Instruction manual
Wattmeter
CLM1000 Professional(Plus)

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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.

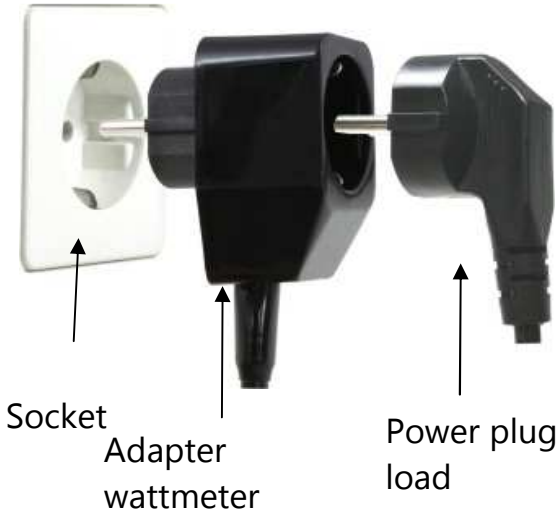
All readings are saved even after unplugging the wattmeter or a mains failure. They will be recalled by plugging in again.

Switch between the different modes using the arrow keys.

Approve the settings with the OK key.

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. **The contrast setting is only possible in menu item 1.**

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-Professional operational system

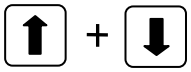
The Wattmeter CLM1000-Professional is made for measuring the following electric parameters:

- Instantaneous real power [W]
- min. and max. of instantaneous real power [W]
- Instantaneous apparent power [VA]
- Instantaneous reactive power [var]
- Voltage [V]
- min. and max. of voltage [V]
- Current [A]
- min. and max. of current [A]
- Power factor
- Load detection (resistance, inductance, capacitance)
- Active energy (consumption) [kWh]
- Apparent energy [kVAh]
- Reactive energy [kvarh]
- Testing time [hh:mm]
- Rate of time over Stand-By threshold [%]
- Time over Stand-By threshold [hh:mm]
- Setting the display color for different performance levels

The CLM1000 Professional-Plus has the following options:

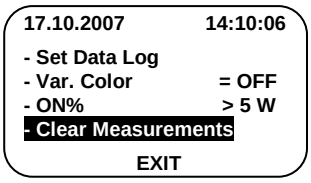
- Setting of date and time
- Setting the transmission speed of the interface
- Sending the actual measurement data
- Storing the actual measurement data to internal memory (Datalogging)
- Setting of the storage rate (1 ,5 10, 30, 60 seconds)
- Sending the stored data

2.3.1. Settings menu for CLM1000-Professional



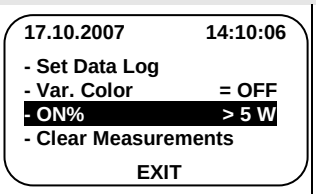
Through the simultaneous pressing of the two arrows for about 2 seconds, the setting menu of CLM1000-Professional will appear. The various menu items can be selected using the **arrow keys**. With **"EXIT"** the setting menu will be closed.

Start a new measurement



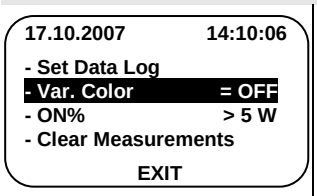
If the OK button is pressed for the shown setting, then all measured values and the measurement times will be set to zero and the device starts a new measurement! The CLM1000 changes to item 5 (10).
(The consumer that needs to be measured should already be switched on)

Set up of the ON%-Threshold (Standby Mode)

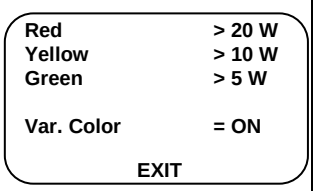


If the OK button is pressed for the shown setting, then you can use the arrow keys to adjust the threshold for the "ON%" calculation. This threshold can be from 0 Watts to 100 Watts.
An accurate description of this function can be seen under:
"2.3.3 Description of the" ON% "

Set up the display color for different values



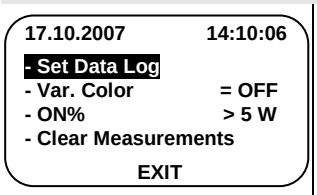
If the OK button is pressed for the shown setting, then the Settings menu for the Colour-Setup will be displayed.



