WOODWARD

MPU1-F Multiple Measuring Converter 3.5

CE

Contents

1 Introduction

NOTE

This operating manual is intended for unit models including all available options. In the event that inputs/outputs, functions, configuration masks and other details are described which are not existing, these descriptions do not apply.

ATTENTION !

This operating manual has been prepared for the installation and commissioning of the unit. On account of the large variations of parameter settings it is not possible to cover every possible combination. The specifications are only intended to provide useful information. In case of incorrect entries or a total loss of functions, the default settings can be taken from the enclosed list of parameters.

1.1 Safety notes for users

This document includes the necessary information for the proper use of the described product. It is intended to be read by qualified staff.

Danger Warning

The following notes are intended to prevent injuries as well as damage to the described product and to any machine connected to it. Safety notes and warnings to avoid any danger to the life and health of users or maintenance staff as well as to avoid any damage to property are identified in this document by means of the following symbols and terms. Within this framework the symbols and terms have the following meaning:

DANGER !!!

The DANGER symbol points out dangers. The description indicates how to handle and/or avoid such hazards. Any non-observance may cause fatal or serious injuries as well as considerable damage to property.

WARNING !

To avoid the destruction of electric components due to improper handling, please read and adhere to the relevant notes.

ATTENTION !

This symbol points to important notes concerning the setting up, installation and connection of the unit. When connecting the unit you must follow the instructions.

NOTE

References to other notes and supplements as well as tables and lists are identified by means of the "i" symbol. Most of the sections referred to are also included in the appendix.

Note on Proper Use

The unit must only be used for those applications which are laid out and described in this operating manual. Proper and safe operation of the product assumes correct storage, transportation, setting up and installation as well as careful operation and maintenance.

1.2 Ratings

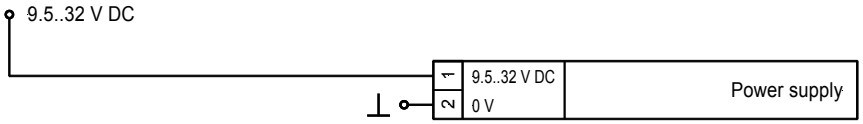
WARNING !

A circuit breaker which is easily accessible to the operator must be situated near to the device. This must also bear a sign marking it as an isolating switch for the device.

NOTE

Connected inductances (e.g. coils of operating current or undervoltage releasers, auxiliary or power contractors) must be wired with a suitable interference suppressor.

1.2.1 Power supply



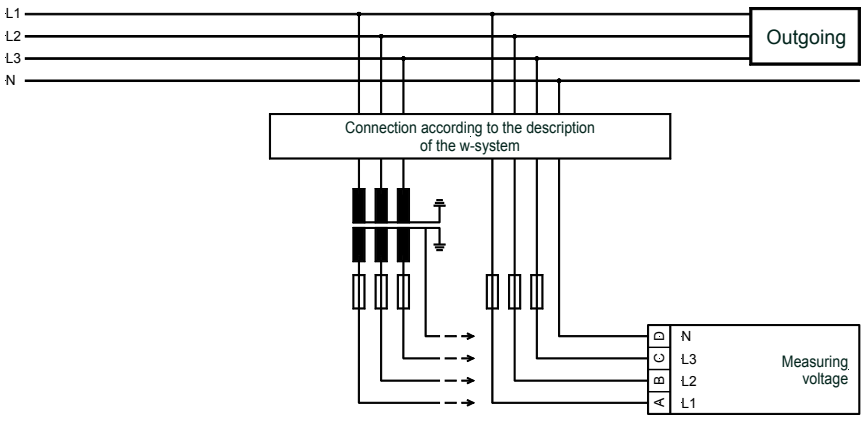
Terminal	Description	Amax
1	+9.5..32 V DC, 10 W	2.5 mm²
2	0 V reference potential	2.5 mm²

1.2.2 Measuring inputs

NOTE

Please take the different measuring configurations at the description of the w-system beginning at page 23 in chapter "Measuring system configuration" into account.

a.) Voltage



Terminal		Measurement	Description	A_{max}
Rated voltage: 100 V_{AC}				
A	19	direct or via measuring transducer	Measuring voltage L1	2.5 mm²
B	21		Measuring voltage L2	2.5 mm²
C	23		Measuring voltage L3	2.5 mm²
D	18		Neutral point of the 3-phase system/ transducer	2.5 mm²
Rated voltage: 400 V_{AC}				
A	20	direct or via measuring transducer	Measuring voltage L1	2.5 mm²
B	22		Measuring voltage L2	2.5 mm²
C	24		Measuring voltage L3	2.5 mm²
D	18		Neutral point of the 3-phase system/ transducer	2.5 mm²

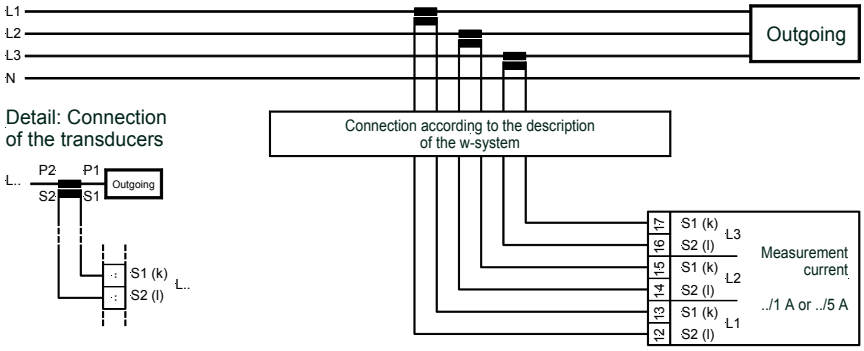
b.) Current

WARNING !

Before disconnecting the secondary terminals of the transducer or the connection of the transducer at the unit make sure that the transducer is short-circuited.

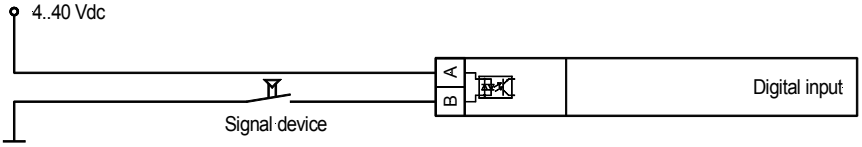
NOTE

Current transducers are secondary and generally to be earthed single-sided.



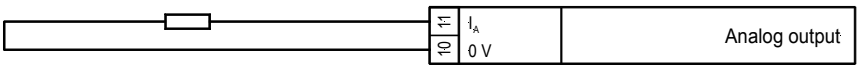
Terminal	Measurement	Description	A_{max}
12	Measuring transformer ../1 A or ../5 A	Measuring current L1, transducer terminal S2 (l)	2.5 mm²
13		Measuring current L1, transducer terminal S1 (k)	2.5 mm²
14		Measuring current L2, transducer terminal S2 (l)	2.5 mm²
15		Measuring current L2, transducer terminal S1 (k)	2.5 mm²
16		Measuring current L3, transducer terminal S2 (l)	2.5 mm²
17		Measuring current L3, transducer terminal S1 (k)	2.5 mm²

1.2.3 Discrete inputs



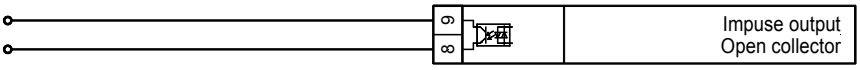
Terminal	Accompanying Zero terminals	Name (according to DIN 40 719 Part 3, 5.8.3)	A_{max}
NO (normally open) contact			
3	7	Discrete input 1 - CB status This discrete input is used to display the status of the breaker on the front folio.	2.5 mm²
4		Discrete input 2 - Test/Operation This discrete input is transmitted via the interface only.	2.5 mm²
5		Discrete input 3 - Earthing switch on/off This discrete input is transmitted via the interface only.	2.5 mm²
6		Discrete input 4 - free This discrete input is transmitted via the interface only.	2.5 mm²

