SIMEAS P

Power Meter

Instruction Manual

Edition: 25.02.04

E50417-B1076-C210-A7

Personal Safety Information

The warnings and notes contained in these operating instructions serve for your own safety and for an appropriate lifetime of the device. Please observe them!
The following indicators and standard definitions are used:

Warning

indicates that death, severe personal injury or substantial property damage can result if proper precautions are not taken.

Caution

indicates that minor personal injury or property damage can result if proper precautions are not taken. This particularly applies to damage on or in the device itself and consequential damage thereof.

Note

indicates information about the device or respective part of these operating instructions which is essential to highlight.

Qualified personnel
Commissioning and operation of the equipment (module, device) described in this manual may only be performed by qualified personnel. Qualified personnel, in the context of the safety information contained in this manual, are persons authorized to commission, start-up, ground and label devices, systems and circuits according to all applicable safety standards.

Use for the intended purpose
The equipment (device, module) may only be used for the applications specified in the catalog and the technical manual, and only in connection with OEM devices and components recommended and approved by Siemens.
The prerequisites for trouble-free, reliable operation of the product include proper transport, proper storage, proper installation and assembly, as well as proper operation and maintenance.
When operating electrical equipment, certain parts of this equipment are subject to dangerous voltage levels. Therefore, improper handling can result in serious injury or equipment damage:

- The equipment must be grounded at the PG terminal before making any connections whatsoever.
- Dangerous voltages may occur in all circuit components connected to the inputs or power supply.
- Dangerous voltages due to capacitor memory may still exist in the equipment even after it has been disconnected from the power supply or input circuits.
- Equipment with current transformer circuits must never be operated in any state where the current transformer circuits are open-circuited.
- The operating limits specified in the manual and in the operating instructions must not be exceeded at any time (including inspection and commissioning).

Foreword

Purpose of this Manual

This manual describes the functions, features, and operation of the SIMEAS P Power Meter.

Target Group

This manual is intended for all persons who will specify, test, calibrate, and/or use the SIMEAS P Power Meter.

Standards

The SIMEAS P Power Meter was developed to comply with ISO 9000 standards.

Additional Support

If you have questions concerning the SIMEAS P, please contact one of the following:

- Your local Siemens distributor
- The Siemens hotline (workdays from 7:30 to 17:00 h):
  - +0049(0)180- 5247000
  - Fax: 0180-5242471
    or
  - Email: support@ptd.siemens.de

Additional information is available at:

- www.powerquality.de
- www.simeas.com

Additional documents

- SIMEAS P Instruction manual PROFIBUS DP
  Ordering number E50417-B1076-C238
- SIMEAS P Instruction manual Modbus
  Ordering number E50417-B1076-C212
- SIMEAS P Betriebsanleitung/Operating Instructions
  Ordering number E50417-B1074-C247

Conformity

CE

This product complies with the directives of the Council of the European Communities in accordance with the laws of the Member States regarding electromagnetic compatibility (EMC Council Directive 89/336/EEC) and the application of electrical equipment within specified voltage limits (Low Voltage Directive 73/23/EEC).

Compliance has been verified via testing performed by Siemens AG as per article 10 of the Council Directives in accordance with the generic standards EN 50081-2 and EN 61000-6-2 (for EMC Directive) as well as EN 61010-1 (for Low Voltage Directive).

The device is designed and manufactured for application in industrial environments as defined in the standard EN 50081.

The device is designed and manufactured in accordance with the international standard IEC 60688, EN 60688 and DIN EN 60688.

Commissioning 1

1.1 Delivery

Delivery Note: The power meter will be delivered in a cardboard box containing the SIMEAS P logo.

Contents:

- 1 SIMEAS P Power Meter
- 2 Panel Mounting Fittings (only 7KG75xx/7KG76xx)
- 1 Operating Instructions (Ordering no. E50417-B1074-C247)
- 1 Return Card
- 1 Device Test Report
- 1 Battery VARTA CR2032 (only 7KG7200/7KG76xx)

Warning

Servicing of the battery circuit and replacing of the battery must be performed by qualified personnel only.

Battery may explode if mistreated:
Do not reverse the polarity! Do not disassemble! Do not completely discharge!
Do not throw the battery into a fire!

Warning

Hint on battery disposal

When discharged, or when properly secured against short-circuit, lithium batteries can be disposed of through retailers or at depots run by competent organizations (e.g. in Germany GRS collection points).

Caution

The Lithium-batteries in our equipment are subject to special provision 188/A45 of the dangerous goods regulations of the different transport modes (as in edition 2003, lithium content and tests of UN-Manual of Tests and Criteria).

This is only valid for the original battery or original spare batteries. For general transport security by shipment as freight: Electric equipment is only to be sent as freight if shut off.

1.2 Ordering Data

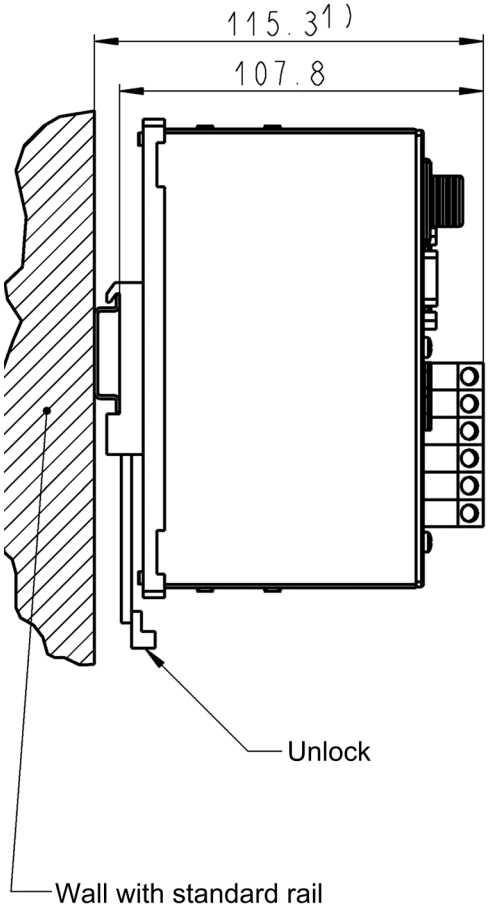
Description	Order-No.
Power Meter without display	
SIMEAS P100 Standard snap-on mounting unit	**7KG7 1 0 0 - 0 A A 0 0 - 0 A A 0**
SIMEAS P200 Extended snap-on mounting unit with real time module, battery and memory for recording of measured quantities	**7KG7 2 0 0 - 0 A A 0 0 - 0 A A 0**
Power Meter with graphic-display	
SIMEAS P500 Standard built-in device for control panels 144x144 with graphic-display	**7KG7 5 ☐ 0 - 0 A A 0 ☐ - 0 A A 0**
Version	
standard	**0**
With UL-listing	**5**
Front protection class	
IP 41	**1**
IP 54	**2**
SIMEAS P600 Extended built-in device for control panels 144x144 with graphic displayreal time clock module, battery and memory for recording of measured quantities	**7KG7 6 ☐ 0 - 0 ☐☐ 0 ☐ - 0 ☐☐ 0**
Version	
Standard without I/O-modules	**0 A A A A**
Standard with I/O-modules	**1**
with UL-listing without I/O-modules	**5 A A A A**
with UL-listing with I/O-modules	**6**
I/O-module in slot A	
without	**A**
2 binary outputs	**B**
2 binary inputs	**C**
2 analog outputs (0-20mA$_{DC}$)	**D**
2 analog inputs (0-20mA$_{DC}$)	**E**
3 relay outputs	**G**
I/O-module in slot B	
without	**A**
2 binary outputs	**B** *)
2 binary inputs	**C**
2 analog outputs (0-20mA$_{DC}$)	**D**
2 analog inputs (0-20mA$_{DC}$)	**E**
Front protection class	
IP 41	**1**
IP 54	**2**
I/O-module in slot C	
without	**A**
2 binary inputs	**C**
2 analog outputs (0-20mA$_{DC}$)	**D**
2 analog inputs (0-20mA$_{DC}$)	**E**
I/O-module in slot D	
without	**A**
2 binary inputs	**C**
2 analog outputs (0-20mA$_{DC}$)	**D**
2 analog inputs (0-20mA$_{DC}$)	**E**
Parameterization package SIMEAS P	
	7KG7 0 5 0 - 8 A ☐
Auxiliary power AC 230 V / 50 Hz	**A**
Auxiliary power AC 120 V / 60 Hz	**B**

*) only if position 9 ≠ G

1.3 Dimensions and Weight

1.3.1 For Devices 7KG7100 and 7KG7200

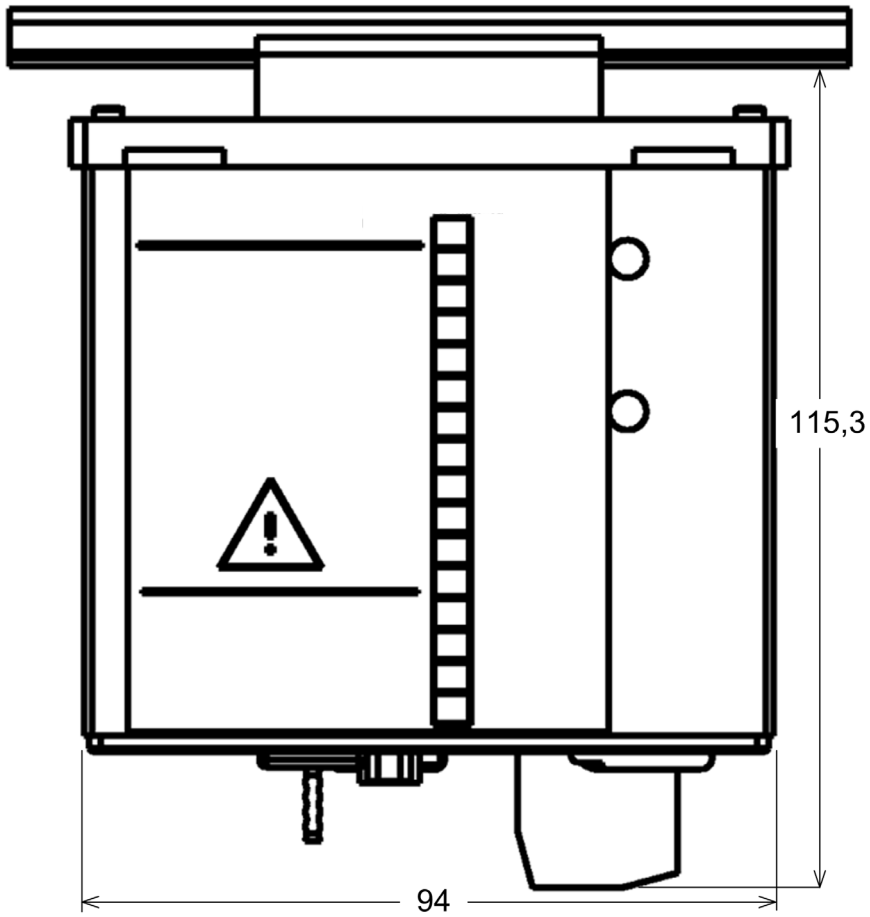
NOTE: All dimensions in mm.



[1)]Valid for a standard rail according to DIN EN 50022-35-7,5

Dimensions of the device (W x H x D): 94 x 142 x 115.3

NOTE: All dimensions in mm



Technical Data for Housing

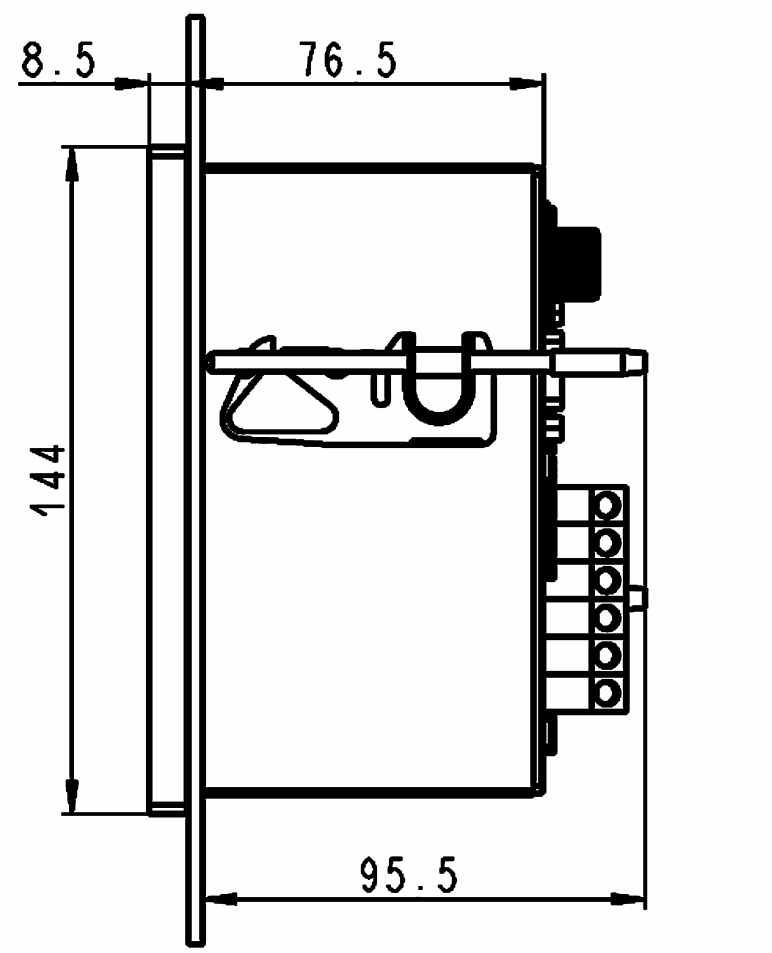
Housing:	Standard rail mounting
Protection Class:	for the device: IP 20 personal protection: IP 2x

Terminals

Auxiliary Supply:	Terminal for max. wire of 2.5 mm^2
Voltage Inputs:	Terminal for max. wire of 2.5 mm^2
Current Inputs:	Terminal for max. wire of 4 mm^2
Binary Outputs:	Terminal for max. wire of 2.5 mm^2
RS485-Interface:	9-pole D-SUB female connector

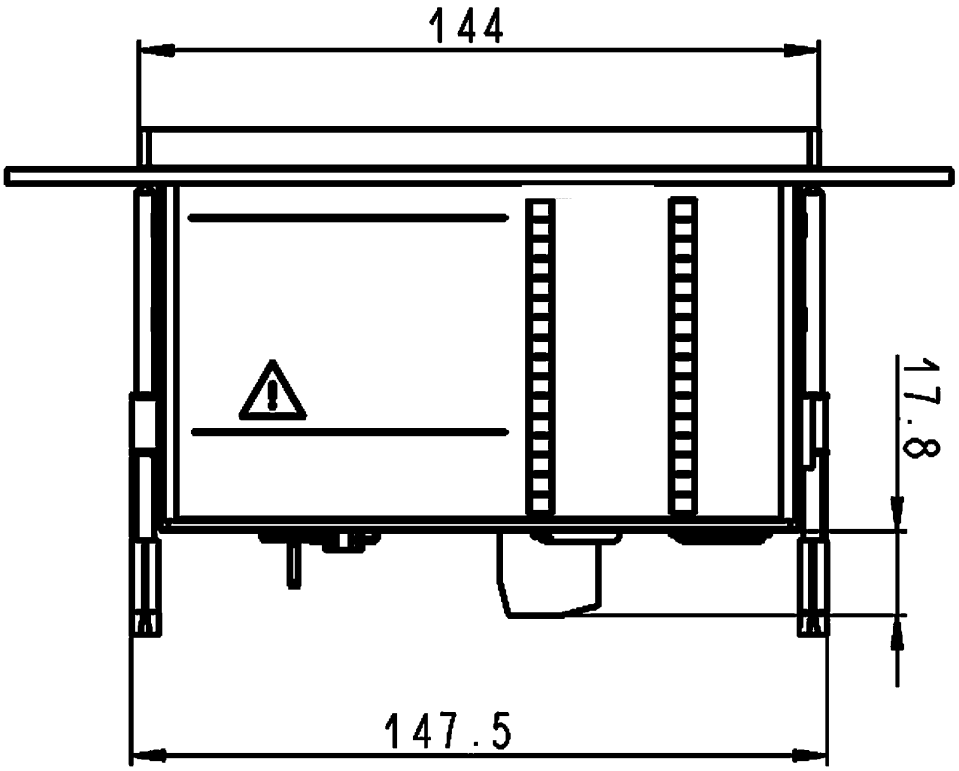
1.3.2 For Devices 7KG7500, 7KG7600 and 7KG7610

NOTE: All dimensions in mm.



Dimensions of the device (W x H x D): 144 x 144 x 95.5

NOTE: All dimensions in mm.



Technical Data for Housing

Housing:	Flush-mounting according to DIN 43700
Panel section:	138^{+1} x 138^{+1} mm
Protection Class:	for the device: IP 41 personal protection: IP 2x

Terminals

Auxiliary Supply:	Terminal for max. wire of 2.5 mm^2
Voltage Inputs:	Terminal for max. wire of 2.5 mm^2
Current Inputs:	Terminal for max. wire of 4 mm^2
Binary Outputs:	Terminal for max. wire of 2.5 mm^2
RS485-Interface:	9-pole D-SUB female connector
Input/output modules (optional, 7KG7610 only)	Terminal for max. wire of 2.5 mm^2

1.3.3 For Devices 7KG7550, 7KG7650 and 7KG7660

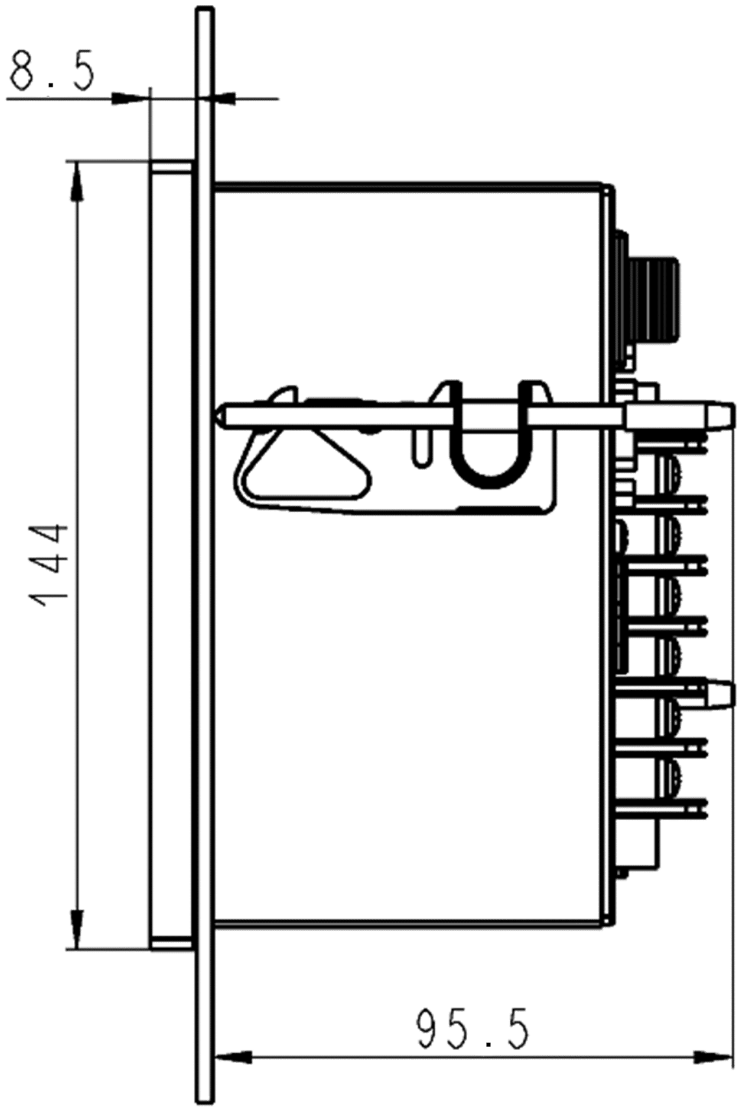
This product is UL-certified to Standard UL 61010B-1, based on the specification stated in Chapter 8.2 (Technical Data). UL File No.: E228586

c UL US LISTED

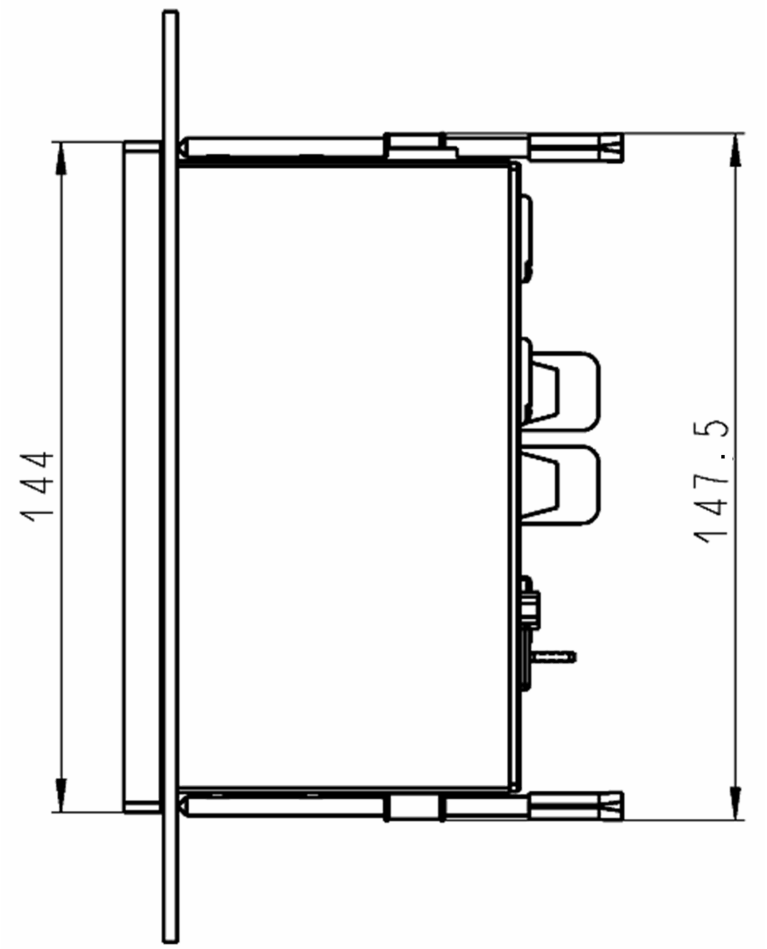
Measuring Equipment

2UD1

NOTE: All dimensions in mm.



NOTE: All dimensions in mm.



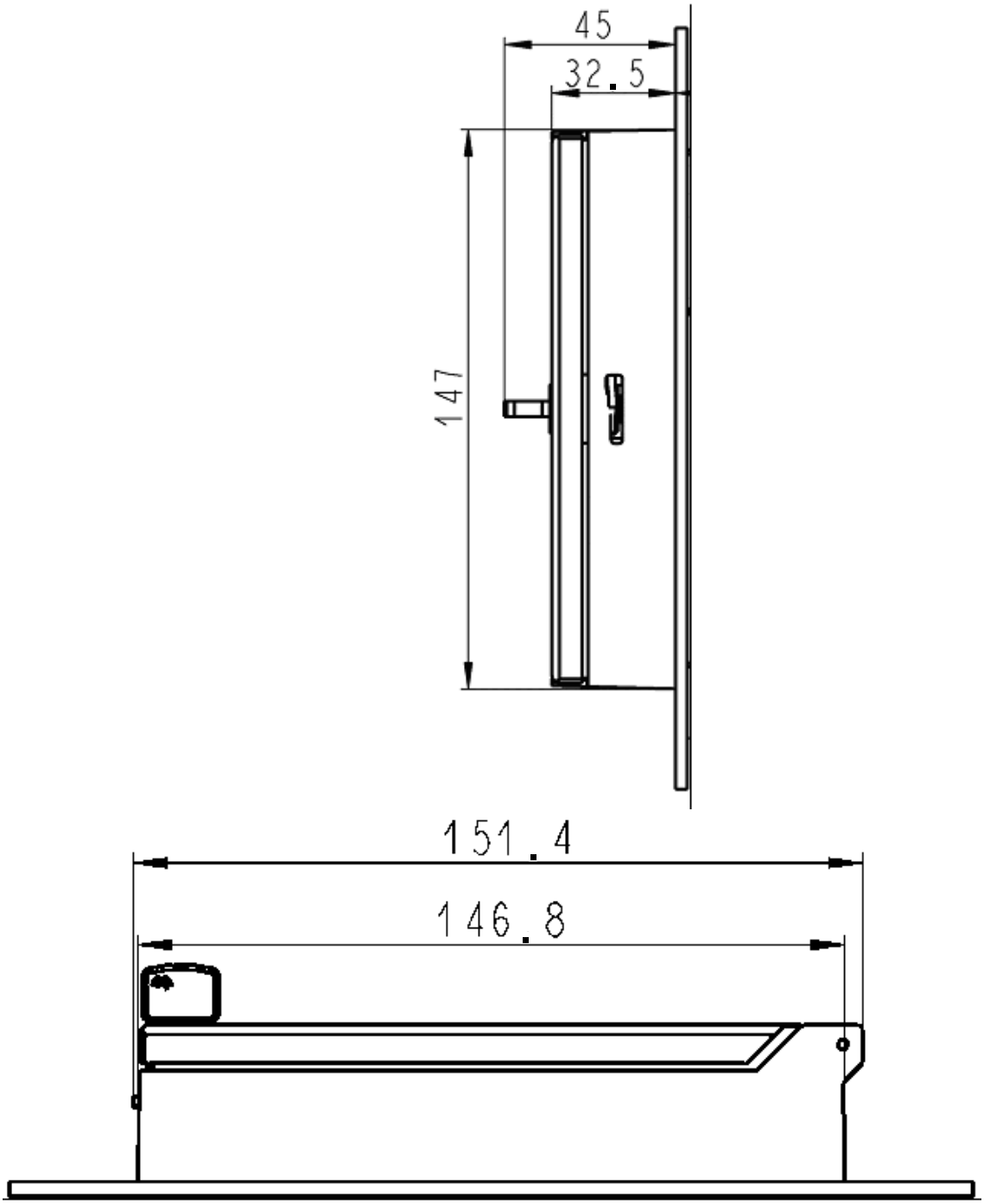
Technical Data for Housing

Housing:	Flush-mounting according to DIN 43700
Panel section:	138^{+1} x 138^{+1} mm
Protection Class:	for the device: IP 41 personal protection: IP 2x
Terminals	Screw-drive terminals
Power supply/PG:	Wire size #12-22 AWG
Voltage and current inputs:	Wire size #12-22 AWG
Contact outputs:	Wire size #12-22 AWG
RS485-Interface:	9-pole D-SUB female connector
Input/output modules (optional, 7KG7660 only)	Wire size #12-22 AWG

1.3.4 For Devices with IP54 Front

The devices 7KG75xx and 7KG76xx may be ordered with front protection class IP54 (see ordering data in section 1.2)

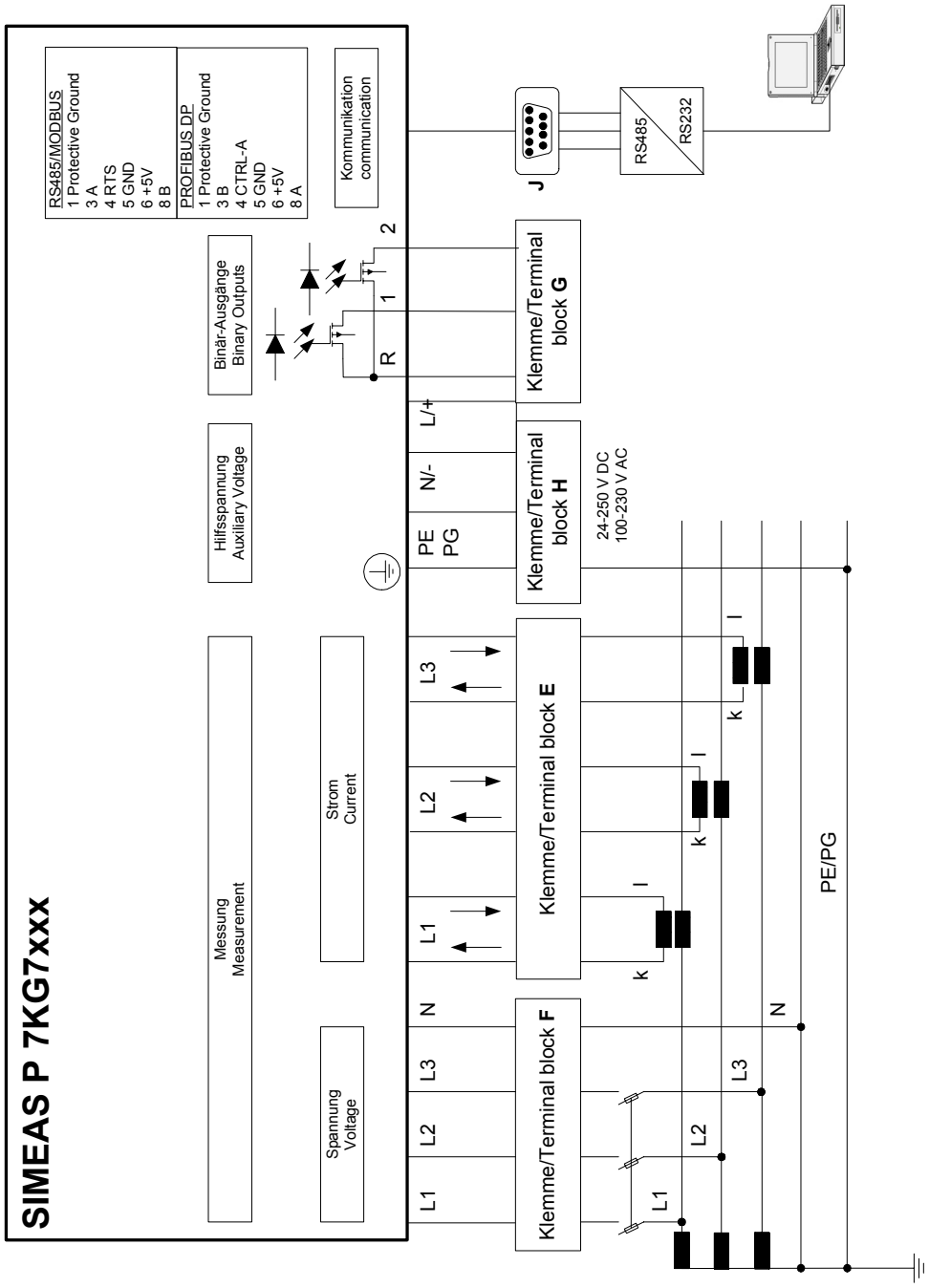
NOTE: All dimensions in mm.



- Additional technical data as stated above!

1.4 Block Diagram

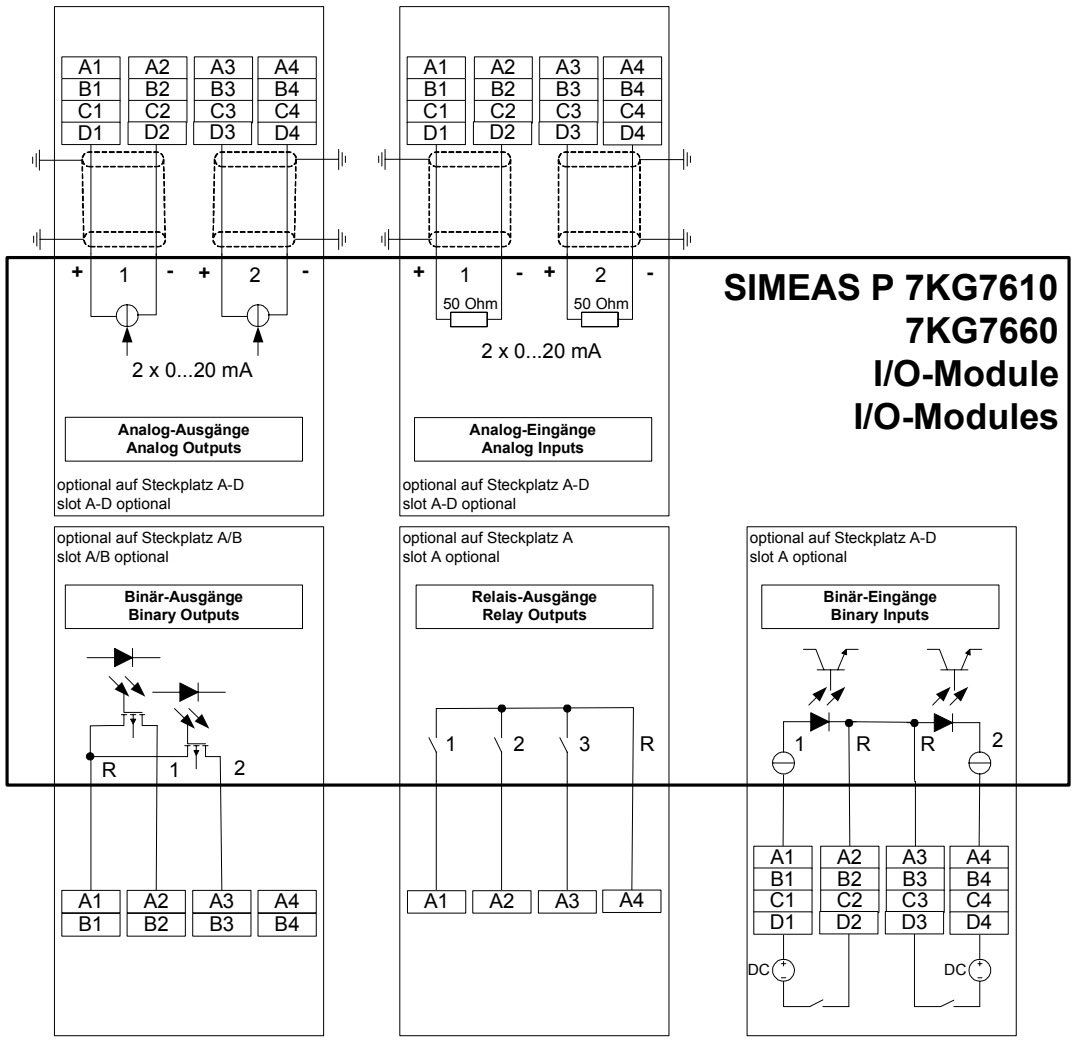
Basic device:



Note

In the devices 7KG7200 and 7KG76xx a battery is integrated. This battery serves to buffer the memory and the real-time clock.

