

Automation

Multimeter and Automatic Power Factor Controller





Multimeter and Automatic Power Factor Controller

Summary

Introduction	04
MMW – Multimeters & Analyzers	06
Benefits and Advantages	07
Overview of the Line	10
Parameter Setting Software	11
Function Identification on the Front of the Device	12
Function Identification on the Display	13
Connection Identification - Back View	14
Measurement Wiring Diagrams	15
Digital Input and Output and Alarm Contact Wiring Diagrams	16
Technical Characteristics	17
Dimensions (mm)	19
PFW – Automatic Power Factor Controllers	20
Benefits and Advantages	21
Overview of the Line	25
Control Operations and Functions	26
Function Identification on the Front of the Device	28
Connection Identification - Back View	29
Wiring Diagrams	31
Technical Characteristics	33
Dimensions (mm)	35
Accessories	36
Technical Characteristics	39
Dimensions (mm)	40



CONNECTIVITY, INTEGRATION AND OPTIMIZATION OF PROCESSES IN INDUSTRY 4.0

Energy management and energy efficiency are part of the industry 4.0. Implementing these activities requires data acquisition and the capacity of switching loads. MMW multimeters and analyzers and PFW Power Factor Automatic Controllers enable the measurement of electrical quantities, reactive energy consumed in industrial, commercial and residential processes and load control.

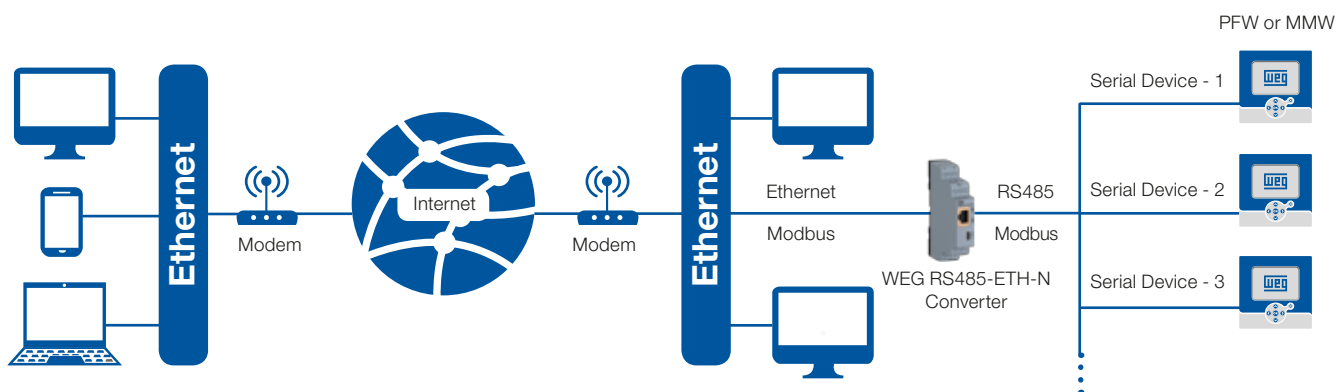
With connectivity, integration of the measurements and control of the electrical quantities, it is possible to optimize processes, speed up troubleshooting and consequently reduce costs of the supervised systems.



Connectivity

For interconnection with power management and control systems, the MMW multimeters and analyzers and PFW automatic power factor controllers have an RS485 port with Modbus-RTU communication protocol and configurable digital inputs and outputs.

In addition to management, the MMW and PFW allow assessing the electric energy quality. Such analysis can be done by means of the records or the quick view of voltage, current, power, demand, electric energy and harmonics up to the 51st order, in addition to screens with phasor diagram, waveform and bar graph of harmonics.



Suggestion of architecture for remote access with WEG equipment for energy management.

Note: the software and connectivity system are not part of the equipment scope of supply.



MMW - Multimeter

RELIABILITY, SAFETY AND MANAGEMENT OF THE ELECTRICAL INSTALLATIONS



The MMW family of multimeters and energy analyzers reads and calculates electrical quantities. The energy analyzer, besides being a multimeter, also monitors, analyzes and controls an electrical system. It is suitable for advanced applications such as energy measurement, recording of electrical parameters, programmable digital inputs and outputs.

It allows viewing and recording current, voltage, power factor, power, demand, energy and harmonics, including the minimum and maximum values of such quantities.

For integration and communication with other systems, it has digital inputs and outputs, alarm relays and RS485 isolated serial port with Modbus-RTU protocol.

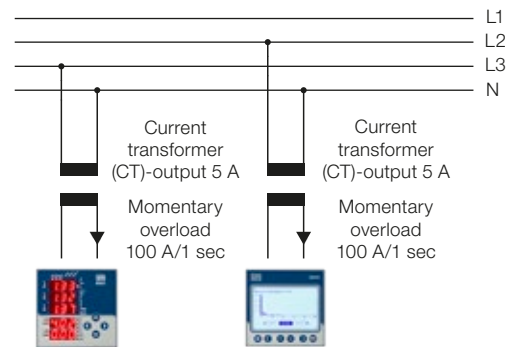
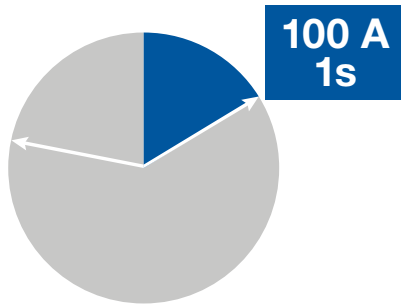
General Characteristics

- Direct and reverse energy measurement;
- Internal temperature sensor;
- Configurable digital inputs and outputs;
- Phasor diagram; waveform and bar graph of harmonics;
- Calendar and real-time clock;
- Programmable password to access the keyboard and parameter setting;
- Communication with RS485 isolated serial output, Modbus-RTU protocol;
- Identification on the display of the activated alarms;
- Pluggable connecting terminals for easy maintenance;
- Reading of $\cos \phi$ and power factor;
- Memory for 1,920 records of hourly parameters, 240 daily parameters and 36 monthly parameters for local reading or export via communication network;
- Simple and easy parameter setting via front keys or remotely using the parameter setting application and WEG converters;
- Phase sequence and phase loss identification and current and voltage presence indication;
- Energy measurements can be separated into two different periods;
- Connections to single-phase or three-phase star (3F + N) systems or three-phase delta (3F) systems.

Benefits and Advantages

Robustness for Momentary Overloads

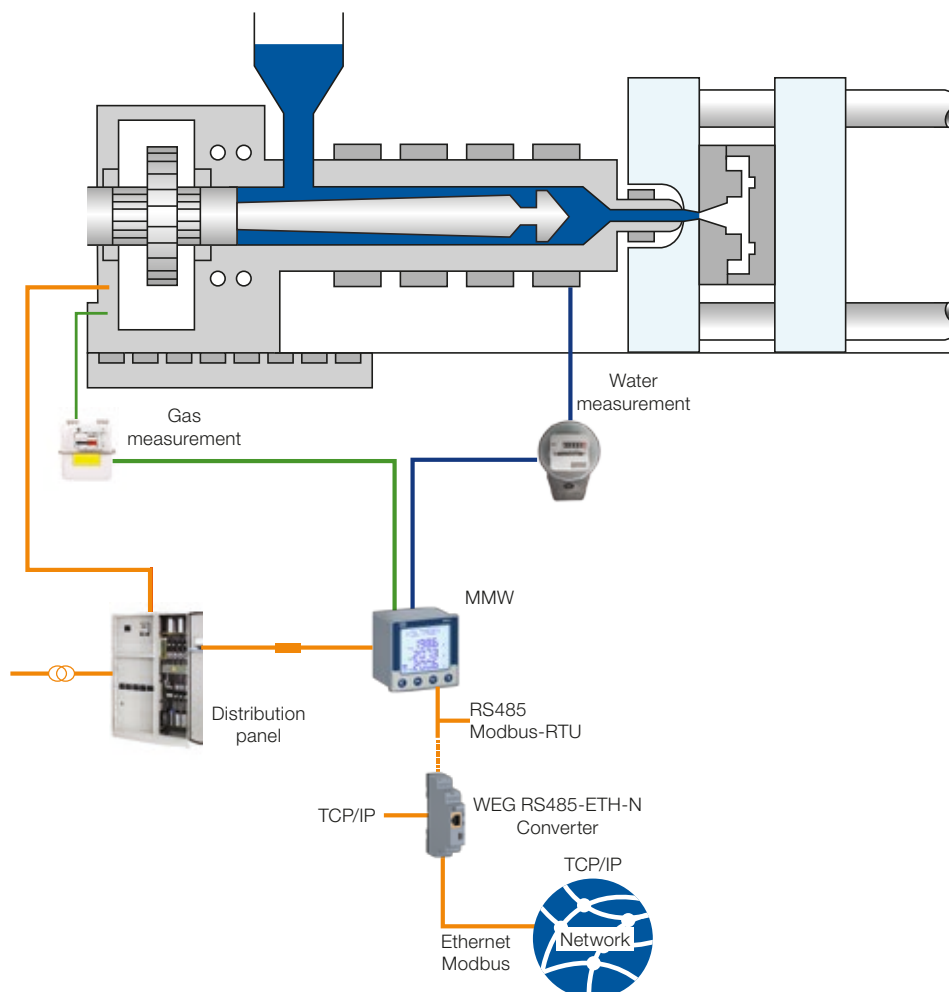
The MMW current inputs withstand current surges up to 100 A for 1 second. This feature increases the safety of the installation by avoiding interruption/burning of the current circuit on the equipment.



Data Collection and Power Management

With the digital inputs available you can:

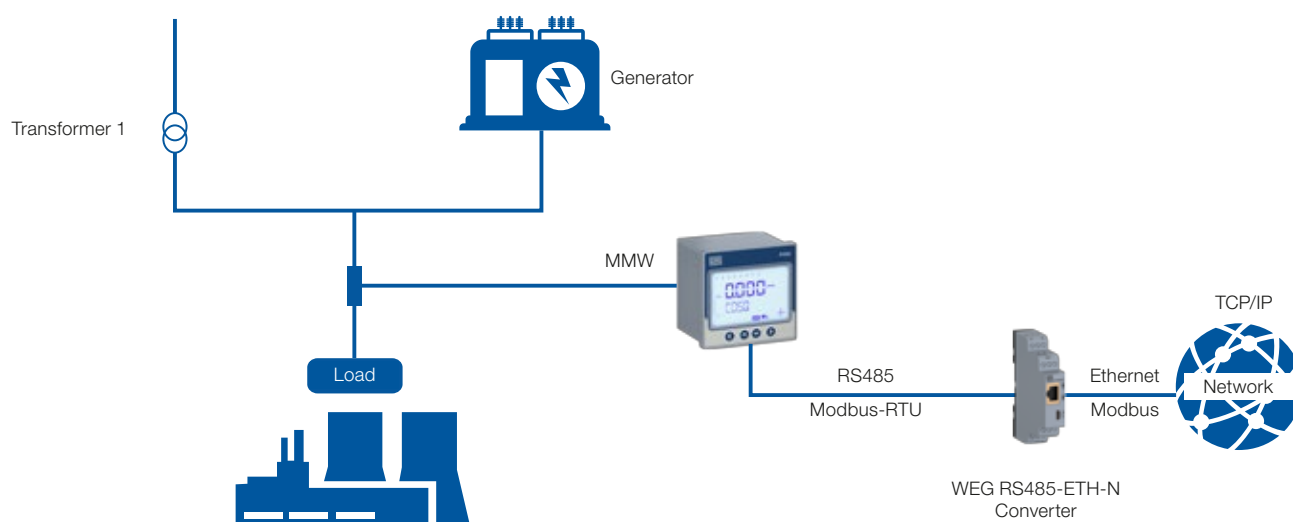
- Collect consumption data of gas, water or any pressure or flow measurement device with a pulsed digital output.
- Quantify production through a limit switch or dry contact of a proximity sensor.
- Associate total consumption of energies spent in the process and calculate the cost of used energy per produced unit.



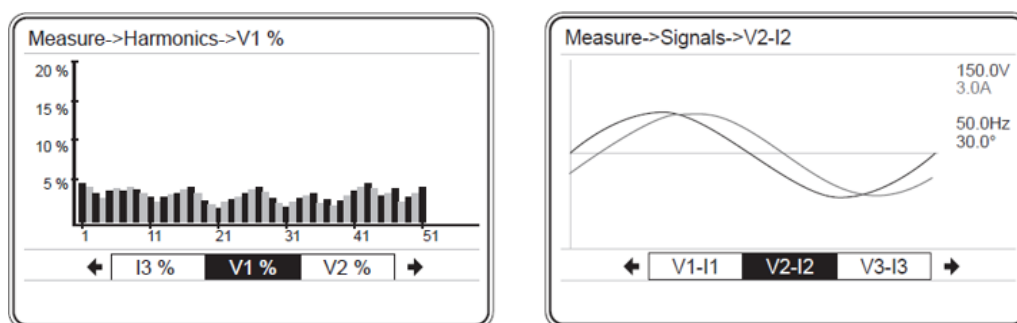
Benefits and Advantages

Energy Measurement with 2 Different Power Supplies

For an industry powered by 2 different energy sources, for example a transformer and a generator, it is necessary to measure the energy supplied by the generator and by the transformer separately. The MMW has a GEN input that is enabled when the generator is turned on. That allows setting tariff 2 available on the device to measure the energy delivered by the generator and identifying the effective cost of the produced energy. Tariff 1 measures the energy consumption provided by transformer 1.



Analysis of the Electric Energy System



The view of the harmonics in the electrical system enables an analysis and consequent corrective action, if necessary.

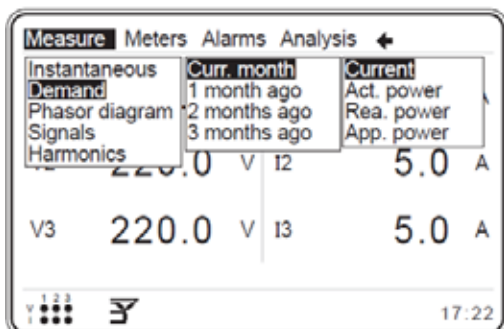


Benefits and Advantages

Demand Management

The recording of demands allows evaluating a tariff reclassification or load rearrangement in order to improve the load factor of the industrial consumption unit.

- The recording of the demand is done with a real-time clock;
- You can adjust the demand calculation period between 1 and 60 minutes;
- Monitoring of P, Q, S and I and recording of the average values for each demand period;
- Monthly recording of the maximum demand values;
- Recording of demand in 4 months.



Measure->Demand->Curr. month->Current		
Phase 1	5.0	A
	02:44:59 - 10/10/12	
Phase 2	5.1	A
	13:29:59 - 11/10/12	
Phase 3	4.9	A
	14:29:59 - 09/10/12	
Total	15.6	A
	09:14:59 - 12/10/12	

Storage of Measured and Calculated Values

It allows assessing the performance of the electrical installation by analyzing minimum, maximum or average parameters recorded on the device. Able to record different parameters on the device memory:

- 68 hourly records for 1,920 hours;
- 68 daily records for 240 days;
- 68 monthly records for 36 months;
- 16 different demand records for 4 months;
- 50 alarm records.

Meters->T1->Imp. active		
Index	267500.156	kWh
Curr. hour	0.501	kWh
Prev. hour	0.600	kWh
Curr. day	21.321	kWh
Prev. day	22.600	kWh
Curr. month	598.451	kWh
Prev. month	439.521	kWh



Overview of the Line



General characteristics		MMW - Multimeters and energy analyzers			
					
Reference		MMW03	MMW03-CH	MMW03-M22CH	MMW03-M22CHB
Function		Multimeter	Multimeter	Energy analyzer	Energy analyzer
Material code		14386964	14386967	14387019	14387025
Mechanical characteristics	Dimensions - W x H x D (mm)	96 x 96 x 80	96 x 96 x 80	96 x 96 x 80	96 x 96 x 80
	Degree of protection ¹⁾	IP40 (front)	IP40 (front)	IP40 (front)	IP40 (front)
	Display type	7-segment display	7-segment display	LCD	LCD
Configurable password to access the keyboard		Yes	Yes	Yes	Yes
Available electrical quantities	Voltage (V); current (I); frequency (F)	Yes	Yes	Yes	Yes
	Direct and reverse energy measurement	-	Yes	Yes	Yes
	Powers (P; Q; S); demand; energy; power factor and Cos φ	-	Yes	Yes	Yes
	Total harmonic distortion (THD) and individual harmonic distortion (HD) of voltage and current	-	Only THD up to 31st	Yes (HD up to 31st)	Yes (HD up to 51st)
Recording of active energy (kwh) consumed		-	Yes	Yes	Yes
Modbus-RTU communication RS485 port		-	Yes	Yes	Yes
Alarms	Alarm relay	-	2	2	2
	Temperature alarm	-	-	-	Yes
Programmable digital inputs and outputs		-	-	2 and 2	2 and 2
Recording (memory) of the demand values last 3 months		-	-	-	Yes
Recording (memory) of alarms		-	-	-	50
Recording (memory) of electrical quantities and alarms		-	-	-	Yes
Calendar and real-time clock		-	-	-	Yes
Phasor diagram; waveform; harmonics bar graph		-	-	-	Yes
CE certification		Yes	Yes	Yes	Yes

Note: 1) The degree of protection of the device is extended to IP66 by installing the MBN96X96 silicone membrane accessory code 14432877.

