Communications interface

CEM M-RS485

INSTRUCTION MANUAL

(M014B01-03-14A)

CE

SAFETY PRECAUTIONS

Follow the warnings described in this manual with the symbols shown below.

	**DANGER** Warns of a risk, which could result in personal injury or material damage.

	**ATTENTION** Indicates that special attention should be paid to a specific point.

If you must handle the unit for its installation, start-up or maintenance, the following should be taken into consideration:

	Incorrect handling or installation of the unit may result in injury to personnel as well as damage to the unit. In particular, handling with voltages applied may result in electric shock, which may cause death or serious injury to personnel. Defective installation or maintenance may also lead to the risk of fire. Read the manual carefully prior to connecting the unit. Follow all installation and maintenance instructions throughout the unit's working life. Pay special attention to the installation standards of the National Electrical Code.
	**Refer to the instruction manual before using the unit** In this manual, if the instructions marked with this symbol are not respected or carried out correctly, it can result in injury or damage to the unit and /or installations.

CIRCUTOR, SA reserves the right to modify features or the product manual without prior notification.

DISCLAIMER

CIRCUTOR, SA reserves the right to make modifications to the device or the unit specifications set out in this instruction manual without prior notice.

CIRCUTOR, SA on its web site, supplies its customers with the latest versions of the device specifications and the most updated manuals.

www.circutor.com

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NB: *The images of the units are solely for the purpose of illustration and may differ from the original unit.*

REVISION LOG

Table 1: Revision log.

Date	Revision	Description
07/14	M014B01-03-14A	Initial Version

1.- VERIFICATION UPON RECEPTION

Check the following points upon receiving the unit:

a) The unit meets the specifications described in your order.
b) The unit has not suffered any damage during transport.
c) Perform an external visual inspection of the unit prior to switching it on.
d) Check that it has been delivered with the following:
- An installation guide,.

	If any problem is noticed upon reception, immediately contact the transport company and/or **CIRCUTOR's** after-sales service.

2.- PRODUCT DESCRIPTION

The **CEM M-RS485** optical-electric interface converts the optical service port of any unit of the **CEM** range into an RS-485 port with **MODBUS** protocol.

The unit features:

- 3 indicator LEDs: **POWER**, **LINK** and **COMS**.

The unit is installed on 2-step DIN rails, on the left of any unit of the **CEM** range.

3.- UNIT INSTALLATION

3.1.- PRELIMINARY RECOMMENDATIONS

	In order to use the unit safely, it is critical that the individuals who handle it follow the safety measures set out in the standards of the country where it is being used, use the necessary personal protective equipment and pay attention to the various warnings indicated in this instruction manual.

The **CEM M-RS485** unit must be installed by authorised and qualified staff.

The power supply plug must be disconnected before handling, altering the connections or replacing the unit. It is dangerous to handle the unit while it is powered.

Also, it is critical to keep the cables in perfect condition in order to avoid accidents, personal injury and damage to installations.

The manufacturer of the unit is not responsible for any damage resulting from failure by the user or installer to observe the warnings and/or recommendations set out in this manual, nor for damage resulting from the use of non-original products or accessories or those made by other manufacturers.

If an anomaly or malfunction is detected in the unit, do not use the unit to take any measurements.

Inspect the work area before taking any measurements. Do not take measurements in dangerous areas or where there is a risk of explosion.

	Disconnect the unit from the power supply (unit and measuring system power supply) before maintaining, repairing or handling the unit's connections. Please contact the after-sales service if you suspect that there is an operational fault in the unit.

3.2.- INSTALLATION

On the side of the unit are all of the indications adjusted to the CEI 62052-11 standard.

The unit is installed on a DIN rail.

Before connecting the unit, you must couple it to a **CEM** energy meter as shown in **Figure 1** and **Figure 2**.