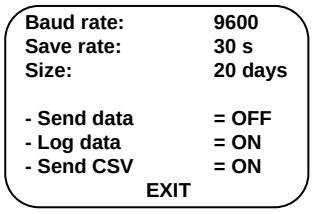
Here, the thresholds for the red, yellow and green colours can be set.
For the example in the left, the colour modification of the display is enabled and the display lights up:
green when power is bigger than 5 watts
yellow when power is bigger than 10 watt
red when power is bigger than 20 watt

Caution: The colour change function is valid only for the Menu Setting 1 (10) (Effective Power)

Setup of the interface and of the data logger (only Plus-Version)



If the OK button is pressed for the shown setting, then the interface and the data logger menu appears on the display.



The individual menu items can be selected by using the arrow keys and the settings can be applied by pressing the OK button.

Baud rate: The transfer speed can be here adjusted (9600, 18200, 38400, 57600, 115200) Baud.

When exiting this menu, the transfer speed will be set up and stored.

Save rate: The storage rate for internal memory can be chosen here. (1, 5, 10, 30, 60 seconds)

Size: Available storage space depends on the current storage rate.

- ➔ 1 Second: 24 hours
- ➔ 5 Seconds: 5 days etc.

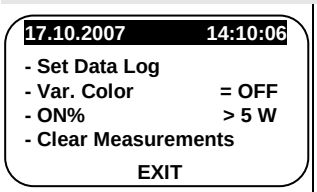
Send data: Once activated the device sends all the measurement data previously "Log data" saved with and deactivates the menu point automatically after the after the successful data transmission.

Log data: If this menu item is activated, CLM1000 will save the measurement data in the internal memory.

Attention: Starting a new data storage means that the previously recorded data will be deleted.

Send CSV: The current measured data is continuously transmitted with the adjusted speed and storage rate. Deactivate this setting to stop the transmission.

Setup the date and time setting (only Plus-Version)

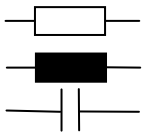


If the OK button is pressed for the shown setting, then the time and date can be adjusted.

The settings remain stored even after you turn off the device.

The summer and winter time switch is not automatic.

2.3.2. Display representations of CLM1000-Professional

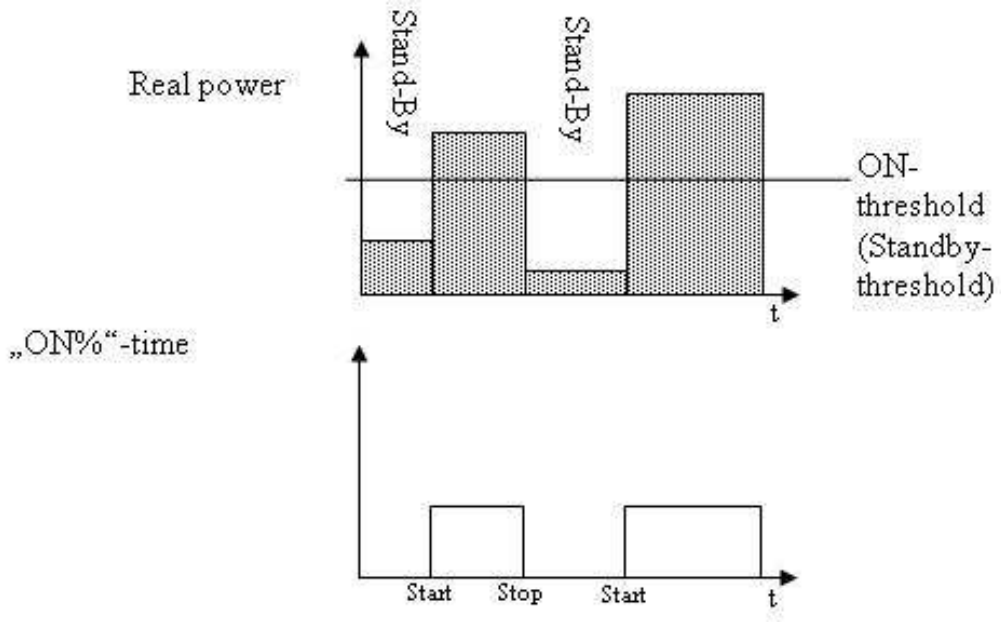
Displayimage	Mode	Range	Description
35.9 1(10) WATT	Active power [W]	0,0 - 4224 Watt	Power consumption of the connected consumer in Watts
233.6 VOLT 0.201 2(10) AMPERE	Voltage [V] Current [A]	100,0 - 264,0 V 0,000 - 16,00 A	Instantaneous voltage Instantaneous current
254.5 VA 100.4 3(10) var	Apparent power [VA] Reactive power [var]	0,0 - 4224 VA 0,0 - 4224 var	Apparent power Reactive power
0.958 PF 4(10) LOAD	Power factor Load type	0,000 – 1,000	Power factor of the consumer **Identification of load type:** Resistor Inductance Condensator 
0.0238 kWh 00:39 5(10) h	Active energy [kWh] Measurement time [h]	0,0000 - 99999,99 kWh 00:00 – 9999:59 h	Active energy consumption since the beginning of the measurement Passed time since the beginning of the measurement
2.0000 kVAh 7.0257 6(10) kvarh	Apparent energy [kVAh] Idle energy [kvarh]	0,0000-99999,99 kVAh 0,0000-99999,99 kvarh	Apparent energy consump. since the beginning of the measurement. Idle energy consump. since the beginning of the measurement.
233.9 Vmax 231.0 7(10) Vmin	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