1.2.4 Analog output



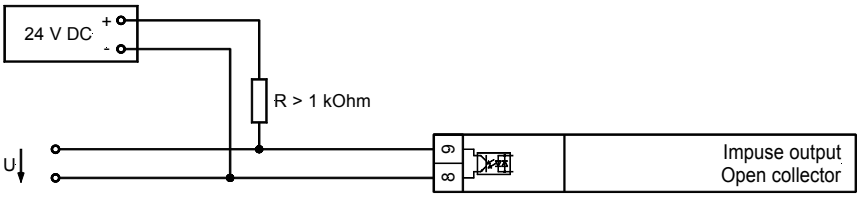
Terminal	Terminal	Description	A_{max}
-20/0/4..20 mA			
I_A	0 V		
11	10	Analog output (-20/0/4..20 mA)	1.5 mm²

1.2.5 Impulse output

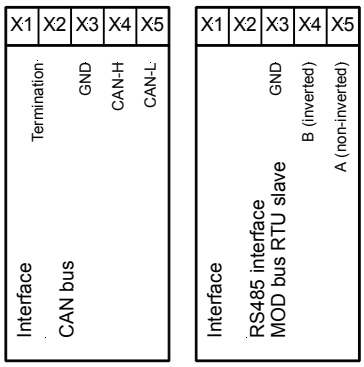


Terminal	Description	A_{max}
9	Pulse output (kWh-/kvarh-Impus): ON: max. 30 mA; OFF: 27 V	1.5 mm²
8	Emitter (Open Collector)	1.5 mm²

Example

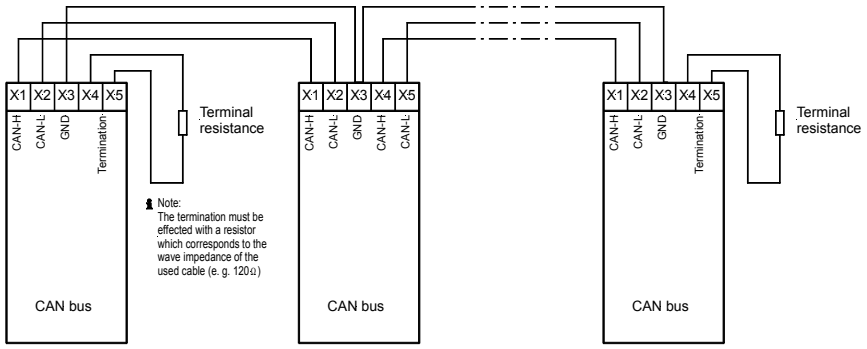


1.2.6 Interface



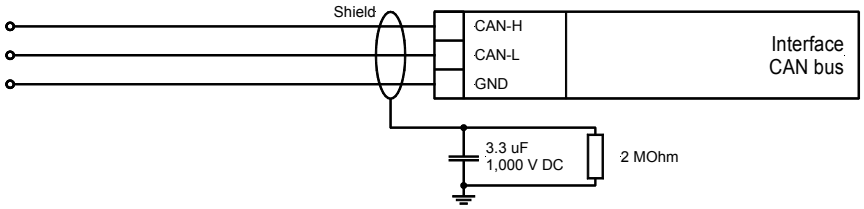
Terminal					Description
X1	X2	X3	X4	X5	
		GND	B	A	RS485, MOD bus RTU slave
[1]	[1]	GND	CAN-H	CAN-L	CAN bus

[1]..can be used to loop the CAN bus or to connect the termination resistor



NOTE

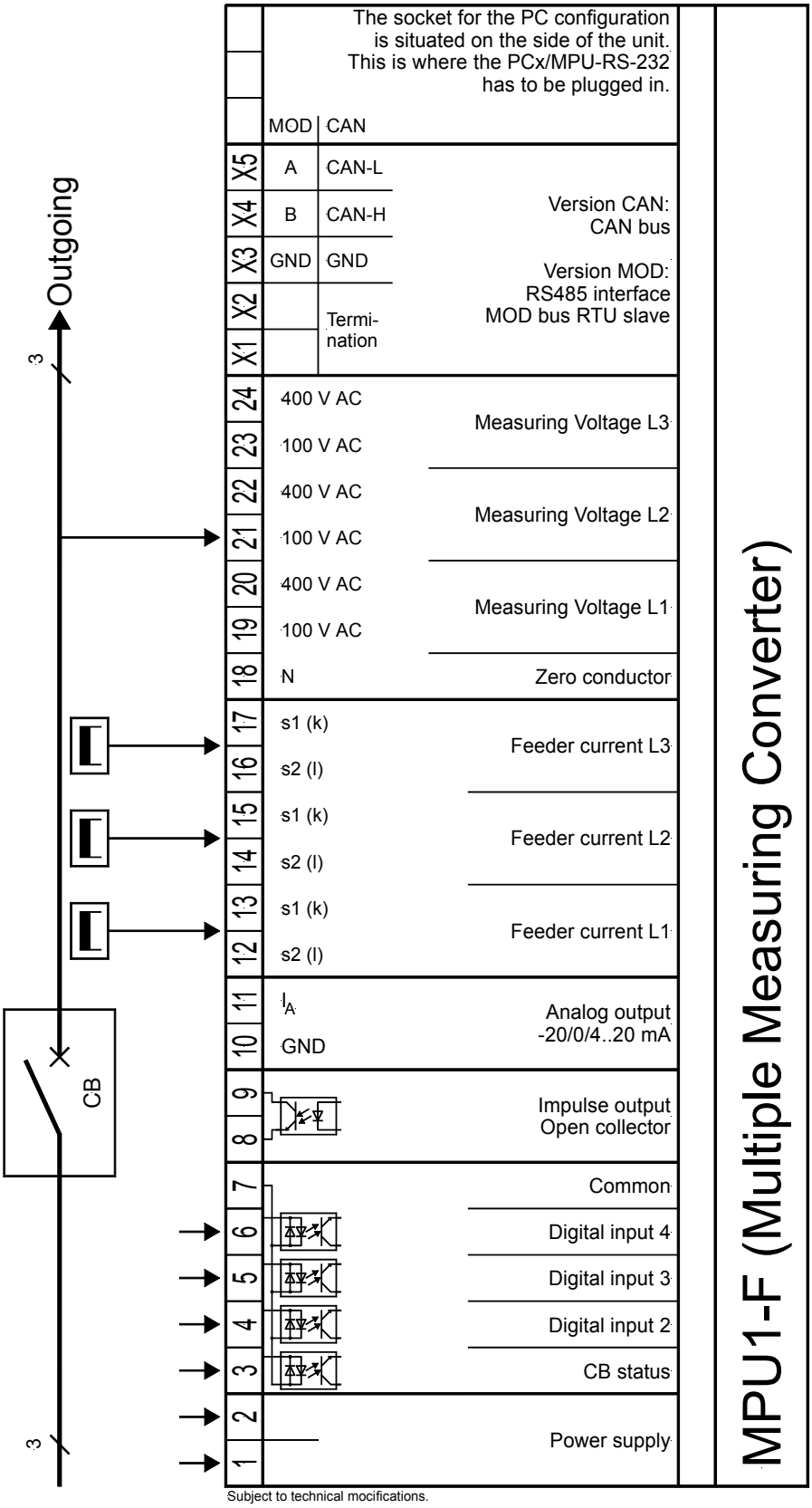
Please note that the CAN bus must be terminated with an impedance which corresponds to the wave impedance of the cable (e.g. 120 Ohm).



NOTE

In order to configure via the service interface, you require a configuration cable, the PC program (supplied with the cable) and the corresponding configuration files. Please consult the online help installed when the PC program is installed for a description of the PC program and its setup.

1.2.7 Wiring diagram



Subject to technical mocifications.

