server should be on and providing its services permanently, and must have an uninterruptible power supply.

■ WEB SERVER:

The web server is a **computer server connected to the internet.** It refers to both the physical device and the software. It is used to **publish data on intranets or on the internet.** It is less commonly called the HTTP server. It is often specialised according to the type of data provided.

■ HARDWARE:

Hardware is **all the IT equipment which makes up a computer**. Their role is to send, receive, store, or process data.

■ SOFTWARE:

Software is all the programs needed for the computer system to work correctly.

■ FIRMWARE:

Firmware is a **computer device's internal software**. It consists of a set of instructions and data to ensure it works correctly.

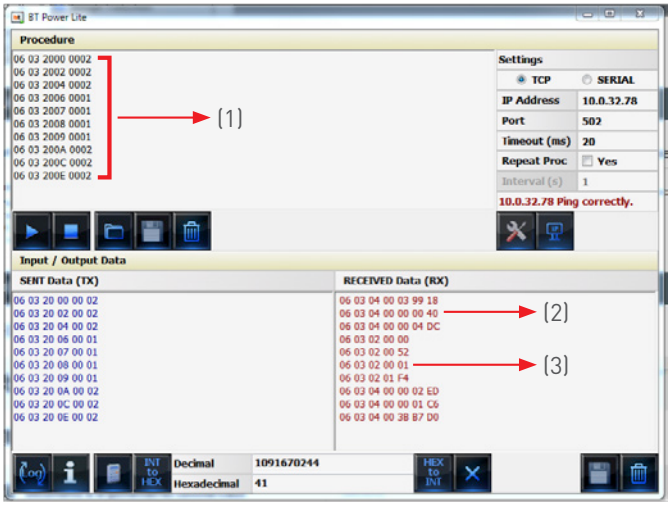
RS485 BUS

■ LINE TERMINATION RESISTOR:

The line termination resistor must be the same value as the line impedance. It can attenuate any disturbance on the cable. We recommend using the **Belden 9842 cable** with an impedance of 120 Ω, and a 120 Ω resistor should therefore be placed **at each end of the BUS**, between the signal "-" and "+".
It can be incorporated in the device (RS485/IP converter Cat. No. 0 046 89), or may or may not be supplied with the device.

■ MODBUS DIALOGUE FRAME:

• Send/receive a read request frame (for example meter 0 046 77):



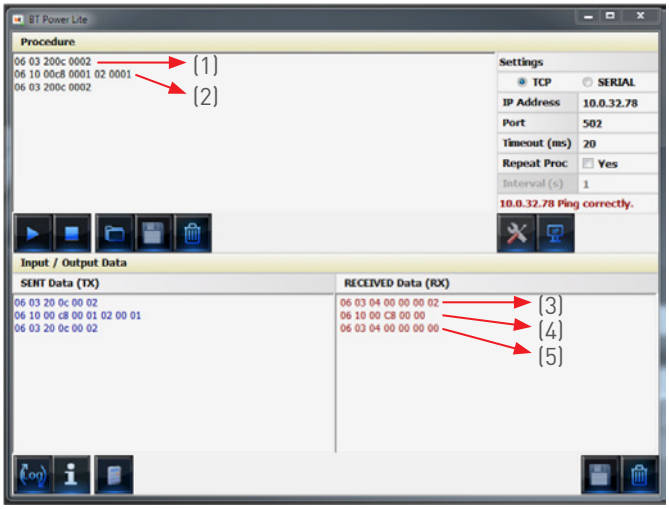
(1) A code read request **03 h** is sent from the **200x h** registers on **1** or **2** words, for the device at address **06 h**.

(2) Receipt of response from the device at address 06 h, a code read request **03 h**, response on **4 bytes** = 00 03 99 18 hexadecimal value and mV of the voltage value.
00 03 99 18 h = 235,800 decimal = 235,800 mV = 235.8 V.

(3) Receipt of response from the device at address **06 h**, a code read request **03 h**, response on **2 bytes** = 00 52 hexadecimal value of the power factor to be halved.
00 52 h = 82 in decimal = 0.82.

■ MODBUS DIALOGUE FRAME (CONTINUED):

• Send/receive a write request frame (for example meter 0 046 77):



(1) A code read request **03 h** is sent from the **200c h** registers (partial active energy) on **2** words, for the device at address **06 h**.

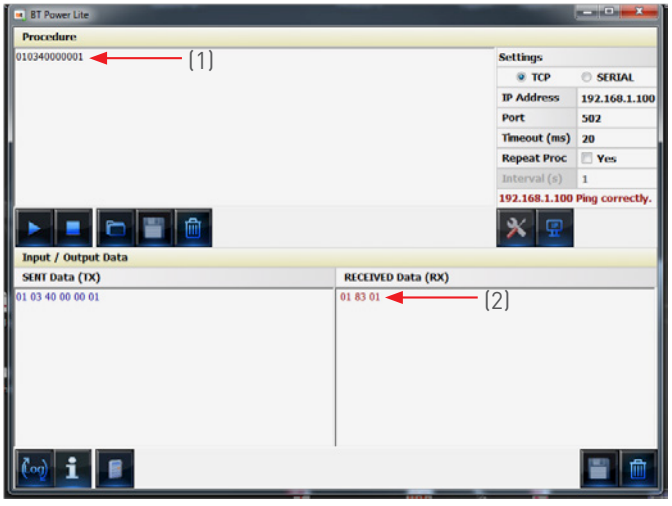
(2) A code write request **10 h** is sent from the **00c8 h** registers (bit-by-bit reset register) on **1** word, by writing the code **0001** corresponding to partial active energy reset, for the device at address **06 h**.

(3) Receipt of response from the device at address **06 h**, a code read request **03 h**, response on **4 bytes** = 00 00 00 02 hexadecimal value.

(4) Receipt of response from the device at address **06 h**, a code write request **10 h**, response on **2 bytes** = 00 00 acknowledging receipt.

(5) Receipt of response from the device at address **06 h**, a code read request **03 h**, response on **4 bytes** = 00 00 00 00 checking reset.

• Receipt of a frame in the event of a fault:



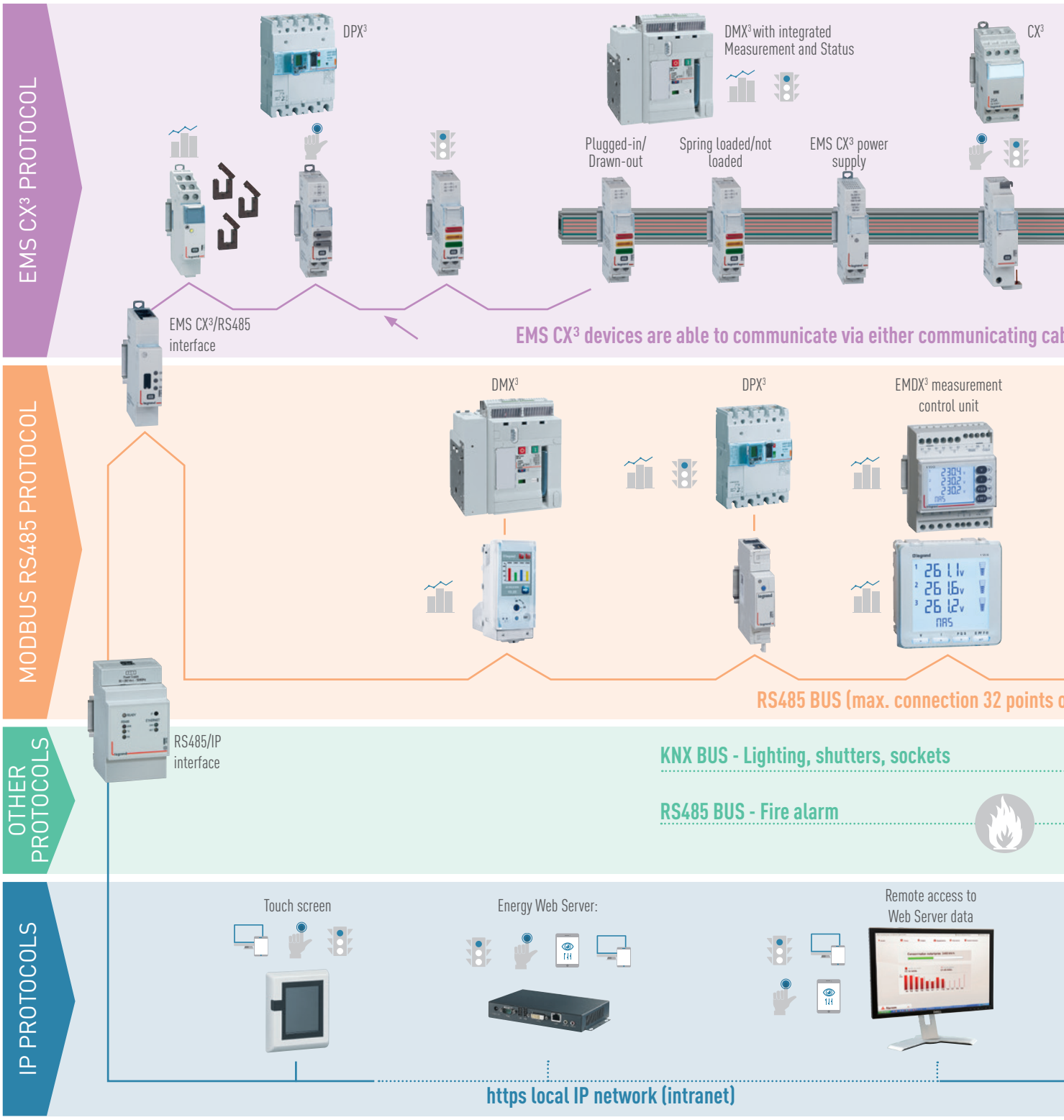
(1) A code read request **03 h** is sent from the **4000 h** register on **1** word, for the device at address **01 h**.

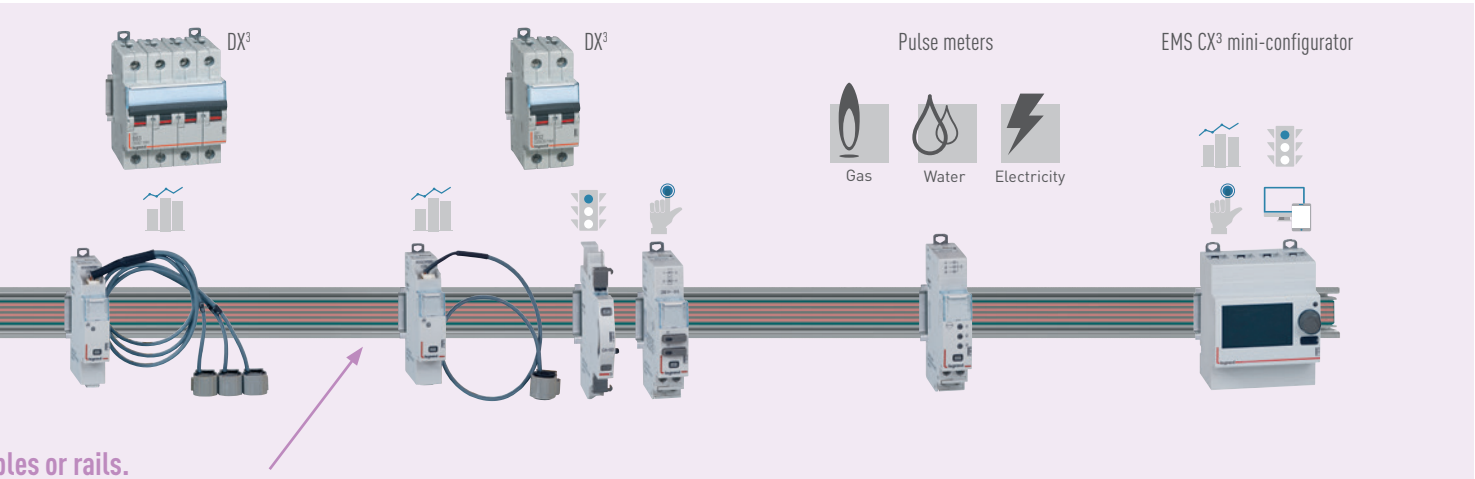
(2) Receipt of response from the device at address **01 h**, a code read request 03 h, response on **2 bytes** = 83 01 identifying a fault.
83 h = **80 h** (fault code) + **03 h** (after read request)
01 h = fault type, corresponding to a function not managed by the device.

