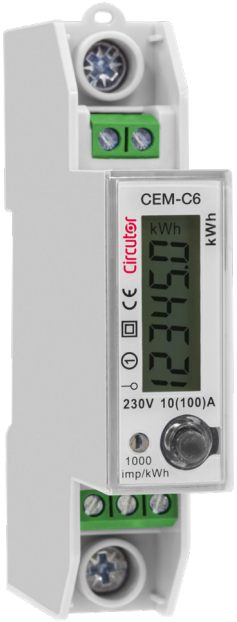
Multifunctional Energy Meter

CEM-C6
CEM-C6-MID



INSTRUCTION MANUAL

(M187B01-03-20A)

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

	**CIRCUTOR,** recommends using the original cables and accessories that are supplied with the device.

CONTENTS

Note: *The images of the devices are solely for the purpose of illustration and may differ from the original device.*

REVISION LOG

Table 1: Revision log.

Date	Revision	Description
12/17	M187B01-03-17A	Initial Version
04/18	M187B01-03-18A	Changes in the following sections: 3.2. - 6.- 7.
10/18	M187B01-03-18B	Changes in the following sections: 4. - 5. - 6. - 6.1. - 6.2.
01/19	M187B01-03-19A	Changes in the following sections: 2. - 7. - 6.2.
10/19	M187B01-03-19B	Changes in the following sections: 2. - 4.1. - 6. - 6.2.
12/19	M187B01-03-19C	Changes in the following sections: 4 - 6.2.- 7.
09/20	M187B01-03-20A	Changes in the following sections: 6.2.

SYMBOLS

Table 2: Symbols.

Symbol	Description
CE	In compliance with the relevant European directive.
	Device covered by European directive 2012/19/EC. At the end of its useful life, do not leave the unit in a household waste container. Follow local regulations on electronic equipment recycling.
~	AC current

1.- VERIFICATION UPON RECEPTION

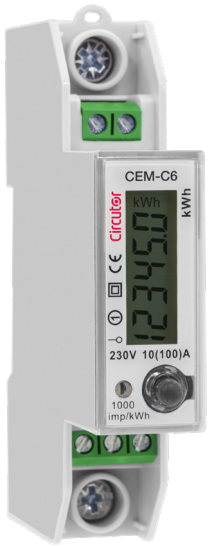
Check the following points upon receiving the device:

a) The device meets the specifications described in your order.
b) The device has not suffered any damage during transport.
c) Perform an external visual inspection of the device 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-C6** static single-phase energy meter measures class 1 (IEC 62053-21) / class B (EN50470), with multifunction, RS-485 communications and DIN rail standard installations. It is the ideal solution for residential and commercial installations.



The device features:

- The meter can read these data during the definite time period and analysis the quality and load condition of user's grid.
- **DIN** rail standard installation size.
- Only 18 mm wide, can up to 100A.
- **RS-485** communication, protocol: IEC1107 or Modbus-TRU Mode.
- **Multi-tariff function.** The user can set time period through RS-485 communication, then the meter will measure the energy of each different time period.
- Meter has 3.6V Lithium battery, which is used to support multy-tariff function. And the precision of RTC is better that 0.5s/day.
- Blue LCD backlight allows the meter to be read in low light conditions.
- Accurately measure fordward and reverse energy.

3.- DEVICE INSTALLATION

3.1.- PRELIMINARY RECOMMENDATIONS

	In order to use the device safely, it is critical that 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-C6** device must be installed by authorised and qualified staff.

The measuring systems switched off before handling, altering the connections or replacing the device. 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 device 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 device, do not use the device 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 device from the power supply before maintaining, repairing or handling the device's connections. Please contact the after-sales service if you suspect that there is an operational fault in the device.

3.2.- INSTALLATION

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

Installation instruction:

1.- Choose 35mm standard DIN rail (the length is confirmed by yourself), fixed them in the location which are waiting for installation.