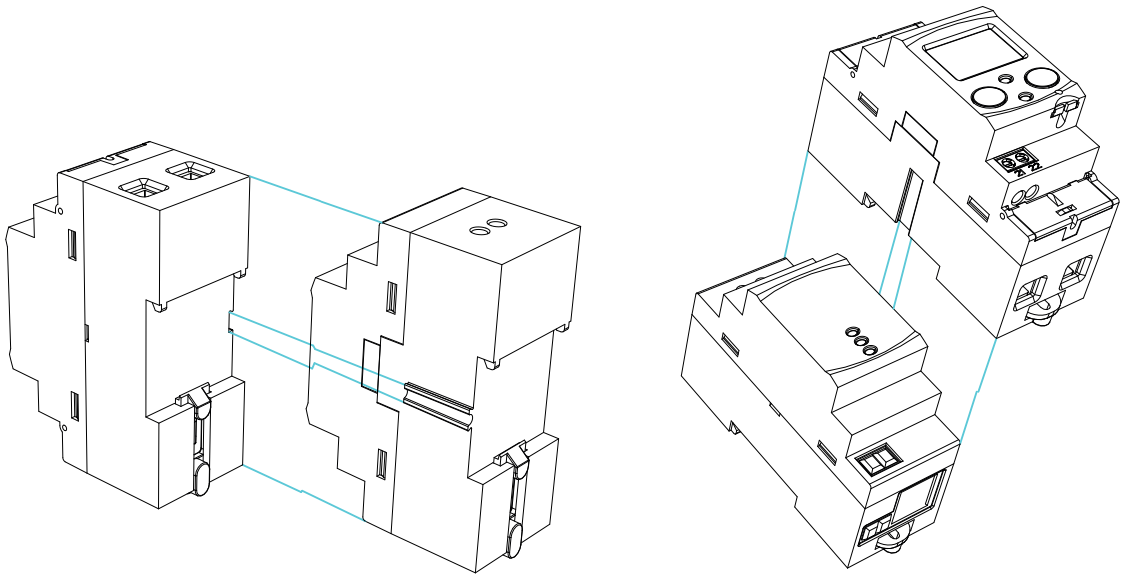

Figure 1: Coupling the CEM M-RS485 to a CEM energy meter.

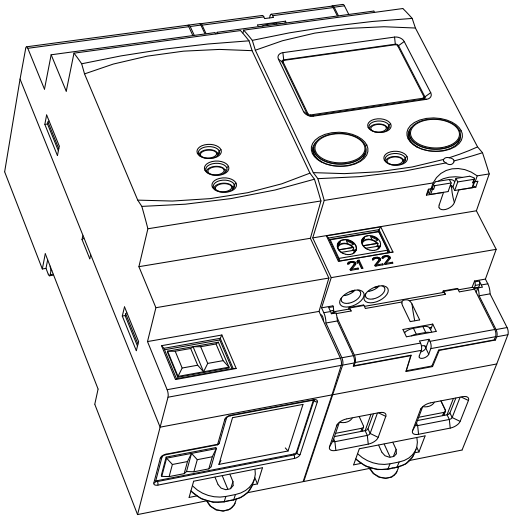

Figure 2: Coupled CEM M-RS485 and CEM.

⚠	Terminals, opening covers or removing elements can expose parts that are hazardous to the touch while the unit is powered. Do not use the unit until it is fully installed.

The unit must be connected to a power circuit that is protected with gL fuses (IEC 269) or M fuses, with a rating of 0.5 to 2 A. It must be fitted with a circuit breaker switch or equivalent device for disconnecting the unit from the power supply mains.

The RCCB or equivalent device must be in the immediate vicinity of the unit and must be easily accessible.

The power circuit is connected with a cable with a section measuring up to 2.5 mm^2.
The RS-485 connector enables cables of up to 1.5 mm^2 to be inserted.

	The unit's operating temperature is between -25ºC and +70ºC; always use connection cables that can withstand these temperatures.

3.3.- UNIT TERMINALS

Table 2:List of CEM M-RS485 terminals.

Unit terminals	
1: Auxiliary power supply.	**3: A(+)**, RS-485
2: Auxiliary power supply.	**4: B(-),** RS-485