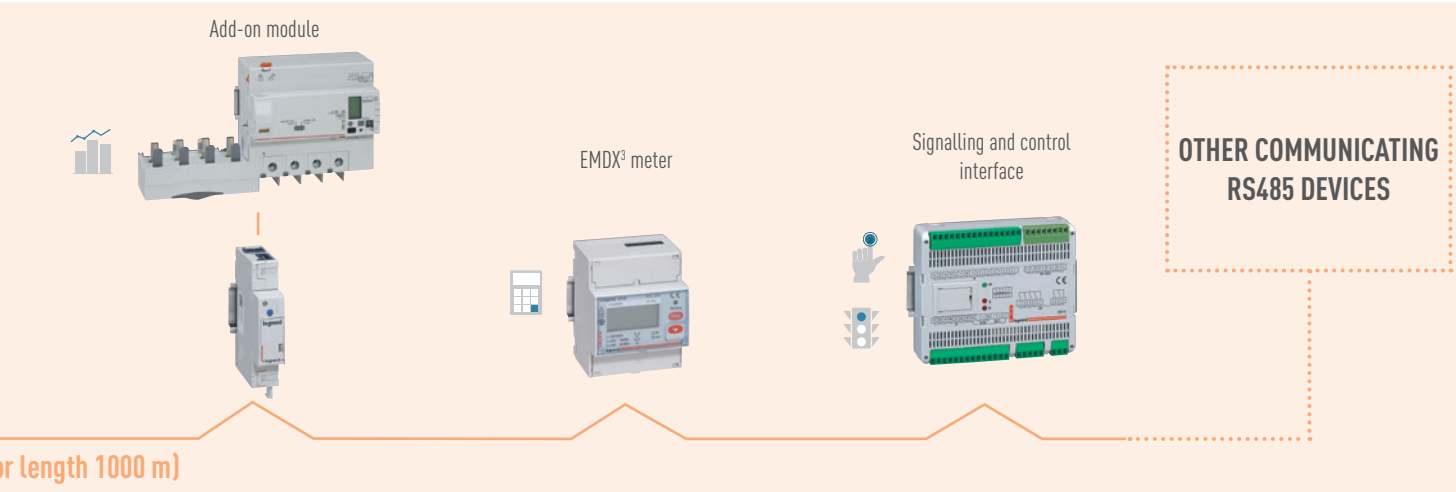
List of faults: "Communication protocols" section

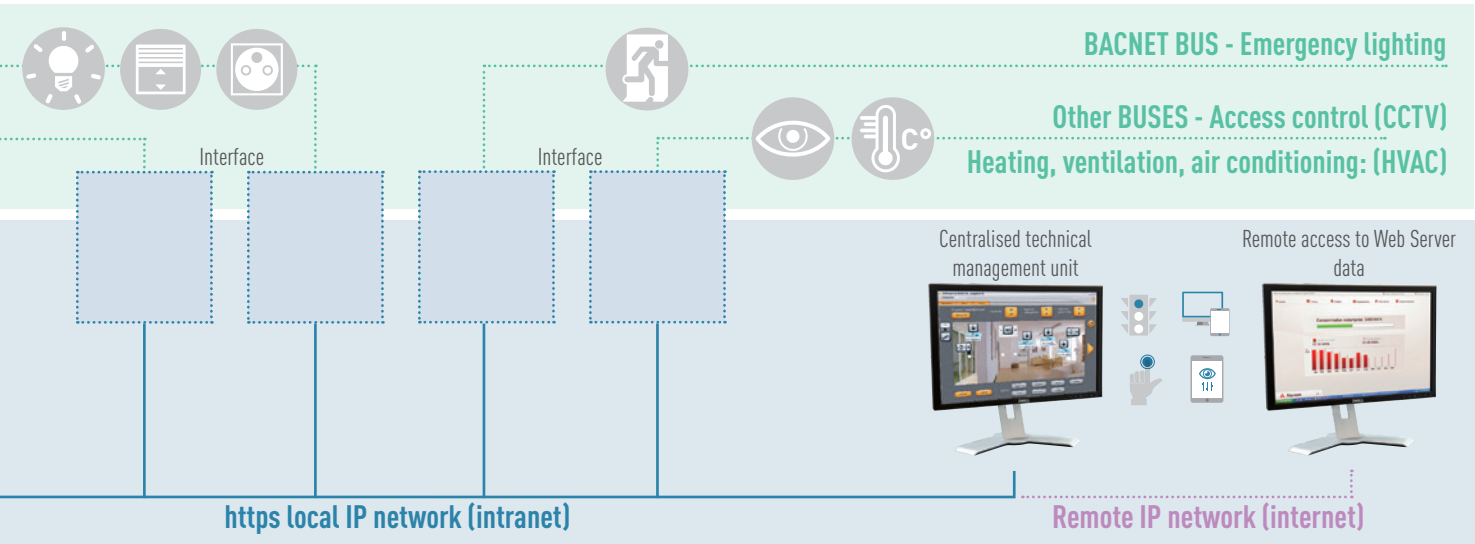
COMMUNICATION PROTOCOLS

GENERAL ARCHITECTURE (schematic diagram)




DX³
DX³
Pulse meters
Gas
Water
Electricity
EMS CX³ mini-configurator
les or rails.


Add-on module
EMDX³ meter
Signalling and control interface
OTHER COMMUNICATING RS485 DEVICES
r length 1000 m)


BACNET BUS - Emergency lighting
Other BUSES - Access control (CCTV)
Heating, ventilation, air conditioning: (HVAC)
Interface
Interface
Centralised technical management unit
Remote access to Web Server data
https local IP network (intranet)
Remote IP network (internet)

RS485-MODBUS NETWORKS

PRINCIPLE

The RS485-Modbus network is a communication network which allows measuring equipment to exchange various information with a computer or a PLC. This network is based on the master/slave principle.

Legrand metering devices operate in 8-bit Modbus RTU protocol.

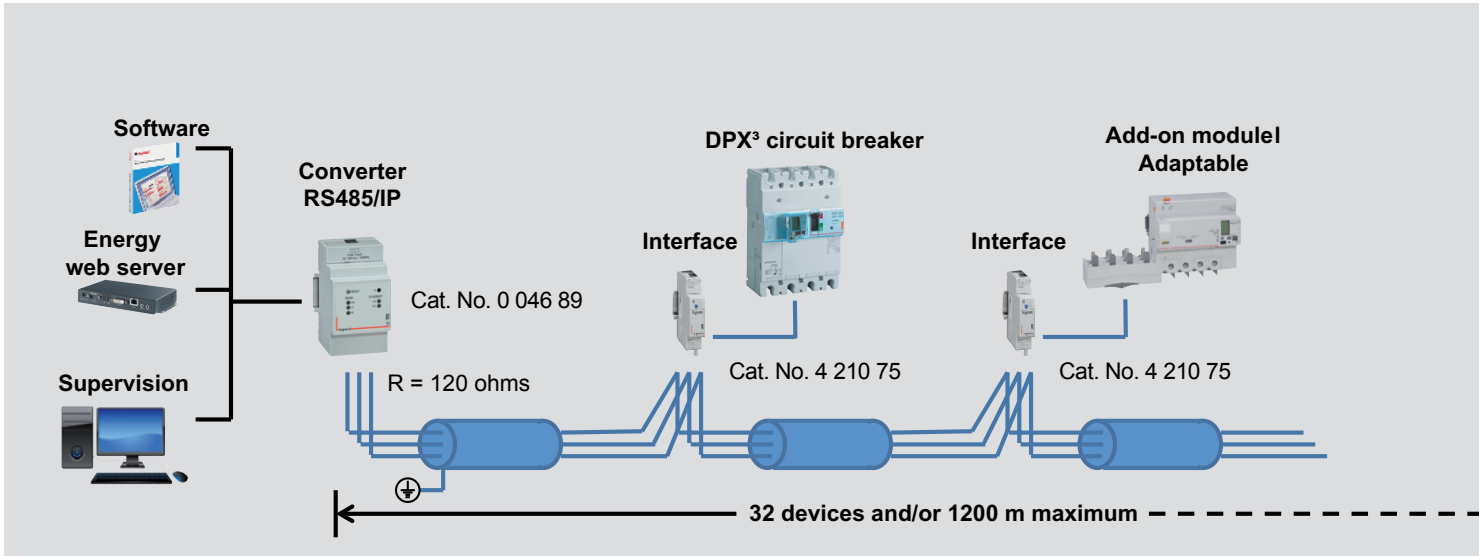
CONNECTION

To create a Modbus network, the various measuring devices with an output, or RS485 interface, must be connected in series (see diagram below).

For connection, Legrand recommends using a cable with 2 shielded twisted pairs (Belden 9842 or equivalent), with minimum cross-section of 0.20 mm² and impedance of 120 Ω.

To ensure equipotentiality of the shielding, only one end must be connected to earth.

A 120 Ω resistor (corresponding to the cable impedance) must be placed on each end of the BUS (first and last device) to prevent reflected signals.



PARAMETER SETTING

Four parameters are essential to ensure correct operation of a Modbus network:

- **MODBUS address:**

Each device must have a different Modbus address. Each meter, measurement control unit or interface must therefore be configured with a different address between 1 and 255.

- **Communication speed:**

The communication speed is the data transmission speed between master and slave in bps (bits per second). This must be identical for all devices connected to the same RS485 BUS.

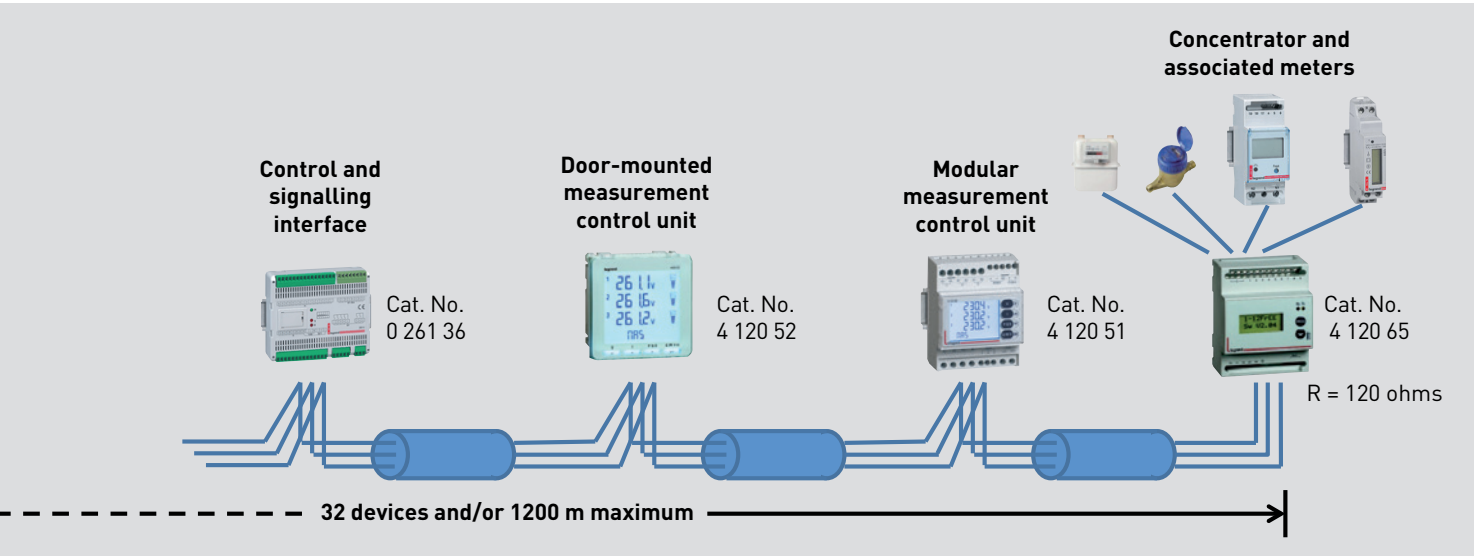
- **Parity bit:**

This improves the reliability of communication.
Legrand recommends setting no parity bit (none) because other more effective checking methods exist within the supervision system.

- **Stop bit:**

After transmission, the line is set to off for 1 or 2 clock periods depending on the chosen stop bit number.
Legrand has chosen to opt for 1 stop bit.

Refer to the "Communication protocols" sections for more information.



REMINDER ABOUT CODING SYSTEMS

DEFINITION

Nowadays, our computers, phones and other devices can manipulate not just numbers, text, but also images, videos and music.
How are these diverse objects from the real or virtual world represented?
What techniques are used to represent all these values digitally?

We will describe the 3 coding systems used in order to understand and use the various protocols: RS485, IP, etc.
As a general rule, coding is used to change from one type of data representation to another and more specifically in our case, to retranscribe the different information into computer language.

DECIMAL CODING SYSTEM

The **decimal system** (or **base 10**) represents numbers as sums to the power of ten, each power being assigned an integer coefficient between **"0 and 9"** inclusive.

Coding a decimal number						
Example of an integer N = **9548** where 0=← a =←9	Row x	Row 4	Row 3	Row 2	Row 1	Row 0
	...	...	Thousands	Hundreds	Tens	Ones
	0 x 10^{x}	0 x 10^{4}	**9** x 10^{3}	**5** x 10^{2}	**4** x 10^{x1}	**8** x 10^{0}
	a_5 x 10^{x}	a_4 x 10^{4}	a_3 x 10^{3}	a_2 x 10^{2}	a_1 x 10^{1}	a_0 x 10^{0}

We can therefore see that:
a number N = a_x x 10^{x} + a_{x-1} x 10^{x-1}..... + a_3 x 10^{3} + a_2 x 10^{2} + a_1 x10^{1} + a_0 x 10^{0}

BINARY CODING SYSTEM

The components which make up a computer system react internally to **digital** signals.
These 2 stable states are defined by the "**0**" and "**1**" symbols or "**L**" (low) and "**H**" (high).
The **binary system** (or **base 2**) only uses 2 states, the numbers "**0**" and "**1**".

Coding a binary number						
Row value Binary number = 1001 Decimal number = 8 + 1 = 9 where 0=← a =←9	Row x	Row 4	Row 3	Row 2	Row 1	Row 0
	...	16	8	4	2	1
	0 x 2^{x}	0 x 2^{4}	**1** x 2^{3}	**0** x 2^{2}	**0** x 2^{1}	**1** x 2^{0}
	0	0	**8**	**0**	**0**	**1**
	a_5 x 2^{x}	a_4 x 2^{4}	a_3 x 2^{3}	a_2 x 2^{2}	a_1 x 2^{1}	a_0 x 2^{0}

We can therefore see that:
a number N = a_x x 2^{x} + a_{x-1} x 2^{x-1}..... + a_3 x 2^{3} + a_2 x 2^{2} + a_1 x 2^{1} + a_0 x 2^{0}

BINARY CODING SYSTEM (continued)

This unit for coding information in the binary system is called a "**Bit**" (contraction of Binary Digit).
Elementary information (bits) is manipulated in groups, thus forming binary words.
These words are usually a multiple of $8 = 2^3$.

The transfer unit used to exchange data is the **byte = 8 bits**.
For larger exchanges, the following names are used:
1 byte = 8 bits
2 bytes = a word = 16 bits
4 bytes = a long word = 32 bits
8 bytes = a double long word = 64 bits

In a binary **word**, the bit furthest to the left is the most significant bit **MSB** and the one furthest to the right is the least significant bit **LSB**.

Example:

MSB															LSB
0	0	0	0	1	0	1	0	0	1	0	1	0	0	1	1
Most significant byte								Least significant byte							
0 x 2^{15}	**0** x 2^{14}	**0** x 2^{13}	**0** x 2^{12}	**1** x 2^{11}	**0** x 2^{10}	**1** x 2^{9}	**0** x 2^{8}	**0** x 2^{7}	**1** x 2^{6}	**0** x 2^{5}	**1** x 2^{4}	**0** x 2^{3}	**0** x 2^{2}	**1** x 2^{1}	**1** x 2^{0}
32768	16384	8192	4098	2048	1024	512	256	128	64	32	16	8	4	2	1
				2048		512			64		16			2	1
2048 + 512 + 64 + 16 + 2 + 1 = 2643 in decimal															
Word (16 bits)															

Hence: 0000 1010 0101 0011 binary = 2643 decimal

HEXADECIMAL CODING SYSTEM

The **hexadecimal system** (or **base 16**) uses 16 symbols, numbers from "**0 to 9**" and letters from "**A to F**". This coding system is a compromise between machine binary coding and the numbering used by people. In fact each hexadecimal digit corresponds to exactly 4 binary digits (or bits), making it more compact to write.
Hexadecimal coding is frequently indicated by an "h" after the datum, for example: 4F67h.

