

Guide

Multi-E11/E4/E-MU Tool



MÜLLER ZIEGLER

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Introduction

The measuring converters Multi-E11/E4/E-MU serves for the simultaneous conversion and separation of current, voltage, frequency, active power, reactive power, apparent power and the power factor with sinusoidal shape of curve in 11(Multi-E11-MU) or 4(Multi-E4-MU) load independent direct current and direct voltage signals. The Multi-E-MU does not have analog outputs. The measurement is possible in alternating current systems and three or four wire three phase alternating current systems with equal or any other loading. The 29 quantities being measured can be displayed, stored and configured through an 10MBits/s Ethernet LAN interface on the PC. The internal memory of the transmitters, up to 13,000 measured values can be stored. Furthermore, you can show the measurement results via a web browser or via HTTP-, TCP/IP- or Modbus TCP-protocol to process and read. Two further outputs can be used as limit values or impulse outputs. The switching status of the limit value outputs or impulse outputs is indicated over two LED's.

The program "Multi-E11/E4/E-MU Tool" is used to configure the inputs/outputs of measuring converters. The software has a user interface that is simple to use. With the aid of the software, all measured data belonging to the multifunction transducer can be displayed and stored in a text or excel file. In this way series of measurements can be logged over very long periods of time and graphically evaluated. Data transmission takes place via an Ethernet LAN interface with the LAN cable supplied.

The program for the Multi-E11/E4/E-MU can be used with the following operating systems: Windows 2000, Windows XP, Windows Vista, Windows 7 and Windows 10.

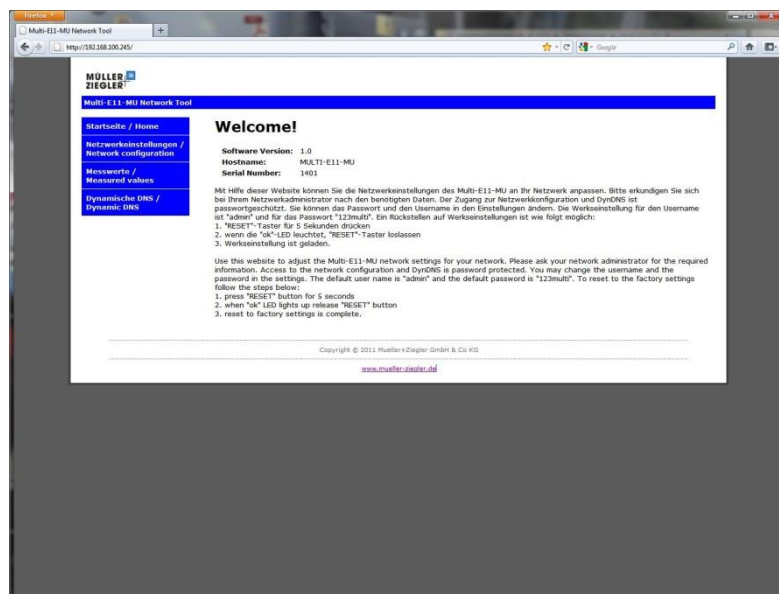
Connection of a Multi-E11/E4/E-MU to the PC

Open up the clear screen over the Ethernet LAN interface on the Multi-E11/E4/E-MU. Connect up the computer and the measuring transducer using the LAN cable supplied. The measuring transducer auxiliary supply must be connected in order for data transfer to take place. When the connection between the computer and the Multi-E11/E4/E-MU is no longer in use, remove the LAN cable and cover the transducer's Ethernet LAN box with the clear screen. When connecting a Multi-E11/E4/E-MU to a battery-powered computer (e.g. laptop), there may be interference to the transfer of data due to radiation caused by high-frequency electromagnetic fields (>6V/m).

Attention! The Ethernet LAN interface is galvanically connected to the Multi-E11/E4/E-MU outputs!

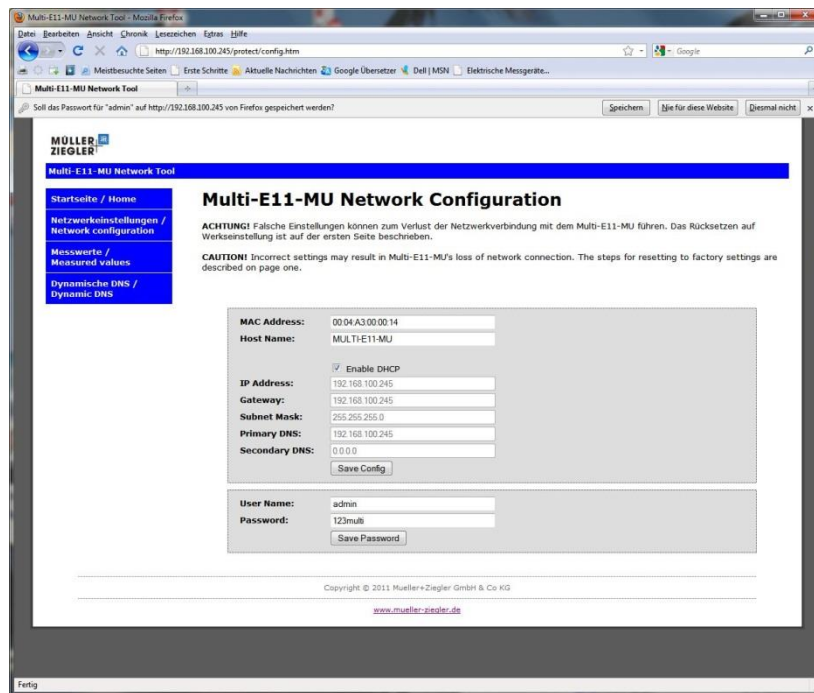
Network configuration

Connect the Multi-E11/E4/E-MU to the computer or network and connect the auxiliary supply to the measuring transducer. Open your web browser and enter the standard IP address of the Multi-E11/E4/E-MU (192.168.2.2 or e.g. "Multi-E11-MU", see rating plate) into the address bar. The following web site should appear.



Website Home

Use this website to adjust the Multi-E11/E4/E-MU network settings for your network. Please ask your network administrator for the required informations. Access to the network configuration and DynDNS is password protected. You may change the username and the password in the settings. The default user name is "admin" and the default password is "123multi".



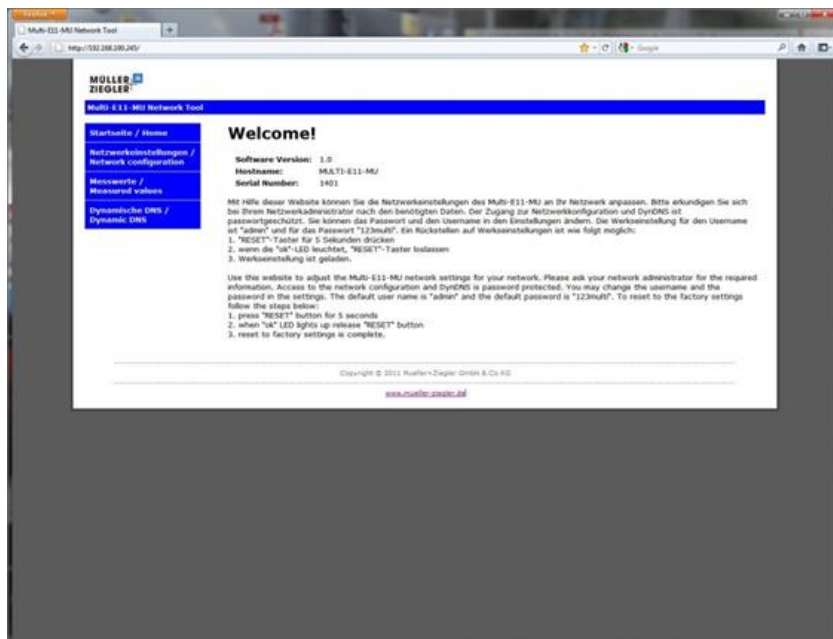
Website Network

CAUTION! Incorrect settings may cause the Multi-E11/E4/E-MU to lose network connectivity.