2.- Push down the clip under the bottom of the meter for a gear, see **Figure 1.**

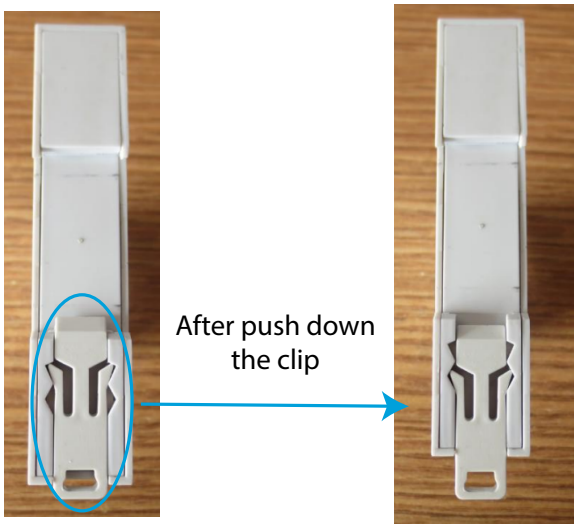


Figure 1:Push down the clip.

3.- Put the meter into the DIN rail as per **Figure 2**, then push up the clip for a gear, install meter to the DIN rail, see **Figure 3**.

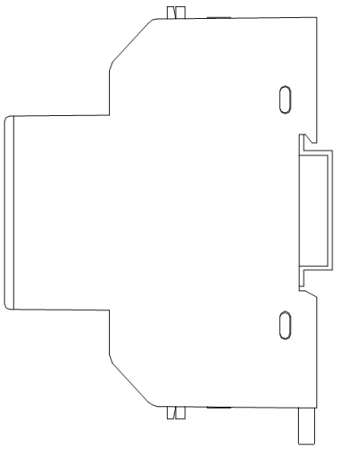


Figure 2:Put the meter into the DIN rail.

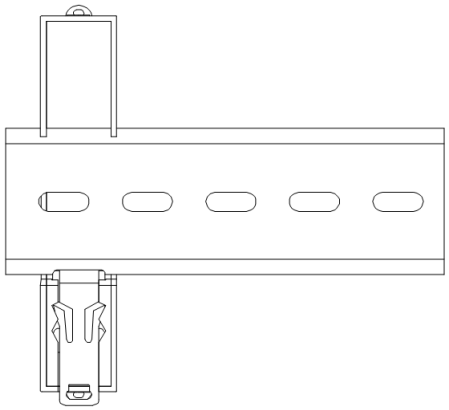


Figure 3: Install meter to the DIN rail.

4.- Making the connection according to the wiring diagram.

5.- After connection, use lead sealing to seal terminal cover.

3.3.- DEVICE TERMINALS

Table 3:List of CEM-C6 terminals.

Device terminals	
1 : L, Input, connected to the mains phase	**23: A,** RS-485 connection
3: LOAD, Output	**24: G,** RS-485 connection
N: N, Input, connected to neutral	**25: B,** RS-485 connection

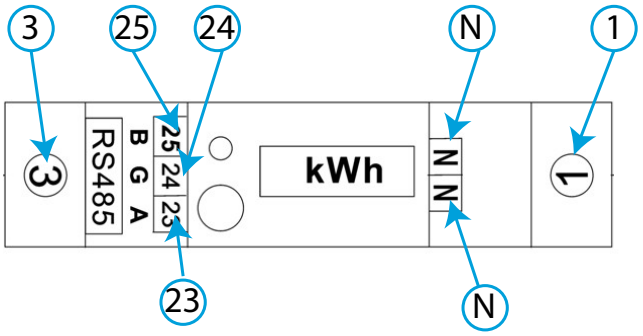


Figure 4:Terminals of the CEM-C6.

Note: *The Neutral wire can be connected to one of N ports or borh.*
Note: *If RS-485 transverter does not have G port, it's Ok to disconnect it.*

3.4.- CONNECTION DIAGRAM

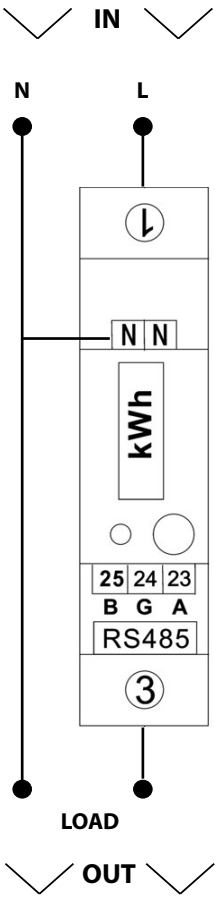


Figure 5: Connection diagram, CEM-C6.