Coding a hexadecimal number						
Row value Hexadecimal number = A30F Decimal number = 40960 + 768 + 15 = 41743 where 0=← a =←F	Row x	Row 4	Row 3	Row 2	Row 1	Row 0
	.....	65536	4096	256	16	1
	0 x 16^{x}	0 x 16^{4}	**A** x 16^{3}	**3** x 16^{2}	**0** x 16^{1}	**F** x 16^{0}
	0	0	**40960**	**768**	**0**	**15**
	a_5 x 16^{x}	a_4 x 16^{4}	a_3 x 16^{3}	a_2 x 16^{2}	a_1 x 16^{1}	a_0 x 16^{0}

We can therefore see that:
a number N = a_x x 16^{x} + a_{x-1} x 16^{x-1}..... + a_3 x 16^{3} + a_2 x 16^{2} + a_1 x 16^{1} + a_0 x 16^{0}

HEXADECIMAL CODING SYSTEM (continued)

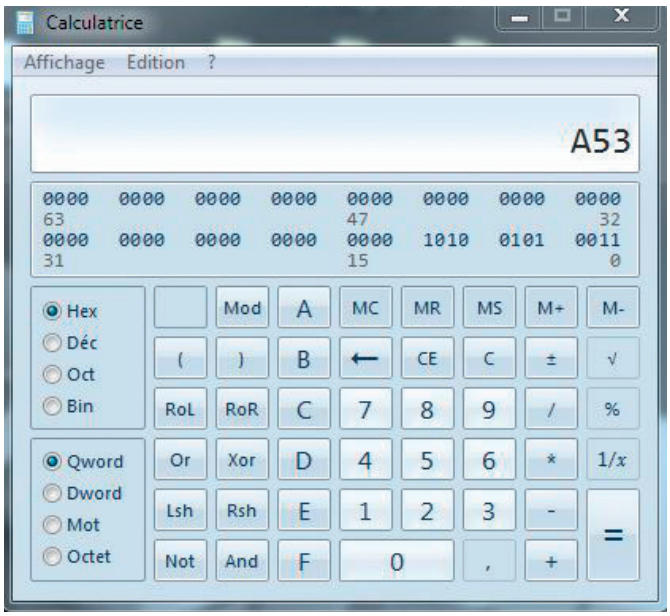
Example:

MSB															LSB
0	0	0	0	1	0	1	0	0	1	0	1	0	0	1	1
Most significant byte								Least significant byte							
0 x 2^3	**0** x 2^2	**0** x 2^1	0 x 2^0	1 x 2^3	**0** x 2^2	**1** x 2^1	**0** x 2^0	**0** x 2^3	**1** x 2^2	**0** x 2^1	**1** x 2^0	**0** x 2^3	**0** x 2^2	**1** x 2^1	**1** x 2^0
0 decimal				10 decimal				5 decimal				3 decimal			
0 hexadecimal				A hexadecimal				5 hexadecimal				3 hexadecimal			
2643 decimal = 0A53 hexadecimal = 0000 1010 0101 0011 binary															
Word (16 bits)															

CONVERSION FROM ONE CODE TO ANOTHER

Decimal	Hexadecimal	Binary
0	0	0000
1	1	0001
2	2	0010
3	3	0011
4	4	0100
5	5	0101
6	6	0110
7	7	0111
8	8	1000
9	9	1001
10	A	1010
11	B	1011
12	C	1100
13	D	1101
14	E	1110
15	F	1111

The conversion can be calculated mathematically, but it is easier to use an app such as the calculator included on any electronic device.



UNSIGNED AND SIGNED REGISTERS

For ease of understanding and to make it easier to convert certain data, we need to talk about **signed** or **unsigned** registers.

If we think about natural numbers, the lowest value is "0" value and the highest value is given by the formula 2(exponent n-1), where n = number of bits used.
For example, a byte (8 bits), can contain integer values between 0 and 255, and a word (16 bits) values between 0 and 65,535, etc.

It should be possible to propose integer numbers. Here is the simplified principle used to indicate whether the number indicated is positive or negative:

You should always indicate whether the register is signed or unsigned:
- unsigned = the number does not have a sign, it is a natural number
- signed = the number can be positive or negative, it is an integer number

■ **Interpretation of a signed register by an example:**

For an active power value, the response to a request gives the value of **FF FF FF ED** of a signed register.

This register is **signed** type, so care must be taken when interpreting the read operation.

To determine the negative data value correctly, proceed as follows:

1 - Convert it to binary format:	1111 1111 1111 1111 1111 1111 1110 1101
2 - One's complement: (replace all the 1s with 0s and the 0s with 1s)	0000 0000 0000 0000 0000 0000 0001 0010
3 - Two's complement with the result: (add 1)	0000 0000 0000 0000 0000 0000 0001 0011

This result corresponds to the negative value which is: "**-19**" x scale 0.01 = **- 0.19** kW.

If a negative value is displayed on an EMDX³ device which is not consistent with the installation, you need to open the cabinet and check the CT wiring (do this with the mains power off or at least the CT off-load).
Then check whether the value in the register is definitely positive.

RS485 MODBUS

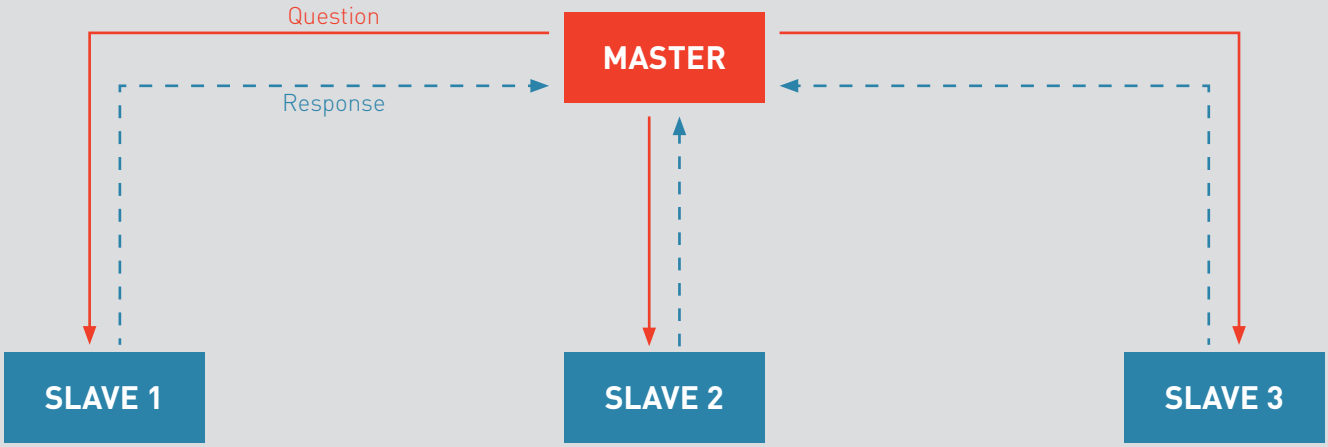
DEFINITION

A communication protocol is a specification of a number of rules used for communication within computer networks and communications.
It is established to simplify communication between different components and allow communication with a single language.

Communication consists of sending data between various parties. In order to communicate, they need to speak the same language and also handle the minimum rules for transmission and receipt of data.

Modbus is a non-proprietary communication protocol, created by Modicon in 1979, based on a hierarchical structure between a master and a number of slaves.

BASIC PRINCIPLE

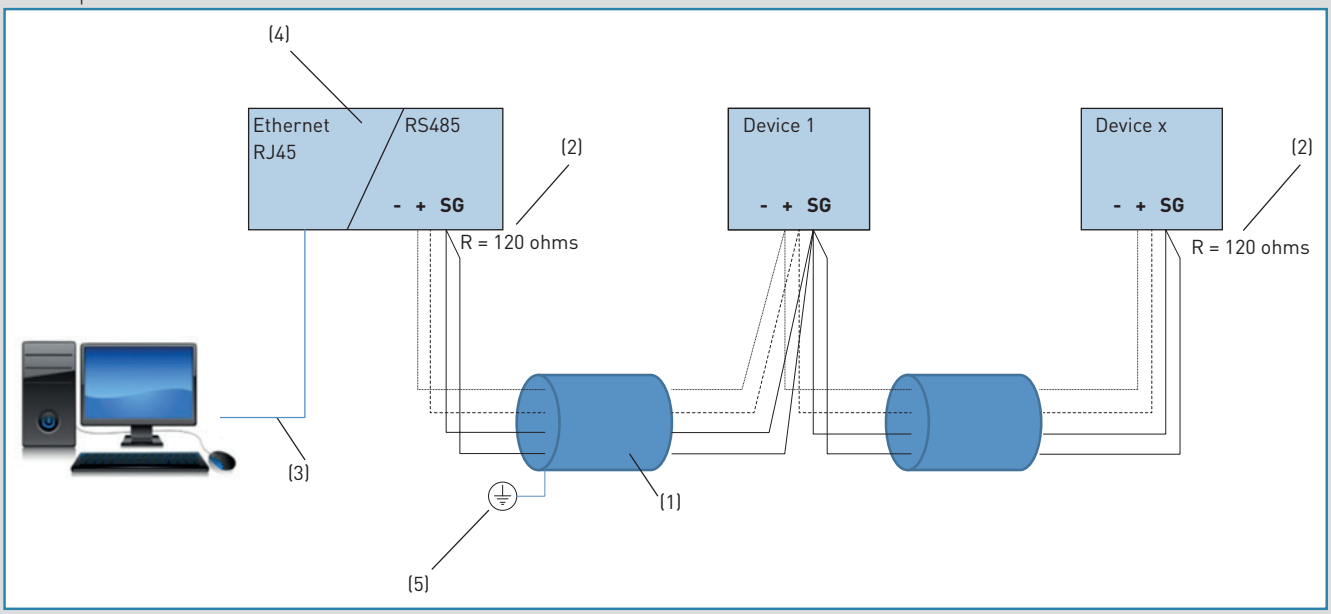


Some important rules to remember:

- Master/slave communication principle.
- The master talks to a slave and waits for its response.
- The master talks to all the slaves, without waiting for a response before broadcasting generally.
- Only one device can transmit on the line at any one time.
- Two slaves cannot talk at the same time.
- No slave can send a message without having had a request from the master.
- Dialogue between slaves is not possible.
- The address of each element is independent of its physical location.
- No two elements can have the same address.
- Master/slave dialogue can be drawn in a diagram as successive point-to-point links.
- Etc.

SCHEMATIC DIAGRAM

A multipoint connection is used to link master and slaves:



(1) RS485 BUS cable
(2) Line termination resistor at each end
(3) Ethernet cable
(4) Ethernet/RS485 interface
(5) Shielding connected to earth at a single point

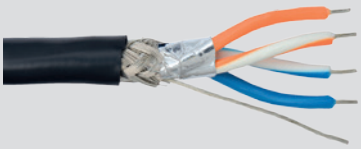
INSTALLATION CONDITIONS

• 32 devices maximum on the same line, thereafter add commercially-available RS485 signal repeaters, up to 247 devices for each line. **(1)**

• Maximum length 1000 m with BELDEN 9842 cable (cable with 2 twisted shielded pairs impedance 120 Ω) or BELDEN 3106A (cable with 2 twisted shielded pair, + 1.22 AWG, impedance 120 Ω) or equivalent.

We recommend implementing RS485 serial wiring, using the first pair for the signal (the cable is polarised) and the second pair for connecting the SG (Signal Ground). **(1)**

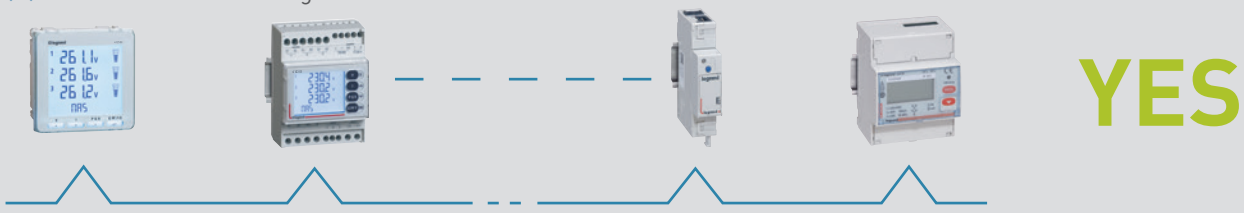
• Wiring devices in series. **(2)**



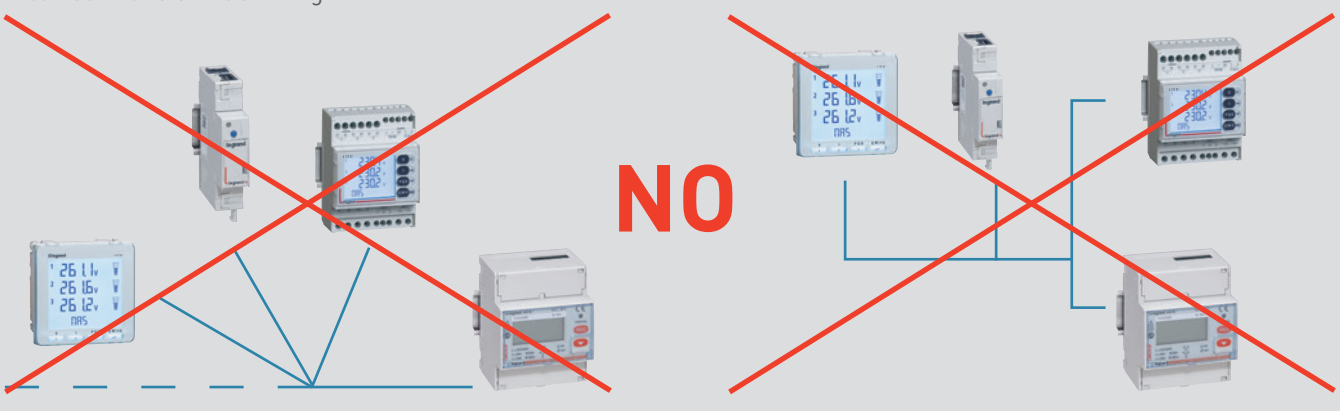
(1) The limits per line are 32 devices or 1000 m.
The signal repeater is used if the installation contains:
- less than 1000 m of line but more than 32 devices
- up to 32 devices but more than 1000 m of line
- more than 1000 m of line and more than 32 devices

The 1000 m of line or 32 devices are calculated:
- between the converter and the last device
- between the converter and the next signal repeater
- between 2 signal repeaters
- between the last signal repeater and the last device

(2) Correct serial BUS wiring:



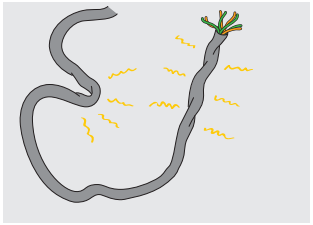
Incorrect T or star BUS wiring:



PRACTICAL ADVICE FOR WIRING THE BUS

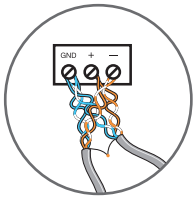
At the design stage:
- Opt for limited distribution on a number of branches, in order to speed up data transfer, simplify maintenance and minimise malfunctions.
- Don't assign the same address to 2 devices on the same RS485 line.

