Instruction manual
Wattmeter
CLM1000 Standard

Document-No.	E461755
Issue	01
Dated	19.01.2011

Postal address	Christ-Elektronik GmbH Alpenstraße 34 DE-87700 Memmingen
Phone	+49 (0)8331 8371 – 0
Fax	+49 (0)8331 8371 – 99
eMail	info@christ-elektronik.de
Internet	http://www.christ-elektronik.de

Table of contents

1. General information

1.1 Maintenance

INFORMATION!
This device is made to DIN EN ISO 9001 standard and has left the factory in flawless condition regarding technical safety.

To maintain this condition and ensure safe operation pay attention to the information and warnings contained in this instruction manual.

1.2 Safety instructions

DANGER!
If the casing, connection cable or another part of the device is damaged, it is to be unplugged and switched off immediately.

DANGER!
Before opening the casing unplug connecting cable.
The screws at the battery cover on the back of the device shall not be opened.

Warranty voids if the device is opened.

DANGER!
Ensure that any repairs to the unit are carried out by qualified personnel. Substantial risk for the user arises from improper repairs.

Liquids and dust shall not enter the device. Don't expose the device to humidity or solar radiation for any length of time!

DANGER!
Connect the CLM1000 only to approved security sockets 100-264 VAC/47-63 Hz with protective earth conductor.
Maximum power of any kind of load shall not exceed 4424 Watt (max. 16A)

CAUTION!
If the device is diverted from its intended use or operated wrongly no liability can be assumed for possible harms.

The device shall not be handled with abrasive and sharp-edged objects.
The device shall not be cleaned with solvent-containing or acidic substances.

2. Operation

2.1 Brief instruction

Unplug the load (e.g. household appliance, HIFI, PC…) and plug it in the adapter of the measuring device. Subsequently connect the adapter of the measuring device to the socket.

All readings are saved even after unplugging the wattmeter or a mains failure. They will be recalled by plugging in again.

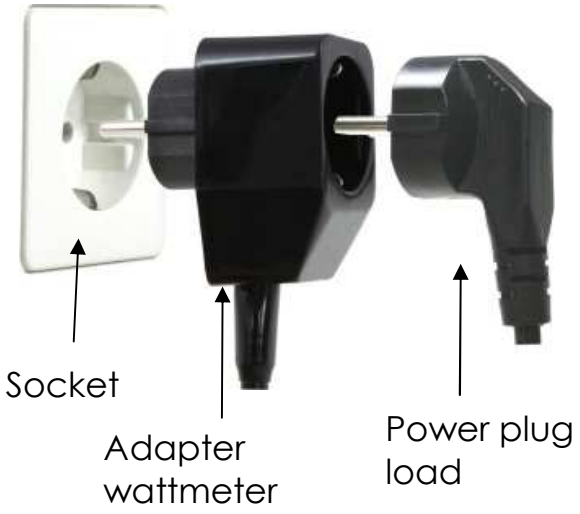
Switch between the different modes using the arrow keys.

OK Approve the settings with the OK key.

CLM1000

Example:

Reading 1
Unit of reading 1
Reading 2
Unit of reading 2
3(9)
Page 3 of 9
Keys



2.2 Contrast setting

The contrast setting is saved after switching off the wattmeter.

OK + ⬆ **Increase contrast:**
Press the „OK“ button and the „arrow up“ button simultaneously to increase contrast.

OK + ⬇ **Decrease contrast:**
Press the „OK“ button and the „arrow down“ button simultaneously to increase contrast.