4.- OPERATION

The **CEM-C6** is an energy meter capable of measuring:

- ✓ Voltage and current
- ✓ Active and reactive energy.
- ✓ Active, reactive and apparent power.
- ✓ Power factor.

The **CEM-C6** model measures in the 4 quadrants (consumption and generation) and the **CEM-C6-MID** model in 2 quadrants.

4.1.- KEYBOARD FUNCTIONS

The **CEM-C6** has 1 key that allows you to browse the different screens (**Figure 6**).

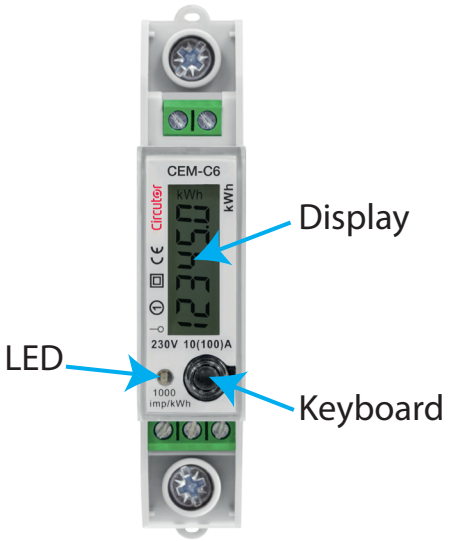


Figure 6: CEM-C6, description.

4.2.- DISPLAY

The device has an LCD where all parameters are displayed (**Figure 6**).

4.3.- LED INDICATORS

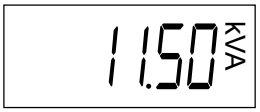
The device has one verification LED, to verify the **active energy.** The weight of the LED is 1000 imp/kWh (**Figure 6**).

5.- DISPLAY

The data can be displayed through 2 methods:

✓ Display data automatically by page and the time interval is 5s.
✓ Check data through the external key.

Table 4: Display.

Screen	Parameters
	Partial active Energy counter (kWh)
	Partial reactive Energy counter (kVArh)
	Voltage (V)
	Current (A)
	Active power (kW)
	Reactive power (kVAr)
	Apparent power (kVA)
	Power factor (cos ϕ)

6.- RS-485 COMMUNICATIONS

The **CEM-C6** has one RS-485 communications port to view the measurement data and configure the devices. The visualization and configuration can also be done through the **CIRCUTOR PowerStudio** software.

Note:** Default values of RS-485 communication: **No. of peripheral 1, 9600 bps, No parity, 8 data bits and 1 stop bit.

6.1.- MODBUS PROTOCOL

In the Modbus protocol, the **CEM-C6** device uses the RTU (Remote Terminal Unit) mode. The Modbus functions implemented in the device are as follows:

Function 0x03: Reading integer registers
Function 0x10: Writing multiple registers

6.1.1. READING EXAMPLE : Function 0x03.

Question: Voltage value

Address	Function	Initial register	No. of registers	CRC
01	03	0000	0001	840A

Address: 01, Peripheral number: 1 in decimals.
Function: 03, Read function.
Initial Register: 0000, register on which the reading will start. (Modbus address).
No of registers: 0001, number of registers read.
CRC: 840A, CRC Character.

Response:

Address	Function	No of Bytes	Register no 1	CRC
01	03	02	091F	FFDC

Address: 01, Responding peripheral number: 10 in decimals.
Function: 03, Read function.
No. of bytes: 02, No. of bytes received.
Register: 091F, value of the voltage :091F : 2335 → 233.5V
CRC: FFDC, CRC Character.

6.1.2. WRITING EXAMPLE : Function 0x10.

Question: Modify the Modbus baud rate to 9600 bps

Address	Function	Initial Register	No of Registers	No of Bytes	Value	CRC
01	10	002A	0001	02	0004	xxxx

Address: 01, Peripheral number: 1 in decimals.
Function: 10, Writing function.
Initial Register: 002A, Address of the Baud rate parameter.
No of registers: 0001, number of registers write.
No of bytes: 02, number of bytes write.
Value: 0004, 0004 → 9600 bps.
CRC: xxxx, CRC Character.