When installing the BUS cables, avoid making tight bends, and don't twist the cables.

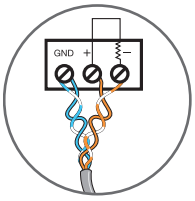


Avoid twisting or untwisting the BUS cable any more than necessary.

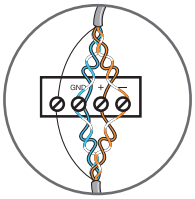
Connect the shielding to ground at a single point.



Make sure the polarity is correct and maintain the shielding continuity.



Insert a 120 Ω resistor at the start and end of the line.



USE

■ **Interpreting a Modbus addressing table:**

Register number	Register address (Dec)	Register address (Hex)	Dimension (word)	Bit position	Description
51079	51078	C786	2		Max/avg P+
51081	51080	C788	2		Max/avg P-
51083	51082	C78A	2		Max/avg Q+
51085	51084	C78C	2		Max/avg Q-
51087	051086	C78E	2		Max/avg S
51281	51280	C850	30		Measure - Metrology Not Affected by current and voltage transformers
51281	51280	C850	1		Hour meter
51282	51281	C851	1		Phase to Phase Voltage: U12
51283	51282	C852	1		Phase to Phase Voltage: U23
51284	51283	C853	1		Phase to Phase Voltage: U31
51285	51284	C854	1		Simple Voltage: V1
51286	51285	C855	1		Simple Voltage: V2
51287	51286	C856	1		Simple Voltage: V3
51288	51287	C857	1		Frequency: F
51289	51288	C858	1		Current: I1
51290	51289	C859	1		Current: I2
51291	51290	C85A	1		Current: I3

Dimension (word): indicates the data size and number of words used. The unit is the word (= 2 bytes = 16 bits). A register corresponds to one word. In some cases, there is a large amount of data to be processed and it is therefore necessary to use several registers. See "Reminder about coding systems" section.

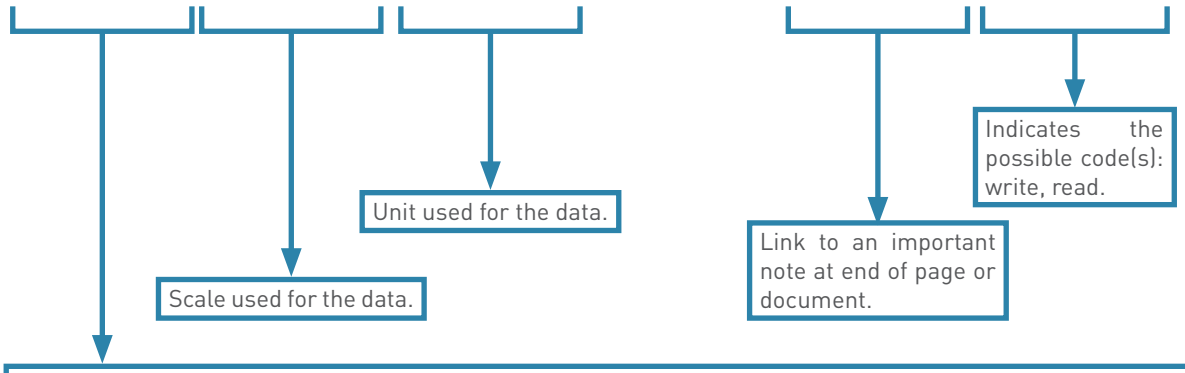
Description: description of data transmitted in the register(s).

A register is a memory location (a box) which is used to store data:
- Register Number: register sequence number
- Register Address (dec): the address, as a decimal value, where the said register is stored
- Register Address (hex): the address, as a hexadecimal value, where the said register is stored

There is a difference in unit between the register sequence number and its address: the sequence number of all registers starts with 1 whereas the address of all initial registers is 0. Whenever working on the registers, use the address, not the sequence number.

The Energy web server manages the data registers automatically

Type	Scale	Unit	Range	Note	Read Function Code (Dec)	Data Storing (2)
Unsigned long	0.01	kW		NOTE1	3	
Unsigned long	0.01	kW		NOTE1	3	
Unsigned long	0.01	kvar		NOTE1	3	
Unsigned long	0.01	kvar		NOTE1	3	
Unsigned long	0.01	kVA		NOTE1	3	
Unsigned word	1	h		NOTE1	3	
Unsigned word	0.01	V		NOTE1	3	
Unsigned word	0.01	V		NOTE1	3	
Unsigned word	0.01	V		NOTE1	3	
Unsigned word	0.01	V		NOTE1	3	
Unsigned word	0.01	V		NOTE1	3	
Unsigned word	0.01	Hz		NOTE1	3	
Unsigned word	1	mA		NOTE1	3	
Unsigned word	1	mA		NOTE1	3	
Unsigned word	1	mA		NOTE1	3	
Unsigned word	1	mA		NOTE1	3	



Type of data transmitted. This datum indicates what the information consists of. For example: integer, number with decimal places, signed or unsigned (with a + or - sign).
- unsigned long: a long word without a sign
- unsigned word: a word without a sign
- signed long: a long word with a sign
- signed word: a word with a sign

In the case of signed data, the automation systems engineer will easily recognise the sign. If not, the easiest thing to do is to use a calculator for coding.

PROTOCOL STRUCTURE

■ **Modbus protocol explained**

Modbus protocol is a set of rules used to define the dialogue frames between a master and slaves.

The master sends a request and waits for a response.

All devices communicating on the same BUS should have the same communication settings.

■ **Addressing**

Each device communicating on the same BUS is identified by a user-defined address.

Its address is independent of its location on the BUS.

The addresses can range from 1 to 247 and do not necessarily need to be assigned sequentially.

Two devices communicating on the same BUS cannot have the same address.

■ **Possible message frames**

2 types of transmission are possible:

• RTU mode, in which data is transmitted on 8 bits

• ASCII mode, in which data is on 7 bits, the frames are therefore visible in hexadecimal and need two characters to represent one byte. This mode is very rarely used.

■ **The communication settings must be common to all parties**

• Device address: from 1 to 247

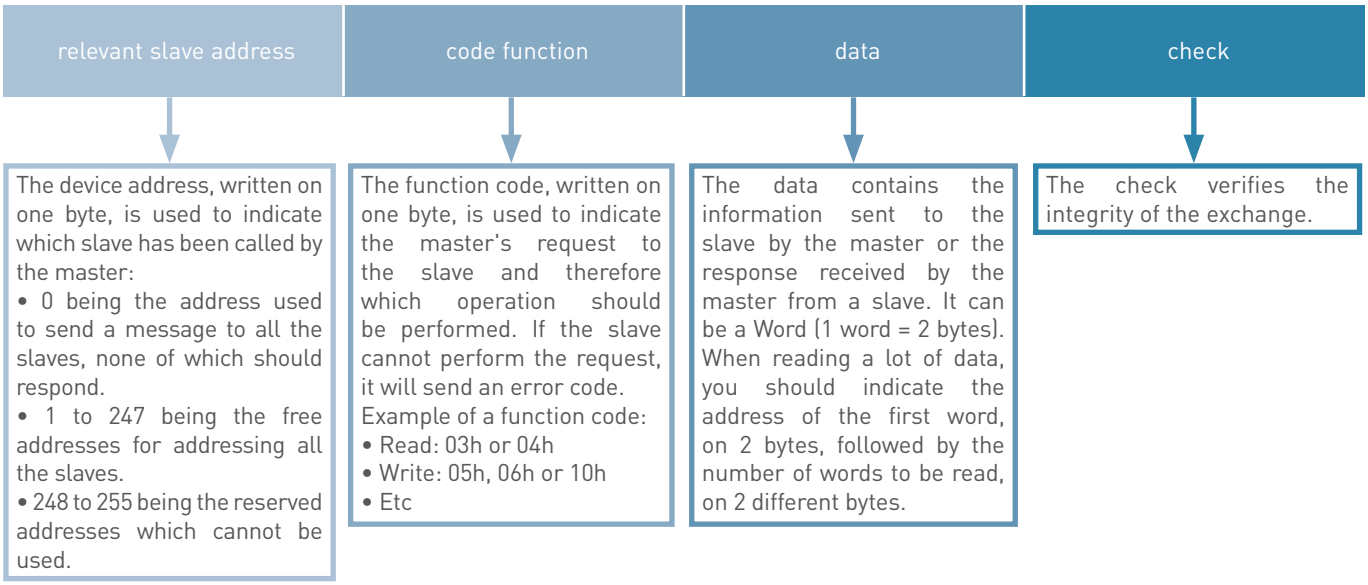
• Frame transmission speed:
1.2 - 2.4 - 4.8 - 9.6 - 19.2 - 38.4 kbps

• Transmission mode: RTU or ASCII

• Stop bit: 1, 2

• Parity: even, odd, none

FRAME STRUCTURE IN MODBUS PROTOCOL



PROTOCOLS
COMMUNICATION

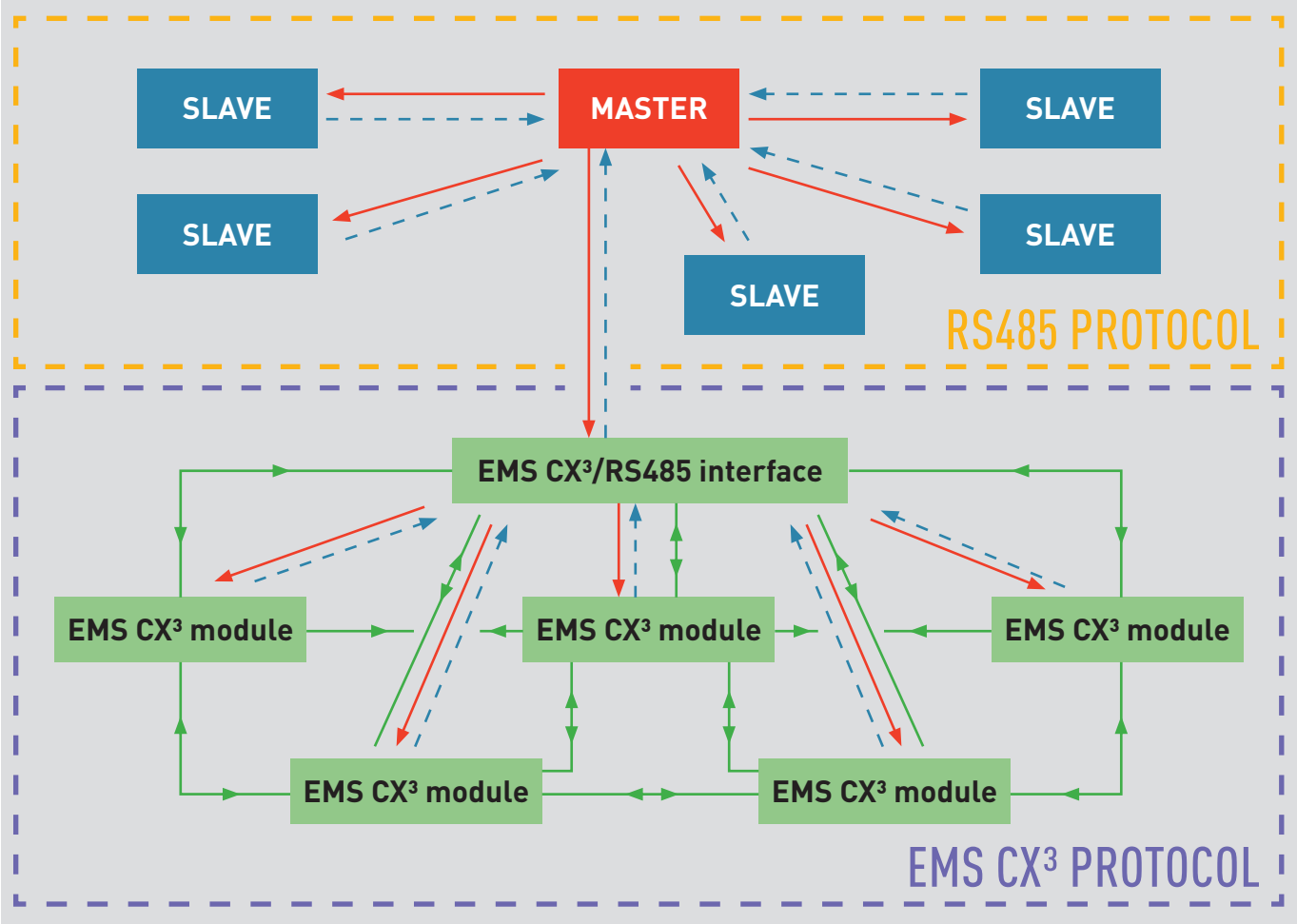
EMS CX³ SYSTEM

DEFINITION

The general definition of a communication protocol is given in the previous section "MODBUS RS485".

EMS CX³ is a proprietary communication protocol which remains "open", thus allowing it be integrated in a Modbus protocol by means of an EMS CX³/RS485 interface.

BASIC PRINCIPLE



Question / **Answer** — The master talks to a slave and waits for an answer or the master talks to all the slaves, without waiting for an answer, for general broadcast.