I/O modules (optional):

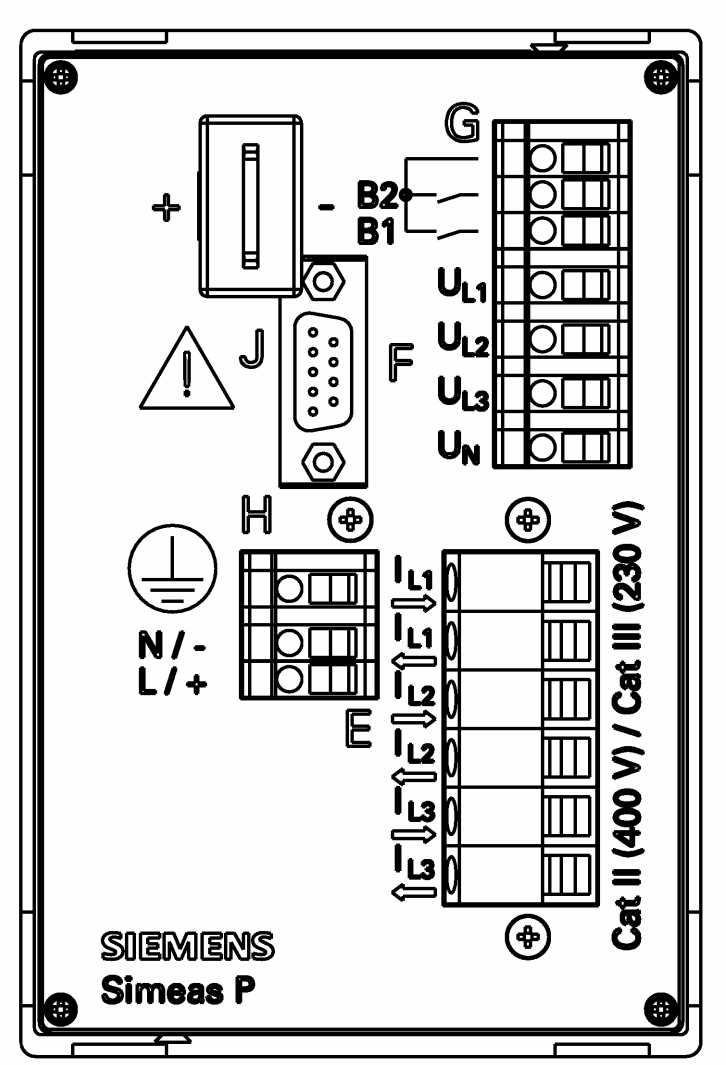


Additional input and output modules (see ordering data, section 1.2) are available for the devices 7KG7610 and 7KG7660:

- binary input (2 contacts with common contact)
- binary output (2 contacts with common contact)
- relay output (3 contacts with common contact)
- analog input (2 channels)
- analog output (2 channels)

1.5 Interface and Terminals

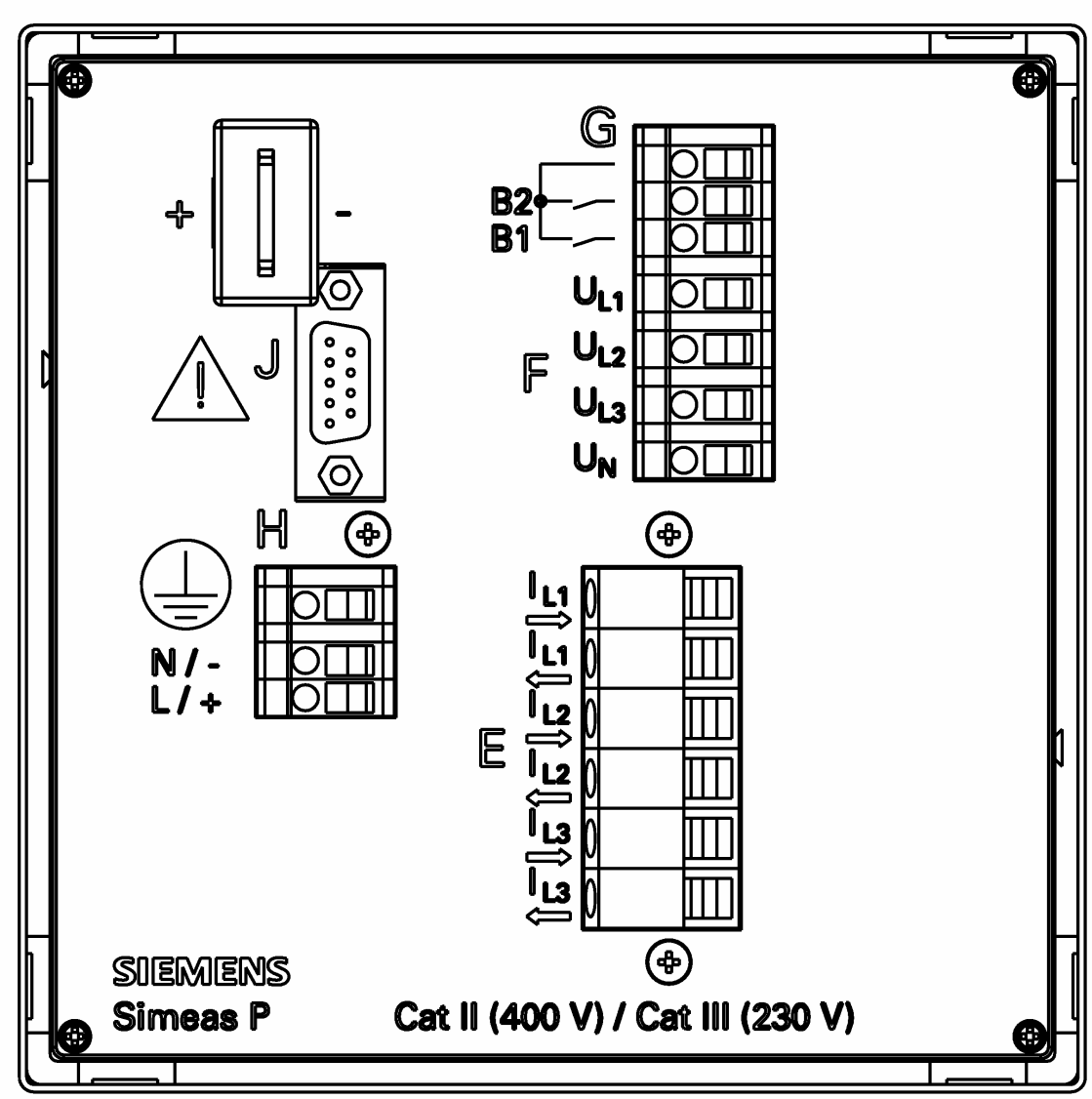
1.5.1 For Devices 7KG7100 and 7KG7200



Attention

A protective ground must be connected to the SIMEAS P prior to operation.

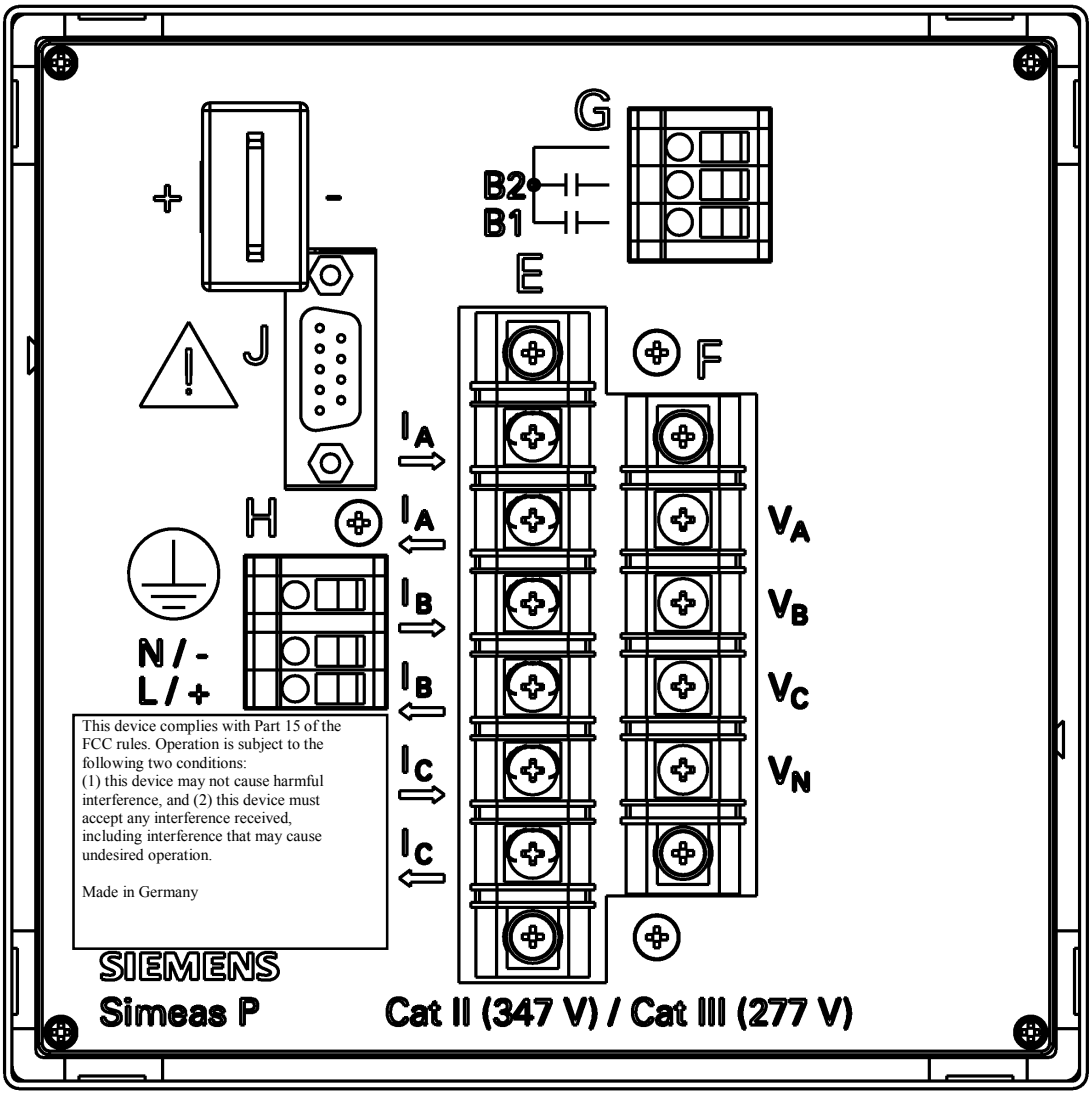
1.5.2 For Devices 7KG7500 and 7KG7600 (IP 41 and IP 54)



Attention

A protective ground must be connected to the SIMEAS P prior to operation.

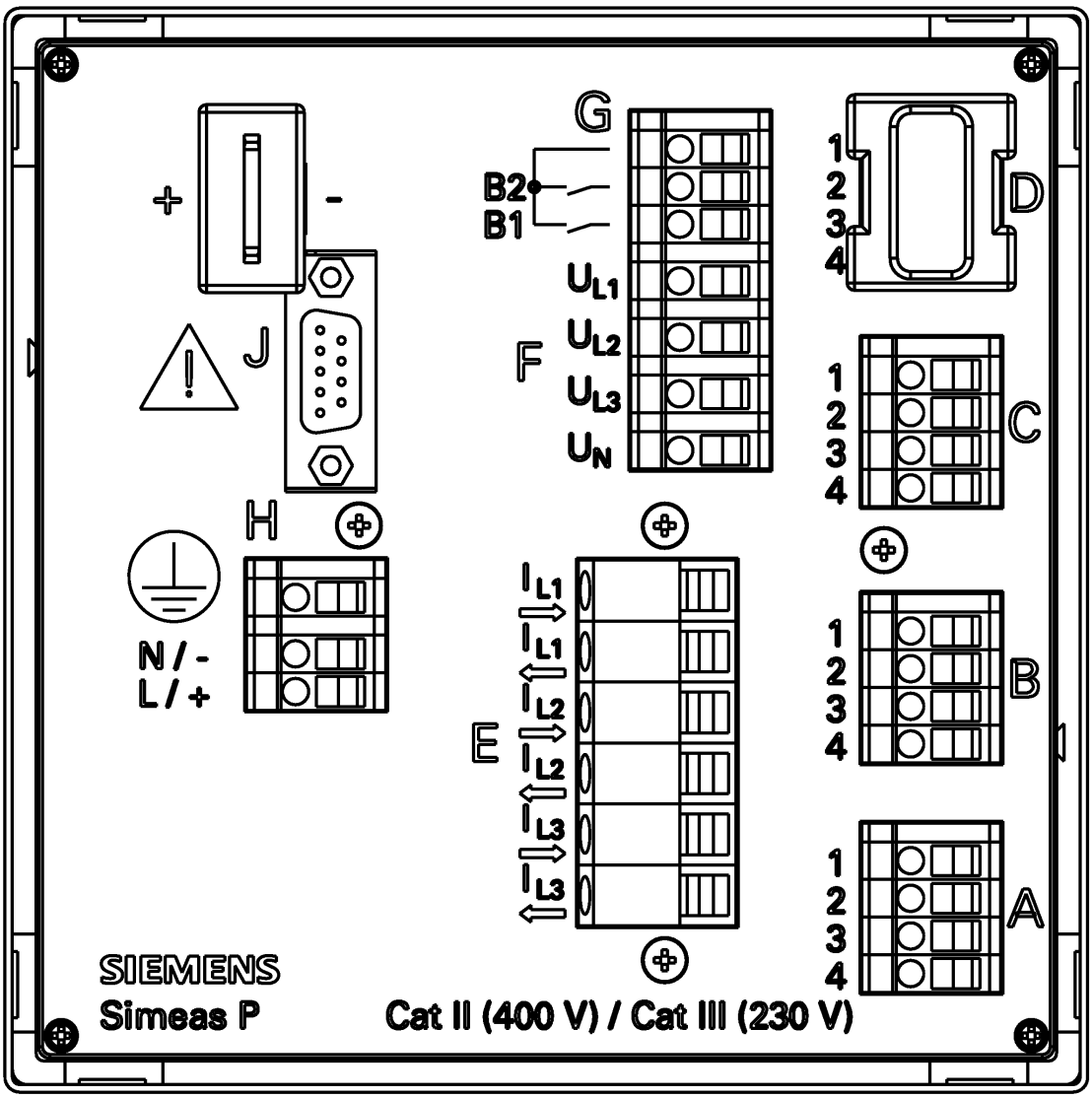
1.5.3 For Devices 7KG7550 and 7KG7650



Attention

A protective ground must be connected to the SIMEAS P prior to operation.

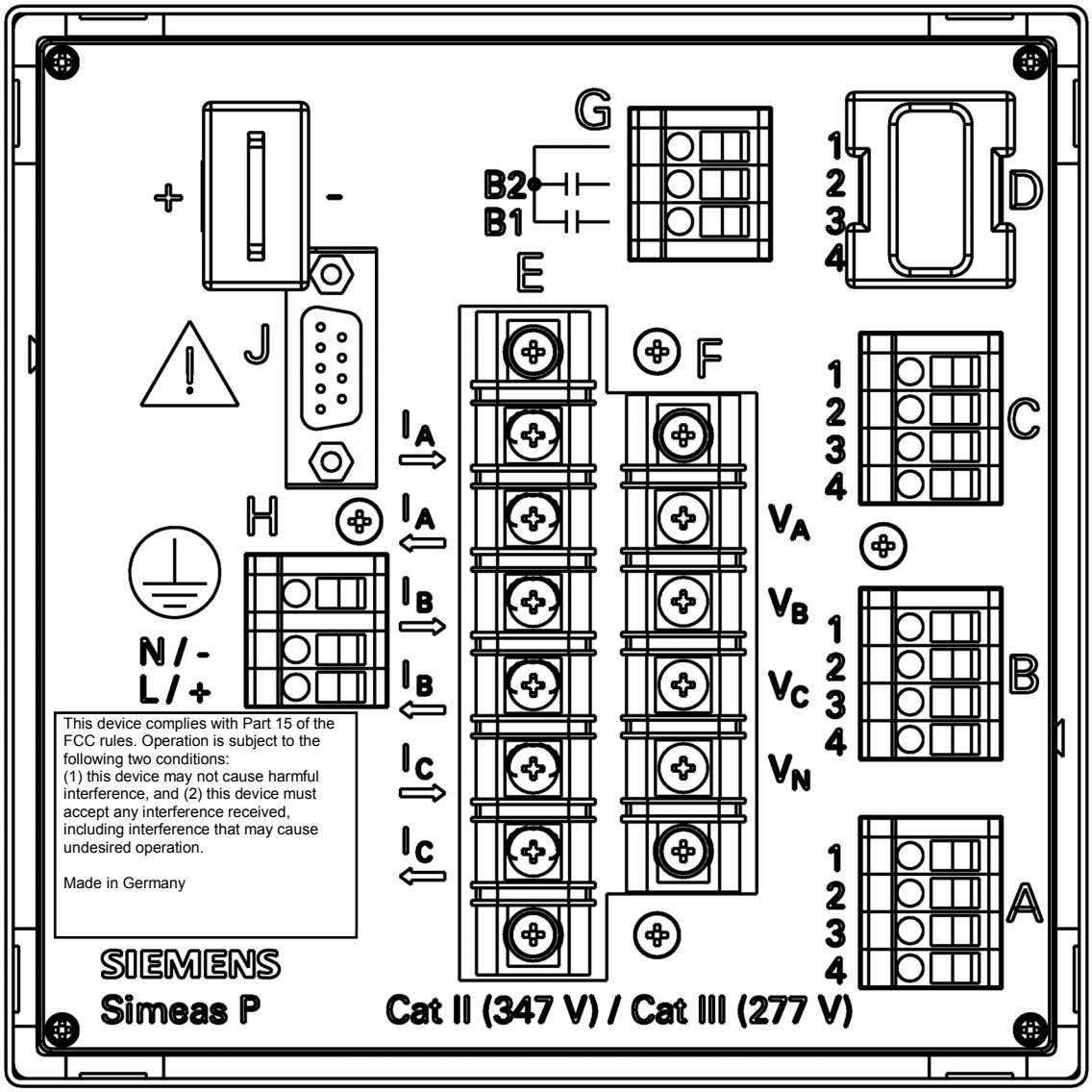
1.5.4 For Devices 7KG7610



Attention

A protective ground must be connected to the SIMEAS P prior to operation.

1.5.5 For Devices 7KG7660



Attention

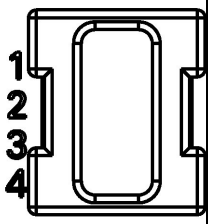
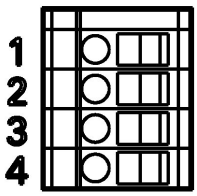
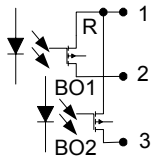
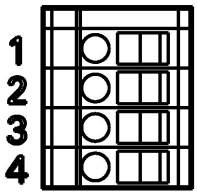
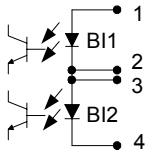
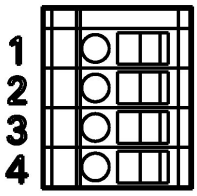
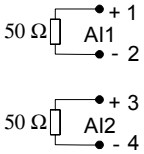
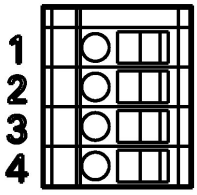
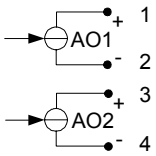
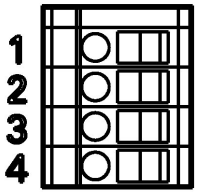
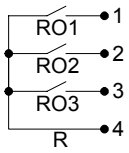
A protective ground must be connected to the SIMEAS P prior to operation.

1.5.6 Terminal Assignment

Table 1-1 Terminal Assignment

Terminal	**Function**		
E1	I_{L1}	I_A	Phase current 1, input
E2	I_{L1}	I_A	Phase current 1, output
E3	I_{L2}	I_B	Phase current 2, input
E4	I_{L2}	I_B	Phase current 2, output
E5	I_{L3}	I_C	Phase current 3, input
E6	I_{L3}	I_C	Phase current 3, output
F1	U_1	V_A	Phase voltage 1
F2	U_2	V_B	Phase voltage 2
F3	U_3	V_C	Phase voltage 2
F4	U_N	V_N	Star point voltage measurement
G1	Common contact	Common contact	Common contact for the internal binary outputs 1 and 2
G2	B2	B2	Contact output 2
G3	B1	B1	Contact output 1
H1			Protective ground (PG)
H2	N/-	N/-	Supply voltage -
H3	L/+	L/+	Supply voltage +
A1 ... A4	Optional for 7KG7610 and 7KG7660, see Table 1-2, I/O modules		
B1 ... B4			
C1 ... C4			
D1 ... D4			

Table 1-2 I/O modules

Module Type	Terminal	Allocation		Ordering Code (refer to section 1.2)
Not equipped				**A**
BO 2 binary outputs		BOR BO1+ BO2+ n.c.		**B**
BI 2 binary inputs		BI1+ BIR BIR BI2+		**C**
AO 2 analog outputs		AO1+ AO1- AO2+ AO2-		**D**
AI 2 analog inputs		AI1+ AI1- AI2+ AI2-		**E**
RO 3 relays outputs		RO1 RO2 RO3 ROR		**G**

1.5.7 Pin Assignment of the Communications Interface

Pin-#	RS485 interface	Profibus interface
1	Shield	Shield
2		
3	A	B (RxD/TxD-P)
4	RTS	CTRL-A
5	GND_{EXT}	GND_{EXT}
6	+5 V_{EXT}	+5 V_{EXT}
7		
8	B	A (RxD/TxD-N)
9		

The housing of the RS 485 interface (refer to "J" in 1.5.1 or 1.5.2) is connected to the protective ground.
We recommend to use standard connecting cables.
The bus termination is accomplished via the connecting cable.
The isolated supply voltage of the interface is available at the D-SUB female connector, thus allowing the data signal terminating resistors to be connected to the connecting cable.

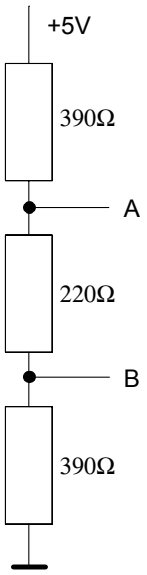


Figure 1-1: Termination of the RS485 interface (external)

1.5.8 Input Connection Examples

1.5.8.1 General

The following are examples of current and voltage input connections (according to DIN 43807). The device can be connected without current or voltage transformers as long as the maximum voltage and current ratings of the device are not exceeded.

The voltage transformers can be connected in wye or open-delta configurations.

All input and/or output terminals not required for a particular input voltage and current configuration are not used.

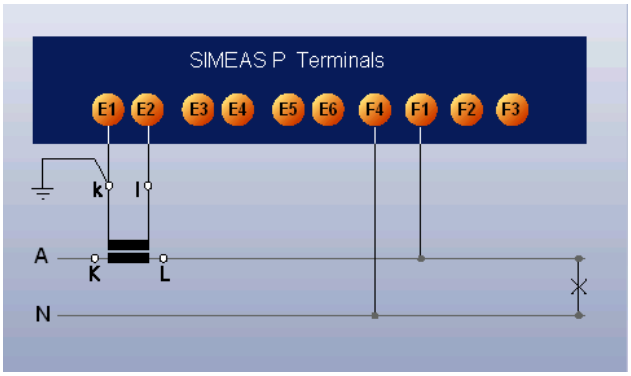
Terminal designation of measuring instruments for single-phase and three-phase alternating current
According to DIN 43807 / Oct. 1983:

DIN 43807	1	3	4	6	7	9	11	2	5	8
Terminal	I_A ↑	I_A ↓	I_B ↑	I_B ↓	I_C ↑	I_C ↓	N	V_A	V_B	V_C
SIMEAS P	E1	E2	E3	E4	E5	E6	F4	F1	F2	F3

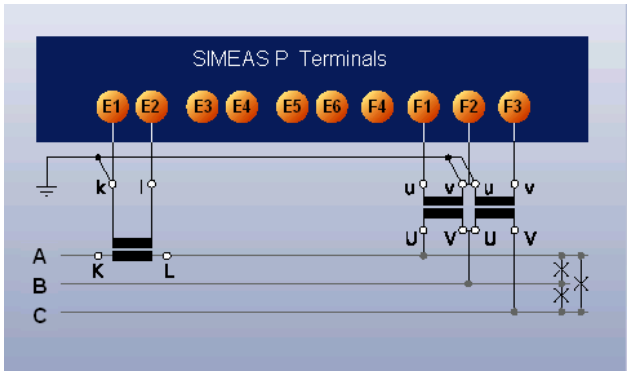
Caution
The single ground connection of the instrument transformers is shown for illustration only.

Actual grounds must be installed directly at each instrument transformer.

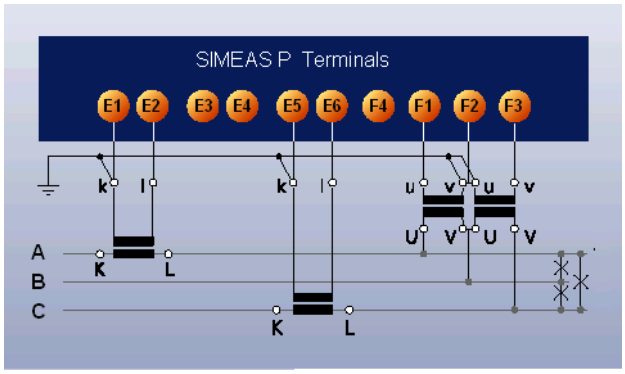
1.5.8.2 Single-phase



1.5.8.3 Three-phase, Three-wire, Balanced



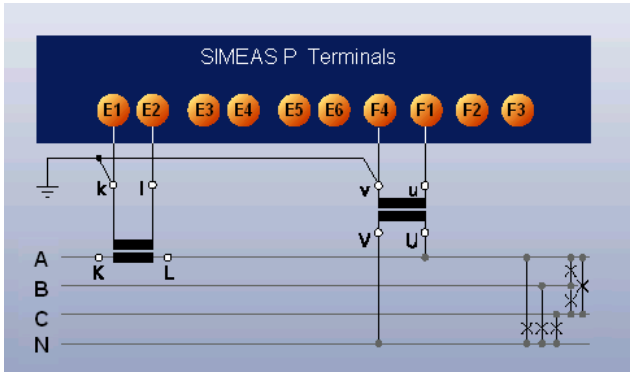
1.5.8.4 Three-phase, Three-wire, Unbalanced (2 I)



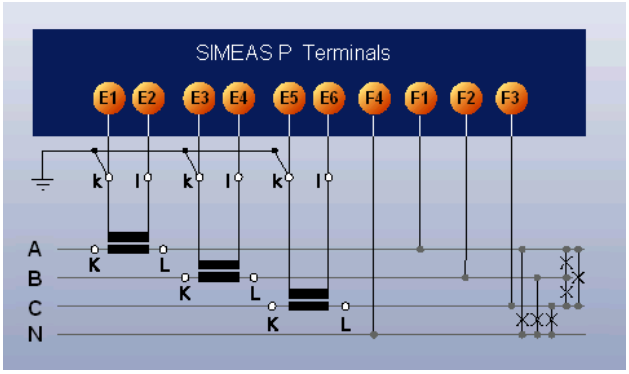
1.5.8.5 Three-phase, Three-wire, Unbalanced (3 I)

Without picture

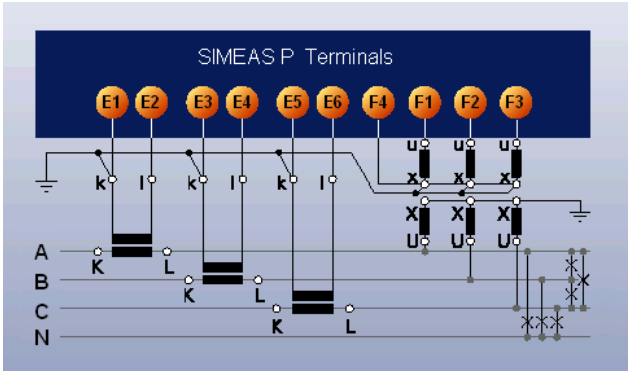
1.5.8.6 Three-phase, Four-wire, Balanced



1.5.8.7 Three-phase, Four-wire, Unbalanced (low-voltage system)



1.5.8.8 Three-phase, Four-wire, Unbalanced (high-voltage system)



1.5.10 Commissioning

The ratings and information on the nameplate should be checked prior to connecting the power supply voltage. In particular, power supply voltage ratings, as well as input voltage and current ratings should be verified. An operating period of 15 minutes is required before the device will perform within specified accuracy limits.
For the models # 7KG7200 and # 7KG76xx, a battery is included with the device. This battery provides a buffer for all memory and the real-time clock within the SIMEAS P. The battery must be installed prior to applying voltage to the power supply or voltage or current to the measured quantity inputs: Remove the cover of the battery slot on the rear of the device (refer to section 1.5.1 and 1.5.2), insert the battery according to the polarity printed on the rear of the device, and replace the back cover.

Warning

Servicing of the battery circuit and replacing of the battery must be performed by qualified personnel only.

Battery may explode if mistreated:
Do not reverse the polarity! Do not disassemble! Do not completely discharge!
Do not throw the battery into a fire!

Warning

Hint on battery disposal
When discharged, or when properly secured against short-circuit, lithium batteries can be disposed of through retailers or at depots run by competent organizations (e.g. in Germany GRS collection points).

Caution

The Lithium-batteries in our equipment are subject to special provision 188/A45 of the dangerous goods regulations of the different transport modes (as in edition 2003, lithium content and tests of UN-Manual of Tests and Criteria).

This is only valid for the original battery or original spare batteries. For general transport security by shipment as freight: Electric equipment is only to be sent as freight if shut off.

1.5.11 Electrical connection

Warning

Warning of dangerous voltages when operating an electrical device. Only qualified people shall work on and around this device. They must be thoroughly familiar with all warnings and safety notices in this instruction manual as well as with the applicable safety steps, safety regulations, and precautionary measures.

During electrical installation, all rules and regulations for power systems must be observed.

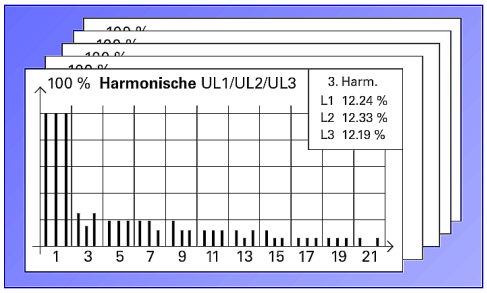
- Short-circuit the current transformer secondary circuits before current connections to the device are opened.
- The protective ground terminal of the device must be connected to the protective ground of the panel or cubicle.
- For connection of an auxiliary DC voltage, the correct polarity must be used.
- All of the terminals should be checked to verify proper connections.
- The polarities and phasing of all instrument transformers should be checked.
- Before initial energization with supply voltage, the device shall be situated in the operating area for at least two hours to ensure temperature equalization and to avoid humidity and condensation problems.

Operation (7KG75xx and 7KG76xx) 2

This chapter describes how to operate the devices 7KG75xx and 7KG76xx. The devices 7KG7100 and 7KG7200 may be parameterized and operated via PC only.

2.1 Screen Displays

Once the SIMEAS P has been programmed (see Chapter 4) and connected (see Chapter 1), the measured quantities selected by the user are displayed on screens.



- Specific screens can be selected via the two front arrow buttons.
- Press an arrow button once to display the next or previous screen.
- Hold an arrow button down to scroll through the screens automatically.
- If desired, automatic scrolling can be programmed for normal display.
- When scrolling, the screens are arranged in a loop format (i.e., the first screen follows the last in one direction, whereas the last screen follows the first in the opposite direction, etc.).

2.2 Screen Content

The user must be able to read all relevant information at a glance for a specific monitoring application.

For this reason, each screen can be easily customized to fit the specific needs of the user. The total number of screens (maximum of 20), as well as the type and content of each individual screen, are programmed by the user.

The following screen types are available:

2.2.1 Screen types

- 2 Measured Values - Digital
- 2 Measured Values - Digital / Analog
- 4 Measured Values - Digital
- 4 Measured Values - Digital / Analog
- Phasor Diagram
- Harmonics - V & I
- Min – Max Values
- Oscilloscope (waveform/RMS values)

Note:

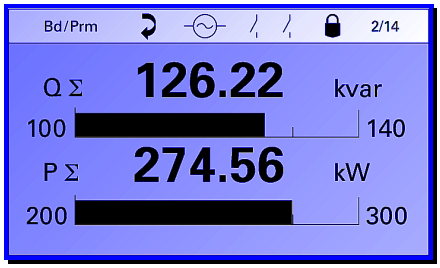
- For devices with the ordering number 7KG76** the Oscilloscope can be found in the Datalogger group (see section 5.1, page 68).

2.2.2 2 Measured Values - Digital

- Display of any two measured quantities from the Measured Quantities table (see Chapter 3).

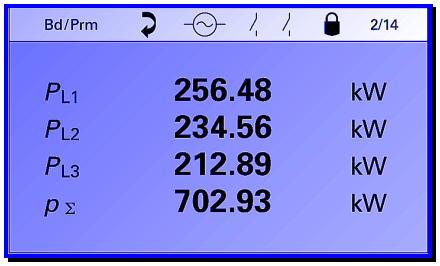
2.2.3 2 Measured Values - Digital / Analog

- Status Bar for the SIMEAS P
- Display of any two measured quantities from the Measured Quantities table.
- Programmable low and high values for each analog bar.



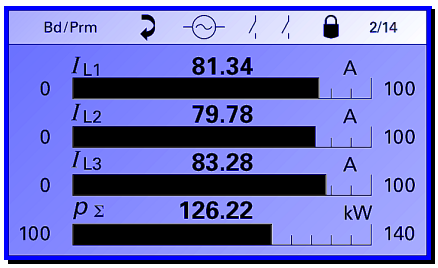
2.2.4 4 Measured Values - Digital

- Status Bar for the SIMEAS P
- Display of any four measured quantities from the Measured Quantities table.



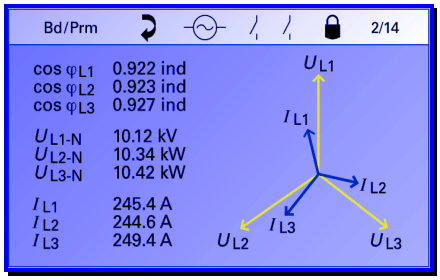
2.2.5 4 Measured Values - Digital / Analog

- Status Bar for the SIMEAS P
- Display of any four measured quantities from the Measured Quantities table.
- Programmable low and high values for each analog bar.

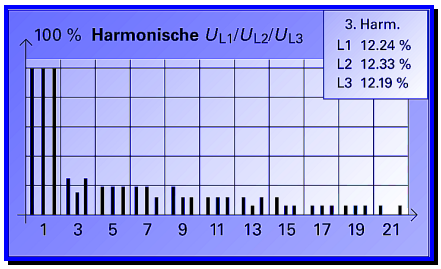


2.2.6 Phasor Diagram

- This screen displays the overall status of the system at a glance



2.2.7 Harmonics Screens



- Graphical display of current or voltage harmonic components.
- Display of all odd harmonics in all phases up to the 21st harmonic.
- When ENTER is pressed, a window appears in the upper right corner of the screen indicating the digital values of a specific harmonic for all three phases. To enter the Main Menu of Level 2 from this screen, hold the ENTER key down.
- Via the arrow ▼ ▲ buttons, any odd harmonic up to the 21st can be selected for display in this window.
- Graphical display is in % where 100% represents the highest value of the first harmonic (fundamental) existing in any one of the three phases. For digital values, voltages are expressed in % and currents are expressed in A.
- The 5th, 7th, 11th, 13th, 17th, and 19th harmonics (which are considered important in the standards) can also be displayed individually as measured quantities on the measured values screens if desired.

2.2.8 Min – Max Values

	Min.	Mtl.	Max.	1:32
U_{L1-N}	10.34	10.38	10.64	kV
U_{L2-N}	10.25	10.42	10.78	kV
U_{L3-N}	10.19	10.48	10.73	kV
I_{L1}	36.5	46.72	48.59	A
P_{Σ}	564.41	753.82	822.80	kW
Q_{Σ}	318.37	377.81	378.06	kvar
S_{Σ}	648.01	843.20	902.19	kVA
$\cos_{\Sigma}$	∓0.871	∓0.894	∓0.912	

- Up to 8 measured quantities from the Measured Quantities tables (except energy and metered values) can be monitored here.
- The minimum, average and maximum values since recording was last initiated are displayed for a specific measured quantity.
  For devices 7KG76xx the values remain valid in case of a power failure.
- Recording is initiated via "Reset" of the Min – Max Values at the programming level or when the device is switched on.
- If no time is set, the duration of the recording is indicated in hours and minutes. If the time is set, the date and time of recording initiation are indicated.
- Any number of listing screens can be programmed for Min-Max Values.
- Using space lines in place of measured quantities for every other row provides a clearer overview of the representation.