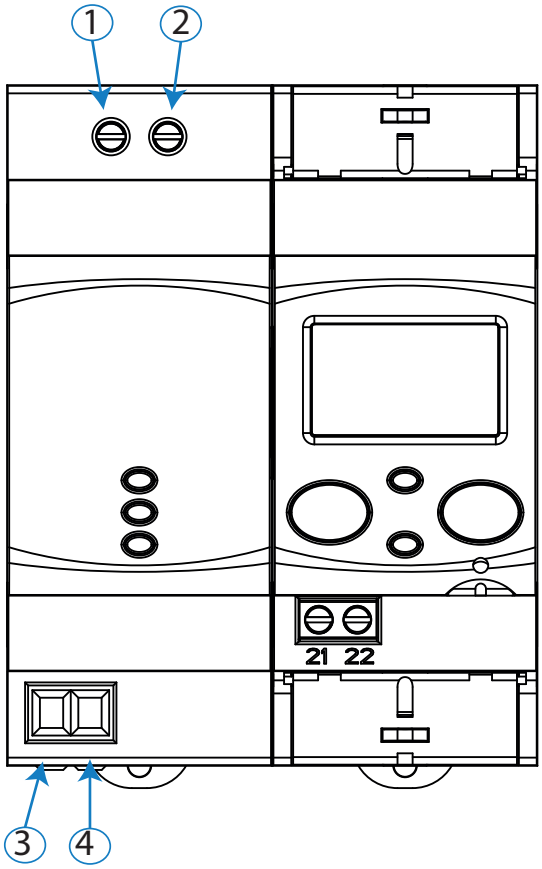

Figure 3:CEM M-RS485 terminals.

3.4.- CONNECTION DIAGRAM

The RS-485 cable must be made up of a twisted pair cable with a braided shield with a maximum distance of 1,200 metres between the **CEM M-RS485** and the master unit.
A maximum of 32 units can be connected to this bus.

Use an intelligent RS-232 to RS-485 network protocol converter to establish communications with the master unit.