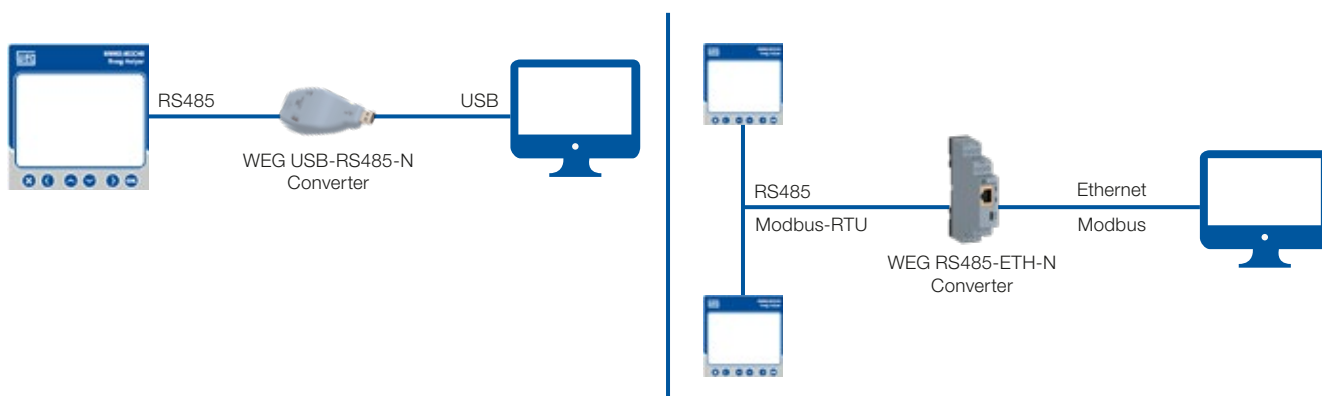
Parameter Setting Software

The device can be set locally with the keypad or remotely using the appropriate configuration applications for each product. Preferably, the connection between the device and the computer should be done through a WEG converter.

For a USB/RS485 connection you must use WEG USB-RS485-N converter, and for an RS485/Ethernet connection you must use WEG RS485-ETH-N converter. For details on these accessories, see page 37.

The table and diagram below show the parameter setting application and an example of interconnection for parameter setting.

Model	Parameter setting application
MMW03	Not applicable - direct on the device keys
MMW03-CH	WPM-MMW03CH
MMW03-M22CH	
MMW03-M22CHB	WPM-MMW03CHB



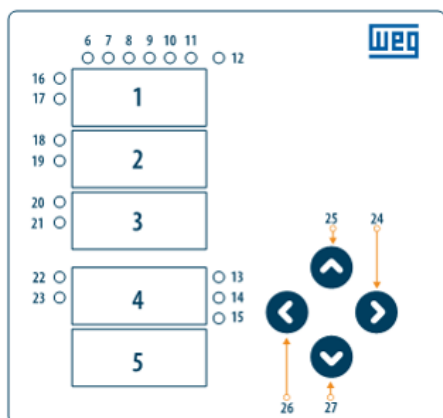
Parameter setting of the MMW using the USB/RS485 converter or the RS485/ETH-N converter.

Electrical Quantities and Interfaces Available

Description	MMW03	MMW03-CH	MMW03-M22CH	MMW03-M22CHB
Phase-Neutral (L-N) and Phase-Phase (L-L) Voltage	Yes	Yes	Yes	Yes
Current per phase, total current (I), neutral current (IN)	Yes	Yes	Yes	Yes
Frequency (F) per phase	Yes	Yes	Yes	Yes
Phase sequence and phase loss	Yes	Yes	Yes	Yes
Programmable 4-digit access password	Yes	Yes	Yes	Yes
Cos ϕ by phase and Cos ϕ of the system	No	Yes	Yes	Yes
Power Factor (PF) per phase and Power Factor (PF) of the system	No	Yes	Yes	Yes
Active power (P), reactive power (Q), apparent power (S) per phase and total	No	Yes	Yes	Yes
Total active energy - direct and reverse (kWh)	No	Yes	Yes	Yes
Total reactive energy (capacitive and inductive) - direct and reverse (kvarh)	No	Direct	Direct	Yes
Total THDv distortion and individual DHv distortion of voltage (%) per phase and total	No	Only THDv (up to 31st)	Only THDv (up to 31st)	Up to 51st
Total THDi distortion and DHi of current (%) per phase and total	No	Only THDi (up to 31st)	Only THDi (up to 31st)	Up to 51st
Programming of kWh energy measurement in different periods (tariff characterization)	No	1 period	2 periods	2 periods
Programming of maximum and minimum alarms of V; I; F; Cos ϕ ; PF; THDv; THDi; P; Q; S	No	Yes	Yes	Yes
Recording of maximum and minimum values of V; I; F; Cos ϕ ; PF; THDv; THDi	No	Yes	Yes	Yes
Isolated RS485 communication port Modbus-RTU protocol	No	1	1	1
Relay output for alarms	No	2	2	2
Total active demand (kW)	No	Yes	Yes	Yes
Reactive demand (capacitive and inductive) (kvar)	No	No	Yes	Yes
Total apparent demand (kVA)	No	No	Yes	Yes
Programmable digital input and output	No	No	2 / 2	2 / 2
Calendar and real-time clock	No	No	No	Yes
Hourly, daily and monthly record Demand, I, P, Q; S; Cos ϕ ; PF; IN; F; DHv, DHi	No	No	No	Yes
Alarm record V; I; P; Q; S	No	No	No	Yes
Voltage and current phasor diagram	No	No	No	Yes
Current and voltage waveform	No	No	No	Yes
Individual harmonics table and bar graph	No	No	No	Yes
Temperature monitor and alarm	No	No	No	Yes

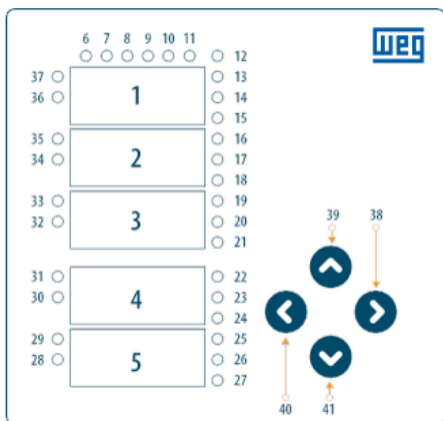
Function Identification on the Front of the Device

MMW03



- 1, 2, 3, 4, 5** - 7-segment indicators
- 6, 7, 8** - Voltage ON/OFF LEDs (V1, V2, V3)
- 9, 10, 11** - Current ON/OFF LEDs (I1, I2, I3)
- 12** - Phase sequence error (SEQ)
- 13, 14, 15** - Voltage indicators
- 16, 18, 20, 22** - "Kilo" (k) indication LEDs
- 17, 19, 21, 23** - "Mega" (M) indication LEDs
- 24** - Right key
- 25** - Up key
- 26** - Left key
- 27** - Down key

MMW03-CH



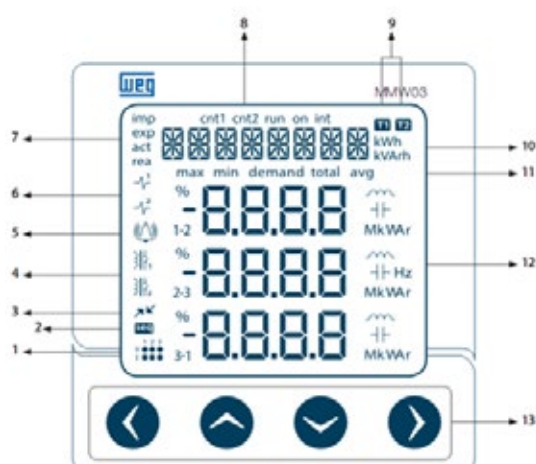
- 1, 2, 3, 4, 5** - Indicators with 7-segment display
- 6, 7, 8** - Phase ON/OFF (L1, L2, L3)¹⁾
- 9** - Alarm actuated
- 10, 11** - Alarm relays actuated
- 12** - Phase-neutral voltage (VL-N)
- 13** - Phase-phase voltage (VLL)
- 14** - Current (I)
- 15** - Cos ϕ
- 16** - Power Factor (PF)
- 17** - Active power (P)
- 18** - Reactive power (Q)
- 19** - Apparent power (S)
- 20** - Total harmonic distortion (THD)
- 21** - Demand (Dem)
- 22** - Capacitive reactive power phase 1 – Qcap ---|---
- 23** - Capacitive reactive power phase 2 – Qcap ---|---
- 24** - Capacitive reactive power phase 3 – Qcap ---|---
- 25** - Total capacitive reactive power – Qcap ---|---
- 26** - Maximum value (Hi)
- 27** - Minimum value (Lo)
- 28, 30, ...36** - Reading in Mega (M)
- 29, 31, ...37** - Reading in Kilo (K)
- 38** - Right key. Key to navigate the menus and enter the submenus and move across the digital indicators
- 39** - Up key. Key to navigate the menus and change numeric values
- 40** - Left key. Key to change menus, return to the previous menu and confirm selected values
- 41** - Down key. Key to switch menus and change numeric values

Note: 1) If L1, L2 and L3 (points 6, 7 and 8):

- Blink simultaneously and very slowly = error in phase sequence;
- One or more blink slowly (0.5 sec) - no voltage;
- One or more blink fast (0.2) - current loss.

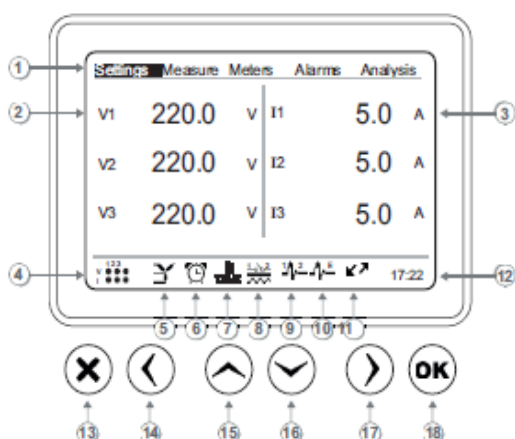
Function Identification on the Display

MMW03-M22CH



- 1 - Voltage and current presence indicators
- 2 - Symbol of error in the phase sequence
- 3 - Communication enabled
- 4 - Output relays actuated
- 5 - Alarm actuated
- 6 - Pulsed output enabled
- 7 - Energy type indicated on the display
- 8 - Type of actuated counter
- 9 - Indicates the period in which the counter shown on the display is
- 10 - Indicates the energy type on the display, counters and parameter setting
- 11 - Shows which submenus are on the display
- 12 - Indicators of measurements, maximum and minimum, demand and their units
- 13 - Keys to navigate the menus and submenus and change numeric values

MMW03-M22CHB

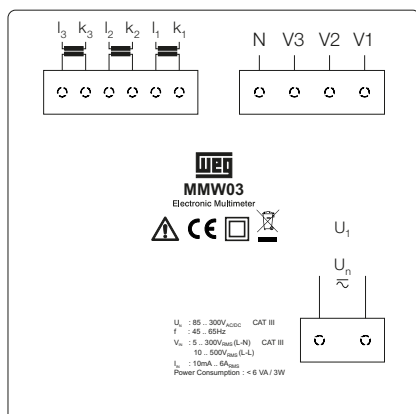


- 1 - Navigation menus
- 2 - Phase-Neutral Voltage (L-N) of the three phases
- 3 - Current on the three phases
- 4 - Voltage and current presence indicators
- 5 - Connection type of the electrical system
- 6 - Alarm status
- 7 - Temperature alarm
- 8 - Alarm relay 1 or 2 actuated
- 9 - Pulsed digital output actuated
- 10 - Digital output actuated
- 11 - Communication enabled
- 12 - Clock
- 13 - Cancel an action or return to the previous menu
- 14 - Left key
- 15 - Up key
- 16 - Down key
- 17 - Right key
- 18 - Access the submenu, save or change configuration parameters



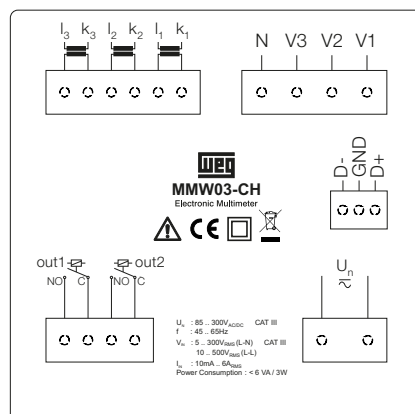
Connection Identification - Back View

MMW03



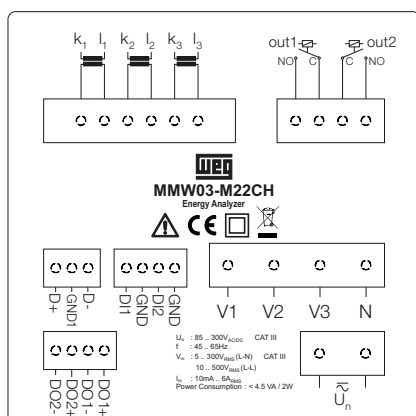
I3, K3, I2- K2; I1- K1 - Current measurement input
N, V3, V2, V1 - Voltage measurement input
Un - Power supply of the MMW03

MMW03-CH



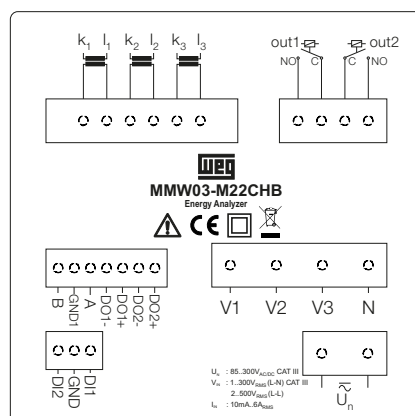
I3, K3, I2- K2; I1- K1 - Current measurement input
N, V3, V2, V1 - Voltage measurement input
Un - Power supply of the MMW03-CH
OUT1-NO, C; OUT2-NO, C - Alarm output relays 1 and 2
D-, GND, D+ - RS485 isolated communication port

MMW03-M22CH



K1, I1, K2, I2, K3, I3 - Current measurement input
V1, V2, V3, N - Voltage measurement input
Un - Power supply of the MMW03-M22CH
OUT1-NO, C; OUT2-NO, C - Alarm output relays 1 and 2
D-, GND, D+ - RS485 communication port
DI1, GND, DI2, GND - Digital inputs 1 and 2
DO2-, DO2+, DO1-, DO2+ - Digital outputs 1 and 2

MMW03-M22CHB

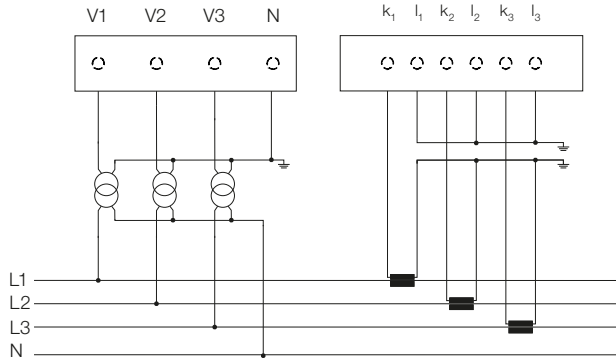


K1, I1, K2, I2, K3, I3 - Current measurement input
V1, V2, V3, N - Voltage measurement input
Un - Power supply of the MMW03-M22CH
OUT1-NO, C; OUT2-NO, C - Alarm output relays 1 and 2
OUT1-NO, C; OUT2-NO, C - Alarm output relays 1 and 2
B, GND, A, DO1-, DO1+, DO2-, DO2+ - RS485 communication port and digital outputs 1 and 2
DI2, GND, DI1 - Digital inputs 1 and 2