2.2.9 Oscilloscope

Note:

- For devices with the ordering number 7KG76** the Oscilloscope can be found in the Datalogger group (see section 5.1, page 68).

2.2.9.1 General

The oscilloscope represents a special screen. Only one oscilloscope screen can be selected. To program settings for the oscilloscope, select the Oscilloscope screen, press ENTER, and the Oscilloscope Menu screen will appear for data entry.

- Three measured quantities are always recorded.
- The amplitude scale of each measured quantity is established automatically.
- Display of the value of each measured quantity is obtained via the cursor.
- In general, 10% of the recording is allocated to pre-triggering history.
- Only one recording is possible. When initiating a new recording, the previous one is deleted.
- When triggering the oscilloscope via limit violation, the recording can also be executed in the background.
- Only the first of several limit violations that trigger a recording is recorded. Further violations are ignored. A new recording must be initiated in the Oscilloscope Menu via "OK + Enable".
- The total duration of a recording, including the pre-trigger and post-trigger history, is limited to 7,040 samples for instantaneous values and 14,000 samples for RMS values, per measured quantity.

Note:

- For devices with the ordering number 7KG76xx the memory range can be set by the user.

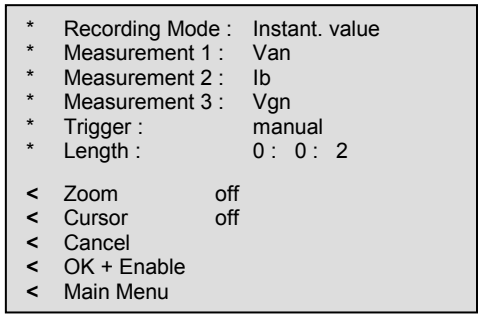
2.2.9.2 Oscilloscope Menu

Recording Mode

- Instantaneous Values
- RMS Values

Measurement 1 to 3

- Selected from the Measured Quantities table (depends on recording mode)



Trigger

- Manual (select "OK + Enable" and press ENTER)
- Limit Values 1 to 6. Upon selection and confirmation, an input window appears for modifying or confirming the limit value settings and logical relationships, the bandwidth setting, the filter time, and the pulse length. (see Chapter 4 - "Input Window for Limit Values" for more details).

Recording Time

- The recording time depends on the recording mode.
- For instantaneous values, the recording time is fixed to 2 seconds (except for the devices 7KG76xx).
- For RMS values, the recording time can be adjusted up to 4.0 hours (except for the devices 7KG76xx).

Zoom

- If the zoom function is activated (set to "on"), the time axis can be adjusted within the minimum and maximum limits via the arrow buttons ▼ ▲

Cursor

- If the cursor is activated (set to "on"), the cursor can be moved along the time axis by using the arrow buttons ▼ ▲. If the button is pressed once, the cursor moves by one position. If the button is held down, the cursor moves continuously with increasing speed.
- The values of the measured quantities are automatically displayed on the Y-axis for the corresponding cursor position.

Cancel

- Select "Cancel" if the modified settings in the menu are not correct. When "Cancel" is selected, the oscilloscope screen will reappear.

OK + Enable

- Select "OK + Enable" if the modified settings in the menu are correct. When "OK + Enable" is selected, the recording is initiated and the oscilloscope screen will reappear.

Main Menu

- The user can access the Main Menu of Level 2 from the Oscilloscope Menu screen by selecting Main Menu and pressing ENTER.

2.2.9.3 Characteristics of "Instantaneous Value" Recording

- Recording time 7KG75xx
  Recording time cannot be changed and is fixed to approximately 2 seconds (200 ms of pre-trigger history and approximately 1800 ms of post-trigger history - 7,040 samples per measured quantity).
- Recording time 7KG76xx
  Recording time can be parameterized. The recording time to be saved in the allocated memory is calculated according to the following formula:

$$t_{MAX}[s] = \frac{AllocatedMemory[Byte]}{64 * 16Byte * 50}$$

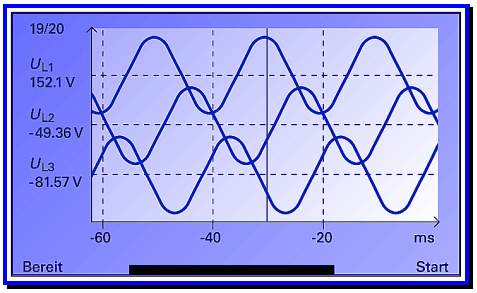
- The time axis on the screen can be changed via "Zoom" from 60 ms to 2000 ms

Sampling Points

The sampling rate is adjusted such that there are 64 samples per cycle. Therefore, the sampling rate is as follows for 50 Hz and 60 Hz respectively:

- at 50 Hz = 3.20 kHz
- at 60 Hz = 3.84 kHz

Trigger via Limit Violation:
The RMS value of each half wave is calculated and tested for Max/Min violations. If a violation is detected, recording is triggered immediately. The bandwidth and filter time settings are irrelevant here.



Note:

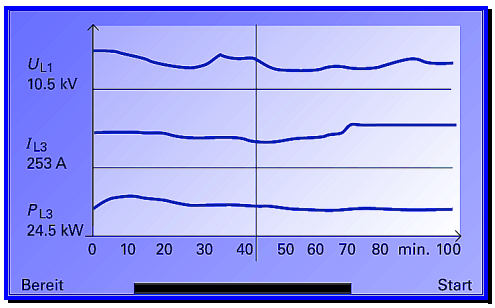
- The recording type "Instantaneous value" allows to record the measurement values "current" and "voltage" only.

2.2.9.4 Characteristics of "RMS Value" Recording

- Any three measured quantities can be selected from the Measured Quantities table with the exception of energy and metered values.
- Recording time 7KG75xx
  Recording time can be modified up to a maximum of 3 hours 59 minutes (approximately 14,000 samples per measured quantity)
- Recording time 7KG76xx
  Recording time can be parameterized. The recording time to be saved in the allocated memory is calculated according to the following formula:

$$t_{MAX}[h] = \frac{AllocatedMemory[Byte]}{8Byte * 3600}$$

- One sample of a measured quantity is saved each second.
- Pre-trigger history is always 10% of the selected recording time.
- The time axis on the screen can be changed via the "Zoom" function:

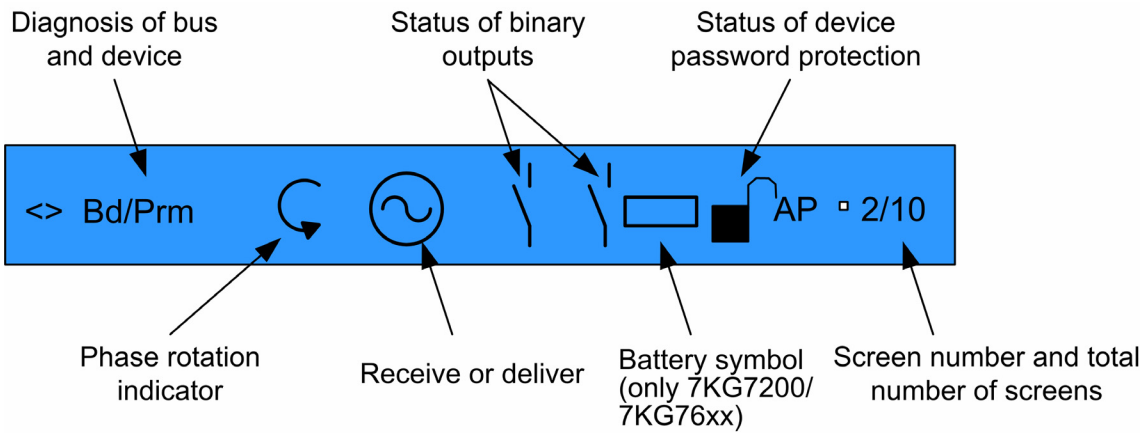


Notes:

- Since 10% of the recording time is always allocated to pre-trigger history, the time for recording the pre-trigger history must expire before a new recording can be triggered.
- The minimum time resolution on the display for a specific recording event is limited by the number of pixels (approximately 200). That is, 1 pixel = 1second per measured value. Therefore, the shortest time period that can be displayed on the time axis is approximately 3 minutes. For recording times less than 3 minutes, only a part of the display width is used for recording.
- The recording type "RMS Value" does not allow to record analog inputs (7KG7610 and 7KG7660 only).

2.2.10 Status Bar

All screens other than the Harmonics and Oscilloscope screens feature a status bar that displays the status of the SIMEAS P.



"<>"	Serial transmission was received.
"Bd"	Searching for the Profibus baud rate
"Cfg"	Waiting for the correct configuration of Profibus
"Prm"	Waiting for the correct parameters of Profibus
"()"	Direction of rotation from V1 to V2; Va to Vn
	Receive (this symbol) or Deliver
	Limit violation (the limit violation is displayed and not the status of the output contact)

If the battery voltage falls below the defined threshold a blinking battery symbol will be displayed in the status. Please replace the battery in this case (see section 1.5.10, page 28).
If the password protection is active (see 4.3.1.5, 5.5.3 and 6.7.2), a lock with a closed fastener will be displayed.

„A“	Recording of average values active
„P“	Recording of power values active

Measured Quantities

3

3.1 Measured Quantities that Depend on the Input Connection Type

Table 3-1: Measured Quantities that Depend on the Input Connection Type

#°	Measured Quantity	1-phase AC current	Three-wire Three-phase-Balanced	Three-wire Three-phase Unbalanced 3I	Three-wire Three-phase Unbalanced 2I	Three-phase Four-wire Balanced	Three-phase Four-wire Unbalanced	Comments
1	(space line)*	X	X	X	X	X	X	
2	Voltage (A-N)	X				X	X	Van
3	Voltage (B-N)						X	Vbn
4	Voltage (C-N)						X	Vcn
5	Voltage (G-N)	X	X	X	X	X	X	Vgn
6	Voltage (A-B)		X	X	X		X	Vab
7	Voltage (B-C)		X	X	X		X	Vbc
8	Voltage (C-A)		X	X	X		X	Vca
9	Average Voltage (ϕ-N)*		Σϕ-N/3	Σϕ-N/3	Σϕ-N/3	A-N	Σϕ-N/3	Vϕn
10	Current (A)	X	X	X	X	X	X	Ia
11	Current (B)			X	X		X	Ib
12	Current (C)			X	X		X	Ic
13	Average Current *			X	X		IΣ / 3	Iϕ
14	Neutral Current			X			X	3I0
15	Real Power (Aϕ)	X					X	Pa
16	Real Power (Bϕ)						X	Pb
17	Real Power (Cϕ)						X	Pc
18	Real Power (3N)		X	X	X	X	X	P3ϕ
19	Reactive Power (Aϕ)	X					X	Qa
20	Reactive Power (Bϕ)						X	Qb
21	Reactive Power (Cϕ)						X	Qc
22	Reactive Power (3N)		X	X	X	X	X	Q3ϕ
23	Apparent Power (Aϕ)	X					X	Sa
24	Apparent Power (Bϕ)						X	Sb
25	Apparent Power (Cϕ)						X	Sc
26	Apparent Power (3N)		X	X	X	X	X	S3ϕ
27	cosϕ (Aϕ)*	X					X	Cos(ϕa)
28	cosϕ (Bϕ)*						X	Cos(ϕb)
29	cosϕ (Cϕ)*						X	Cos(ϕc)
30	cosϕ (3ϕ)*		X	X	X	X	X	Cos(ϕ)
31	Power Factor (Aϕ)*	X					X	PFa
32	Power Factor (Bϕ)*						X	PFb
33	Power Factor (Cϕ)*						X	PFc
34	Power Factor (3ϕ)*		X	X	X	X	X	PF3ϕ
35	Phase Angle (Aϕ)	X					X	ϕa
36	Phase Angle (Bϕ)						X	ϕb
37	Phase Angle (Cϕ)						X	ϕc
38	Phase Angle (ϕ)		X	X	X	X	X	ϕ
39	System Frequency	X	X	X	X	X	X	Freq
40	Asymmetrical Voltage						X	ASymV
41	Asymmetrical Current						X	ASymI
42	THD Voltage (A-N)	X					X	THD Van
43	THD Voltage (B-N)						X	THD Vbn
44	THD Voltage (C-N)						X	THD Vcn
45	THD Current (Aϕ)	X					X	THD Ia

#°	Measured Quantity	1-phase AC current	Three-wire Three-phase-Balanced	Three-wire Three-phase Unbalanced 3I	Three-wire Three-phase Unbalanced 2I	Three-phase Four-wire Balanced	Three-phase Four-wire Unbalanced	Comments
46	THD Current (Bϕ)						X	THD Ib
47	THD Current (Cϕ)						X	THD Ic
48	Harmonic Voltage (A-N)*	X	X	X	X	X	X	HVan 5,7,11,13,17,19
49	Harmonic Voltage (B-N)*			X	X		X	HVbn 5,7,11,13,17,19
50	Harmonic Voltage (C-N)*			X	X		X	HVcn 5,7,11,13,17,19
51	Harmonic Current (Aϕ)*	X	X	X	X	X	X	HIa 5,7,11,13,17,19
52	Harmonic Current (Bϕ)*			X	X		X	HIb 5,7,11,13,17,19
53	Harmonic Current (Cϕ)*			X	X		X	HIc 5,7,11,13,17,19
54	kWh received (Aϕ)*	X					X	kWh a rec.
55	kWh received (Bϕ)*						X	kWh b rec.
56	kWh received (Cϕ)*						X	kWh c rec.
57	kWh received (3ϕ)*		X	X	X	X	X	kWh 3ϕ rec.
58	kWh delivered (Aϕ)*	X					X	kWh a del.
59	kWh delivered (Bϕ)*						X	kWh b del.
60	kWh delivered (Cϕ)*						X	kWh c del.
61	kWh delivered (3ϕ)*		X	X	X	X	X	kWh 3ϕ del.
62	Total kWh (Aϕ)*							kWh a tot.
63	Total kWh (Bϕ)*							kWh b tot.
64	Total kWh (Cϕ)*							kWh c tot.
65	Total kWh (3ϕ)*							kWh 3ϕ tot.
66	Net kWh received (3ϕ)*	X	X	X	X	X		kWh 3ϕ net
67	kVARh lagging (Aϕ)	X					X	kVARh a lag.
68	kVARh lagging (Bϕ)						X	kVARh b lag.
69	kVARh lagging (Cϕ)						X	kVARh c lag.
70	kVARh lagging (3ϕ)		X	X	X	X	X	kVARh 3ϕ lag.
71	kVARh leading (Aϕ)	X					X	kVARh a lead.
72	kVARh leading (Bϕ)						X	kVARh b lead.
73	kVARh leading (Cϕ)						X	kVARh c lead.
74	kVARh leading (3ϕ)		X	X	X	X	X	kVARh 3ϕ lead.
75	Total kVARh (Aϕ)*	X					X	kVARh a tot
76	Total kVARh (Bϕ)*						X	kVARh b tot
77	Total kVARh (Cϕ)*						X	kVARh c tot
78	Total kVARh (3ϕ)*		X	X	X	X	X	kVARh 3ϕ tot
79	Total kVAh (Aϕ)	X					X	kVAh a
80	Total kVAh (Bϕ)						X	kVAh b
81	Total kVAh (Cϕ)						X	kVAh c
82	Total kVAh (3ϕ)		X	X	X	X	X	kVAh 3ϕ
83	Counter 1 / 2 / 3 / 4*	X	X	X	X	X	X	Cntr.1,2,3,4
84	Binary inputs	X*	X*	X*	X*	X*	X*	
85	Analog inputs	X*	X*	X*	X*	X*	X*	

* Explanation to Table 3-2

#	Name	Description
1	(space line)	If a space line is selected as a measured quantity, the corresponding fields remain empty on the display screens.
9	Average Voltage (ϕ-N)	The average value of the three phase-to-neutral voltages (ϕ-N) is displayed here. For three-wire, three-phase connection types, this value is calculated
13	Average Current	The average value of the three phase currents is displayed here.
27 to 34	cosϕ vs. Power Factor	The measured value cosϕ has the same magnitude as the power factor, but will become negative if real power flow is reversed. Power factor is always a positive quantity, and is equal to the absolute value of cosϕ
48 to 53	Harmonics V/I	For harmonics up to the 21st, the standards (IEC 61000-2-2 and EN 50160) specify compatibility levels only for harmonics of orders 5, 7, 11, 13, 17, and 19. Those of even order and those divisible by 3 are considered irrelevant. Therefore, on the "Harmonics" screen, selection is limited to all uneven orders up to the 21st. The selection of single harmonics on the measured values screens is limited to the 5th, 7th, 11th, 13th, 17th and 19th. For voltage harmonics, values are displayed as a percentage of the first harmonic. For current harmonics, the values are displayed directly in A.
54 to 61	kWh received	The default setting (industry mode) is "Load (standard)" indicated by a positive energy flow direction. You can configure the power supply company mode (refer to 4.3.1.7 and 4.3.1.7). In this mode, a positive value indicates "Generator".
62 to 65	Total kWh	The sum of the absolute values (without sign) of kWh received and kWh delivered.
66	Net kWh received	Net kWh received is equal to kWh received minus kWh delivered. Because this measured value can be negative and can decrease as well as increase, it is not possible to use this measured value to generate pulses via the output contacts.
75 to 78	Total kVARh	The sum of the absolute values (without sign) of leading and lagging kVARh.
83	Counters 1 / 2 / 3 / 4	Number of limit violations
84, 85	Binary inputs, analog inputs	7KG7610/7KG7660 only

3.2 Formulas and Calculation of Derived Quantities

3.2.1 Calculation of Derived Quantities

Table 3-2: Formulas to calculate derived quantities

Line	Derived Quantity	Formula	Note
1	RMS value voltage, distorted waveform included	$V = \sqrt{\frac{1}{64}\sum_{\nu=1}^{64} u_\nu^2}$	
2	RMS value voltage, fundamental component U_1 only	$V_1 = \sqrt{\frac{a^2 + b^2}{2}}$	From the Fourier coefficients a and b of the fundamental component
3	RMS value current, distorted waveform included	$I = \sqrt{\frac{1}{64}\sum_{\nu=1}^{64} i_\nu^2}$	
4	RMS value voltage, fundamental component I_1 only	$I_1 = \sqrt{\frac{a^2 + b^2}{2}}$	From the Fourier coefficients a and b of the fundamental component
5	Active power P_{Std}	$P = \frac{1}{64}\sum_{\nu=1}^{64} v_\nu i_\nu$	From sample values
6	Active power P_{Four}	$P = Va_1 Ia_1 + Vb_1 Ib_1$	From the Fourier coefficients of the fundamental component
7	Active power P_{DIN}	$P = \sum_{n=1}^{21} (Va_n Ia_n + Vb_n Ib_n)$	From the Fourier coefficients of the fundamental component and from the harmonics.
8	Reactive power Q_{Std}	$Q = \frac{1}{64}\sum_{\nu=1}^{64} v_\nu i_\nu \cdot e^{-j\frac{1}{2}\pi}$	Standard up to now, additional fault for distortions[1]
9	Reactive power Q_{Four}	$Q = Va_1 Ib_1 + Vb_1 Ia_1$	
10	Reactive power Q_{DIN}	$Q_{tot} = \sum_{n=1}^{21} (Va_n Ib_n + Vb_n Ia_n)$	From the Fourier coefficients of the fundamental component
11	Apparent power S_{Std}	$S = V_{1N} \cdot I_1 + V_{2N} \cdot I_2 + V_{3N} \cdot I_3$	From the RMS values according to line 1 and 3
12	Apparent power S_{Four}	$S = \sqrt{V_{1N}^2 + V_{2N}^2 + V_{3N}^2} \cdot \sqrt{I_1^2 + I_2^2 + I_3^2}$	From the RMS values according to line 1 and 3
13	Apparent power S_{DIN}	$S = \sqrt{V_{1N}^2 + V_{2N}^2 + V_{3N}^2} \cdot \sqrt{I_1^2 + I_2^2 + I_3^2}$	From the RMS values according to line 2 and 4
14	Power factor	$\cos\varphi = \frac{\lvert P\rvert}{S}$ or $\frac{P_1}{S_{DIN}}$	No sign!
15	Power factor DIN	$\cos\varphi = \frac{\lvert P\rvert}{S_{DIN}}$	No sign!
16	Power factor cos φ	$\cos\varphi = \frac{P_1}{S_1}$	Four quadrants according to note 4
17	Phase Angle	$\varphi = \arctan\frac{Q_1}{P_1}$	From the fundamental component only!

[1] According to classic measuring devices (electrodynamic power meter)

Line	Derived Quantity	Formula	Note
18	System Frequency	$f = \frac{N}{\frac{T}{P}}$	Refer to note 1
19	kWh received	$W = \sum_{\nu=1} P_\nu \quad for P > 0$	The received power will be calculated every second.
20	kWh delivered	$W = \sum_{\nu=1} P_\nu \quad for\ P < 0$	The delivered power will be calculated every second.
21	Power without sign	$W = \sum_{\nu=1} P_\nu$	Calculation without sign
22	Net kWh received	$W = \sum_{\nu=1} P_\nu$	Calculation with sign
23	Asymmetrical voltage U or current I	$V = \frac{G}{M}$	Refer to note 2 Range is 0 to ∞, avoid division by 0!
24	THD voltage, current	$THD = \sqrt{\frac{M_{tot}}{M_1} - 1}$	Refer to note 3
25	Harmonics		From Fourier transformation

Note 1:
N: Nominal value of the counting pulses per period at nominal value of the system frequency
T: Nominal value of the period length of the system frequency in µs
P: Counted pulses within one period

Note 2:

Equation 1 $G = \sqrt{A^2 + B^2}$

Equation 2 $A = M_1 + M_2 \cos\left(\varphi_{12} - \frac{2}{3}\pi\right) + M_3 \cos\left(\varphi_{13} + \frac{2}{3}\pi\right)$

Equation 3 $B = M_2 \sin\left(\varphi_{12} - \frac{2}{3}\pi\right) + M_3 \sin\left(\varphi_{13} + \frac{2}{3}\pi\right)$

Equation 4 $M = \sqrt{C^2 + D^2}$

Equation 5 $C = M_1 + M_2 \cos\left(\varphi_{12} + \frac{2}{3}\pi\right) + M_3 \cos\left(\varphi_{13} - \frac{2}{3}\pi\right)$

Equation 6 $D = M_2 \sin\left(\varphi_{122} + \frac{2}{3}\pi\right) + M_3 \sin\left(\varphi_{13} - \frac{2}{3}\pi\right)$

V: Asymmetry
G: Unbalanced system
M: Balanced system
M_n: Vector of the measured quantity, U_{LN} or I_L, from Fourier transformation

Note 3:
Derivation of the formula:

Total distortion D according to IEC 61000-2-2:

Equation 7 $$D = \sqrt{\sum_{n=2}^{N} u_n^2} = \frac{1}{M_1}\sqrt{\sum_{n=2}^{N} M_n^2}$$

u_n: U_n/U_1
n Order of the harmonic
U_n Voltage of the n-th harmonic
U_1 Voltage of the fundamental component
N 40, for SIMEAS P: 21
M_n Harmonic (n-th order) of voltage or current
M_1 Fundamental component of voltage or current

It is possible to derive the result from the harmonic M_1 and the RMS value M_{ges} of the distorted measured quantity. With the root (**H**) from equation 8:

M_{tot}: RMS value of the distorted measured quantity U or I
M_1: RMS value of the fundamental component of the measured quantity

Equation 8 $$H = \sqrt{M_{ges}^2 - M_1^2}$$

With equation 1:

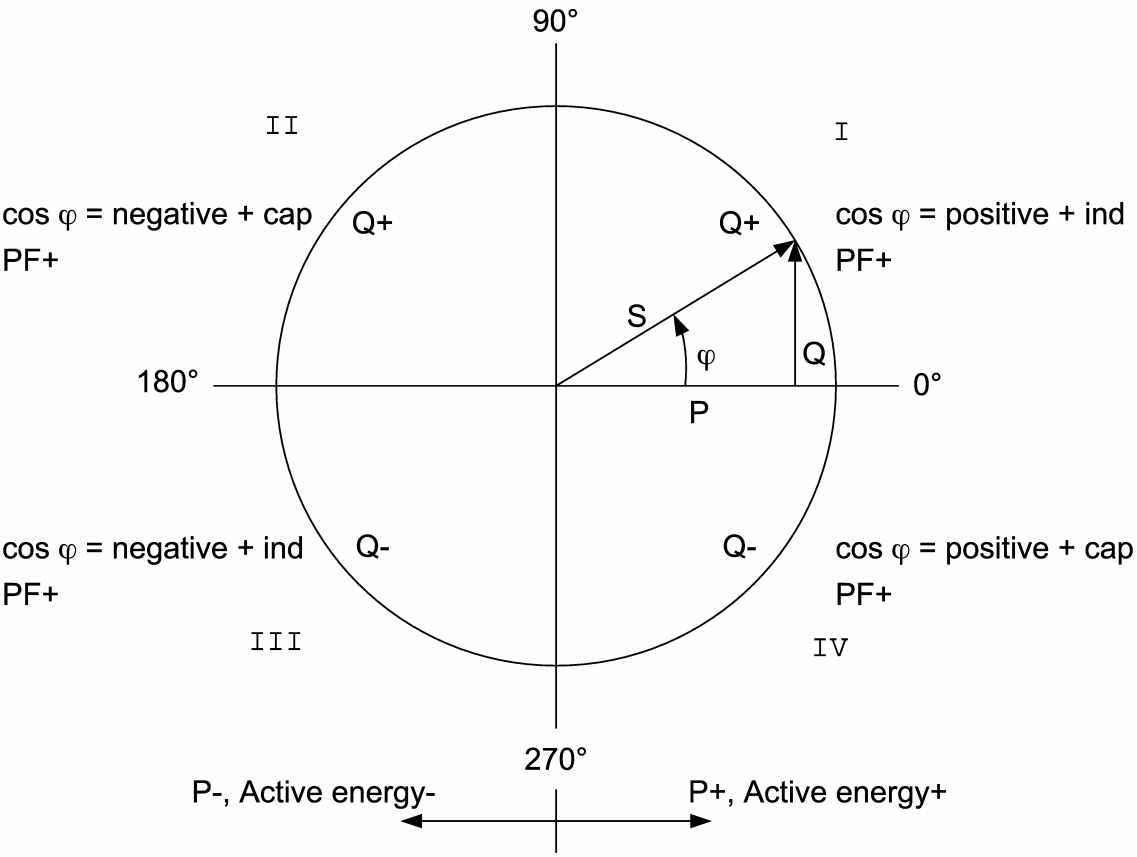
Equation 9 $$THD = \frac{1}{M_1} H = \frac{1}{M_1}\sqrt{M_{ges}^2 - M_1^2}\ .$$

$1/M_1$ under the root:

Equation 10 $$THD = \sqrt{\frac{M_{ges}^2 - M_1^2}{M_1^2}} = \sqrt{\frac{M_{ges}^2}{M_1^2} - 1}\ ,$$

provides the THD formula in table 1.

Note 4:
4 Quadrants



3.3 Connection Modes

3.3.1 Four-wire Three-phase Current with Any Load

Depending on the measuring method some quantities to be measured are not available. For the method according to DIN, for example the apparent power S or S are available; only S_{DIN} can be calculated.

3.3.2 Single-phase AC

The measuring path for the voltage is A-N for the voltage and A for the other quantities. This applies also for the power values. The apparent power according to DIN, the reactive power Q_{tot} DIN and the asymmetry are not valid.

3.3.3 Four-wire Three-phase Current with Symmetrical Load

Current A and voltage A-N are available. You can display the same measured quantities as for Single-phase AC. For power Σ, the value calculated from U and I must be multiplicated by 3. For power, power factor, cosϕ, phase angle and energy only the sum Σ is relevant. The measurement values Asymmetrical U or I are not available. THD and harmonics can be derived for A only.

3.3.4 Three-wire Three-phase Current with Symmetrical Load

For this connection mode, an artificial neutral point is formed via resistors. Since this internal neutral point is connected to the grounding conductor, it cannot be used here. The reactive power (Standard) can be derived from U_{32} and $I_{1:}$

Equation 11 $$Q = \frac{\sqrt{3}}{64}\sum_{\nu=1}^{64} u_{32} i_1$$

You have to calculate u_{32} from $u_{3E} – u_{2E}$. To calculate the reactive power for the fundamental Q_1, the adequate phasors are used. For the reactive power (Standard), sample points are used for the voltage which are shifted by 90°.

Equation 12 $$P = \frac{\sqrt{3}}{64}\sum_{\nu=1}^{64} u_{32} \cdot e^{-j\frac{\pi}{2}} i_1$$

To calculate the active power of the fundamental P_1 the adequate phasors are used. The measurement values Asymmetrical U or I are not available. THD and harmonics can not be calculated. The apparent power is the multiplication of the RMS values voltage and current, e.g:

Equation 13 $$S = \sqrt{3} \cdot U_{32} \cdot I_1$$

For S1, the RMS values of the fundamental component are used; as symmetrical load is supposed $S_{DIN} = S$.

3.3.5 Three-wire Three-phase Current with Any Load

For this connection mode, the phase-to-ground voltage are not available. Active and reactive power are calculated from the formulas of the two-wattmeter (Aron) circuit:

Equation 14 $$P = \frac{1}{64}\sum_{\nu=1}^{64} u_{12} i_1 + \frac{1}{64}\sum_{\nu=1}^{64} u_{23} i_3$$

This is also valid for the calculation via Fourier analysis. For the reactive power according to classic measuring devices (electrodynamic power meter), the following equation is valid:

Equation 15 $$Q = \frac{1}{64}\sum_{\nu=1}^{64} u_{12} i_1 e^{-j\frac{1}{2}\pi} + \frac{1}{64}\sum_{\nu=1}^{64} u_{23} i_3 e^{-j\frac{1}{2}\pi}$$

Distortions will cause an additional fault. For the apparent power (classical method), the following equation is valid:

Equation 16 $$S = \sqrt{3}\left(U_{12} I_1 + U_{23} I_3\right)$$

For the apparent power according to DIN calculated from the phase voltages, the following equation is valid:

Equation 17 $$S = \sqrt{\frac{1}{3}\left(U_{12}^2 + U_{23}^2 + U_{13}^2\right)} \cdot \sqrt{I_1^2 + I_2^2 + I_3^2}$$

In both cases, current B must be calculated from the geometrical sum of the currents –A and –B. To do this, you can sum up the sample points or the Fourier coefficient.

The artificial neutral point does not allow to measure the voltage asymmetry exactly and is not realized. The measured values are only exact, if you use a four-wire net with neutral point. Often the three-wire net is used only to save the cable connection to current transformer 2. Only in this case, it would be useful to measure the asymmetry.

3.4 Measured Values

Table 3-3: Measured values and tolerances

Measured values	Measuring path [1]	Menu	Tolerances [2]
Voltage	L1-N, L2-N, L3-N, (N-E)	▼ ■ ●	± 0,1% [2] / ± 0,3% [7]
Voltage	L1-L2, L2-L3, L3-L1, Σ [3]	▼ ■ ●	± 0,1% [2] / ± 0,3% [7]
Current	L1, L2, L3, N, Σ [3]	▼ ■ ●	± 0,1% [2] / ± 0,3% [7]
Active power P + import, - export	L1, L2, L3, Σ	▼ ■ ●	± 0,5%
Reactive power Q + cap, - ind	L1, L2, L3, Σ	▼ ■ ●	± 0,5%
Apparent power S	L1, L2, L3, Σ	▼ ■ ●	± 0,5%
Power factor |cosφ| [4]	L1, L2, L3, Σ	▼ ■ ●	± 0,5%
Active power factor cosφ [4]	L1, L2, L3, Σ	▼ ■ ●	± 0,5%
Phase angle [4]	L1, L2, L3, Σ	▼ ■ ●	± 2°
Frequency [5]	L1-N	▼ ■ ●	± 10 mHz
Active power import	L1, L2, L3, Σ	▼ ■	± 0,5%
Active power export	L1, L2, L3, Σ	▼ ■	± 0,5%
Active power absolute	L1, L2, L3, Σ	▼ ■	± 0,5%
Active power saldo	Σ	▼ ■	± 0,5%
Reactive power cap	L1, L2, L3, Σ	▼ ■	± 0,5%
Reactive power ind	L1, L2, L3, Σ	▼ ■	± 0,5%
Reactive power absolute	L1, L2, L3, Σ	▼ ■	± 0,5%
Apparent power	L1, L2, L3, Σ	▼ ■	± 0,5%
Unbalance voltage	Four-wire system	▼ ■ ●	± 0,5%
Unbalance current	Four-wire system	▼ ■ ●	± 0,5%
THD voltage	L1, L2, L3	▼ ■ ●	± 0,5%
THD current	L1, L2, L3	▼ ■ ●	± 0,5%
Harmonic voltage U 5. 7. 11. 13. 17. 19. H.	L1, L2, L3	▼ ■ ●	± 0,5%
Harmonic current I 5. 7. 11. 13. 17. 19. H.	L1, L2, L3	▼ ■ ●	± 0,5%
Limit violations	counter 1 to 4	▼ ■	
Analog inputs [6]	external	▼ ■	± 0,5%
Binary inputs [6]	external	▼ ■	

1) Phases are displayed based on the type of connection.
2) Tolerances at reference conditions (see chapter 8) are applicable from 0.5 to 1.2 times nominal value.
3) Average value of all phases.
4) Measuring beginning with 2% of the internal apparent power
5) Measuring beginning with 30% of the input voltage L1-N
6) 7KG7610 and 7KG7660 only
7) Limit values for the complete temperature range (see chapter 8) referring to: 0.1 to 1.2 x nominal range.

▼ Measured values can be displayed on measured value screens (only 7KG7500 and 7KG7600)
■ Measured values selectable over communication
● Measured values selectable for list screens and oscilloscope (only 7KG7500 and 7KG7600)

Device Programming 7KG75xx

4

4.1 Operating Notes

This chapter describes all of the setting options of the SIMEAS P that are made via the buttons.

The Main Menu (see section 4.3) of the programming level can be accessed from the Measured Values screens, the Min-Max Values screens or the Phasor Diagram screen via the ENTER button.
In addition, the Main Menu of the programming level can be accessed from the Harmonics screen by holding down the ENTER button, or from the Oscilloscope Menu by selecting "Main Menu" and pressing the ENTER button.

4.1.1 Button Functions

The following functions are performed via the ▼ ▲ buttons:

- Moving the cursor to the entry line.
- Scrolling through selection lists when entering settings.
- Selecting numbers when entering numerical values.

If the buttons are held down, the scrolling continues automatically.

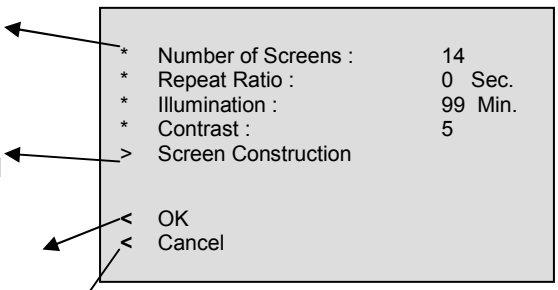
The selected line, setting, or number is confirmed by pressing the ENTER button.

4.1.2 Window Structure

Selecting * and pressing ENTER moves the cursor directly to the data entry field on the same line.

Selecting **>** and pressing ENTER opens a new window for additional data entry.

Selecting **<** "OK" and pressing ENTER confirms the settings and returns the user to the previous level.



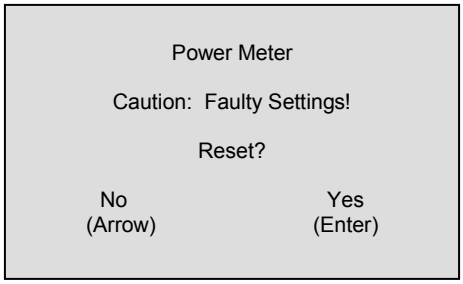
Selecting **<** "Cancel" and pressing ENTER cancels the setting changes just made and returns the user to the previous level.