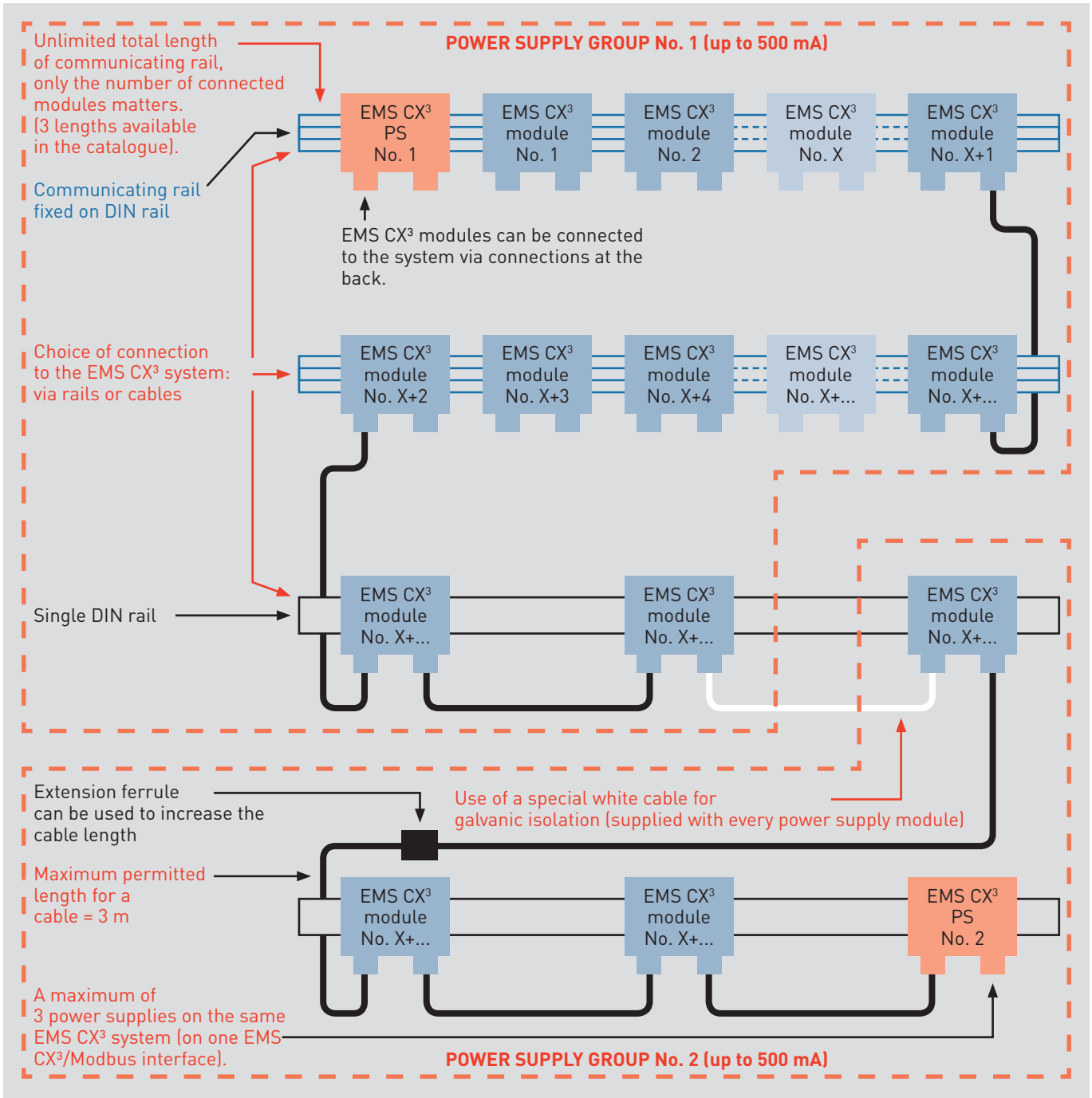
Dialogue between EMS CX³ modules — EMS CX³ modules can talk to one another.

A FEW IMPORTANT RULES TO REMEMBER

- For communication with MODBUS RS485 devices and EMS CX³ devices, the rules are identical to the principle of the MODBUS protocol (more details in the "Modbus RS485" section).
- For communication between 2 EMS CX³ devices:
  - 2 EMS CX³ modules can talk to one another.
  - 1 EMS CX³ module can send a common message to several EMS CX³ modules.
  - The address for each EMS CX³ module EMS CX³ is independent of its physical location.
  . Several EMS CX³ modules can only have the same address if they have different functions.
  - Etc.

* The Legrand EMS CX³ system can be integrated in a MODBUS RS485 bus using one or more EMS CX³/RS 485 interfaces. These interfaces are then deemed to be "physical slaves" by the MODBUS system. Remember, an RS485 bus can take up to 32 physical slaves.

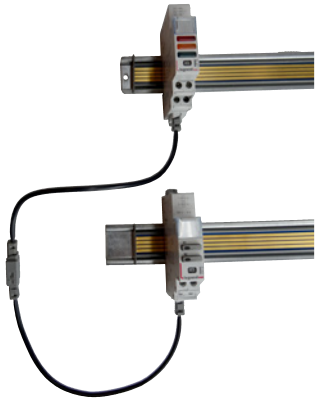
SCHEMATIC DIAGRAM



INSTALLATION CONDITIONS

- EMS CX³ bus continuity provided by communicating rail or cables.

- Maximum cable length: 3 m.



- Every EMS CX³ communicating module can be connected to the system by either: a rail via connection at the back or cables via the dedicated connection terminals downstream.

The EMS CX³ bus is intended for use inside the enclosure, then the RS485 and IP networks should take over to transfer data from one enclosure to another (TGS BCXT,³TD, cabinet, enclosure, etc).

- System limit differs according to the programming selected:

Local.

By software.

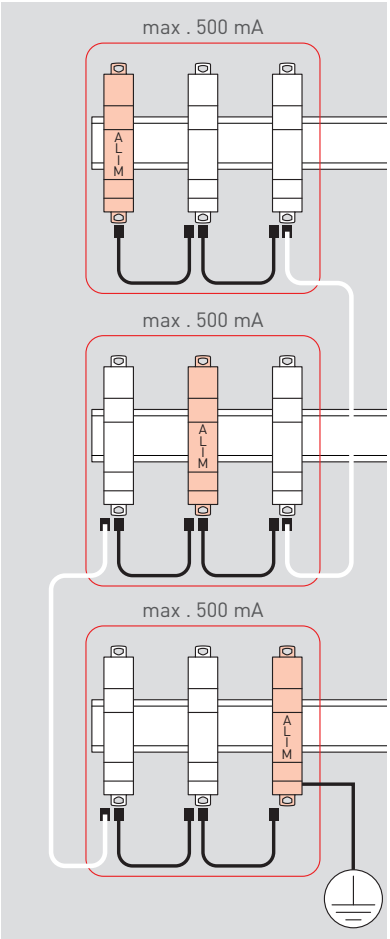
Details of limits can be found in the Addressing section.

At the back of the modules via communicating rail Cat. Nos. 4 149 01/02/03

Downstream of the modules via communicating cables Cat. Nos. 4 149 07/08/09

- A power supply module delivers maximum power of 500 mA.

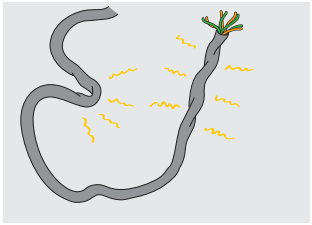
- 3 power supplies maximum can be used in one system.



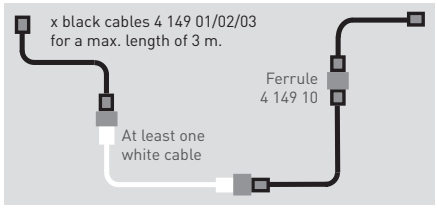
PRACTICAL ADVICE FOR WIRING UP THE EMS CX³ BUS

At the design stage:
- Be sure to adhere to the EMS CX³ system limits, detailed in the following pages.

When laying the EMS CX³ cables, don't create tight bends, nor twist communicating cables.

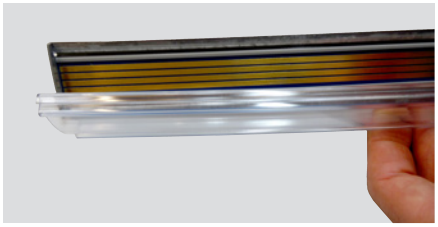


Consider sizing the circuits in order to take account of the number of power supplies required (max. 3). In this case, use the white cable supplied with the power supply module, for galvanic isolation of the power supplies.



Don't cut the communicating rail. EMS CX³ communicating rails clip onto DIN rails of the same length.
For example: Cat. No. 4 149 01, an 18-module rail on an 18-module DIN rail.

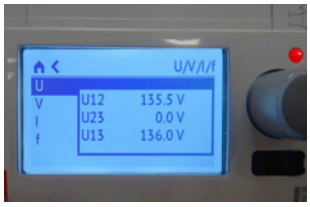
Ensure the accessible part of the rail is protected by its plastic cover.



Don't slide the communicating module along the communicating rail, to avoid damaging its printed circuits or the connections at the back of the modules.

EMS CX³ BUS FAULT IDENTIFICATION

Every EMS CX³ module has an LED on the front. It is used to identify that the system is working correctly or to indicate any faults on the aforementioned system.

LED push-button	Status	Details
(4)	Flashing slowly	Addressing error
	Flashing quickly	Function not available on this module
	Steady (without pressing the push-button)	Alarms detected (1)
	Steady (after pressing the LED push-button for 20 seconds)	Full reset (all the Firmware updates are retained)
(4)	Flashing slowly	System executing, wait for the LED to turn steady green unless (2)
	Flashing quickly (after pressing the LED push-button for 10 seconds)	Set the EMS CX³ module to "standby" (no action nor switching possible)
	Steady	System operational
(4)	Flashing slowly	Function not available unless (3)
	Flashing quickly	Firmware updating
	Steady	Function not available on this module

(1) **Only for interface 4 149 40 and mini-configurator 4 149 36**, list of alarms in the product technical data sheets.

(2) **Except for mini-configurator 4 149 36** for which the function is not available.

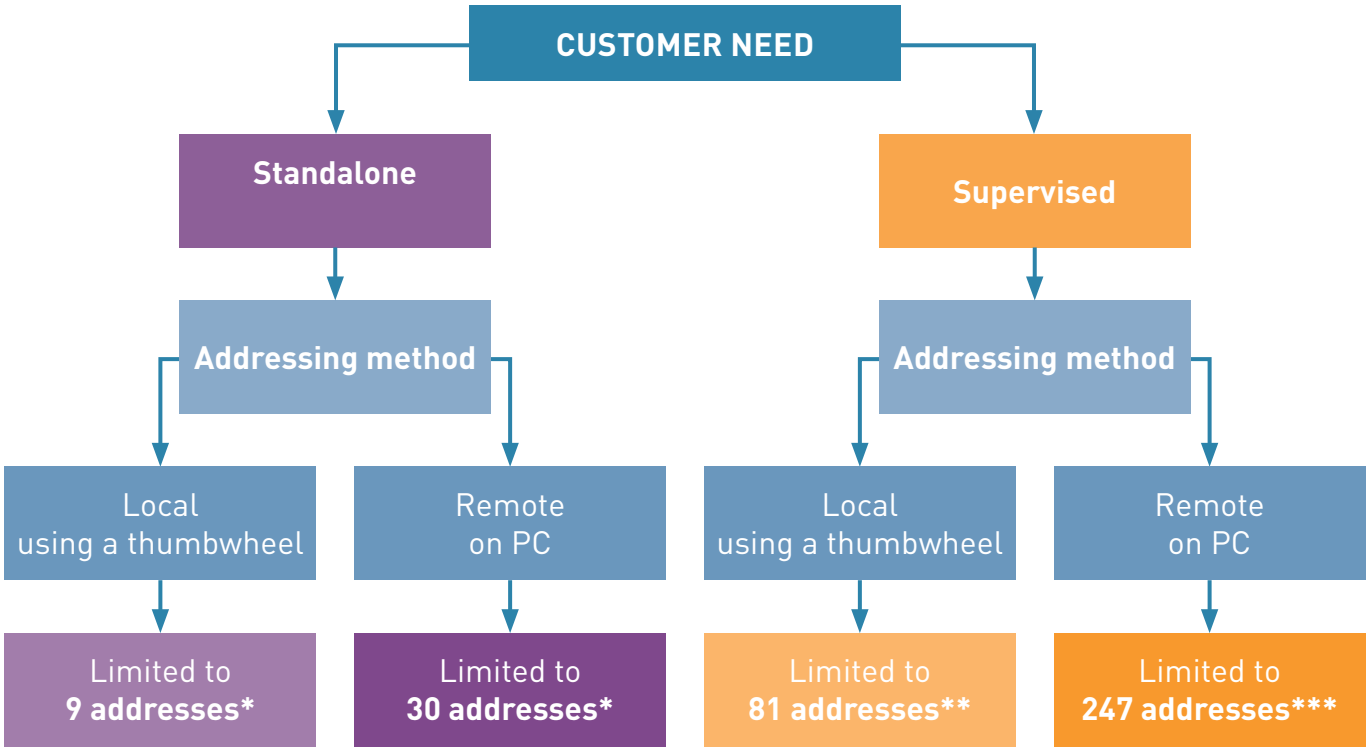
(3) **Except for mini-configurator 4 149 36** for which the meaning is: system executing, wait for the LED to stop flashing.

(4) **In the case of mini-configurator 4 149 36** it is equipped with a single LED, and the push-button action is via the push-button on the mini-configurator.

COMMUNICATION PROTOCOLS

ADDRESSING

The EMS CX³ system can be used as a "Standalone" or "supervised" system according to customer need. There are 4 possible architectures:



* In the case of a standalone EMS CX³ system, the limit is 30 modules per standalone system.

** In the case of a supervised EMS CX³ system with local addressing, the limit is 30 modules and 9 addresses on each EMS CX³/RS485 interface.

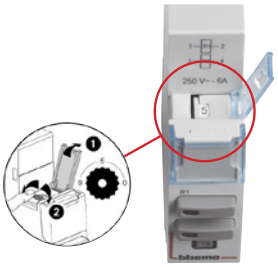
*** In the case of a supervised EMS CX³ system with addressing on a PC, the limit is 30 modules and 30 addresses on each EMS CX³/RS485 interface. The 247-address total limit is set by the Modbus protocol.

■ Addressing on a Standalone EMS CX³ with local addressing

The parameters are set and the system is managed locally directly on EMS CX³ devices, and via mini-configurator Cat. No. 4 149 36.

Maximum
9
addresses*

* In the case of a standalone EMS CX³ system, the limit is 30 modules per standalone system.