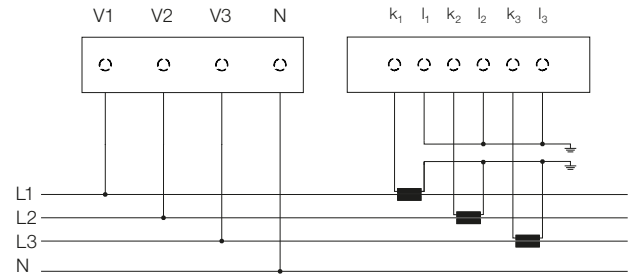
Measurement Wiring Diagrams

3F + N (4 Wire) Connection - Star

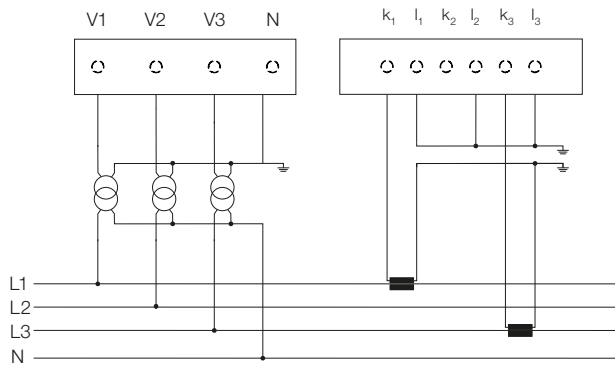
MMW03 / MMW03-CH / MMW03-M22CH / MMW03-M22CHB



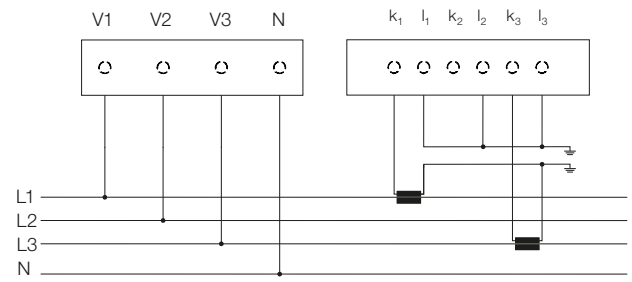
Measurement with 3 PTs and 3 CTs



Direct measurement of voltage and current with 3 CTs



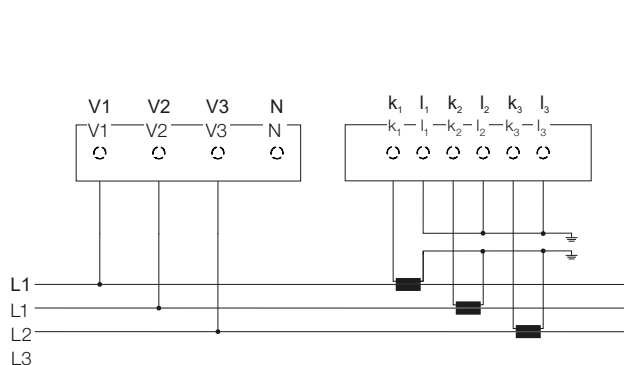
Measurement with 3 PTs and 2 CTs (ARON)
(Valid for MMW03-M22CHB)



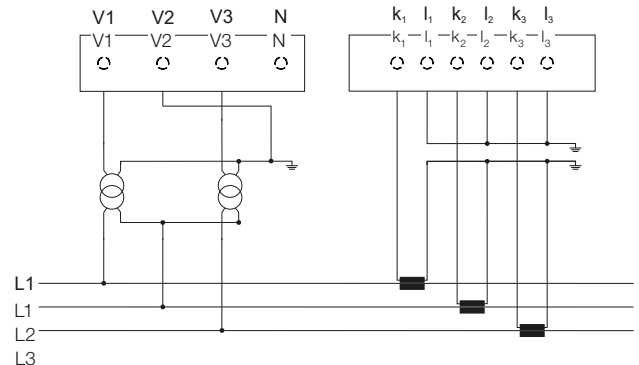
Direct measurement of voltage and current with 2 CTs (ARON)
(Valid for MMW03-M22CHB)

3F (3 Wires) Connection - Delta

MMW03 / MMW03-CH / MMW03-M22CH / MMW03-M22CHB



Direct measurement of voltage and current with 3 CTs

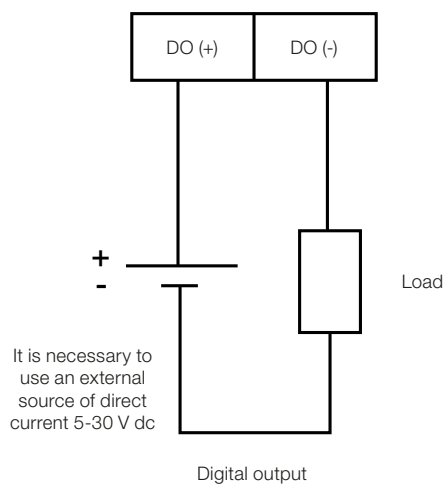
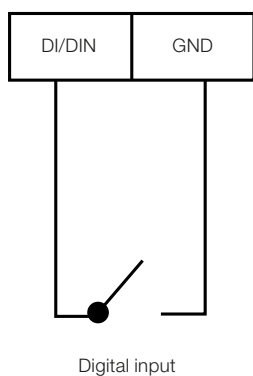


Measurement with 2 PTs and 3 CTs

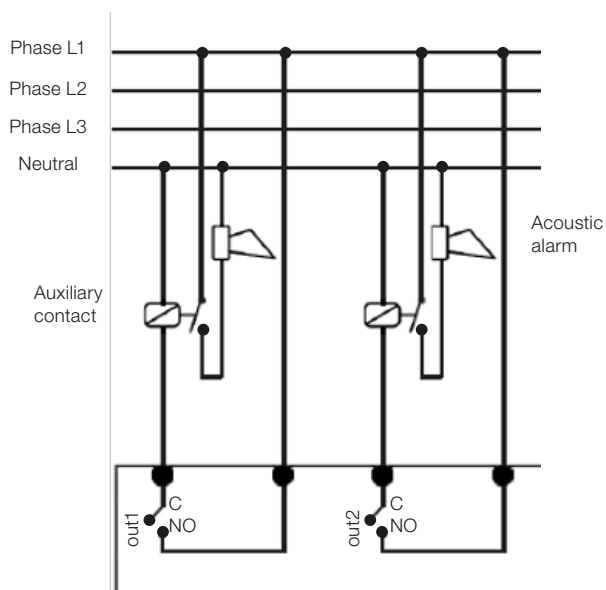
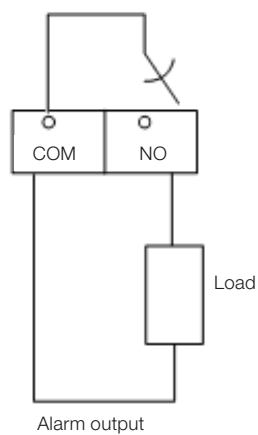
Note: valid for MMW03-M22CHB.

Digital Input and Output and Alarm Contact Wiring Diagrams

Digital Input and Output Wiring Diagram



Alarm Output Relay Wiring Diagram



Suggested connection of the alarm output relays OUT1 and OUT2 (alarm)

Technical Data

Identification					
Reference		MMW03	MMW03-CH	MMW03-M22CH	MMW03-M22CHB
Function		Multimeter	Multimeter	Energy analyzer	Energy analyzer
Product code		14386964	14386967	14387019	14387025
CE certification		Yes	Yes	Yes	Yes
General	Dimensions W x H x D (mm)	96.8 x 96.8 x 80	96.8 x 96.8 x 80	96.8 x 96.8 x 80	96.8 x 96.8 x 80
	7-segment display	Available	Available	-	-
	LCD display	-	-	Available	Available
	Supported language	-	English	English	English
	Battery	-	-	-	Available
	Real-time clock	-	-	-	Available
	Password protected	Available	Available	Available	Available
	Current transformer (CT) adjustment range	1...5,000	1...5,000	1...5,000	1...5,000
	Voltage transformer (VT) adjustment range	1...5,000	1...5,000	1...5,000	1...5,000
	Measurements - V, I, F, Cos φ, PF, P, Q, S, THD	Only V, I, F	Available	Available	Available
	Power factor reading range	-	0.5i to 0.8c	0.5i to 0.8c	0.5i to 0.8c
	Demand period	-	1-60 minutes adjustable	1-60 minutes adjustable	1-60 minutes adjustable
	Connection type	3P4W, 3P3W	3P4W, 3P3W	3P4W, 3P3W	3P4W, 3P3W, Aron
	Measurement in the 4 quadrants	Available	Available	Available	Available
	Number of measurements in the period	256	256	256	512
	Data refresh rate	1s	1s	1s	1s
	Electrical system type	TT, TN, IT	TT, TN, IT	TT, TN, IT	TT, TN, IT
	Phasor diagram	-	-	-	Available
	Waveform	-	-	-	Available
	Min/max/demand values	Available (except demand)	Available	Available	Available
Energy measurement	Number of tariffs	-	1	2	2
	Multi sub tariffs (peak, day, off-peak)	-	-	-	Available
	Energy meter 1Ø phase	-	Available	Available	-
	Energy meter 2Ø phase	-	Available	Available	Available
	Recording of measured energy	-	Available	Available	Available
Current measurement input	Measuring range	10 mA - 6 A AC	10 mA - 6 A AC	10 mA - 6 A AC	10 mA - 6 A AC
	Overvoltage category	300 V Cat II	300 V Cat II	300 V Cat II	300 V Cat II
	Surge voltage measurement	2 kV	2 kV	2 kV	2 kV
	Consumption	<0.2 VA	<0.2 VA	<0.2 VA	<0.2 VA
	Intermittent overload	100 A for 1s	100 A for 1s	100 A for 1s	100 A for 1s
	Signal sample between 45 and 65 Hz	12.8 kHz	12.8 kHz	12.8 kHz	25.6 kHz
Voltage measurement input	Overvoltage category	300 V Cat III	300 V Cat III	300 V Cat III	300 V Cat III
	Measuring range L-N	5-300 Vrms	5-300 Vrms	5-300 Vrms	1-300 Vrms
	Measuring range L-L	10-500 Vrms	10-500 Vrms	10-500 Vrms	2-500 Vrms
	Frequency measuring range	45-65 Hz	45-65 Hz	45-65 Hz	45-65 Hz
	Consumption	<0.1 VA	<0.1 VA	<0.1 VA	<0.1 VA
	Signal sample between 45 and 65 Hz	12.8 kHz	12.8 kHz	12.8 kHz	25.6 kHz
Measurement for energy analysis	Voltage and current harmonics	-	Up to 31st	Up to 31st	Up to 51st
	THD-voltage in %	-	Available	Available	Available
	THD-current in %	-	Available	Available	Available
Other measurements	Running time (operating time of the load in hours)	-	Available	Available	Available
	In the time (time of operation of the meter in hours)	-	Available	Available	Available
	Interruption counter (number of interruptions due to power outage)	-	Available	Available	Available
		-	Available	Available	Available
Accuracy	According to IEC 61557-12	Total active power	-	Class 0.5	Class 0.2
		Total reactive power	-	Class 1	Class 1
		Total apparent power	-	Class 0.5	Class 0.2
		Total active energy	-	Class 0.5	Class 0.5
		Total reactive energy	-	Class 2	Class 2
		Frequency	-	Class 0.1	Class 0.05
		Current	-	Class 0.5	Class 0.2
		Neutral current (calculated)	-	Class 0.5	Class 0.5
		Voltage	-	Class 0.2	Class 0.2
		Power factor	-	Class 0.5	Class 0.5
		THDV, THDI	-	Class 1	Class 1
	According to IEC 62053-22	Total active energy	-	Class 0.5S	Class 0.2S
	According to IEC 62053-23	Total reactive energy	-	Class 2	Class 2

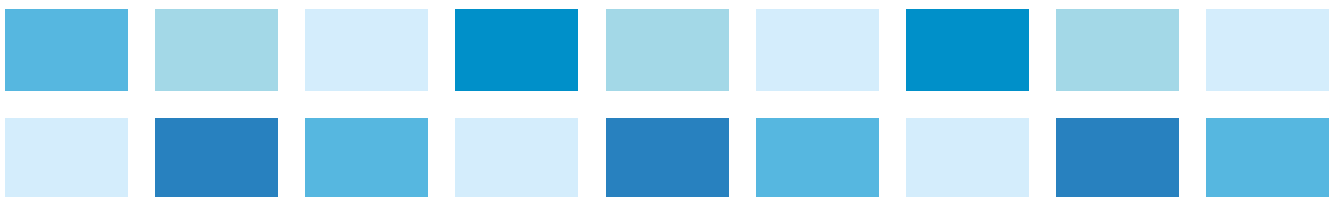
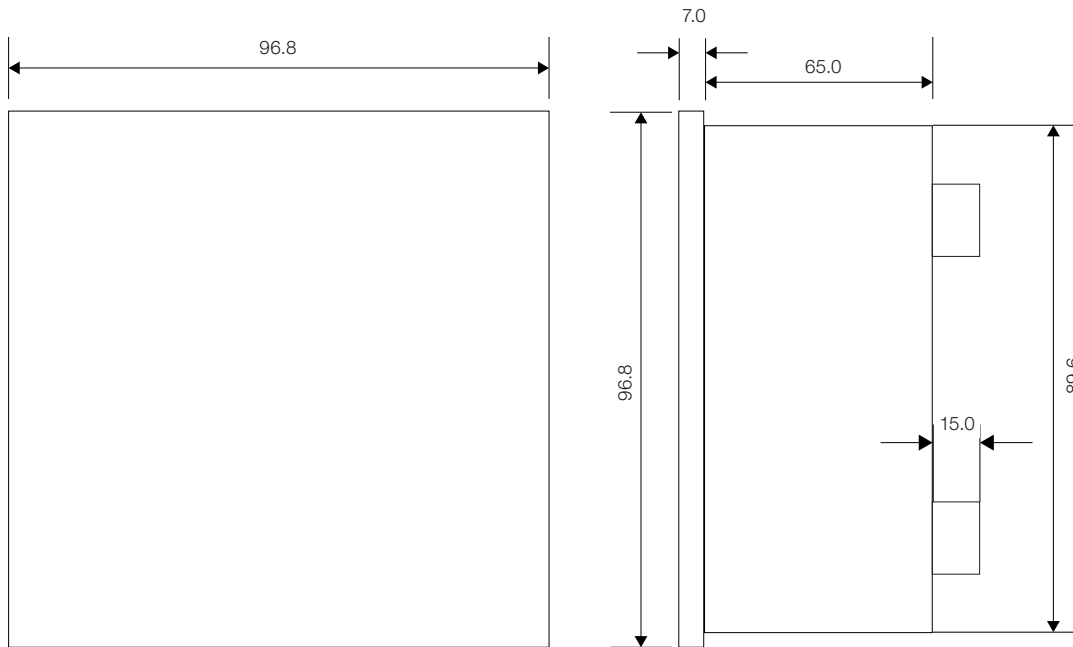
Note: 1) The accuracy of the measurements of the MMW + CT and/or PT set depends directly on the accuracy of the CTs and PTs used.