4.1.3 Notes on Parameterization

- The selection of the measured quantity depends on the selected input voltage and current connections.
- If the number selected is too large, "Overflow" is displayed and the input value is automatically set to the maximum value.
- If the power supply voltage is switched off during programming, the message illustrated below appears when the device is restarted. Therefore, the power supply voltage should only be switched off in level 1 (measuring screens).

Select "No" via the ▼ ▲ buttons to retain the settings as they existed prior to the loss of power supply voltage.

Choose "Yes" by pressing the ENTER button to restore the default settings.



Note

This means, that you should always leave the parameter screens completely (OK or Cancel) until the measurement screens are displayed again. This ensures that all parameters will be accepted by the device.

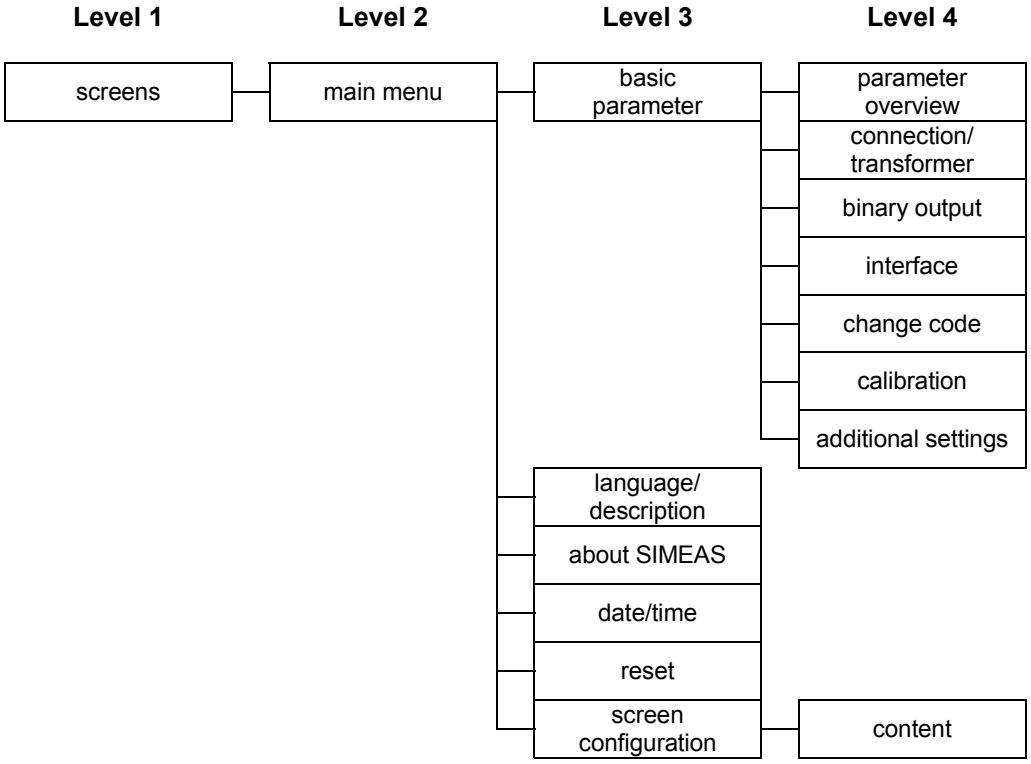
Note

Please check the parameters and the adjustment data afterwards, to ensure the correct function of the SIMEAS P.

If you have adjusted the device manually (refer to section 7.1), these data will not be overwritten by default settings.

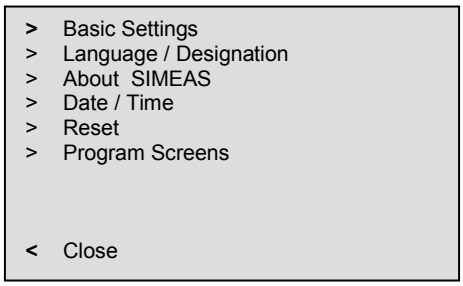
4.2 Overview of the Programming Levels

- Level 1 corresponds to the measurement screens
- Levels 2 through 4 correspond to the programming screens and are described as follows:



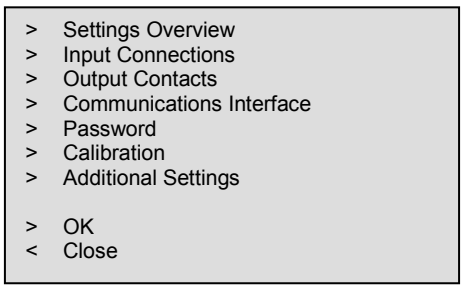
4.3 Main Menu

The main menu is used to access various submenus.



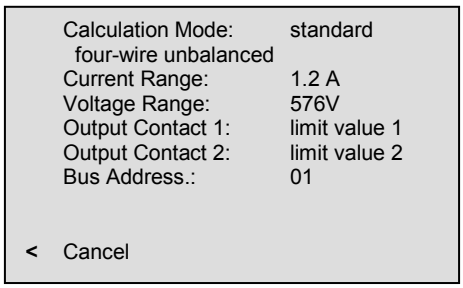
4.3.1 Basic Settings

The "Basic settings" submenu is used to access various input screens for device programming



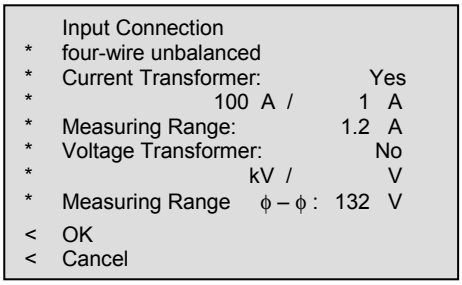
4.3.1.1 Settings Overview

Settings Overview is where the most important settings associated with the device are displayed.



4.3.1.2 Input Connections

Input Connection:



The input connection, as described in Chapter 1 - "Input Connection Examples", is selected on this screen from the following choices:

- Single-phase
- Three-phase, Four-wire, Balanced
- Three-phase, Four-wire, Unbalanced
- Three-phase, Three-wire, Balanced
- Three-phase, Three-wire, Unbalanced (2 x I)
- Three-phase, Three-wire, Unbalanced (3 x I)

" Three-phase, Three-wire, Unbalanced " can be selected either with the connection of two current transformers (standard / Aron measuring circuit) or three current transformers.

Current Transformer:
The user must specify whether or not current transformers are utilized in the input circuits as well as the primary and secondary ratings of the current transformers.

- Yes (Current transformers utilized/ Max Prim: 999,999 A; Max Sec: 6 A)
- No (Current transformers not utilized)

Measuring Range:

The secondary input current measuring range is selected for the SIMEAS P as follows:

- 1.2 A (rated input 1 A)
- 6 A (rated input 5 A)

Caution:

- You must make these settings for a direct connection or for a connection with current transformers.
- The selected measuring range must be greater than the secondary rating of the current transformer!
- The accuracy of SIMEAS P (see Table 3-3) is based on the selected measuring range.
- The determination of this range indicates the maximum current value that can be displayed on the device.

Note

When you change the current transformer settings, the power calculation in the device has to be reset.

Example:
CT rating: 500 / 1 A
Measuring range 1.2 A: Maximum display range: 0 to 600A
Measuring range 6 A: Maximum display range: 0 to 3000A

Voltage Transformer
The user must specify whether or not voltage transformers are utilized in the input circuits as well as the primary and secondary ratings of the voltage transformers.

Yes (Voltage transformers are utilized / Max Prim: 1000 kV; Max Sec: 420 V)
No (Voltage Transformers are not utilized)

Measuring range ϕ-ϕ:
The secondary input voltage measuring range (phase-to-phase) is selected for the SIMEAS P as follows:
7KG7500

- 132 V (nominal input 100/110 V)
- 228 V (nominal input 208 V)
- 480 V (nominal input 480 V)
- 828 V (nominal input 600 V)

Table for converting phase-to-phase voltages into phase-to-neutral voltages

Selectable measuring range ϕ - ϕ	Equivalent to measuring range ϕ - N
0 to 132 V	0 to 76.2 V
0 to 228 V	0 to 132 V
0 to 480 V	0 to 276 V
0 to 828 V	0 to 480 V

7KG7550

- 132 V (nominal input 100/110 V)
- 228 V (nominal input 190 V)
- 576 V (nominal input 480 V)
- 720 V (nominal input 600 V)

Table for converting phase-to-phase voltages into phase-to-neutral voltages

Selectable measuring range ϕ - ϕ	Equivalent to measuring range ϕ - N
0 to 132 V	0 to 76.2 V
0 to 228 V	0 to 132 V
0 to 576 V	0 to 332 V
0 to 720 V	0 to 420 V

Here, the user selects the internal measuring range of the SIMEAS P.
Up to 400V (ϕ - N) / 690V (ϕ - ϕ) can be connected directly without a voltage transformer.

Caution:

- You must make these settings for a direct connection or for a connection with current transformers.
- The selected measuring range must be greater than the secondary rating of the voltage transformer!
- The accuracy of SIMEAS P is based on the selected measuring range.
- The determination of this range indicates the maximum voltage value that can be displayed on the device.
- The frequency measurement of the SIMEAS P is initiated only when the measured voltage is > 20% of the maximum voltage of the measuring range.
- In addition, for a single-phase connection, the measuring range must be indicated as phase-to-phase voltage ϕ-ϕ. The ϕ-N measuring range must be determined according to the conversion table.

Note

When you change the voltage transformer settings, the power calculation in the device has to be reset.

Example:

VT Rating:	10 kV / 100 V	
Measuring range 132 V:	Max display range:	0 to 13.2 kV
Measuring range 250 V:	Max display range:	0 to 25.0 kV

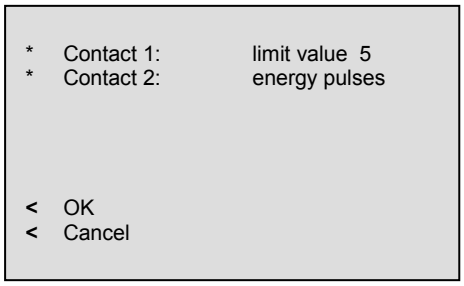
Recommendations:

If the connection is made to voltage transformers with secondary voltage ratings of 100, 115, or 120 V, the measuring range "132 V" should be selected.
If the connection is made directly to 230V (ϕ - N) / 400V (ϕ-ϕ), the measuring range "480 V" should be chosen.
If the connection is made directly to 400V (ϕ - N) / 690V (ϕ-ϕ), the measuring range of "828 V" should be selected.
If a single-phase connection is made directly to 230 V (ϕ - N)*, the measuring range "480 V" (=277 V (ϕ - N)) should be chosen.*

4.3.1.3 Outputs

Here, the user can determine the function of the programmable output contacts (potential-free electronic relays).

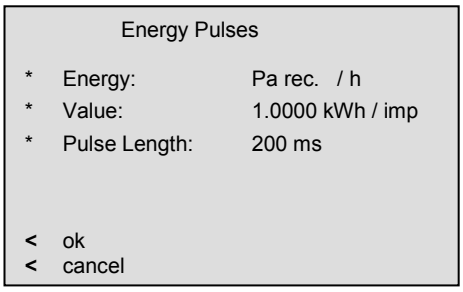
The various options for programming an output contact are discussed below.



Selection:

- Off — Contact has no function
- SIMEAS P is on — Contact closed if power supply voltage is present.
- Energy Pulses — If selected, a new window "Energy Pulses" appears.
- Limit Value 1 — If selected, a new window "Limit Value 1" appears.
- Limit Value 2 — If selected, a new window "Limit Value 2" appears.
- Limit Value 3 — If selected, a new window "Limit Value 3" appears.
- Limit Value 4 — If selected, a new window "Limit Value 4" appears.
- Limit Value 5 — If selected, a new window "Limit Value 5" appears.
- Limit Value 6 — If selected, a new window "Limit Value 6" appears.
- Direction of rotation — This option allows you to output the rotation direction of the voltage.
  - 1: Contact activated; direction of rotation for clockwise display (phase sequence L1-L2-L3, clockwise rotation)
  - 0: Contact deactivated; direction of rotation for anti-clockwise display (2 phases interchanged, anti-clockwise rotation)

Input Window for Energy Pulses



Energy

- Selection of an energy or other metered quantity from the Measured Quantities table (depends on the type of the input connection).

Value

- Selection of the amount of energy required to generate a pulse.

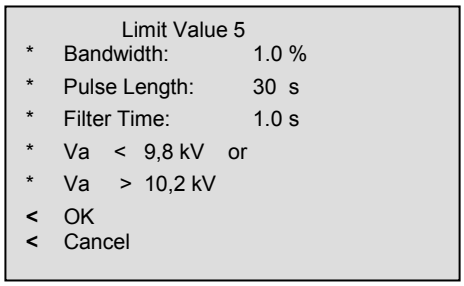
Pulse length

- Can be selected from 50, 100, 150, 200.....to 500 ms.

You will find a description of the energy pulse measurement in section 6.6.2.

Input Window for Limit Value Groups

The values entered for bandwidth, pulse duration and filter time are valid for all logically selected measured quantities.



Bandwidth

- Input of 0.1 to 10 % of rated value
- Governs contact dropout.

Pulse Length

- 0,5s; 1s; 5s; 10s; 30s; 60s; 300s;
- ∞ (Continuous pulse for as long as a limit violation applies)

Filter Time

- Input of 0.0 to 9.9 s max. (Minimum time during which a limit violation must occur to launch a output pulse)

Note

To make sure that limit violations will be registered, enter a filter time ≥1 s.

Limit Values

- Selection of any measured quantity from the Measured Quantities table (no energy or metered quantities)
- Selection as to whether triggering should be launched when the measured quantity exceeds or drops below the threshold value (< >).
- Selection of the threshold value that initiates triggering.
- Additional measured quantities can be connected logically via "and" or "or". A maximum of six (6) measured quantities are possible.

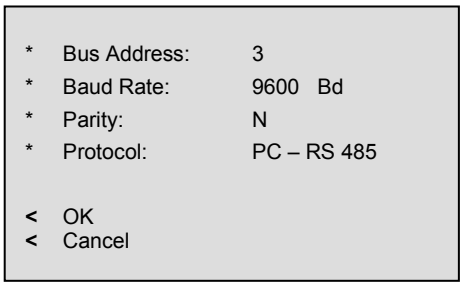
Note

You can parameterize limit value groups also in **Additional Settings – Counter** (level 4, see section 4.2)!

4.3.1.4 Communication Interface

Bus Address

- Input of address 1 to 255



Baud Rate

- Selection only for connection to a PC or Modbus.
  The following baudrates are allowed:
  300, 600, 1200, 3400, 4800,
  9600, 19200, 38400, 75600, 115200
- The baud rate of the
  Profibus is supported automatically
  up to 12 MBd with the selection being
  performed via the master station.

Parity

- Only for Modbus

Protocol

- PC-RS485 (For connection to a PC via programming software)
- Profibus DP
- Modbus RTU
- Modbus ASCII

For further information, refer to the Foreword of this manual.

Note

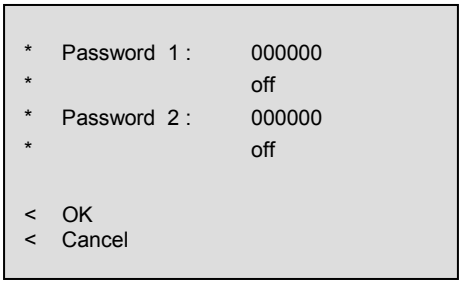
At delivery, the following communication parameters are preset:

Address:	0
Protocol:	Serial ASCII
Baud rate:	9600
Parity:	No

4.3.1.5 Changing the Password

Password 1:

- Off: No function
- On: Active if Password 2 is active.



Secured functions:

- Programming the Screens
- Resetting the Device
- Selecting Language / Designation

Password 2:

- Off: No function (Password 1 is also deactivated)
- On: Password activated.

Secured functions:

- Basic Settings

Notes:

- A password always consists of a 6-digit number.
- If you have forgotten the password, the device can also be activated by using the master password.
- Password 1 is only active if Password 2 is also activated.
- If both Password 1 and Password 2 are activated, Password 2 can be used to access all protected functions of Password 1.
- If an identical password is chosen for Password 1 and Password 2, all functions of Password 1 and Password 2 can be activated by means of a single password.
- In Level 1, a lock displayed on the status bar indicates whether the status of the device is password protected (lock closed) or unprotected (lock open).
- After a password has been programmed, a time of 1 minute elapses before it is activated in Level 1 (the activation can be detected when the lock closes on the status bar).
- If the protected functions are called in the menu, a window for entering the password appears.
- If a protected setting is activated by means of a password, all other settings associated with this password are activated as well. A reactivation is required after a time of 1 minute has elapsed in Level 1.

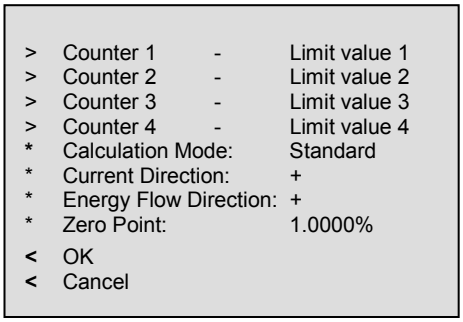
4.3.1.6 Calibration

See Chapter 7 - "Service".

4.3.1.7 Additional Settings

Counters 1 to 4

On this screen, the four counters (1 through 4) can be displayed.
Limit value groups can be assigned to each counter. When a counter is, selected a second window opens for the input of the corresponding limit value group (see Outputs).



Note

You can parameterize limit value groups also in **Outputs – Limit value group** (level 4, see section 4.2)!

Calculation Mode

- Standard
- DIN
- Fourier

The calculation mode for some measured quantities can be changed here. For further information, see the Chapter 3 - "Measured Quantities".

Current Direction

- \+ (Default if connection was performed correctly pursuant to the standards)
- \- (Current direction is negated)

The current direction can be changed here in lieu of making physical changes to the input connections.

Energy Flow Direction

- \+ positive energy flow direction = load reference (standard)
  negative energy flow direction = consumer reference
  (default setting; industry mode)
- \- positive energy flow direction = generator
  negative energy flow direction = load reference
  (power generation mode)

Zero Point
The zero point suppression can be changed here.
Can be selected from 0,0 ... 10,0% of the upper limit of the measurement range (Default setting: 1.0000%)

Note

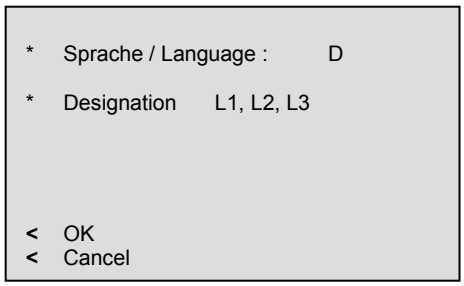
Due to its high precision, SIMEAS P can measure voltages and currents even without measuring values connected to the device. If you do not want this behaviour in your application, you can suppress measuring below a certain threshold.

4.3.2 Language / Designation

Sprache / Language

Used to select the language of the SIMEAS P as follows:

- D = German
- GB = English
- US = U. S. English



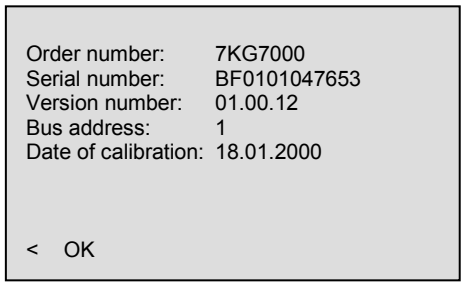
Designation

Used to select the phasing designation on the screens from the following choices:

- L1, L2, L3
- a, b, c

4.3.3 About SIMEAS

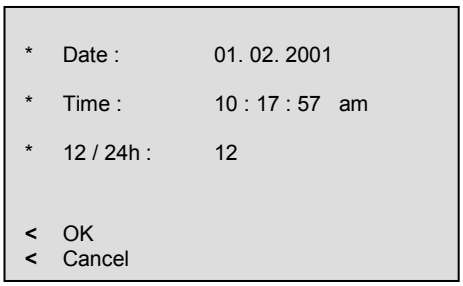
Information on the device is displayed on this window.



4.3.4 Date / Time

Only the following functions of the SIMEAS P (standard version) utilize time information (time information is not mandatory for any function):

- Oscilloscope
- Date of adjustment (calibration)

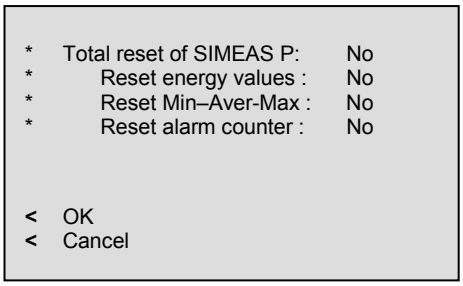


Since the standard version does not utilize battery backup, time information is reset if the power supply voltage is lost.

4.3.5 Reset

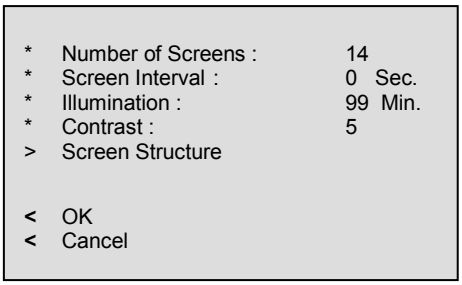
Reset

- Total reset of the SIMEAS P
- All energy and metered values
- Min – Aver – Max values
- Alarm counter (counter for limit violations)



4.3.6 Programming Screen

The contents and display mode of the various screens are established in this window.



Number of Screens

- Between 1 and 20

The number of screens that can be selected in Level 1 via the buttons ▼ ▲ .

Screen Interval

- Between 0 and 60 seconds

0 sec. = fixed screens (only selection via buttons possible)
1...60 seconds: scrolls automatically to the next screen after 1...60 seconds

Illumination:

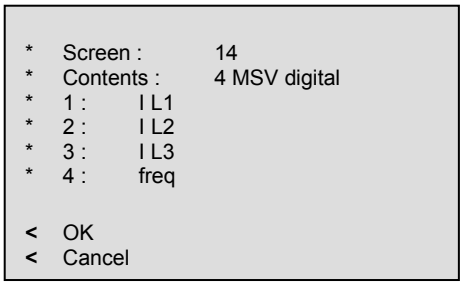
- Between 0 and 99 minutes

0 Min. = Illumination off
99 Min. = Illumination on permanently

Contrast:

- Between 0 and 9 (standard: 4)

4.3.6.1 Screen Structure



The contents of specific measuring screens are programmed on the "Screen Structure" window.

Screen:

Selection of a specific screen among the number previously established.

The contents of the screen are automatically displayed when switching from one screen to the next.

Contents:

The contents of the selected screen can be established or modified here as follows:

- 2 measured values digital
- 2 measured values digital / analog
- 4 measured values digital
- 4 measured values digital / analog
- Harmonics V / I
- Min – Max values
- Phasor diagram
- Oscilloscope

If a specific screen content is selected, the input fields for the corresponding characteristics are automatically displayed.

Device Programming 7KG76xx

5

5.1 Notes for the Devices 7KG76xx

For devices with the ordering number 7KG76xx, some parameters can only be set via the PC software SIMEAS P Parameterization (ordering number see 1.2). For these parameters, refer to chapter 6.
In addition to the standard version (refer to 4), the devices 7KG76xx offer additional screens located in a second group:

- **Standard measurement values on screens**
  The Oscilloscope can be found in the Datalogger group.
- **Datalogger** (Functions from 7KG76xx)
  This group offers the following screens:
  - Date and time
  - Oscilloscope
  - Limit value group
  - Binary states

5.2 Operating Notes

This chapter describes all of the setting options of the SIMEAS P that are made via the front buttons.

The Main Menu (programming level 2, see section 5.3) can be accessed
- from the Measured Values screens, the Min-Max Values screens or the Phasor Diagram screen via the ENTER button.
- from the Harmonics screen by holding down the ENTER button
- from the Oscilloscope screen via the ENTER button and the entry <Main menu.
- from the Datalogger: Use the arrow buttons to select the Date/Time screen and press the ENTER button.

5.2.1 Button Functions

The following functions are performed via the ▼ ▲ buttons:

- Moving the cursor to the entry line.
- Scrolling through selection lists when entering settings.
- Selecting numbers when entering numerical values.

If the buttons are held down, the scrolling continues automatically.

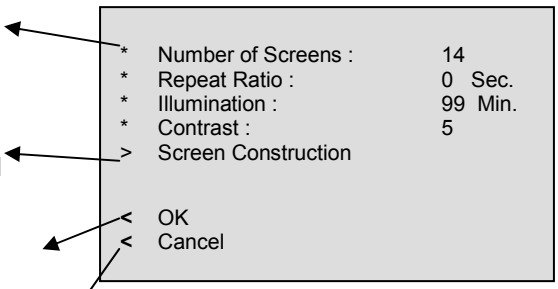
The selected line, setting, or number is confirmed by pressing the ENTER button.

5.2.2 Window Structure

Selecting ***** and pressing ENTER moves the cursor directly to the data entry field on the same line.

Selecting **>** and pressing ENTER opens a new window for additional data entry.

Selecting **<** "OK" and pressing ENTER confirms the settings and returns the user to the previous level.



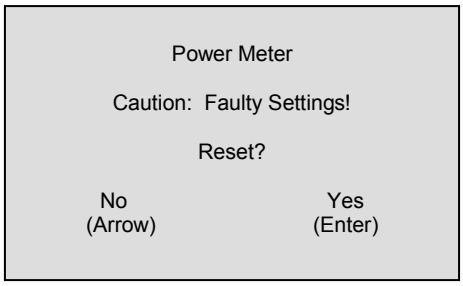
Selecting **<** "Cancel" and pressing ENTER cancels the setting changes just made and returns the user to the previous level.

5.2.3 Notes on Parameterization

- The selection of the measured quantity depends on the selected input voltage and current connections.
- If the number selected is too large, "Overflow" is displayed and the input value is automatically set to the maximum value.
- If the power supply voltage is switched off during programming, the message illustrated below appears when the device is restarted. Therefore, the power supply voltage should only be switched off in level 1 (measuring screens).

Select "No" via the ▼ ▲ buttons to retain the settings as they existed prior to the loss of power supply voltage.

Choose "Yes" by pressing the ENTER button to restore the default settings.



Note

This means, that you should always leave the parameter screens completely (OK or Cancel) until the measurement screens are displayed again. This ensures that all parameters will be accepted by the device.

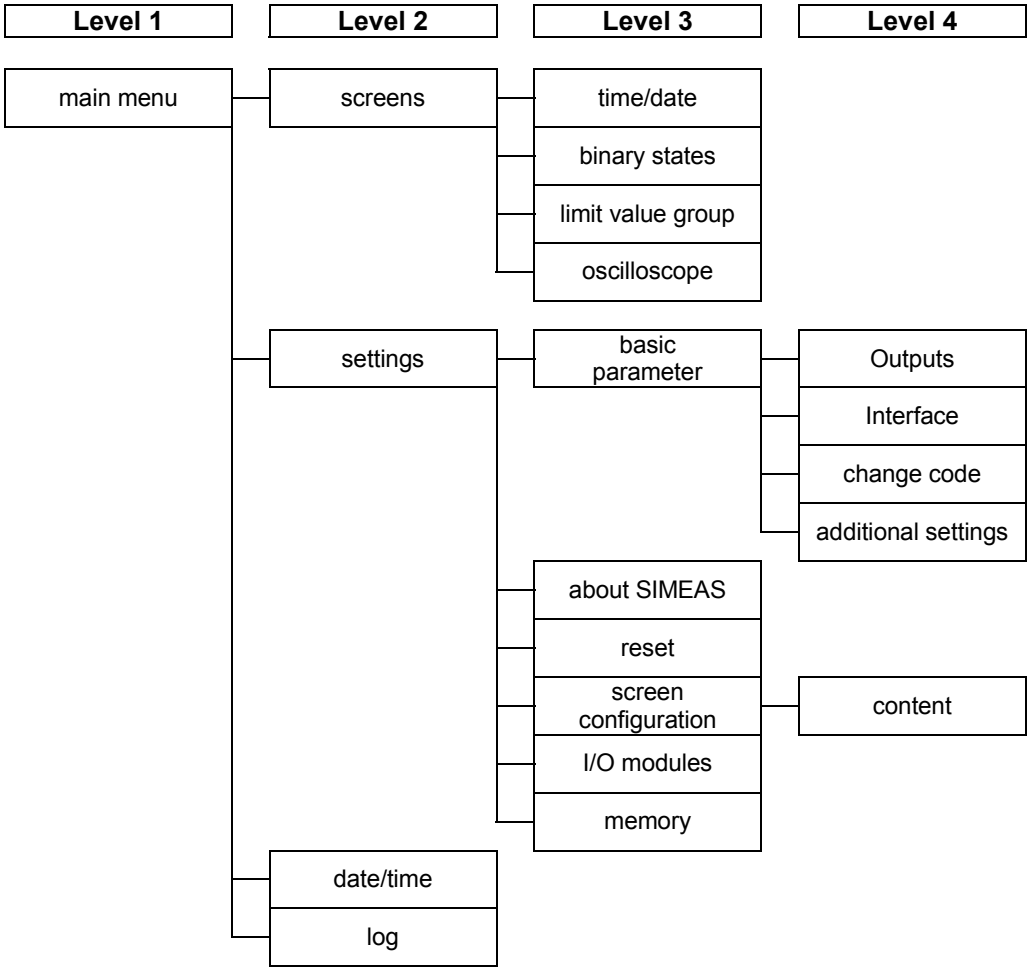
Note

Please check the parameters and the adjustment data afterwards, to ensure the correct function of the SIMEAS P.

If you have adjusted the device manually (refer to section 7.1), the adjustment data will not be overwritten by default settings.

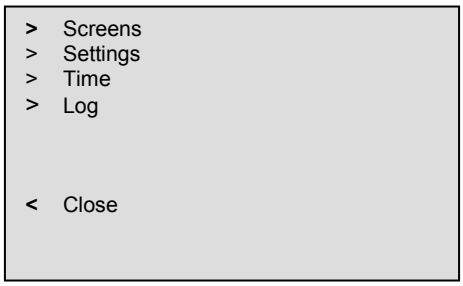
5.3 Overview of the Programming Levels

- Level 1 corresponds to the measurement screens
- Levels 2 through 4 correspond to the programming screens and are described as follows:



5.4 Main Menu

The main menu is used to access various submenus.



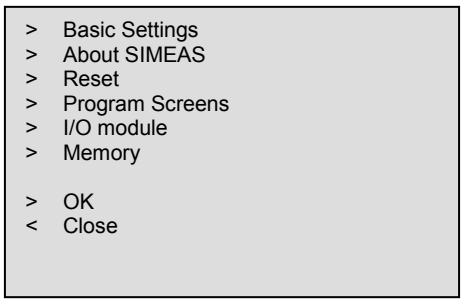
5.4.1 Screens

Via Screens you can access the following displays:

- Main menu
- Measured value screens
- Datalogger

5.4.2 Settings

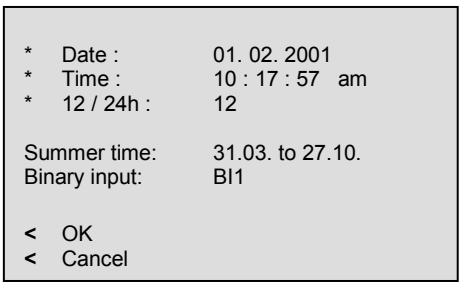
The "Basic settings" submenu is used to access various input screens for device programming



5.4.3 Date / Time

Only the following functions of the SIMEAS P (basic version) utilize time information (time information is not mandatory for any function):

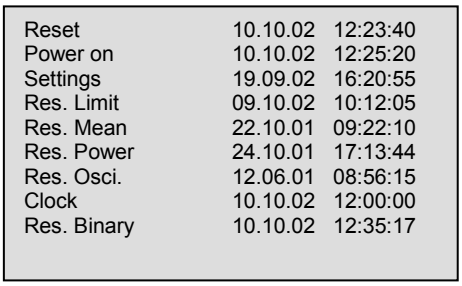
- Oscilloscope
- Date of adjustment (calibration)
- Measured value memory



One binary input (optional 7KG7610/7KG7660) may be used for time synchronization via minute impulse.
The data for summer/winter time and the binary input can only be set via the PC software SIMEAS P Parameterization (refer to section 6).

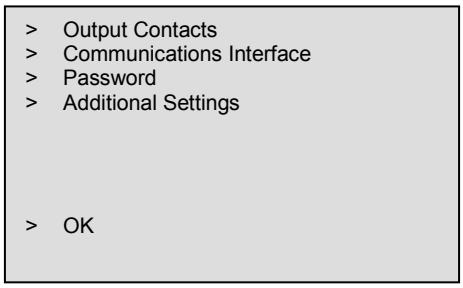
5.4.4 Log

The screen "Log" displays date and time of the most recent status changes.



5.5 Basic Settings

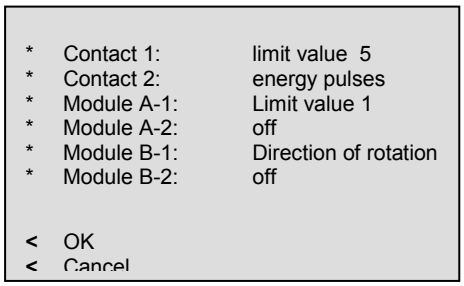
The "Basic settings" submenu is used to access various input screens for device programming



5.5.1 Output Contacts

Here, the user can determine the function of the programmable output contacts (potential-free electronic relays).

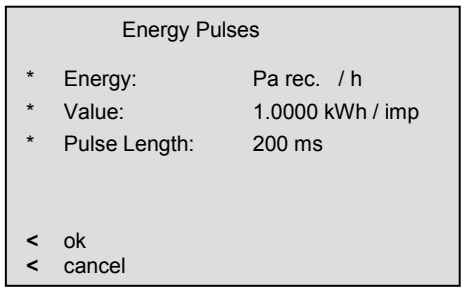
The various options for programming an output contact are discussed below.



Selection:

- Off — Contact has no function
- SIMEAS P is on — Contact closed if power supply voltage is present.
- Energy Pulses — If selected, a new window "Energy Pulses" appears.
- Limit Value 1 — If selected, a new window "Limit Value 1" appears.
- Limit Value 2 — If selected, a new window "Limit Value 2" appears.
- Limit Value 3 — If selected, a new window "Limit Value 3" appears.
- Limit Value 4 — If selected, a new window "Limit Value 4" appears.
- Limit Value 5 — If selected, a new window "Limit Value 5" appears.
- Limit Value 6 — If selected, a new window "Limit Value 6" appears.
- Direction of rotation — This option allows you to output the rotation direction of the voltage.
  - 1: Contact activated; direction of rotation for clockwise display (phase sequence L1-L2-L3, clockwise rotation)
  - 0: Contact deactivated; direction of rotation for anti-clockwise display (2 phases interchanged, anti-clockwise rotation)

Input Window for Energy Pulses



Energy

- Selection of an energy or other metered quantity from the Measured Quantities table (depends on the type of the input connection).

Value

- Selection of the amount of energy required to generate a pulse.

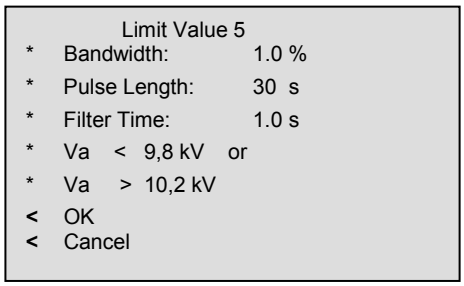
Pulse length

- Can be selected from 50, 100, 150, 200.....to 500 ms.