Displayimage	Mode	Range	Description
0.231 Amax 0.196 Amin 8(10)	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 9(10)	Max. Power [W]	0,0 - 4224 W	Maximum real power of the measuring
	Min. Power[W]	0,0 - 4224 W	Minimum real power of the measuring
82.5 ON% 10:02 ONh 10(10	ON Time in [%]	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) doesn't need constantly the full power from the supply! Therefore it is interesting to know for how long a consumer really needs the full power, and not only for how long it runs on Stand-by Mode.

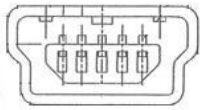
The function "ON%" indicates how much of the entire measurement time and for how many hours does the consumer run in the adjusted ON threshold (Stand-by Mode). The following diagram illustrates the measurement principle.



CLM1000

3. Interface (only Plus-Version)

USB-Interface:



The measuring instrument CLM1000 has a USB- interface. The current measuring data and the stored data can be transferred cyclically in the CSV- mode. In addition, the provided transmission cable can be used.

The CLM1000 uses internally a USB-RS232 converter.
After the successful installation of the WINCLM program, the interface of the CLM1000 is recognized and can be used as COM Port on your computer.

Transfer format: 1 bit Start, 8 bit Data, 1 bit Stop, without parity

Transfer rate: Depending on the setting:

- 9600 Baud
- 18200 Baud
- 38400 Baud
- 57600 Baud
- 115200 Baud

Since the transmission rate of the measuring instrument is limited to 115200 Baud, the transmission time of the internal data memory on the computer could take some minutes.

Structure of a data block:

The measuring data of the CLM1000 will be transferred in the CSV-format. The individual values will be separated by a semicolon; (ASCII code 0x3B). The end of a data record is marked with CR(Carrige Return ASCII code 0x0D) and LF(Line feed ASCII code 0x0A).

Ein Datensatz enthält folgende Werte:

Description	Example
Date Time	01.01.2007 20:50:00**;**
Active power [W]	1001,1**;**
Apparent power [VA]	2001,5**;**
Reactive power [var]	1733,1**;**
Tension [V]	230,0**;**
Current [A]	8,702**;**
Power factor	0,500**;**
Active energy [kWh]	0,5415**;**
Apparent energy [kVAh]	0,8745**;**
Reactive energy [kvarh]	0,1257**;**
Indentification of load 0 = resistor 1 = inductivity 2 = capacitor	0**;CR LF**