Technical Data

Identification						
Reference			MMW03	MMW03-CH	MMW03-M22CH	MMW03-M22CHB
Inputs and outputs	Alarm output relays	Number of outputs (dry contact)	-	2 pieces	2 pieces	2 pieces
		Type	-	NO (SPST)	NO (SPST)	NO (SPST)
		Maximum operation current	-	10 A (AC) / 5 A (DC)	10 A	5 A
		Maximum operation voltage	-	250 V ac / 30 V dc	250 V ac	250 V ac
		Maximum operation power	-	1,250 VA / 150 W	1,250 VA	1,250 VA
	Digital inputs	Number of inputs	-	-	2 pieces	2 pieces
		Minimum frequency and time	-	-	100 Hz, 10ms	100 Hz, 10ms
		Input signal type	-	-	Dry contact	Dry contact
		Insulation level	-	-	5,000 Vrms	3,750 Vrms
	Digital outputs	Number of outputs	-	-	2 pieces	2 pieces
		Type	-	-	Transistor	Transistor
		Operation voltage range	-	-	5-30 V dc	5-30 V dc
		Rated current	-	-	50 mA	50 mA
		Insulation level	-	-	5,000 Vrms	3,750 Vrms
		Minimum frequency and time	-	-	20 Hz, 50ms	20 Hz, 50ms
Power supply	Voltage	AC	85-300 V	85-300 V	85-300 V	85-300 V
		DC	85-300 V	85-300 V	85-300 V	85-300 V
	Consumption	AC	<6 VA	<6 VA	<4.5 VA	<3 VA
		DC	<3 W	<3 W	<2 W	<2.5 W
	Frequency		45-65 Hz	45-65 Hz	45-65 Hz	45-65 Hz
Records in the memory	Min./max./ave. averages	Hourly recording	-	-	-	1,920 hours x 68 different parameters
		Daily recording	-	-	-	240 hours x 68 different parameters
		Monthly recording	-	-	-	36 months x 68 different parameters
	Demand		-	-	-	4 months x 16 different parameters
	Alarm recording/records		-	-	-	50
Communication	Protocol		-	Modbus-RTU	Modbus-RTU	Modbus-RTU
	Baud rate		-	1,200-57,600 bps adjustable	1,200-57,600 bps adjustable	2,400-115,200 bps adjustable
	Parity		-	Even, odd, none	Even, odd, none	None
	Stop bit		-	1	1	1
	Address		-	1-247	1-247	1-247
Mechanical properties	Insulation		-	2,750 Vrms	2,750 Vrms	2,750 Vrms
	Weight (g)		272	296	378	404
	Protection rating		Front IP40 / rear IP20 (IP66 with accessory)	Front IP40 / rear IP20 (IP66 with accessory)	Front IP40 / rear IP20 (IP66 with accessory)	Front IP40 / rear IP20 (IP66 with accessory)
	Mounting type		Panel door	Panel door	Panel door	Panel door
Cable cross-section for connection	Power supply, voltage, current, output relays	Cable	2.5 mm ² - 14 AWG	2.5 mm ² - 14 AWG	2.5 mm ² - 14 AWG	2.5 mm ² - 14 AWG
		Wire	4 mm ² -12 AWG, 2x1.5 mm ² -2x16 AWG	4 mm ² -12 AWG, 2x1.5 mm ² -2x16 AWG	4 mm ² -12 AWG, 2x1.5 mm ² -2x16 AWG	4 mm ² -12 AWG, 2x1.5 mm ² -2x16 AWG
	Digital I/O, RS485	Cable	1.5 mm ² -16 AWG	1.5 mm ² -16 AWG	1.5 mm ² -16 AWG	1.5 mm ² -16 AWG
		Wire	1.5 mm ² -16 AWG, 2x0.75 mm ² -2x18 AWG	1.5 mm ² -16 AWG, 2x0.75 mm ² -2x18 AWG	1.5 mm ² -16 AWG, 2x0.75 mm ² -2x18 AWG	1.5 mm ² -16 AWG, 2x0.75 mm ² -2x18 AWG
Environment conditions	Operating temperature		-20 to +60 °C	-20 to +70 °C	-20 to +70 °C	-20 to +70 °C
	Storage temperature		-30 to +80 °C	-30 to +80 °C	-30 to +80 °C	-30 to +80 °C
	Non-condensing relative humidity		Max. 95%	Max. 95%	Max. 95%	Max. 95%
Electromagnetic Compatibility EMC - EMI	According to IEC 61010-1		300 V ac cat. II	300 V ac cat. II	300 V ac cat. II	300 V ac cat. II
	EN 55011/A1:2010, EN 61000-4-2, EN 61000-4-3, EN 61000-4-4, EN 61000-4-5, EN 61000-4-6, EN 61000-4-8, EN 61000-4-11		Yes	Yes	Yes	Yes

Dimensions (mm)

MMW03 / MMW03-CH / MMW03-M22CH / MMW03-M22CHB





PFW – Automatic Power Factor Controllers

RELIABILITY, SAFETY AND MANAGEMENT OF ELECTRICAL INSTALLATIONS

The PFW is an automation device for permanently monitoring the reactive power of the installation and controlling the power factor. This control in the PFW is done by connecting and disconnecting steps of capacitors. Therefore, the Automatic Power Factor Controller enables the power distribution system to operate at maximum efficiency by reducing the reactive power. In addition, it informs electrical parameters such as: current, voltage, power, energy, demands and maximum and minimum values.

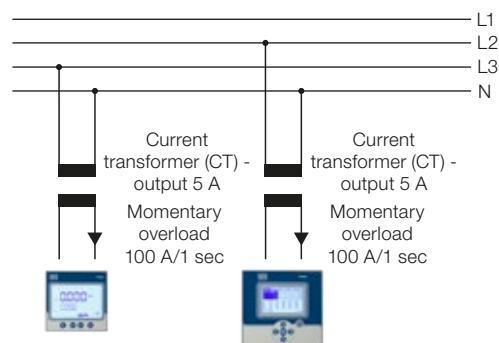
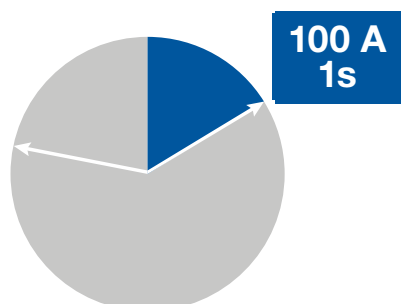
General Characteristics

- Switching of capacitors and reactors with 8 to 24 control steps available.
- Applicable to balanced and unbalanced systems.
- Ability to "learn" and record the reactive powers of the steps. No parameter setting of each one required.
- Dynamic step monitoring - DCM that speeds up maintenance and increases reliability in power factor correction.
- Ability to "learn" and check the current and voltage connections making it easy to correct such connections.
- Multiple reactive power compensation modes.
- Option to create 2 reading periods of electrical parameters using the available digital input.
- Internal temperature sensor.
- Recording of the switching cycles and actuated times of the steps.
- Configurable step discharge times.
- Direct and reverse energy measurement.
- Recording of the maximum, minimum and average values of the available electrical parameters.
- Configurable digital inputs and outputs.
- Phasor diagram, table and bar graph of harmonics up to the 51st order for current and voltage.
- Calendar and real-time clock.
- Programmable password to access the keyboard.
- Identification on the display of the activated alarms;
- Communication with RS485 isolated serial output, Modbus-RTU protocol.
- Pluggable connecting terminals for easy maintenance.
- Equipment with CE certification.

Benefits and Advantages

Robustness for Momentary Overloads

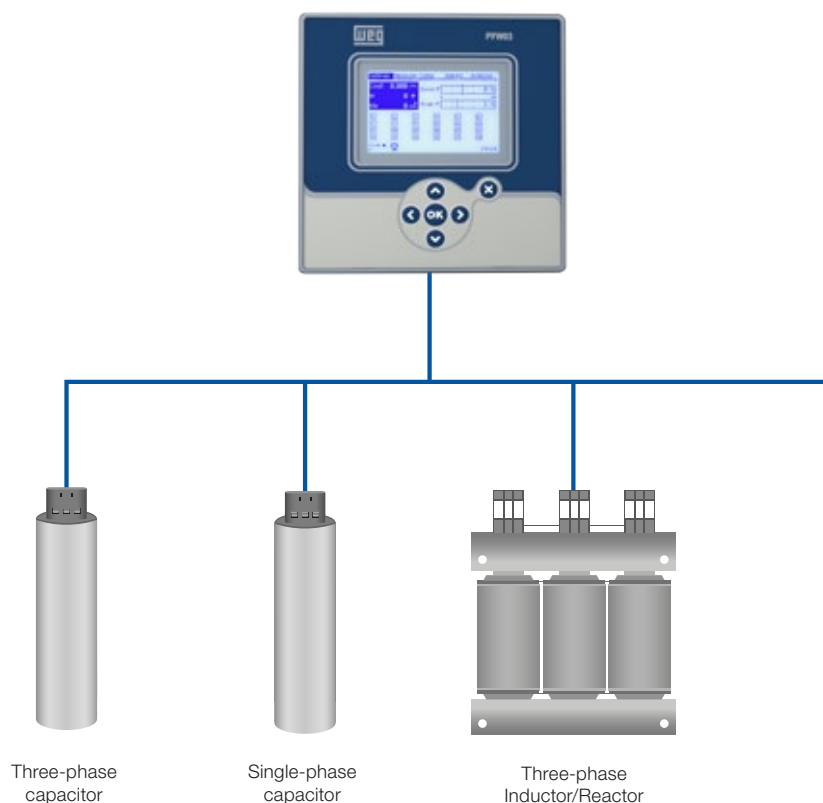
The PFW current inputs withstand current surges up to 100 A for 1 second. This feature increases the safety of the installation by avoiding interruption/burning of the current circuit on the equipment.



Inductive or Capacitive Reactive Power Control

Depending on the environment in which the PFW is installed, it works with different components.

- In environments with predominantly inductive loads, such as industrial areas, the PFW works with single-phase or three-phase capacitors.
- In environments with reactive capacitive loads, such as Data Centers, the PFW works with inductors.
- In environments that float between capacitive and inductive loads, the PFW can work with inductors and capacitors in their various steps.



Benefits and Advantages

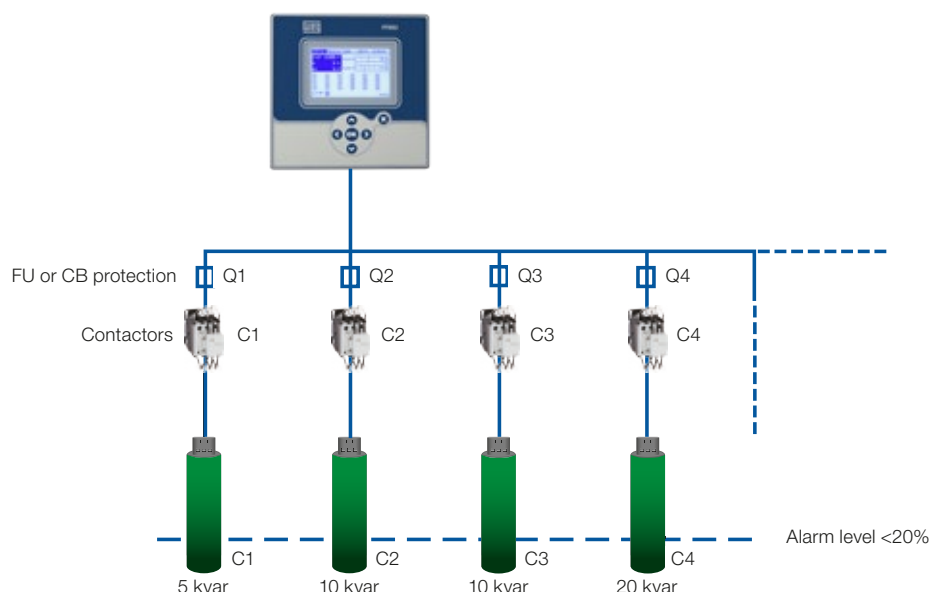
Easy Parameter Setting and Connection of the PFW with the Advanced Reading Function (Learning)

In the parameter setting, the PFW identifies and records the powers available in the steps, both capacitors and inductors/reactors. When reading, it evaluates the voltage and current connections. If an error is found in the connection sequences, an error indication will be displayed on the device screen.

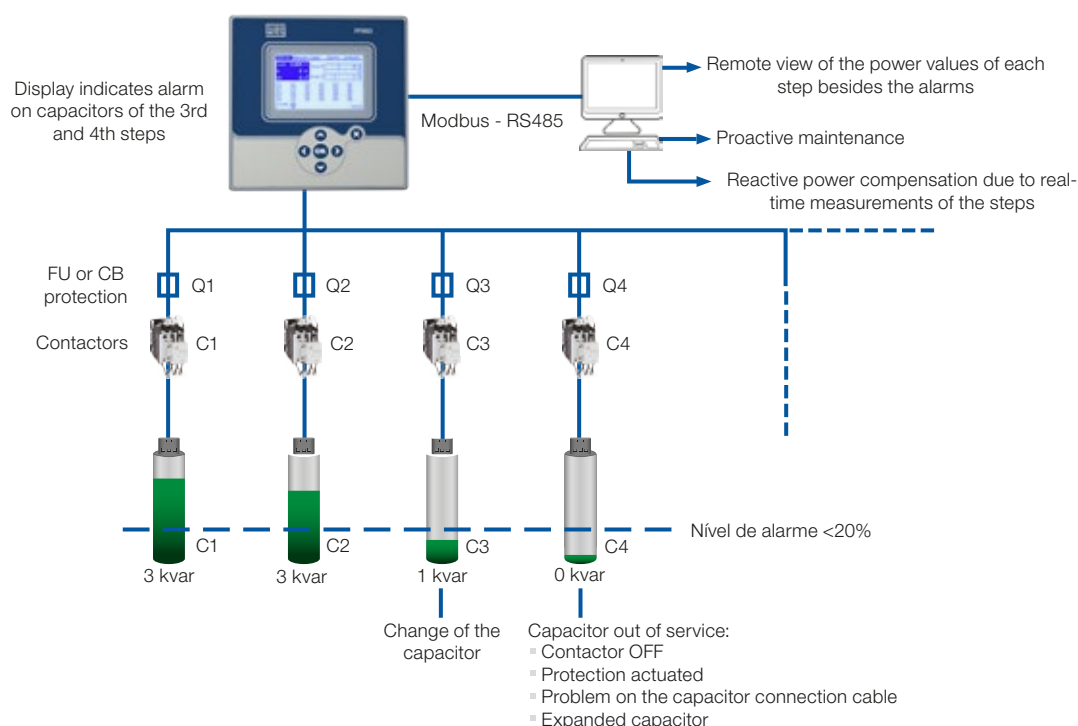
Reliability and Speed in the Maintenance of the Capacitor Bank

Based on the Dynamic Step Monitoring (DCM) of the steps, the actual kvar values of each step are tracked and used in the compensation calculations. That makes the compensation more accurate and reliable, in addition to optimizing the maintenance of the capacitor bank, generating alarm to change it.

Initial Condition - Capacitors at Rated Condition



Condition after Use Where Capacitor Reactive Power Loss Occurred



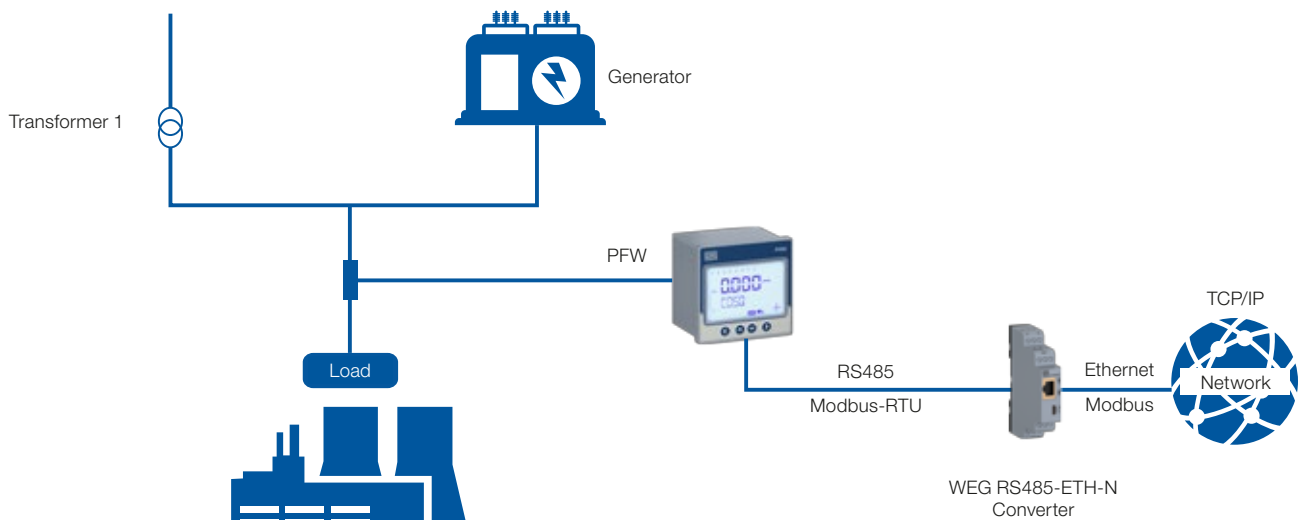
Benefits and Advantages

Segmentation of the Power Factor Control and Energy Measurement with 2 Different Power Supplies

For an industry powered by 2 different energy sources, for example a transformer and a generator, it is necessary to measure the energy supplied by the generator and by the transformer separately. The PFW has a GEN input that is enabled when the generator is turned on.

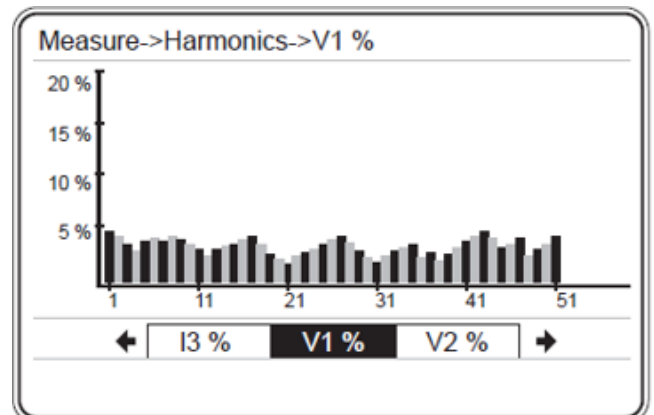
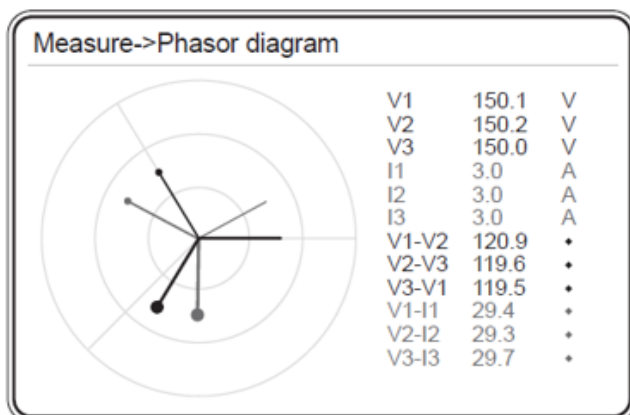
This input allows:

- Configuring a new control power factor, characterizing 2 values of $\cos \varphi$ to be reached. The second one is enabled via the GEN input.
- Having 2 specific periods of electric energy measurement. The user sets the $\cos \varphi$ 2 available on the device to measure the energy delivered by the generator. And $\cos \varphi$ 1 measures the energy consumption supplied by transformer 1.



