

EMDX³

ELECTRICITY METERS



Legrand offers complete solutions to meet energy efficiency needs.

This technical guide provides all the essential information you need to know about **EMDX³ electricity meters** in order to understand how to choose them, their characteristics, installation and configuration rules, etc ...

This document can be downloaded from the online catalog and is a complete technical guide on **EMDX³ electricity meters** in the distribution board.

LEGAL INFORMATION

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EMDX³

ELECTRICITY METERS

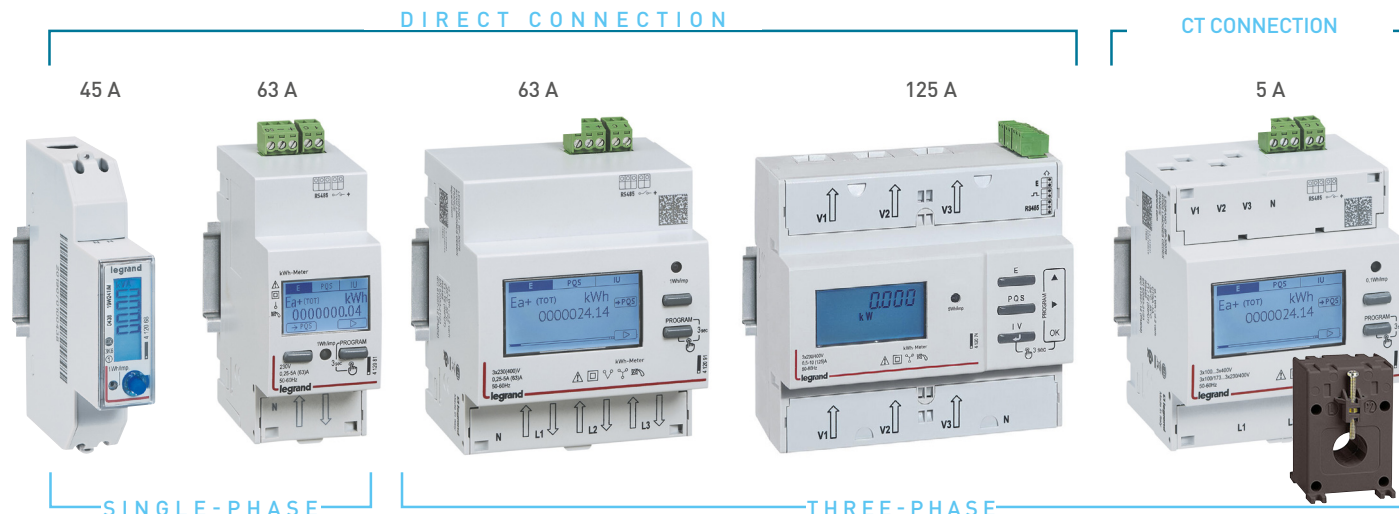
Product specifications

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 VAC $\pm$ 15%
 - Three-phase: 3x230 VAC or 400 $\pm$ 15% – 240 (415) VAC
- **Frequency:** 50 – 60 Hz.
- **Conforming to standards:**
 - IEC 62052-11
 - IEC 62053-21/23
 - IEC 61010-1
 - IEC 61557-12
 - EN 50470-1 and EN 50470-3 for MID products
- **Accuracy:**
 - Active energy (EN 62053-21): class 1
 - Reactive energy (EN 62053-23): class 2
 - Active energy (EN 50470): class B for MID products
- **Connection:** Direct or with CT.
- **Product:** MID or non-MID.
- **Output:** pulse and/or RS485.
- **Mounting:** DIN rail.
- **Dimensions:** from 1 to 6 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.

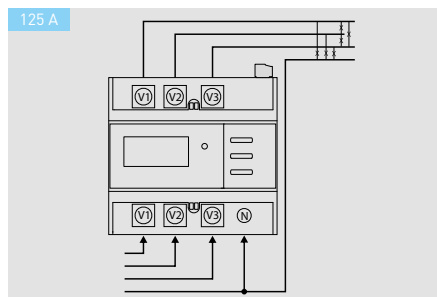
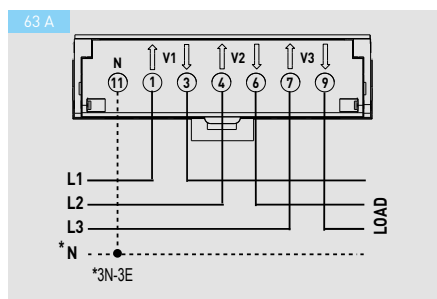
MID certification, in some meters, ensures the accuracy of metering with a view to charging out the electricity used.