Websites

Startseite / Home

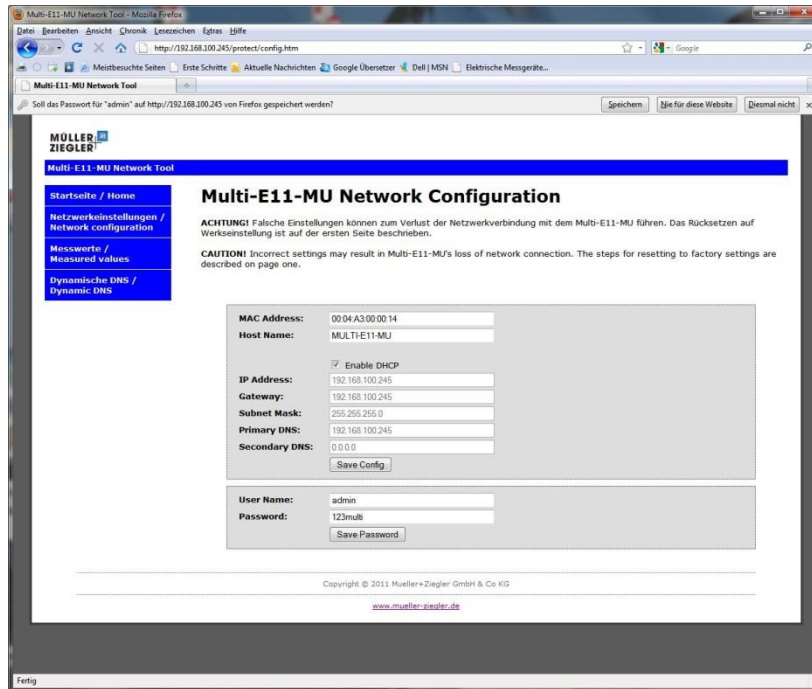
On this web site you will find general information and instructions on how to restore the factory settings.



Website Home

Netzwerkeinstellungen / Network configuration

Use this website to adjust the Multi-E11/E4/E-MU network settings for your network. Please ask your network administrator for the required informations. Access to the network configuration and DynDNS is password protected. You may change the username and the password in the settings. The default user name is "admin" and the default password is "123multi".



Website Network

Messwerte / Measured values

This web site allows you to display the measured values of the Multi-E11/E4/E-MU. It is possible to adjust the interval in which the measured values are updated. Measuring is started with the "Start measured" button and stopped with the "Stop measured" button or by leaving the web site. The energy counters are reset with the "Reset kWh / kvarh" button.

The measured values can also be saved in the measuring transducer's internal memory. Up to 13,000 series of measurements can be stored. Saving of the measured values is started with the "Save values" button. Measurement is stopped with the "Stop Saving" button. The selected time interval "Save Intervall" determines the interval between saving of the measured values. The measured values are saved in file "value.csv". Always only one measured value file can be saved. Upon restarting the recording of measured values, the old measured values are overwritten. No further measurements are saved when all the available memory has been used up. The file can be downloaded by using the download link. All measured values are saved in ASCII format along with the associated unit. Individual measured values are separated by the semicolon sign (0x3B), and series of measurements by the "CR/LF" character (0x0D, 0x0A). The last character in the file is a blank (0x00). Decimal places in the measured values are indicated with a dot (0x2E). By virtue of the ASCII format and semicolon-separation of values, it is very easy to further process the measured values. The arrangement of the measured values in the file is as follows:

Arrangement of the measured values

value	bytecount	possible values
time stamp	13	0000:00:00
measured value voltage L1-N/L1-L2	5	
unit voltage L1-N/L1-L2	1	V
measured value voltage L2-N/L2-L3	5	
unit voltage L2-N/L2-L3	1	V
measured value voltage L3-N/L3-L1	5	
unit voltage L3-N/L3-L1	1	V

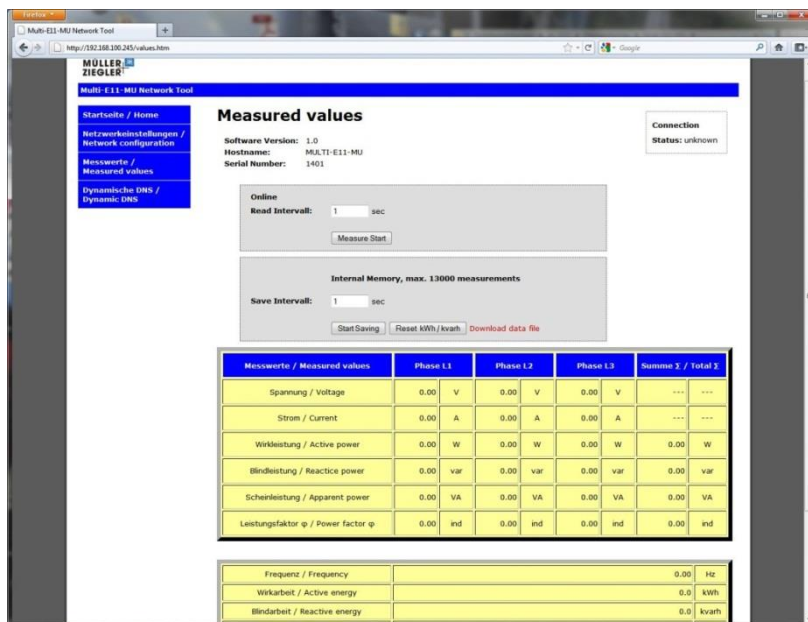
measured value current L1	6	
unit current L1	2	mA, A
measured value current L2	6	
unit current L2	2	mA, A
measured value current L3	6	
unit current L3	2	mA, A
measured value frequency	5	
unit frequency	2	Hz
measured value active power L1	6	
unit active power L1	2	W, kW, MW
measured value active power L2	6	
unit active power L2	2	W, kW, MW
measured value active power L3	6	
unit active power L3	2	W, kW, MW
measured value active power sum	6	
unit active power sum	2	W, kW, MW
measured value reactive power L1	6	
unit reactive power L1	4	var, kvar, Mvar
measured value reactive power L2	6	
unit reactive power L2	4	var, kvar, Mvar
measured value reactive power L3	6	
unit reactive power L3	4	var, kvar, Mvar
measured value reactive power sum	6	
unit reactive power sum	4	var, kvar, Mvar
measured value apparent power L1	6	
unit apparent power L1	3	VA, kVA, MVA
measured value apparent power L2	6	
unit apparent power L2	3	VA, kVA, MVA
measured value apparent power L3	6	
unit apparent power L3	3	VA, kVA, MVA
measured value apparent power sum	6	
unit apparent power sum	3	VA, kVA, MVA
measured value cos phi L1	4	
unit cos phi L1	3	ind, cap
measured value cos phi L2	4	
unit cos phi L2	3	ind, cap
measured value cos phi L3	4	
unit cos phi L3	3	ind, cap
measured value cos phi sum	4	
unit cos phi sum	3	ind, cap
measured value kWh-counter / import	11	
unit kWh-counter / import	3	kWh
measured value kvarh-counter	11	
unit kvarh-counter	5	kvarh

operating hours	9	
unit operating hours	1	h
settings output G1	1	A, B, C, D, E, F, G, H, I, J, K, L, M, O, P * ¹
condition output G1	1	0, 1 * ²
settings output G2	1	A, B, C, D, E, F, G, H, I, J, K, L, M, O, P * ¹
condition output G2	1	0, 1 * ²
measured value kWh-counter / export from serial number 0092 / 4414 / 8007	11	
unit kWh-counter / export from serial number 0092 / 4414 / 8007	1	kWh