Analysis of the Electric Energy System

The view of the harmonics in the electrical system enables an analysis and consequent corrective action, if necessary.



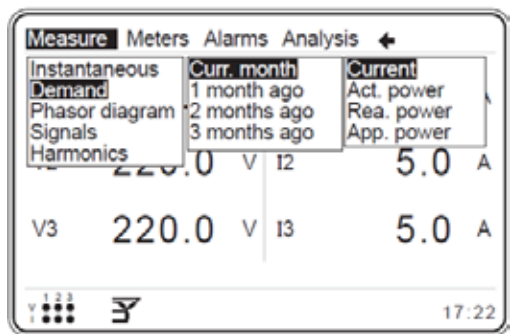
Benefits and Advantages

Demand Management

The recording of demands allows evaluating a tariff reclassification or load rearrangement in order to improve the load factor of the industrial, commercial or residential consumption unit.

- The demand recording is done with a real-time clock;
- The user can adjust the demand calculation period between 1 and 60 minutes;

- Monitoring of P, Q, S and I and recording of the average values for each defined demand period;
- Monthly recording of the maximum demand values;
- Recording of 4 months of demand.



Measure->Demand->Curr. month->Current		
Phase 1	5.0	A
	02:44:59 - 10/10/12	
Phase 2	5.1	A
	13:29:59 - 11/10/12	
Phase 3	4.9	A
	14:29:59 - 09/10/12	
Total	15.6	A
	09:14:59 - 12/10/12	

Storage of Measured and Calculated Values

The PFW allows assessing the performance of the electrical installation by analyzing minimum, maximum or average parameters recorded on the device. Able to record different parameters on the device memory:

- 68 hourly records for 1,920 hours;
- 68 daily records for 240 days;
- 68 monthly records for 36 months;
- 16 different demand records for 4 months;
- 50 alarm records.

Meters->T1->Imp. active		
Index	267500.156	kWh
Curr. hour	0.501	kWh
Prev. hour	0.600	kWh
Curr. day	21.321	kWh
Prev. day	22.600	kWh
Curr. month	598.451	kWh
Prev. month	439.521	kWh



Overview of the Line



		PFW - Automatic power factor controllers				
General characteristics						
Reference		PFW03-M8	PFW03-M12	PFW03-M24	PFW03-T12	PFW03-T24
Material code		14387138	14387141	14387143	14387080	14387086
Mechanical characteristics	Dimensions - W x H x D (mm)	96 x 96 x 80	144 x 144 x 75	144 x 144 x 75	144 x 144 x 75	144 x 144 x 75
	Protection rating	IP40 (front) ¹⁾	IP40 (front)	IP40 (front)	IP40 (front)	IP40 (front)
	Display type	LCD liquid Crystal	LCD liquid Crystal	LCD liquid Crystal	LCD liquid Crystal	LCD liquid Crystal
General characteristics	Measurement system	Single-phase	Single-phase	Single-phase	Three-phase	Three-phase
	Number of steps	8	12	24	12	24
	Configurable password to access the keyboard	Yes	Yes	Yes	Yes	Yes
	Types of step loads	Capacitor 3Ø and capacitor 1Ø	Capacitor 3Ø, reactor/inductor 3Ø	Capacitor 3Ø, reactor/inductor 3Ø	Capacitor 3Ø, reactor/inductor 3Ø	Capacitor 3Ø, reactor/inductor 3Ø
	Alarm relay	2	2	2	2	2
	Temperature sensor	Yes	Yes	Yes	Yes	Yes
	Modbus-RTU communication, RS485 isolated port	Yes	Yes	Yes	Yes	Yes
	Reading and recording of reactive powers of the steps	No	Yes	Yes	Yes	Yes
	Reading and indication of the measurement electrical connections	No	Yes	Yes	Yes	Yes
	Dynamic capacitor monitoring - DCM	No	Yes	No	Yes	No
	Calendar and real-time clock	No	Yes	Yes	Yes	Yes
	Adjustment for 2 periods of the day with different Cos φ	No	Yes	Yes	Yes	Yes
Available electrical quantities	Voltage (V); current (I); frequency (F)	Yes	Yes	Yes	Yes	Yes
	Powers (P; Q; S); demand; energy; power factor and Cos φ	Yes, except energy and demand	Yes	Yes	Yes	Yes
	Voltage and current total harmonic distortion (THD) and individual harmonic distortion (HD)	Only DHT (up to 51st order)	Yes (HD up to 51st)	Yes (HD up to 51st)	Yes (HD up to 51st)	Yes (HD up to 51st)
	Direct and reverse energy measurement	No	Yes	Yes	Yes	Yes
Recording (memory) of the demand values last 3 months		No	Yes	Yes	Yes	Yes
Recording (memory) of alarms		No	50	50	50	50
Recording (memory) of electrical quantities and alarms		No	Yes	Yes	Yes	Yes
Phasor diagram; table and bar graph of harmonics;		No	Yes	Yes	Yes	Yes
CE certification		Yes	Yes	Yes	Yes	Yes

Note: 1) The degree of protection of the device is extended to IP66 by installing the MBN96X96 silicone membrane accessory code 14432877.

Control Operations and Functions

Reactive Power Compensation Modes

Functions	Setting type	Smart	Sequential ascending	Sequential descending	Linear	Circular	Manual
Activates the closest step to the requested reactive power and deactivates when it is no longer needed		√					
DCM - Dynamic step monitoring - check of the life of capacitors and inductors		√	√	√	√		
The activation and deactivation of steps is done from the lowest power to the highest power in order to meet the requested reactive power			√				
The activation and deactivation of steps is done using the highest power available in order to meet the requested reactive power				√			
The first activated step will be the last to be deactivated					√		
The first activated step will be the first to be deactivated						√	
Automatic reading system and deactivated step control. Manual actuation of the steps							√
Steps with capacitors or three-phase reactors		√	√	√	√	√	√
Single or two-phase capacitors or reactors		√					√
In the steps, capacitors or reactors may have any reactive power value		√	√	√			√
In the steps, capacitors or reactors must have the same reactive power value					√	√	

Note: check in the technical data table, on pages 34 and 35, which types of settings and functions are available for each PFW model.



Control Operations and Functions

Setting Modes of the Reactive Power of the Steps

Manual Parameter Setting

- Step values are entered manually, one by one.

Parameter Setting with Preset Steps

The power of the first step is defined, and the others are recorded according to the sequence chosen during the parameter setting. Example considering an 8-step controller:

- Sequence chosen = 1-2-4-8.
- Power of step 1 = 10 kvar.
- Power of steps 2 to 8 = 20; 40; 80; 80; 80; 80; 80 kvar.

Reading and Recording of the Powers (Learning Function)

In this mode, the controller automatically reads the powers in the steps and records them on the device.

Fixed Step

The fixed step is activated while the controller is switched on and allows defining the steps that will not automatically participate in the correction.

Entry and Exit of the Steps

The controller allows defining the step entry and exit times. In addition to this configuration, the controller can delay the entry and exit based on the "average time" programming.

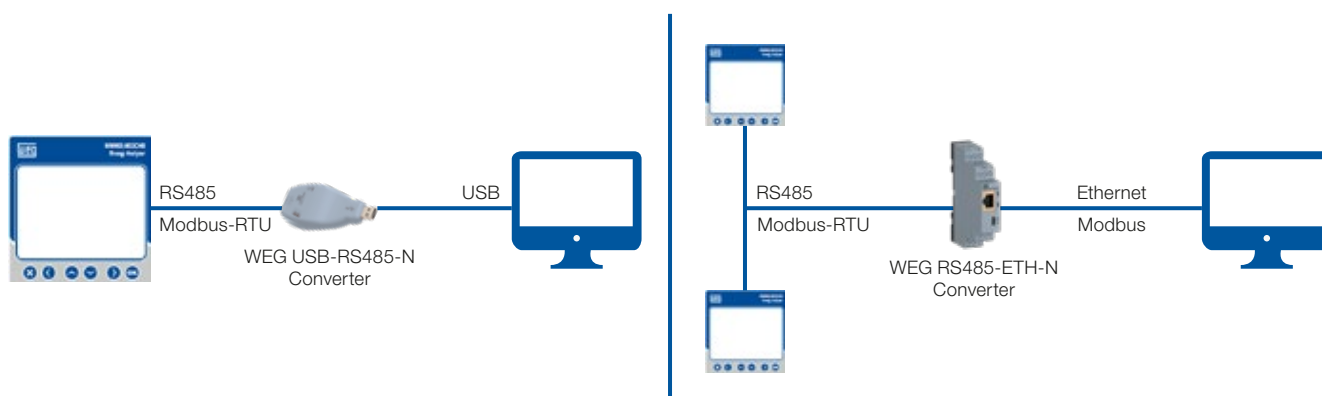
Parameter Setting Software

The device can be set locally with the keypad or remotely using the appropriate configuration applications for each product. Preferably, the connection between the device and the computer should be done through a WEG converter.

For a USB/RS485 connection you must use WEG USB-RS485-N converter, and for an RS485/Ethernet connection you must use WEG RS485-ETH-N converter. For details on these accessories, see page 37.

The table and diagram below show the parameter setting software and an example of interconnection for parameter setting.

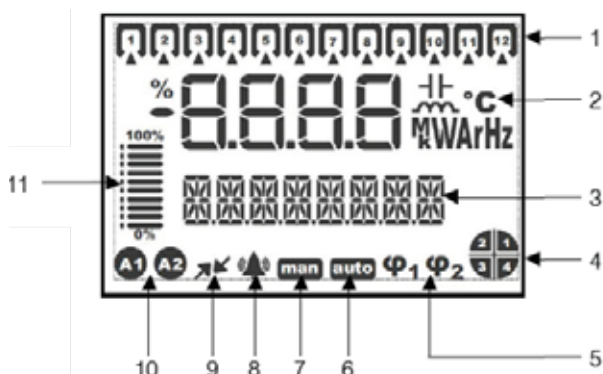
Model	Parameter setting application
PFW03-M8	WPM-PFW03
PFW03-M12	
PFW03-M24	
PFW03-T12	
PFW03-T24	



Parameter setting of the PFW using the USB/RS485 converter or the RS485/ETH-N converter.

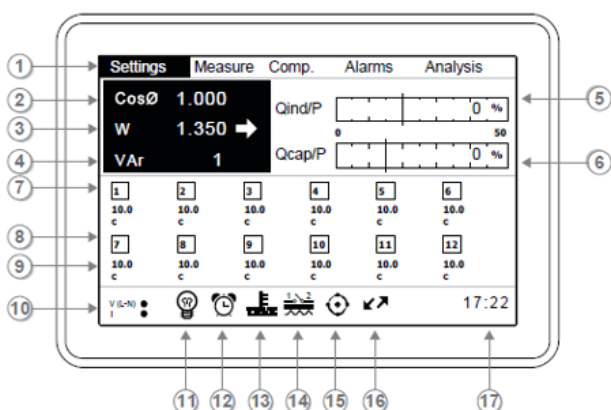
Function Identification on the Front of the Device

PFW03-M8

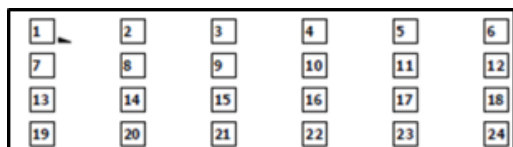


- 1 - Steps
- 2 - Indicators and units
- 3 - Menu bar
- 4 - 4-quadrant indicator
- 5 - $\cos\phi$ 1 and 2
- 6 - Automatic mode
- 7 - Manual mode
- 8 - Alarm indication
- 9 - Active communication indication
- 10 - Indication of which alarm relay is actuated
- 11 - Percentage of steps in operation in relation to the total number of steps

PFW03-M12 / M24

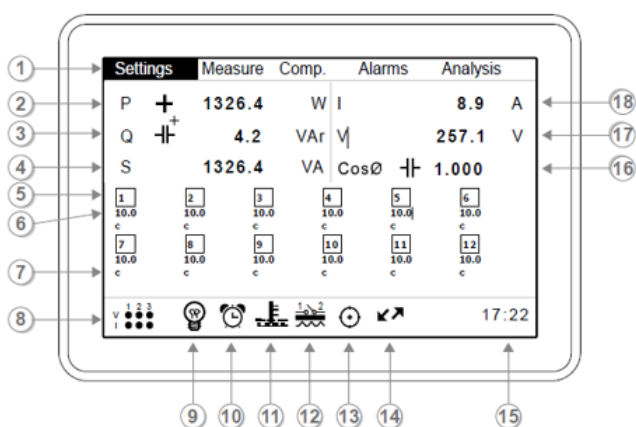


- 1 - Menus
- 2 - $\cos\phi$ of the system
- 3 - Total active power
- 4 - Total reactive power
- 5 - Total apparent power
- 6 - Step number
- 7 - Step power
- 8 - Step load type
- 9 - Voltage and current presence indicator
- 10 - Compensation mode active
- 11 - Alarm indicator actuated
- 12 - Temperature alarm indicator
- 13 - Alarm relay active indication
- 14 - DCM active indication
- 15 - RS485 communication active indication
- 16 - Clock

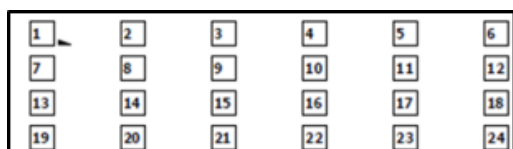


On-screen indication when the controller has 24 steps

PFW03-T12 / T24



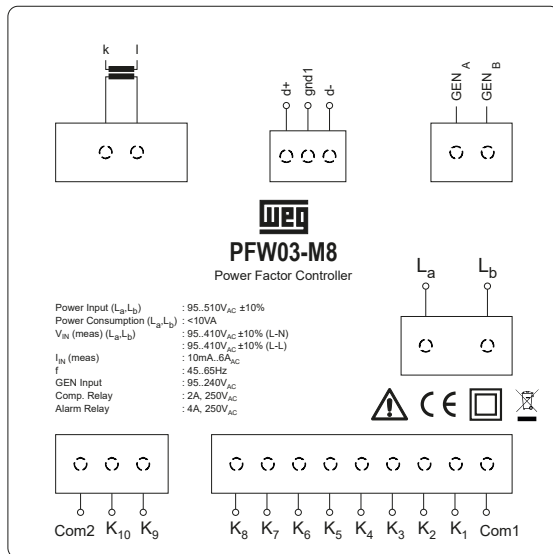
- 1 - Menus
- 2 - Total active power
- 3 - Total reactive power
- 4 - Total apparent power
- 5 - Step number
- 6 - Step power
- 7 - Step load type
- 8 - Voltage and current presence indicator
- 9 - Compensation mode active
- 10 - Alarm indicator actuated
- 11 - Temperature alarm indicator
- 12 - Alarm relay active indication
- 13 - DCM active indication
- 14 - RS485 communication active indication
- 15 - Clock
- 16 - $\cos\phi$ of the system
- 17 - Average line voltage (F-F)
- 18 - Total three-phase current