2.3 CLM1000-Standard operational system

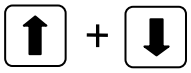
The **Wattmeter CLM1000-Standard** is made for measuring the following electric parameters:

- Instantaneous real power [W]
- min. and max. of Instantaneous real power [W]
- Voltage [V]
- min. and max. of Voltage [V]
- Current [A]
- min. and max. of Current [A]
- active energy (consumption) [kWh]
- active energy /24 hours [kWh]
- consumption costs [€]
- consumption costs /24 hours [€]
- Tariff adjustment [€]
- test time [hh:mm]
- rate of time over Stand-By threshold [%]
- time over Stand-By threshold [hh:mm]

The 24-hour-measurement calculate the consumption and costs of one day. A successful measurement result is shown on the green display.

The €-sign in the manual is an indicator for money.

2.3.1. Adjusting menu of the CLM1000-Standard

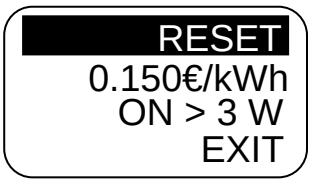


By the simultaneous pressing of the two arrow keys for approx. 2 seconds the adjusting menu of the CLM1000-Standard appears.

With the **arrow keys** the different menu options can be started.

With **exi**t the adjusting menu will be left.

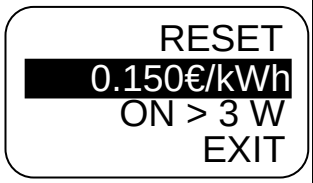
Beginning of a new measurement



In this attitude: If the **OK** key is pressed, then all measured values and the gate time sets to zero and the equipment starts a new measurement.

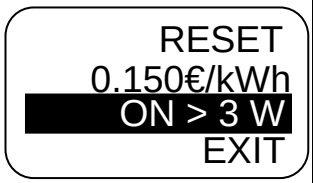
The consumer who can be measured should be already switched on.

Adjust the tariff



In this attitude: If the **OK** key is pressed, then the price in Euro per kWh can be adjusted with the arrow keys. The entered price is confirmed with pressing the OK-key and the equipment changes again into the adjusting menu shown.

Adjust the On%-threshold (Standby threshold)

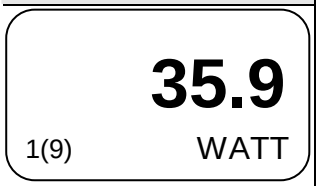
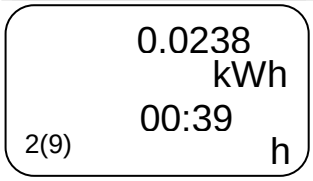
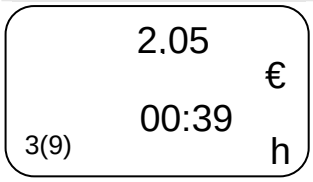
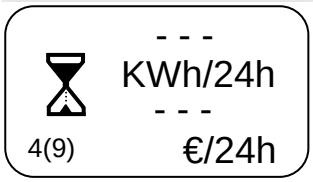
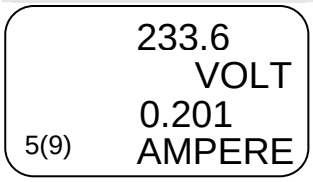
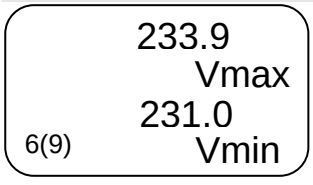


In this attitude: If the **OK** key is pressed, then the threshold for the "ON%"-computation can be adfusted with the arrow keys.

This threshold value can be adfusted from 0 watts to 100 watts.

