Installation manual

GOSSEN METRAWATT

MAVOLOG | PRO

Power Quality Analyzer

GB

3-349-805-03
2/3.15

Contents

Page

Attention!

Please make sure to read the detailed operating instructions in pdf format at www.gossenmetrawatt.com. There you will find also the short-form instructions. The installation manual and the short-form instructions are no substitute for the detailed instructions!

1 Safety Instructions and Warnings

Please note

This booklet contains instructions for installation and use of Power Quality Analyser MAVOLOG PRO. Installation and use of a device also includes handling with dangerous currents and voltages therefore should be installed, operated, serviced and maintained by qualified personnel only. GMC-I Messtechnik GmbH assumes no responsibility in connection with installation and use of the product. If there is any doubt regarding installation and use of the system in which the device is used for measuring or supervision, please contact a person who is responsible for installation of such system.

We advise you to entrust only qualified personnel with the installation of power quality analyzers by GMC-I Messtechnik GmbH.

Before switching the device ON

Check the following before switching on the device:

- Nominal voltage,
- Supply voltage,
- Nominal frequency,
- Voltage ratio and phase sequence,
- Current transformer ratio and terminals integrity,
- Protection fuse for voltage inputs (recommended maximal external fuse size is 6 A),
- Integrity of earth terminal,
- Proper connection and voltage level of I/O modules.

Warning!
Auxiliary power supply can be LOW range (19 ... 70 V DC, 48 ... 77 V AC). Connecting device with LOW power supply to higher voltage will cause device malfunction. Check devices' specification before turn it on!

Opening of Equipment / Repair

The equipment may be opened only by authorized service personnel to ensure the safe and correct operation of the equipment and to keep the warranty valid.

Even original spare parts may be installed only by authorized service personnel.

In case the equipment was opened by unauthorized personnel, no warranty regarding personal safety, measurement accuracy, conformity with applicable safety measures or any consequential damage is granted by the manufacturer.

Meaning of Symbols on the Housing and Labels of the Instrument

Warning concerning dangerous voltage

Warning concerning a source of danger (attention: observe documentation!)
„Warning!“ draws your attention to dangerous situations which require strict observance of the instructions given in this installation manual to avoid injuries.

Functional earth
Note: this symbol is also used for marking the ground potential on the fourth voltage connection terminal.

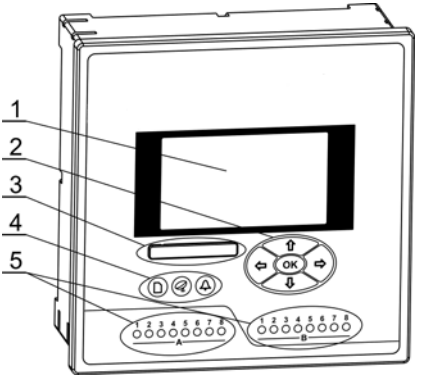
Double insulation in accordance with EN 61010-1: 2010

The device and included batteries may not be disposed of with the trash. Further information regarding the WEEE mark can be accessed on the Internet at www.gossenmetrawatt.com by entering the search term “WEEE”.

EC mark of conformity
Compliance of the product with the European CE Directives.

2 Description of the device

1 – Graphical LCD
2 – Navigation keyboard
3 – A slot with a cover for memory card
4 – General operation LED indicators (card/com./alarm)
5 – I/O status LED indicators



Graphical LCD

A graphical LCD with back light is used for high resolution of displayed measuring quantities and for a display of selected functions when setting the device.

Navigation keyboard

The **OK** key is used for confirming the settings, selecting and exiting the display. Direction keys are used for shifting between screens and menus.

A slot with a cover Memory card

A Quality Analyser is provided with a slot for a full size MMC or SD card that is used for data transfer from the internal memory, device setting and software upgrading. A slot protection cover for the card prevents penetration of humidity and dust into device.

LED indicators

There are two types of LED indicators positioned on the front panel. General operation LED indicators and I/O status LED indicators.

3 Connection

Before use please check the following:

- Nominal voltage (UP-Pmax = 1000 V AC_{rms}; UP-Nmax = 600 V AC_{rms}),
- Supply voltage (type HIGH or type LOW),
- Nominal frequency,
- Voltage ratio and phase sequence,
- Current transformer ratio and terminals integrity,
- Protection fuse for voltage inputs (recommended maximal external fuse size is 6 A),
- Integrity of earth terminal,
- Proper connection and voltage level of I/O modules.