*¹) Limit setting: A = Active energy, import (impulses output) at output G1 or reactive energy, inductive (impulses output) at output G2

- B = Current L1
- C = Current L2
- D = Current L3
- E = Voltage L1-N/L1-L2
- F = Voltage L2-N/L2-L3
- G = Voltage L3-N/L3-L1
- H = Frequency
- I = Active power, import
- J = Active power, export
- K = Reactive power, inductive
- L = Reactive power, capacitive
- M = Apparent power, import
- N = Apparent power, export
- O = Power factor cos phi, inductive
- P = Power factor cos phi, capacitive

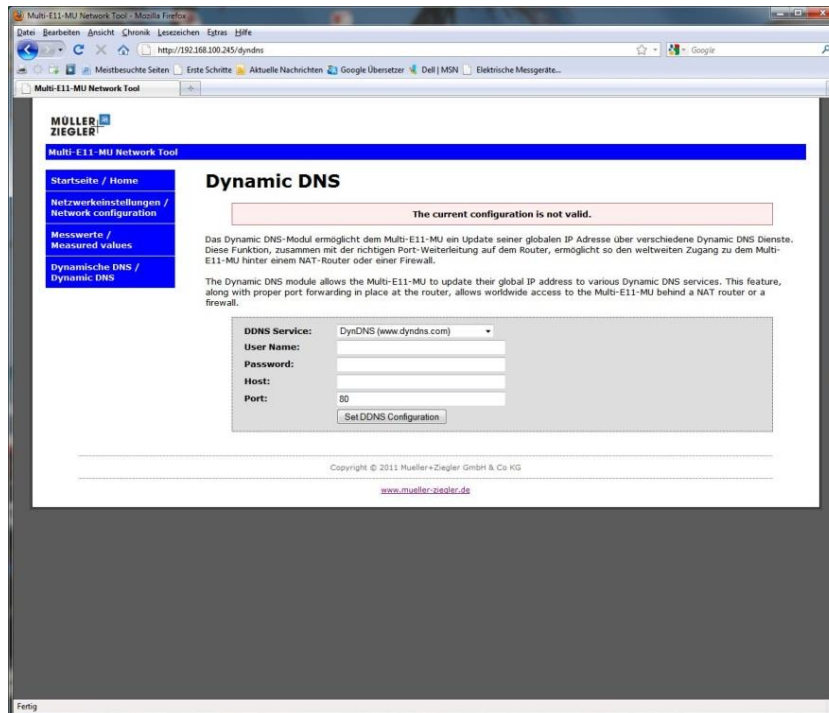
*²) The 0 means limit off while 1 means limit on



Website Measured values

Dynamische DNS / Dynamic DNS

The Dynamic DNS module allows the Multi-E11/E4/E-MU to update their global IP address to various Dynamic DNS services. This feature, along with proper port forwarding in place at the router, allows worldwide access over the internet to the Multi-E11/E4/E-MU behind a NAT router or a firewall.



Website DDNS

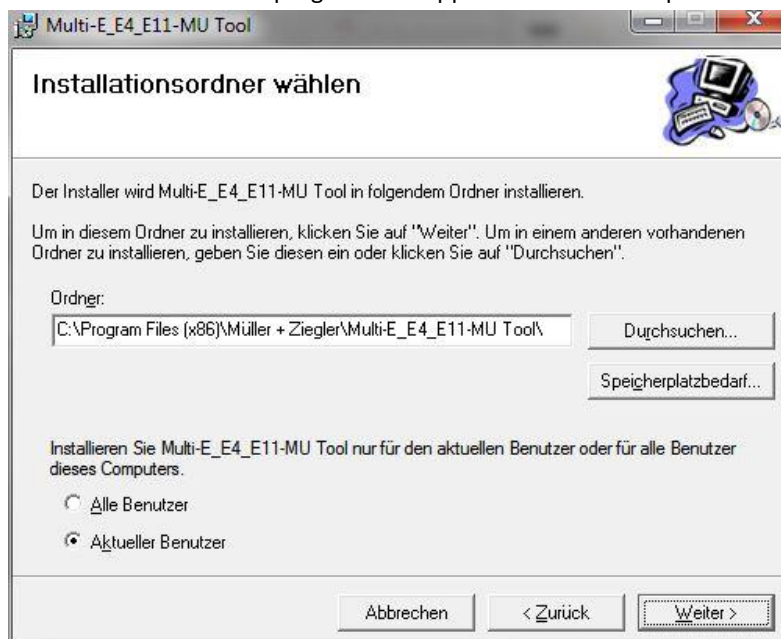
Reset

To reset to the factory settings follow the steps below:

1. press the "RESET"-button for 5 seconds
2. when "ok" LED lights up release "RESET" button
3. reset to factory settings is complete.

Software installation

Please download the program "Multi-E11 / E4 / E-MU Tool" from the website <https://www.mueller-ziegler.de/downloads/>. Start the installation routine with the "setup.exe" file. Follow the instructions of the installation routine, select the target folder and complete the installation. During installation, an entry is automatically made on the start menu and a program icon appears on the desktop.



Target file select

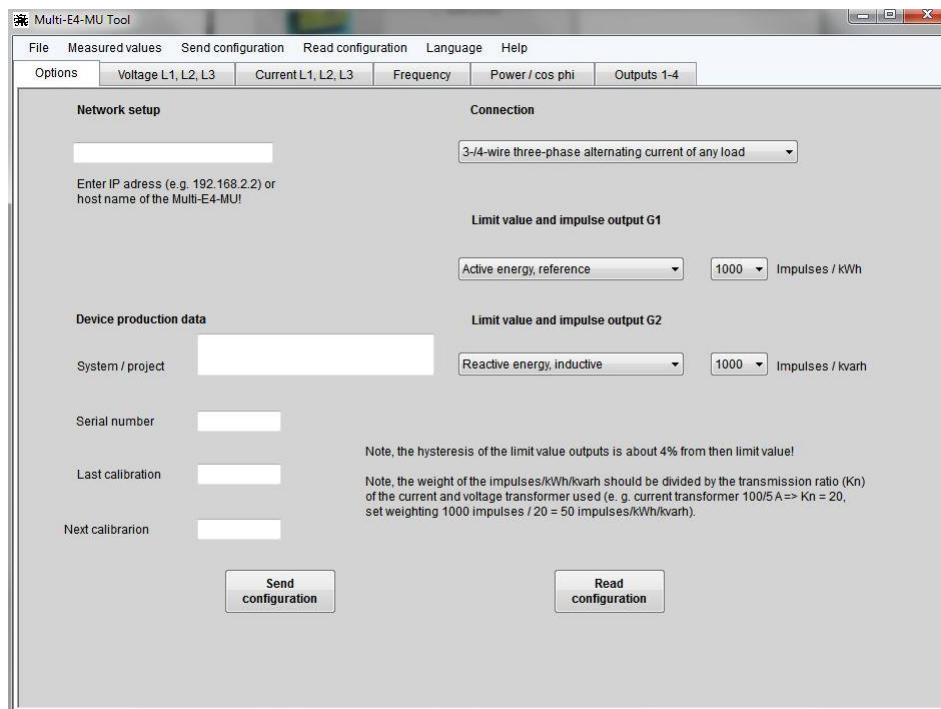
Starting the program

Start the program from the start menu or from your desktop. The start window will appear and you can select the program's language.