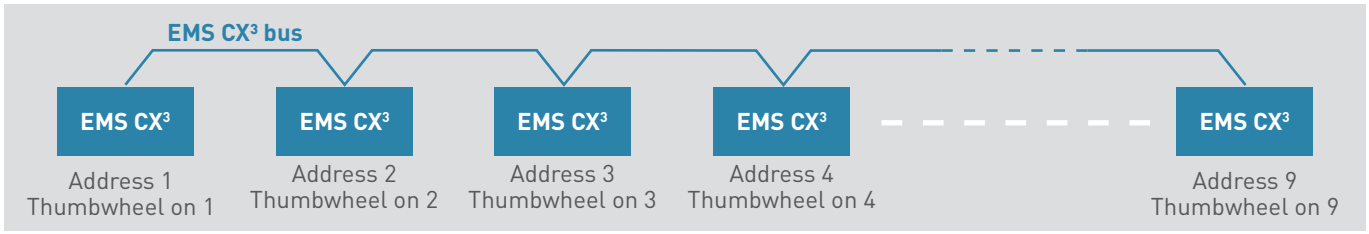


Addressing is performed using a thumbwheel located on the top of each EMS CX³ module. Each system module should be addressed:

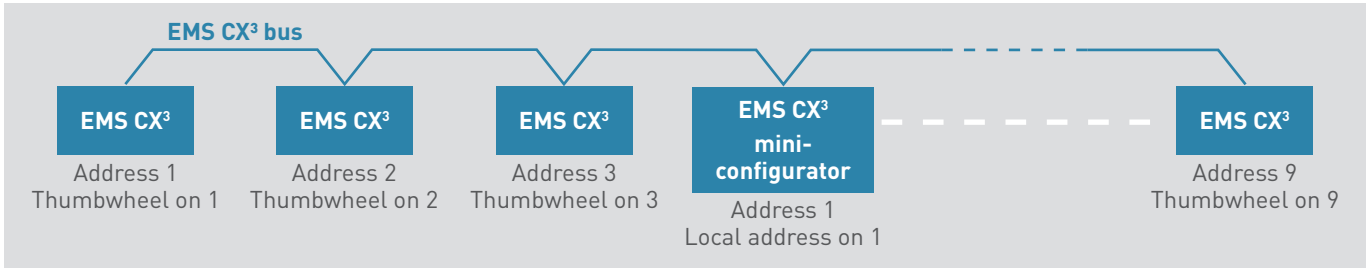
- **Addressing possible from 1 to 9.**
- Address 0 prohibited; reserved for remote addressing.

The mini-configurator does not have a thumbwheel, so the parameters are set on the front in the settings. It can have the same address as another EMS CX³ module.

Use without mini-configurator:



Use with mini-configurator:



The same address can be given to modules in the same group, but only if they have a different function. More details at the end of the section.

If an EMS CX³ module thumbwheel is left on 0, this triggers a system operating fault and that module is ignored.

■ Addressing on a Standalone EMS CX³ with remote addressing

If the limits offered by local parameter setting with a thumbwheel are not sufficient, or simply by choice, it is possible to opt for software programming, in order to unleash all the possibilities.

The system parameters are set remotely by software programming. The thumbwheel on each module should be on 0, which is the factory setting.

Maximum
30
addresses*

* In the case of a standalone EMS CX³ system, the limit is 30 modules per standalone system.

The configuration software can be downloaded free of charge from www.legrand.com.

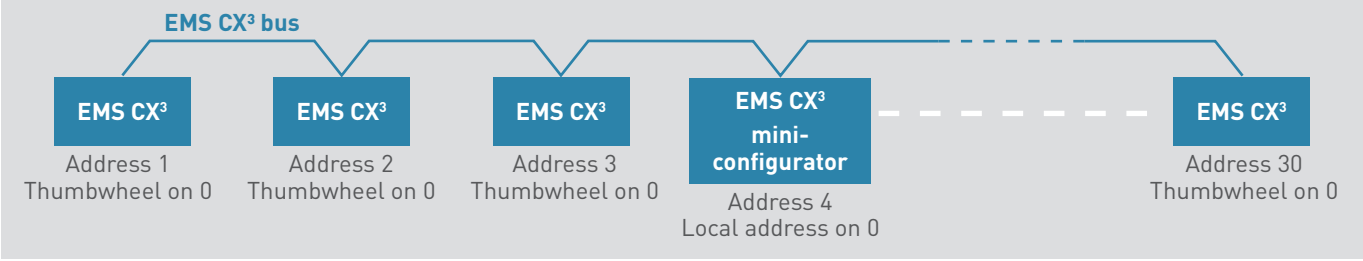
The thumbwheel local setting takes priority over software programming. In the event of malfunction, check that the thumbwheel is definitely on zero.

The addressing principle is still simple and identical to Modbus addressing:

- Every EMS CX³ module retains its factory setting, with the thumbwheels on 0.
- A computer equipped with the EMS CX³ configuration software (which can be downloaded free of charge from the E-cat) should be connected directly to mini-configurator 4 149 36 (USB/micro USB cable) in order to be able to address and set the parameters on each EMS CX³ module.
- The software automatically recognises all the EMS CX³ modules connected on its bus.

Limits:

- **On an EMS CX³ bus:**
  Up to 30 EMS CX³ modules, considering that the same address (from 1 to 30) can be given to modules in the same group, but only if they have a different function. More details at the end of the section.



The same address can be given to modules in the same group, but only if they have a different function. More details at the end of the section.

■ Addressing of supervised EMS CX³ with local addressing

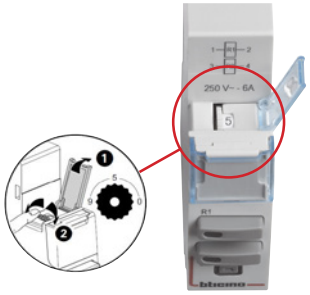
The EMS CX³ range can be used by a supervision system either on a PC, etc (memory stick) or on a number of devices with the Energy Web Server, and will then allow information (circuit breaker status, etc), and remote controls (motorised control, contactor, etc) to be fed back. In this case, one or more EMS CX³/RS485 interfaces (+ in certain cases (RS485/IP) are needed.

This solution does not need any additional software for parameter setting.

Parameter setting, as well as use of the web server, remains identical to devices in the EMDX³ range.

The system parameters are set locally directly on the EMS CX³ devices. It can be managed both locally and remotely.

Maximum
81
addresses*



Addressing is performed using a thumbwheel located on the top of every EMS CX³ module. Every system module should be addressed:

- Addressing possible from 1 to 9.
- Address 0 prohibited; reserved for remote addressing.

If an EMS CX³ module thumbwheel is left on 0, this triggers a system operating fault and that module is ignored.

* In the case of a supervised EMS CX³ system with local addressing, the limit is 30 modules and 9 addresses on each EMS CX³/RS485 interface.

The addressing principle is still simple and identical to Modbus addressing:

- Every EMS CX³ interface can have an address from 1 to 9 (thumbwheel addressing) and should be counted as ten on the same EMS CX³ bus.
- Every EMS CX³ module can have an address from 1 to 9 (thumbwheel addressing) and should be counted as one unit in a group on the same EMS CX³ bus.

Example

- one EMS CX³ interface thumbwheel address = 1 therefore 10 as the figure for ten
- a 1st EMS CX³ module thumbwheel address = 1 therefore address 11 in Modbus addressing
- a 2nd EMS CX³ module thumbwheel address = 4 therefore address 14 in Modbus addressing

Limits

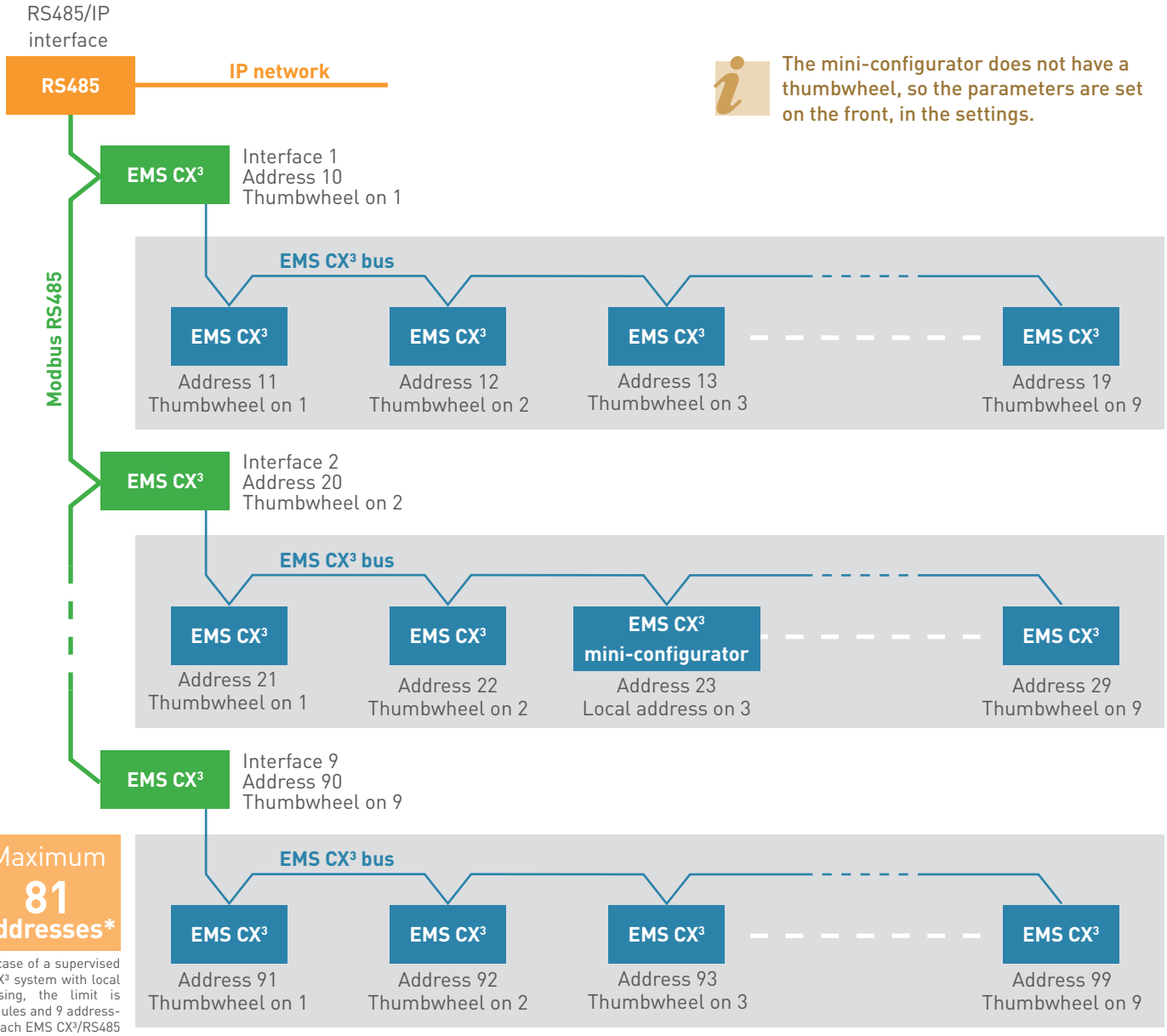
- **On an RS485/IP interface Cat. No. 0 046 89:**

- Up to 81 Modbus addresses, i.e. up to 9 EMS CX³/RS485 interfaces, each with 9 addresses assigned to x EMS CX³ modules.
- Limited to 9 EMS CX³/RS485 interfaces or 1000 m of Modbus cable (Belden 9842, Belden 3106A cable, or equivalent).

- **On an EMS CX³/RS485 interface:**

- Up to 30 EMS CX³ modules, considering that the same address (from 1 to 9) can be given to modules in the same group, but only if they have a different function; more details at the end of the section.

■ **Addressing of supervised EMS CX³ with local addressing (continued)**



The mini-configurator does not have a thumbwheel, so the parameters are set on the front, in the settings.

Maximum **81 addresses***

* In the case of a supervised EMS CX³ system with local addressing, the limit is 30 modules and 9 addresses on each EMS CX³/RS485 interface.

The same address can be given to modules in the same group, but only if they have a different function. More details at the end of the section.

If an EMS CX³ module thumbwheel is left on 0, this triggers a system operating fault and that module is ignored.

■ Addressing of supervised EMS CX³ with remote addressing

As indicated in the previous section, the EMS CX³ range can be used by a supervision system such as our web server, and will then allow information (circuit breaker status, etc), and remote controls (motorised control, contactor, etc) to be fed back.

In this case, one or more EMS CX³/RS485 interfaces (+ in certain cases (RRSS485/IP) are needed.

If the limits offered by local parameter setting with a thumbwheel are not sufficient, or simply by choice, it is possible to opt for software programming.

Parameter setting, as well as use of the web server, remains identical to devices in the EMDX³ range.

The system parameters are set remotely by software programming. The thumbwheel on each module should be on 0, which is the factory setting.

The thumbwheel local setting takes priority over software programming. In the event of malfunction, check that the thumbwheel is definitely on zero.

Maximum
247
addresses*

* In the case of a supervised EMS CX³ system with addressing on a PC, the limit is 30 modules and 30 addresses on each EMS CX³/RS485 interface. The 247-address total limit is set by the Modbus protocol.

The addressing principle is still simple and identical to Modbus addressing:

- Every EMS CX³ interface and module retains its factory setting, with the thumbwheels on 0.
- A computer equipped with the EMS CX3 configuration software should be connected directly to each of the EMS CX³/RS485 interfaces (USB/micro USB cable) in order to be able to address and set the parameters on each EMS CX³ module.
- The software automatically recognises all the EMS CX³ modules connected on its bus.