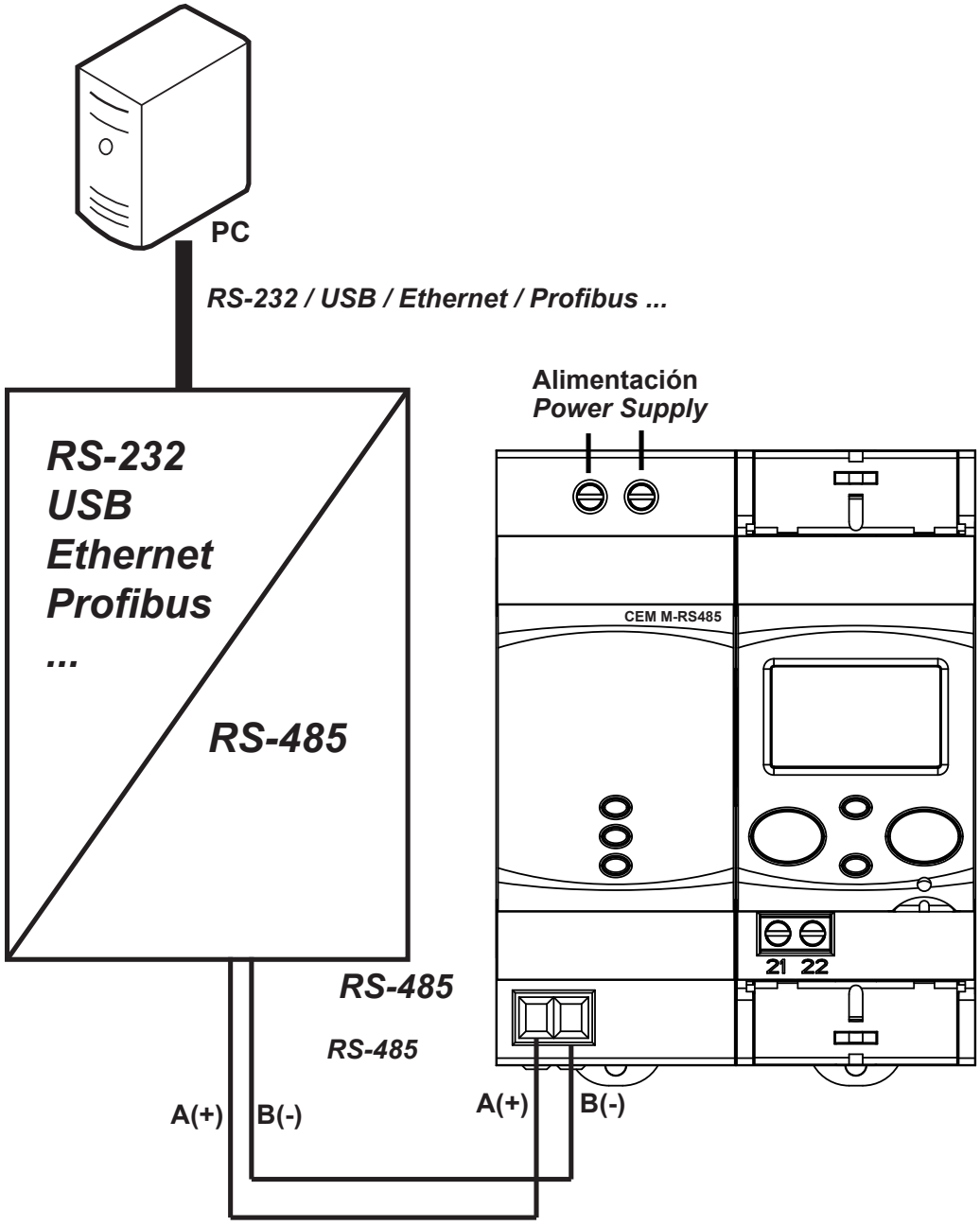

Figure 4: CEM M-RS485 connection diagram.

4.- OPERATION

The **CEM M-RS485** is designed to be used as a RS-485 electrical port for any device in the **CEM** family, using the mechanical coupling next to the optical port.

4.1.- OPERATING PRINCIPLE

The **CEM M-RS485** is an optional accessory for electrical energy meters from the **CEM** range that are mounted on DIN rails.

The **CEM M-RS485** provides **CEM** units with RS-485 communications with the **MODBUS** protocol.

Once the unit is coupled to the **CEM** energy meter (See ***"3.2.- INSTALLATION"***) the **LINK** LED turns green to let the user know that the link has been made correctly.

From this point onward, the new **CEM** energy meter + **CEM M-RS485** assembly functions as a single device.
This assembly operates the same as any standard slave device with a RS-485 bus, responding to **MODBUS** requests from the bus's master peripheral.

4.2.- LED INDICATORS

The unit has three indicator LEDs:

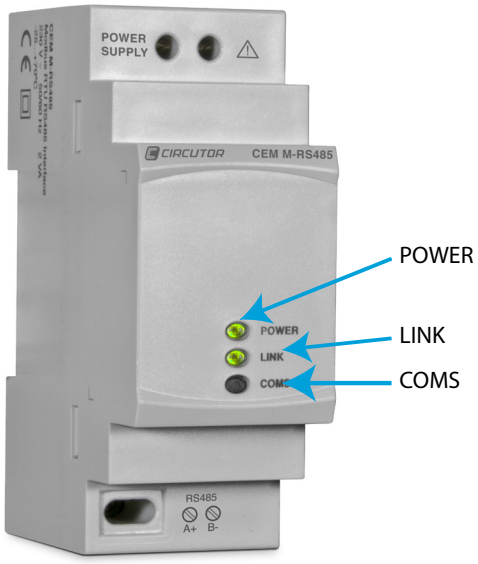

Figure 5:CEM M-RS485 indicator LEDs.

✓**POWER** LED: Indicates that the unit is connected to a power supply**.**
✓**LINK** LED: Indicates the status of the link with the **CEM** unit. (**Table 3**)

Table 3:LINK LED, colour codes.

LINK LED	
Colour	**Status**
Flashing red	Unit not linked
Steady green	Unit linked

✓**COMS** LED: Flashes with each transmission made by the RS-485 port.

4.3.- OPTICAL COMMUNICATIONS PORT

The unit has an optical serial communications port on its right side, in accordance with the UNE EN 62056-21:2003 standard, in order to communicate with other devices in the **CEM** family.

4.4- RS-485 COMMUNICATIONS

4.4.1.- MODBUS PROTOCOL

The **MODBUS** protocol is a communication standard in the industry that enables the network connection of multiple units, where there is a master and multiple slaves. Within the **MODBUS** protocol the **CEM M-RS485** uses the RTU (Remote Terminal Unit) mode.

In RTU mode, message starts and ends are detected with silences of at least 3.5 characters, and the 16-bit CRC error-detection method is used.

The **MODBUS** functions implemented in the unit are:

Functions 03 and 04. Reading logs.
Function 10. Writing multiple logs.

4.4.2.- READ COMMANDS

The **CEM M-RS485** supports integer type read functions: 0x03 and 0x04.
The unit's Modbus variables are specified in **Table 4**.