Warning!
Wrong or incomplete connection of voltage or other terminals can cause non-operation or damage to the device.

Warning!
It is imperative that terminal 12 which represents fourth voltage measurement channel is connected to earth pole ONLY. This terminal should be connected to EARTH potential at all times! This input channel is used only for measuring voltage between neutral end earth line.

Attention!
Aux. supply inrush current can be as high as 20 A for short period of time (< 1 ms). Please choose an appropriate MCB for connection of aux. Supply.

Note
After connection, settings have to be performed via a keyboard on the front side of the device that reflect connection of device to voltage network (connection mode, current and voltage transformers ratio…). Settings can also be done via communication or a memory card.

Mounting

MAVOLOG PRO is intended only for panel mounting. Pluggable connection terminals allow easier installation and quick replacement should that be required.

This device is not intended for usage as portable equipment and should be used only as a fixed panel mounted device.

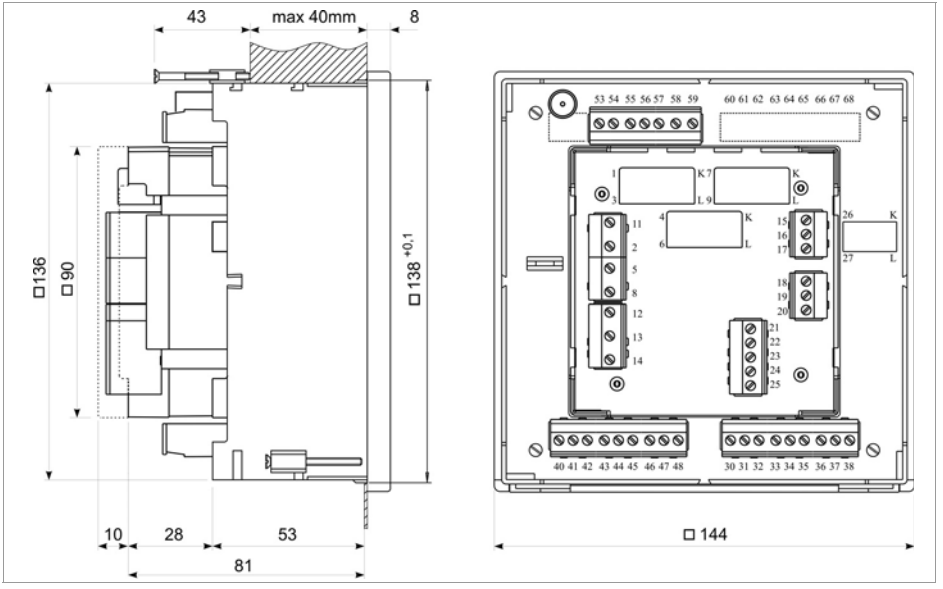


Figure 1 Dimensional drawing and rear connection terminals position

Recommended panel cutout is:
138 mm x 138 mm + 0.8 mm

Please remove protection foil from the screen.

Permitted conductor cross-sections

Terminals	Max. conductor cross-sections	
Voltage inputs (4)	2.5 mm^2 4 mm^2	with pin terminal solid wire
Current inputs (3)	≤ 6 mm Ø	one conductor with insulation
Supply (3)	2.5 mm^2 4 mm^2	with pin terminal solid wire
Modules 1, 2 (2 x 3)	2.5 mm^2 4 mm^2	with pin terminal solid wire
Modules A, B (2 x 9)	2.5 mm^2 4 mm^2	with pin terminal solid wire
Module C (1 x 7)	2.5 mm^2 4 mm^2	with pin terminal solid wire

Warning!

It is imperative that terminal 12 which represents fourth voltage measurement channel is connected to earth pole ONLY. This terminal should be connected to EARTH potential at all times!