You will find a description of the energy pulse measurement in section 6.6.2.

Input Window for Limit Value

The values entered for bandwidth, pulse duration and filter time are valid for all logically connected measured quantities.



Bandwidth

- Input of 0.1 to 10 % of rated value
- Governs contact dropout.

Pulse Length

- 0,5s; 1s; 5s; 10s; 30s; 60s; 300s;
- ∞ (triggering for as long as a limit violation applies)

Filter Time

- Input of 0.0 to 9.9s max. (Minimum time during which a limit violation must occur to launch a triggering)

Note

To make sure that limit violations will be registered, enter a filter time ≥1 s.

Limit Values

- Selection of any measured quantity from the Measured Quantities table (no energy or metered quantities)
- Selection as to whether triggering should be launched when the measured quantity exceeds or drops below the threshold value (< >).
- Selection of the threshold value that initiates triggering.
- Additional measured quantities can be connected logically via "and" or "or". A maximum of six (6) measured quantities are possible.

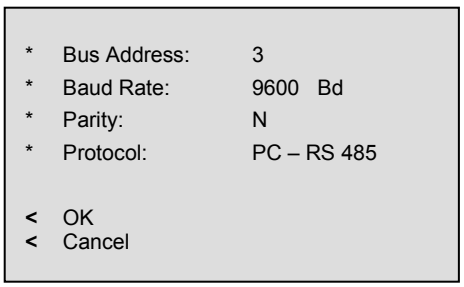
Note

You can parameterize limit value groups also in **Additional Settings – Counter** (level 4, see section 5.3) and in the Oscilloscope menu!

5.5.2 Communications Interface

Bus Address

- Input of address 1 to 255



Baud Rate

- Selection only for connection to a PC or Modbus.
  The following baudrates are allowed:
  300, 600, 1200, 3400, 4800,
  9600, 19200, 38400, 75600, 115200
- The baud rate of the
  Profibus is supported automatically
  up to 12 MBd with the selection being
  performed via the master station.

Parity

- Only for Modbus

Protocol

- PC-RS485 (For connection to a PC via programming software)
- Profibus DP
- Modbus RTU
- Modbus ASCII

For further information, refer to the Foreword of this manual.

Note

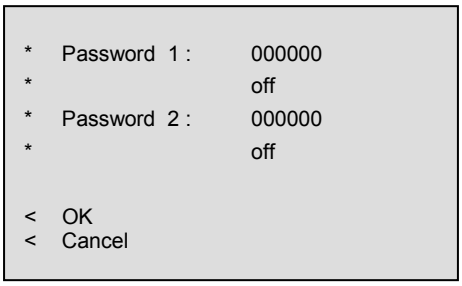
At delivery, the following communication parameters are preset:

Address:	0
Protocol:	Serial ASCII
Baud rate:	9600
Parity:	No

5.5.3 Changing the Password

Password 1:

- Off: No function
- On: Active if Password 2 is active.



Secured functions:

- Programming the Screens
- Resetting the Device
- Selecting Language / Designation

Password 2:

- Off: No function (Password 1 is also deactivated)
- On: Password activated.

Secured functions:

- Basic Settings

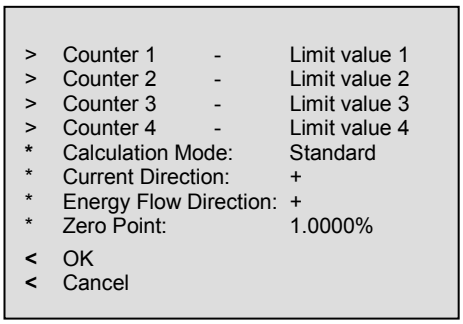
Notes:

- A password always consists of a 6-digit number.
- If you have forgotten the password, the device can also be activated by using the master password. Please contact our hotline for the master password.
- Password 1 is only active if Password 2 is also activated.
- If both Password 1 and Password 2 are activated, Password 2 can be used to access all protected functions of Password 1.
- If an identical password is chosen for Password 1 and Password 2, all functions of Password 1 and Password 2 can be activated by means of a single password.
- In Level 1, a lock displayed on the status bar indicates whether the status of the device is password protected (lock closed) or unprotected (lock open).
- After a password has been programmed, a time of 1 minute elapses before it is activated in Level 1 (the activation can be detected when the lock closes on the status bar).
- If the protected functions are called in the menu, a window for entering the password appears.
- If a protected setting is activated by means of a password, all other settings associated with this password are activated as well. A reactivation is required after a time of 1 minute has elapsed in Level 1.

5.5.4 Additional Settings

Counters 1 to 4

On this screen, the four counters (1 through 4) can be displayed digitally and limit values can be assigned to each counter. When a counter is selected, a second window opens for the input of the corresponding values (see Output Contacts).



Calculation Mode

- Standard
- DIN
- Fourier

The calculation mode for some measured quantities can be changed here. For further information, see the Chapter 3 - "Measured Quantities".

Current Direction

- \+ (Default if connection was performed correctly pursuant to the standards)
- \- (Current direction is negated)

The current direction can be changed here in lieu of making physical changes to the input connections.

Energy Flow Direction

- \+ positive energy flow direction = load reference
  negative energy flow direction = consumer reference
  (default setting; industry mode)
- \- positive energy flow direction = generator reference
  negative energy flow direction = load reference
  (power generation mode)

Zero Point

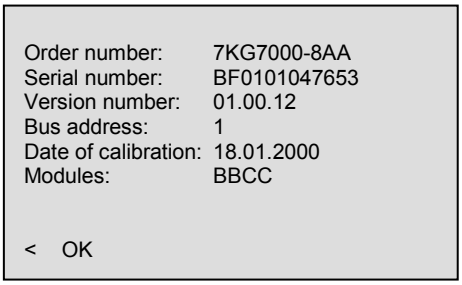
The zero point suppression can be changed here.
Can be selected from 0,0 ... 10,0% of the upper limit of the measurement range (Default setting: 1%)

Note

Due to its high precision, SIMEAS P can measure voltages and currents even without measuring values connected to the device. If you don not want this behaviour in your application, you can suppress measuring below a certain threshold.

5.6 About SIMEAS

All of the device characteristics are displayed on this window.

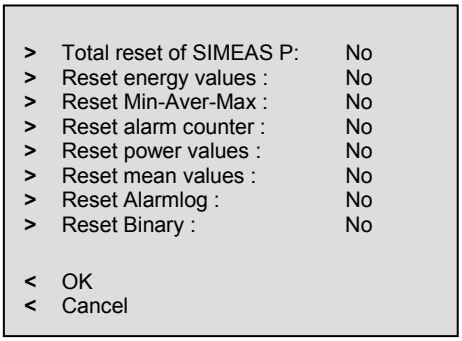


For the devices 7KG7610 and 7KG7660 the line **Modules** displays the optional I/O modules (ordering code) in the slots A, B, C, and D.
For devices without I/O modules the line **Modules** displays **AAAA** (= no modules).

5.7 Reset

Reset

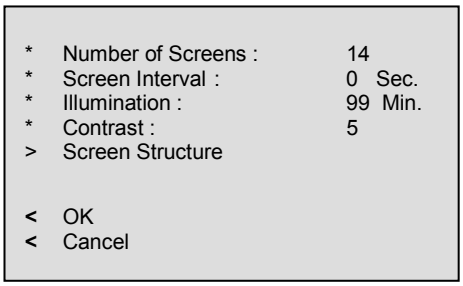
- Total reset of the SIMEAS P
- All energy and metered values
- Min – Aver – Max values
- Alarm counter (counter for limit violations)
- Power values (records in the memory)
- Mean values (records in the memory)
- Alarmlog (memory for the states of the limit value groups)
- Binary (memory for the binary states)



For reset power values, mean values, alarmlog and binary the recordings will be deleted from the memory and started again.

5.8 Programming Screen

The contents and display mode of the various screens are established in this window.



Number of Screens

- Between 1 and 20

The number of screens that can be selected in Level 1 via the buttons ▼ ▲ .

Screen Interval

- Between 0 and 60 seconds

0 sec. = fixed screens (only selection via buttons possible)
1...60 seconds: scrolls automatically to the next screen after 1...60 seconds

Illumination:

- Between 0 and 99 minutes

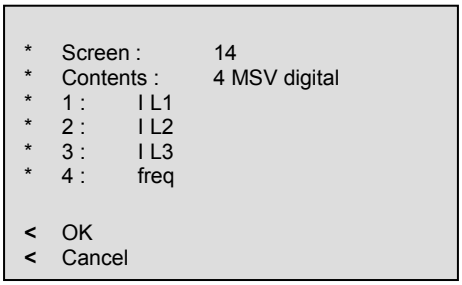
0 Min. = Illumination off
99 Min. = Illumination on permanently

Contrast:

- Between 0 and 9

5.8.1.1 Screen Structure

The contents of specific measuring screens are programmed on the "Screen Structure" window.



Screen:

Selection of a specific screen among the number previously established.

The contents of the screen are automatically displayed when switching from one screen to the next.

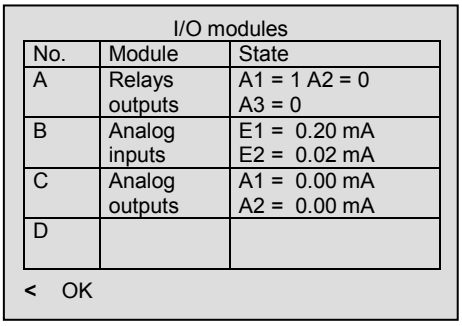
Contents:

The contents of the selected screen can be established or modified here as follows:

- 2 measured values analog
- 2 measured values digital
- Phasor diagram
- Min – Max values
- Harmonics V / I
- 4 measured values analog
- 4 measured values digital

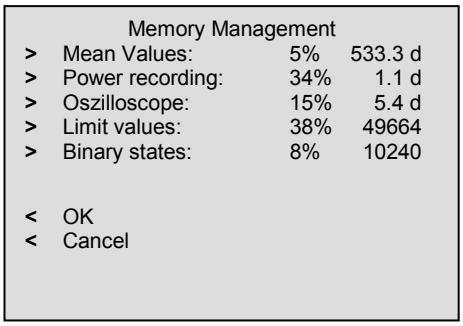
If a specific screen content is selected, the input fields for the corresponding characteristics are automatically displayed.

5.9 Input/Output Modules (7KG7610 and 7KG7660 only)



This screen displays the optional I/O modules (7KG7610 and 7KG7660 only) together with their current state.
For devices without I/O modules the table remains empty.

5.10 Memory Management



In this screen you can determine how the available memory capacity (1 MByte) will be allocated to the available functions. The indicated percentages must be in the range between 1 and 96 percent and total 100%. Once you have entered a percent value, SIMEAS PAR displays to its right the recording time and the number of values that will be stored for this setting.
You have only to enter the percentual values; the recording time will be calculated automatically. For limit values and binary states the maximum number of entries will be displayed.

Notes:

- For power recording, the recording time will be calculated from the number of channels to be recorded and the period time.
- For mean values and power recording, you have to use the PC software SIMEAS P Parameterization (ordering number see section 1.2).

5.11 Datalogger

The group "Datalogger" displays the following screens:

- Date and time
- Oscilloscope
- Limit value group
- Binary states

To work with the group "Datalogger" proceed as follows:

- In the "Main menu", select "Screens" and press two times ENTER.
- Use the buttons ▼ ▲ to access the group "Datalogger".
- To leave the "Datalogger", go back to the screen "Date and time" and press ENTER to return to the "Main menu".

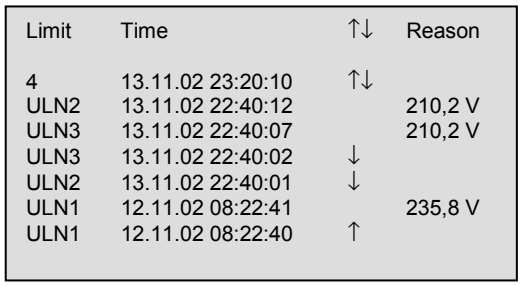
5.11.1 Datalogger Date and Time

This screen the current time of the SIMEAS P. To set the values, refer to 5.4.3.

5.11.2 Datalogger Oscilloscope

The oscilloscope is equivalent to the device 7KG7500/7KG7550 (described in section 2.2.9).
For the devices 7KG76xx, the memory capacity can be allocated to the available functions (refer to section 5.10).

5.11.3 Datalogger Limit Value group



This screen displays all limit violations ordered by time. You have to read the lines from bottom to top.

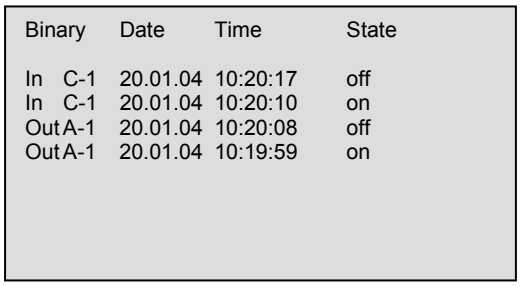
Meaning of the display:

Line 1:	ULN1	08:22:40	Limit violation
Line 2:	ULN1	08:22:41	Return to normal area; Highest measured value: 235.8 V Duration: 1 s
Line 3:	ULN2	22:40:01	Below limit
Line 4:	ULN3	22:40:02	Below limit
Line 5:	ULN3	22:40:07	Return to normal area; Lowest measured value: 210.2 V Duration: 5 s
Line 6:	ULN2	22:40:12	Return to normal area; Lowest measured value: 210.2 V Duration: 11 s
Line 7:	4	23:20:10	Limit violation in limit value group 4. Since limit value groups can be combined, only a general limit violation is displayed.

Notes:

- Press ENTER to activate the arrow buttons Up/Down to display all messages.
- Press ENTER again to deactivate this mode. This allows you to switch to the other screens via the arrow buttons Up/Down.
- Go back to the screen "Date/Time" and press ENTER to return to the main menu.

5.11.4 Binary States



This screen displays all changes of the binary states ordered by time. You have to read the lines from bottom to top.

Notes:

- Press ENTER to activate the arrow buttons Up/Down to display all messages.
- Press ENTER again to deactivate this mode. This allows you to switch to the other screens via the arrow buttons Up/Down.
- Go back to the screen "Date/Time" and press ENTER to return to the main menu.

6 Programming via PC Software

6.1 Basics

In order to program your SIMEAS P via the PC software SIMEAS P Parameterization you have to meet the following preconditions:

Preconditions:

- The device is ready to operate.
- The PC software SIMEAS P Parameterization (ordering number see section 1.2) is installed on your PC.
- The parameterization cable set (ordering number see section 1.2) or a RS232/RS485 converter is available.

Proceed as follows:

- Connect the device and the PC as described in the online help.
- Set the connection parameters on the device:
  - Select the protocol "PC-RS485".
  - Select the baudrate for the connection.
- Set the connection parameters in the PC software SIMEAS P Parameterization (**Connection → Setup connection**). Make sure to use the same baudrate.
- Load the settings from the device (**Device → Connection configuration → Receive**).
- Edit the settings in the PC software.
- Send the new settings to the device again (**Device → Connection configuration → Send**).

Note

SIMEAS P Parameterization displays the parameters depending on the ordering number of the device. Reading the ID from the device, recognizes the device type and sets the functional scope.

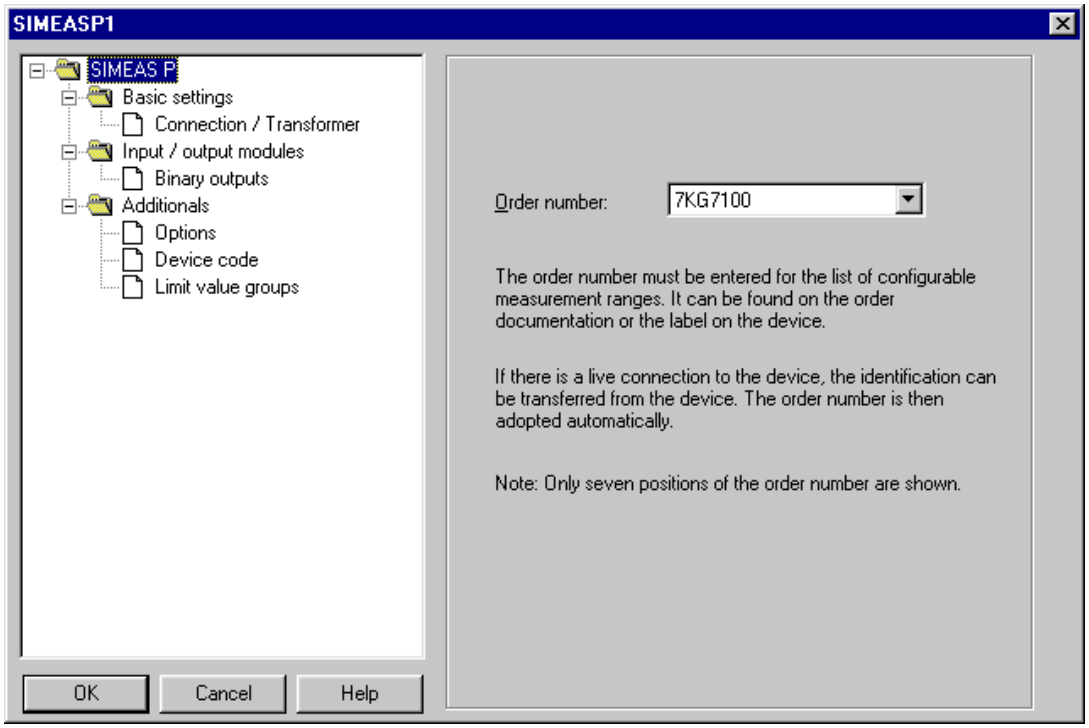
Note

All others functions of SIMEAS P Parameterization (ordering number see section 1.2) are described in the online help.

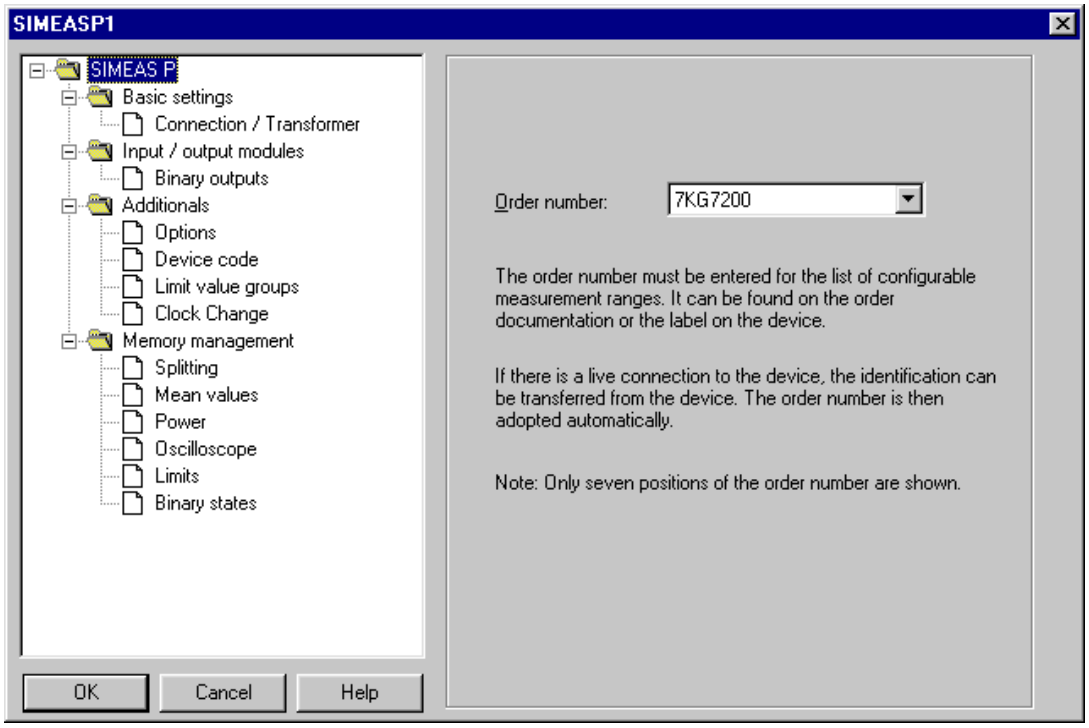
6.2 Overview

The following figures give an overview on all layers of the PC software SIMEAS P Parameterization depending on the device type.

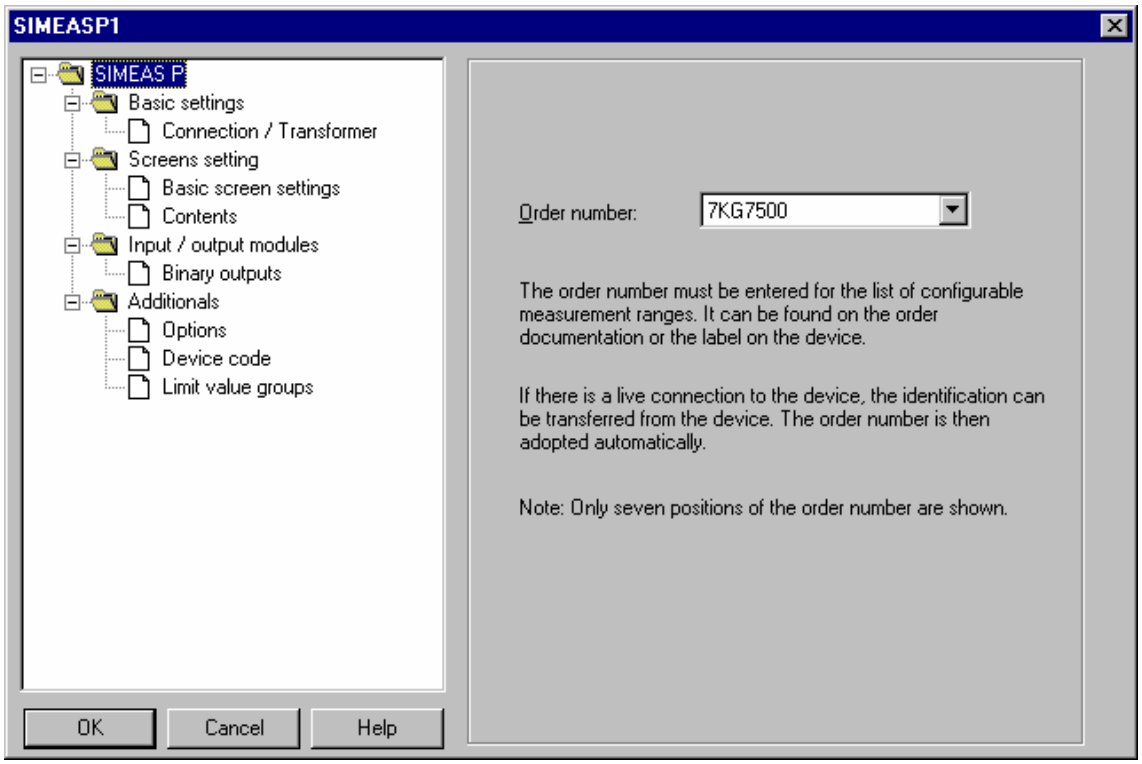
6.2.1 Overview 7KG7100



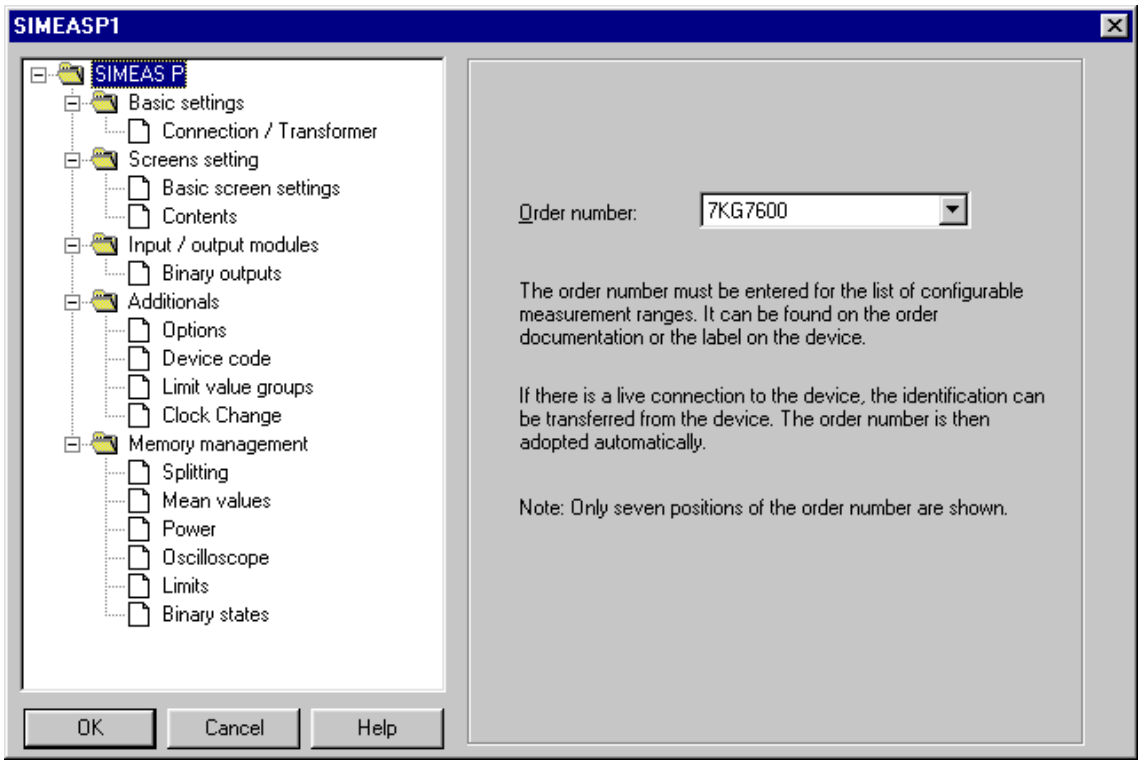
6.2.2 Overview 7KG7200



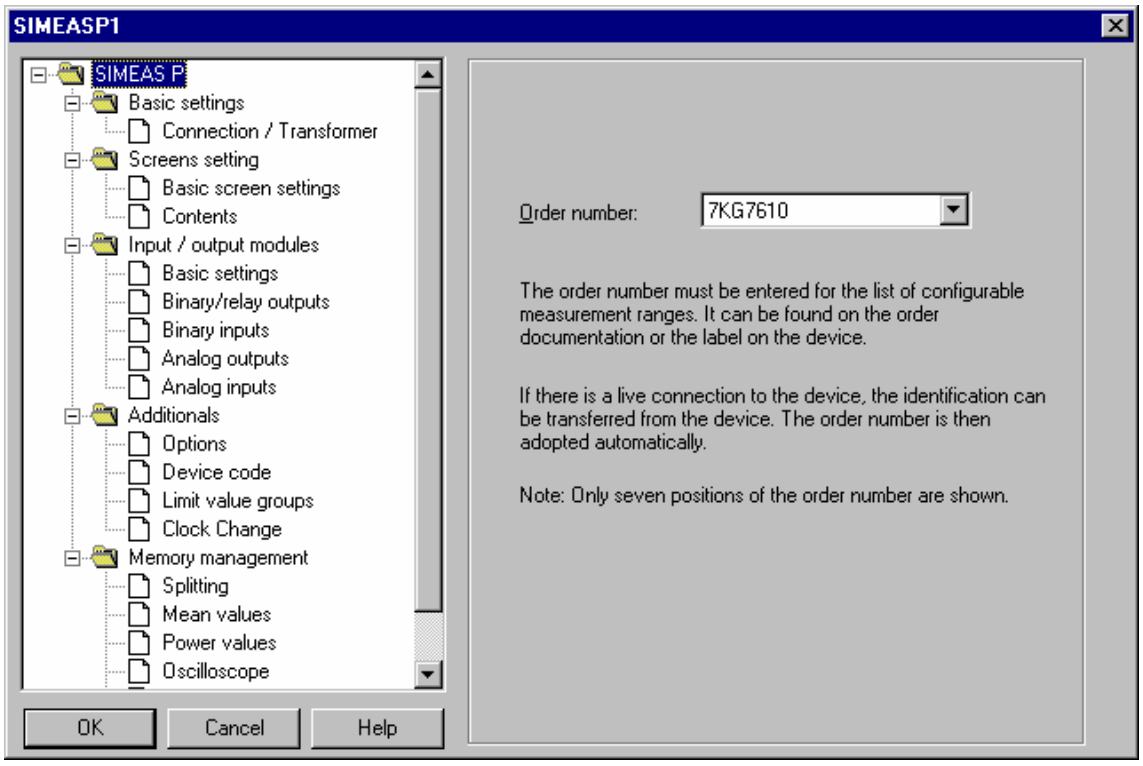
6.2.3 Overview 7KG7500/7KG7550



6.2.4 Overview 7KG7600/7KG7650

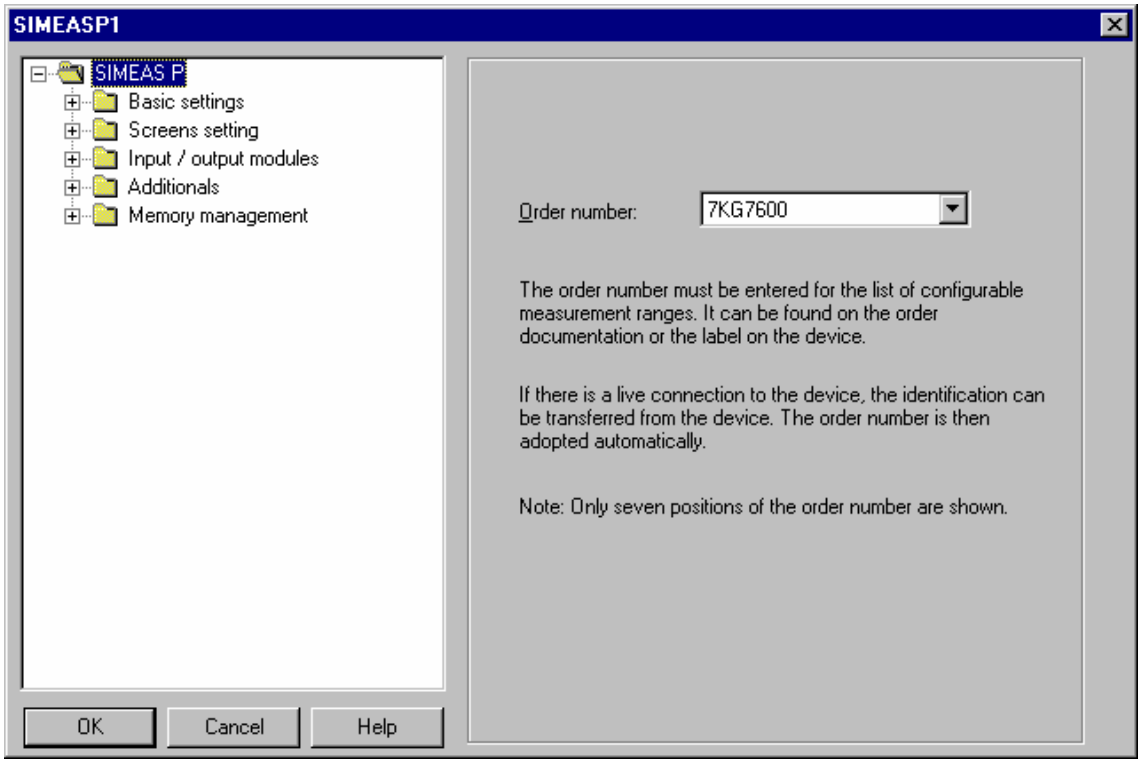


6.2.5 Overview 7KG7610/7KG7660



6.3 Dialog SIMEAS P

This dialog allows you to select the device type of your SIMEAS P.

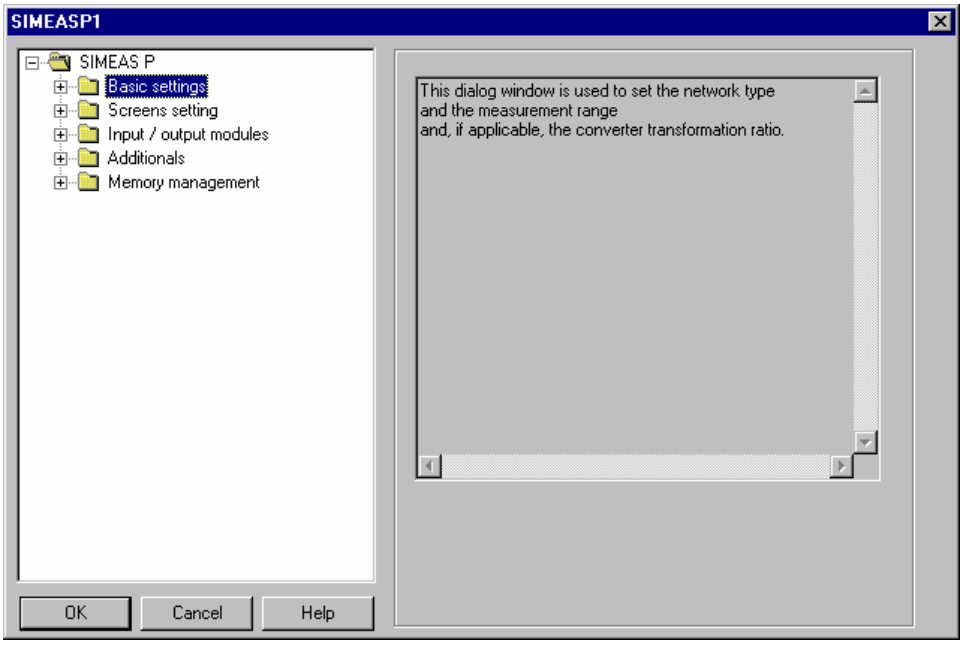


Note

SIMEAS P Parameterization displays the parameters depending on the order number of the device. Thus, the display above may be different for your device. Reading the ID from the device, recognizes the device type and sets the functional scope.

6.4 Basic Settings

This dialog allows you to set the network type, the measuring range and the transformer ratio (optionally).



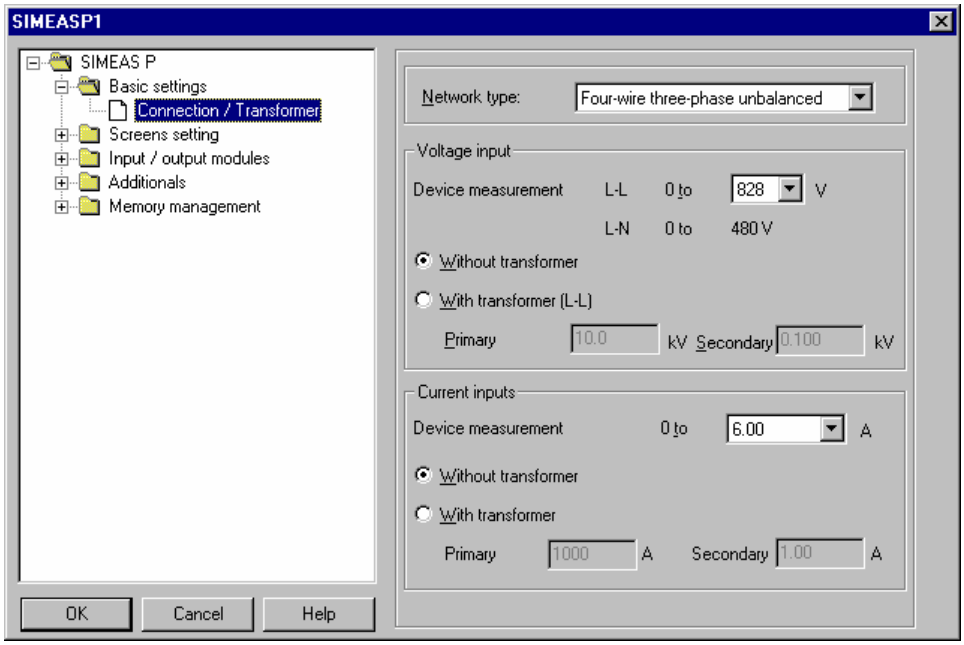
6.4.1 Connection / Transformer

In order to adapt the SIMEAS P to the network to be measured, enter the network properties and the parameters for the current and voltage measurement inputs.