CAT.NO																		
Type of main supply		Single-phase							Three-phase									
Number of modules		1	1	1	2	2	2	2	4	4	4	4	6	6	4	4	4	4
Connection	Direct (max. current)	45 A	45 A	32 A	63 A	63 A	63 A	63 A	63 A	63 A	63 A	63 A	125 A	125 A	1/5 A	1/5 A	5 A	5 A
	Via a current transformer														●	●	●	●
Metering and measurement	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			●				●	●			●	●		●			●	●
Operating conditions	Reference temperature	23°C ± 2°C																
	Operating temperature	-5 to +55°C		-20 to +55°C		-10 to +45°C			-5 to +55°C									

CONNECTION

■ Direct connection electricity 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.

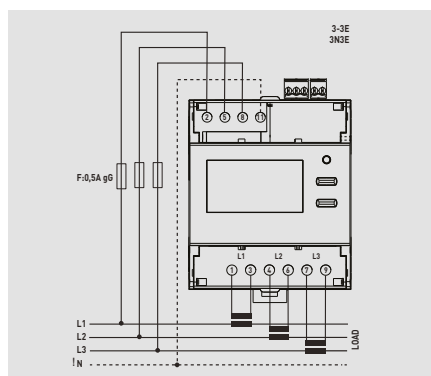


i To protect the meters, refer to the information in the product manuals and technical data sheets.

■ CT connection electricity 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.

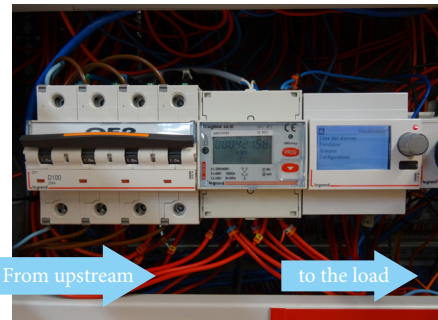


i Some three-phase meters can be also used to measure a single-phase mains supply and are compatible with different wiring methods, but this is not the case for all models. Please refer to the manuals and technical data sheets.

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DIRECT CONNECTION

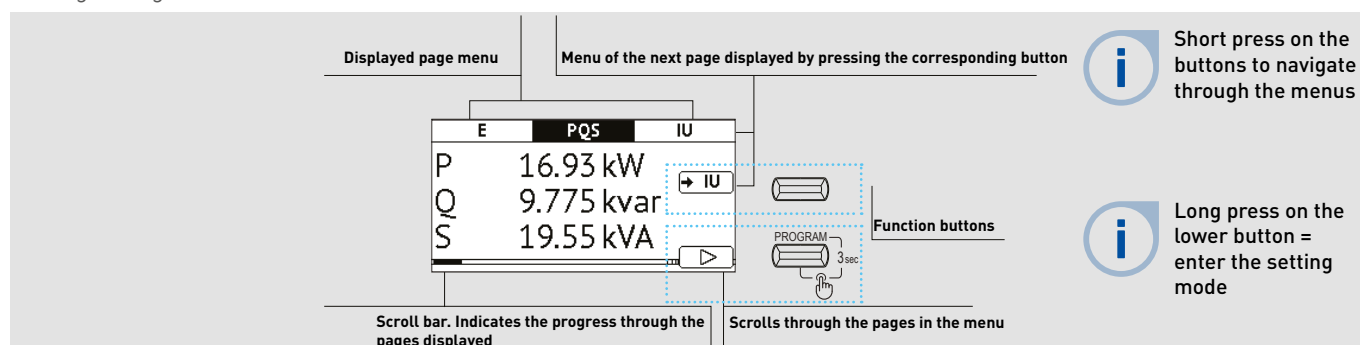


CT CONNECTION

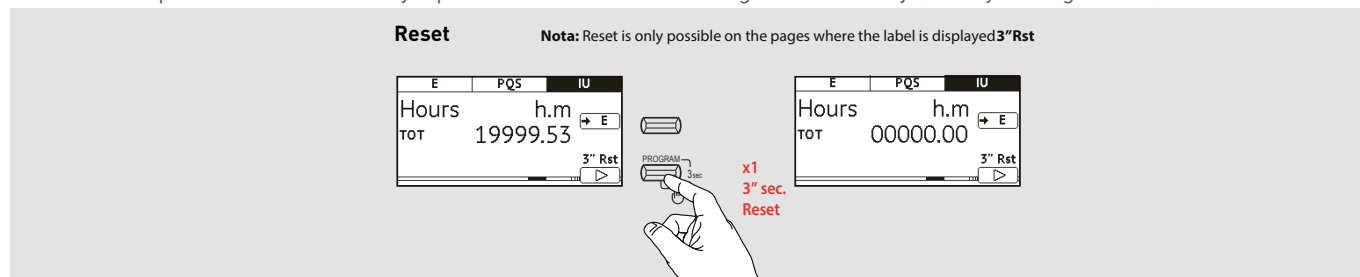


SETTING PARAMETERS

After connection, the electricity meter parameters may need to be adjusted 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 setting = 1000).