6.2.- MODBUS COMMANDS

Note: *The waiting time of a Modbus query can exceed 200 ms, depending on the number of registers requested.*

All the adresses of Modbus memory are in Hexadecimal.

Table 5: Modbus memory map (Table 1).

Parameter	Modbus address	Function	Units
CEM-C6			
Voltage	00	03	V x 10
Current	01	03	A x 10
Frequency	02	03	Hz x 10
Active Power	03	03	W
Reactive Power	04	03	var
Apparent Power	05	03	VA
Power Factor	06	03	x 1000
CEM-C6-MID			
Voltage	0131	03	V x 100
Current	0139 - 013A	03	A x 1000
Frequency	0130	03	Hz x 100
Active Power	0140 - 0141	03	W
Reactive Power	0148 - 0149	03	VAr
Apparent Power	0150 - 0151	03	VA
Power Factor	0158	03	x 1000

Table 6: Modbus memory map (Table 2).

Parameter	Modbus address	Function	Units
CEM-C6			
Total Active energy	07 - 08	03	kWh x 100
Total reactive energy	11 - 12	03	kVarh x 100
Total Consumed Active Energy	2D - 2E	03	kWh x 100
Total Generated Active Energy	37 - 38	03	kWh x 100
Total consumed inductive reactive Energy	41 - 42	03	kWh x 100
Total generated inductive reactive Energy	4B - 4C	03	kWh x 100
Total consumed capacitive reactive Energy	55 - 56	03	kVarh x 100
Total generated capacitive reactive Energy	5F - 60	03	kVarh x 100
CEM-C6-MID			
Total Active energy	A000 - A001	03	kWh x 100
Total reactive energy	A01E - A01F	03	kVarh x 100

Table 7: Modbus memory map (Table 3).

Parameter	Modbus address	Function	Data format
CEM-C6			
Date and time	21 ... 24	03 / 10	YY YY MM DD WW hh mm ss (1)
CEM-C6-MID			
Date and time	8120 - 8123	03 / 10	YY MM DD hh mm ss (1)

(1)Data format :

Table 8: Data format.

Parameter	Data format	Description
Date and time	YY YY (decimal value) YY (decimal value) (**CEM-C6-MID** Model)	Year
	MM (decimal value)	Month
	DD (decimal value)	Day
	WW (decimal value)	Week
	hh (decimal value)	Hour
	mm (decimal value)	Minutes
	ss (decimal value)	Seconds

Table 9: Modbus memory map (Table 4).

Parameter	Modbus address	Function	Default values	Data format
CEM-C6				
Baud Rate (2)	2A	03 / 10	**04**	**01:** 1200 bps, **02:** 2400 bps **03:** 4800 bps, **04:** 9600 bps
ID (peripheral number) (2)	2B	03 / 10	1	1 - 247
CEM-C6-MID				
Baud Rate (2)	0111 (Low part)	03 / 10	**04**	**01:** 1200 bps, **02:** 2400 bps **03:** 4800 bps, **04:** 9600 bps
Parity (2)	0111 (High part)	03 / 10	**01**	**01:** none, **02:** odd **03:** Even
ID (peripheral number) (2)	0110	03 / 10	1	1 - 247

(2)The writing of the Baud Rate, Parity and the peripheral number must be done through individual frames. It is not possible to modify the two parameters at the same time.

7.- TECHNICAL FEATURES

Power supply	
Mode	Self-powered

Voltage Measurement		
Connection	Single-phase	
Reference voltages	230 V ~	
Frequency	**CEM-C6**	50 - 60 Hz
	CEM-C6-MID	50 Hz
Power consumption	≤ 8 VA, ≤ 0.4 Wh	

Current measurement	
Current	10 A
Maximum current (Imax)	100 A
Starting current	0.004 Ib

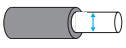
Accuracy (3)		
Accuracy	**CEM-C6**	Class 1 (IEC 62053-21)
	CEM-C6-MID	Class B (EN50470)

(3) The **CEM-C6** model measures in the 4 quadrants (consumption and generation) and the **CEM-C6-MID** model in 2 quadrants.