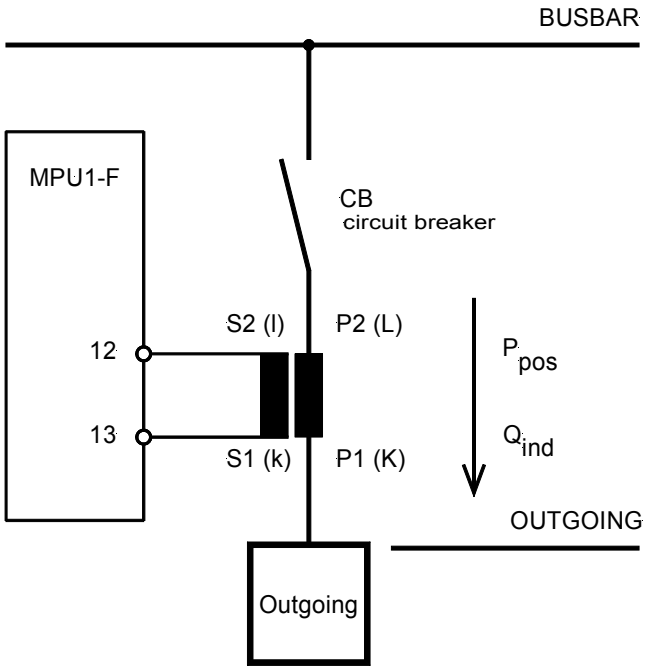
2003-02-14 | MPU1-F Wiring Diagram Woodward mpu1fseg-0703-ap.skf

2 Functional description

2.1 Direction of power

In the event that the current transformers of the unit are wired according to the wiring picture below, the following values are displayed:

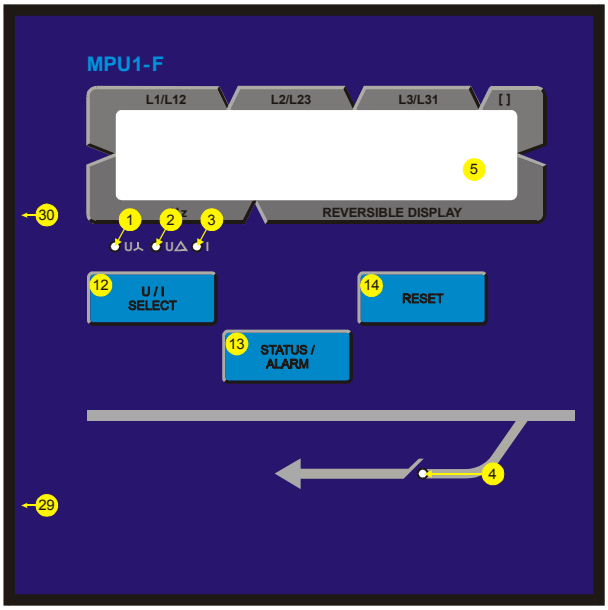
- Positive real power — The source exports real power.
- Inductive power factor cosφ
Positive re-active power — The source is overexcited and exports inductive re-active power



3 Display and operating elements

3.1 Front panel

The front panel consists of a plastic coating. All keys have been designed as touch-sensitive folio switches. The display is an LC Display, comprising 2 × 16 characters which are illuminated indirectly (red). The contrast of the display can be adjusted continuously by means of a rotary potentiometer on the left.



LEDs

① "U⊥" ..... Display L-N voltage
② "U△" ..... Display L-L voltage
③ " I " ..... Display Line current
④ "CB" ..... CB status

Others

⑤ LC Display ..... LC Display
㉙ RS232 ..... Plug for configuration cable
㉚ "Potentiometer" ..... Adjust LC display contrast

Push-buttons

⑫ "U/I SELECT" ..... Voltages/Currents
⑫ "Digit↑" ..... Increase digit
⑬ "STATUS / ALARM" ..... Select menu
⑬ "Select" ..... Confirm Selection
⑭ "RESET" ..... Acknowledgment alarm
⑭ "Cursor→" ..... Move cursor one position to the right

3.2 LEDs

NOTE

The measuring frequency is to be displayed always in the second row.

① ..... ***LED "U⅄"*** — Display L-N voltage — color "YELLOW"

If this LED lights up the displayed values in the first row are the L-N voltages.

② ..... ***LED "U△"*** — Display L-L voltages — color "YELLOW"

If this LED lights up the displayed values in the first row are the L-L voltages.

③ ..... ***LED " I "*** — Display line currents — color "YELLOW"

If this LED lights up the line currents are displayed in the first row.

④ ..... ***LED "CB status"*** — CB status — color "GREEN"

This LED lights up if the digital input "CB status" on terminal 3 is energized.

3.3 Display

⑤ ..... ***DISPLAY "LC display"*** — LC display

The two-line LC display indicates messages and values depending on the respective mode. The entry mode serves to modify the parameters while e.g. voltages and currents are indicated in the automatic mode.

Upper line
- L1, L2 and L3 ..... Display of the voltages and the currents corresponding to the LEDs "U⅄", "U△" and " I ".
- [ ] ..... Display of the unit.

Lower line — Display of the following measuring values:

• Total real power P	[kW / MW]
• Power factor cosφ (L1)	[1.00]
• Total re-active power Q	[kvar / Mvar]
• Total apparent power S	[kVA / MVA]
• Voltage (average of $U_{L12\text{-}23\text{-}31}$)	[V / kV]
• Voltage (maximum) U_{High}	[V / kV]
• Voltage (minimum) U_{Low}	[V / kV]
• Current (average of $I_{L1\text{-}2\text{-}3}$)	[A / kA]
• Current (maximum) I_{High}	[A / kA]
• Current (minimum) I_{Low}	[A / kA]
• Current slave pointer $I_{M1\text{-}2\text{-}3}$	[A / kA]
• Real power P_{L1}	[kW / MW]
• Real power P_{L2}	[kW / MW]
• Real power P_{L3}	[kW / MW]
• Real energy (positive)	[+kWh / +MWh] /1
• Real energy (negative)	[-kWh / -MWh] /1
• Re-active energy (inductive)	[+kvarh / +Mvarh] /1
• Re-active energy (capacitive)	[-kvarh / -Mvarh] /1

/1 switchable

3.4 Push-buttons

In order to ease the setting of the parameters the pushbuttons have an "AUTOROLL function" which allows the operator to switch to the next setting of the configuration screens, to the next digit or the next cursor position. The "AUTOROLL function" is only activated if the operator presses the corresponding keys for a longer period of time.

NOTE

After entering into the configuration mode the push-buttons will have another function. This function will be as follows. Their function is not printed on the push-button and is permitted to authorized personnel only.

⑫ ***.....PUSHBUTTON "U / I SELECT..Digit↑"***

U / I SELECT..Digit↑ color "NONE"

Automatic mode....."U / I SELECT" By pressing this pushbutton the operator can display voltages and currents in the first row.

Configuration ....."Digit↑" Using this pushbutton the number on which the cursor is currently located is increased by one. The increase is restricted by the admissible limits (see list of parameters included in the appendix). In case the maximal number which can be set is reached the number automatically returns to the lowest admissible value.

⑬ ***.....PUSHBUTTON "STATUS / ALARM..Select"***

STATUS / ALARM..Select color "NONE"

Automatic mode....."STATUS / ALARM" Select messages to be displayed.

Configuration ....."Select" By pressing this pushbutton the user jumps to the next entry screen. If the original value was modified using the pushbuttons "Select" or "Cursor→" the new entered value is saved by pressing "Digit" once. By pressing this pushbutton again the operator moves on to the next entry screen.

⑭ ***.....PUSHBUTTON "RESET..Cursor→"***

RESET..Cursor → color "NONE"

Automatic mode....."RESET" By pressing this pushbutton counters can be re-setted.

Configuration ....."Cursor→" Using this pushbutton the cursor is moved one position to the right. On reaching the extreme right the cursor automatically moves to the digit on the left of the value being entered.

4 Configuration screens (input of the parameters)

When the configuration mode is activated (simultaneous depression of the keys "U / I SELECT" and "RESET"; flashing of LEDs "U↕", "U△" and " I "), the configuration screens can be browsed by pressing the key "STATUS / ALARM". If the pushbutton "STATUS / ALARM" is depressed for a longer period of time the scroll function is activated and the screens can be browsed quickly. Simultaneously pressing the "STATUS / ALARM" and "RESET" buttons allows you to scroll through the last four configuration screens. Exception: The service routine and the break from the first to the last screen. If no entry, modification or any other action is carried out for 120 s, the unit returns unaided to the automatic mode.