“Options” menu

This program menu allows you to read or send the configuration from the Multi-E11/E4/E-MU. Type in the text box "IP address or host name" the corresponding data of the measuring transducer. You can also select the type of connection and set the impulse or limit values function.



„Options“ menu

“Connection”

Here you can select the type of connection in which the transformer should take measurements.

You can select from:

- alternating current
- 3-/4- wire three-phase current, asymmetric load (measuring current in all 3 phases)
- 3- wire three-phase current, asymmetric load (measuring current in 2 phases)
- 3-/4- wire three-phase current, symmetric load (measuring current in phase L1)

Important! When taking alternating current measurements, the voltage must be connected to terminals 2 and 11 and the current to terminals 1 and 3.

“Limit value and impulses output G1”

This option allows you to set the function of the G1 output. When used as an impulse output, this output issues active energy during the supply of energy. The number of impulses per kWh can be selected from 1 to 2000. The impulse length is approx. 40 ms. Important! The value of the impulses per kWh must be divided by the transmission ratio (Kn) of the current and voltage transformers used (e.g. voltage transformer 100/5 A => Kn = 20, set value 1000 impulses/20 = 50 impulses/kWh).

The G1 output can be assigned any measured value when operating as a limit value. In terms of power measured values and power factor, it is possible to choose between energy supply and energy transfer or between inductive and capacitive. The G1 limit output switch point is stated as a percentage of the measured value selected and its measurement range (e.g. voltage limit value L1, measurement range 0 – 250 V, switch point at 50% = 125 V). If “maximum” is selected, the G1 limit value is activated once the limit value has been exceeded. If “minimum” is selected, the G1 limit value is activated once the value falls below the set limit value. Important! The limit output hysteresis amounts to approx. 4% of the set limit value.

“Limit value and impulses output G2”

The function of the G2 output can be set using this option. When used as an impulse output, this output issues inductive reactive energy. The number of impulses per kvarh can be selected from 1 to 2000. The impulse length is approx. 40ms. Important! The value of the impulses per kvarh must be divided by the transmission ratio (Kn) of the current and voltage transformers used (e.g. voltage transformer 100/5 A => Kn = 20, set value 1000 impulses / 20 = 50 impulses/kvarh).

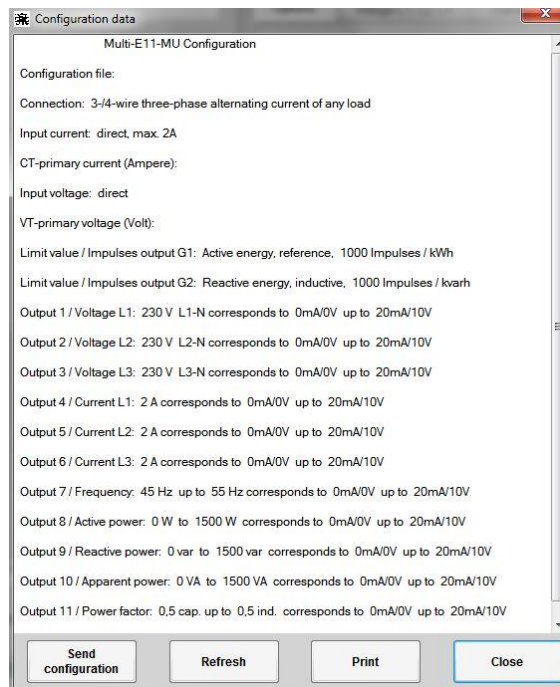
The G2 output can be assigned any measured value when operating as a limit value. In terms of performance measured values and performance factor, it is possible to choose between energy supply and energy transfer or between inductive and capacitive. The G2 limit value switch point is stated as a percentage of the measured value selected and its measurement range (e.g. voltage limit value L1, measurement range 0 – 250 V, switch point at 50% = 125 V). If “maximum” is selected, the G2 limit value is activated once the limit value has been exceeded. If “minimum” is selected, the G2 limit value is activated once the value falls below the set limit value. Important! The limit output hysteresis amounts to approx. 4% of the set limit value.

“Device production data”

Once the configuration data has been read from the Multi-E11/E4/E-MU, the serial number of the unit, the date of the last manufacturer’s calibration and the date of the next manufacturer’s calibration are entered in these fields. We recommend that the Multi-E11/E4/E-MU unit is factory inspected and recalibrated every 2 years.

“Send configuration” button

A window opens when you click on this button in order to recheck or print the selected configuration. Once you have checked it, click on “Send configuration” and the data are then transmitted to the Multi-E11/E4/E-MU. Incorrect selection of the measurement transducer displays an error message. Please then restart the program!



Overview of the configuration data

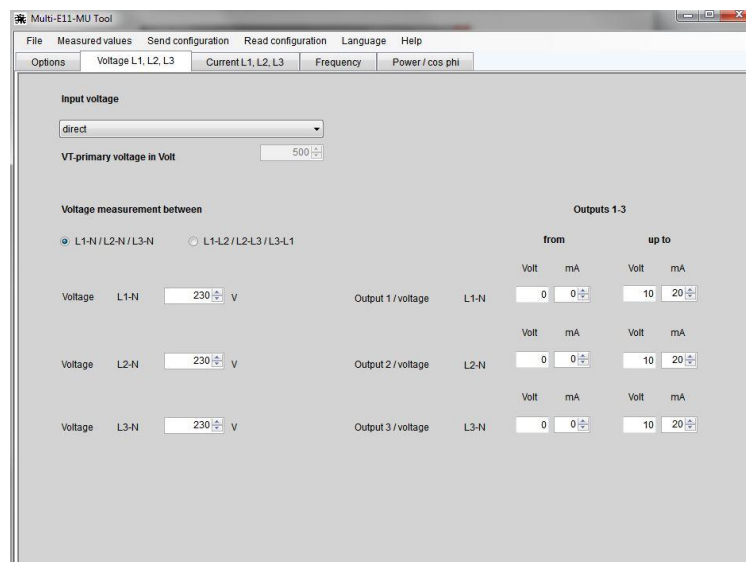
“Read configuration” button

Once this button has been activated, the configuration data is read from the Multi-E11/E4/E-MU and displayed in the program. Incorrect selection of the measurement transducer displays an error message. Please then restart the program!

"Voltage L1, L2, L3" menu

For Multi-E11-MU:

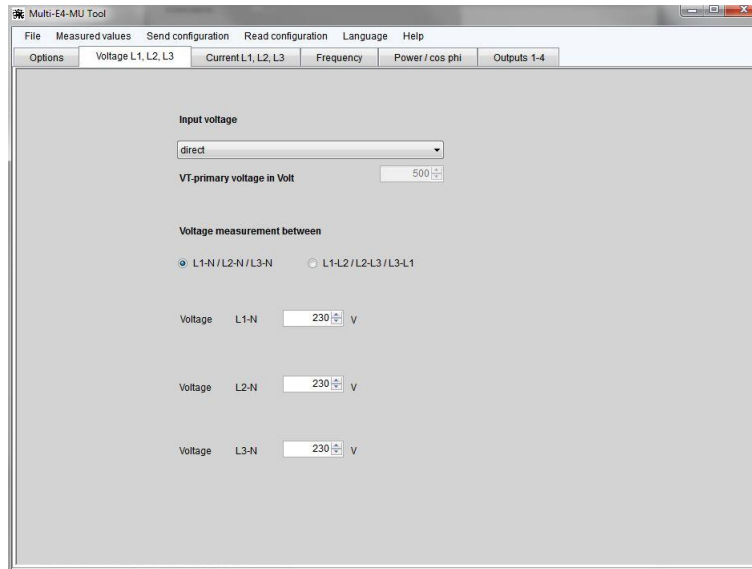
This program menu allows you to configure the voltage inputs and corresponding outputs. Enter the nominal voltage (between 40 – 60000 V) and input the required output values (e.g. 4 – 20 mA / 2 – 10 V). Any input values outside of these ranges are displayed as an error message.