RS-485 Communications	
Bus	RS-485
Protocol	Modbus RTU
Baud rate	1200 - 2400 - 4800 - 9600

User interface	
Display	LCD
Maximum counter value	99999.9 kWh
Keys	1 keys
LED (kWh)	1000 imp/kWh (width: 90 ms)

Environmental features	
Operating temperature	-20ºC... +65ºC
Relative humidity (maximum value)	95%
Average humidity value of year	75%

Mechanical features	
Dimensions (Figure 7)	90x18x72 mm
Weight	0.10 kg
Enclosure	ABS, PC alloy material
Protection degree	IP 51 (indoor meter)
Connections	 (maximum)
RS-485 (A, G, B)	1.5 mm^2
Neutral (N)	1.5 mm^2
Measure (L, LOAD)	22 mm^2

Standards	
Electrical energy metering equipment (AC). Particular requirements. Part 21: Static active energy meters (classes 1 and 2)	IEC 62053-21

(Continuation) Standards	
Electricity metering equipment (AC) - General requirements, tests and test conditions -- Part 11: Metering equipment	IEC 62052-11
Electricity metering equipment (a.c.) -- Part 1: General requirements, tests and test conditions - Metering equipment (class indexes A, B and C)	EN 50470-1
Electricity metering equipment (a.c.) -- Part 3: Particular requirements - Static meters for active energy (class indexes A, B and C)	EN 50470-3
CEM-C6-MID	
EU Directive 2014/32/EU on Measuring Instruments Annex II, Module B	

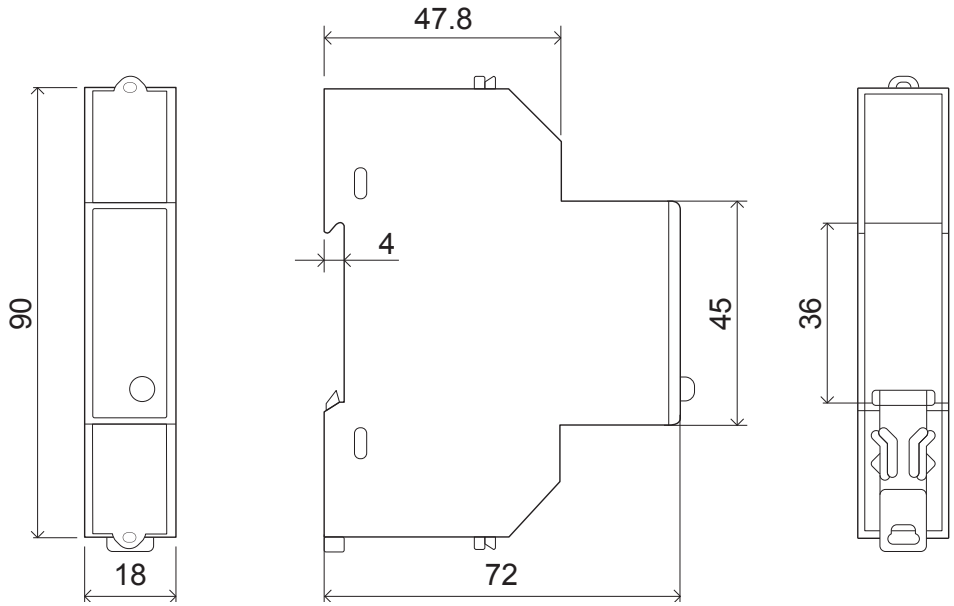


Figure 7: Dimensions of the CEM-C6.

8.- MAINTENANCE AND TECHNICAL SERVICE

In the case of any query in relation to device 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.com

9.- 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.