On-screen indication when the controller has 24 steps

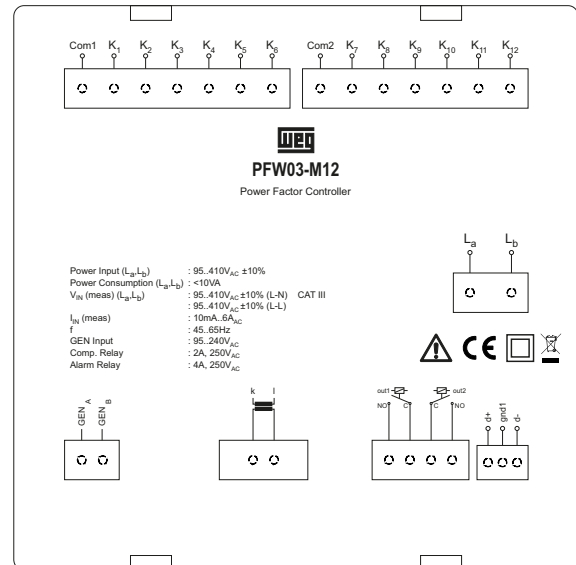
Connection Identification - Back View

PFW03-M8



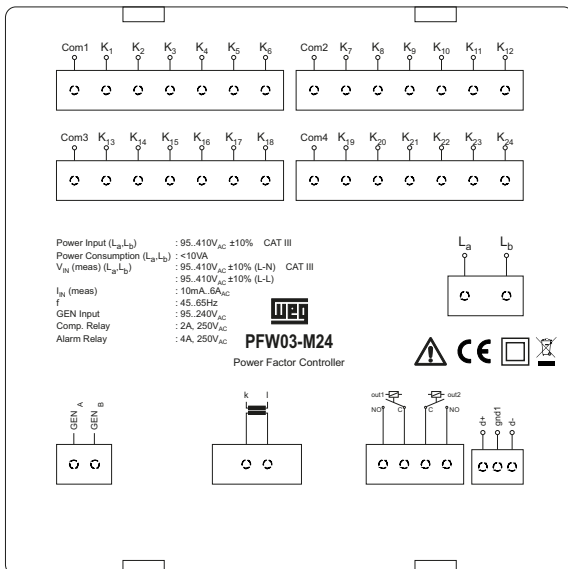
k; l - Current measurement input
La; Lb - Voltage supply measurement input
K8 to K1; Com1 - Step actuation relay outputs
Com2; A1; A2 - Alarm output relays 1 and 2
D+, GND, D - RS485 isolated communication port
GEN A; GEN B - GEN input

PFW03-M12



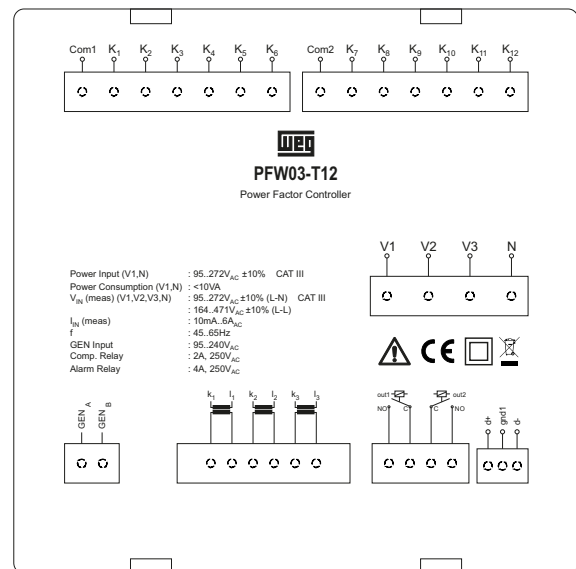
k; l - Current measurement input
La; Lb - Voltage supply measurement input
Com1; K1 to K6 - Step actuation relay outputs
Com2; K7 to K12 - Step actuation relay outputs
NO; C (out1); NO; C (out2) - Alarm output relays 1 and 2
D+, GND, D - RS485 isolated communication port
GEN A; GEN B - GEN input

PFW03-M24



k; l - Current measurement input
La; Lb - Voltage supply measurement input
Com1; K1 to K6 - Step actuation relay outputs
Com2; K7 to K12 - Step actuation relay outputs
Com3; K13 to K18 - Step actuation relay outputs
Com4; K19 to K24 - Step actuation relay outputs
NO; C (out1); NO; C (out2) - Alarm output relays 1 and 2
D+, GND, D - RS485 isolated communication port
GEN A; GEN B - GEN input

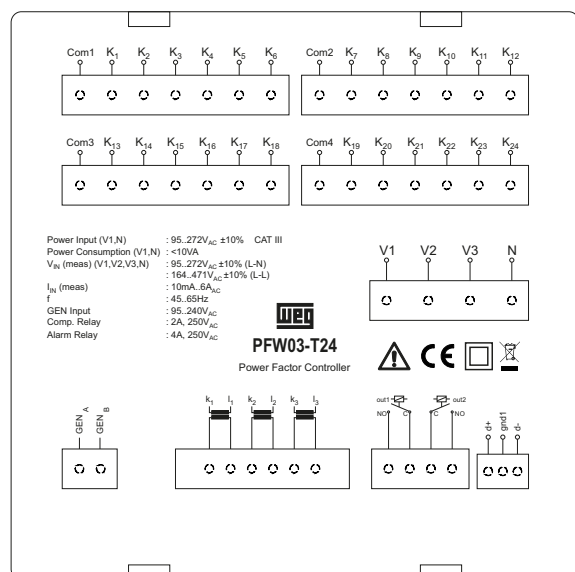
PFW03-T12



k1;l1; k2;l2; k3;l3 - Current measurement input
V1;V2;V3;N - Voltage supply measurement input ($V1;N$)
Com1; K1 to K6 - Step actuation relay outputs
Com2; K7 to K12 - Step actuation relay outputs
NO; C (out1); NO; C (out2) - Alarm output relays 1 and 2
D+, GND, D - RS485 isolated communication port
GEN A; GEN B - GEN input

Connection Identification - Back View

PFW03-T24

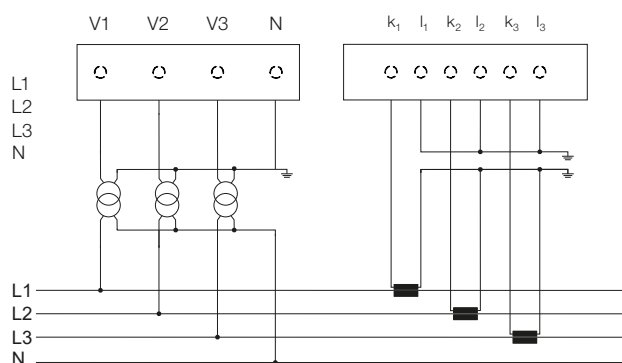


k1;l1; k2;l2; k3;l3 - Current measurement input
V1;V2;V3;N - Voltage supply measurement input (V1;N)
Com1; K1 to K6 - Step actuation relay outputs
Com2; K7 to K12 - Step actuation relay outputs
Com3; K13 to K18 - Step actuation relay outputs
Com4; K19 to K24 - Step actuation relay outputs
NO; C (out1); NO; C (out2) - Alarm output relays 1 and 2
D+, GND, D - RS485 isolated communication port
GEN A; GEN B - GEN input

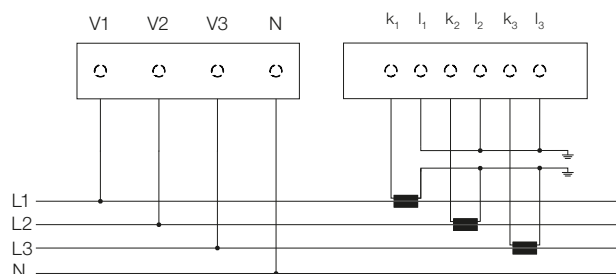
Wiring Diagrams

3F+N (4 Wires) Connection

PFW03-T12 and PFW03-T24



Measurement with 3 PTs and 3 CTs

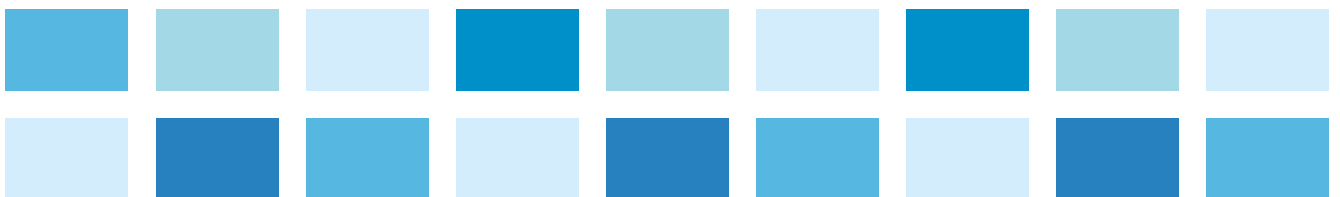
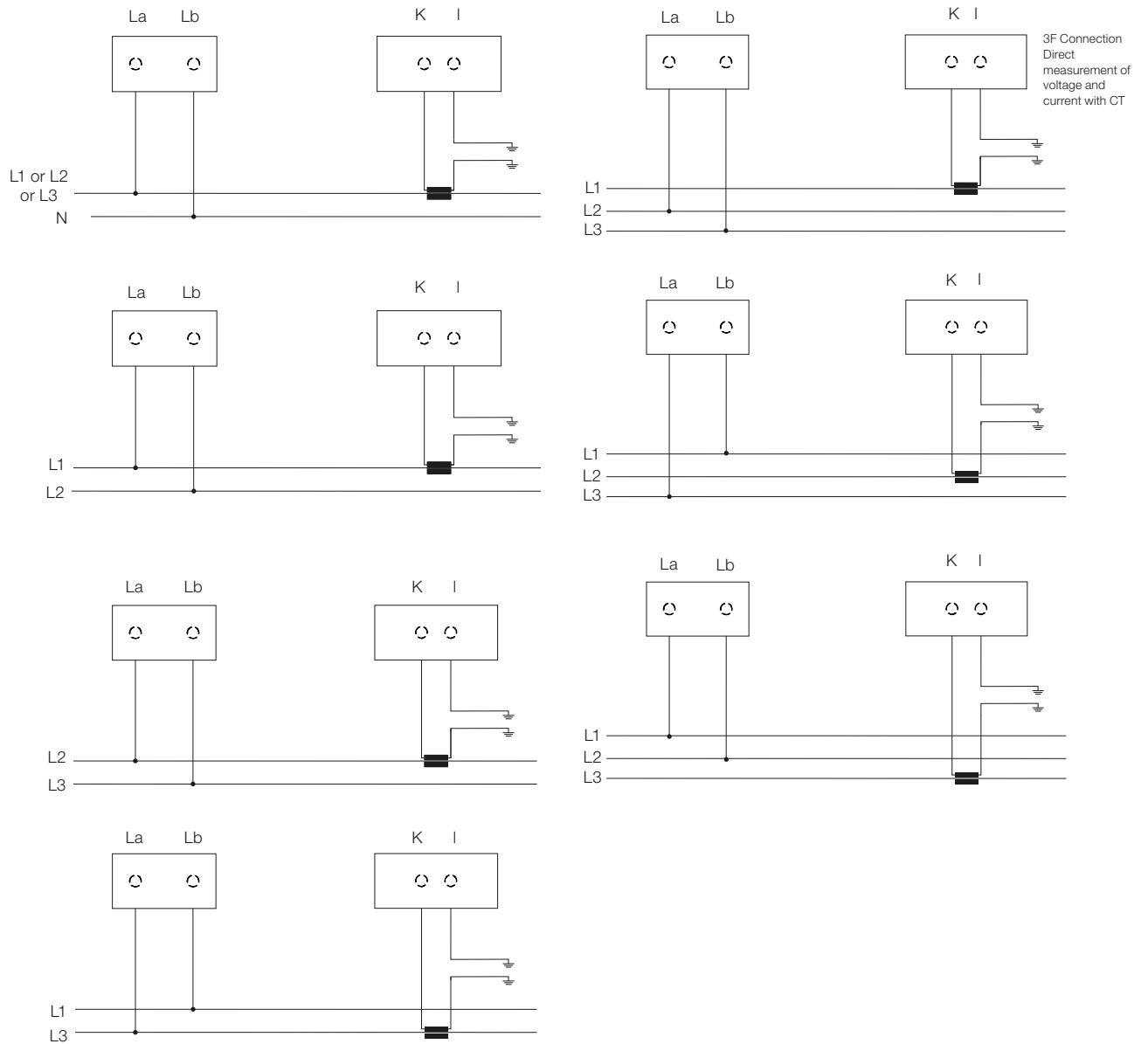


Direct measurement of voltage and current with 3 CTs

Wiring Diagrams

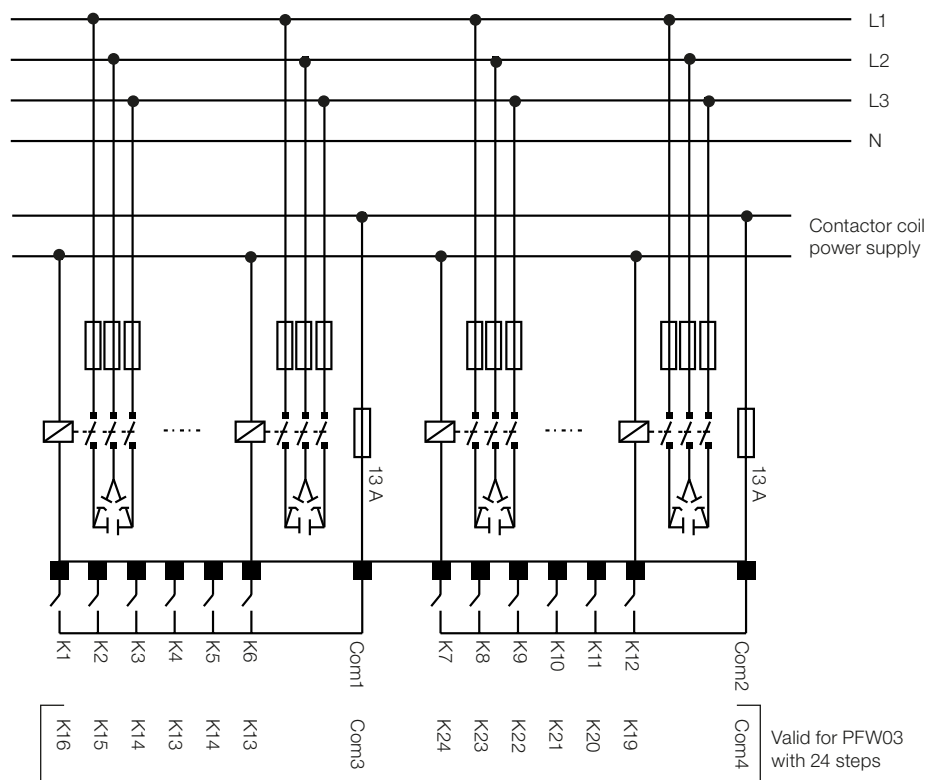
1F+N or 2F Connection

PFW03-M8; PFW03-M12 and PFW03-M24

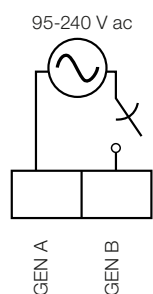


Wiring Diagrams

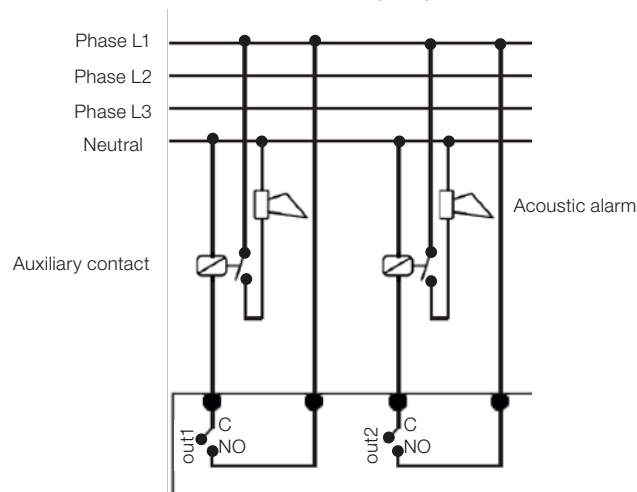
Step Output Connection



GEN input connection



Suggested connection of the alarm output relays
OUT1 and OUT2 (alarm)



