



CIRWATT Series Type B 100 SINGLE-PHASE METER



INSTRUCTION MANUAL

(M98240801-03-12A)

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E
ADVERTENCIAS / SÍMBOLOS
PELIGRO


Una conexión incorrecta del equipo puede producir la muerte, lesiones graves y riesgo de incendio. Lea y entienda el manual antes de conectar el equipo. Observe todas las instrucciones de instalación y operación durante el uso de este instrumento.

La instalación, operación y mantenimiento de este instrumento debe ser efectuado por personal cualificado solamente. El Código Eléctrico Nacional define a una persona cualificada como "una que esté familiarizada con la construcción y operación del equipo y con los riesgos involucrados".

ATENCIÓN

Consultar el manual de instrucciones antes de utilizar el equipo

En el presente manual, si las instrucciones precedidas por este símbolo no se respetan o realizan correctamente, pueden ocasionar daños personales o dañar el equipo y /o las instalaciones.

GB
WARNINGS / SYMBOLS
DANGER


Death, serious injury, or fire hazard could result from improper connection of this instrument. Read and understand this manual before connecting this instrument. Follow all installation and operating instructions while using this instrument.

Installation, operation, and maintenance of this instrument must be performed by qualified personnel only. The National Electrical Code defines a qualified person as "one who has the skills and knowledge related to the construction and operation of the electrical equipment and installations, and who has received safety training on the hazards involved."

WARNING

Consult the instruction manual before using the equipment.

In this manual, if the instructions preceded by this symbol are not met or done correctly, can cause personal injury or equipment damage and / or facilities.

F
WARNHINWEISE / SYMBOLE
DANGER


Un branchement incorrect de l'appareil peut entraîner la mort ou des lésions graves et peut provoquer un incendie. Avant de brancher votre appareil, lisez attentivement le manuel et assurez-vous de bien avoir compris toutes les explications données. Respectez toutes les instructions concernant le mode d'installation de l'appareil et son fonctionnement.


L'installation, le fonctionnement et la maintenance de cet appareil doivent être réalisés uniquement par du personnel qualifié. Le code électrique national définit en tant que personne qualifiée toute personne connaissant le montage et le fonctionnement de l'appareil ainsi que les risques que ceux-ci comportent »


ATTENTION

Consulter le manuel d'instructions avant d'utiliser l'appareil


Si les instructions suivantes, précédées dans le manuel d'un symbole, ne sont pas respectées ou sont réalisées incorrectement, elles pourront provoquer des dommages personnels ou abîmer l'appareil et/ou les installations.



WARNHINWEISE / SYMBOLE

GEFAHR 	Durch einen nicht sachgemäßen Anschluss der Anlage können Tod, schwere Verletzungen und Brandrisiko hervorgerufen werden. Bevor Sie die Anlage anschließen, lesen Sie bitte das Handbuch durch und machen Sie sich dessen Inhalt klar. Beachten Sie bei Einsatz dieses Instrumentes sämtliche Installations- und Betriebshinweise. Installation, Betrieb und Wartung dieses Instrumentes müssen ausschließlich von entsprechend qualifiziertem Personal vorgenommen werden. Von dem nationalen Elektrocode wird eine qualifizierte Person als jemand definiert, "der mit der Konstruktion und dem Betrieb einer Anlage und der damit verbundenen Risiken vertraut ist".
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ACHTUNG 	Vor Inbetriebnahme der Anlage ist das Handbuch zu lesen. Werden die in dem vorliegenden Handbuch mit diesem Symbol versehenen Hinweise nicht beachtet oder falsch verstanden, können Personenschäden und Schäden an der Anlage und/oder den Installationen verursacht werden.
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ADVERTÊNCIAS / SÍMBOLOS