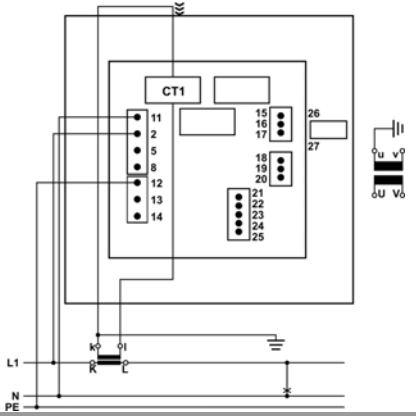
4 Electrical connection

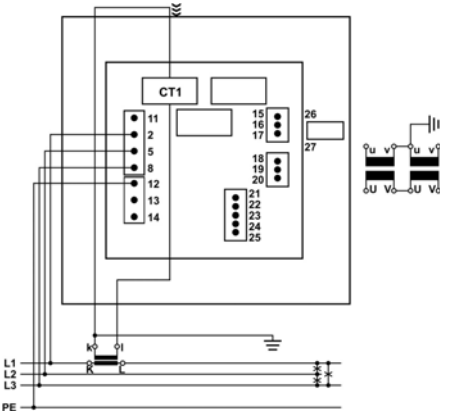
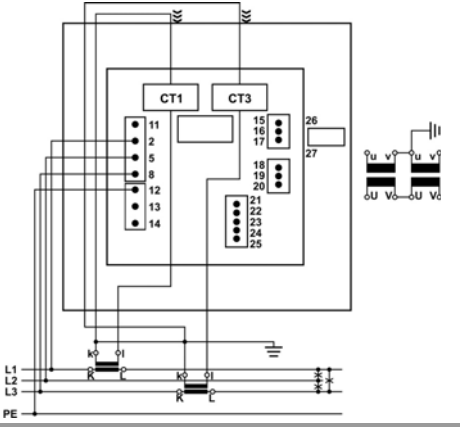
Voltage inputs of a device can be connected directly to low-voltage network or via a voltage measuring transformer to a high-voltage network.

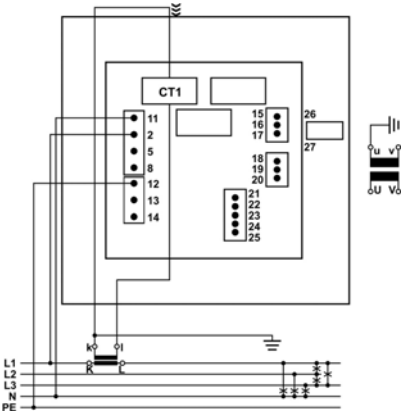
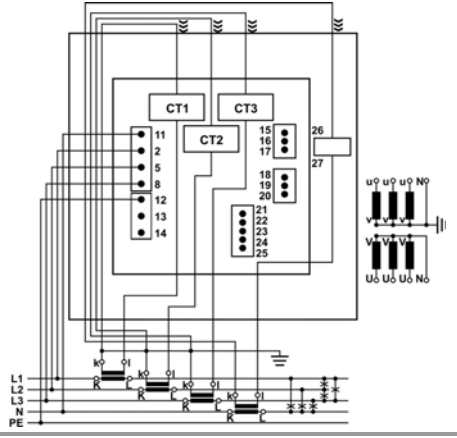
Current inputs of a device are led through a hole in current transformers to allow uninterrupted current connection. Connection to network is performed via a corresponding current transformer.

Choose corresponding connection from the figures below and connect corresponding voltages and currents. Information on electrical consumption of current and voltage inputs is given in the operating manual, chapter I/O modules on page 79.

Attention!
For accurate operation and to avoid measuring signal crosstalk it is important to avoid driving voltage measuring wires close to current measuring transformers.

System / Connection	Terminal Assignment
1b (1W1b) Single-phase connection	

System / Connection	Terminal Assignment
3b (1W3b) Three-phase – three-wire connection with balanced load	
3u (2W3u) Three-phase – three-wire connection with unbalanced load	

System / Connection	Terminal Assignment
4b (1W4b) Three-phase – four-wire connection with balanced load	
4u (3W4) Three-phase – four-wire connection with unbalanced load. This connection type allows for measuring neutral conductor current with a fourth current sensor.	

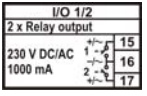
Connection of input/output modules

Warning!
Check the module features that are specified on the label, before connecting module contacts. Wrong connection can cause damage or destruction of module and/or device.

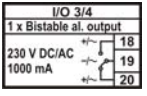
Note
Examples of connections are given for device with built in two input / output modules and RS232/RS485 communication. Connection does not depend on a number of built-in modules and communication, and is shown on the devices' label.

Connect module contacts as specified on the label. Examples of labels are given below and describe modules built in the device. Information on electrical properties of modules is given in the operating manual, chapter I/O modules on page 79.

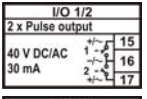
I/O module 1 and 2 (terminal numbers 15-20) – output options



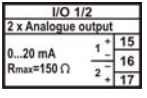
Alarm (relay) output module with two outputs.



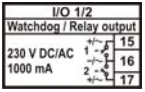
Bistable alarm output module; keeps the state also in case of device power supply failure.