Technical Data

Identification						
General	Reference	PFW03-M8	PFW03-M12	PFW03-M24	PFW03-T12	PFW03-T24
	Code	14387138	14387141	14387143	14387080	14387086
	CE certification	Yes	Yes	Yes	Yes	Yes
	Dimensions	1Ø	1Ø	1Ø	3Ø	3Ø
	Measurement form	96.8 x 96.8 x 80	144 x 144 x 75	144 x 144 x 75	144 x 144 x 75	144 x 144 x 75
	Number of steps	8	12	24	12	24
	LCD display	Available	Available	Available	Available	Available
	Language	English	English	English	English	English
	Battery	-	Available	Available	Available	Available
	Real-time clock	-	Available	Available	Available	Available
	Password protected	Available	Available	Available	Available	Available
	Current transformer (CT) adjustment range	1 - 5,000	1-5,000	1-5,000	1-5,000	1-5,000
	Voltage transformer (VT) adjustment range	1 - 999.9	1-5,000	1-5,000	1-5,000	1-5,000
	Demand period	-	1-60 minutes adjustable	1-60 minutes adjustable	1-60 minutes adjustable	1-60 minutes adjustable
	Connection type	Single-Phase (L-L or L-N); voltage connection with 1 CT	Single-Phase (L-L or L-N); voltage connection with 1 CT	Single-Phase (L-L or L-N); voltage connection with 1 CT	3P4W	3P4W
	Measurement in the 4 quadrants	-	4	4	4	4
	Number of measurements in the period	512	512	512	512	512
	Data refresh rate	<0.5s	1s	1s	1s	1s
	Electrical system type	TT, TN	TT, TN, IT	TT, TN, IT	TT, TN, IT	TT, TN, IT
	Phasor diagram	-	Available	Available	Available	Available
	Min/max/demand values	-	Available	Available	Available	Available
Control functions and operations	Reactive power compensation mode	Smart control mode	Available	Available	Available	Available
		Sequential	-	Available	Available	Available
		Linear	-	Available	Available	Available
		Circular	-	Available	Available	Available
		Manual	Available	Available	Available	Available
	Manual parameter setting		Available	Available	Available	Available
	Step settings	Preset	1-1-1-1, 1-2-2-2, 1-2-4-4	1-1-1-1, 1-1-2-2, 1-2-2-4, 1-2-3-3, 1-2-4-4, 1-1-2-4, 1-2-3-4, 1-2-4-8, 1-1-2-3	1-1-1-1, 1-1-2-2, 1-2-2-4, 1-2-3-3, 1-2-4-4, 1-1-2-4, 1-2-3-4, 1-2-4-8, 1-1-2-3	1-1-1-1, 1-1-2-2, 1-2-2-4, 1-2-3-3, 1-2-4-4, 1-1-2-4, 1-2-3-4, 1-2-4-8, 1-1-2-3
		Dynamic compensation mode - DCM	-	Available	-	Available
		Fixed step parameter setting	-	Available	Available	Available
		Power (kvar)	0.00-1,000 adjustable	0.00-1,000 adjustable	0.00-1,000 adjustable	0.00-1,000 adjustable
	Compensation type		Capacitor 3Ø, reactor 1Ø	Capacitor 3Ø, reactor/ inductor 1Ø	Capacitor 3Ø, reactor/ inductor 1Ø	Capacitor 3Ø, reactor/ inductor 1Ø
	Dual cosφ Target		Available	Available	Available	Available
	Power factor settings	Target 1 cosφ	0.8 cap. to 0.8 ind. adjustable	0.8 cap. to 0.8 ind. adjustable	0.8 cap. to 0.8 ind. adjustable	0.8 cap. to 0.8 ind. adjustable
		Target 2 cosφ	0.8 cap. to 0.8 ind. adjustable	0.8 cap. to 0.8 ind. adjustable	0.8 cap. to 0.8 ind. adjustable	0.8 cap. to 0.8 ind. adjustable
	Reading and recording of the powers of the steps and connections		-	Available	Available	Available
	Operation in the 4 quadrants for generator		Available	Available	Available	Available
	Setting time	Step activation time	1-600s adjustable	1-600s adjustable	1-600s adjustable	1-600s adjustable
		Step deactivation time	1-600s adjustable	1-600s adjustable	1-600s adjustable	1-600s adjustable
		Step discharge time	3-1,000s adjustable	3-1,000s adjustable	3-1,000s adjustable	3-1,000s adjustable
	Additional angular difference		-	±45 degrees adjustable	±45 degrees adjustable	±45 degrees adjustable
	Average time		-	Of, 5s, 10s, 20s, 30s, 40s, 50s, 60s adjustable	Of, 5s, 10s, 20s, 30s, 40s, 50s, 60s adjustable	Of, 5s, 10s, 20s, 30s, 40s, 50s, 60s adjustable
Energy measurement	Energy meter 2nd phase		-	Available	Available	Available
Current measurement input	Measuring range		10 mA-6 A AC	10 mA-6 A AC	10 mA-6 A AC	10 mA-6 A AC
	Overvoltage category		300 V Cat III	300 V Cat II	300 V Cat II	300 V Cat II
	Rated insulation voltage		-	2 kV	2 kV	2 kV
	Consumption		<0.2 VA	<0.2 VA	<0.2 VA	<0.2 VA
	Intermittent overload		100 A for 1s	100 A for 1s	100 A for 1s	100 A for 1s
Voltage measurement input	Signal sample between 45 and 65 Hz		25.6 kHz	25.6 kHz	25.6 kHz	25.6 kHz
	Overvoltage category		300 V Cat III	300 V Cat III	300 V Cat III	300 V Cat III
	Measuring range L-N		120...510 V ac ±10%	95-410 V ac ±10%	95-410 V ac ±10%	95-272 V ac ±10%
	Measuring range L-L		120...510 V ac ±10%	95-410 V ac ±10%	95-410 V ac ±10%	164-471 V ac ±10%
	Frequency measuring range		45-65 Hz	45-65 Hz	45-65 Hz	45-65 Hz
Measurement for energy analysis	Consumption		<0.2 VA	<0.1 VA	<0.1 VA	<0.1 VA
	Signal sample between 45 and 65 Hz		25.6 kHz	25.6 kHz	25.6 kHz	25.6 kHz
	Voltage and current harmonics		-	Up to the 51st order	Up to the 51st order	Up to the 51st order
	THD-voltage in %		Available	Available	Available	Available
	THD-current in %		Available	Available	Available	Available

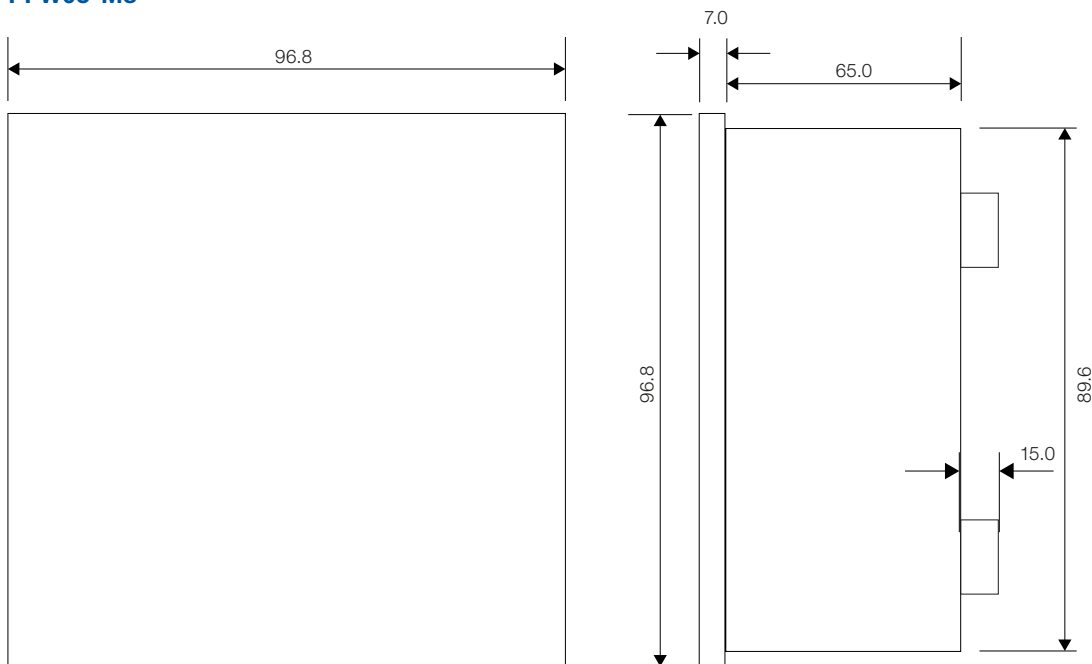
Technical Data

Identification							
Accuracy	According to IEC 61557-12	Total active power	Class 0.5	Class 0.2	Class 0.2	Class 0.2	Class 0.2
		Total reactive power	Class 1	Class 1	Class 1	Class 1	Class 1
		Total apparent power	Class 0.5	Class 0.2	Class 0.2	Class 0.2	Class 0.2
		Total active energy	Class 0.5	Class 0.5	Class 0.5	Class 0.5	Class 0.5
		Total reactive energy	Class 2	Class 2	Class 2	Class 2	Class 2
		Frequency	Class 0.1	Class 0.05	Class 0.05	Class 0.05	Class 0.05
		Current	Class 0.5	Class 0.2	Class 0.2	Class 0.2	Class 0.2
		Neutral current (calculated)	Class 0.5	Class 0.5	Class 0.5	Class 0.5	Class 0.5
		Voltage	Class 0.2	Class 0.2	Class 0.2	Class 0.2	Class 0.2
		Power factor	Class 0.5	Class 0.5	Class 0.5	Class 0.5	Class 0.5
Inputs and outputs	Output step relays (reactive power compensation)	THDV, THDI	Class 1	Class 1	Class 1	Class 1	Class 1
		According to IEC 62053-22					
		Total active energy	Class 0.5S	Class 0.2S	Class 0.2S	Class 0.2S	Class 0.2S
		According to IEC 62053-23					
		Total reactive energy	Class 2	Class 2	Class 2	Class 2	Class 2
		Number of outputs	8	12 pieces	12 pieces	12 pieces	24 pieces
		Type	NO (SPST)	NO (SPST)	NO (SPST)	NO (SPST)	NO (SPST)
		Maximum operation current	1.5 A (all relays active) 5 A (only one relay active)	2 A	2 A	2 A	2 A
		Maximum operation voltage	250 V ac	250 V ac	250 V ac	250 V ac	250 V ac
		Maximum operation power	1,250 VA	1,250 VA	1,250 VA	1,250 VA	1,250 VA
Power supply	Mechanical life	Electrical life (for NO contact)	≥100,000,000 operations 5×10 ⁴ (5 A@250 V ac) 1×10 ⁵ (5 A@30 V dc)	≥100,000,000 operations 5×10 ⁴ (5 A@250 V ac) 1×10 ⁵ (5 A@30 V dc)	≥100,000,000 operations 5×10 ⁴ (5 A@250 V ac) 1×10 ⁵ (5 A@30 V dc)	≥100,000,000 operations 5×10 ⁴ (5 A@250 V ac) 1×10 ⁵ (5 A@30 V dc)	≥100,000,000 operations 5×10 ⁴ (5 A@250 V ac) 1×10 ⁵ (5 A@30 V dc)
		Number of outputs (NO contact)	2	2 pieces	2 pieces	2 pieces	2 pieces
		Type	NO (SPST)	NO (SPST)	NO (SPST)	NO (SPST)	NO (SPST)
		Maximum operation current	4 A	4 A	4 A	4 A	4 A
		Maximum operation voltage	250 V ac	250 V ac	250 V ac	250 V ac	250 V ac
		Maximum operation power	1,250 VA	1,250 VA	1,250 VA	1,250 VA	1,250 VA
		Mechanical life	≥100,000,000 operations	≥100,000,000 operations	≥100,000,000 operations	≥100,000,000 operations	≥100,000,000 operations
		Electrical life (for NO contact)	5×10 ⁴ (5 A@250 V ac) 1×10 ⁵ (5 A@30 V dc)	5×10 ⁴ (5 A@250 V ac) 1×10 ⁵ (5 A@30 V dc)	5×10 ⁴ (5 A@250 V ac) 1×10 ⁵ (5 A@30 V dc)	5×10 ⁴ (5 A@250 V ac) 1×10 ⁵ (5 A@30 V dc)	5×10 ⁴ (5 A@250 V ac) 1×10 ⁵ (5 A@30 V dc)
		Gen Input / day-night					
		Input number	1	1 pc.	1 pc.	1 pc.	1 pc.
Recording on the memory with real-time clock	Frequency	Frequency	45-65 Hz	45-65 Hz	45-65 Hz	45-65 Hz	45-65 Hz
		Voltage presence or not	95-240 V ac	95-240 V ac	95-240 V ac	95-240 V ac	95-240 V ac
		Voltage	120-510 V ac ±10% La-Lb	95-410 V ac ±10% La-Lb	95-272 V ac ±10% L1-N	95-272 V ac ±10% L1-N	95-272 V ac ±10% L1-N
		Frequency	45-65 Hz	45-65 Hz	45-65 Hz	45-65 Hz	45-65 Hz
		Consumption	AC	<10 VA	<10 VA	<10 VA	<10 VA
		Hourly recording	-	1,920 hours x 68 different parameters	1,920 hours x 68 different parameters	1,920 hours x 68 different parameters	1,920 hours x 68 different parameters
		Daily recording	-	240 days x 68 different parameters	240 days x 68 different parameters	240 days x 68 different parameters	240 days x 68 different parameters
		Monthly recording	-	36 months x 68 different parameters	36 months x 68 different parameters	36 months x 68 different parameters	36 months x 68 different parameters
		Demand	-	4 months x 16 different parameters	4 months x 16 different parameters	4 months x 16 different parameters	4 months x 16 different parameters
		Alarm recording/records	-	50	50	50	50
Communication	Port type	Port type	RS485 - 1 channel	RS485 - 1 channel	RS485 - 1 channel	RS485 - 1 channel	RS485 - 1 channel
		Protocol	Modbus-RTU	Modbus-RTU	Modbus-RTU	Modbus-RTU	Modbus-RTU
		Baud rate	1,200-38,400 bps adjustable	24,000-115,200 bps adjustable	2,400-115,200 bps adjustable	2,400-115,200 bps adjustable	2,400-115,200 bps adjustable
		Parity	-	None	None	None	None
		Stop bit	1	1	1	1	1
		Address	1-247	1-247 adjustable	1-247 adjustable	1-247 adjustable	1-247
		Insulation	2,000 Vrms	2,000 Vrms	2,000 Vrms	2,000 Vrms	2,000 Vrms
		Weight (g)	-	663	670	670	765
		Protection rating	IP40 front / IP20 rear	IP40 front / IP20 rear	IP40 front / IP20 rear	IP40 front / IP20 rear	IP40 front / IP20 rear
		Mounting type	Panel door	Panel door	Panel door	Panel door	Panel door
Cable cross-section for connection	Power supply, voltage, current, output relays, Gen input	Cable	2.5 mm ² - 14 AWG	2.5 mm ² - 14 AWG	2.5 mm ² - 14 AWG	2.5 mm ² - 14 AWG	2.5 mm ² - 14 AWG
		Wire	4 mm ² - 12 AWG, 2x1.5 mm ² - 2x16 AWG	4 mm ² - 12 AWG, 2x1.5 mm ² - 2x16 AWG	4 mm ² - 12 AWG, 2x1.5 mm ² - 2x16 AWG	4 mm ² - 12 AWG, 2x1.5 mm ² - 2x16 AWG	4 mm ² - 12 AWG, 2x1.5 mm ² - 2x16 AWG
		Cable	1.5 mm ² - 16 AWG	1.5 mm ² - 16 AWG	1.5 mm ² - 16 AWG	1.5 mm ² - 16 AWG	1.5 mm ² - 16 AWG
		Wire	1.5 mm ² - 16 AWG, 2x0.75 mm ² - 2x18 AWG	1.5 mm ² - 16 AWG, 2x0.75 mm ² - 2x18 AWG	1.5 mm ² - 16 AWG, 2x0.75 mm ² - 2x18 AWG	1.5 mm ² - 16 AWG, 2x0.75 mm ² - 2x18 AWG	1.5 mm ² - 16 AWG, 2x0.75 mm ² - 2x18 AWG
		RS485					
		Operating temperature	-20°C +55°C	-20 to +55 °C	-20 to +55 °C	-20 to +55 °C	-20 to +55 °C
		Storage temperature	-30°C +80°C	-30 to +80 °C	-30 to +80 °C	-30 to +80 °C	-30 to +80 °C
		Non-condensing relative humidity	Max. 95%	Max. 95%	Max. 95%	Max. 95%	Max. 95%
		EN 61000-6-1:2011	Available	Available	Available	Available	Available
		EN 61000-6-3/A1/ AC:2013	Available	Available	Available	Available	Available

Note: 1) The accuracy of the measurements of the MMW + CT and/or PT set depends directly on the accuracy of the CTs and PTs used.