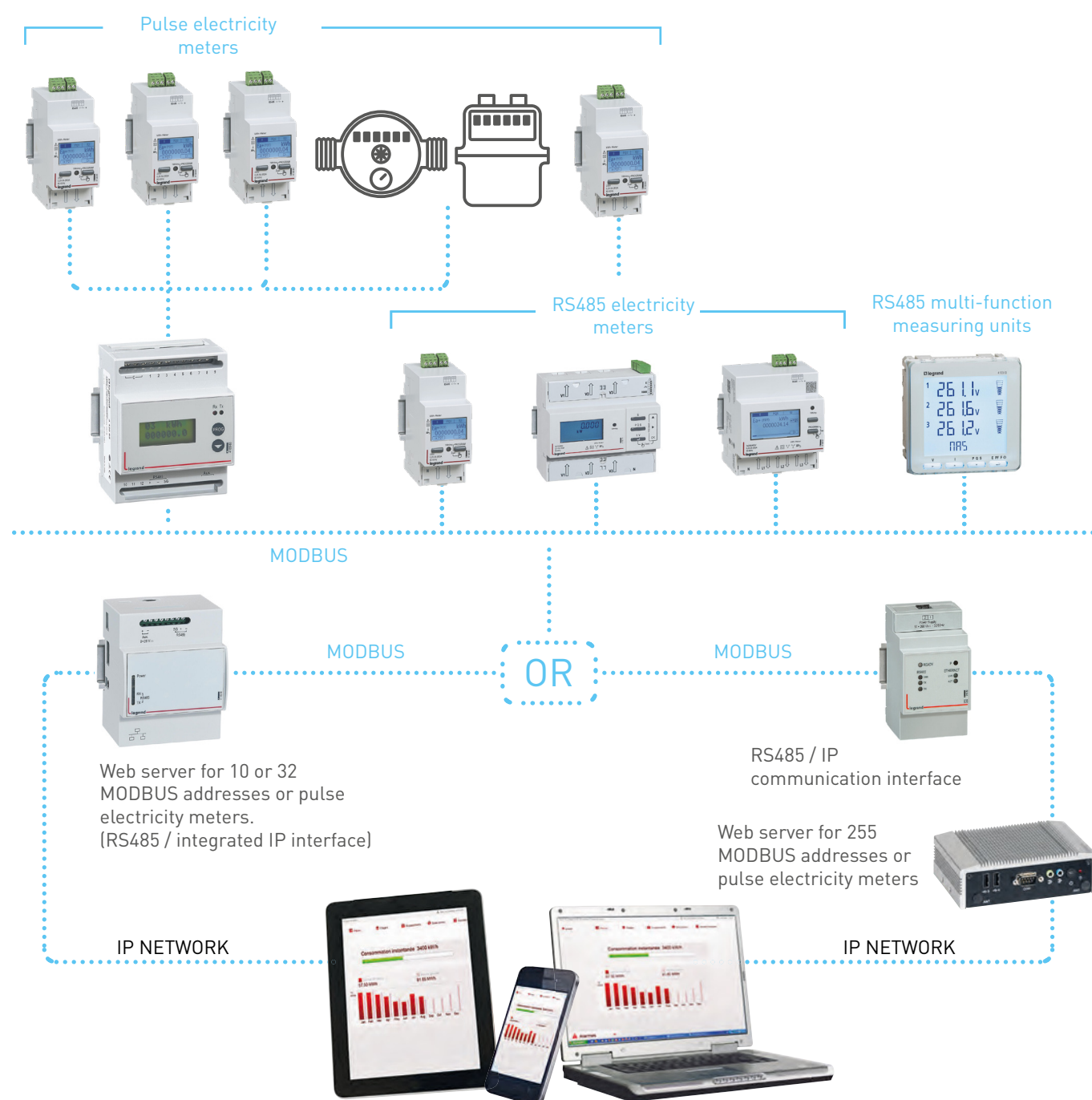
PARAMETER IDENTIFICATION

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 or 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	Time start
PC, PASS	Password modification
SAU inG	Configuration backup
CrC	Software version

! If the current and/or voltage transformer ratios are changed, the non-MID energy meters are automatically reset.