PERIGO 	Uma ligação incorrecta do equipamento pode provocar a morte, lesões graves e risco de incêndio. Leia e compreenda o manual antes de ligar o equipamento. Observe todas as instruções de instalação e operação durante o uso deste aparelho. A instalação, operação e manutenção deste aparelho devem ser levadas a cabo exclusivamente por pessoal qualificado. O Código Eléctrico Nacional define uma pessoa qualificada como "uma pessoa que se encontre familiarizada com a construção e operação do equipamento assim como com os riscos inerentes".
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ATENÇÃO 	Consultar o manual de instruções antes de utilizar o equipamento No presente manual, se as instruções que precedem este símbolo não forem respeitadas ou realizadas de forma correcta, podem ocorrer ferimentos pessoais ou danos no equipamento e/ou nas instalações.
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AVVERTENZE / SIMBOLI

PERICOLO 	Un collegamento errato del dispositivo può provocare morte, lesioni gravi nonché rischio di incendio. Prima di collegare il dispositivo leggere attentamente il manuale. Osservare tutte le istruzioni relative all'installazione e all'operatività durante l'uso di questo strumento. L'installazione, operatività e manutenzione di questo strumento devono essere realizzate solamente da personale qualificato. Il Codice Elettrico Nazionale definisce una persona qualificata come "colui che ha familiarità con la costruzione e operatività del dispositivo e con i rischi che ne possano derivare".
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ATTENZIONE 	Consultare il manuale di istruzioni prima di utilizzare il dispositivo Qualora le istruzioni riportate nel presente manuale precedute da questo simbolo non vengano osservate o realizzate correttamente, possono provocare danni personali o danneggiare il dispositivo e/o gli impianti.
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1. GENERAL DESCRIPTION OF THE ENERGY METER

1.1. Introduction

The CIRWATT B Single-Phase Standard (**TBM B100**) is a static energy meter for measuring Active energy class A or B (depending on the version), which, together with the corresponding data collection system via optical interface.



1.2. Energy meter versions

The following table shows all the available options for the CIRWATT B 100. This is a general table, meaning that not all versions shown on the table may be currently available.

ENERGY METER TYPE	TBM B100		
2 wires asymmetrical connection	•	2	Connection mode
2 wires symmetrical connection	•	S	
Class A Active. Does not measure reactive	•	20	Accuracy
Class B Active Does not measure reactive	•	10	
127 V	•	B	Measurement voltage
230V	•	E	
Shunt 5(65)A	•	S7	Current measurement
Shunt 10(60)A	•	S4	
Shunt 5(60)A	•	S2	
50 Hz	•	A	Frequency
60 Hz	•	B	
Without communications (only optical port)	•	0	Communications
Without inputs/outputs	•	0	Expansion
Small industrial/household model	•	B	Model
2 Quadrants	•	0	Number of quadrants
Unidirectional	•	2	
Without added features	•	0	Extra features

For example: The **210-ES4A-00B-20** code would be for a *Type B 100 Single-Phase domestic energy meter, class B in active energy; with asymmetric connection and storage in any direction; at 50 Hz; with 230 V power supply/measurement voltages and 10(60)A current measurement; without communications; without expansion module or extra features.*

1.3. Metrology

The metrology features of the **CIRWATT TBM B100** are as follows:

- The type of current sensor is shunt.
- Current ranges:

	Class A Active	Class B Active
I_{tr}	0.5A/1A	0.5A/1A
I_{st}	0.025A/0.050A	0.02A/0.04A
I_{min}	0.250A/0.500A	0.250A/0.500A
$I_{ref.} / I_{no.}$	5A/10A	5A/10A
I_{max}	60A/ 65A	60A/ 65A

1.4. Measured items

The energy meter can measure the following:

- Active energy.
- Active power (only for communications)

1.5. Nominal, maximum and minimum operating conditions

1.5.1. Electrical parameters

- Reference voltage (U_{ref}): 127 (V) or 230 (V)
- Operating voltages
 - minimum: 80% U_{ref}
 - maximum: 120% U_{ref}
- Operating voltage limit: 230 V or 440 V for 4 hours
- Reference frequency: 50 - 60 Hz
- Absorbed power per phase: <2 W; <10 VA for I_b , U_{ref}

1.5.2. Environmental parameters

- Minimum temperature: -25 °C
- Minimum temperature of metrology part: -40 °C
- Maximum temperature: +70 °C; 95% relative humidity without condensation.