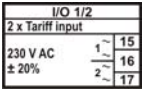
Pulse output (solid state) module with two pulse outputs for energy meters.



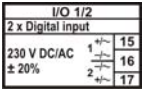
Analogue output module with two analogue outputs (0 … 20 mA), proportional to measured quantities.



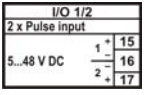
Status (watchdog) output module enables proper device operation supervision on one output (WD) and alarm output functionality on the other.



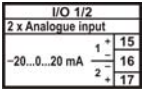
Tariff input module with two tariff inputs for changeover between up to four tariffs.



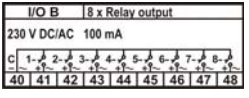
Digital input module with two digital inputs enables reception of impulse signals.



Pulse input module enables reception of pulses from various meters (water, gas, heat, flow).

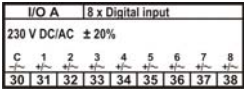


Analogue input module enables measurements of DC U, I, R or temp. (PT100, PT1000) values from external sources. Modules have different hardware, so programming is possible within one quantity.



Auxiliary I/O module A and B – output options

Digital output relay module with eight digital outputs enables alarm functionality.



Auxiliary I/O module A and B – input options

Digital input module with eight digital inputs enables reception of digital signals.

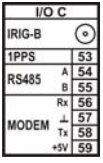
Connection of Real Time Synchronization module C

Synchronisation module is used to synchronise RTC of the device and to maintain its accuracy for correct aggregation intervals and time stamps of recorded events appearing in monitored electro distribution network.

Different types of RTC synchronisation are possible:

– IRIG-B modulated; 1 kHz modulation with <1ms resolution.
– IRIG-B unmodulated (level shift)
– 1PPS + RS232 Date & Time telegram (from GPS)

Synchronization Module C



Synchronisation module is equipped with support for two different synchronisation methods IRIG-B and GPS modem.

When modulated IRIG-B signal is used it should be connected to BNC terminal. When level-shift IRIG-B signal is used it should be connected to 1PPS terminal.

In case of GPS modem, 1pps signal should be connected to 1PPS terminal and serial RS232 signal should be connected to RS232 terminals.

When IRIG-B (modulated or level-shift) or 1PPS signal is used for time synchronisation serial communication interface (RS232 or RS485) can be used as a devices' secondary communication port (COM2).

Attention!

Max consumption of +5V supply terminal is 100mA. When GPS with consumption greater the 100mA is used it is advisable to use external power supply.

Survey of synchronisation connection

Terminals	Connector type
	BNC for modulated IRIG-B and pluggable screw terminals for level-shift IRIG-B, GPS modem or serial RS232 or RS485

Connection type	Position	Data direction	Description
BNC plug	600 Ohm input impedance: standard Coaxial cable (55 Ohm) recommended		
Screw terminals	53	1PPS (GPS) or IRIG-B (level shift)	Synchronisation pulse
	54	zu/von (A)	RS485
	55	zu/von (B)	RS485
	56	zu	Data reception (Rx)
	57	**GND**	Grounding
	58	von	Data transmission (Tx)
	59	+5 V	external voltage +5 V (supply for GPS modem)

More information regarding use of Synchronisation module C is in a chapter Synchronisation module C on page 80 and Serial communication via Synchronisation module C (COM2) in the operating manual on page 81.

Memory Card

The analyzer is equipped with a front panel slot for a SD memory card that supports capacity up to 2 GB.

Attention!
When memory slot is not used it should be covered with attached cover to avoid penetration of dust and small objects.

Memory card is useful for transferring stored data and performing other system operations (downloading settings, firmware update) when device is not connected to communication.

Memory card allows different operations:

– **Transferring data stored in internal memory**

All data (readings, alarms, PQ reports and details), which are stored in internal memory can be transferred to a memory card.

– **Upload and download settings**

This is a very convenient way of programming devices. Settings can be manually programmed once and stored to a memory card by Upload settings. Using that memory card more devices can be programmed very fast with identical settings.

– **Firmware update**

When new features are added or when certain fixes should be implemented it is necessary to update devices' firmware. This can again be performed fastest by using memory card. New firmware should be transferred to a memory card from computer once. After that multiple devices can be updated only with memory card.

Attention!
During firmware update aux. power supply must not be interrupted.