NOTE

The rated measuring voltage (secondary) is selectable via the following configuration screens in two different ranges. The measuring voltage has to be applied either to the "100 V AC" or to the "400 V AC" inputs: The shortage of the different versions is as follows: reated 100 V version = [1] and rated 400 V version = [4]. There is a difference as far as the configuration masks and the entry of the parameters of the two versions are concerned, and the setting limits are also different.

Adjust Settings:
SELECT (STATUS)

Configuration mode — Push-button "Select"

By simultaneously pressing the pushbuttons "U / I SELECT" and "RESET" the configuration mode is activated. The subsequent screen masks can then be viewed and/or modified within the given limits. Please note that any depression of the pushbutton "STATUS / ALARM" causes the system to switch to the next configuration mask. In the event that "OFF" was selected in the parameter options, the parameters are not displayed and cannot be edited either.

Software version
x.xxxx

Software version

Indication of the software version.

4.1 General

4.1.1 Password protection

The device is equipped with a three-step code and configuration hierarchy which allows to make different configuration masks visible for different users. The difference is made between:

Code level 0 (CS0) — User: External person
This code level does not allow any access to the parameters. The configuration is blocked.

Code level 1 (CS1) — User: Client
This code level authorizes the user to modify a few pre-selected parameters. The password cannot be changed at this level.

Code level 2 (CS2) — User: Commissioning engineer
With this code level 2 the user obtains all access rights, thus having direct access to all parameters (viewing and changing) Moreover, at this level, the user is also authorized to establish passwords for levels 1 and 2.

NOTE

Once the code level is set, it will not be changed even after entering the configuration repeatedly. If entering an incorrect code number, the code level is set to CS0, thus locking the device for external persons (entering of the passwords on page 14). Two hours after the last operator action, the device automatically switches to the code level CS0. By entering the appropriate code number you go back to the corresponding level.

Enter code number XXXX

Enter code number — 0..9999

When entering the configuration, a code number to identify the different users is inquired first. The number XXXX, which is indicated is a random number and is confirmed with the button "STATUS / ALARM". If the random number is confirmed with "STATUS / ALARM" without changing it, the code level of the device is not changed. In order to change the code level and to install new passwords for the users, there are two four-digit code numbers (0000..9999). For the user level "External person" no assignment is necessary, since normally, the user does not obtain the right to access the configuration level (protected by the codes).

4.1.2 General

SPRACHE/LANGUAGE english

Select language — English/German

The screens (configuration screens and display masks) can be displayed in either English or German.

Password Protection ON

Password protection enabling/disabling — ON/OFF

ON .....The user is requested to enter a password to enter configuration.
OFF.....No password is required.

4.1.3 Enable/disable service interface

NOTE

For the configuration via the service interface you need the configuration cable, the PC program (will be delivered with the cable) and the appropriate configuration files. For the description and setting up of the PC program please refer to the online help which will also be installed when installing the PC program.

WARNING!

If the following parameter "Direct parametr." is set to "YES", the communication via the interface is blocked with terminals X1..X5. If, after the configuration of the device, communication via the interface X1..X5 should be established again, (e. g. CAN bus connection or MOD bus connection via gateway), the subsequent parameter must be set to "NO"!

Direct parametr.
YES

Configuration via the service interface — YES/NO

YES ..... Configuration via the service interface is possible, and an interface connection that may be existing via the terminals X1..X5, is deactivated. The function of existing analog outputs is restricted. The following requirements must be met for the configuration via the service interface:
- A connection between the device and the PC must be established with the configuration cable,
- the Baudrate of the PC program must be set to 9,600 Baud and
- the appropriate configuration file must be used (file name: *.asm).

NO ..... Configuration via the service interface cannot be carried out, and an interface connection that may be existing via the terminals X1..X5, is enabled. All existing analog output do function without any restriction.

4.2 Basic settings

4.2.1 Configuration of the voltage transformer

NOTE

Please apply the measuring voltage in dependence of the rated voltage to the following terminals:

Shortage	Rated voltage	Voltage range	Terminals L1/L2/L3[/N]
[1]	100 Vac	50..160 Vac	19/21/23[/18]
[4]	400 Vac	161..480 Vac	20/22/24[/18]

Volt.transformer
secondary 000V

Voltage transformer secondary — 50..480 V

Here, the secondary voltage is set in V. This information is needed for the indication of the secondary voltages on the display. For measuring voltages of 400 V without a measurement transformer, "**400V**" must be set here.

Volt.transformer
primary 000.00kV

Voltage transformer primary — 0.10..650.00 kV

Here, the primary voltage is set in kV. This information is needed for the indication of the primary voltages on the display. For measuring voltages of 400 V without a measurement transformer, "**000,40kV**" must be set here.

4.2.2 Configuration of the current transformer

Current transf.
0000/0

Current transformer 1..9,999/x A

In order to prevent some loss of precision, it is recommended to use a current transducer by which at least 60 % of the transducer nominal current flow.

{X} / 1 A... Secondary nominal current = 1 A at primary nominal current = {X} A;
{X} / 5 A... Secondary nominal current = 5 A at primary nominal current = {X} A;
{X}..... e.g. taken from the main series 10, 15, 20, 30, 50 or 75 A as well as decimal fractions and multiples of this series or the corresponding secondary series with 12.5, 25, 40 or 60 A.

4.2.3 Connection type

NOTE

The measuring transducer has to be connected in accordance with the connection type.

Connection type
2W4

Measuring system 1W / 1W4 / 1W3 / 2W3 / 2W4

By selecting one of the measuring variants, according to the w-System corresponding to the description on page 23 in chapter 6.1 "Measuring system configuration", different mains variants and mains configurations are predetermined.

4.3 Energy counter

4.3.1 Impulse output of energy counter

NOTE

The impulse output of the energy counter is not calibrated.

Pulse output	
P.duration	**0.00s**

Length of impulse output of energy counters 0.04..1.00 s

The length of the impulse signal of the energy counter output is set here.

Pulse output
+kWh

Select the energy output +kWh / -kWh / +kvarh / -kvarh

With this screen mask the type of the output of the energy impulses can be determined on the impulse output (terminal 8/9). It is possible to select between the positive or negative active energy and the inductive or capacitive reactive energy. Only one type of the energy impulse can be output. According to this setting the following screen masks will be different.

4.3.2 Screen masks at the setting "+kWh" and "-kWh"

Pulse/kWh	
Logic	**negative**

alternatively to kvarh

Counter impulse to measure the active energy positive/negative

The output of the kWh impulse (positive as well as negative) can occur both negative (per kWh impulse the open collector output [terminal 8/9] is opened) and positive (per kWh impulse the open collector output [terminal 8/9] is closed).

Active energy	
Pulse/kWh	**000.0**

alternatively to kvarh

Counter impulse of the active energy 0.1..150.0/kWh

The number of the impulses/kWh can be entered in this mask.

4.3.3 Display of the energy counters

Display kWh on?	Activate kWh display	Y/N
+- YY		

The display of the kWh counter, which is not required (positive active energy = +; negative active energy = -) is here extracted. By means of the entry of "N" the concerned display does not appear in the second line of the display.

Display kvarh on?	Activate kvarh display	Y/N
+- YY		

The display of the kvarh counter, which is not required (inductive reactive energy = +; capacitive reactive energy = -) is here extracted. By means of the entry of "N" the concerned display does not appear in the second line of the display.

Display 2 kWh on?	Activate second kWh display	Y/N
+ Y		

The display of the second (differential) kWh counter, which is not required (positive active energy = +) is here extracted. By means of the entry of "N" the concerned display does not appear in the second line of the display.

4.3.4 Reset energy counters

RESET kWh/kvarh	RESET kWh/kvarh measurement	ON/OFF
ON		

If here the setting "ON" is selected, the energy counters can be re-setted to zero by pressing the "RESET" push-button .

NOTE

The re-setting of the energy counter is to be done as follows:

- Bring the kWh/kvarh into the lowest display line.
- Press the push-button "RESET" at least 5 seconds.

After a successful re-setting the result is
"50.00 0000.0 kWh" / "50.00 0000.0kvah".