Example: *Reading of the unit's serial number with peripheral number 01.*

We will send the following Modbus frame:

Address	Function	Initial log	Log no.	CRC
01	04	2710	0002	CRC

The unit will respond to us with the next frame:

Address	Function	No. of bytes	Serial no.	CRC
01	04	04	XXXX XXXX	CRC

Note: *The values are shown in hexadecimal.*

The number of requested logs must be the same as the size of the variable requested.
It is possible to read several consecutive addresses, if the request meets the correct format.

4.4.3.- WRITE COMMANDS

The **CEM M-RS485** supports integer type write functions: 0x01.
The unit's Modbus variables are specified in **Table 4**.

Example: *Changing the Modbus address of peripheral 01 to the address 0x000A.*

We will send the following Modbus frame:

Address	Function	Initial log	Log no.	No. bytes	Data	CRC
01	10	0008	0001	02	000A	CRC

The unit will respond to us with the next frame:

Address	Function	Initial log	Log no.	CRC
01	10	0008	0001	CRC

Note: *The values are shown in hexadecimal.*

The number of logs to write must be the same as the size of the variable that is being accessed.
It is possible to write several consecutive addresses, if the request meets the correct format.

4.4.4.- MODBUS VARIABLES

Table 4: CEM M-RS485 Modbus variables.

Description	Address (Hexadecimal)	Size	Read/Write	Default value
Modbus Address	0x0008	16-bit	Read/Write	1
Transmission speed (Baud rate)	0x0106	16 bits	Read/Write **0:** 9600 **1:**19200 **2:** 38400	**0:** 9600
Serial no.	0x2710	32 bits	Read	-
Instantaneous values				
Imported active energy	0x0000	32 bits	Read	-
Exported active energy	0x0002	32 bits	Read	-
Q1 Reactive energy	0x0004	32 bits	Read	-
Q2 Reactive energy	0x0006	32 bits	Read	-
Q3 Reactive energy	0x0008	32 bits	Read	-
Q4 Reactive energy	0x000A	32 bits	Read	-
Partial imported active energy	0x0030	32 bits	Read	-
Partial exported active energy	0x0032	32 bits	Read	-
Q1 partial reactive energy	0x0034	32 bits	Read	-
Q1 partial reactive energy	0x0036	32 bits	Read	-
Q3 partial reactive energy	0x0038	32 bits	Read	-
Q4 partial reactive energy	0x003A	32 bits	Read	-

Note: *Some* ***MODBUS*** *variables may not be available depending on the* ***CEM*** *energy meter coupled to the* ***CEM M-RS485****.*

5.- TECHNICAL FEATURES

Power supply	
Rated voltage	230 V~ ± 20%
Maximum power consumption	4 VA
Frequency	50/60 Hz with no differentiation

Insulation	
AC voltage	4kV RMS 50Hz during 1 minute

Overimpulse	
1.2/50ms 0Ω source impedance	6 kV at 60º and 240º, with positive and negative polarization

Memory	
Setup, events, load curve	Non-volatile EEPROM memory

User interface	
LED	3 LEDs (**POWER - LINK - COMS**)

RS-485 communication	
Communications protocol	Modbus
Baud rate	9600, 19200, 38400
Stop bits	1
Parity	no parity

Environmental features	
Operating temperature	-25ºC... +70ºC
Storage temperature	-35ºC... +80ºC
Relative humidity (non-condensing)	5 ... 95%
Maximum altitude	2,000 m

Mechanical features	
Dimensions	**Figure 6**
Enclosure	ABS + V0 polycarbonate
Weight	115 gr
Protection degree	IP 51 installed IP 40 in the terminal area

Standards	
Safety requirements for electrical units for measurement, control and laboratory use. Part 1: General requirements.	EN 61010-1: 2010
Electromagnetic compatibility (CEM). Part 6-2: Generic standards. Immunity for industrial environments.	EN 61000-6-2: 2005
Electromagnetic compatibility (CEM). Part 6-3: Generic standards. Emission standard for residential, commercial and light industry environments.	EN 61000-6-3: 2007