Communication connection

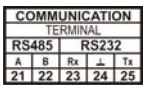
Primary communication interface (COM1) type is normally specified when placing an order. Device can support several types of communication:

– serial RS232/ 485 communication designed as a pluggable 5-pole screw terminal connector,
– Ethernet communication designed as standard RJ-45 terminal and USB communication designed as standard USB-B type terminal
– single USB communication designed as standard USB-B type terminal

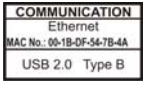
Note

When connecting serial communication please note that only RS232 or RS485 should be used and not both at a time. Connector terminals that are not used should remain unconnected otherwise the communication could not work properly.

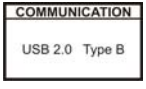
Connect a communication line by means of a corresponding terminal. Communication parameters are stated on the device label, regarding the selected/equipped type of communication. Connector terminals are marked on the label on a devices' rear side. More detailed information on communication is given in chapter Communication in the operating manual on page 55.



Example of a label for RS232 and RS485 communication with a pluggable screw terminal connector



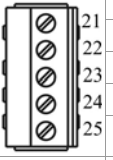
Example of a label for Ethernet/USB communication module equipped with RJ–45 and USB-B type connector.



Example of a label for USB communication with USB-B type connector.

Note
When device is connected to a PC through USB communication for the first time, a user is prompted to install a driver. The driver is provided on the CD, enclosed in the original shipment package, or it can be downloaded from the GOSSEN METRAWATT homepage www.gossenmetrawatt.com. With this driver installed, USB is redirected to a serial port, which should be selected when using MAWO-View setting software.

Survey of communication connection:

	Connection type	Terminals	Position	Data direction	Description
RS485 RS232	Screw terminals		21	to/from	A
			22	to/from	B
			23	to	Data reception (Rx)
			24	—	Grounding (⊥)
			25	from	Data transmission (Tx)
Ethernet	RJ–45			100BASE-T CAT5 cable recommended	
USB	USB-B			Standard USB 2.0 compatible cable recommended (Type B plug)	

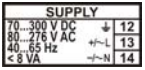
Connection of aux. power supply

Device can be equipped with either of two types of universal (AC/DC) switching power supply.

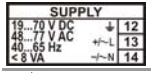
Type High:	70 ... 300 V DC 80 ... 276 V AC; 40 ... 65 Hz
Type Low:	19 ... 70 V DC 48 ... 77 V AC; 40 ... 65 Hz

Power supply voltage depends on ordered voltage. Information on electric consumption is given in chapter „Technical Data“ in the operating manual.

Regarding power supply voltage specification on the label, choose and connect the power supply voltage:



Connection of universal power supply type High to terminals 13 and 14.



Connection of universal power supply type Low to terminals 13 and 14.

Warning!

Auxiliary power supply can be LOW range (19-70 V DC, 48-77 V AC). Connecting device with LOW power supply to higher voltage will cause device malfunction. Check devices' specification before turn it on!

Attention!

Aux. supply inrush current can be as high as 20 A for short period of time (< 1 ms). Please choose an appropriate MCB for connection of aux. supply.

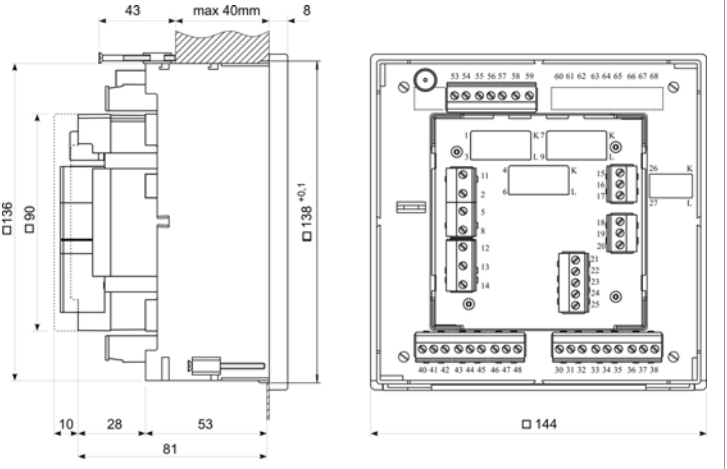
5 Analog Inputs

Voltage inputs		
	Number of channels	4 (1)
	Sampling rate	31 kHz
	Min. voltage for sync.	1 Vrms
	Nominal value (U_N)	500 VLN , 866 VLL
	Max. measured value (cont.)	600 VLN ; 1000 VLL
	Max. allowed value	1,2 × UN permanently 2 × UN ; 10 s
	Consumption	< U2 / 4.2 MΩ per phase
	Input impedance	4.2 MΩ per phase
	(1) 4^{th} channel is used for measuring U EARTH-NEUTRAL	
Current inputs		
	Number of channels	4
	Sampling rate	31 kHz
	Nominal value (I_N)	1 A, 5 A
	Max. measured value	12,5 A sinus
	Max. allowed value (thermal)	15 A cont. ≤ 300 A; 1 s
	Consumption	< I2 × 0.01 Ω per phase
Frequency		
	Nominal frequency (f_n)	50, 60 Hz
	Measuring range	16 … 400 Hz