1.6. Build features

1.6.1. Overview

The energy meter has an insulating enclosure, with protection class II and double insulation.

No materials or substances not established in the 2002/96/EC and 2002/95/EC directives are used on such enclosures. The materials used are fireproof, halogen-free and with low emissions of opaque, toxic and corrosive fumes.

The unit's operation will not be affected by the presence of external magnetic fields.

The energy meter manufacturer certifies the useful life of the unit for a minimum of 15 years at an average temperature of 35 °C.

1.6.2. Environmental features

The energy meter offers:

- Protection degrees provided by the Code IP 55 enclosures, CEI 60529:2001 standard.
- Protection against saline mist, UNE-EN 60068-2-11:2000 standard.
- Resistance to ultraviolet rays, UNE-EN 60068-2-5:2000 standard.

1.6.3. Voltage measurement

The voltage bridge internally separates the voltage and current circuits, so that they can not be externally tampered with.

1.6.4. Seals

The cover and base of the energy meter are sealed, making it impossible to open them or to insert objects without breaking the enclosure. It also has the regulatory seals on the wire cover lids.

1.6.5. Wire cover lids (depending on the version)

The energy meter has an opaque cover over the top of the terminal box, the fastening screws and the connection conductors. The bottom part is made for easy breakage and to provide a partial outlet for the wires, protecting access to the terminals.

1.6.6. Wire cover lids (depending on the version)

The energy meters have an opaque cover over the top of the terminal box and the fastening screws.

1.6.7. Terminal box

Screws:

The screws are mixed, allowing the use of flat head and Pozidriv screwdrivers. Fastening is done with a double screw designed to not become deformed with the various tightening and loosening operations that may occur throughout the energy meter's life.

Terminals:

All terminals are permanently numbered on the front panel, from left to right, with the driver function indicated on the features label on the energy meter enclosure.

1.7. Data display

The data is displayed on an LCD display especially designed for this application, where the energy can be seen.




- *Data line.* Zone where the energy is shown.
- *Indicators.* The indicated option is identified by arrow markings on the enclosure.

1.7.1 Verification impulses

The unit has a single verification LED with a constant of 1000 imp/kWh. The same LED is used to indicate the "no load" status. The LED stays lit whenever the energy meter's load is insufficient for starting up.

1.7.2 Features plate

The features plate is located on the energy meter's front panel and contains instructions adapted to the CEI 62052-11 standard:

- Manufacturer's identification mark and place of manufacture
- Definition of the type and approval indications
- Number of phases and number of circuit conductors to which the unit can be connected (for example, 2-wire single-phase)
- Energy meter serial number (9 numerical characters). This number individually identifies each energy meter
- Year of manufacture, the year when the energy meter was manufactured
- Reference voltage, depending on the voltage assigned by the network
- Reference current and maximum current, for example 5(65)A would be an energy meter with a 5 A base current and 65 A maximum current
- Reference frequency in Hz
- The energy meter's constant is based on the active energy impulse ratio, which defines the LED's flashing frequency.
- Energy meter class index
- The double square symbol is used  since it is an energy meter with a class II protection insulating enclosure
- Definition of the number and layout of the measuring elements
- Bar code identifying the energy meter
- Model identifier. Manufacturer code identifying the energy meter model. The unit's configuration can be checked with this code: power supply, current measurement, measurement system, etc.
- Temperature range -40 ...+70 °C.
- Minimum current.
- Additional metrology marks
- EC marking

1.7.3 Enclosure

The **CIRWATT** enclosure is subject to the DIN 43859 standard and its dimensions comply with the DIN 43857 standard.

1.7.4 Connections

Laser-marked on the energy meter's enclosure is a figure showing the electrical wiring diagram. In addition, a small installation manual may be included to facilitate start-up operations, when necessary.

1.7.5 Optical communications port

The unit has an optical serial communications port in every version, in accordance with standard UNE EN 62056-21:2003 in mode C. The communications port is fully compatible with the optical heads standardised by the main utility companies.