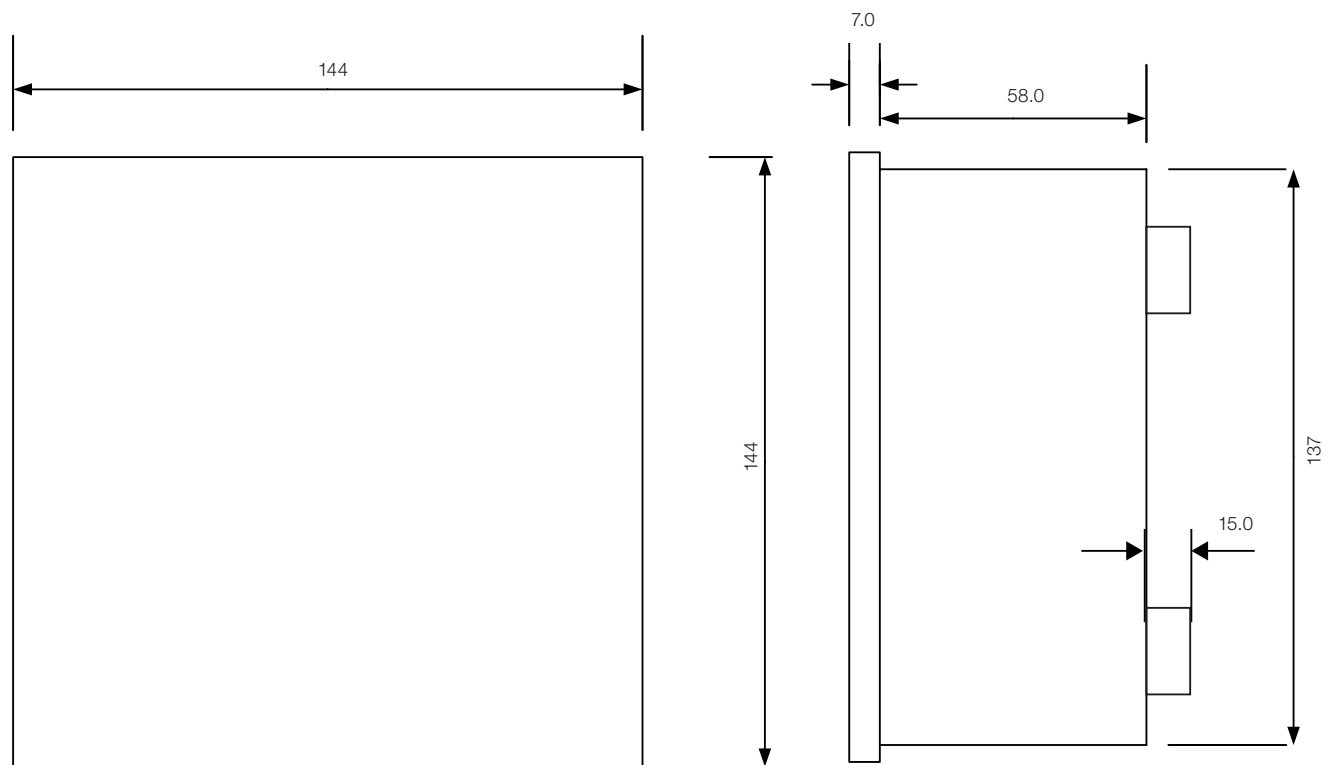
Dimensions (mm)

PFW03-M8



Note: dimensions in mm.

PFW03-M12/M24/T12/T24



Note: dimensions in mm.



Accessories

FAST AND FLEXIBLE CONNECTIVITY ON DATA TRANSFER

The RS485/Ethernet converter provides speed and versatility for data transmission between the device and the communication system on Ethernet network. The RS485/USB converter, on the other hand, simplifies the use of parameter setting applications and enables fast access to the devices.



WEG RS485-ETH-N
Converter



WEG USB-RS485-N
Converter

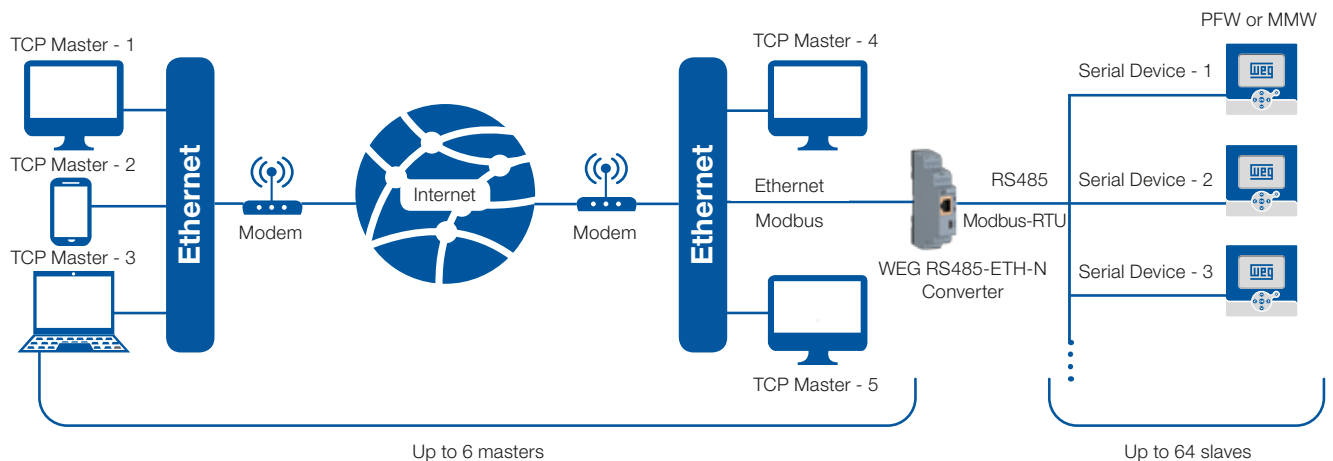
Connectivity Accessories

Conversor RS485 / Ethernet Converter

This converter has flexibility to set the parameters for slave/server mode and master/client mode.

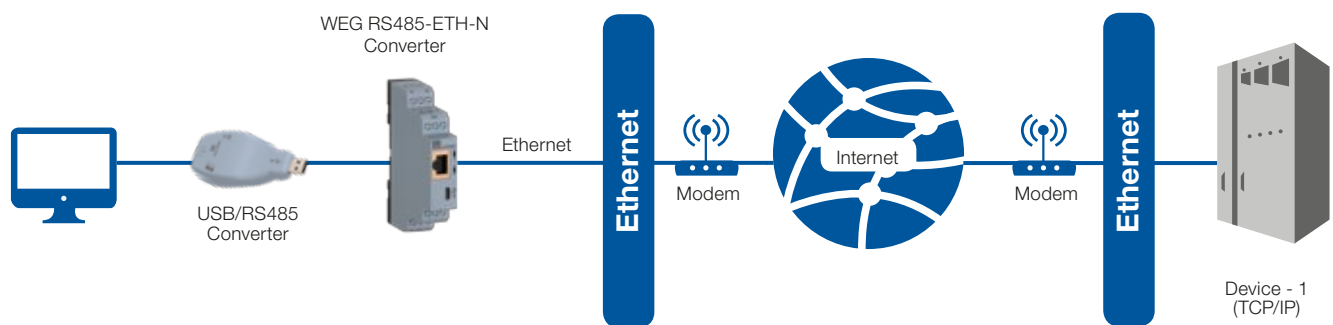
Slave Mode

When running in the slave mode, the RS485-ETH-N converts the Modbus-TCP and Modbus-RTU over TCP queries into Modbus-RTU, and Modbus-ASCII over TCP queries into Modbus-ASCII. Either way, the queries are transmitted to the serial devices. After that, it converts the received responses and transmits them to the master devices. Up to 6 TCP clients and 64 serial devices can communicate simultaneously on a converter.



Client Mode

When running in client mode, the RS485-ETH-N converts the Modbus-RTU and Modbus-ASCII queries into the Modbus-TCP, Modbus-RTU over TCP and Modbus-ASCII over TCP queries. Those queries are transmitted to the remote device that is connected to the internet or the local network. After that, it converts the responses the devices received and transmits them to the master devices. 1 TCP client and 1 serial device can communicate simultaneously on an RS485-ETH-N gateway in the client mode.



Connectivity Accessories

RS485/USB Converter

This converter has a barrier that provides electrical isolation between the computer and the serial devices, since it is fed directly through the USB port without requiring an external source.



Membrane 96 x 96

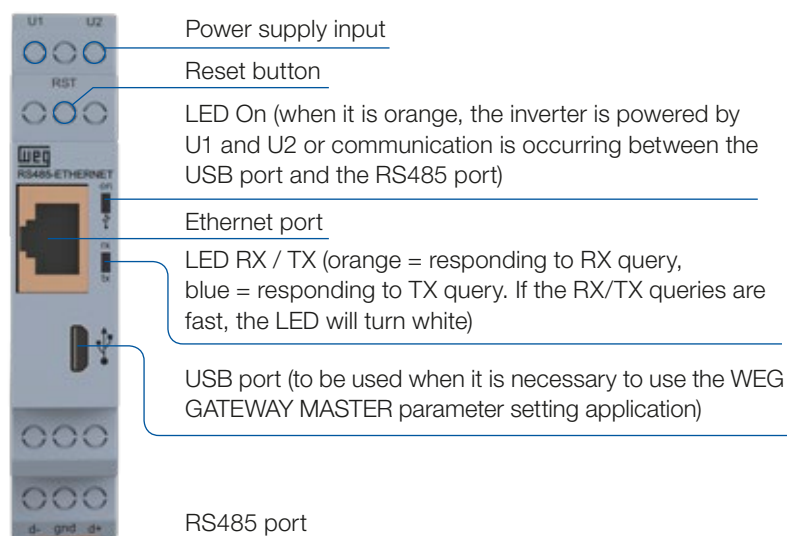
This accessory allows increasing the protection degree of the MMW03 and PFW03 with dimensions 96 x 96 for IP66 protection rating.

Parameter Setting Software

Model	Parameter setting application
RS485-ETH-N	WEG GATEWAY MASTER
USB-RS485-N	Not applicable

Front Identification of the Devices

RS485-ETH-N



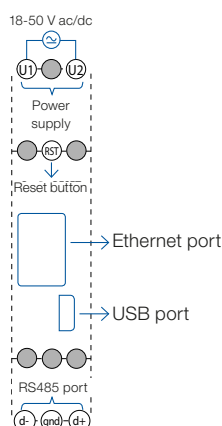
USB-RS485-N



Note: if the On and RX/TX LEDs are blinking simultaneously, the converter has been reset.

Connection Identification

RS485-ETH-N



Technical Data

Description			Technical data	
			RS485-ETH-N	
Code			14389293	
Function			Ethernet Converter (TCP/IP - RS485)	
Width (mm)			17.5	
Connections			Screw terminal (for source and serial interface)	
General	Operating mode		Selectable slave or client (bidirectional)	
	Configuration		Mini USB port or web interface	
	DHCP (automatic IP receive)		Available	
	ARP		Available	
	Ping blocking		Available	
	LED indicators		Available	
	Reset Function		Available	
	ESD Protection		Available	
Supported drive			Windows® XP/Vista/7/8.1	
Interface Ethernet	Number of ports		1	
	Operating modes		Modbus-TCP	
	Number of remote connections	Server Mode	6	
		Client mode	1	
	Connector		RJ45	
Baud rate		10/100 Base-TX		
Serial interface	Number of ports		1	
	Operating modes		Modbus-RTU	
	Serial standard		RS485	
	Number of serial devices	Slave Mode	64	
		Master Mode	1	
	Serial communication parameters	Baud rate	300 to 115,200 bps	
		Data bit	8	
		Stop bits	1 or 2	
Parity		None, even, odd		
Power supply	Voltage	AC	18-50 V	
		DC	18-50 V	
	Consumption	AC	<2.2 VA	
		DC	<1.2 W	
	Frequency		45-65 Hz	
Galvanic isolation	Source-Ethernet port		1,500 Vrms, 2,250 V dc	
	Source-serial port		1,500 Vrms, 2,250 V dc	
	Serial port - Ethernet port		2,500 Vrms	
Mechanical properties	Weight (g)		58	
	Protection rating		IP20	
	Mounting type		Rail mounting	
	Permissible mounting position		Any	
Environment conditions	Operating temperature		-10 to +60 °C	
	Storage temperature		-30 to +80 °C	
	Relative humidity (non-condensing)		Max. 95%	
EMC-EMI	TS EN 55022, TS EN 55024		Ok	
Accompanies the converter			Mini USB cable	

U1U2

RST

Weg

RS485-ETHERNET

5V

TX

USB

-d-

gnd

-d+



Reference			USB-RS485-N	
Code			14389292	
Function			RS485/USB Converter	
Interface	USB	Compatibility	USB 1.1 and USB 2.0	
		Connector	USB type A	
		Number the port	1	
		Standard	RS485	
		Connector	Terminal with removable screw	
	Serial	Insulation	2,500 Vrms	
		Baud rate	300 ... 115,200 bps	
		Stop bits	1, 1.5, 2	
		Data bits	5, 6, 7, 8	
		Parity	None, even, odd	
Terminals			D+, D-, gnd	
Power supply			Via USB port	
Environment conditions	Operating temperature		-20 °C...+60 °C	
	Storage temperature		-20 °C...+70 °C	
	Relative humidity (non-condensing)		Max. 95%	
Protection rating			IP20	
Accompanies the converter			USB Cable	



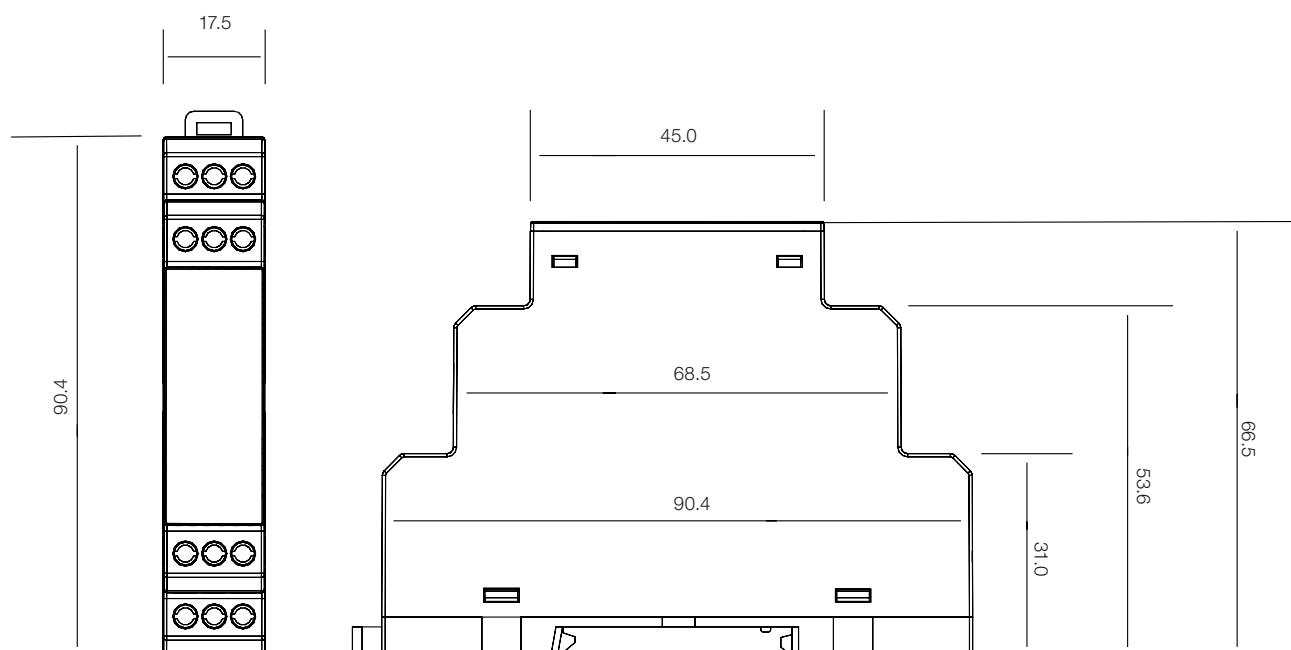


Technical Data

Reference	MBN96x96
Code	14432877
Function	Membrane for IP66 protection
Dimensions in mm (height x width)	96 x 96
Material	Silicone

Dimensions (mm)

RS485-ETH-N



Note: dimensions in mm.

[illegible]



Global presence is essential, as much as understanding your needs.

Global Presence

With more than 30,000 employees worldwide, WEG is one of the largest electric motors, electronic equipments and systems manufacturers. We are constantly expanding our portfolio of products and services with expertise and market knowledge. We create integrated and customized solutions ranging from innovative products to complete after-sales service.

WEG's know-how guarantees our **Multimeter and Automatic Power Factor Controller** are the right choice for your application and business, assuring safety, efficiency and reliability.



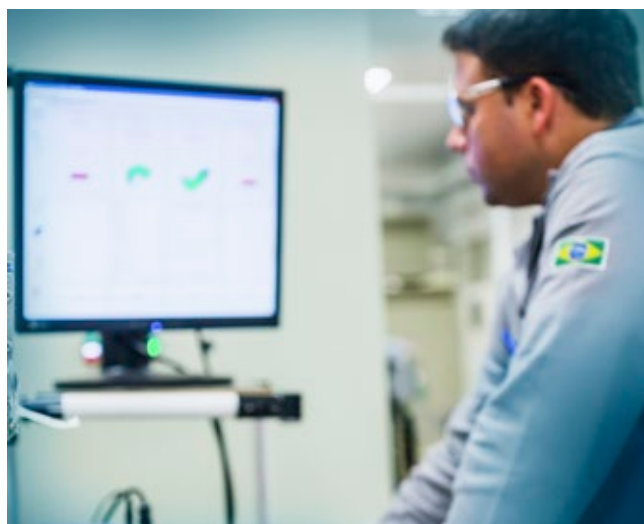
Availability is to have a global support network



Partnership is to create solutions that suit your needs



Competitive edge is to unite technology and innovation



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