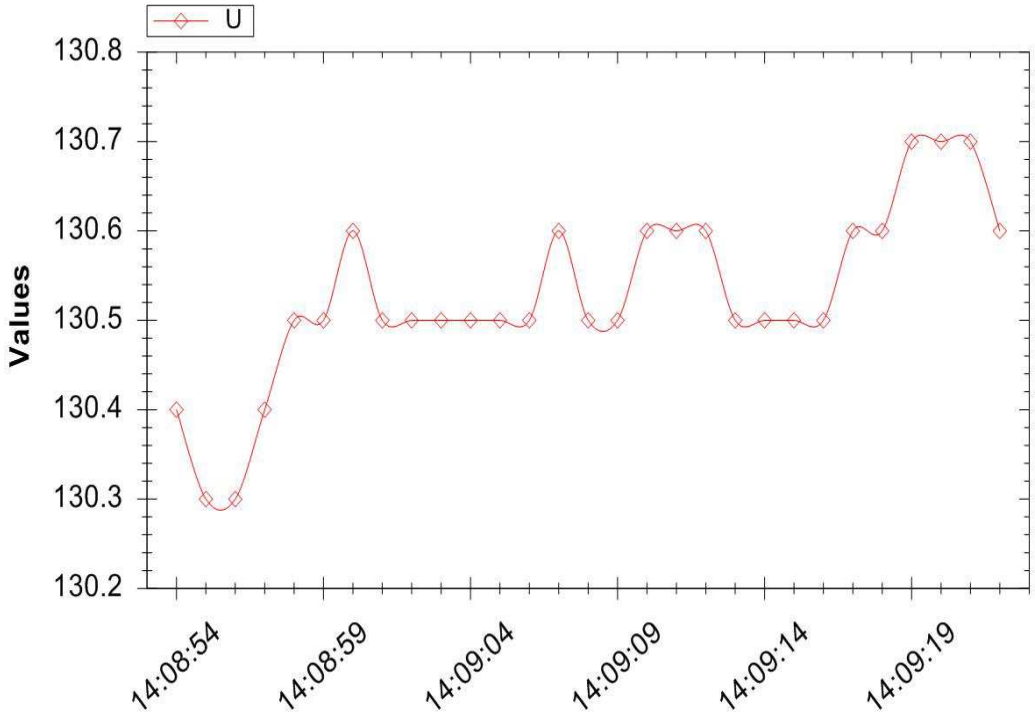
Example Data block:

01.01.2007 20:50:00; 1001,1;2001,5;1733,1;230,0;8,702;0,500;0,5415;0,8745;0,1257;0;
01.01.2007 20:50:01; 1001,1;2001,5;1733,1;230,0;8,702;0,500;0,5417;0,8746;0,1258;0;
01.01.2007 20:50:02; 1001,1;2001,5;1733,1;230,0;8,702;0,500;0,5419;0,8747;0,1259;0;
01.01.2007 20:50:03; 1001,1;2001,5;1733,1;230,0;8,702;0,500;0,5421;0,8748;0,1260;0;

Visualising Software:

The current and the stored measuring data can be stored, analyzed and visualized in the CSV- format with the visualising tool **WINCLM**. The stored * csv file can be opened and processed with the usual spread-sheet programs.

Example visualization WINCLM:



The WINCLM software and the software description can be downloaded from the homepage of Christ-Elektronik GmbH.
www.christ-elektronik.de (Product Range of Measuring Instruments)

Important pointer:

The software WINCLM will no longer be supported. See chapter 7 "Software and data evaluation" for further information about other software and about the data evaluation.

4. Error handling

The CLM1000 gives users warning of internal errors which occurred!

If there is an error the display is red and displays the occurred error!

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 a 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!
ERROR4	The internal memory doesn't work.	If this error keeps occurring during start-up the CLM1000 has to be sent in for further inspection.

5. Technical data

5.1 CLM1000 variant types and measurings

CLM1000 H=Home S=Standard **P=Professional (Plus)**

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	Ohmscher Widerstand, Kapazität, Induktivität				●
Power factor	0,000 - 1,000	0,001			●
Data logger (Plus-Version)	For a storing rate of 1 seconds 24 hours can be recorded. For 5 seconds, 5 days and so on. Maximum 60 days.				●
USB interface (Plus-Version)	Max. transmission speed 115200 Baud				●

5.2 Display and operation

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

5.3 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

5.4 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

5.5 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

6. 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.

7. Software and data evaluation

7.1 Installation of the VCP driver

Check the installation of the driver

If the driver is already installed, the computer will identify it during the connection and a corresponding message will be displayed.