Network type

Select the relevant network type using the Drop-Down-List box.

- Single-phase
- Three-wire three-phase balanced
- Three-wire three-phase unbalanced (2 current inputs → Aron switch)
- Three-wire three-phase unbalanced (3 current inputs)
- Three-phase four-wire balanced
- Three-phase four-wire, unbalanced



Voltage inputs

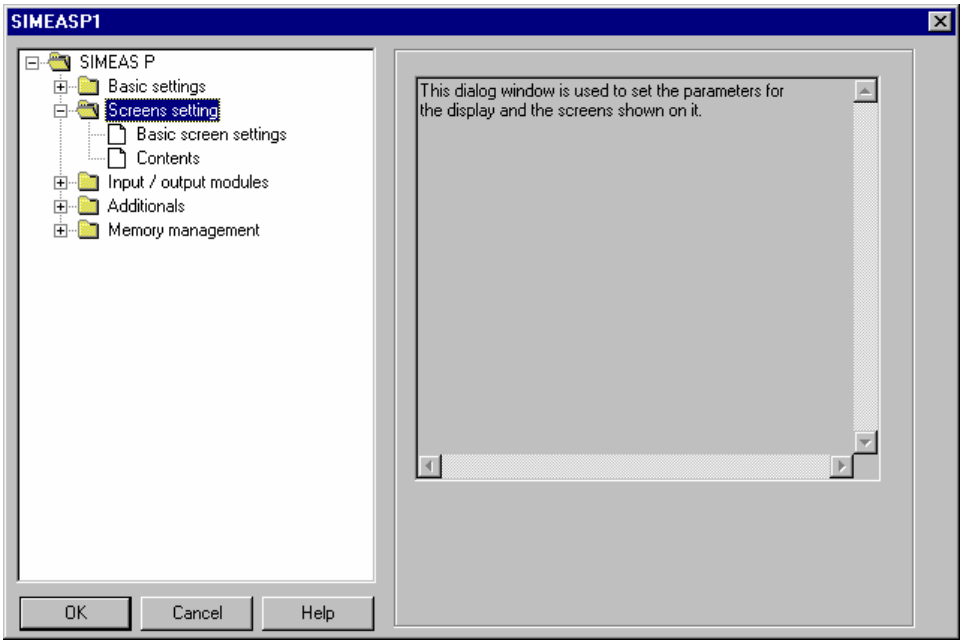
- Device measurement range
  Select the maximum voltage measurement range up to which the device should display. For Single-phase or three-wire three-phase networks, both the core and the phase voltage are displayed here.
  The precision information for the device relates to the range selected here.
- Without voltage transformer
  SIMEAS P can be operated without a voltage transformer up to a maximum of 690 V L-L.
- With voltage transformer
  If a voltage transformer is used, enter the primary and secondary data for the transformer here. The device measurement range is extrapolated internally by the factor of the transformation ratio.

Current inputs

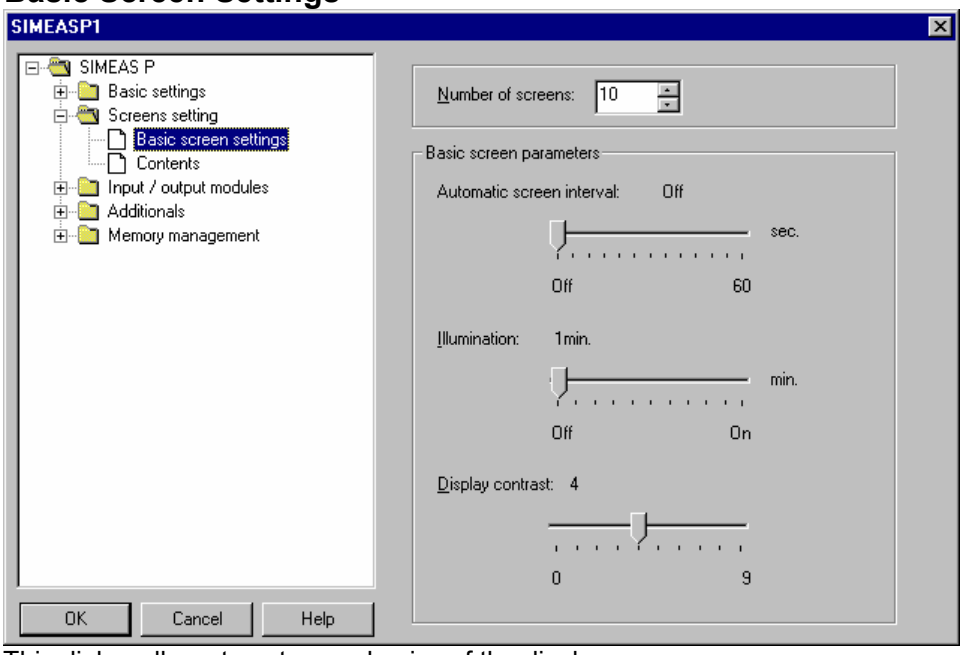
- Device measurement range
  Select the maximum current measurement range up to which the device should display. The precision information for the device relate to the range selected here.
- Without current transformer
  SIMEAS P can be operated without a current transformer up to a maximum of 6 A.
- With current transformer
  If a current transformer is used, enter the primary and secondary data for the transformer here. The device measurement range is extrapolated internally by the factor of the transformation ratio.

6.5 Screens Setting

The screens displayed in SIMEAS P (only for 7KG7500 and 7KG7550) and their contents are defined in the following windows.



6.5.1 Basic Screen Settings



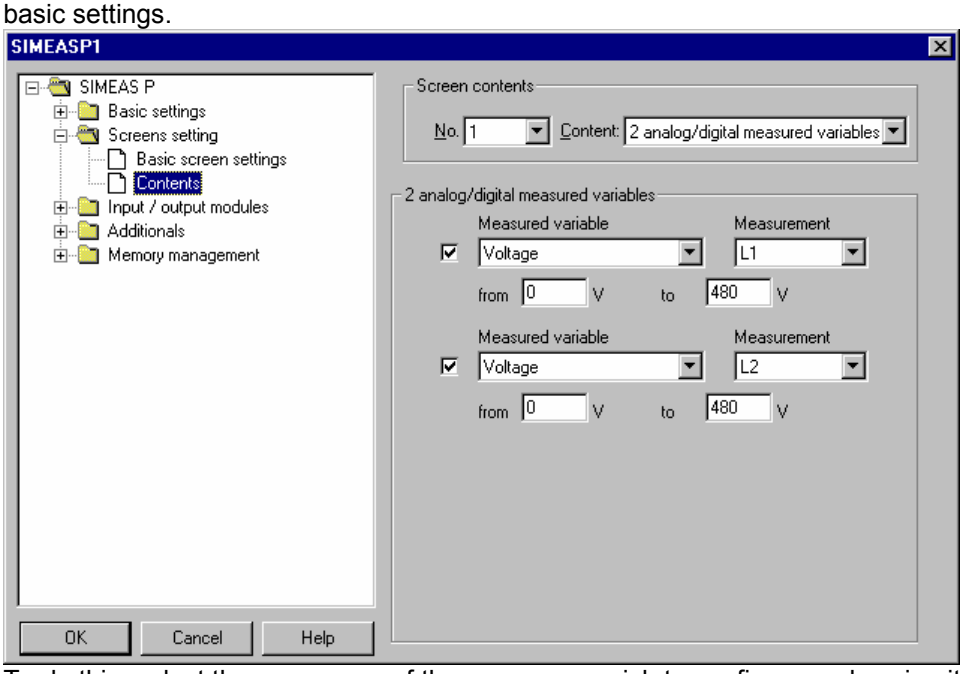
This dialog allows to set some basics of the display.

- Number of screens
  Use the Drop-Down-List box to select the number of screens, which can be selected using the buttons on the front of SIMEAS P.
  You can enter between 1 and 20 screens.
- Automatic screen interval
  In SIMEAS P, you can switch between screens either manually using the buttons or automatically.
  Settings options:
  - 0 sec.
    manual switching using buttons.
  - 1 to 60 sec.
    Automatic switching after the period set.

  The device then switches automatically from screen to screen on a loop.
- Display illumination
  You can enter the time the backlighting remains on in minutes here. Settings options:
  - 0 min.
    no backlighting.
  - 1 to 98 min.
    After a button is pressed on the device, the back lighting remains on for the time set.
  - 99 min.
    permanent backlighting.
- Display contrast
  Here, you can adjust the contrast of the SIMEAS P display. The default value is 4.
  Input options: 0 to 9

6.5.2 Contents

You now have to assign contents to the number of screens you set earlier under basic settings.



To do this, select the screen **no.** of the screen you wish to configure and assign it a screen type in the **Content** selection box. Screen types are predefined display formats for your measured variables on the SIMEAS P display. You can choose between the screen types:

- 2 Measured values digital
- 2 Measured values digital / analog
- 4 Measured values digital
- 4 Measured values digital / analog
- Vector diagram
- Harmonic bar chart
- Min – Max values
- Oscilloscope
  The oscilloscope screen type can only be selected once for any screen.

For each screen type, further selection options are displayed.

- If you select **2 measured values digital, 4 measured values digital** or **Min – Max values**, the options are the measured variables to be displayed and the measurement point.
- If you select **2 Measured values digital / analog** or **4 Measured values digital / analog**, the options are the measured variables to be displayed and the measurement point, plus the start and end range for the analog bar below the digital value. Energy and counter values cannot be displayed in this format.
- If you select **harmonic bar chart**, you have the option of selecting whether the harmonics for current or voltage should be displayed.
- If you select vector diagram or oscilloscope, no further settings are required. In the basic version, the oscilloscope can be operated directly from the screen on the SIMEAS P.

Note

For 7KG7500, the screen type Oscilloscope can be set directly at device. For 7KG76xx, there is a special dialog to program the Oscilloscope (**Memory management → Oscilloscope**).

6.6 Input/Output Modules

SIMEAS P provides 2 binary outputs

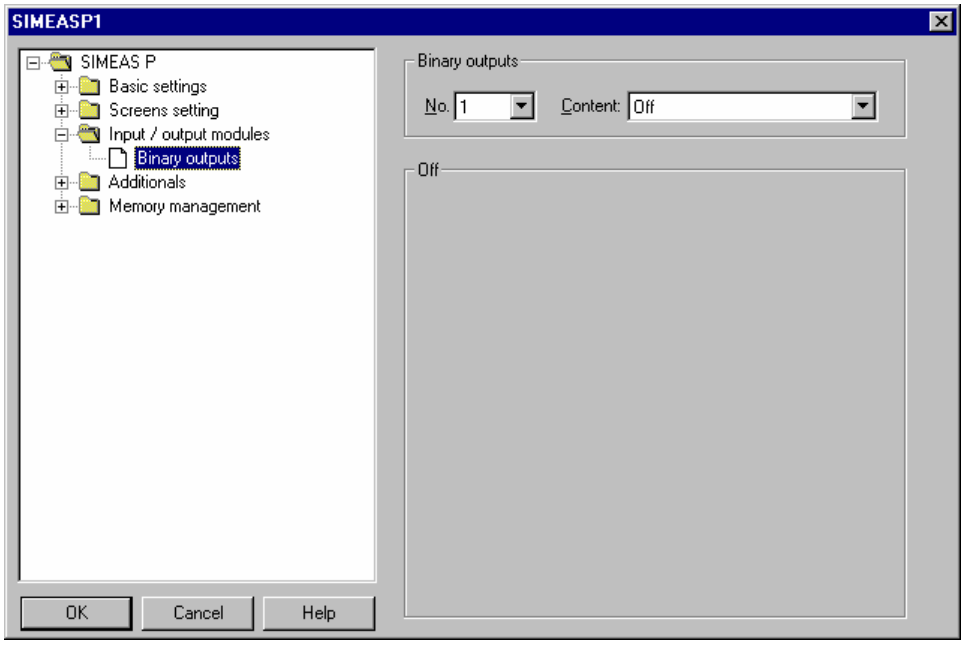
- Binary/Relay Outputs (section 6.6.1)

The devices 7KG7610 and 7KG7660 provide optionally the following I/O modules:

- Basic (section 6.6.3)
- Analog outputs (section 6.6.4)
- Analog inputs (section 6.6.5)
- Binary (section 6.6.6)

6.6.1 Binary/Relay Outputs

SIMEAS P has 2 electronic relays contacts for 2 binary outputs.
The devices 7KG7610 and 7KG7660 provide optionally one module with three relays contacts or up to 2 modules with 2 binary outputs each.



In order to define the function of the two binary/relay outputs, select the binary output to be parameterized from the **no.** selection box. In the **Contents** selection box, you can assign this binary output a function. You can select from the following options:

- Off

  Binary output with no function

- Device active

  The SIMEAS P active function allows you to monitor whether the device is switched on (contact closed). If there is no contact, the device is switched off or broken.

- Limit values

  Here, you can output the limit value group signals via the binary outputs.
  The pulse length indicates how long the binary contact is closed by means of a signal from a limit value group.

- Energy pulses

  If you assign this function to a binary output, the consumption or supply of the selected work is output as a pulse. Select a measured variable and the related measurement point. Set a limit value (energy increase per pulse) for which a pulse should be triggered. The parameterizable range (minimum and maximum value) can be found by entering the max. consumer power in the help box. The pulse length (high level) can be set in increments of 50 ms.

  You will find a description of the energy pulse measurement in section 6.6.2.

- Direction of rotation

  This option allows you to output the rotation direction of the voltage.

1	Contact activated	Direction of rotation for clockwise display (phase sequence L1-L2-L3, clockwise rotation)
0	Contact deactivated	Direction of rotation for anti-clockwise display (2 phases interchanged, anti-clockwise rotation)

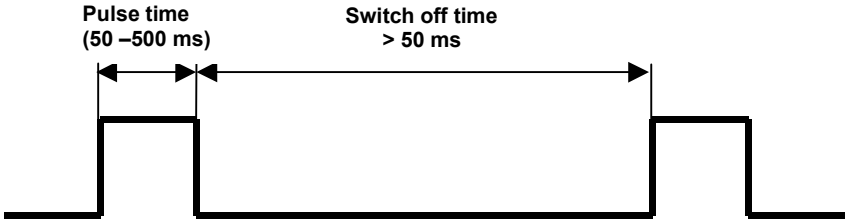
6.6.2 Information on Energy Pulse Measurement

The binary (digital) outputs of the SIMEAS P may be used to generate impulses for energy measurement: You can parameterize a specific amount of energy. When this threshold is reached, a defined pulse will be applied to the output. For energy pulse measurement, you have to adjust several settings at the device and in the parameterization software.

6.6.2.1 Parameterization via the Front Panel

Refer to section 4.3.1.3 or 5.5.1.

6.6.2.2 Pulse Time, Switch Off Time, Number of Pulses



Pulse time
defines the “high” time of the signal at the binary output.
Possible values: 50 … 500 ms
Switch off time
defines the “low” time of the signal at the binary output.
The switch off time depends on the measured energy and may be within the range of days or months.
Minimum switch off time
The minimum switch off time must not be smaller than 50 ms to reach a defined switch off time.
Number of impulses
The minimum pulse length and the minimum switch off time define the following maximum number of impulses per hour:

Pulse time [ms]	Minimum switch off time [ms]	Minimum switch on/switch off time [ms]	Max. number of pulses/h
50	50	100	36,000
100	50	150	24,000
150	50	200	18,000
200	50	250	14,400
250	50	300	12,000
300	50	350	10,286
350	50	400	9,000
400	50	450	8,000
450	50	500	7,200
500	50	550	6,545

6.6.2.3 How to Parameterize Energy Pulses

If you want to use the binary contacts for energy measurement, you have to calculate the smallest possible input (kWh/pulse) first. Please use the following description:

1. Select the pulse length (e.g. 200 ms). Refer to the table in section 6.6.2.2 for the maximum number of impulses/h: 14400
2. Calculation of the maximum load to be connected:

   Single-phase circuit: Maximum load to be connected =
   (Voltage measuring range L-N x Transformation ratio of the voltage transformer) x (Current measuring range x Transformation ratio of the current transformer)
   e.g: $V_{L\text{-}N,\ max}$ = 276 V, T_V = 1; I_{max} = 1.2 A, T_I = 1
   $P_{max} = V_{L\text{-}N,\ max} \times I_{max} = 331.2$ W

   Three-phase or four-phase circuit: Maximum load to be connected =
   (Voltage measuring range L-N x Transformation ratio of the voltage transformer) x (Current measuring range x Transformation ratio of the current transformer) x 3
   e.g: $V_{L\text{-}N,\ max}$ = 276 V, T_V = 1; I_{max} = 1.2 A, T_I = 1
   $P_{max} = (V_{L\text{-}N,\ max} \times I_{max}) \times 3 = 993.6$ W

3. Calculation of the minimum energy increase per pulse
   Depending on the pulse length and the maximum number of impulses/h the following calculation applies:

   Single-phase circuit:
   Pmax [W] / 14,400 [Imp/h] = 331.2 [W] / 14,400 [Imp/h] = 0.023 [Wh/Imp] = 0.000023 [kWh/Imp]

   Three-phase or four-phase circuit:
   Pmax [W] / 14,400 [Imp/h] = 993.6 [W] / 14,400 [Imp/h] = 0.069 [Wh/Imp] = 0.000069 [kWh/Imp]

For the example, the smallest energy increase is as follows:
Single-phase circuit: 0.000023 [kWh/Imp]
Three-phase or four-phase circuit: 0.000069 [kWh/Imp]
If you use a setting higher than these values the increase of energy will be registered correctly.

Note

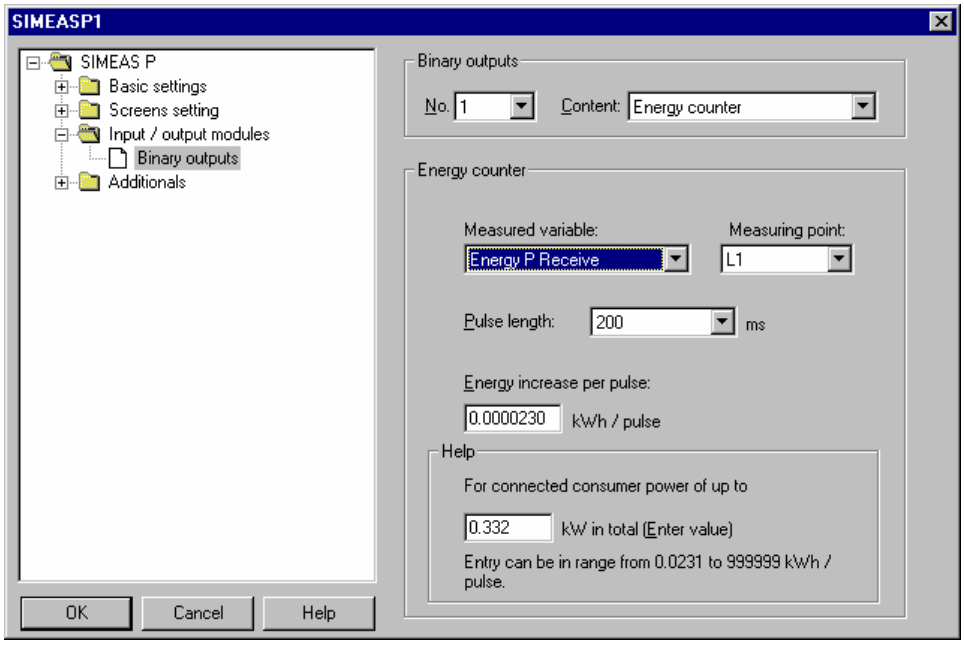
The smallest possible input values only apply if the connected load is close to the threshold of the measuring range of the device. If the connected load is smaller, the calculated values may also be smaller.

Note

A transformation ratio >1 has to be used in the calculation described above and in the parameterization of the device.

6.6.2.4 Parameterization of Energy Impulses via Parameterization Software

To parameterize energy impulses via parameterization software (refer also to section 6.6.1), proceed as follows:



1. Select the **Measured variable** to be counted.
2. Select the **Measuring point** for the energy measurement.
3. Select the **Pulse length** for the signal.

Note

Smallest pulse length = 50 ms.

4. Calculate the smallest energy increase per pulse. Use the description in section 6.6.2.3 to calculate the minimum value.

   As an alternative, you can use the field **Help** in the parameterization dialog. Enter the connected load in the field **kW in total** and leave the field. The smallest energy increase for the given load will now be displayed in the field **Entry can be in range from**.

Note

When you open the dialog for the first time, default values will be displayed. These values are derived from the connection type (single-phase, three-phase or four-phase circuit), the voltage and current range and the transformer ratios

The default values are only valid when you open the dialog for the first time!

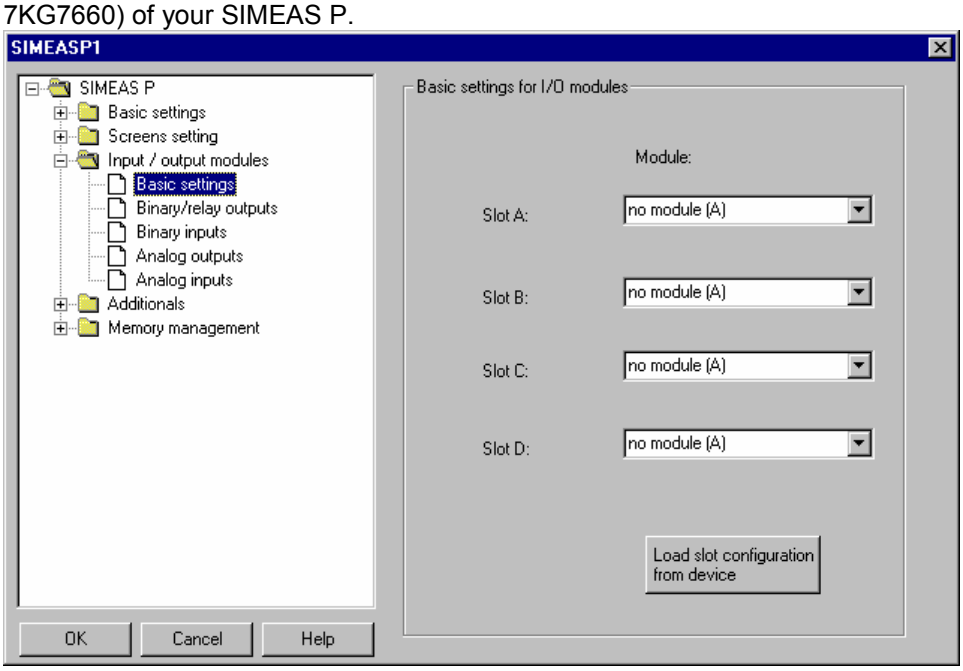
5. For the value entered in the field **Energy increase per pulse**, a pulse will be applied to the selected output each time when the given value will be reached.

Note

To ensure proper energy registration, this value must not be lower than the value calculated in step 4.

6.6.3 Basic Settings (7KG7610 and 7KG7660 only)

This dialog allows you to specify the I/O modules (optionally for 7KG7610 and 7KG7660) of your SIMEAS P.



There are two possibilities:
1. Online

- Click the button **Load slot configuration from device**. The information will be loaded from the device and displayed on the screen.
- Parameterize the I/O modules.
- Send the new configuration to the device.

Note

This procedure ensures that the I/O modules displayed on the screen correspond to those in the device.

2. Offline

- Choose the I/O modules for the **slots A** to **D** via the drop-down lists.

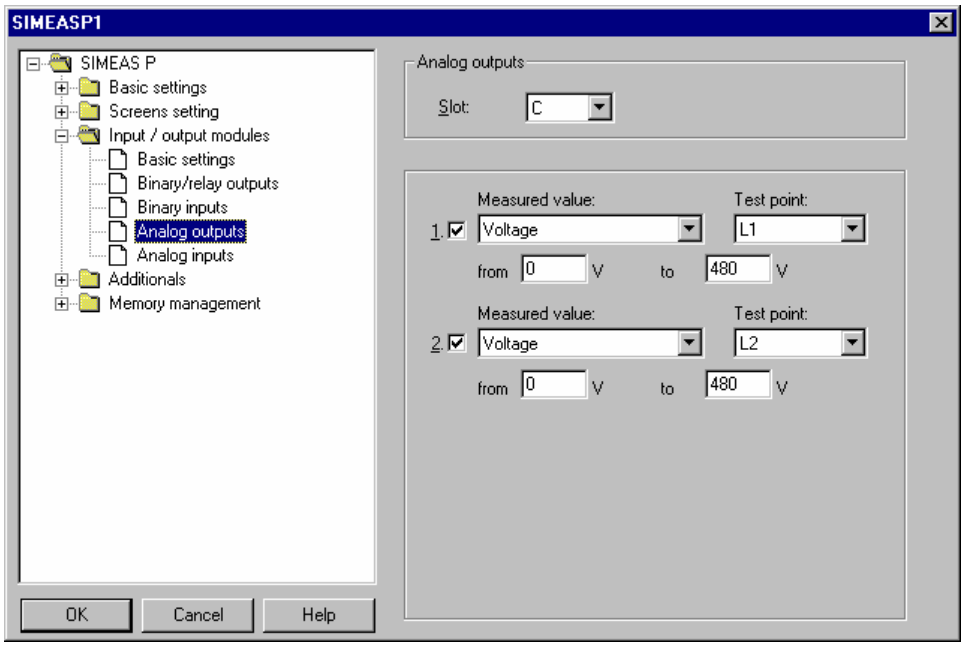
Warning

These settings must correspond to the I/O modules in the device (refer to the ordering number, see section 1.2)!

- Parameterize the I/O modules.
- Send the new configuration to the device, as soon as the connection to the device has been established.

6.6.4 Analog Outputs (7KG7610 and 7KG7660 only)

The analog outputs (optionally for 7KG7610 and 7KG7660 only) allow you to output internal measurement values as analog values in the range of 0 ... 20 mA. This features represents a measuring transducer.

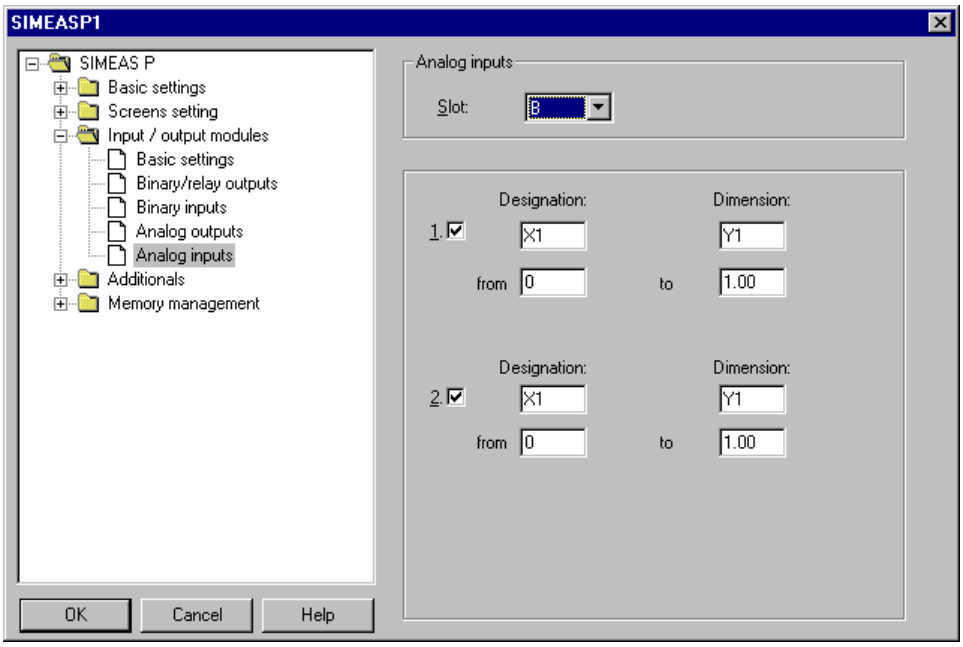


Proceed as follows:

- Choose the I/O module in the field **Slot**.
- Deactivate the outputs not used via the checkbox next to the number of the output.
- For each output used, choose the **measured value** together with the **test point** and set the signal range in the fields **from** and **to**.

6.6.5 Analog inputs (7KG7610 and 7KG7660 only)

The analog inputs (optionally for 7KG7610 and 7KG7660 only) allow you to measure analog signals in the range of 0 ... 20 mA.



Proceed as follows:

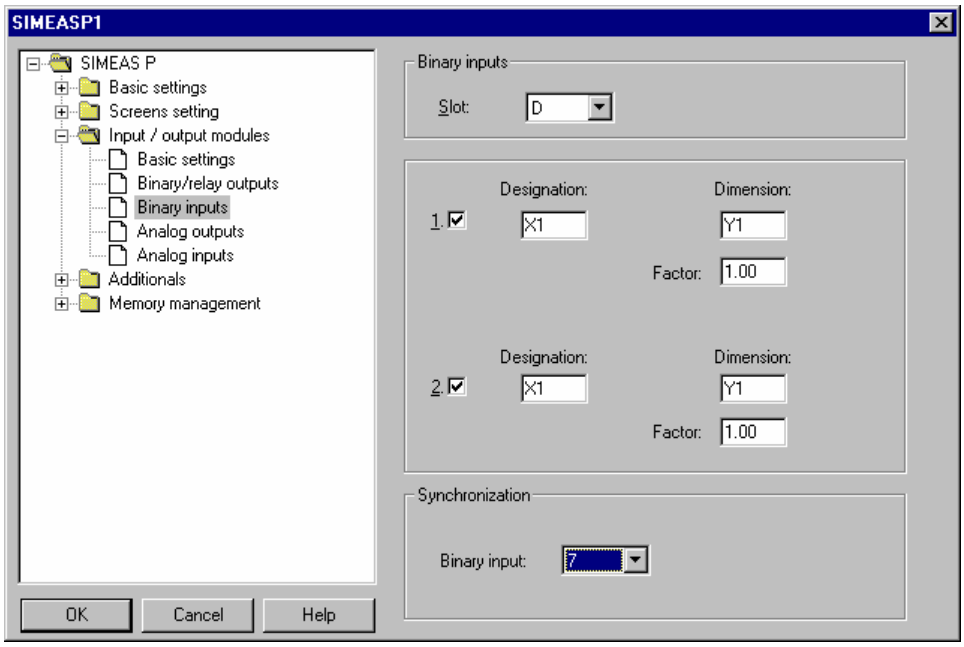
- Choose the I/O module in the field **Slot**.
- Deactivate the inputs not used via the checkbox next to the number of the input.
- For each input used, set the **designation** together with the **dimension** (max. 6 characters).
- Select the signal range in the fields **from** and **to**.
- The device display will be parameterized via screen Contents (section 6.5.2), the supervision of limit values concerning the analog inputs via Limit Value Groups (section 6.7.3).

Note

It is possible to save the values (together with the time information) recorded via analog inputs to the memory for mean values (see section 6.8.2).

6.6.6 Binary inputs (7KG7610 and 7KG7660 only)

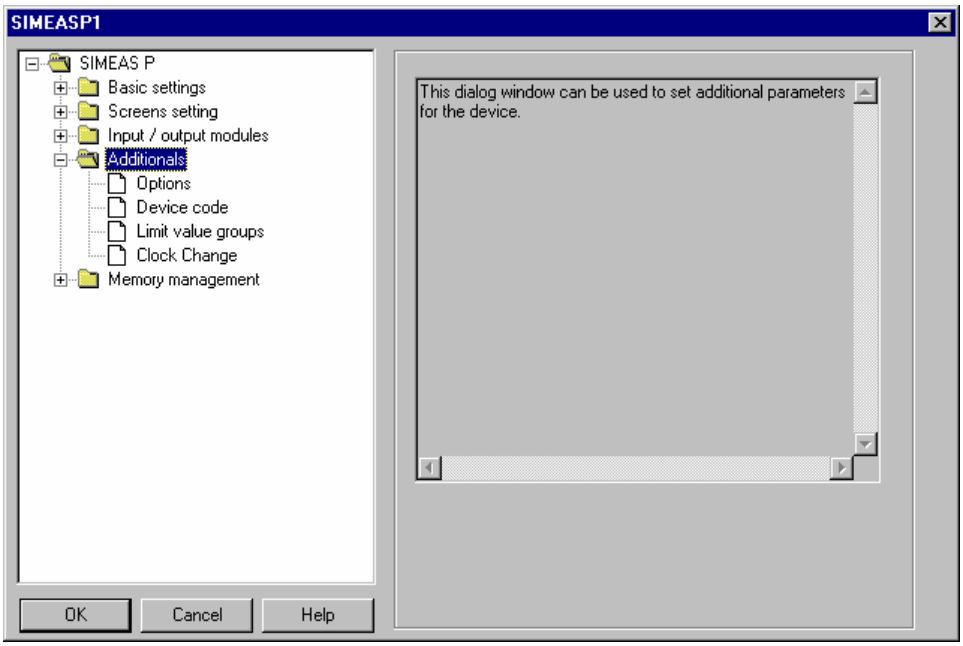
The binary inputs (optionally for 7KG7610 and 7KG7660 only) can be used for static messages and impulse inputs.



Proceed as follows:

- Choose the I/O module in the field **Slot**.
- Deactivate the inputs not used via the checkbox next to the number of the input.
- For each input used, set the **designation** together with the **dimension**.
- If you want to use the input as an external counter, you have to define the factor e.g. as **Energy increase per pulse** (refer to section 6.6.2).
- From the list box, choose the binary input to be used for time **synchronization** via minute impulses. The device will display the designation, not the number of the binary input.
- Analog to measured values, binary inputs may be displayed on measurement screens (see section 6.5.2).

6.7 Additionals



All other settings in SIMEAS P are made in the following windows.

Options

- Regional settings, such as device language and measured variable descriptor
- Type of power calculation
- Current direction
- Assignment of digital counter in screens
- Zero point suppression

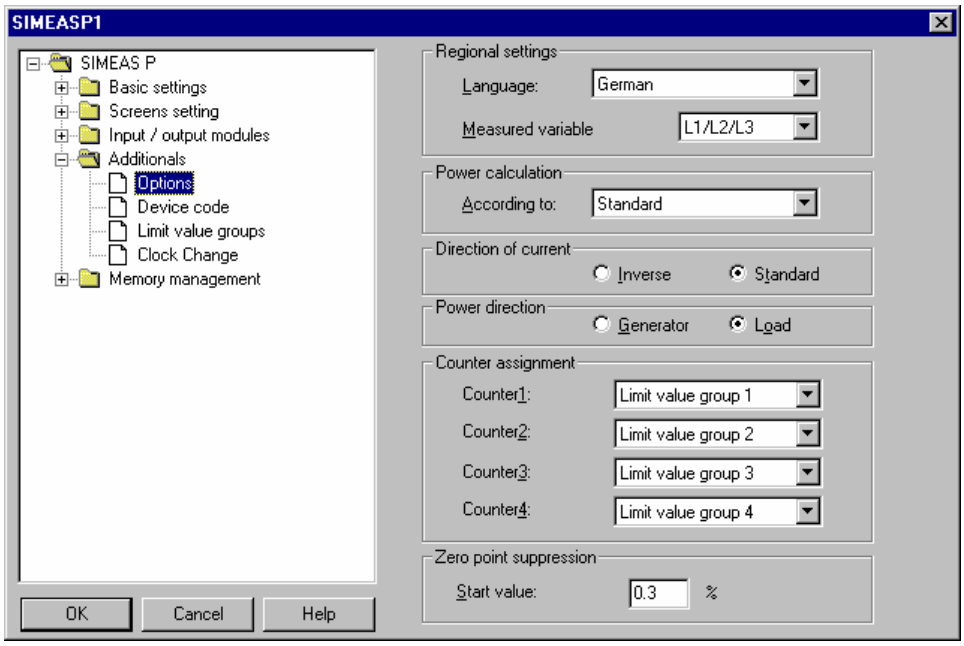
Device code
Setting device codes to secure the device settings against unauthorized changes.