Specification of this function see: "Description of the ON%-function"

2.3.2. Display of the CLM1000-Standard

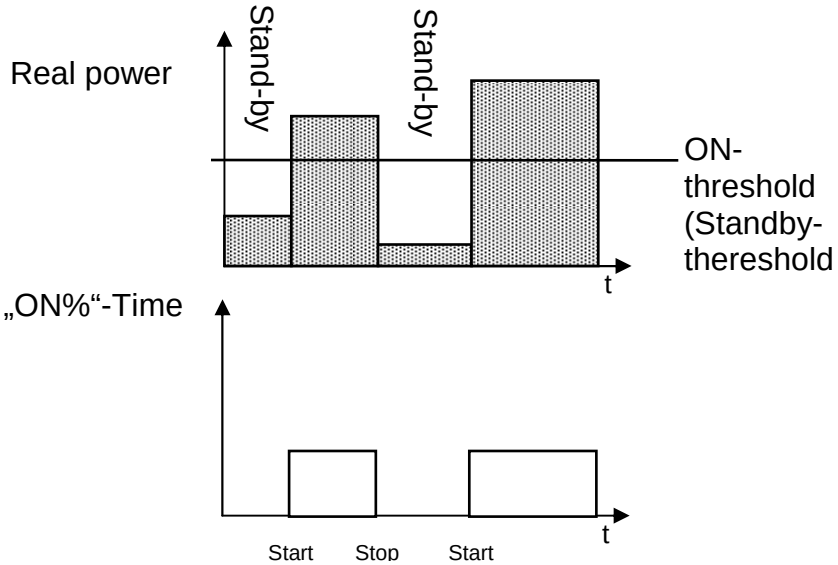
Display	Mode of operation	Range	Meaning
	Real power]	0,0 - 4224 Watt	Instantaneous real power of the consumer.
	Active energy [kWh] (consumption) Time [h]	0,0000 - 99999,99 kWh 00:00 – 9999:59 h	Energy since begin the measuring. Time since begin the measuring.
	Cost [€] Time [h]	0,00 - 99999,99 € 00:00 - 9999:59 h	Costs since begin the measuring. Time since begin the measuring.
	Active energy of 24h measuring [kWh] Cost of 24h measuring [€]	0,0000 - 108,0000 kWh 0,00 - 99999,99 €	24 hour measuring runs! The display backlight is green if the 24 hour measuring is ready und the result is shown.
	Voltage [V] Current [A]	100,0 - 264,0 V 0,000 - 16,00 A	Instantaneous voltage. Instantaneous current.
	Max. voltage [V] Min. voltage [V]	100,0 - 264,0 V 100,0 - 264,0 V	Maximum voltage of the measuring. Minimum voltage of the measuring.

Display	Mode of operation	Range	Meaning
0.231 Amax 0.196 Amin 7(9)	Max. Current [A]	0,000 - 16,00 A	Maximum current of the measuring.
	Min. Current [A]	0,000 - 16,00 A	Minimum current of the measuring.
43.7 Wmax 34.9 Wmin 8(9)	Max. real power [W]	0,0 - 4224 W	Maximum real power of the measuring.
	Min. real power [W]	0,0 - 4224 W	Minimum real power of the measuring.
82.5 ON% 10:02 ONh 9(9)	ON Time [%]	0,00 - 100,0 %	Percent and time over the adjusted ON-threshold. (Standby-threshold)
	ON Time [h]	00:00 - 9999:59 h	

2.3.3. Description of the ON%-function

Many consumers (e.g. refrigerator) not constantly need the full achievement from the net. Therefore it is good to be known which time a consumer really needs the full electrical power and not only works in the standby-mode.

The function indicates how much percent of the measured time and how many hours the consumers worked over the adjusted ON-threshold (Standby-threshold).
The following diagram illustrates the measurement principle.



3. Error handling

The CLM1000 gives users warning of internal errors which occurred!

If there is an error the display is red.

Error	Meaning	Solution
ERROR1	Internal error 1! CLM1000 doesn't start!	Unplug the CLM1000 and plug it again! If the error continues to exist the CLM1000 can't be used. **!Please send in!**
ERROR2	Internal error 2! The CLM1000 shows the error and all readings are reset. The CLM1000 starts an new measuring!	If this error keeps occurring during start-up the CLM1000 has to be sent in for further inspection.
ERROR3	Amperage above the maximum allowable value (more than 16 ampere)	Unplug wattmeter!