Limits

- **On an RS485/IP interface Cat. No. 0 046 89:**

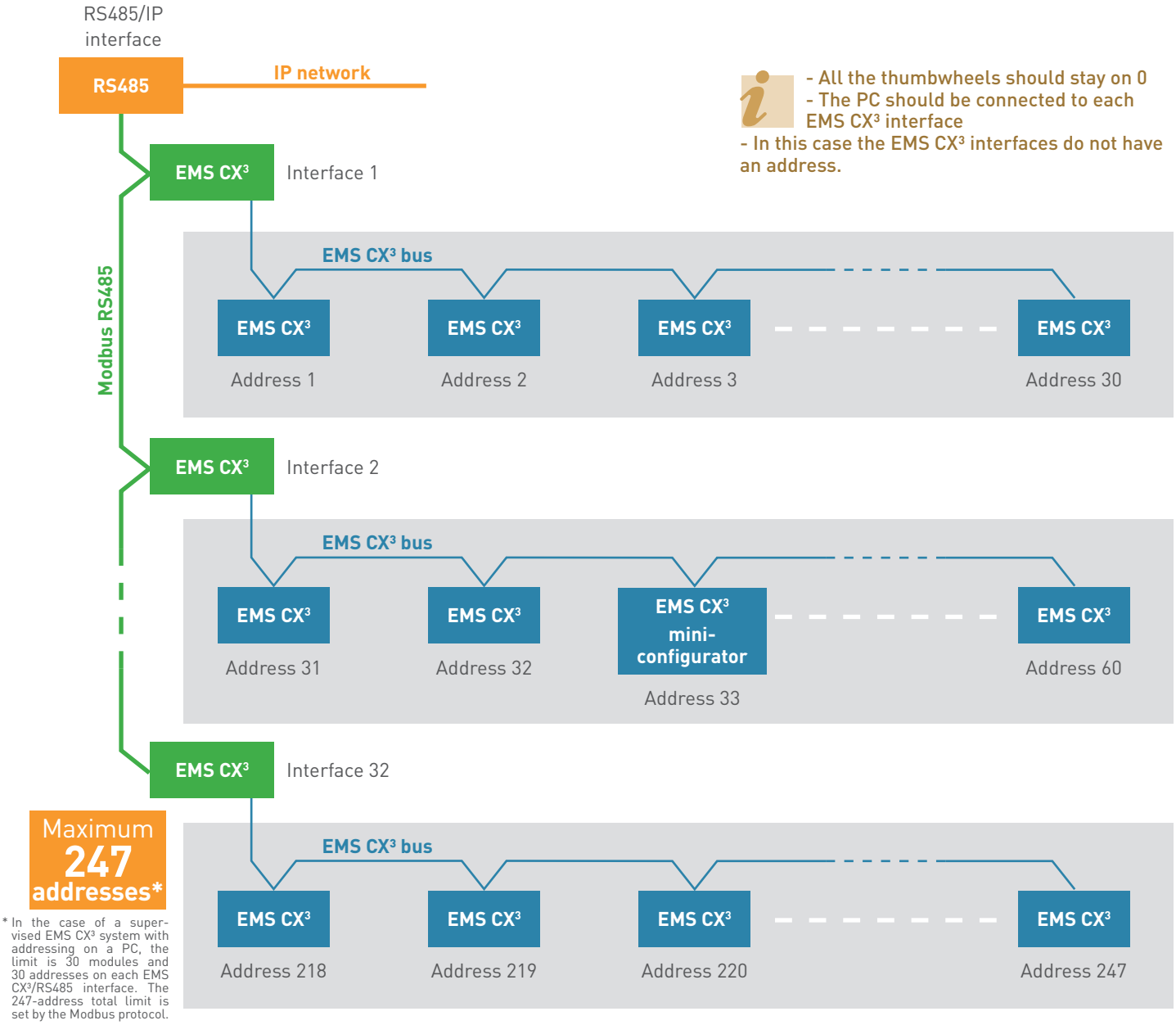
- Up to 247 Modbus addresses.
- Limited to 32 EMS CX³/RS485 interfaces (32 Modbus devices max.) or 1000 m of Modbus cable (Belden 9842, Belden 3106A cable, or equivalent).

- **On an EMS CX³/RS485 interface:**

- Up to 30 EMS CX³ modules, considering that the same address (from 1 to 30) can be given to modules in the same group, but only if they have a different function; more details at the end of the section.

The configuration software can be downloaded free of charge from www.legrand.com.

■ **Addressing of supervised EMS CX³ with remote addressing (continued)**



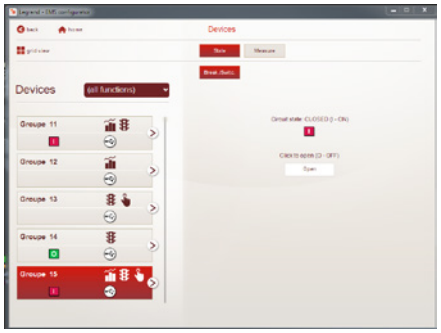
Maximum **247 addresses***

* In the case of a supervised EMS CX³ system with addressing on a PC, the limit is 30 modules and 30 addresses on each EMS CX³/RS485 interface. The 247-address total limit is set by the Modbus protocol.

The same address can be given to modules in the same group, but only if they have a different function. More details at the end of the section.

The thumbwheel local setting takes priority over software programming. In the event of malfunction, check that the thumbwheel is definitely on zero.

■ Group of modules with the same address



The same address can be given to EMS CX³ modules **if and only if**:
- they are associated with the same wiring circuit
- **AND** they have different functions.

Here are some concrete examples to help you understand. This addressing mode is used to:
- **increase the number of modules** with the same address number
- **automatically assign functions to the same group** without reconfiguring
- remotely view **several functions on the same page.**

EXAMPLE 1:

Group 1 consists of modules dedicated to the circuit breaker outgoing line:
- one single-phase measurement module ← 63 A
- one universal control module
- one AC + FS signalling auxiliary module

These modules have different functions in the group, and can all have the same address.

GROUP 1

EMS CX³ modules with different functions and the same address

For example:

For thumbwheel addressing, **all 3 thumbwheels are on 1**.

DX³ circuit breaker with its motorised control

EXAMPLE 2:

Group 2 consists of modules dedicated to the circuit breaker outgoing line:
- one three-phase measurement module ← 63 A
- one universal signalling module

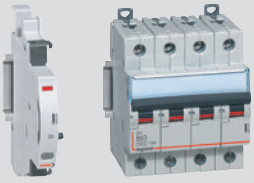
These modules have different functions in the group, and can all have the same address.

GROUP 2

EMS CX³ modules with different functions and the same address

For example:

For PC addressing, **both thumbwheels are on 1**.



DX³ circuit breaker with its auxiliary contact

EXAMPLE 2:

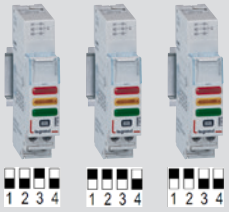
Group 3 consists of modules dedicated to the circuit breaker outgoing line:

- one high current measurement module
- one universal signalling module with ON/OFF/FLT parameter setting
- one universal signalling module with spring loaded/not loaded parameter setting
- one universal signalling module with circuit breaker plugged-in/drawn-out/ready parameter setting

These modules have different functions in the group, and can all have the same address.

GROUP 3

EMS CX³ modules
with different functions
and the same address



For example:

For PC addressing, **all 4 thumbwheels are on 1**.

DMX³ circuit breaker

IP ADDRESSING

DEFINITION

A network is a set of hardware and software devices allowing 2 machines or more to communicate.

The IP (Internet Protocol) network is a family of computer network communication protocols designed to be used over the internet. IP protocols provide a unique addressing service for all connected terminals.

An IP address is an identification number which is assigned permanently (static IP address) or temporarily (automatic or dynamic IP address) to every device connected to a computer network which uses internet protocol. Some devices such as PCs allow the user to choose whether to assign a static or automatic IP address; others, such as certain Legrand devices (Energy web server, RS485/IP converter) can only be assigned static IP addresses.

For a device to be assigned an automatic IP address, it must be connected to a network connected to a DHCP (Dynamic Host Configuration Protocol) server. It is this server which will assign the IP address automatically on connection of the device to the said network.

The advantage for the service provider, in this case, is that they can assign the same IP address to several customers, knowing that statistically not all customers are connected at the same time.

Another reason for choosing to connect the device to the network with automatic addressing: having a static IP address makes you an easy target for pirates since your computer constantly has the same address, giving them time to hack into it. With an automatic IP address, it is more difficult to hack a moving target.

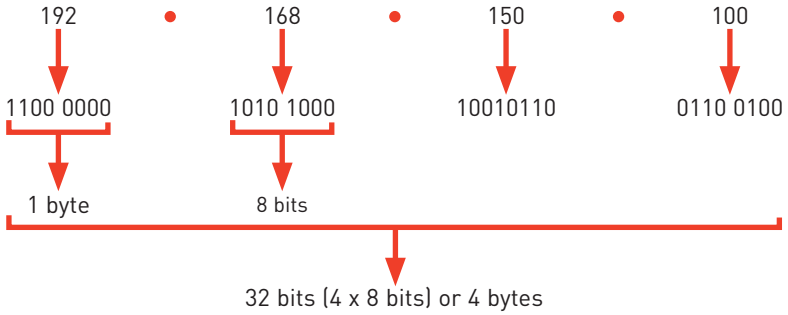
BASIC PRINCIPLE

■ **An IP address:**

An IP (Internet Protocol) address is an identification number which is assigned permanently (static IP address) or temporarily (automatic IP address) to every device connected to a computer network which uses internet protocol. Version 4 and version 6 IP addresses are available.

Version 4 is currently the most commonly used. It is represented in decimal notation with 4 numbers between 0 and 255, separated by dots, for example 192.168.150.100.

• **IP version 4**: 32-bit addressing, 4 bytes



• (**IP version 6**: addressing on 128 bits, 16 bytes)

Since version 4 IP address ranges are close to saturation, operators are encouraging a transition from version 4 IP addresses to version 6 IP addresses.

■ **A subnet mask:**

A subnet is a logical subdivision of a larger network.

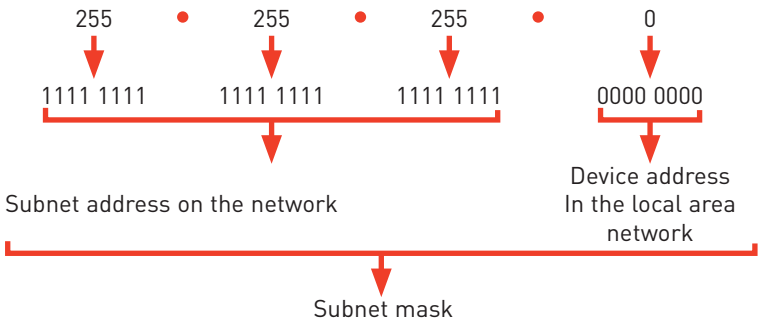
The subnet mask is used to distinguish the part of the address used to address the network and that reserved for addressing an IT product connected inside the logical local area network.

The subnet mask indicates to the local area network software the number of bytes corresponding to the web address which constitutes the network address.

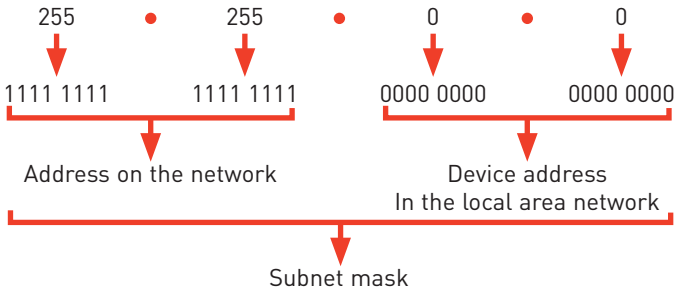
255 = 1111 1111 when the byte is reserved for network addressing

0 = 0000 0000 when the byte is reserved for addressing the device on the local area network

• Example 1



• Example 2



• Example 3

If we consider the following subnet mask: 255.255.255.0, the first 3 bytes are reserved for the subnet address in the network and the 4th byte is reserved for addressing IT devices in the subnet, local area network.

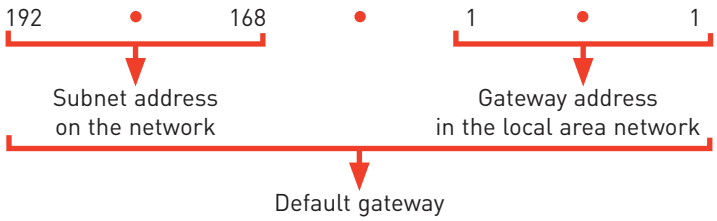
In this example, we could consider that we can connect between 0 and 255 different devices on the local area network from address 0, address 1, address 2, ... address 255.

But be careful, some addresses are reserved. You should therefore ideally consult the company's IT department before choosing one.

BASIC PRINCIPLE (CONTINUED)

■ **A default gateway:**

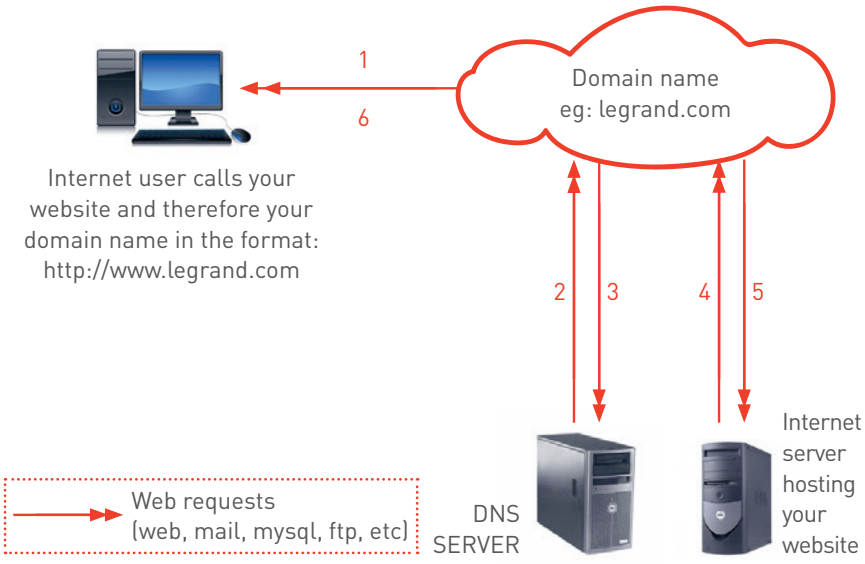
In computing, a gateway is the name given to the device used to link 2 different computer networks, for example a local area network and the internet. This term usually denotes the modem-router, which is used to link several computers, or the whole of the local area network can access the internet via the gateway.



■ **A DNS server:**

A **DNS** (Domain Name System) server is a service used to translate a **domain name** into information of various types associated with it, including **the IP address**.

Computers connected to an internet have an IP address. These addresses are digital. To simplify access to these systems, a mechanism has been put in place so that a name (called a domain name) can be associated with an IP address, as it is easier to remember. The mechanism consists of finding the IP address. Domain names can be associated with other information than IP addresses.