„Voltage L1, L2, L3“ menu Multi-E11-MU

For Multi-E4/E-MU:

This program menu allows you to configure the voltage inputs. Enter the nominal voltage (between 40 – 60000 V). Any input values outside of these ranges are displayed as an error message.



„Voltage L1, L2, L3“ menu Multi-E4/E-MU

"Input voltage"

This option allows you to choose between direct voltage measurements (max. 750 V between L – L and 433 V between L – N) or voltage measured on voltage transformers with a secondary voltage of 100 V or 110 V. When measuring the voltage on voltage transformers, enter the voltage transformers primary voltage in the box "Transformers – primary voltage in volts". Transformer voltages of up to 60000 V can be entered.

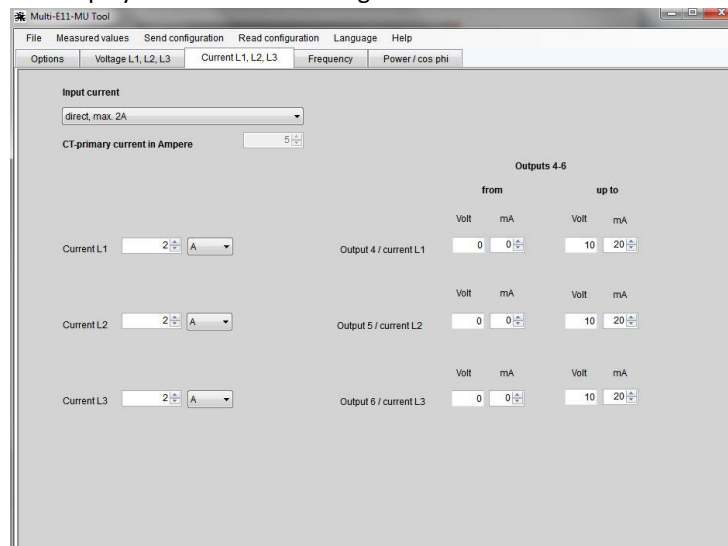
"Voltage measurement between"

For alternating current or 4-wire networks, select a voltage measurement between L and N and for 3-wire networks a measurement between L and L.

"Current L1, L2, L3" menu

For Multi-E11-MU:

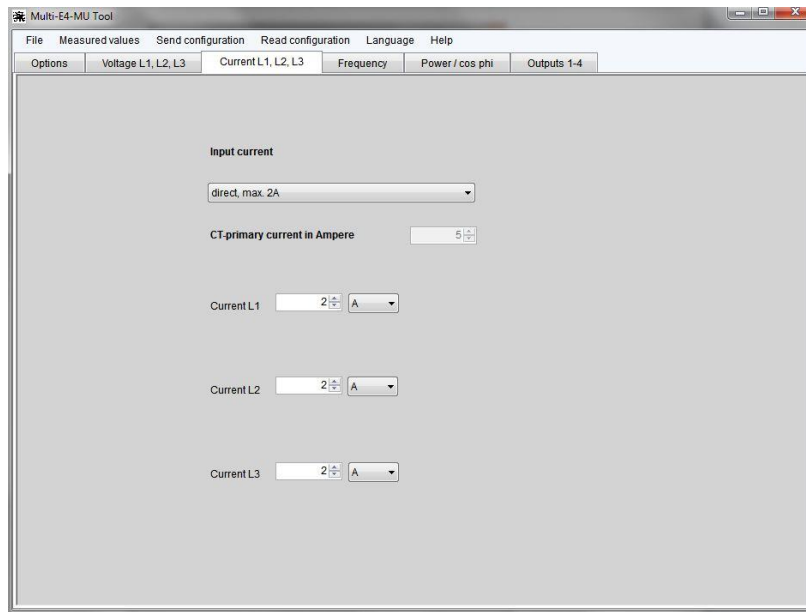
This program menu allows you to configure the current inputs and the corresponding outputs. Enter the nominal current (between 300 – 10000 mA, 1 – 20 A directly or 1 – 50000 A via transformers) and input the required output values (e.g. 4 – 20 mA / 2 – 10 V). The input current measured value can be between A and mA. Any input values outside of these ranges are displayed as an error message.



„Current L1, L2, L3“ menu Multi-E11-MU

For Multi-E4/E-MU:

This program menu allows you to configure the current inputs. Enter the nominal current (between 300 – 10000 mA, 1 – 20 A directly or 1 – 50000 A via transformers). The input current measured value can be between A and mA. Any input values outside of these ranges are displayed as an error message.



„Current L1, L2, L3“ menu Multi-E4/E-MU

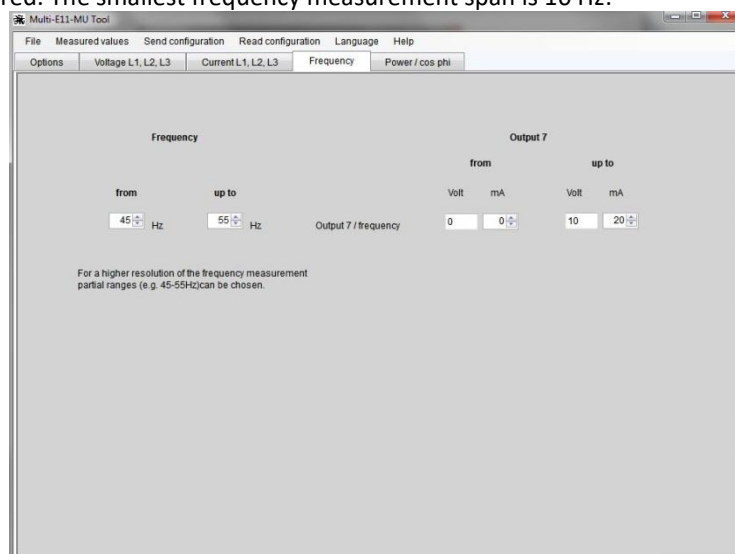
“Input current”

This option allows you to choose between direct current measurement (max. 2 A or max. 6 A) or current measured on current transformers with a secondary current of 1 A or 5 A. When measuring current on current transformers, enter the current transformers’ primary current in the box “Transformer – primary current in amps”. Transformer currents of up to 50000 A can be entered.

“Frequency” menu

For Multi-E11-MU:

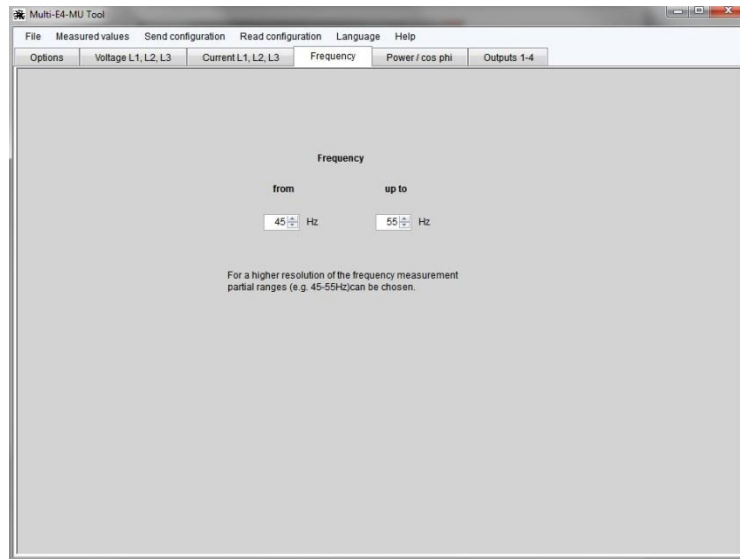
The “frequency” menu allows you to input the frequency range and configure the corresponding output (e.g. 4 – 20 mA / 2 – 10 V). The measurable frequency range is between 40 Hz and 100 Hz. A partial range, of 45 – 55 Hz for example, should be selected to achieve a higher resolution of the frequency measurements. Measurement ranges of 0 – 100 Hz can be entered. The smallest frequency measurement span is 10 Hz.