Limit value groups
The max. 7 limit value groups for the device can be set here.

Further Options
Select the date (day/month) when summer time (daylight saving time) will start or end.

6.7.1 Options

You can set more parameters for the SIMEAS P under Options.



Regional settings

- Language
  Here, you can select what language the device display is in when you parameterize it using the device buttons.
- Measured variable descriptor
  The description of the conductor on device L1/L3/L3 or a/b/c can be selected here.

Power calculation

Here, you can select the type of power calculation and the calculation for current and voltage. The basic setting is standard.
Settings options:

- Standard
  All measured variables are true RMS, taking all harmonics into consideration. Calculation of reactive power using methods used by traditional measuring devices. (electrodynamics power measurement)
- DIN
  All measured variables are true RMS, taking all harmonics into consideration. Customized from standard: reactive power calculation, apparent power calculation, plus cos phi and power factor, taking into consideration the new definition of apparent power in: DIN 40110-2.
- Fourier
  All measured variables calculated from the basic vibration. Harmonics not considered.

Current direction

If the polarity was wrong when the power cables were connected to SIMEAS P, you can change the polarity using the software without having to change the connections on the device.

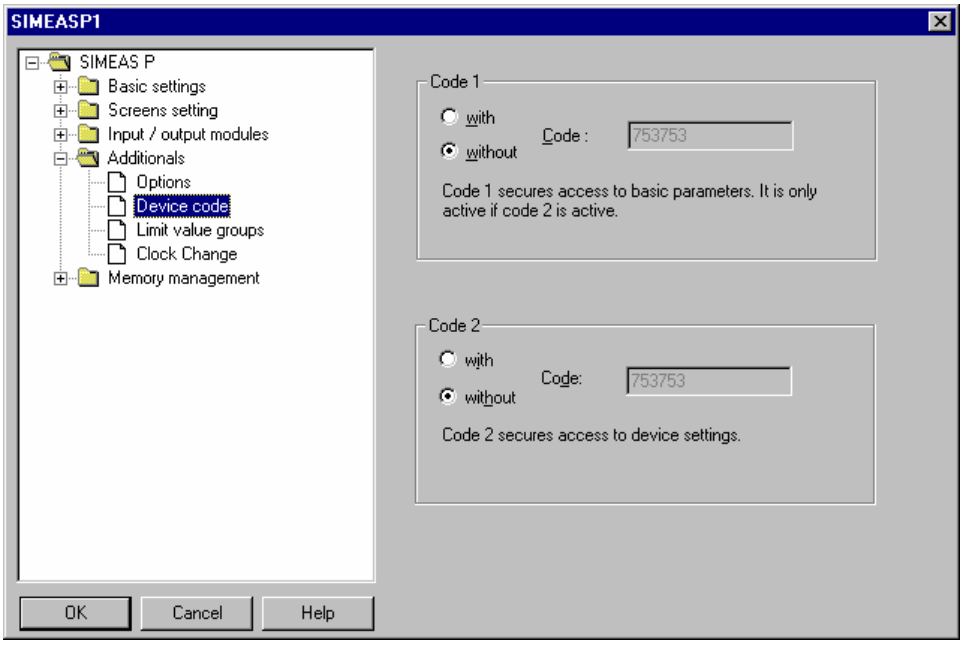
Power direction
This parameter allows you to set the working mode of the **SIMEAS P**:

- Load (standard)
  this means: Power positive = Energy import
  Power negative = Energy export
- Generator
  this means: Power negative = Energy import
  Power positive = Energy export

Counter assignment
Internal counters 1 to 4 can be displayed in the digital measured value screens of the SIMEAS P. You can assign the 4 internal counters to the max. 7 limit values groups here.

Zero point suppression
The zero point suppression can be changed here. Can be selected from 0,0 ... 10,0% of the upper limit of the measurement range (Default setting: 1%).
Note: Due to its high precision, SIMEAS P can measure voltages and currents even without measuring values connected to the device. If you do not want this behaviour in your application, you can suppress measuring below a certain threshold.

6.7.2 Device Code



Setting the device code secures the SIMEAS P against unauthorized changes.

When the code is activated, you are prompted to enter the password when you call up the parameterization menu from the buttons on the device. The relevant menu is only enabled if you enter the correct password.

Note

However, you do not have to use a password when you access the device via the programming software.

Code 1

- Off
  No security.
- On
  Device code 1 is only active if Code 2 is activated as well.
  Functions secured: screen parameterization, reset energy min / max values and changing device language.

Code 2

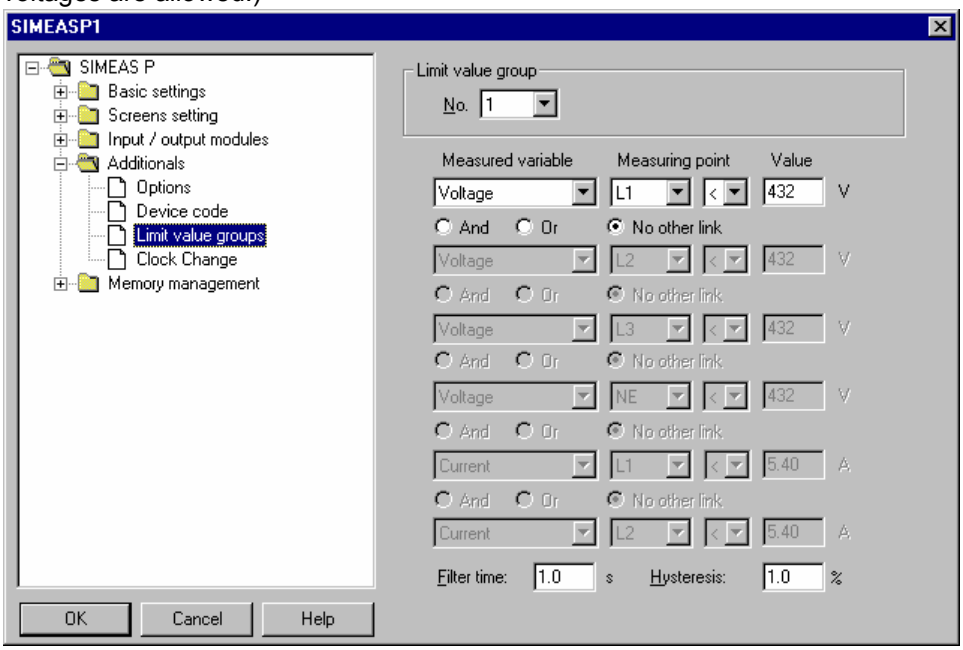
- Off
  No security (code 1 also deactivated).
- On
  Device code 1 is only active if Code 2 is activated as well.
  Functions secured: screen parameterization, reset energy min / max values and changing device language.

Notes:

- A password always consists of a 6-digit number.
- If you forget your password, you can activate the machine either using a master password (available from the hotline) or using the SIMEAS P parameterization software.
- Device code 1 is only active if code 2 is activated as well.
- If code 1 and 2 are activated, the code 2 password can also be used to unlock all the functions secured using code 1.
- If the secured parameter settings are called up in SIMEAS P, a window appears asking you to enter a password.
- If a secured parameter is unlocked by entering a password on the device, a new password prompt appears after a wait of 1 minute in level 1.

6.7.3 Limit value groups

In SIMEAS P, you can parameterize up to 7 limit value groups. In the enhanced version, 7 limit value groups are available. (Note: For limit value group 7, only voltages are allowed.)



In every limit value group, you can monitor that measured values do not exceed or fall short of a pre-definable measured value. In each of the max. 7 limit value groups, up to 6 measured variables (not energy variable) can be linked with and / or connections. The limit value groups can be switched to

- Binary outputs, or
- Options → Counter assignment
  switched to the internal counter. The oscilloscope can be triggered via a limit value group in the same way. (Assigning the limit value group directly to the device on the oscilloscope screen).
- Filter time
  Time for which a threshold breach must remain in order to trigger an alarm. Input from 0.0 to 9.9 s.

Note

To make sure that limit violations will be registered, enter a filter time ≥1 s.

- Hysteresis
  Entry from 0.1 to max. 10 %. The value relates to the nominal values for the individual measured variables.

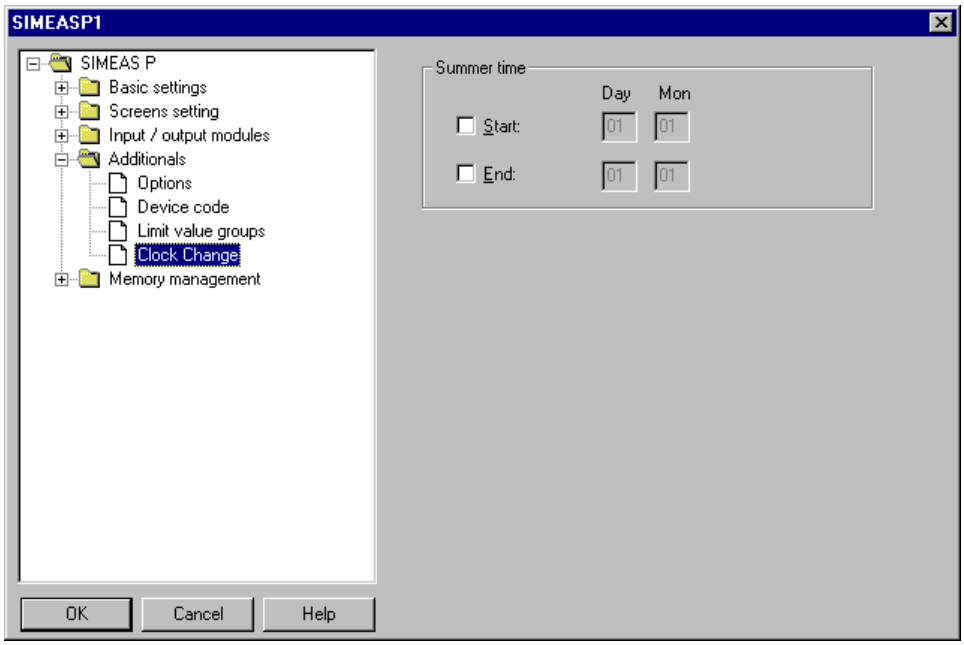
Note

If the device provides additional analog inputs (7KG7610 and 7KG7660 only), you can use external measurement signals for limit-value monitoring.

Limit value group 7 allows you to monitor the measured voltages in real-time and logs the measured value that caused a limit violation.

6.7.4 Clock Change

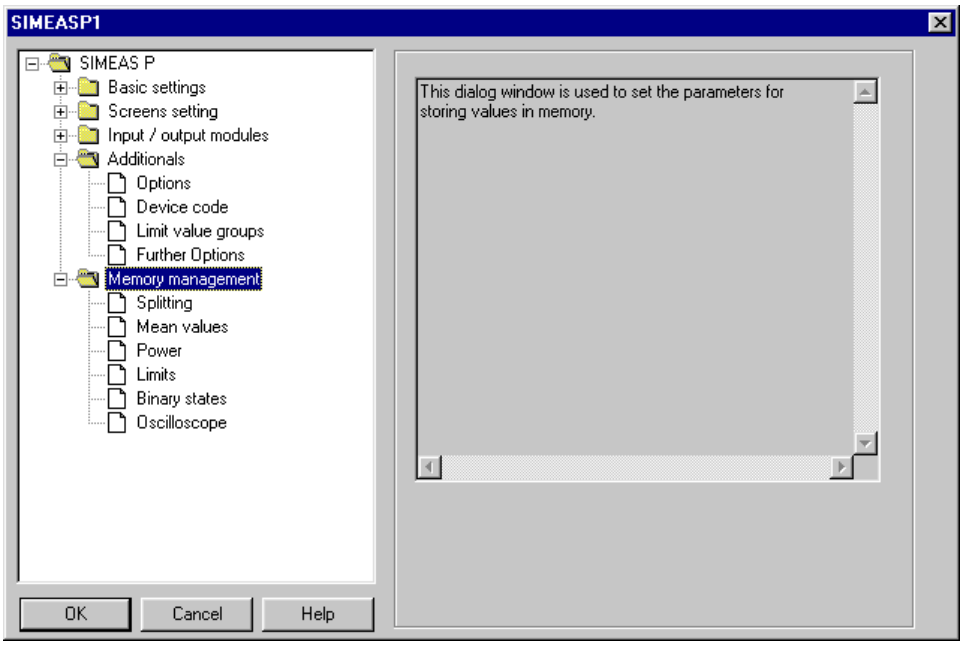
Select the date (day/month) when summer time (daylight saving time) will start or end.



You do not have to indicate the hour since SIMEAS P considers the fact that the time change will always take place at 2 a.m.
If you have not entered a date for start or end of the daylight saving time, the corresponding field remains grayed and SIMEAS P assumes that no time change will take place in the device. The time change will only be carried out if the corresponding date field is activated.

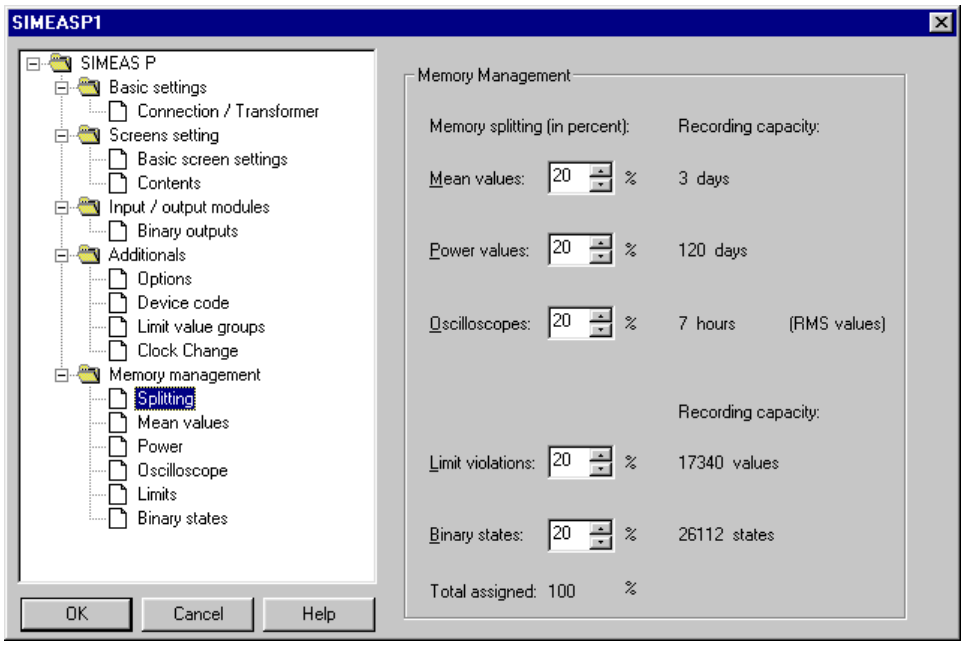
6.8 Memory Management

In the following dialog boxes, you can customize the memory of SIMEAS P according to your requirements.



6.8.1 Splitting

In this dialog box you can determine how the available memory capacity will be allocated to the available functions.



Note

The indicated percentages must be in the range between 1 and 96 percent and total 100%. Once you have entered a percent value, SIMEAS PAR displays to its right the recording time and the number of values that will be stored for this setting. The oldest values will be overwritten if you have selected **Ring buffer = Yes** for the recording or if overwriting is enabled by default. If you have selected **Ring buffer = No**, the recording will be terminated when the capacity of the associated memory area is exhausted.

The recording capacities will be calculated according to the following formulas:

- Mean values:

$$t_{MAX}[h] = \frac{AllocatedMemory[Byte] * Periodtime}{((n*12)+4)Byte*3600}$$

n: Number of channels (max. 8)
Period time: 5, 10, 15, 30, 60, 600, 900, 1800 or 3600 s

- Power values:

$$t_{MAX}[d] = \frac{AllocatedMemory[Byte] * Periodentime}{((n*4)+6)Byte*1440}$$

n: Number of channels (max. 8)
Period time: 15, 30 or 60 minutes

- Oscilloscope:
  A) Instantaneous value:

$$t_{MAX}[s] = \frac{AllocatedMemory[Byte]}{64 * 16Byte * 50}$$

  B) RMS value:

$$t_{MAX}[h] = \frac{AllocatedMemory[Byte]}{8Byte * 3600}$$

- Limit violations:

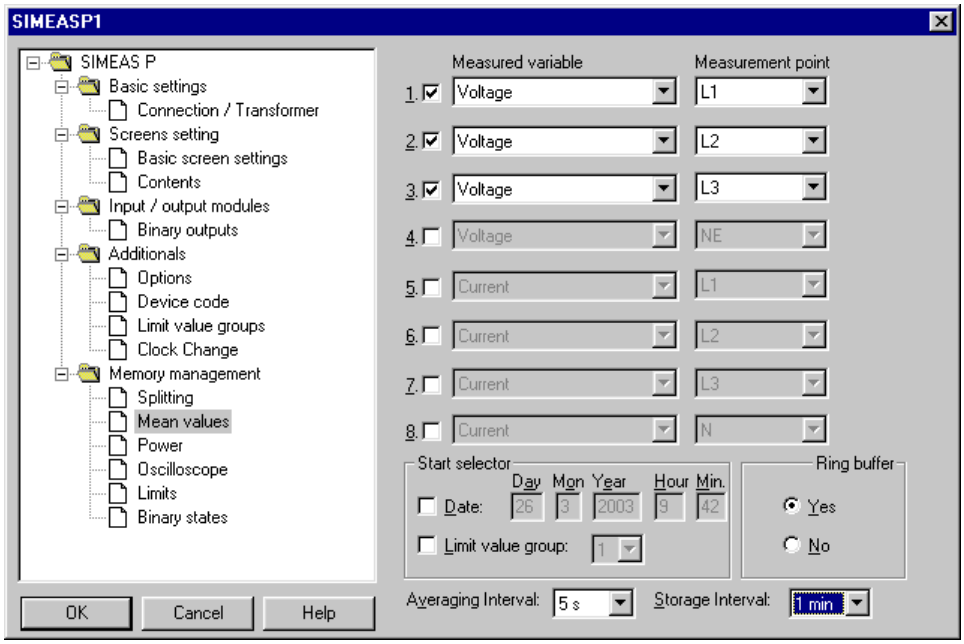
$$Values = \frac{AllocatedMemory[Byte]}{12Byte}$$

- Binary states:

$$Values = \frac{AllocatedMemory[Byte]}{8Byte}$$

6.8.2 Mean Values

In this dialog box you can specify the settings for mean value recording.



Proceed as follows:

- Select up to eight measured variables and measurement points.
- Select a date or one of the six limit value groups as start selector for the average value recording. It is possible to combine date and limit value group as start selectors. The first of the two criteria fulfilled, will launch the recording. When entering a date as start selector, you must indicate a year between 2000 and 2060.
- The **Ring buffer** mode allows you to select, if the oldest values will be overwritten (= **Yes**) or not (= **No**) when the capacity of the associated memory area is exhausted.
- Also, you must indicate the **Averaging Interval** (5 s, 10 s, 15 s, 30 s, 1 min, 5 min, 10 min, 15 min, 30 min, 60 min) and the **Storage Interval** (5 s, 10 s, 15 s, 30 s, 1 min, 5 min, 10 min, 15 min, 30 min, 60 min). These parameters set the number of measured values to be used for mean value calculation and the interval for saving the values.

Note

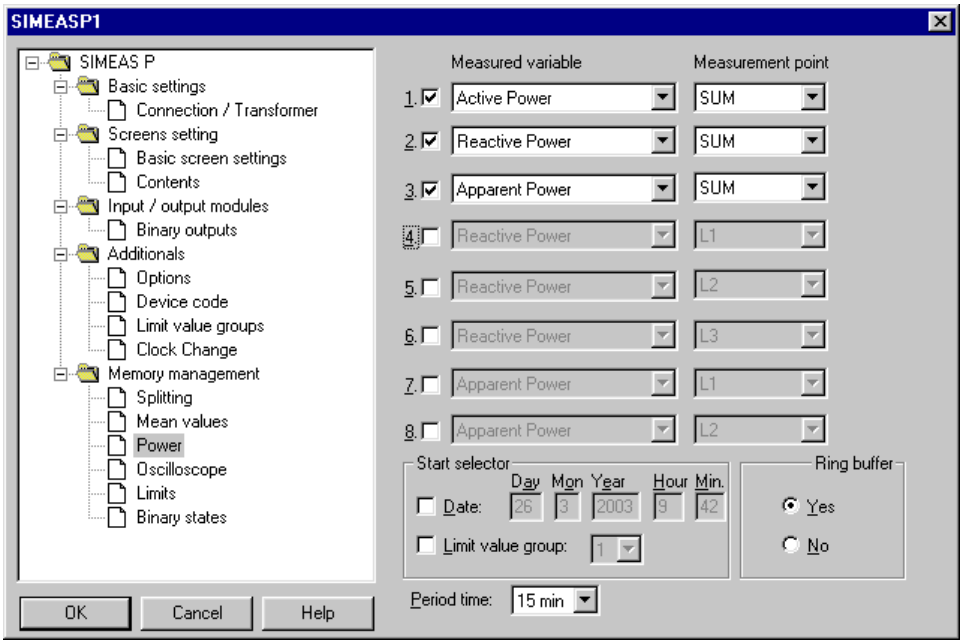
If you have entered a past start date, SIMEAS P will initiated mean value recording immediately after the setting.
Manual start is not activated by configuration but can be initiated at any time.

Note

If the device provides additional analog inputs (7KG7610 and 7KG7660 only), you can record external measurement signals.

6.8.3 Power

In this dialog box you can specify the settings for power recording.



Proceed as follows:

- Select up to eight measured variables and measurement points.
- Select a date or one of the six limit value groups as start selector for the power recording. It is possible to combine date and limit value group as start selectors. The first of the two criteria fulfilled, will launch the recording.
- When entering a date as start selector, you must indicate a year between 2000 and 2060.

Note

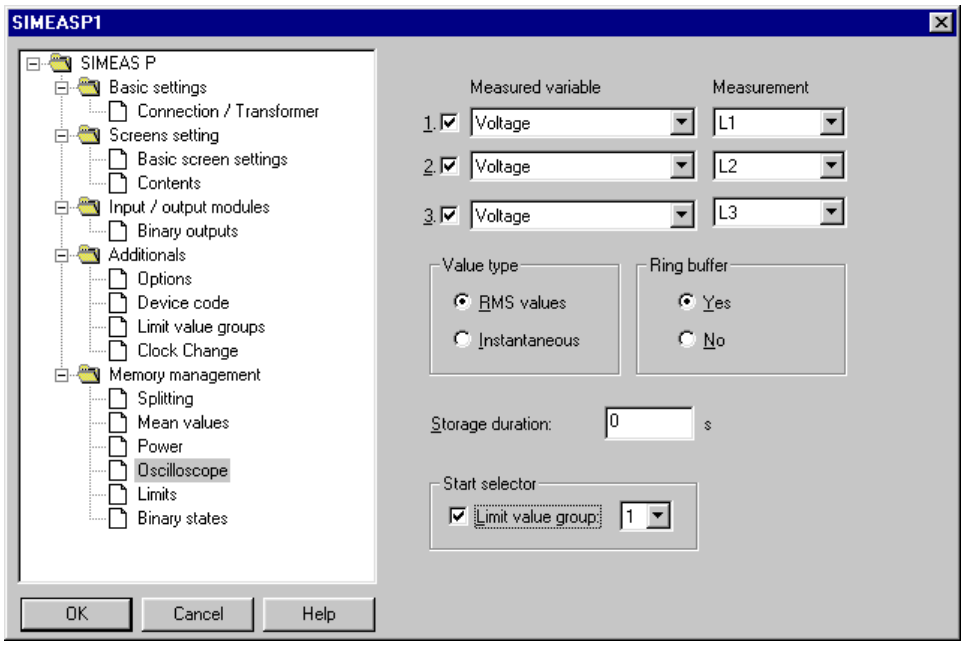
If you have entered a past start date, SIMEAS P will initiated mean value recording immediately after the setting.

Manual start is not activated by configuration but can be initiated at any time.

- The **Ring buffer** mode allows you to select, if the oldest values will be overwritten (= **Yes**) or not (= **No**) when the capacity of the associated memory area is exhausted.
- Also, you must indicate the **Period time**.

6.8.4 Oscilloscope

The oscilloscope can be set via this dialog box.



Proceed as follows:

- Select up to three measured variables.
  Oscilloscope recording is launched either via the selected limit value group or, if no such group was selected, via manual start.
- Also, you must determine whether to record Instantaneous or RMS values.

Note

When changing the value type (instantaneous or RMS), the present selection will be reset since the two types of measured variables have different value ranges.

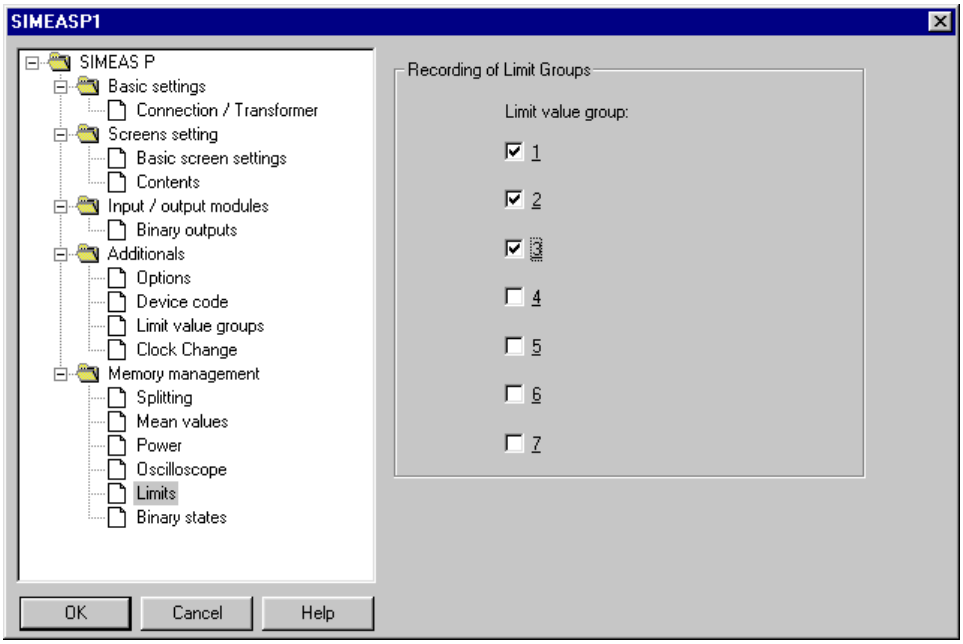
- The **Ring buffer** mode allows you to select, if the oldest values will be overwritten (= **Yes**) or not (= **No**) when the capacity of the associated memory area is exhausted.
- Indicate the **Storage duration** in seconds.

Note

In the submenu **Memory Management → Memory Splitting** you can see what storage time corresponds to the indicated percentage for oscilloscope.

6.8.5 Limits

In this dialog box you can specify the limit value groups to be recorded.



Proceed as follows:

- Select up to six limit value groups.

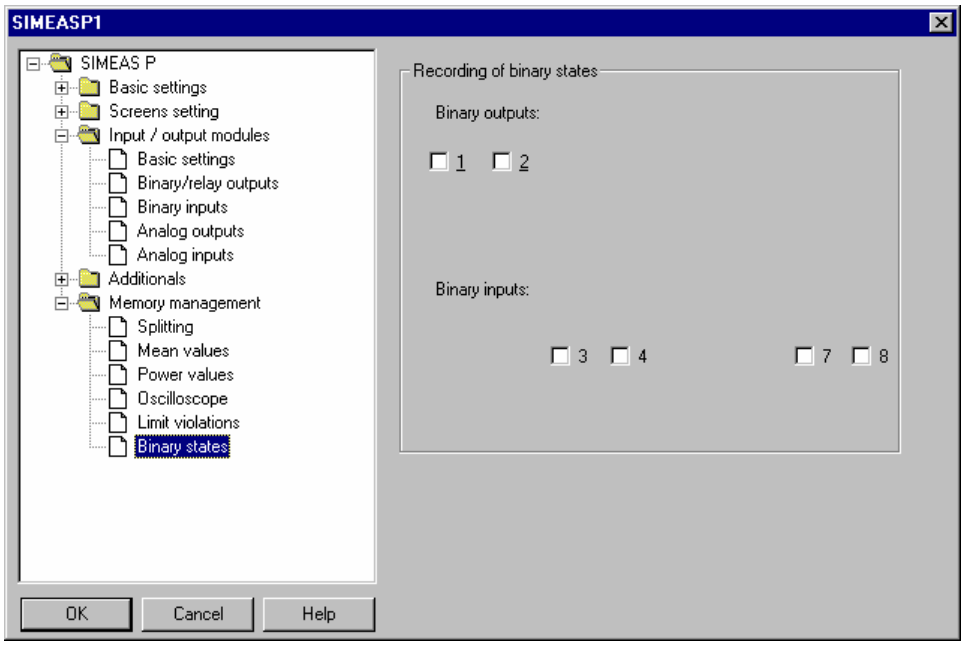
A violation of the specified limits will be recorded in the memory.

Note

If the memory capacity for the recording of limit violations is exhausted, data within this area will be overwritten.

6.8.6 Binary States

In this dialog box you can specify the settings for recording of binary states.



Proceed as follows:

- Select the binary/relay outputs to be recorded.
  The states of the binary outputs will then be recorded in the memory.
- For the devices 7KG7610 and 7KG7660, you have to select if the signals of the optional I/O modules will be recorded.

Note

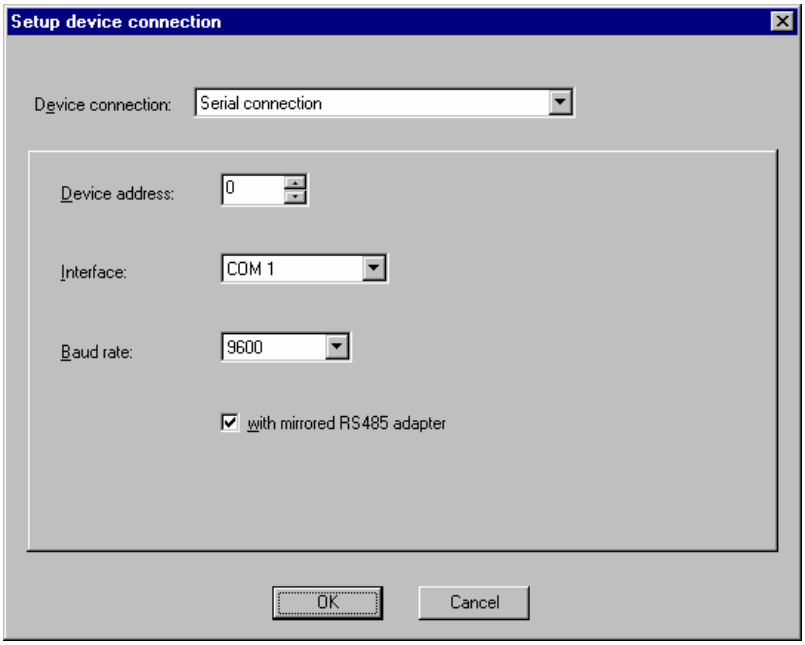
If the memory capacity for the recording of binary states is exhausted, data within this area will be overwritten. This means that the oldest data will be overwritten.

6.9 Updating the Firmware

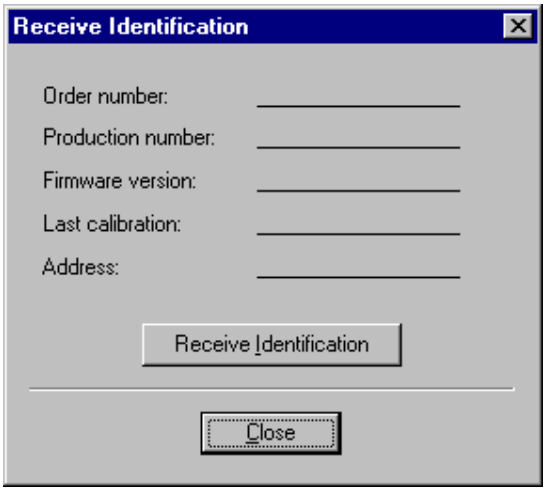
Proceed as follows to update the firmware:

1. Establish a connection to the device. From the menu bar, select **Connection** → **Setup connection** and set the following parameters in the **Setup device connection** dialog:
   - Device connection: Serial connection
   - Device address (Note: Address 0 is valid for all devices).
   - Interface (e.g. COM1)
   - Baud rate (9600 Baud at delivery)
   - RS232/RS485 adapter type (Note: The adapter delivered with parameterization cable set 7KG7050 is a mirrored adapter.)

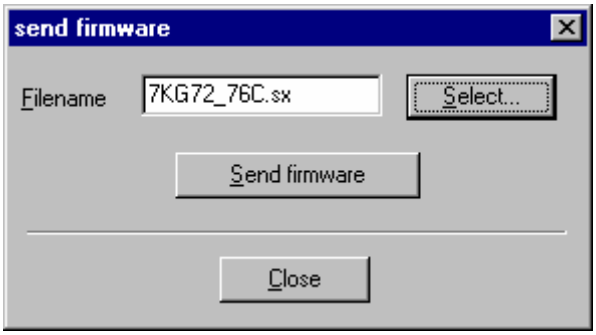
   Make sure to set the same parameter values in SIMEAS P Parameterization and in the device.
   In the device, the serial interface must be set to „PC-RS 485“.



2. Click the button **ID** to receive the ID from the device to check the connection.



3. In the **Receive Identification** dialog, click Receive Identification to call the data from the device. If the configuration is correct, the data will be displayed in the dialog. Close the **Receive Identification** dialog.
4. From the menu bar, select **Device → Send new firmware**.
5. In the **Send firmware** dialog, enter the path to the firmware (file 7KG*.SX)



6. Click the button **Send firmware**. The transfer may take some minutes. Check the ID again ((Button **ID**, see item 2). The new firmware version will be displayed.

Note:
A check sum allows to relate each firmware version to device types (standard or extended version) and hardware versions. This ensures that no incompatible hardware and software version are updated. In this case, the transfer will be terminated with the message "Timeout while waiting for reply from device". The original firmware in the device remains unchanged.