Furthermore the CLM1000 will be indicated in the device manager, under the connections as USB serial port like USB serial port (COM 22).
Click on
Start -> System control ->Hardware and sound-> device manager->Connections (COM&LPT)
to call up the device manager.

Pointer

If you are not logged as administrator and select the device manager, the advice meaning that you can access the device settings but cannot modify anything without administrator rights will be displayed. Click on OK to confirm this dialogue and continue according to the above mentioned description.

Installation

1. Call up the Internet page of the manufacturer with your browser. http://www.ftdichip.com/Drivers/VCP.htm
2. Select the VCP driver corresponding to your operating system.
3. Open the zip file.
4. Double click the *.exe file to start the installation.
5. Follow the instructions of the installation guide.

Pointer

You can call up the system properties of your computer by simultaneously pressing the Windows and Pause keys. Whether it is a 32 or 64 bit driver system is mentioned under "System type".

7.2 Installation terminal software HTerm

Terminal software such as Freeware HTerm is required to transfer the measured values to
the computer.

For example the software HTerm is available for download on the following Internet page:
http://www.heise.de/download/hterm-eea223273b529eea4efb930f381de933-1378287065-2653283.html

Installation

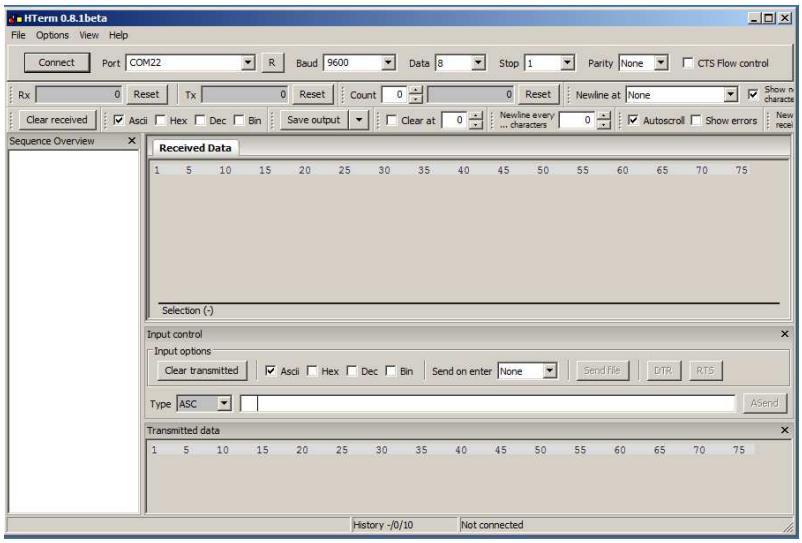
1. Click the download button to start the download.
2. Open the storage location for download files, which is most of the time the folder "Downloads".
3. Unzip the file and double click th HTerm to open the program.

Pointer

Downloading the file means you accept the conditions of use of HTerm.

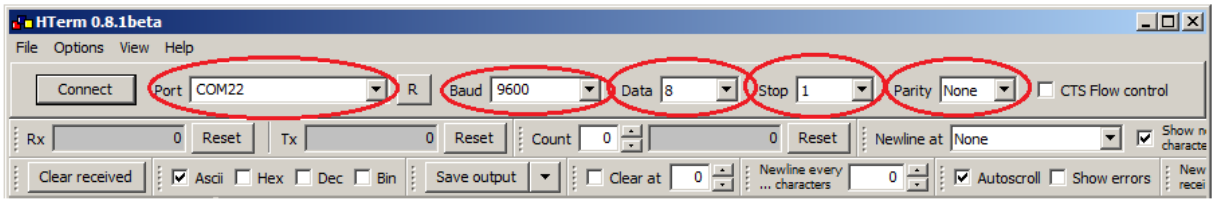
7.3 Configuration of HTerm

1. Connect the CLM1000 Professional Plus to the network and the computer.
2. Open the sub-point Connections (COM&LPT) in the device manager of the computer and note the COM-port of the CLM1000.
   Therefore open Start->System control->Hardware and sound-> Device manager->Connections (COM&LPT). Consider the first pointer page 16. The CLM1000 appears as USB serial port like USB serial port (COM22). If several USB serial ports are indicated, double click the respective port to open the properties. The manufacturer FTDI is mentioned under the tab "General" of the CLM1000.