On the surface of the cover there is a profile for the correct fastening and location of the optical heads.

1.8. Accessories

1.8.1. Tariffs

The energy meter only has one tariff where the active energy is stored.

1.9. Technical features

Power supply

Mode	Self-powered
Rated voltage	127 V – 230 V
Tolerance	± 20%
Consumption	< 2 W 10 VA
Frequency	50/60 Hz
Operating temperature	-25 ... +70°C

Voltage Measurement

Connection	Asymmetrical
Reference voltages	127 V – 230 V
Frequency	50/60 Hz
Own consumption of the voltage circuit	< 2 W <10 VA

Current measurement

Currents (I_n)	5 / 10 A
Maximum current	65 A
Start-up current	< 20 mA
Own consumption of the current circuit	<0.15 VA @ 10A

Accuracy

Active Energy	Class A or B (UNE EN 50470)
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Calculation and processing

Microprocessor	RISC 16 bits
Converter	16 bits

Memory

Data	EEPROM
Setup	EEPROM

Build features

Enclosure	In accordance with the DIN 43859 standard
Dimensions	In accordance with the DIN 43857 standard
Protection degree	IP 55

Optical port

Hardware	EN 62056-21
Speed	9600 bauds
Protocol	Mode C in data reading mode

Insulation

Alternating voltage	4 kV RMS 50 Hz for 1 minute
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Impulse voltage

1.2/50 ms 0 Ω source impedance	6 kV at 60° and 240°, with positive and negative polarization
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Tests/Standards:

EN 50470-1 and EN 50470-3	Standards for static active energy meters for class B alternating current.
EN 55022	Conducted emissions: Class B
	Radiated emissions: Class B
EN 61000-4-11	Gaps and brief voltage drops
EN 61000-4-2	Electrostatic discharges
EN 61000-4-3	Radiofrequency electromagnetic fields (RF)
EN 61000-4-4	Electrical transients in bursts
EN 61000-4-5	Shockwave.
EN 61000-4-6	Driven disturbances induced by radiofrequency fields
EN 61000-4-8	Magnetic fields at external mains frequency

1.10. Safety

1.10.1. Seals

The CIRWATT TBM 100 can be protected with regulatory seals.



1.10.2. Measurement validation criteria

When the energy meter detects that there may be a falsity in the data measured or stored in memory, the corresponding measurement invalidity flag is activated.

2. ENERGY METER OPERATION

This section describes the behaviour of the unit from a functional point of view, i.e., we explain how to manage all the information provided by the unit and how to configure the different functions of the system.

2.1. Screen definition

2.1.1. Standby mode screen

The energy meter permanently displays the active energy consumed.



2.1.2. Start screen

When starting up, for 1.5 seconds, the energy meter displays all the segments that are switched on and then it displays the version, the CRC and finally the standby screen.

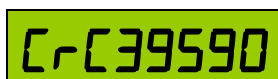
2.1.2.1. Test screen



2.1.2.2. Version screen



2.1.2.3. CRC



3. ESSENTIAL REQUIREMENTS

3.1. Nominal operating conditions

For the specified current values, the energy meter fulfils the conditions shown in the table.

	Class A Active	Class B Active
I_{tr}	0.5A/1A	0.5A/1A
I_{st}	0.025A/0.050A	0.02A/0.04A
I_{min}	0.250A/0.500A	0.250A/0.500A
$I_{ref.} / I_{no.}$	5A/10A	5A/10A
I_{max}	60A/65A	60A/65A

Voltage, frequency and $\cos \varphi$ operating intervals:

$$0,8U_{ref} \leq U \leq 1,2U_{ref}$$

$$49Hz \leq f \leq 51Hz$$

$$0.5inductivo \leq \cos \varphi \leq 0.8capacitivo$$

3.2. Maximum errors for each influence quantity

In influence magnitude tests, additional error is considered as a percentage (%) due to the change of influence magnitudes with respect to the reference conditions.