4. Technical data

4.1 CLM1000 variant types and measurings

CLM1000 H=Home **S=Standard** P=Professional

Modes	Range	Resolution	H	S	P
Real power	0,0 - 4224 W	0,1 W / 1 W	●	●	●
Real power (min/max)	0,0 - 4224 W	0,1 W / 1 W		●	●
Apparent power	0,0 - 4224 VA	0,1 VA / 1 VA			●
Reactive power	0,0 - 4224 var	0,1 var / 1 var			●
Active energy (consumption)	0,0000 - 99999,99 kWh	0,0001 - 0,01 kWh	●	●	●
Active energy / 24 h (consumption / 24 h)	0,0000 - 108,0000 kWh	0,0001 kWh	●	●	
Apparent energy	0,0000 - 99999,99 kVAh	0,0001 - 0,01 kVAh			●
Reactive energy	0,0000 - 99999,99 kvarh	0,0001 - 0,01 kvarh			●
Consumption costs	0,00 - 99999,99 €	0,01 €		●	
Consumption costs / 24 h	0,00 - 99999,99 €	0,01 €		●	
Tariff	0,000 - 99,999 €	0,001 €		●	
Testing time	00:00 - 9999:59 h	1 Minute	●	●	●
% ON (threshold measuring)	0,0 - 100,0 %	0,1 %		●	●
Voltage	100,0 - 264,0 V	0,1 V		●	●
Voltage (min/max)	100,0 - 264,0 V	0,1 V		●	●
Current	0,000 - 16,00 A	0,001 A / 0,01 A		●	●
Current (min/max)	0,000 - 16,00 A	0,001 A / 0,01 A		●	●
Load recognition	resistance, capacitance, inductance				●
Power factor	0,000 - 1,000	0,001			●
Data logger (option)					●
USB interface (option)					●

4.2 Display and operation

Display	128*64 Display with varying background lighting
Control elements	3 membrane buttons

4.3 Measuring principle and accuracy

Measuring principle	Voltage is measured directly at the load and current is measured by a precision shunt.
Measuring rate	approx. 1 second
Sampling rate	approx. 2000 Hz
Open-circuit recognition	If I < 0,002 Ampere current and power values are set to zero. It P < 0,2 Watt power values and current are set to zero. In this case the power factor is set to 1,00. The type of resistance is set to ohm-resistance.
EEPROM-Memory	All readings are saved even after unplugging
Measuring error	± 0,3 % ± 3 digit from reading at power factor > 0,3

4.4 Voltage supply

Connection	Socket at the adapter, permanent load max. 16 A
Supply voltage	100 - 264 V_{AC}, 47 - 63 Hz
Power consumption	< 4 VA

4.5 Enviroment and dimensions

Dimensions	ABS plastic casing approx. 200*95*35 [mm] (L*W*H)
Weight	approx. 490 g
Connection cable	approx. 1,2 m
Working temperature	0° C - 50° C, dew not permissible
Degree of protection	IP 50 according to DIN EN 60529 (with USB-interface IP40) with seal kit even higher values are permissible
Protection class	Protection class II (protective insulation) according to DIN EN 61140
Measuring category	CAT II according to DIN EN 61010-1

5. FAQ

Question 1:

The displayed current varies between 0 mA and 3 mA?

Answer 1:

The measured current almost corresponds to the one of the no-load operation's detection. As a result the displayed value varies between 0 mA (no-load operation detection) and the minimum measurable current of 2 mA. Consider the tolerance of +- 3 mA too.

Question 2:

My measuring instrument doesn't display any measuring values, although at least a 3 mA current runs.

Answer 2:

A current exceeding 3 mA may run through instruments having only an inductive or a capacitive load and no measured value would be displayed. Reason: in the case of a low power factor, the active power lowers under the point of no-load operation's detection and every measured value is reset.