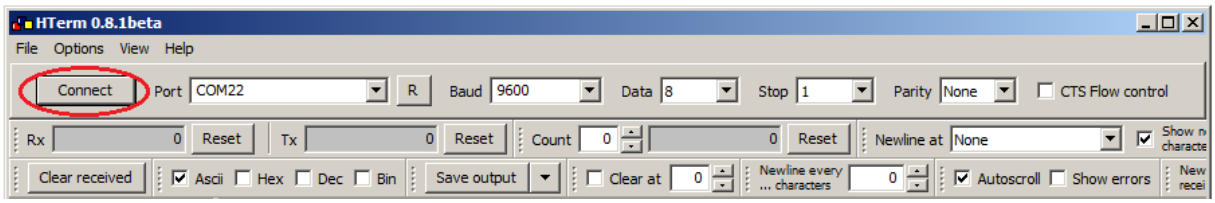
3. Open the program HTerm. The following start window appears.

4. Select the noted port of the CLM1000 like COM22 under port.
5. Call up the menu of the measuring instrument as described under "Setting of the interface and data memory (data logger) (Plus version only)" page 6.
6. Input the Baud rate mentioned in the menu of the measuring instrument like 9600 under Baud.
7. Select 8 for data, 1 for stop and none for parity, to adjust the transmission format.
   After the adjustments have been carried out, the upper bar should look like the one in the following illustration, whereas the values for Baud and port depend on the settings of the device or the computer and may differ from the ones in the illustration.

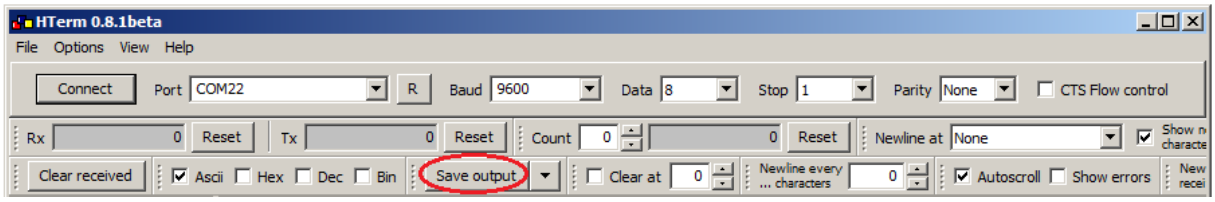


Further settings are not necessary.

8. Click the button "Connect" to connect the measurement instrument.



9. Transfer data as described page 6.
10. The data might be saved in *.csv format, be treated and represented graphically with spreadsheet software like Microsoft Excel® or Apache Open Office™. Click the button "Save output" to save the data.

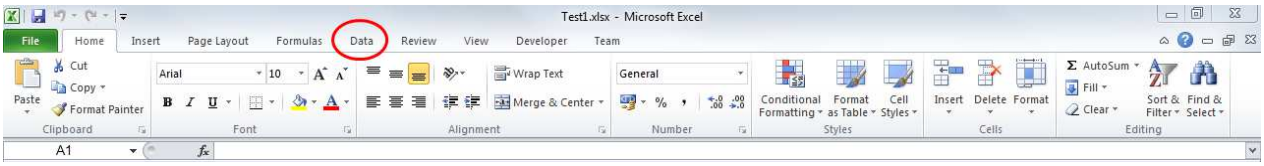


The next window opens. Select a storage location and enter a file name. The file name must end with .csv. Click Save output to close the process and save the data.

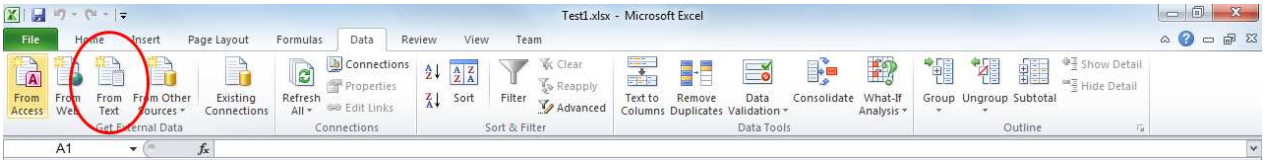
7.4 Import *.csv files

Import the data in the corresponding program before treating text files in spreadsheet software like Microsoft Excel® or Apache Open Office™ Calc. The following instruction indicates step for step how to import *.csv files in Microsoft Excel® 2010. Refer to the corresponding handbook when using another program.