Disturbance	Value	Value of current (balanced unless otherwise stated)		Power factor	Critical change value for meters of class index, %		
		For direct connected meters	For trans- former operated meters		A	B	C
Severe voltage variation	$0,8 U_n \leq U < 0,9 U_n$	$10 I_r$	I_n	1	$\pm 3,0$	$\pm 2,1$	$\pm 0,6$
	$1,1 U_n < U \leq 1,15 U_n$			0,5 ind	$\pm 4,5$	$\pm 3,0$	$\pm 1,2$
	$U < 0,8 U_n$			1 and 0,5 ind	+10...-100		
Reversed phase sequence	Any two phases interchanged	I_r	$0,1 I_n$	1	$\pm 1,5$	$\pm 1,5$	$\pm 0,3$
Voltage unbalance	One or two phases interrupted *	$10 I_r$	I_n	1	$\pm 4,0$	$\pm 2,0$	$\pm 1,0$
Self-heating		I_{max}	I_{max}	1	$\pm 1,0$	$\pm 0,7$	$\pm 0,2$
				0,5 ind	$\pm 1,5$	$\pm 1,0$	$\pm 0,2$
Earth fault ^b	$1,9 U_n$ on two lines	-	$0,5 I_n$	1	$\pm 1,0$	$\pm 0,7$	$\pm 0,3$
Harmonic components in the current and voltage circuits	10 % U, 40 % I 5 th harmonic	$0,5 I_{max}$	$0,5 I_{max}$	1	$\pm 1,0$	$\pm 0,8$	$\pm 0,5$
DC and even harmonics in the a.c. current circuit ^c		$\frac{I_{ms}}{\sqrt{2}}$	-	1	$\pm 6,0$	$\pm 3,0$	$\pm 1,5$
Odd harmonics in the a.c. current circuit		$5 I_r$	$0,5 I_n$	1	$\pm 6,0$	$\pm 3,0$	$\pm 1,5$
Sub-harmonics in the a.c. current circuit		$5 I_r$	$0,5 I_n$	1	$\pm 6,0$	$\pm 3,0$	$\pm 1,5$
Continuous magnetic fields of external origin	1 000 Ampere- turns	$10 I_r$	I_n	1	$\pm 3,0$	$\pm 2,0$	$\pm 1,0$
Power frequency magnetic fields of external origin	0,5 mT	$10 I_r$	I_n	1	$\pm 3,0$	$\pm 2,0$	$\pm 1,0$
Radiated RF electromagnetic fields	10 V/m	$10 I_r$	I_n	1	$\pm 3,0$	$\pm 2,0$	$\pm 1,0$
Operation of auxiliary devices	Most unfavourable condition	I_{min}	I_{min}	1	$\pm 1,0$	$\pm 0,5$	$\pm 0,1$
Electrical fast transient/burst	4 kV (2 kV)	$10 I_r$	I_n	1	$\pm 6,0$	$\pm 4,0$	$\pm 2,0$
Conducted disturbances induced by RF fields	10 V	$10 I_r$	I_n	1	$\pm 3,0$	$\pm 2,0$	$\pm 1,0$
Damped oscillatory waves ^d	2,5 kV / 1 kV	-	I_n	1	$\pm 3,0$	$\pm 2,0$	$\pm 1,0$

a Polyphase meters with three measuring elements shall measure and register, within the limits of variation in percentage error shown in this table, if the following phases are interrupted:
 - in a three-phase, four wire network one or two phases ;
 - in a three-phase, three-wire network (if the meter is designed for this service) one of the three phases
 This only covers phase interruptions and does not cover events such as transformer fuse failures.
 In case of polyphase meters with two measuring elements the test does not apply.

b Only for three-phase four-wire voltage transformer operated meters connected to distribution network equipped with earth fault neutralizers.

c This requirement does not apply to current transformer operated meters.

d For voltage transformer operated meters only.

Source: UNE-EN 50470-3-2007

3.3. Mechanical environment

The complete enclosure of the energy meter is manufactured in high-resistance polycarbonate. The mechanical environment complies with class M1.

3.4. Electromagnetic environment

The energy meter is in compliance with current regulations on electromagnetic compatibility and susceptibility. The electromagnetic environment complies with class E1.