4.4 Common masks

Refresh time Display	Adjust time to refresh displayed values	0.00..5.00 s
0.00s		

Setting this parameter changes the refresh time of the measuring values in the second display line.

Measuring filter Voltage	Measuring filter to display voltage	OFF/0.04/0.08/0.16/0.32/0.64/1.28/2.56s
0.00s		

The measured voltage will be filtered using the time base configured here.

Measuring filter Current	Measuring filter to display current	see above
0.00s		

The measured current will be filtered using the time base configured here.

Measuring filter Power	Measuring filter to display power	see above
0.00s		

The measured power will be filtered using the time base configured here.

Measuring filter Frequency	Measuring filter to display frequency	see above
0.00s		

The measured frequency will be filtered using the time base configured here.

4.5 Analog output

It is possible to apply a certain measuring quantity to the analog output via the push-buttons (possible measuring quantities according to the table below). The output can be carried out either as -20..+20 mA, as 0..20 mA or as 4..20 mA value. The quantity which has to be transmitted can be scaled via an upper and a lower value. The scaling is carried out linear. The inputs can also be afflicted with signs.

Value	Lower and upper setting value
Vol 1	0..650.00 kV
Vol 2	0..650.00 kV
Vol 3	0..650.00 kV
V N-ph	0..650.00 kV
V N-ph H	0..650.00 kV
V N-ph L	0..650.00 kV
Vol 1-2	0..650.00 kV
Vol 2-3	0..650.00 kV
Vol 3-1	0..650.00 kV
V ph-ph	0..650.00 kV
V ph-ph H	0..650.00 kV
V ph-ph L	0..650.00 kV
Freq	30.00..80.00 Hz
Cur 1	0..9,999 A
Cur 2	0..9,999 A
Cur 3	0..9,999 A
Cur	0..9,999 A
Cur H	0..9,999 A
Cur L	0..9,999 A
Cur(+/-)1[1]	-9,999..+9,999 A
Cur(+/-)2[1]	-9,999..+9,999 A
Cur(+/-)3[1]	-9,999..+9,999 A
Cur(+/-)[1]	-9,999..+9,999 A
Cur(+/-)H[1]	-9,999..+9,999 A
Cur(+/-)L[1]	-9,999..+9,999 A
Power	-99.99..+99.99 MW
Re. Pow.	-99.99..+99.99 Mvar
Ap. Pow.	0..150.00 MVA
cosphi	i0.01..1.00..c0.01

[1] .....The symbol of the current values is defined via the polarity of the active components.

Analog. output 1
{xx-xx}mA

Output range {xx-xx} -20..+20 / 0..20 / 4..20 mA / OFF

20 mA analog output (the upper value is always +20 mA)
-20..20 mA ... By outputting the lower value -20 mA are output.
0..20 mA ..... By outputting the lower value 0 mA are output.
4..20 mA ..... By outputting the lower value 4 mA are output.
OFF ..... If this parameter is set to "OFF", 0 mA is output, and the following screen masks are not displayed.

Analog. output 1

Output value of the analog output see list above

Select the value to be output (please take the table above into account).

Example for a 4..20 mA output

Analog. output
4mA = ----------

Scaling of the lower output values see list above

Determination of the lower value.

Example for a 4..20 mA output

Analog. output
20mA = ----------

Scaling of the upper output values see list above

Determination of the upper value.

4.6 Maximum Demand counter

Maximum Demand
ON

Maximum Demand counter ON/OFF

ON ..... The Maximum Demand counter is enabled, and the following screen of this function is visible.

OFF ..... The Maximum Demand counter is disabled, and the following screen of this function is not visible.

Maximum Demand
P.duration 00m

Maximum Demand counter cycle duration 1..30 minutes

The functionality "Maximum Demand counter" is based on the determination of the real power within a certain time period of the period duration T. The length of the period duration can be selected here by 1..30 minutes freely. The real power is mostly determined during one period by 15 minutes. This measuring concept is implemented by the determination of the effect work within small time periods t of the length 10 seconds, so that also short real power points can be entered. The values of the individual time periods result from education of the arithmetic average value from 500 individual values, which are determined every 20 ms. So that with the following determination for "Maximum Demand" no synchronization problems occur, no fixed start and end point are given, but applied the procedure of the "Sliding Window". Here the period duration becomes e.g. in 90 (for 15 minutes Maximum Demand) or in 180 (for 30 minutes Maximum Demand) paragraph of the length 10 seconds partitions. Subsequently, the performance from the measured values is formed. According to applying further 10 seconds a new power rating is determined, after the oldest time period was replaced to the new 10 second value. By this rotary system the possibility exists of receiving every 10 seconds the current power rating of the last period. This maximum Demand value determined every 10 seconds at the display of the device is then output.

Real power value of the current display (for a period duration of x minutes):

$$P = \frac{\sum_{t=1}^{X} W_t}{T}$$

4.7 Serial interface

ATTENTION!

The function of the interface is restricted during configuration via the service interface. The parameter "Direct para." must be set to "NO" to make the serial interface available (also see chapter 4.1.3 "Enable/disable service interface" on page 15).

4.7.1 Masks for protocol CAN bus

Device number CAN-Bus 00	Device number CAN bus	1..15
	The device number with CAN bus is entered here. The device number interferes with the calculation of the sending and control-ID.	
Baudrate 000	Baudrate CAN bus	125 / 250 / 500 kBaud
	Setting of the baudrate.	
Base-ID (send) 0000	Base - ID send	0..2,015
	The ID, from which the device is sending its operating data, is calculated from the base-ID-send plus the device number.	

4.7.2 Masks for protocol MOD bus RTU slave

Device number MOD-Bus 000	Device number MOD-Bus RTU Slave	0..255
	Device number for the MOD-Bus RTU Slave.	
Baudrate 0000	Baudrate MOD-Bus RTU Slave	1,200 / 2,400 / 4,800 / 9,600 / 19,200 Baud
	The baudrate of the MOD-Bus RTU Slave is defined here.	
Parity none	Parity MOD-Bus RTU Slave	none / even / odd
	The parity of the MOD-Bus RTU Slave is defined here.	
Stopbits one	Stoppbits MOD-Bus RTU Slave	one / two
	The number of stoppbits of the MOD-Bus RTU Slave is defined here.	
Delay to send MOD-Bus 00.0ms	Waiting time sending after read request	0.2..50.0 ms
	After the read request by the master waiting time for the response is at least as long as the pre-set time. This way, the time behaviour of the master can be adjusted appropriately, thus ensuring an adequate processing of the response.	

4.8 Change passwords

NOTE

Once the code level is set, it will not be changed even after entering the configuration repeatedly. If an incorrect code number has been entered, the code level is set to CS0, thus locking the device for external persons.

If for 2 hours uninterruptedly supply voltage is applied, the device autom. switches to code level 0.

Define level 1
Code 0000

Code level 1 (client) 0..9999

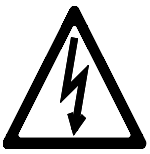
This masks appears only from code level 2. After entering the digits into this mask, the code level for level 1 (client) is set. After entering the code, the client only has the access rights assigned to him.
This code level (CS) is preset to CS1 = 0 0 0 1

Define level 2
Code 0000

Code level 2 (commissioning engineer) 0..9999

This masks only appears from code level 2. After entering the digits into this mask, the code level for level 2 (technician) is set. After entering the code, the technician has the access rights with which he was assigned.
This code level (CS) is preset to CS2 = 0 0 0 2

5 Commissioning



DANGER !!!

When commissioning the unit, please observe the five safety rules that apply to the handling of live equipment. Make sure that you know how to provide first aid in current-related accidents and that you know where the first-aid kit and the nearest telephone are. Never touch any live components of the system or on the back of the system:

DANGER TO LIFE

WARNING !

The unit may only be commissioned by a qualified technician. Before commissioning the unit, make sure that The EMERGENCY OFF function works properly and does not depend on the unit.

ATTENTION !

1. Before commissioning the unit, check that all measuring voltages are correctly connected with respect to the phases. The rotating field must be measured. Any lack or incorrect connection of measuring voltages or other signals may lead to incorrect functions and damage the unit as well as machines and components connected to the unit!