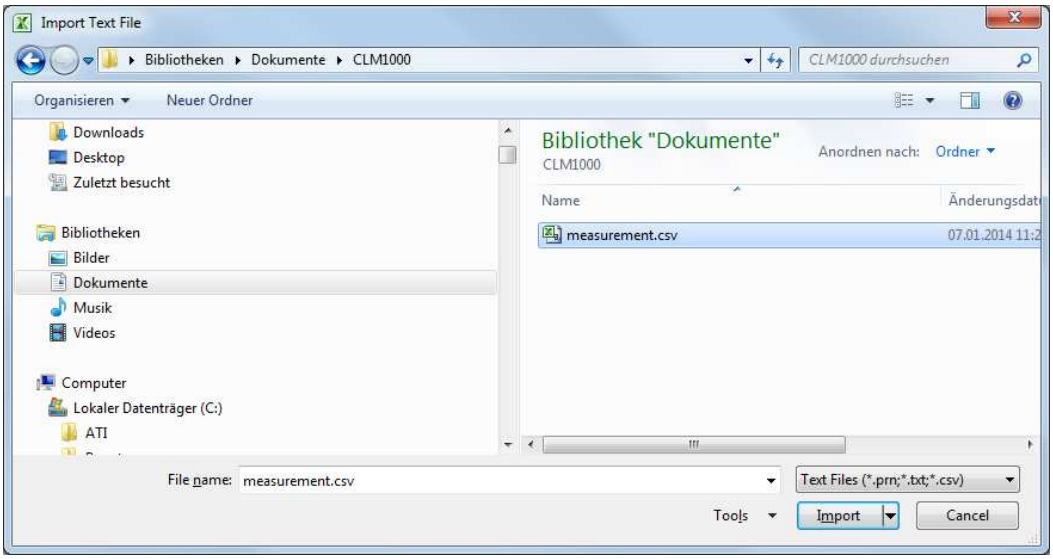
1. Open Microsoft Excel® 2010 to treat the *.csv file.
2. Select the tab "Data".



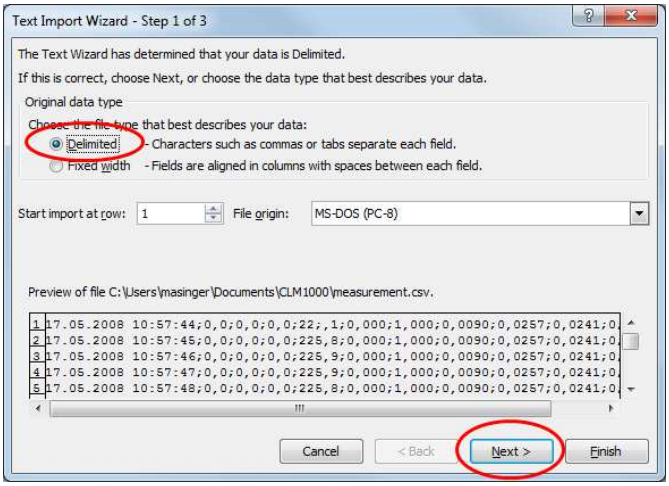
3. Click the button „From text“ in the group "Get external data".



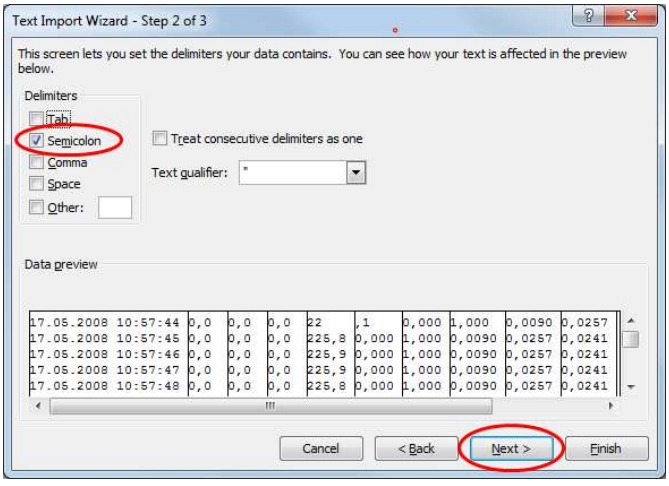
4. Once in the pop-up window "Import text file" navigate to the folder in which the *csv file is stored. Mark the file and click on "Import".