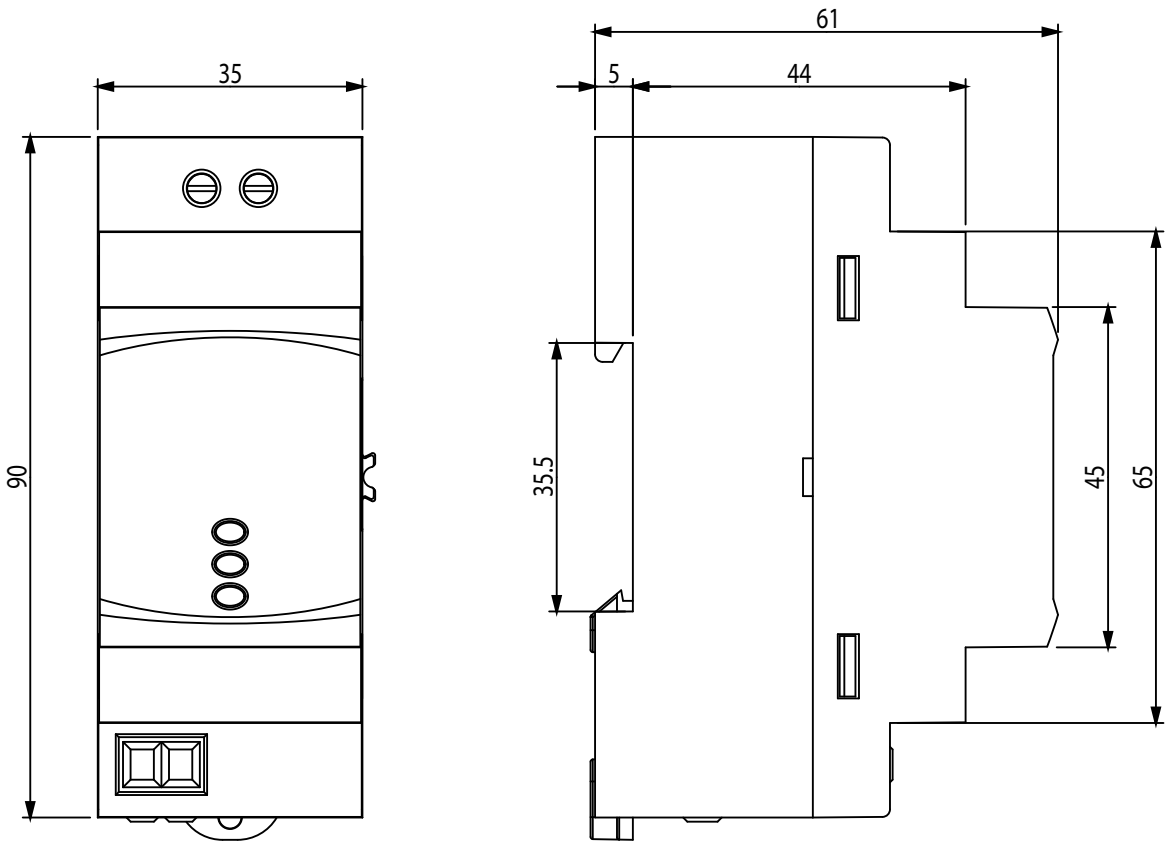

Figure 6: CEM M RS-485 dimensions.

6.- MAINTENANCE AND TECHNICAL SERVICE

The unit does not need any type of maintenance.

In the case of any query in relation to unit operation or malfunction, please contact the **CIRCUTOR, SA** Technical Support Service.

Technical Assistance Service
Vial Sant Jordi, s/n, 08232 - Viladecavalls (Barcelona)
Tel: 902 449 459 (España) / +34 937 452 919 (outside of Spain)
email: sat@circutor.es

7.- GUARANTEE

CIRCUTOR guarantees its products against any manufacturing defect for two years after the delivery of the units.

CIRCUTOR will repair or replace any defective factory product returned during the guarantee period.

• No returns will be accepted and no unit will be repaired or replaced if it is not accompanied by a report indicating the defect detected or the reason for the return.
•The guarantee will be void if the units has been improperly used or the storage, installation and maintenance instructions listed in this manual have not been followed. “Improper usage” is defined as any operating or storage condition contrary to the national electrical code or that surpasses the limits indicated in the technical and environmental features of this manual.
• **CIRCUTOR** accepts no liability due to the possible damage to the unit or other parts of the installation, nor will it cover any possible sanctions derived from a possible failure, improper installation or “improper usage” of the unit. Consequently, this guarantee does not apply to failures occurring in the following cases:
- Overvoltages and/or electrical disturbances in the supply;
- Water, if the product does not have the appropriate IP classification;
- Poor ventilation and/or excessive temperatures;
- Improper installation and/or lack of maintenance;
- Buyer repairs or modifications without the manufacturer’s authorisation.

8.- CE CERTIFICATE

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