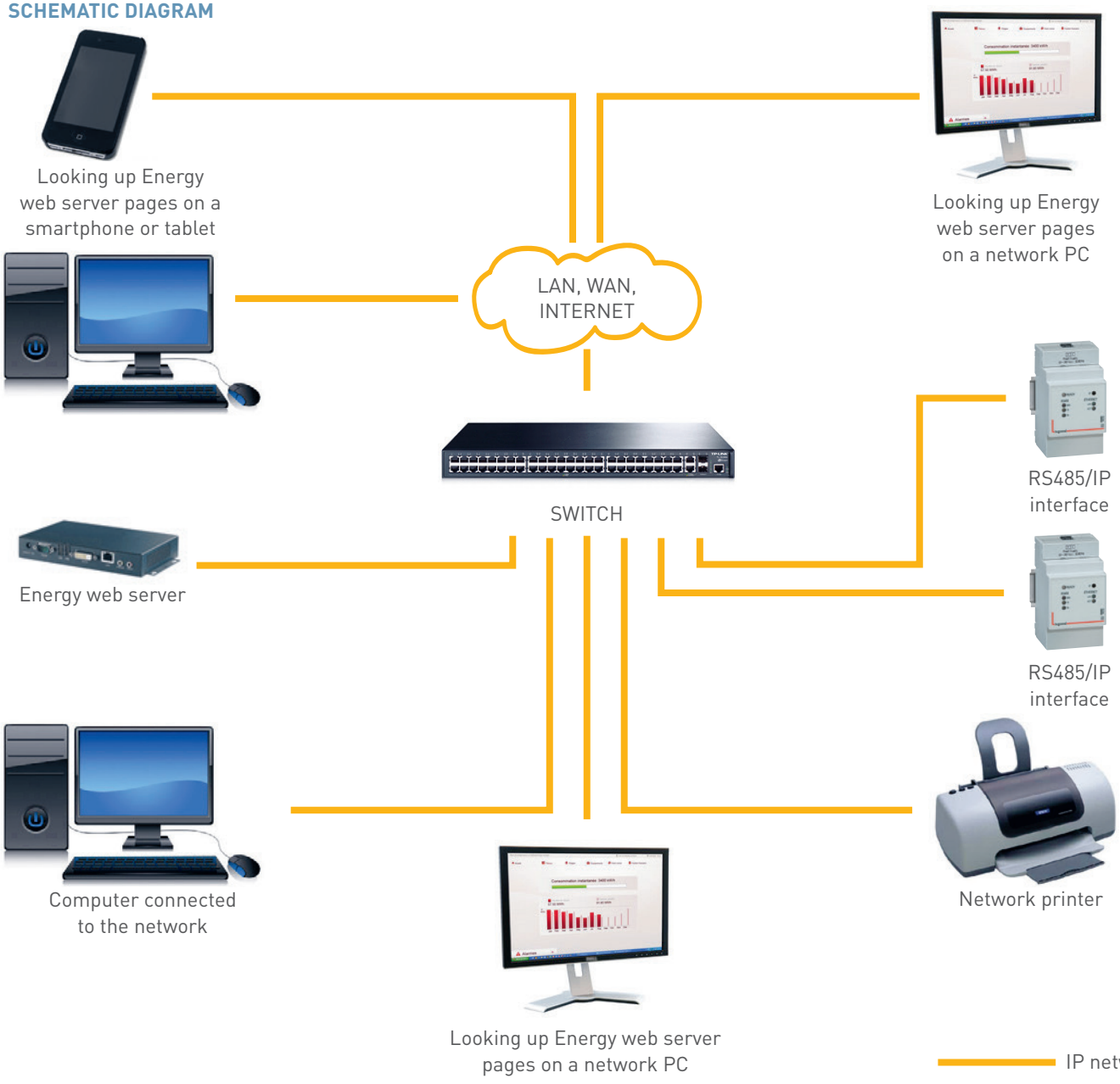


In the example above, the internet user calls, via their browser (request 1), the domain name of the website they wish to connect to. This interrogates its DNS server (requests 2 and 3) in order to find the IP address of the internet server hosting your website. The domain name will be able to exchange with the web server (requests 5 and 6) to make the website visible for the internet user requesting it (request 6).

Some important rules to remember:

- **You must contact the IT department of the website where the measurement system will be hosted in order to follow their recommendations.**
- **Connection to the computer network uses an RJ45 cable, whose characteristics should be specified by the website's IT department.**
- **RS485/IP converters such as the Legrand Energy web server use static IP addresses, from a list issued by the website's IT department.**

SCHEMATIC DIAGRAM



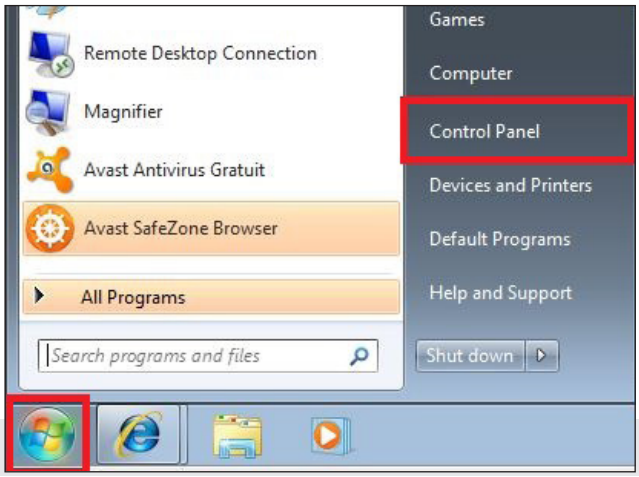
Installation conditions and practical advice for wiring the IP network

You must contact the IT department of the website where the measurement system will be hosted in order to follow their recommendations.

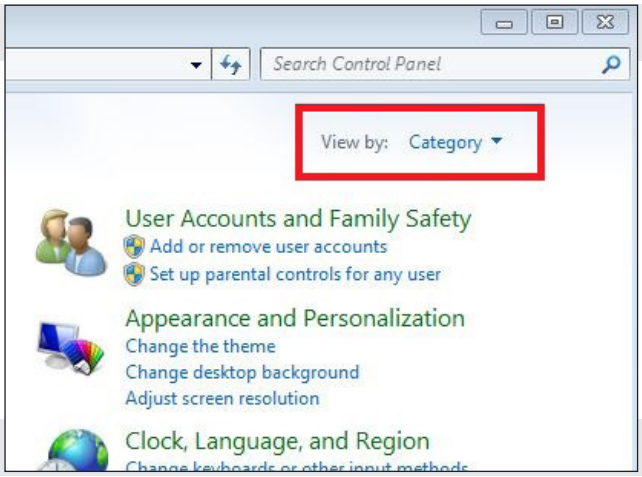
USE

■ **Procedure for modifying a computer's IP address**

• Procedure in Windows 7 environment:



1
Select "Start" at the bottom left of the screen, then "Control Panel".



2
Click "View by" and select "Category".

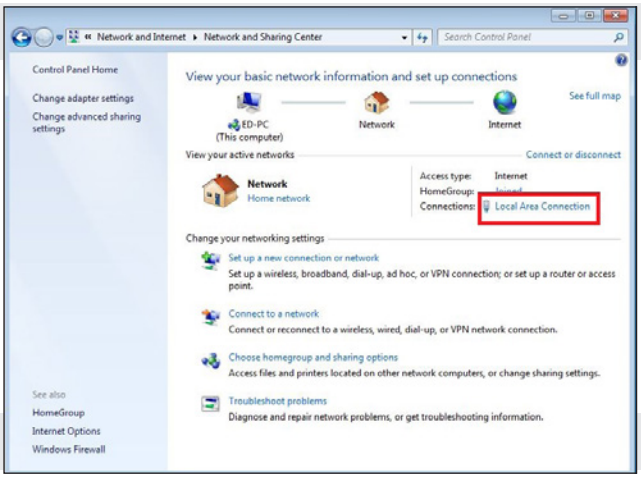
3
Select "View network status and tasks".

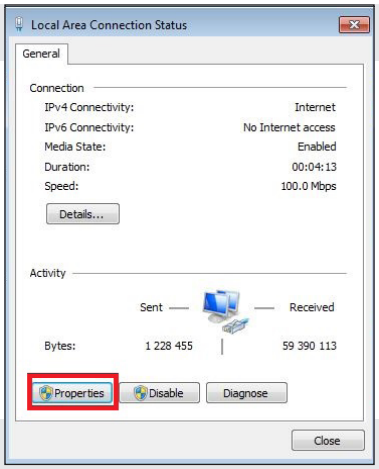
4

Before continuing, make sure you have connected your PC to an RS485/IP converter or an Energy web server, using an RJ45 cable.

5

Select “Local Area Connection”.



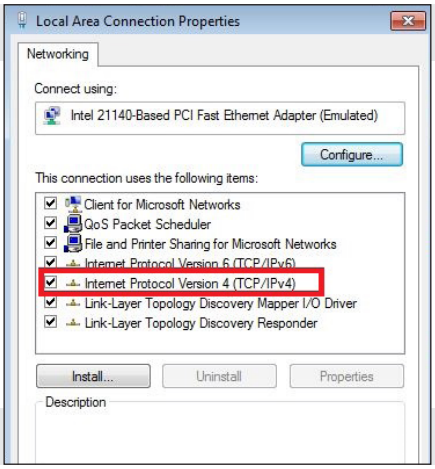


6

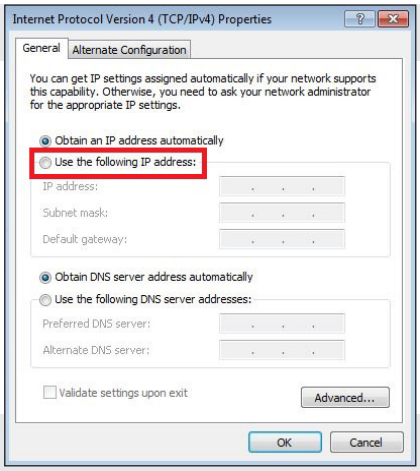
Select “Properties”.

7

Select “Internet Protocol Version 4(TCP/IPv4)”.



USE (CONTINUED)

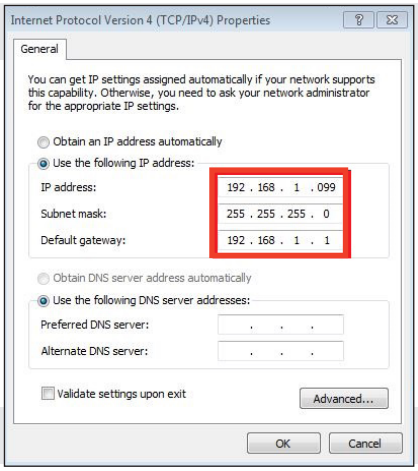


8

Select "Use the following IP address".

9

Enter the static IP address values given by the website's IT department, then press OK to confirm.



10

The PC static IP address is then changed, don't forget to replace it with an automatic IP address once the service is complete.

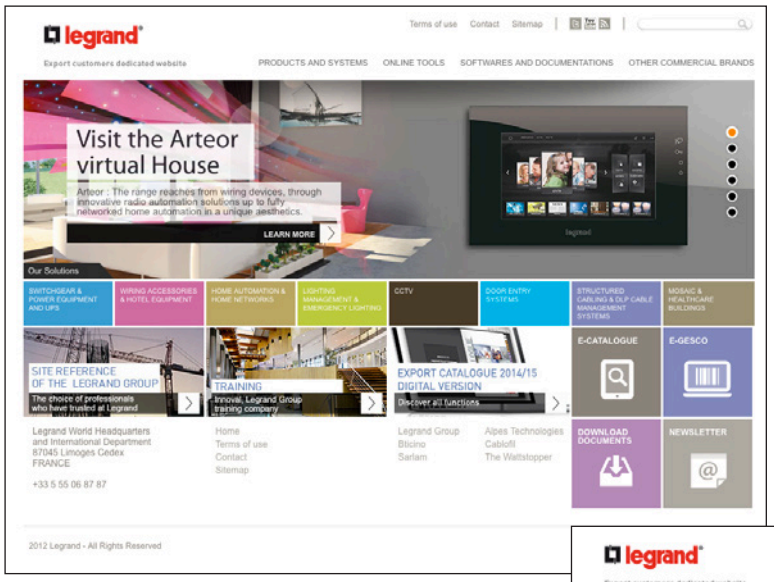
• Procedure for other versions of Windows:

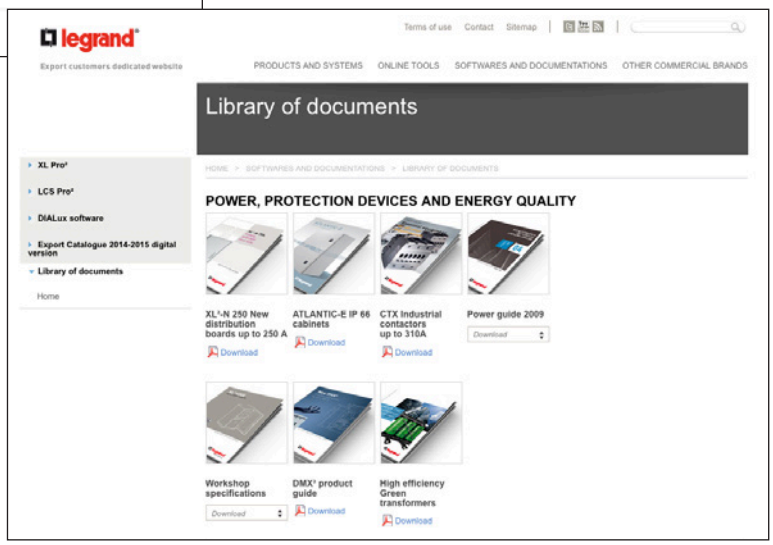
The procedure is the same as that for a Windows 7 environment, the only variant possibly being access to the control panel.
You can find it with the search function by typing "Control Panel".
Once the "Control Panel" opens, refer to points 2 to 9 above.

LIBRARY
OF DOCUMENTS

All technical data of the products inside this workshop specifications book are available on :
http://www.export.legrand.com/EN

Click on
DOWNLOAD DOCUMENTS





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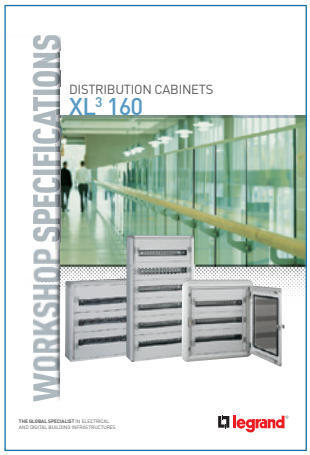

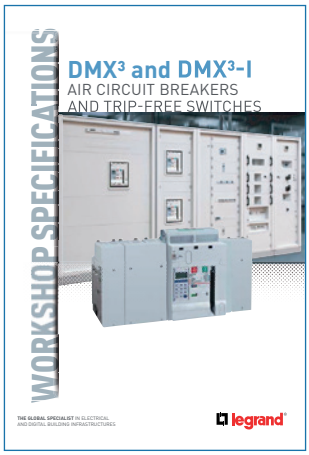

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EXB16025 - April 2017