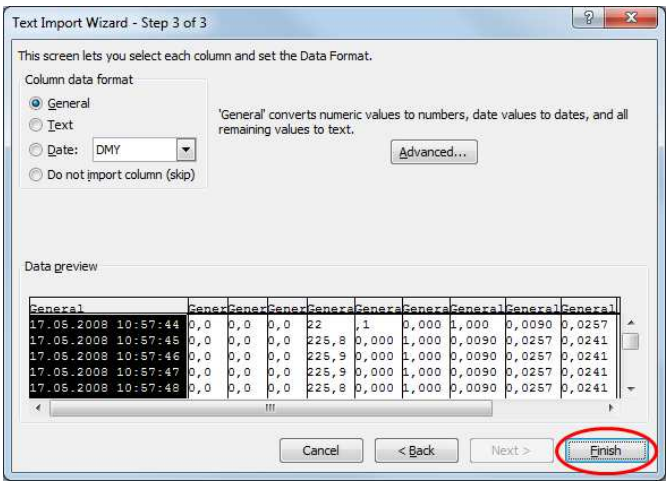
5. The wizard for text conversion appears automatically after the data import. First select the option "Delimited". Click on „Next“.



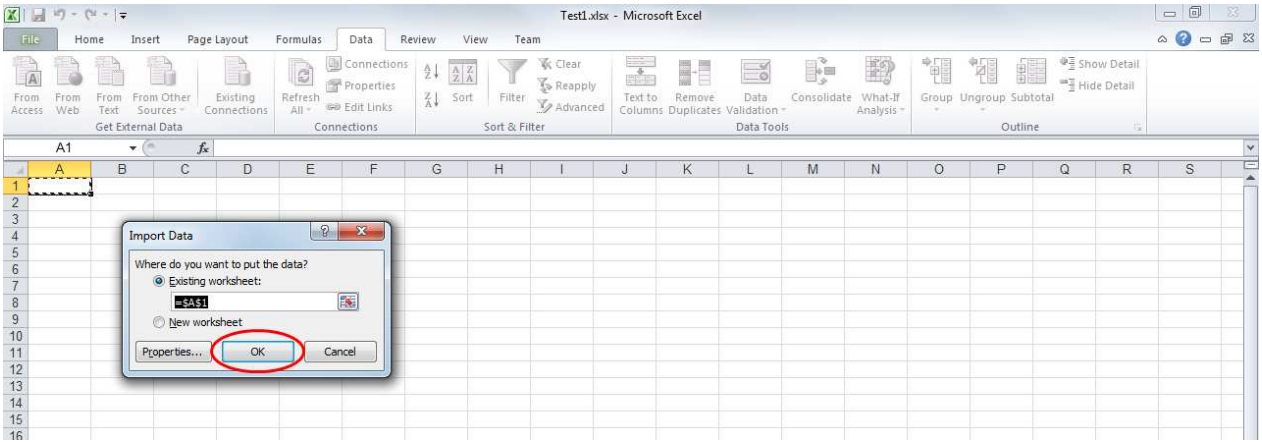
6. Activate "semicolon" as delimiter. Now, the data in the preview should be separated with columns. Click on „Next“.



7. Columns that should not be imported might be selected in the text conversion wizard under the following point. Mark the corresponding column and select the lowest box "Do not import column (skip)". Click on „Finish“.



8. Input the location in which the imported data should be inserted. Mark the cell in which the left upper corner of the imported data should appear. Click on „OK“.



9. Once the work with the wizard is done, the parts of a line of the text file are split into different columns of the table.
   The further process of the data like the visualisation in diagrams is possible. For further information see handbook of Microsoft Excel® 2010.