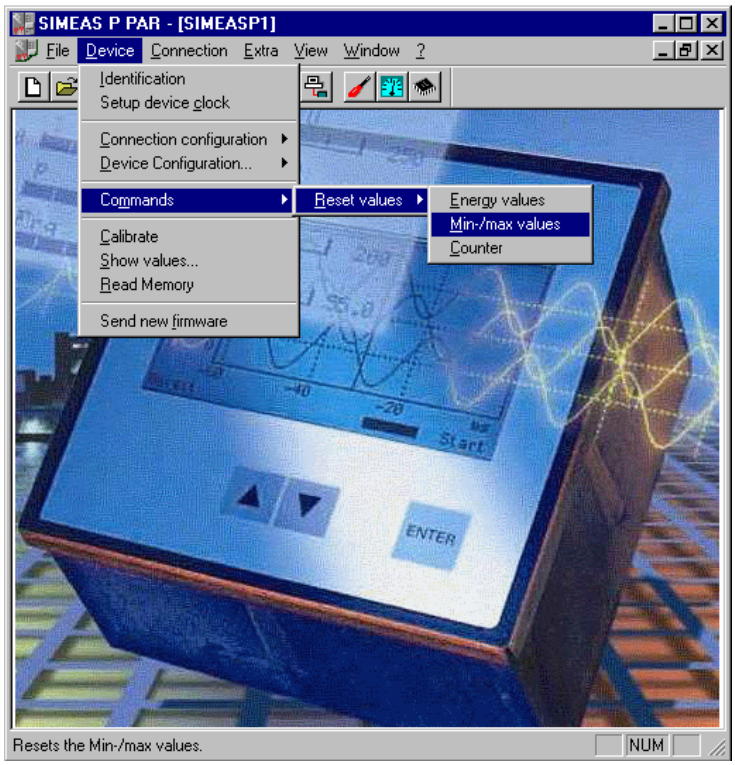
6.10 Resetting Values in the Device

SIMEAS P Parameterization allows you to reset the following values:

- Energy counter
- Counters for limit violations
- Min, Aver and max values

Proceed as follows:

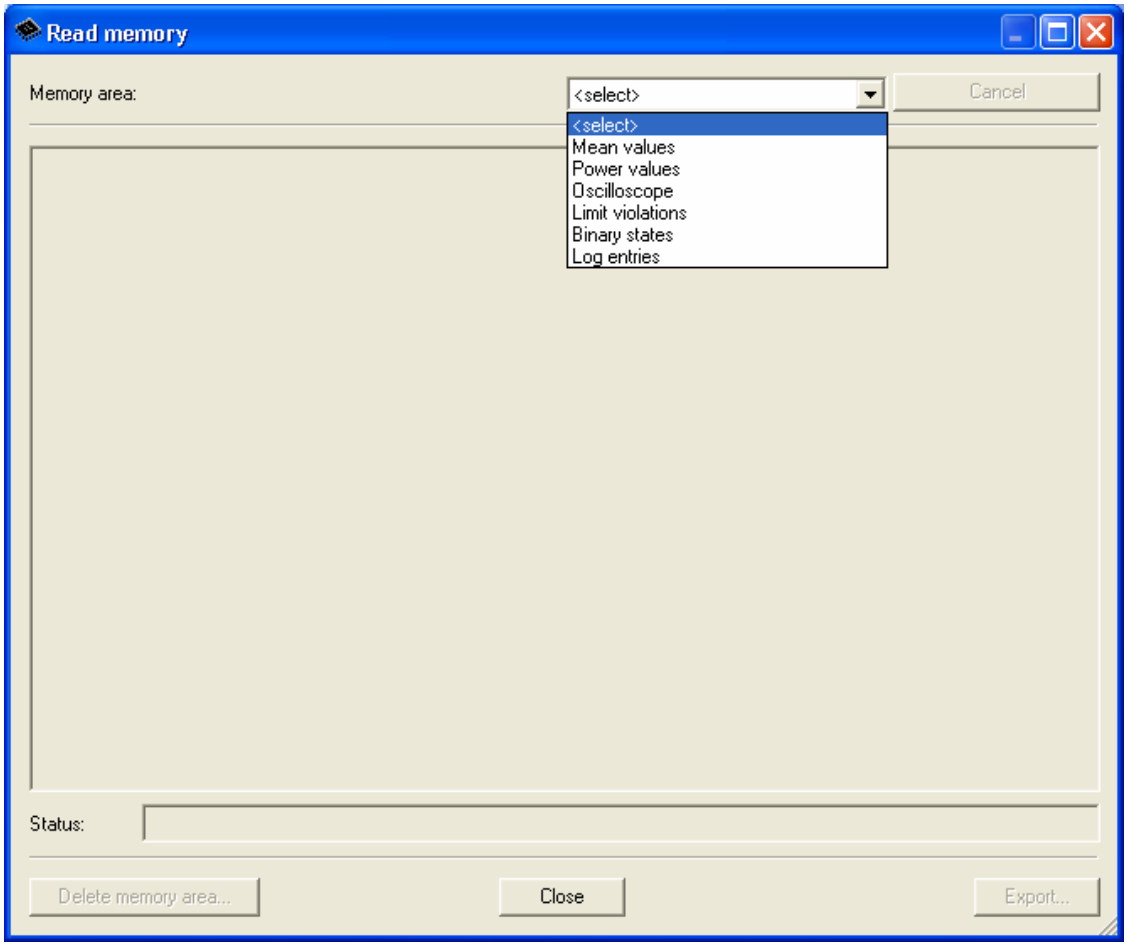
1. Establish a connection to the device. Make sure to set the same parameter values in SIMEAS P Parameterization and in the device.
   In the device, the serial interface must be set to „PC-RS 485“.
2. From the menu bar, select **Device → Commands → Reset values** to reset the displayed items.



6.11 Reading the Device Memory

SIMEAS P Parameterization allows you read the memory content (7KG7200 and 7KG76xx). The available memory capacity (1 MByte) can be allocated by the user to the available functions (see section 6.8.1).

- From the menu bar, select **Device → Read Memory** to select the memory area in the **Read memory** dialog.



- From the list box, select a memory area.

6.11.1 Handling

Button **Cancel**
Click this button to interrupt the data download from the device. If a large amount of the memory is assigned to a record, the download of data may take a few minutes (at low baud rates perhaps some hours). The download progress is shown in the status line. If the download was successful or interrupted by the user, this button will be renamed to **Reload**.

Button **Reload**
Click this button to reload measured values or data from the device.

Button **Close**
Click this button to terminate the dialog box **Read memory**.

Button **Export**
Click this button to save measured values or information as CSV file (comma separated values). For example, you can read these files with Microsoft Excel.

Button **Delete memory area**
Click this button to delete the selected memory area in the device. Optionally, you can restart the recording immediately or with the occurring of a parameterized trigger condition (mean values, power values, and limit violations only).

6.11.2 Charts/Diagrams

Diagrams and charts are coupled: By moving the measuring cursor in the diagram, the corresponding row in the chart is marked; by activating a row in the chart, the cursor in the diagram moves to the corresponding timestamp (mean values, power values, and binary states only).

6.11.3 Diagrams

In diagrams, zooming, measuring and other functions are available. Click the right mouse button in diagrams to activate the functions zoom, optimize, optimize x-axis, optimize y-axis, diagrams (fade in or blind out diagram for measured value), signals (fade in or blind out diagram for minimum, mean respectively maximum value) and copy diagrams in selectable size to the clipboard (mean values, power values, binary states, and oscilloscope data only).

6.11.4 Timestamp

All timestamps are shown in regional normal time. This avoids time gaps or overlap in data (for example, when summer time starts or ends).

6.11.5 Mean value record

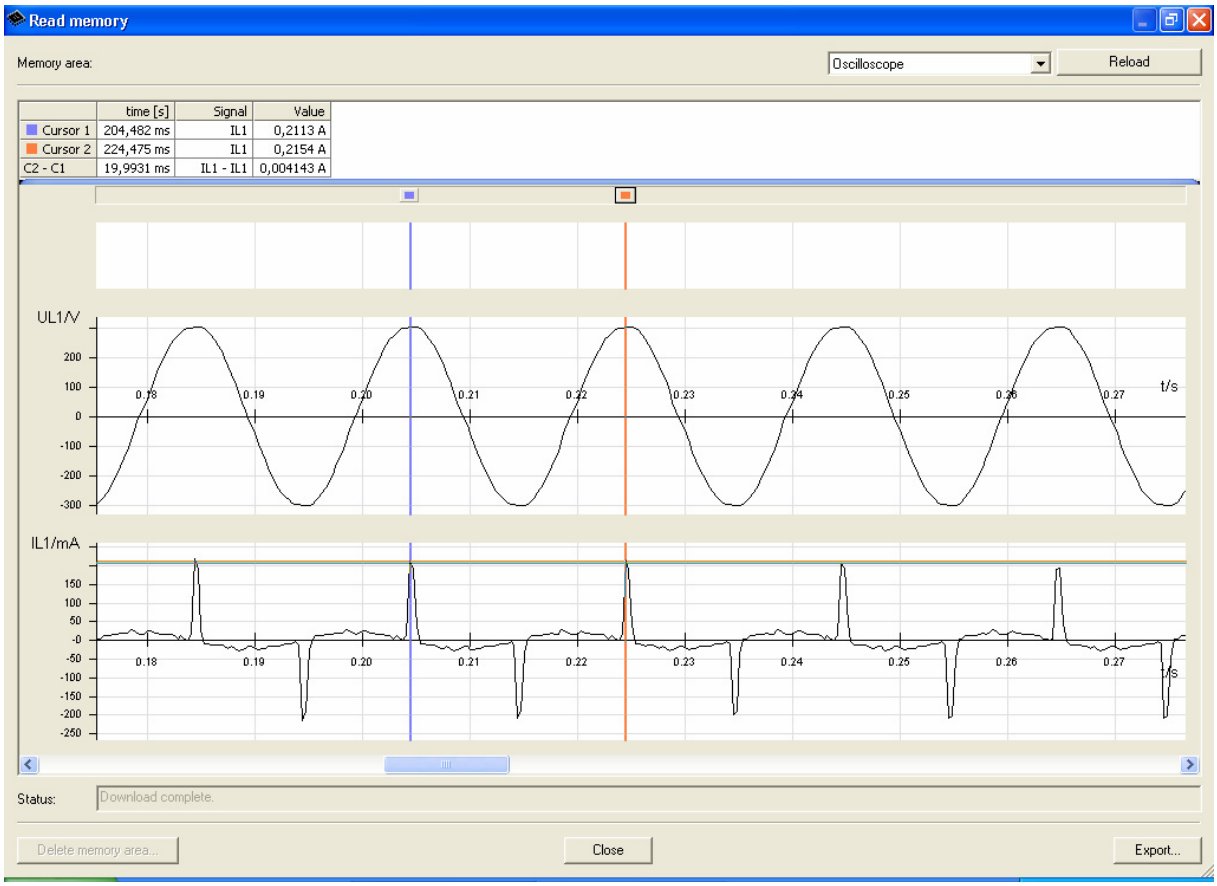
Mean values are represented in a chart and in diagrams. In the chart, you can select between minimum values, mean values and maximum values in headline. For each recorded mean value (max. 8), one column in the chart and one diagram is shown. In the diagram, the mean value and the tolerance area limited by minimum and maximum value are drawn.

6.11.6 Power value record

Power values are represented in a chart and in diagrams. For each recorded power value (max. 8), one column in the chart and one diagram is shown.

6.11.7 Oscilloscope

Records of oscilloscope are represented in one diagram for each value with trigger timestamp. With the two measuring cursors measurement on signals is possible. To do this, select signals in the table. Additional functions are available by pressing the right mouse button (see Diagrams).



6.11.8 Limit violation record

Limit violations are represented in a chart. Limit violations of group 1 to 6 are shown when occurring (ON) and disappearing (OFF). For limit violation group 7, additional information is available: the signal on which the violation occurred and the measured value appeared.

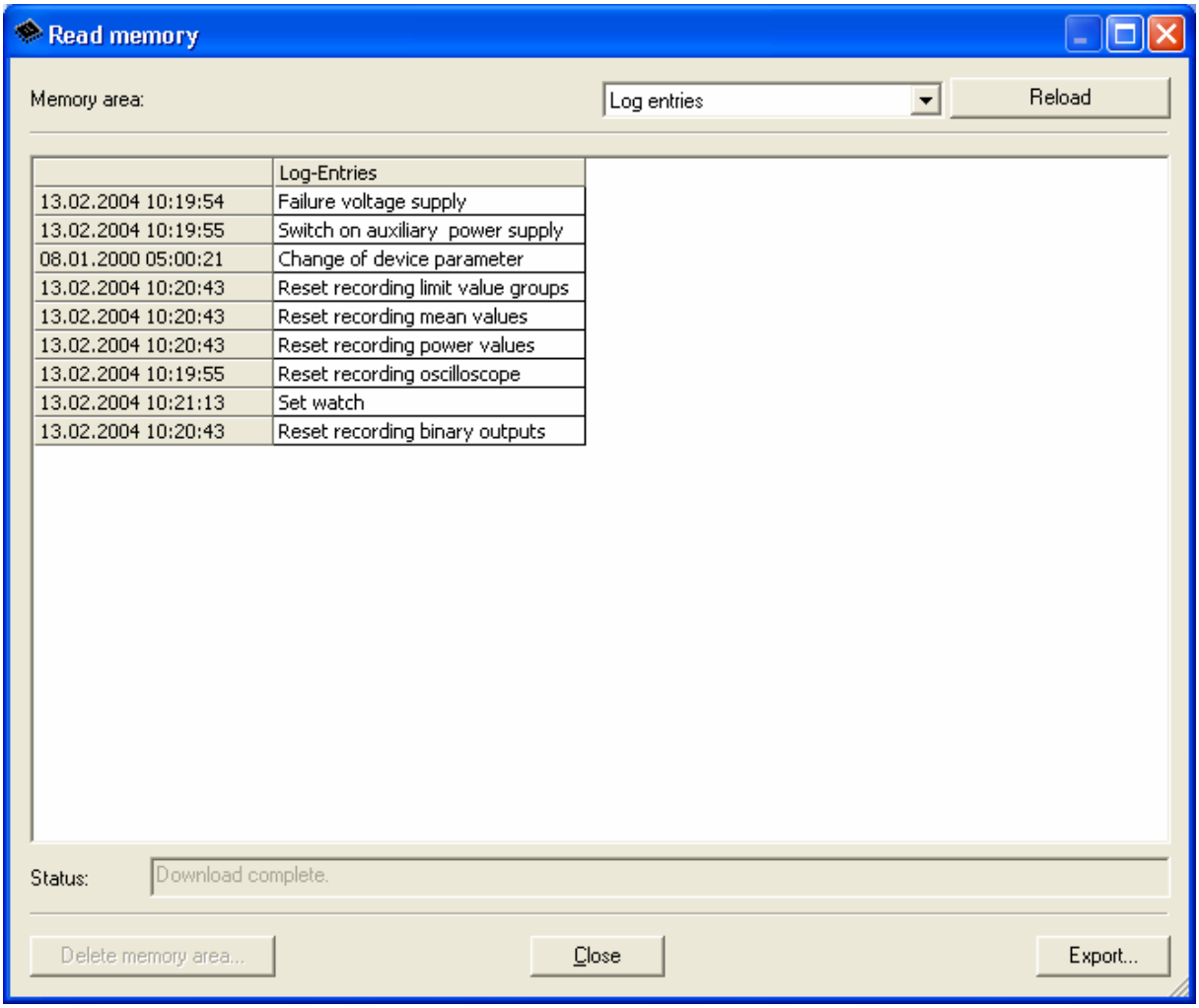
6.11.9 Binary states

Binary states are represented in a chart and in diagrams. For each recorded binary state, one column in the chart and one diagram is shown.

6.11.10 Log Entries

Log entries are represented in a chart. For each of the following entries, date and time are shown:

- Failure voltage supply
- Switch on auxiliary power supply
- Change of device parameter
- Reset recording limit value groups
- Reset recording mean values
- Reset recording power values
- Reset recording oscilloscope
- Set watch



Note

For further information on "Reading the Device Memory", refer to the online help of the PC programming software (press **F1**)

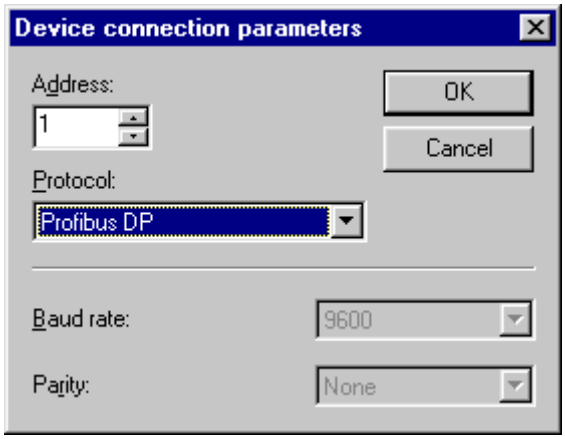
6.12 Changing the Communication Parameters

At delivery, the following communication parameters are preset:

Address:	0
Protocol:	Serial ASCII
Baud rate:	9600
Parity:	No

In order to switch to another protocol, proceed as follows:

- From the menu, select **Device → Connection configuration → Edit**. The dialog **Device → Connection parameter**s will open.
- Select the protocol you want to use. The following possibilities are available: „Serial ASCII“, „Profibus DP“, „Modbus ASCII“, and „Modbus RTU“.



- Set the device address and (if required) **Baud rate** and **Parity**.
- From the menu, select **Device → Connection configuration → Send**, to send the new settings to the device.

Note

You have to perform a hardware reset to make your changes work.

After switching on the device, there are 60 seconds to establish a connection to the PC. After this time, the selected communication protocol will be activated.

Service 7

7.1 Adjustment

7.1.1 Overview

In order to achieve a high level of measurement precision, the SIMEAS P should be regularly adjusted in the range that the device operates. In general, adjustment should be performed at two-year intervals. The SIMEAS P is completely adjusted at the factory prior to shipment.
SIMEAS P can be adjusted either directly from the device using the buttons on the front panel or by using the SIMEAS P Programming Software.
You can select the measurement range under **Basic Settings → Input Connections**. Only the measurement ranges selected for current and voltage inputs can be adjusted in the Calibration menu.

Adjusting the SIMEAS P requires a single-phase adjusting device that can generate voltages and currents to an accuracy of = 0.1 %, e.g. Omicron CMC 156.
Adjustment frequency: 50 or 60 Hz.

Note

In order to adjust the device using the software, there must be a connection between the PC containing the SIMEAS P programming software and the SIMEAS P device.

Before adjustment, you should send the time to the SIMEAS P.
This ensures that the last adjustment is displayed with a date in the SIMEAS P.

When connecting the adjusting outputs to the appropriate inputs, make sure that the SIMEAS P is correctly connected as per the Connection Diagrams for adjustment.

The following three elements should be adjusted during the adjustment process:

- Voltage inputs V
- Current inputs I
- Voltage V0.

7.1.2 Connection Diagrams for Adjustment

Correct adjustment is crucial to the accuracy of the measurements made by the SIMEAS P.

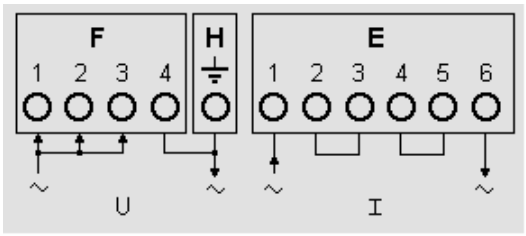
Note

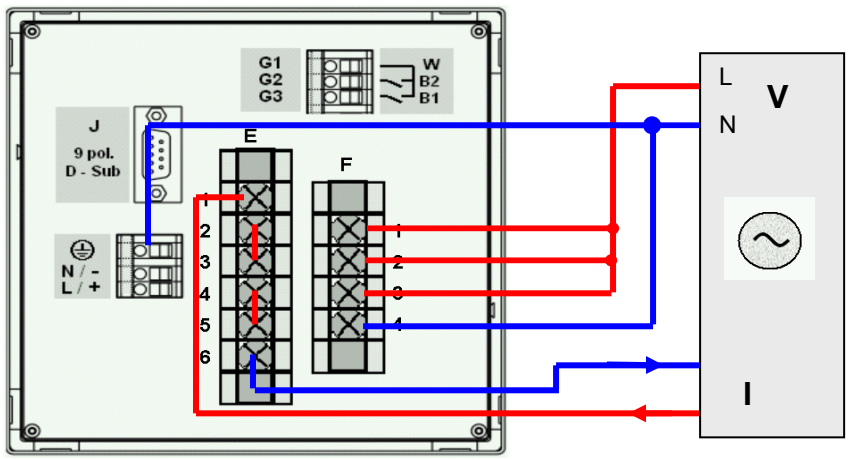
The voltage and current inputs of the SIMEAS P are not compatible with polarity reversal (i.e. if phase and neutral terminals are connected incorrectly, the adjustment will not work correctly).

7.1.2.1 Current and Voltage Inputs

The following is applicable for adjusting the current and voltage inputs of the SIMEAS P:

- Single-phase current and voltage connection.
- Frequency 50 or 60 Hz.
- There must be no phase shift between current and voltage.
- Connect the H (ground) and F4 terminals to "N" on the adjusting device.
- The SIMEAS P must be grounded.

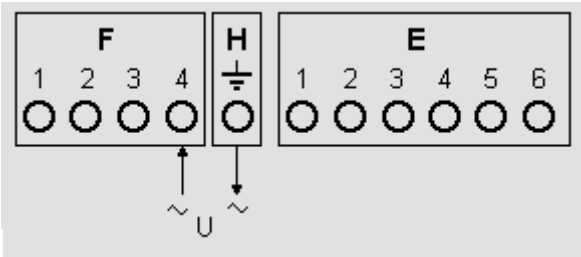




7.1.2.2 Voltage V0 (N-G)

The following is applicable for adjusting the V0 voltage of the SIMEAS P:

- Single-phase voltage connection.
- Frequency 50 or 60 Hz.
- Connect the H (ground) and F4 terminals to "N" on the adjusting device.
- The SIMEAS P must be grounded.



7.1.3 Procedure

- First, connect the SIMEAS R as described in 7.1.2.
- You can adjust the device manually or via programming software.

7.1.3.1 Procedure at the Device

- Select Basic Settings → Input Connections.
  Select the range to be adjusted (e.g. 228 V).
- In the menu, select: Calibrate
  A dialog box appears.
- Enter the setpoints for adjustment of voltage and current. The setpoints given are the nominal values of the measurement ranges set under Input Connections. These preset setpoints ensure optimum precision. If the preset values are not correct, change them accordingly.
- Switch the adjusting device on with the setpoints.
- Follow the instructions. SIMEAS P is readjusted.

7.1.3.2 Procedure for Programming Software

- Establish the communication between device and programming software.
- In the menu, select: Calibrate
  A dialog box appears.
- Select the element you wish to adjust (V / I / V0).
- Enter the setpoints for adjustment of voltage and current. The setpoints given are the nominal values of the measurement ranges set under Input Connections. These preset setpoints ensure optimum precision. If the preset values are not correct, change them accordingly.
- Switch the adjusting device on with the setpoints.
- Follow the instructions. SIMEAS P is readjusted.

Technical Data 8

8.1 7KG7100, 7KG7200, 7KG7500, 7KG7600, and 7KG7610

Input	Only for connection to AC systems
Max. system voltage	400 V (phase-to-ground)/ 690 V (phase-to-phase)
Overload	20%
Frequency of the fundamental component	45 ... 65 Hz
Sampling rate	3,2 kHz (50 Hz) 3,84 kHz (60 Hz)
Resolution	12 bit
Frequency range f_i	+/- 5 Hz, min. > 30% U_{EN}
Waveform	Sinusoidal or distorted up to the 21st harm.
AC current input	I_I Current inputs
Input current I_i	1 A; 5 A
Continuous overload	10 A
Surge withstand capability	100 A for 1s
Power consumption per phase	83 µVA at 1 A; 2.1 mVA at 5 A
AC voltage input	U_I Voltage inputs
Measuring range U_I	100/110 V; 190 V; 400 V; 690 V (phase-to-phase)
Continuous overload capacity	1.5 x U_I
Surge withstand capability	2.0 x U_I
Input resistance (phase-to-ground)	2.663 MΩ
Power consumption per phase	120 mW (U_{LE} = 400 V)
Binary inputs	(optional, only 7KG7610)
Max. input voltage	300 V DC
Current consumption for high level	1.8 mA
Threshold voltage low	≤10 V
Threshold voltage high	≥19 V
Signal delay	max. 3 ms
Binary outputs	Via isolated solid-state relay
Permissible voltage	230 V AC; 250 V DC
Permissible current	100 mA continuous 300 mA for 100 ms
Internal resistance	50 Ω
Permissible operating frequency	10 Hz
Analog inputs	(optional, only 7KG7610)
Measuring range	0 to 20 mA DC
Input range	0 to 24 mA DC
Input resistance	50 Ω ± 0.1%
Accuracy	0.5% of the nominal value
Analog outputs	(optional, only 7KG7610)
Output current	0 to 20 mA DC
Output range	0 to 24 mA DC
Max. load resistance	250 Ω
Accuracy	0.2% (typical); max. 1.1% of nominal value
Relay outputs	(optional, only 7KG7610)
Max. switching voltage	270 V AC / 150 V DC
Max. permanent current	5 A
Min. permanent current	1 mA at 5 mV DC
Rating (resistive)	5 A / 250 V AC or 5 A / 30 V DC
Max. response time	10 ms
Max. release time	7 ms

Overvoltage category	According to IEC 61010 Part1
V_{IN} to 400V (φ-φ) V_{IN} to 230V (φ-N) V_{IN} to 690V (φ-φ) V_{IN} to 400V (φ-N) Power supply Binary outputs, binary inputs and relay outputs Analog inputs and analog outputs	Cat III Cat III Cat II Cat II Cat II Cat II Cat III
Auxiliary power	Multi-range power supply unit AC /DC
Nominal range Operating range 7KG7610 only: Power consumption 7KG7610 only:	24 to 250 V DC or 100 / 230 V AC +/- 20% of nominal range -10% ... +20% of nominal range DC +/- 20% of nominal range AC max. 4 W or 10 VA max. 10 W or 25 VA
Battery (only 7KG7200, 7KG7600, and 7KG7610)	
Type	VARTA CR2032, 3 V, Li-Mn

Display	Graphic display
Resolution Dimensions	120 x 240 pixels 103 x 60 mm
Dimensions, Weight	
Panel mounted housing (7KG7500/7KG7600/7KG7610) Dimensions Weight	 144 x 144 mm ca. 0,9 kg (without I/O modules) ca. 0,95 kg (with 4 I/O modules and connection board)
Standard rail mounting (7KG7100/7KG7200) Dimensions Weight	 94 x 157 mm Approx. 0.55 kg

Communication interface	
Connection	9-pole D-SUB female connector
Data transfer PROFIBUS DP V1 interface transmission speed Data transfer Modbus RTU/ASCII PC RS485	 9.600 bit/s to 12 Mbit/sec Baud rate (bit/s): 300, 600, 1200, 3400, 4800, 9600, 19200, 38400, 57600, 115200

Electromagnetic compatibility	
Immunity	according to IEC 61000-6-2
Emission	according to CISPR 11, Class A and 47 CFR, Part 15, Class A

Dielectric strength, routine test	according to IEC 61010-1
Signal inputs (current to current and current to voltage)	2.2 kV; 50 Hz; AC
Current inputs to serial interface, PG, voltage inputs, relay outputs and power supply	2.2 kV; 50 Hz; AC
Power supply, serial interface, voltage inputs and relay outputs mutually	3.1 kV; DC
Power supply to PG	3.1 kV; DC
Serial interface to PG	500 V; AC
Additional for 7KG7610	
Binary inputs and binary outputs to PG	2.2 kV; 50 Hz; AC
Analog inputs and analog outputs to PG	500 V; 50 Hz; AC

Impulse voltage withstand test, test type	according to IEC 60688 and IEC 60255-5
All circuits mutually except serial interface	5 kV; 1.2 / 50 µs

Insulation type of inputs and outputs	
Signal inputs (current)	Reinforced, max. 600 V AC, Cat II or max. 300 V AC, Cat III
Signal inputs (voltage)	Protective impedance, max. 600 V AC, Cat II or max. 300 V AC, Cat III
Power supply	Reinforced, 230 V AC/250 V DC, Cat II
Outputs	Reinforced, 270 V AC/125 V DC, Cat II
Binary outputs	Reinforced, 230 V AC/250 V DC, Cat II
Binary inputs	Reinforced, 300 V DC, Cat. II

Reference conditions	The stated error limits (Table 3-3) apply for reference conditions
Input current Ii	I_{IN} ± 1%
Input voltage U_i	U_{IN} ± 1%
Frequency	45 ... 65 Hz
Waveform	Sinus, harmonic distortion ≤ 5%
Ambient temperature T_A	23 °C ± 1 °C
Auxiliary voltage U_H	U_{HN} ± 1%
Warm-up time	≥ 15 min
External fields	no

Environmental conditions	The device is designed for indoor use only
Ambient temperature	According to IEC 60688
Operating temperature range	32° F to 131° F (0° C to 55° C)
Storage temperature range	-13° F to 158° F (-25° C to 70° C)
Max. rel. humidity	80 % for temperatures up to 31 °C decrease linearly to 50 % at 40 °C
Max. altitude about sea level	2000 m
Pollution degree	2, no condensation

Additional Technical Data	
Internal fuse	Not replaceable Type T500mA/250V according IEC 60127
Internal fuse, secondary	Not replaceable Type F2A/125 V according UL 248-14

Dynamical mechanical stress	
Standards	IEC 60255-21 and IEC 60068
Vibration, sinusoidal for stationary application	According to IEC 60225-21-1, IEC 60068-2-6, Cl. 2
Shock, semi-sinusoidal for stationary application	According to IEC 60225-21-2, IEC 60068-2-27, Cl. 1
Vibration on earthquake for stationary application	According to IEC 60225-21-3, IEC 60068-3-3, Cl. 1

Protection class according to IEC 60529	
Device	
- Front	IP41 or IP54 see Ordering Data
- Rear	IP20
Personal protection	IP2x

8.2 7KG7550, 7KG7650, and 7KG7660 (with UL Listing)

Input signals	Only for connection to AC systems
Max. system voltage	480 V (phase-to-ground)/600 V (phase-to-phase)
Overload	20%
Frequency of fundamental component	40 ... 65 Hz
Sampling rate	3,2 kHz (50 Hz) 3,84 kHz (60 Hz)
Resolution	12 bit
Frequency range f_i	+/- 5 Hz, min. > 30% V_{IN}
Waveform	Sinusoidal or distorted up to the 21st harmonic
AC current input	I_I Current inputs
Input current I_i	1 A; 5 A
Continuous overload	10 A
Surge withstand capability	100 A for 1s
AC voltage input	V_I Voltage inputs
Input voltage V_{IN}	100/110 V; 190 V; 480 V; 600 V (ϕ-ϕ)
Continuous voltage capability	1.5 x V_{IN}
Surge withstand capability	2.0 x V_{IN}
Input resistance (phase-to-ground)	2.663 MΩ
Binary inputs	(optional, only 7KG7660)
Max. input voltage	300 V DC
Current consumption for high level	1.8 mA
Threshold voltage low	≤10 V
Threshold voltage high	≥19 V
Signal delay	max. 3 ms
Binary outputs	Via isolated solid-state relay
Permissible voltage	230 V/AC; 250 V/DC
Permissible current	100 mA continuous 300 mA for 100 ms
Internal resistance	50 Ω
Permissible operating frequency	10 Hz
Analog inputs	(optional, only 7KG7660)
Measuring range	0 to 20 mA DC
Input range	0 to 24 mA DC
Input resistance	50 Ω ± 0.1%
Accuracy	0.5% of the measuring range limit
Analog outputs	(optional, only 7KG7660)
Nominal output current	0 to 20 mA DC
Output range	0 to 24 mA DC
Max. load resistance	250 Ω
Accuracy	0.2% (typical); max. 1.1% of the nominal value
Relay outputs	(optional, only 7KG7660)
Max. switching voltage	270 V AC / 150 V DC
Max. permanent current	5 A
Min. permanent current	0.1 mA at 100 mV DC
Rating (resistive)	5 A / 250 V AC or 5 A / 30 V DC
Max. response time	10 ms
Max. release time	7 ms

Overvoltage category	According to IEC 61010 Part1
V_{IN} to 480 V (φ-φ) V_{IN} to 277 V (φ-N) V_{IN} to 600 V (φ-φ) V_{IN} to 347 V (φ-N) Power supply Binary outputs, binary inputs and relay outputs Analog inputs and analog outputs	Cat III Cat III Cat II Cat II Cat II Cat II Cat III
Auxiliary power	Multi-range power supply unit AC / DC
Nominal range Operating range 7KG7550 and 7KG7650: 7KG7660: Power consumption 7KG7550 and 7KG7650: 7KG7660:	24 to 250 V DC or 100 / 230 V AC; 50/60 Hz +/- 20% of nominal range -10% ... +20% of nominal range DC +/- 20% of nominal range AC max. 4 W or 10 VA max. 10 W or 25 VA
Battery (only 7KG7650 and 7KG7660)	
Type	VARTA CR2032, 3 V, Li-Mn

Display	Graphic display
Resolution Dimensions	120 x 240 pixels 4-1/6" x 2-3/8" (103 x 60 mm)
Dimensions, Weight	
Panel mounted housing Weight without I/O modules: with 4 I/O modules and connection board	5-11/16" x 5-11/16" (144 mm x 144 mm) Approx. 2.0 lbs (0.9 kg) Approx. 2.1 lbs (0.95 kg)

Communication interface	
Connection	9-pole D-SUB female connector
Data transfer PROFIBUS DP V1 interface transmission speed Modbus RTU/ASCII	 9.600 bit/s to 12 Mbit/sec Baud rate (bit/s): 300, 600, 1200, 3400, 4800, 9600, 19200, 38400, 57600, 115200

Electromagnetic compatibility	
Immunity	according to IEC 61000-6-2
Emission	according to CISPR 11, Class A and 47 CFR, Part 15, Class A

Dielectric strength, routine test	according to IEC 61010-1 and UL 61010B-1
Signal inputs (current to current and current to voltage)	2.2 kV; 50 Hz; AC
Current inputs to serial interface, PG, voltage inputs, relay outputs and power supply	2.2 kV; 50 Hz; AC
Power supply, serial interface, voltage inputs and relay outputs mutually	3.1 kV; DC
Power supply to PG	3.1 kV; DC
Serial interface to PG	500 V; AC
Additional for 7KG7660	
Binary inputs and binary outputs to PG	2.2 kV; 50 Hz; AC
Analog inputs and analog outputs to PG	500 V; 50 Hz; AC

Impulse voltage withstand test, test type	according to IEC 60688 and IEC 60255-5
All circuits mutually except serial interface	5 kV; 1.2 / 50 µs

Insulation type of inputs and outputs	
Signal inputs (current)	Reinforced, max. 600 V AC, Cat II or max. 300 V AC, Cat III
Signal inputs (voltage)	Protective impedance, max. 600 V AC, Cat II or max. 300 V AC, Cat III
Power supply	Reinforced, 230 V AC/250 V DC, Cat II
Outputs	Reinforced, 270 V AC/125 V DC, Cat II
Binary outputs	Reinforced, 230 V AC/250 V DC, Cat II
Binary inputs	Reinforced, 300 V DC, Cat. II

Reference conditions	The stated error limits (Table 3-3) apply for reference conditions
Input current I_i	I_{IN} ± 1%
Input voltage V_i	V_{IN} ± 1%
Frequency	45 ... 65 Hz
Waveform	≤ 5%
Ambient temperature T_A	73.4 °F ± 1.8 °F (23 °C ± 1 °C)
Power supply voltage V_H	V_{HN} ± 1%
Warm-up time	≥ 15 min
External fields	no

Environmental conditions	The device is designed for indoor use only
Ambient Temperature	According to IEC 60688
Operating Temperature Range	32° F to 131° F (0° C to 55° C)
Storage Temperature Range	-13° F to 158° F (-25° C to 70° C)
Maximum relative humidity	80 % for temperatures up to 87 °F decrease linearly to 50 % at 104 °F
Max. altitude about sea level	6,560 ft (2000 m)
Pollution degree	2, no condensation

Additional Technical Data	
Internal fuse, primary	Not replaceable Type T500mA/250V according IEC 60127 and UL 248-14
Internal fuse, secondary	Not replaceable Type F2A/125 V according UL 248-14

Dynamical mechanical stress	
Standards	IEC 60255-21 and IEC 60068
Vibration, sinusoidal for stationary application	According to IEC 60225-21-1, IEC 60068-2-6, Cl. 2
Shock, semi-sinusoidal for stationary application	According to IEC 60225-21-2, IEC 60068-2-27, Cl. 1
Vibration on earthquake for stationary application	According to IEC 60225-21-3, IEC 60068-3-3, Cl. 1

Protection class according to IEC 60529	
Device	
- Front	IP41 or IP54 see Ordering Data
- Rear	IP20
Personal protection	IP1x