„Frequency“ menu Multi-E11-MU

For Multi-E4/E-MU:

The “frequency” menu allows you to input the frequency range. The measurable frequency range is between 40 Hz and 100 Hz. A partial range, of 45 – 55 Hz for example, should be selected to achieve a higher resolution of the frequency measurements. Measurement ranges of 0 – 100 Hz can be entered. The smallest frequency measurement span is 10 Hz.



„Frequency“ menu Multi-E4/E-MU

“Power / cos phi” menu

For Multi-E11-MU:

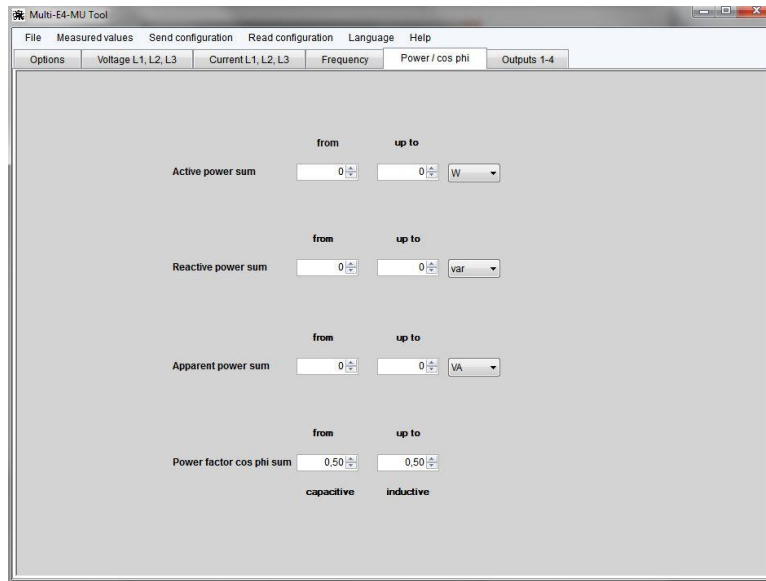
This menu allows you to configure the power rating, power factor and the respective outputs. The power rating can be configured for energy supply or energy transfer or for both energy directions. Inputs of 0 – 50000 can be made in three measured categories (Watt, kW and MW). Decimal points cannot be entered. The power factor can be arbitrarily set between 0.1 capacitive and 0.1 inductive. Any values outside of this range are displayed as an error message. Outputs 8 – 11 can be configured as unipolar outputs (e.g. 0 – 20 mA / 0 – 10 V) or as bipolar outputs (e.g. –20 – 0 – 20 mA / –10 – 0 – 10 V). At this analog outputs are the sum values of the corresponding measured values are displayed.



„Power / cos phi“ menu Multi-E11-MU

For Multi-E4/E-MU:

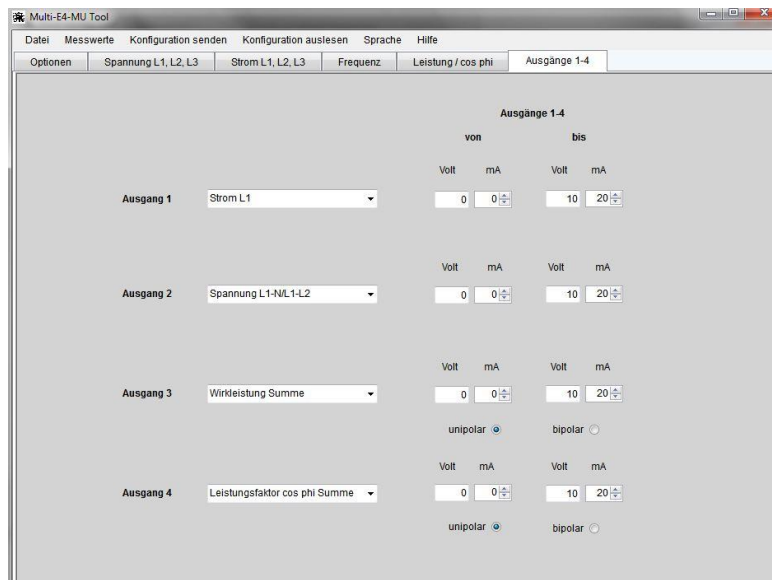
This menu allows you to configure the power rating and the power factor. The power rating can be configured for energy supply or energy transfer or for both energy directions. Inputs of 0 – 50000 can be made in three measured categories (Watt, kW and MW). Decimal points cannot be entered. The power factor can be arbitrarily set between 0.1 capacitive and 0.1 inductive. Any values outside of this range are displayed as an error message.



„Power / cos phi“ menu Multi-E4/E-MU

“Outputs 1 – 4” menu (only Multi-E4-MU)

This program menu allows you to configure the 4 analogue outputs. Any measured variable can be assigned to each output but every measured variable can only be assigned to one output. Outputs 1 – 4 can be configured as unipolar outputs (e.g. 0 – 20 mA / 0 – 10 V) or as bipolar outputs (e.g. –20 – 0 – 20 mA / –10 – 0 – 10 V). Due to the outputs being bipolar analogue outputs, only those outputs which have actual, reactive or apparent output measured values or a cos phi power factor can be activated. At the analog outputs are the sum values of the actual, reactive or apparent power or cos phi power factor displayed.



„Outputs 1-4“ menu Multi-E4-MU

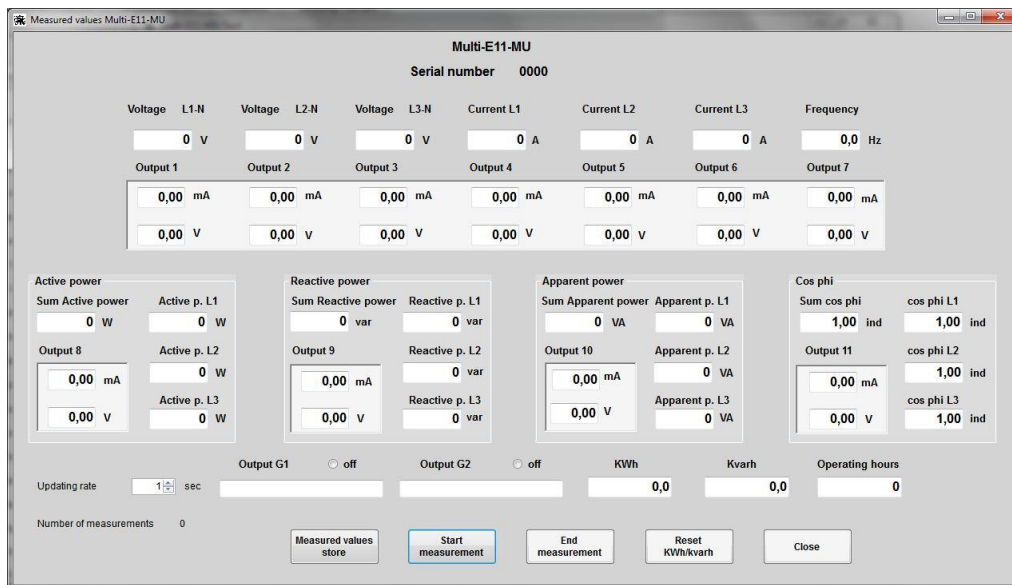
"File" menu

This program menu allows you to load and store multi transducer configurations. The configuration files are denoted by the file type *.mkg. The configurations of the different Multi-MU types are compatible with each other. With each configuration file is a text file stored, in which information on such as project descriptions, location, etc. are stored. The entries for the text file can be entered in the "System / Project" input field in the menu "Options". You can also print the configuration and cancel the "Multi-E11/E4/E-MU Tool" application.