Course of action

2. Following a check whether all measuring voltages have been connected in the correct phase relation, the power supply must be applied.
3. Enter all required parameters using either the push-buttons or the configuration software.

6 Appendix

6.1 Measuring system configuration

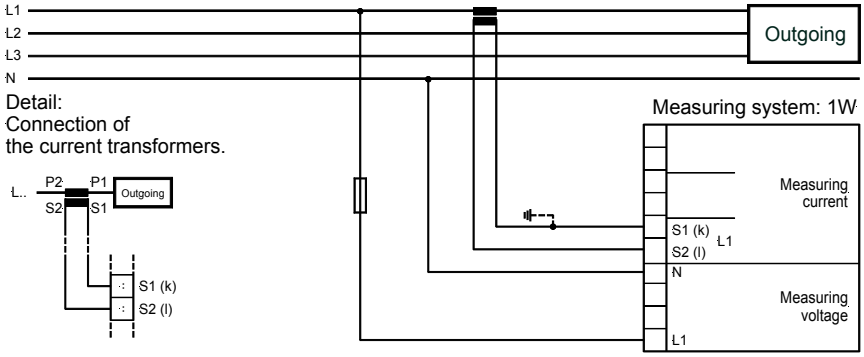
ATTENTION !

The grounding of the N-wire of the voltage measurement must not be effected at *MPU1-F*, but must be carried out at a central place (PEN-System).

6.1.1 Configuration 1W

Single-phase system

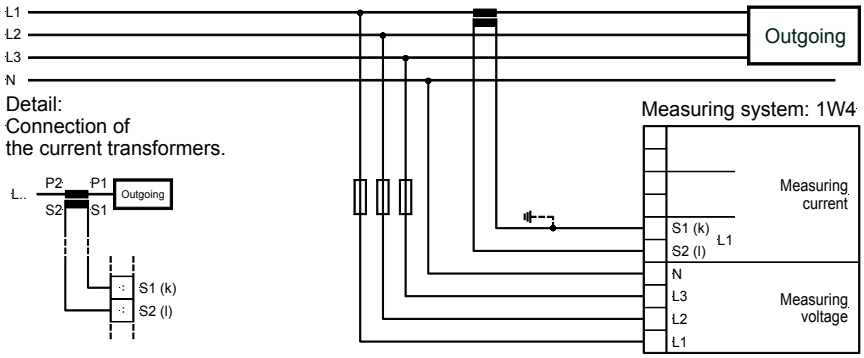
- Voltage measurement in phase L1 ($P = U_{L1N} \times I_{L1} \times \cos\varphi$)
- Current measurement in phase L1
- Grounding of the transformer terminals pointing into the direction of the outgoing.



a.) Configuration 1W4

Three-phase system

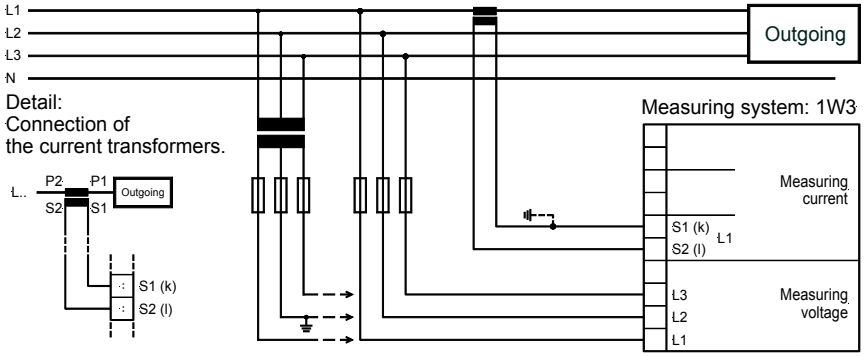
- 4-wire system ($P = \sqrt{3} \times U_{L12} \times I_{L1} \times \cos\varphi$)
- Symmetrical load
- Voltage measurement in phase L1, L2 and L3
- Current measurement in phase L1
- Grounding of the transformer terminals pointing into the direction of the outgoing.



6.1.2 Configuration 1W3

Three-phase system

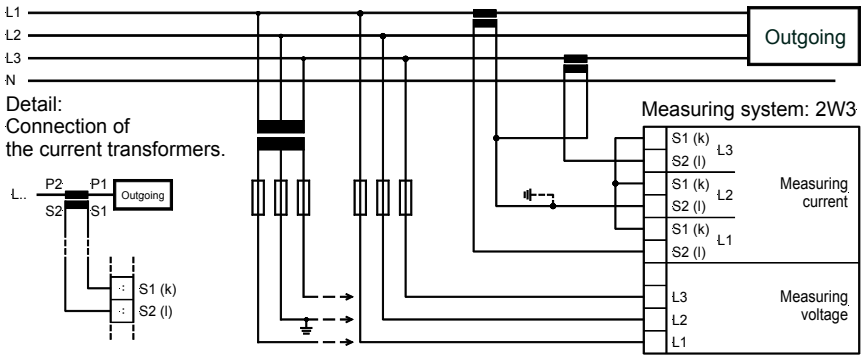
- 3-wire system
- Symmetrical load
- Voltage measurement in phase L1, L2 and L3
- Current measurement in phase L1
- Grounding of the transformer terminals into the direction of the outgoing.



6.1.3 Configuration 2W3

Three-phase system

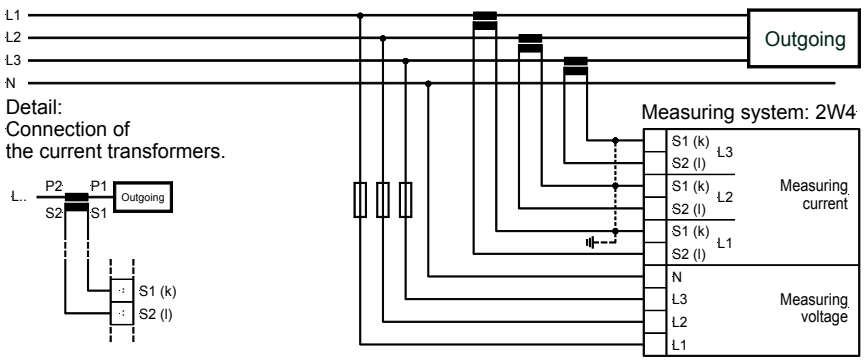
- 3-wire system
- Asymmetrical load
- Voltage measurement in phase L1, L2 and L3
- Current measurement in phase L1 and L3 (Aron connection)
- Grounding of the neutral point (fan-in of both transducer terminals)



6.1.4 Configuration 2W4

Three-phase system

- 4-wire system
- Asymmetrical load
- Voltage measurement in phase L1, L2 and L3
- Current measurement in phase L1, L2 and L3
- Grounding of the transformer terminals into the direction of the outgoing.