CIRCUTOR, SA – Vial Sant Jordi, s/n
08232 Viladecavalls (Barcelona) Spain
(+34) 937 452 900 – info@circutor.com

(ES) DECLARACIÓN UE DE CONFORMIDAD

La presente declaración de conformidad se expide bajo la exclusiva responsabilidad de CIRCUTOR con dirección en **Vial Sant Jordi, s/n – 08232 Viladecavalls (Barcelona) España**

Producto:

Contador de energía monofásico

Serie:

CEM C6

Marca:

CIRCUTOR

EL objeto de la declaración es conforme con la legislación de armonización pertinente en la UE, siempre que sea instalado, mantenido y usado en la aplicación para la que ha sido fabricado, de acuerdo con las normas de instalación aplicables y las instrucciones del fabricante

2014/35/UE: Low Voltage Directive 2014/30/UE: Electromagnetic Compatibility Directive
2011/65/UE: RoHS2 Directive

Está en conformidad con la(s) siguiente(s) norma(s) u otro(s) documento(s) normativos(s):

IEC 62052-11:2003 Ed 1.0 IEC 62053-21:2003 Ed 1.0

Año de marcado "CE":

2018

(EN) EU DECLARATION OF CONFORMITY

This declaration of conformity is issued under the sole responsibility of CIRCUTOR with registered address at **Vial Sant Jordi, s/n – 08232 Viladecavalls (Barcelona) Spain**

Product:

Single-phase energy meter

Series:

CEM C6

Brand:

CIRCUTOR

The object of the declaration is in conformity with the relevant EU harmonisation legislation, provided that it is installed, maintained and used for the application for which it was manufactured, in accordance with the applicable installation standards and the manufacturer's instructions

2014/35/UE: Low Voltage Directive 2014/30/UE: Electromagnetic Compatibility Directive
2011/65/UE: RoHS2 Directive

It is in conformity with the following standard(s) or other regulatory document(s):

IEC 62052-11:2003 Ed 1.0 IEC 62053-21:2003 Ed 1.0

Year of CE mark:

2018

(FR) DÉCLARATION UE DE CONFORMITÉ

La présente déclaration de conformité est délivrée sous la responsabilité exclusive de CIRCUTOR dont l'adresse postale est **Vial Sant Jordi, s/n – 08232 Viladecavalls (Barcelone) Espagne**

Produit:

Mesureurs d'énergie monophasé

Série:

CEM C6

Marque:

CIRCUTOR

L'objet de la déclaration est conforme à la législation d'harmonisation pertinente dans l'UE, à condition d'avoir été installé, entretenu et utilisé dans l'application pour laquelle il a été fabriqué, conformément aux normes d'installation applicables et aux instructions du fabricant

2014/35/UE: Low Voltage Directive 2014/30/UE: Electromagnetic Compatibility Directive
2011/65/UE: RoHS2 Directive

Il est en conformité avec la(les) suivante (s) norme(s) ou autre(s) document(s) réglementaire (s):

IEC 62052-11:2003 Ed 1.0 IEC 62053-21:2003 Ed 1.0

Année de marquage « CE »:

2018

Viladecavalls (Spain), 25/04/2018
General Manager: Ferran Gil Torné

CIRCUTOR, S.A.
NIF. A-08513178
Vial Sant Jordi, s/n.
08232 VILADECAVALLS
(Barcelona) Spain
Tel.(+34) 93 745 29 00

CIRCUTOR, SA – Vial Sant Jordi, s/n
08232 Viladecavalls (Barcelona) Spain
(+34) 937 452 900 – info@circutor.com

(DE)

KONFORMITÄTSERKLÄRUNG UE

Vorliegende Konformitätserklärung wird unter alleiniger Verantwortung von CIRCUTOR mit der Anschrift, Vial Sant Jordi, s/n – 08232 Viladecavalls (Barcelona) Spanien, ausgestellt

Produkt:

Einphasen-Energiezähler

Serie:

CEM C6

Marke:

CIRCUTOR

Der Gegenstand der Konformitätserklärung ist konform mit der geltenden Gesetzgebung zur Harmonisierung der EU, sofern die Installation, Wartung undVerwendung der Anwendung seinem Verwendungszweck entsprechend gemäß den geltenden Installationsstandards und der Vorgaben des Herstellers erfolgt.