"Measured values" menu

This menu entry opens a window in which the Multi-E11/E4/E-MU measured values can be displayed and stored. If the transfer of measured values has already started, then the Multi-E11/E4/E-MU configuration units and notifications are automatically adjusted. Incorrect selection of the measurement transducer displays an error message. Please then restart the program!

The time intervals, at which the measured values are read out, can be set by the updating rate. The adjustment range is between 1 and 600 seconds. To store the measured values, click on "Measured values store" **before** starting the measurements. Enter the file name under which the measured values are to be stored, as well as the file format in the window. You can choose between text file *.txt and excel file *.csv. With the text file, the tab button is used to separate the measured values and, with the excel file, a semicolon sign ";" is used. The measured values are stored at the time interval set by the refresh rate. The measured values are stored with their time and date. Click on "End measurement" or "Close" to cancel the measurement and/or data collection. A click on "Reset kWh / kvarh" reset the kWh- and kvarh-counter. The operating hours counter can't be reset.



„Measured values“ menu

"Send configuration" menu

Configuration data can be transmitted using this button without you being able to recheck the data in the overview. It is used to transfer the data to the Multi-E11/E4/E-MU more quickly and more easily. Incorrect selection of the measurement transducer displays an error message. Please then restart the program!

“Read configuration” menu

The configuration data is read from the Multi-E11/E4/E-MU and displayed in the program via this button. Incorrect selection of the measurement transducer displays an error message. Please then restart the program!

“Language” menu

Here you can select the menu language. You can choose between German and English.

“Help” menu

The “Help” menu allows you to find information, technical data and wiring diagrams for the Multi-E11/E4/E-MU unit. It also provides help and information on the “Multi-E11/E4/E-MU Tool” program.

Remove software

The program can be uninstalled via the Control Panel by clicking on “Software”.

Measured value queries with the TCP/IP protocol

The 29 measured values of the Multi-E11/E4/E-MU can be read out using the TCP/IP protocol. Use a LAN cable to connect the measuring transformer to your PC. Open a TCP/IP client on your PC. The addressing of the Multi-E11/E4/E-MU is via its host name (e.g. 192.168.2.2 or e.g. "Multi-E11-MU") and the port numbered 9760. Send a TCP/IP packet with the following hex values {0xBD 0x57}. The smallest interval for reading out the values should not be less than 50 ms. The data string with the measured values has a size of 301 bytes. All measured values are output in ASCII format along with the associated unit. Individual measured values are separated by the semicolon sign (0x3B). The last character in the file is a blank (0x00). Decimal places in the measured values are indicated with a dot (0x2E). By virtue of the ASCII format and semicolon-separation of values, it is very easy to further process the measured values. The arrangement of the measured values in the data string is as follows:

Arrangement of the measured values

value	bytecount	possible values
measured value voltage L1-N/L1-L2	5	
unit voltage L1-N/L1-L2	1	V
measured value voltage L2-N/L2-L3	5	
unit voltage L2-N/L2-L3	1	V
measured value voltage L3-N/L3-L1	5	
unit voltage L3-N/L3-L1	1	V
measured value current L1	6	
unit current L1	2	mA, A
measured value current L2	6	
unit current L2	2	mA, A
measured value current L3	6	

unit current L3	2	mA, A
measured value frequency	5	
unit frequency	2	Hz
measured value active power L1	6	
unit active power L1	2	W, kW, MW
measured value active power L2	6	
unit active power L2	2	W, kW, MW
measured value active power L3	6	
unit active power L3	2	W, kW, MW
measured value active power sum	6	
unit active power sum	2	W, kW, MW
measured value reactive power L1	6	
unit reactive power L1	4	var, kvar, Mvar
measured value reactive power L2	6	
unit reactive power L2	4	var, kvar, Mvar
measured value reactive power L3	6	
unit reactive power L3	4	var, kvar, Mvar
measured value reactive power sum	6	
unit reactive power sum	4	var, kvar, Mvar
measured value apparent power L1	6	
unit apparent power L1	3	VA, kVA, MVA
measured value apparent power L2	6	
unit apparent power L2	3	VA, kVA, MVA
measured value apparent power L3	6	
unit apparent power L3	3	VA, kVA, MVA
measured value apparent power sum	6	
unit apparent power sum	3	VA, kVA, MVA
measured value cos phi L1	4	
unit cos phi L1	3	ind, cap
measured value cos phi L2	4	
unit cos phi L2	3	ind, cap
measured value cos phi L3	4	
unit cos phi L3	3	ind, cap
measured value cos phi sum	4	
unit cos phi sum	3	ind, cap
measured value kWh-counter / import	11	
unit kWh-counter / import	3	kWh
measured value kvarh-counter	11	
unit kvarh-counter	5	kvarh
operating hours	9	
unit operating hours	1	h
settings output G1	1	A, B, C, D, E, F, G, H, I, J, K, L, M, O, P *1
condition output G1	1	0, 1 *2
settings output G2	1	A, B, C, D, E, F, G, H, I, J, K, L, M, O, P *1

condition output G2	1	0, 1 *2
measured value kWh-counter / export from serial number 0092 / 4414 / 8007	11	
unit kWh-counter / export from serial number 0092 / 4414 / 8007	1	kWh

*1) Limit setting: A = Active energy, reference (impulses output) at output G1 or reactive energy, inductive (impulses output) at output G2

- B = Current L1
- C = Current L2
- D = Current L3
- E = Voltage L1-N/L1-L2
- F = Voltage L2-N/L2-L3
- G = Voltage L3-N/L3-L1
- H = Frequency
- I = Active power, import
- J = Active power, import
- K = Reactive power, inductive
- L = Reactive power, capacitive
- M = Apparent power, export
- N = Apparent power, export
- O = Power factor cos phi, inductive
- P = Power factor cos phi, capacitive

*2) The 0 means limit off while 1 means limit on

Measured value queries with the HTTP protocol

The 29 measured values of the Multi-E11/E4/E-MU can also be read out using the HTTP protocol, via the Internet for example. Connect the measuring transformer to your PC via a LAN cable or to the Internet via a router (using dynamic DNS, for example). Open a HTTP client on your PC. The addressing of the Multi-E11/E4/E-MU is via its IP address or web address (e.g. "http://multi-e11-mu.dyndns.org/httpvalue.xml") and the request for file "httpvalue.xml". The measuring transformer's reply is a string containing the measured data. The smallest interval for reading out the values should not be less than 50 ms. The string with the measured values has a size of 301 bytes. All measured values are output in ASCII format along with the associated unit. Individual measured values are separated by the semicolon sign (0x3B). The last character in the file is a blank (0x00). Decimal places in the measured values are indicated with a dot (0x2E). By virtue of the ASCII format and semicolon-separation of values, it is very easy to further process the measured values. The arrangement of the measured values in the string is as follows:

Arrangement of the measured values

value	bytecount	possible values
measured value voltage L1-N/L1-L2	5	
unit voltage L1-N/L1-L2	1	V
measured value voltage L2-N/L2-L3	5	
unit voltage L2-N/L2-L3	1	V
measured value voltage L3-N/L3-L1	5	
unit voltage L3-N/L3-L1	1	V
measured value current L1	6	
unit current L1	2	mA, A
measured value current L2	6	
unit current L2	2	mA, A
measured value current L3	6	

unit current L3	2	mA, A
measured value frequency	5	
unit frequency	2	Hz
measured value active power L1	6	
unit active power L1	2	W, kW, MW
measured value active power L2	6	
unit active power L2	2	W, kW, MW
measured value active power L3	6	
unit active power L3	2	W, kW, MW
measured value active power sum	6	
unit active power sum	2	W, kW, MW
measured value reactive power L1	6	
unit reactive power L1	4	var, kvar, Mvar
measured value reactive power L2	6	
unit reactive power L2	4	var, kvar, Mvar
measured value reactive power L3	6	
unit reactive power L3	4	var, kvar, Mvar
measured value reactive power sum	6	
unit reactive power sum	4	var, kvar, Mvar
measured value apparent power L1	6	
unit apparent power L1	3	VA, kVA, MVA
measured value apparent power L2	6	
unit apparent power L2	3	VA, kVA, MVA
measured value apparent power L3	6	
unit apparent power L3	3	VA, kVA, MVA
measured value apparent power sum	6	
unit apparent power sum	3	VA, kVA, MVA
measured value cos phi L1	4	
unit cos phi L1	3	ind, cap
measured value cos phi L2	4	
unit cos phi L2	3	ind, cap
measured value cos phi L3	4	
unit cos phi L3	3	ind, cap
measured value cos phi sum	4	
unit cos phi sum	3	ind, cap
measured value kWh-counter / import	11	
unit kWh-counter / import	3	kWh
measured value kvarh-counter	11	
unit kvarh-counter	5	kvarh
operating hours	9	
unit operating hours	1	h
settings output G1	1	A, B, C, D, E, F, G, H, I, J, K, L, M, O, P *1

condition output G1	1	0, 1 * ²
settings output G2	1	A, B, C, D, E, F, G, H, I, J, K, L, M, O, P * ¹
condition output G2	1	0, 1 * ²
measured value kWh-counter / export <small>from serial number 0092 / 4414 / 8007</small>	11	
unit kWh-counter / export <small>from serial number 0092 / 4414 / 8007</small>	1	kWh

*¹) Limit setting: A = Active energy, reference (impulses output) at output G1 or reactive energy, inductive (impulses output) at output G2

- B = Current L1
- C = Current L2
- D = Current L3
- E = Voltage L1-N/L1-L2
- F = Voltage L2-N/L2-L3
- G = Voltage L3-N/L3-L1
- H = Frequency
- I = Active power, import
- J = Active power, import
- K = Reactive power, inductive
- L = Reactive power, capacitive
- M = Apparent power, export
- N = Apparent power, export
- O = Power factor cos phi, inductive
- P = Power factor cos phi, capacitive

*²) The 0 means limit off while 1 means limit on

Measured value queries with the MODBUS-TCP protocol

The measured values of the Multi-E11/E4/E-MU can be read out using the MODBUS-TCP protocol. Connect the transmitter with a LAN cable to your PC or a router with the MODBUS master. The addressing of the Multi-E11/E4/E-MU is via its IP address (Port 502). The smallest interval for reading out the values should not be less than 50 ms. The registers can only be read out. It supports the following Modbus commands:

Code: 0x03 Read Holding Registers
Code: 0x08 Diagnostic

For non-supported commands or incorrect address information, an appropriate error message is issued.

Formats

INT = 2 Byte, signed (high before low Byte)
UINT = 2 Byte, unsigned (high before low Byte)
LONG = 4 Byte, unsigned (high before low Byte, low Word before high Word)

Representation of voltage in the MODBUS-registers of the Multi-E11/E4/E-MU

$U = n \times VT$
U = voltage in V
n = value from MODBUS-Register
VT = ratio of voltage transformer (if present)

Representation of current in the MODBUS-registers of the Multi-E11/E4/E-MU

$I = n \times CT$
I = current in mA
n = value from MODBUS-Register
CT = ratio of current transformer (if present)

Representation of power in the MODBUS-registers of the Multi-E11/E4/E-MU

N = n x CT x VT

N = power in W/var/VA

n = value from MODBUS-Register

CT = ratio of current transformer (if present)

VT = ratio of voltage transformer (if present)

Representation of cos phi in the MODBUS-registers of the Multi-E11/E4/E-MU

Measurement value: 0,00 cap – 0,5 cap – 1,00 – 0,5 ind – 0,00 ind

MODBUS: -000 – -50 – 100 – 50 – 000

Measured values list

adress (hex)	value	format	unit	resolution
0x0001	measured value voltage L1-N/L1-L2	UINT	V	0,1
0x0002	measured value voltage L2-N/L2-L3	UINT	V	0,1
0x0003	measured value voltage L3-N/L1-L3	UINT	V	0,1
0x0004	measured value current L1	UINT	mA	1
0x0005	measured value current L2	UINT	mA	1
0x0006	measured value current L3	UINT	mA	1
0x0007	measured value frequency	UINT	Hz	0,1
0x0008	measured value active power L1	INT	W	1
0x0009	measured value active power L2	INT	W	1
0x000A	measured value active power L3	INT	W	1
0x000B	measured value active power sum	INT	W	1
0x000C	measured value reactive power L1	INT	var	1
0x000D	measured value reactive power L2	INT	var	1
0x000E	measured value reactive power L3	INT	var	1
0x000F	measured value reactive power sum	INT	var	1
0x0010	measured value apparent power L1	INT	VA	1
0x0011	measured value apparent power L2	INT	VA	1
0x0012	measured value apparent power L3	INT	VA	1
0x0013	measured value apparent power sum	INT	VA	1
0x0014	measured value cos phi L1	INT	-	0,01
0x0015	measured value cos phi L2	INT	-	0,01
0x0016	measured value cos phi L3	INT	-	0,01
0x0017	measured value cos phi sum	INT	-	0,01
0x0018	measured value kWh-counter / import	LONG	kWh	0,1
0x001A	measured value kvarh-counter	LONG	kvarh	0,1
0x001C	operating hours	LONG	min	1
0x001E	condition output G1	INT	0, 1 * ²	
0x001F	condition output G2	INT	0, 1 * ²	
0x0020	setting output G1	INT	0 - 15 * ¹	
0x0021	setting output G2	INT	0 - 15 * ¹	
0x0022	Current transformer, primary	INT	A	1
0x0023	Current transformer, secondary	INT	A	1
0x0024	Voltage transformer, primary	INT	V	1

0x0025	Voltage transformer, secondary	INT	V	1
0x0026 from serial number 0092 / 4414 / 8007	measured value kWh-counter / export	LONG	kWh	0,1
0x0028	serial number	UINT		1
0x0029	software version	UINT		x.x
0x002A	MAC-adress 1	UINT		X.X.x.x.x.x
0x002B	MAC-adress 2	UINT		x.x.X.X.x.x
0x002C	MAC-adress 3	UINT		x.x.x.x.X.X
0x002D	IP-adress	LONG		X.X.X.X
0x002F	subnet mask	LONG		X.X.X.X
0x0031	standard gateway	LONG	-	X.X.X.X

*1) Limit setting: 0 = Active energy, reference (impulses output) at output G1 or Reactive energy, inductive (impulses output) at output G2

- 1 = Current L1
- 2 = Current L2
- 3 = Current L3
- 4 = Voltage L1-N/L1-L2
- 5 = Voltage L2-N/L2-L3
- 6 = Voltage L3-N/L3-L1
- 7 = Frequency
- 8 = Active power, import
- 9 = Active power, import
- 10 = Reactive power, inductive
- 11 = Reactive power, capacitive
- 12 = Apparent power, export
- 13 = Apparent power, export
- 14 = Power factor cos phi, inductive
- 15 = Power factor cos phi, capacitive

*2) The 0 means limit off while 1 means limit on