6.2 Interface

No.	CAN bus	CONTENT	Unit (Formula)	Note
1	Mux 0 Word 1	Kennung	"1400"	Telegram type
2	Mux 0 Word 2	Gen.voltage L1 L2	$(10^{UGNEXPO})$V	The actual value has to be calculated using the voltage exponent UGNEXPO with the value transmitted via the interface.
3	Mux 0 Word 3	Gen.voltage L2 L3	$(10^{UGNEXPO})$V	
4	Mux 1 Word 1	Gen.voltage L3 L1	$(10^{UGNEXPO})$V	
5	Mux 1 Word 2	Gen.voltage L1 N	$(10^{UGNEXPO})$V	
6	Mux 1 Word 3	Gen.voltage L2 N	$(10^{UGNEXPO})$V	
7	Mux 2 Word 1	Gen.voltage L3 N	$(10^{UGNEXPO})$V	
8	Mux 2 Word 2	Gen.frequency L1/L2	$\frac{1}{100}$Hz	
9	Mux 2 Word 3	Gen.current L1	$(10^{IGNEXPO})$A	The actual value has to be calculated using the current exponent IGNEXPO with the value transmitted via the interface.
10	Mux 3 Word 1	Gen.current L2	$(10^{IGNEXPO})$A	
11	Mux 3 Word 2	Gen.current L3	$(10^{IGNEXPO})$A	
12	Mux 3 Word 3	Gen. cosφ	$\frac{1}{100}$	Real value / Transmitted value cosφ = –0,98 k — Hex FF9E cosφ = –0,99 k — Hex FF9D cosφ = 1,00 — Hex 0064 cosφ = +0,99 i — Hex 0063 cosφ = +0,98 i — Hex 0062
13	Mux 4 Word 1	Gen.real power	$(10^{PGNEXPO})$W	The actual value has to be calculated using the power exponent PGNEXPO with the value transmitted via the interface.
14	Mux 4 Word 2	Gen.reactive power	$(10^{PGNEXPO})$var	The actual value has to be calculated using the power exponent PGNEXPO with the value transmitted via the interface.
15	Mux 4 Word 3	Internal	Internal	Internal
16	Mux 5 Word 1	Internal	Internal	Internal
17	Mux 5 Word 2	Exponents	1	LowByte: UGNEXPO (voltage) HighByte: IGNEXPO (current)
18	Mux 5 Word 3	Exponents	1	LowByte: PGNEXPO (power) HighByte: internal
19	Mux 6 Word 1	Gen.real energy HighWord	2^{16} kWh	Positive real energy
20	Mux 6 Word 2	Gen.real energy LowWord	kWh	Positive real energy
21	Mux 6 Word 3	Discrete inputs		Bit 0-3: DI 1 term. 3 Bit 4-7: DI 2 term. 4 Bit 8-11: DI 3 term. 5 Bit 12-15: DI 4 term. 6 H'0=DI not active H'F=DI active
22	Mux 7 Word 1	Internal	Internal	
23	Mux 7 Word 2	Internal	Internal	
24	Mux 7 Word 3	Internal	Internal	
25	Mux 8 Word 1	Internal	Internal	PMD (MaximumDemand)
26	Mux 8 Word 2	Internal	Internal	Internal
27	Mux 8 Word 3	Internal	Internal	Internal
28	Mux 9 Word 1	Gen.real energy HighWord	2^{16} kWh	Negative real energy
29	Mux 9 Word 2	Gen.real energy LowWord	kWh	Negative real energy
30	Mux 9 Word 3	Gen.reactive energy HighWord	2^{16} kvarh	Positive reactive energy (inductive)
31	Mux 10 Word 1	Gen.reactive energy LowWord	kvarh	Positive reactive energy (inductive)
32	Mux 10 Word 2	Gen.reactive energy HighWord	2^{16} kvarh	Negative reactive energy (capacitive)
33	Mux 10 Word 3	Gen.reactive energy LowWord	kvarh	Negative reactive energy (capacitive)

6.3 Accuracy

Measuring quantity	*Display*	*Accuracy*[1]	*Range*	*Remark*
Frequency				
f_{L1}	30.0..80.0 Hz	±0.05 Hz	30.0..80.0 Hz	
Voltage				
U_{L1}, U_{L2}, U_{L3}, U_{L12}, U_{L23}, U_{L31}	0..650.00 kV	0.5 %	0..650.00 kV	Adjustable transducer relation
Current				
I_{L1}, I_{L2}, I_{L3}	0..9,999 A	0.5 %	0..9,999 A	-
Max. value I_{L1}, I_{L2}, I_{L3}	0..9,999 A	0.5 %	0..9,999 A	Slave pointer
Real power				
Total real power value	-99.99..+99.99 MW	1 %	-99.99..+99.99 MW	-
Re-active power				
Actual value in L1, L2, L3	-99.99..99.99 Mvar	1 %	-99.99..99.99 Mvar	-
Apparent power				
Actual value in L1, L2, L3	0..150.00 MVA	1 %	0..150.00 MVA	-
Power factor cos φ				
$\cos \varphi_{L1}$	i0.01..1.00..c0.01	1.5 °	i0.01..1.00..c0.01	-
Miscellaneous				
Active energy	0..4,200 GWh	2 %	0..4,200 GWh	Not calibrated
Active energy (impulse)		-		Impulse output
Re-active energy	0..4,200 Gvarh	2 %	0..4,200 Gvarh	Not calibrated
Re-active energy (impulse)		-		Impulse output

Reference conditions for the accuracy

[1] The details are valid for the following reference conditions:

- Input voltage = sinusoidal rated voltage
- Input current = sinusoidal rated current
- Frequency = rated frequency ± 2 %
- Power supply = rated voltage ± 2 %
- Power factor = 1
- Ambient temperature 23 °C ± 2 K
- Warming-up period = 20 minutes.

6.4 Technical data

Measuring values

- Measuring voltage ..... 100/110 V_{AC} and 400 V_{AC}
- Measuring currents ..... /1 A or ../5 A
- Measuring frequency ..... 30.0..80.0 Hz
- Accuracy ..... class 0.5

Environmental variables

- Power supply (U_{AUX}) ..... 9.5..32 V_{DC}
- Intrinsic consumption ..... max. 10 W
- Ambient temperature ..... -20..70 °C
- Ambient humidity ..... 95 %, non-condensing

Measuring inputs

• Voltage ..... resistances 0.1 %
- Continuous input voltage ..... 2.0 × U_N
- Linear measuring range up to ..... 1.3 × U_N
- Input resistance ..... 0.21 MΩ
- Maximum power consumption per path ..... 0.15 W

• Current ..... metallically separated
- Maximum continuous current ..... 1.5 × I_N
- Power consumption ..... < 0.15 VA
- Rated short time current (1 s) ..... [..1/ A] 50.0 × I_N, [../5 A] 10.0 × I_N

Digital inputs

- Metallically separated
- Input range ($U_{Cont, digital input}$) ..... nom. 24 V_{DC} (4..40 V_{DC})
- Input resistance ..... approx. 6.8 kΩ

Analog outputs

- At rated output ..... freely scalable, metallically separated, insulation voltage 3,000 V_{DC}
- -20/0/4..20 mA output ..... maximum load 400 Ω

Interface

- Metallically separated ..... insulation voltage 3,000 V_{DC}
- Version ..... variable