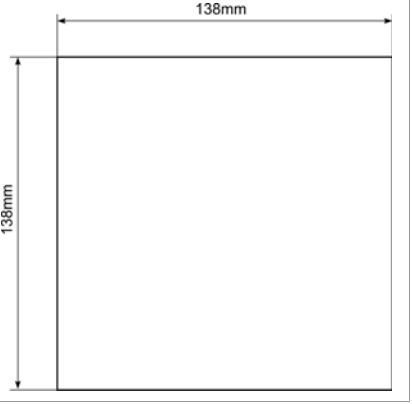
Aux. Supply		
	Standard (high):	CAT III 300 V
	Nominal voltage AC	80 … 276 V
	Nominal frequency	40 … 65 Hz
	Nominal voltage DC	70 … 300 V
	Consumption (max. all I/O)	< 8 VA
	Power-on transient current	< 20 A ; 1 ms
	Optional (low):	CAT III 300 V
	Nominal voltage AC	48 … 77 V
	Nominal frequency	40 … 65 Hz
	Nominal voltage DC	19 … 70 V
	Consumption (max. all I/O)	< 8 VA
	Power-on transient current	< 20 A ; 1 ms

6 Dimensional drawing

Dimensions in mm



Panel Cutout



7 Connection table

Function			Connection	Comment
Measuring inputs	AC current	IL1	1/3	 CAT IV 300 V CAT III 600 V
		IL2	4/6	
		IL3	7/9	
		ILN	26/27	
	AC voltage	UL1	2	 CAT IV 300 V CAT III 600 V
		UL2	5	
		UL3	8	
		UN 1	11	
Ein- / Ausgänge:	Module 1/2	⊖> +	15	
		⊖> – (common)	16	
		⊖> +	17	
	Module 3/4	⊖> +	18	
		⊖> – (common)	19	
		⊖> +	20	
	Module A	⊖>	30-38	
	Module B	⊖>	40-48	
	Module C	⊖>	52-58	
Auxiliary power supply		+ / AC (L)	13	 CAT III 300 V GROUND terminal must be always connected !
		– / AC (N)	14	
		GROUND	12	
Communication:	RS485	A	21	RS232 and RS485 are both supported, but only one at the time can be used! In case of Ethernet / USB communication, terminals from 21 to 25 are not used (unconnected).
		B	22	
	RS232	RX	23	
		GND	24	
		TX	25	

8 Device Return and Environmentally Compatible Disposal

The instrument is a category 9 product (monitoring and control instrument) in accordance with ElektroG (German Electrical and Electronic Device Law). This device is subject to the RoHS directive. Furthermore, we make reference to the fact that the current status in this regard can be accessed on the Internet at www.gossenmetrawatt.com by entering the search term WEEE.

We identify our electrical and electronic devices in accordance with WEEE 2012/19EU and ElektroG with the symbol shown to the right per DIN EN 50419.

These devices may not be disposed of with the trash. Please contact our service department regarding the return of old devices.

9 Repair and Replacement Parts Service Calibration Center * and Rental Instrument Service

When you need service, please contact:

GMC-I Service GmbH
Service Center
Thomas-Mann-Strasse 20
90471 Nürnberg • Germany
Phone +49 911 817718-0
Fax +49 911 817718-253
E-Mail service@gossenmetrawatt.com
www.gmci-service.com

This address is only valid in Germany.
Please contact our representatives or subsidiaries for service in other countries.

* DAkkS Calibration Laboratory for Electrical Quantities D-K-15080-01-01
accredited per DIN EN ISO/IEC 17025:2005
Accredited measured quantities: direct voltage, direct current values, DC resistance, alternating voltage, alternating current values, AC active power, AC apparent power, DC power, capacitance, frequency and temperature

10 Product Support

When you need support, please contact:

GMC-I Messtechnik GmbH
Product Support Hotline
Phone +49 911 8602-0
Fax +49 911 8602-709
E-Mail support@gossenmetrawatt.com

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