2014/35/UE: Low Voltage Directive 2014/30/UE: Electromagnetic Compatibility Directive
2011/65/UE: RoHS2 Directive

Es besteht Konformität mit der/den folgender/folgenden Norm/Normen oder sonstigem/sonstiger Regelwerk/Regelwerken

IEC 62052-11:2003 Ed 1.0 IEC 62053-21:2003 Ed 1.0

Jahr der CE-Kennzeichnung:

2018

(PT)

DECLARAÇÃO DA UE DE CONFORMIDADE

A presente declaração de conformidade é expedida sob a exclusiva responsabilidade da CIRCUTOR com morada em **Vial Sant Jordi, s/n – 08232 Viladecavalls (Barcelona) Espanha**

Producto:

Contadores de energía monofásicos

Série:

CEM C6

Marca:

CIRCUTOR

O objeto da declaração está conforme a legislação de harmonização pertinente na UE, sempre que seja instalado, mantido e utilizado na aplicação para a qual foi fabricado, de acordo com as normas de instalação aplicáveis e as instruções do fabricante.

2014/35/UE: Low Voltage Directive 2014/30/UE: Electromagnetic Compatibility Directive
2011/65/UE: RoHS2 Directive

Está em conformidade com a(s) seguinte(s) norma(s) ou outro(s) documento(s) normativo(s):

IEC 62052-11:2003 Ed 1.0 IEC 62053-21:2003 Ed 1.0

Ano de marcação "CE"::

2018

(IT)

DICHIARAZIONE DI CONFORMITÀ UE

La presente dichiarazione di conformità viene rilasciata sotto la responsabilità esclusiva di CIRCUTOR, con sede in **Vial Sant Jordi, s/n – 08232 Viladecavalls (Barcellona) Spagna**

prodotto:

Contatori di energia monofase

Serie:

CEM C6

MARCHIO:

CIRCUTOR

L'oggetto della dichiarazione è conforme alla pertinente normativa di armonizzazione dell'Unione Europea, a condizione che venga installato, mantenuto e utilizzato nell'ambito dell'applicazione per cui è stato prodotto, secondo le norme di installazione applicabili e le istruzioni del produttore.

2014/35/UE: Low Voltage Directive 2014/30/UE: Electromagnetic Compatibility Directive
2011/65/UE: RoHS2 Directive

È conforme alle seguenti normative o altri documenti normativi:

IEC 62052-11:2003 Ed 1.0 IEC 62053-21:2003 Ed 1.0

Anno di marcatura "CE":

2018

Viladecavalls (Spain), 25/04/2018
General Manager: Ferran Gil Torné

CIRCUTOR, S.A.
NIF. A-08513178
Vial Sant Jordi, s/n.
08232 VILADECAVALLS
(Barcelona) Spain
Tel.(+34) 93 745 29 00

CIRCUTOR, SA – Vial Sant Jordi, s/n
08232 Viladecavalls (Barcelona) Spain
(+34) 937 452 900 – info@circutor.com

(PL)

DEKLARACJA ZGODNOŚCI UE

Niniejsza deklaracja zgodności zostaje wydana na wyłączną odpowiedzialność firmy CIRCUTOR z siedzibą pod adresem: **Vial Sant Jordi, s/n – 08232 Viladecavalls (Barcelona) Hiszpania**

produk:

liczniki energii Jednofazowe

Seria:

CEM C6

marka:

CIRCUTOR

Przedmiot deklaracji jest zgodny z odnośnymi wymaganiami prawodawstwa harmonizacyjnego w Unii Europejskiej pod warunkiem, że będzie instalowany, konserwowany i użytkowany zgodnie z przeznaczeniem, dla którego został wyprodukowany, zgodnie z mającymi zastosowanie normami dotyczącymi instalacji oraz instrukcjami producenta

2014/35/UE: Low Voltage Directive 2014/30/UE: Electromagnetic Compatibility Directive

2011/65/UE: RoHS2 Directive

Jest zgodny z następującą(ymi) normą(ami) lub innym(i) dokumentem(ami) normatywnym(i):

IEC 62052-11:2003 Ed 1.0 IEC 62053-21:2003 Ed 1.0

Rok oznakowania "CE":

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NIF. A-08513178
Vial Sant Jordi, s/n.
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(Barcelona) Spain
Tel.(+34) 93 745 29 00

CIRCUTOR, SA
Vial Sant Jordi, s/n
08232 -Viladecavalls (Barcelona)
Tel.: (+34) 93 745 29 00 - Fax: (+34) 93 745 29 14
www.circutor.com central@circutor.com