3.5. Climatic environment

The **CIRWATT B 100** series is intended for domestic use, not outdoor use. The operating range is guaranteed at -40...+70 °C.

Regarding relative humidity, the normal working range is from 10% to 95% without condensation.

4. READING SOFTWARE

All energy meters have an optical communications channel. The optical interface complies with the electrical and mechanical specifications established in the IEC62056-21 Standard. Only Mode C is permitted in data reading format.

5. INSTALLATION AND START-UP

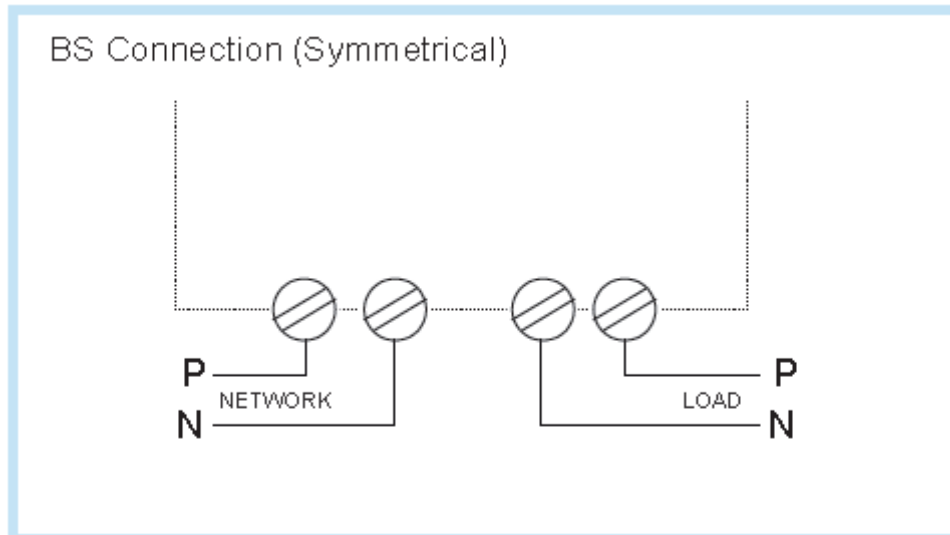
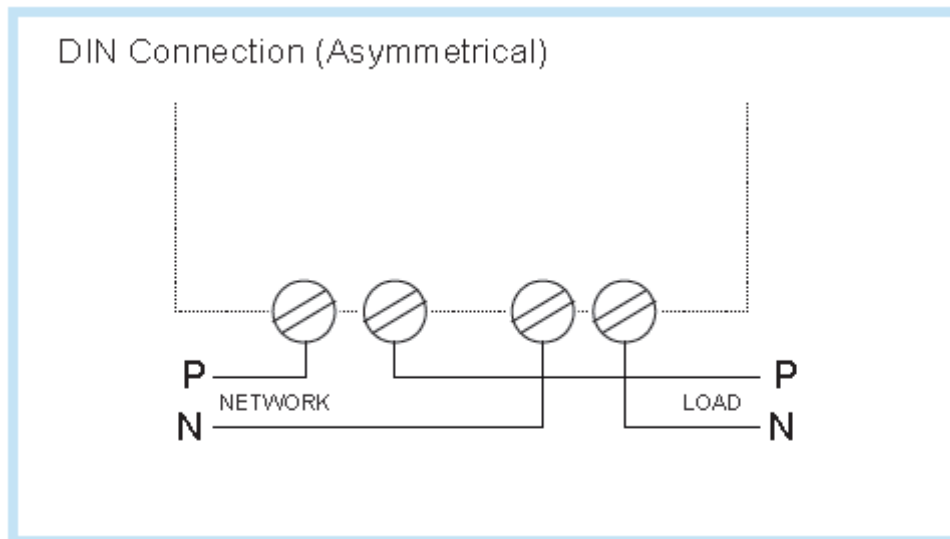
5.1. Installation

The energy meter has been designed in accordance with the DIN 43857 standard, with its defined dimensions and fixing points.