Housing

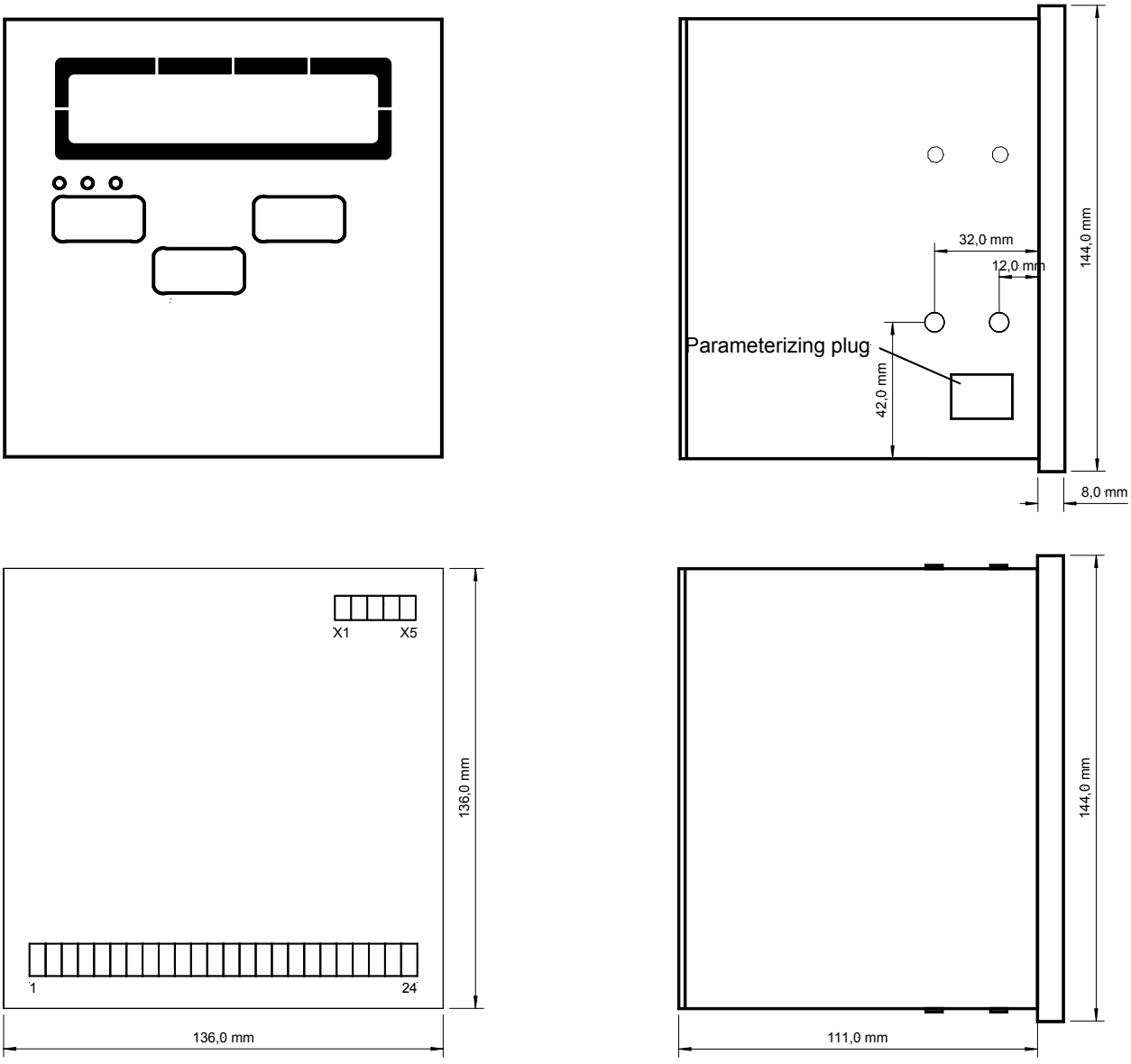
- Type ..... APRANORM DIN 43 700
- Dimensions (W×H×D) ..... 144 × 144 × 118 mm
- Front cutout (W×H) ..... 138 × 136 mm
- Connection ..... 1.5 mm² or 2.5 mm² screw terminals depending on the plug connector
  use 60/75 °C copper wire only; use class 1 wire only or equivalent
- Weight ..... depending on model, approx. 500 g

Protection

- Disturbance test (CE) ..... tested according to valid EN codes of practice
- Degree of protection (for the build-in housing) ..... IP 21, front IP 54
- Front foil ..... insulating surface

6.5 Dimensions

Housing	Type APRANORM DIN 43 700
Dimensions	144 × 144 × 118 mm
Front cutout	138 × 136 mm
Connection	screw terminals depending on plug connector 1.5 mm² or 2.5 mm²
Weight	depending on the model, approx. 500 g



2002-07-03 MPU 1-F Abmessungen Woodward mpu1fseg-2702-ab.skf

7 Parameter list MPU1

MPU1-F – Multiple Measuring Converter

Model _____

Project _____

Unit number _____ Date _____

	Parameter Line 1 - Text - Line 2	Setting range 1/5 A	Standard- setting	Customer's settings	
	SPRACHE/LANGUAGE	German/English	English	☐ g ☐ e	☐ g ☐ e
	Software version	-	Vx.xxx		
	Password Protection	ON/OFF	ON	☐ on ☐ off	☐ on ☐ off
	Direct parametr.	YES/NO	NO	☐ Y ☐ N	☐ Y ☐ N
	BASIC SETTINGS				
	Volt. transformer secondary	50..480 V	400 V		
	Volt. transformer primary	0.10..650.00 kV	0.400 kV		
	Current transf.	1..9,999/x A	1,000/x A		
	Connection type	1W/1W4/1W3 2W3/2W4	2W4		
	ENERGY COUNTER				
	Pulse output P.duration	0.04..1.00 s	0.10 s		
	Pulse output	+kWh/-kWh +kvarh/-kvarh	+kWh		
	Pulse/kWh Logic	positive/negative	Negative	☐ p ☐ n	☐ p ☐ n
	Active energy Pulse/kWh	0.10..150.00	1.00		
	Display kWh +- on? YY	Y/N	YY		
	Display kvarh +- on? YY	Y/N	YY		
	RESET kWh/kvarh	ON/OFF	ON	☐ on ☐ off	☐ on ☐ off
	Display 2 kWh + on? Y	Y/N	Y	☐ Y ☐ N	☐ Y ☐ N
	COMMON MASKS				
	Refresh time Display	0.0..5.0 s	0.20 s		
	Measuring filter Voltage	OFF/0.04/0.08/0.16 /0.32/0.64/1.28/ 2.65 s	0.08 s		
	Measuring filter Current		0.08 s		
	Measuring filter Power		0.08 s		
	Measuring filter Frequency		0.08 s		
	MAXIMUM DEMAND				
	Maximum Demand	YES/NO	YES	☐ Y ☐ N	☐ Y ☐ N
	Maximum Demand P.duration	1..30 min	15 min		
	ANALOG OUTPUT CONFIGURATION				
	Analog. output	OFF 0..20 mA 4..20 mA -20..+20 mA	OFF	☐ OFF ☐ 0..20 ☐ 4..20 ☐ -/+20	☐ OFF ☐ 0..20 ☐ 4..20 ☐ -/+20
	Analog output	See list at the end of the list of parameters			
	Analog output 0/4/-20 mA				
	Analog output 20 mA				
	INTERFACE CONFIGURATION				
MOD	Device number MOD-Bus	0..255	1		
..	Baudrate	1,200/2,400/4,800 / 9,600/19,200 Baud	9,600 Baud		
..	Parity	none/even/odd	none		
..	Stopbits	one/two	one		
MOD	Delay to send MOD-Bus	0.2..50.0 ms	0.2 ms		
CAN	Device number CAN-Bus	1..15	1		
..	Baudrate	125/250/500 kBaud	125 kBaud		
CAN	Base-ID (send)	0..2,015	800		
	BASIC SETTINGS				
	Define level 1 code	0000..9999	0001		
	Define level 2 code	0000..9999	0002		

7.1 List with the setting ranges for the analog output

Value	Lower and upper setting value
Vol 1	0..650.00 kV
Vol 2	0..650.00 kV
Vol 3	0..650.00 kV
V N-ph	0..650.00 kV
V N-ph H	0..650.00 kV
V N-ph L	0..650.00 kV
Vol 1-2	0..650.00 kV
Vol 2-3	0..650.00 kV
Vol 3-1	0..650.00 kV
V ph-ph	0..650.00 kV
V ph-ph H	0..650.00 kV
V ph-ph L	0..650.00 kV
Freq	30.00..80.00 Hz
Cur 1	0..9.999 A
Cur 2	0..9.999 A
Cur 3	0..9.999 A
Cur	0..9.999 A
Cur H	0..9.999 A
Cur L	0..9.999 A
Cur(+/-)1[1]	-9.999..+9.999 A
Cur(+/-)2[1]	-9.999..+9.999 A
Cur(+/-)3[1]	-9.999..+9.999 A
Cur(+/-)[1]	-9.999..+9.999 A
Cur(+/-)H[1]	-9.999..+9.999 A
Cur(+/-)L[1]	-9.999..+9.999 A
Power	-99.99..+99.99 MW
Re. Pow.	-99.99..+99.99 Mvar
Ap. Pow.	0..150.00 MVA
cosphi	i0.01..1.00..c0.01

[1] .....The symbol of the current values is defined via the polarity of the active components.

Woodward Kempen GmbH
Krefelder Weg 47 · D – 47906 Kempen (Germany)
Postfach 10 07 55 (P.O.Box) · D – 47884 Kempen (Germany)
Phone: +49 (0) 21 52 145 1

Internet
www.woodward.com

Sales
Phone: +49 (0) 21 52 145 216 or 342 · Telefax: +49 (0) 21 52 145 354
e-mail: salesEMEA_PGD@woodward.com

Service
Phone: +49 (0) 21 52 145 614 · Telefax: +49 (0) 21 52 145 455
e-mail: SupportEMEA_PGD@woodward.com