Schematic diagram



BI-DIRECTIONAL MEASUREMENT

Bi-directional meters are characterised by their ability to measure both the energy demanded from the system «like any conventional meter» and the energy supplied to it. They are fundamental devices in any photovoltaic installation of self-consumption with oversupply or in a solar installation where you do not use the energy produced. The latter is then resold to your supplier.

DATA TRANSFER

Electricity meters have pulse or RS485 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 Uimp: 115 VAC/DC max - except Cat.No 0 046 70, 4 120 74 & 4 120 75: 27 V max.
- Current Iimp: 50 mA - except Cat.No 0 046 70: 27 mA.
- Connection: on terminals 15 and 29 – except Cat.No 0 046 70 and 0 046 81 terminals 4 and 6 except Cat.No 4 120 74/75 on side terminal
- Data type: Active energy Wh Active energy Wh and reactive energy VARh
- Pulse weight: Programmable with possible values: 1-10-100-1000 Wh/pulse Non-programmable, fixed value for Cat.Nos 0 046 70 (2000 pulse/kWh), 0 046 81 (10 Wh/pulse) 4 120 74/75: 1-10-100-1k-10k-100k-1M-10M / pulse

- Pulse duration:

Programmable with possible values: 50-100-150-200-300-400-500 ms
Non-programmable, fixed value for Cat.Nos 0 046 70 (40 ms), 0 046 81 (100 ms)
For Cat.No 4 120 74/75: 50-100-200-300-400-500 ms

■ Meters with Modbus output:

- RTU mode Modbus protocol
- Baud rate 4800, 9600, 19,200, 38,400 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).

MODBUS ADDRESSING

In order to enable «system integrators» to develop the energy management program, the addressing tables are available on the E-catalogue at www.legrand.com/ecatalogue in the instruction sheets or in separate files depending on the product.

PULSE INPUT

Some of the meters are supplied with a pulse output. On electrical meters, pulse outputs are not potential-free contacts. They are transistors that need to be powered, or opto-relays. The pulse output is polarised. It can be used to connect this type of meter to a supervision system, a computer or a measuring unit in order to count the flow of water flowing through a water meter, for example. It can also be used to monitor the consumption of an installation, an apartment, a pipe, a dwelling... Each pulse corresponds to a number of kWh, liter... There are electric meters where the number of pulses and the duration of the pulse is configurable.

Example:

The number of liters for a pulse (1 pulse for 1 liter, 1 pulse for 10 liters, etc.) is fixed according to the pulse output. This number is defined at the time of production of the meter in the context of outlets installed directly in the water meter. It can be modified if necessary for certain types of meters.



Help and definitions

MID CERTIFICATION

The MID (Measuring Instruments Directive) is a European directive of 2004.

This certification guarantees the design and the manufacturing process of the product, through the control of an external laboratory.

It applies to measuring devices and systems with a view to **rebilling the energy consumed**.

To meet this directive, Legrand provides a **range of MID meters**; for all other cases, Legrand provides non-MID meters and measuring units of the **same accuracy class**.

ACCURACY CLASS

All measuring instruments must be characterized 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, measuring units:

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

MEASURING CIRCUIT

A measuring circuit takes into account all the components used to realise 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 into account of all metering devices, in order to calculate the accuracy class applied to the final measurement result.

Calculating the accuracy class for 2 devices in combination [measuring instrument + current transformers]:

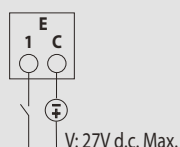
$$\text{Overall system uncertainty} = 1.15 \times \sqrt{(\text{PMD uncertainty of operation})^2 + \sum_{i=1}^N (\text{sensor uncertainty})^2}$$

Example:

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

DUAL TARIFF

Metering according to two tariffs or two sources is possible with energy meters. It is necessary to connect the contact to the dedicated inputs and add an external power supply 12/24 V DC max 10 mA.



The end-of-line resistor $120\ \Omega$ is integrated in the 2 and 4 module Modbus meters. Activation is done in the programming menu.

MEASUREMENT INDEX

Aims for the best match between your needs and the specification of measuring devices at the different levels of your installation. It constitutes a real dialogue frame between supplier and customer for the elaboration of specifications. For each specific need, the indicator level progresses according to the degree of requirement.



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