Attention: All connections must remain inside the terminal cover.

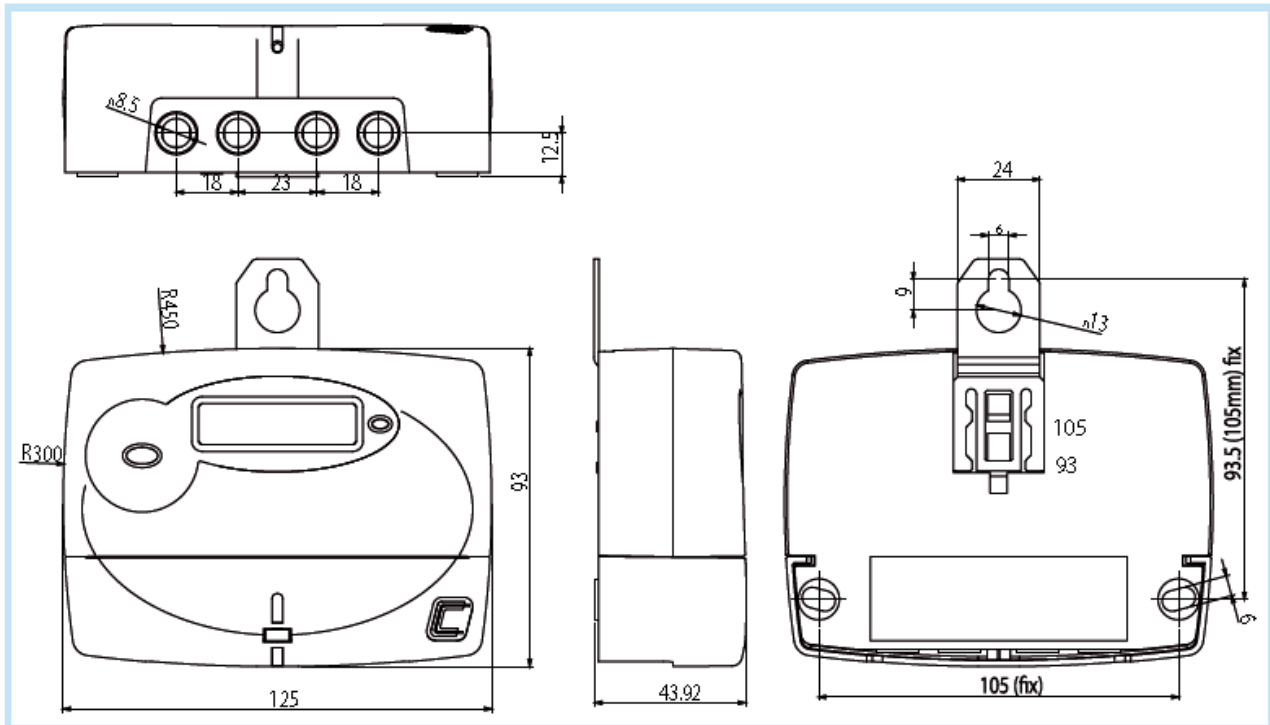
5.2. Connection diagrams

CIRWATT B 100 is especially designed for single-phase networks. Its connection diagram is as follows:



The diagram of connections that must be made is laser-marked on the energy meter's front panel cover

6. DIMENSIONS



7. MAINTENANCE

No special maintenance is required.

8. DISCLAIMER

CIRCUTOR, SA reserves the right to make changes without previous notice to the devices or specifications of the analyzers shown in this manual.

The term of the CIRCUTOR guarantee is two years from the date of purchase and is limited to a refund of the purchase price, repair free of charge or replacement of the defective unit that is returned to the CIRCUTOR after-sales service within the term of the guarantee.

CIRCUTOR, SA makes the latest versions of its device specifications and the most up-to-date manuals available to its clients on its circutor.es and www.circutor.com web sites.

9. TECHNICAL SERVICE

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For any questions regarding unit operation or failure: please contact CIRCUTOR's **Technical Assistance Service (S.A.T.)**

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