Instruction Manual

optek-converter C4101

Version 07.2009_1.2US

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Section 1 of 2

Preface

This instruction manual is written to assist the user in proper procedures for trouble-free operation.

It is explicitly pointed out that optek-Danulat GmbH assumes no responsibility for loss or damage caused due to improper use of this instruction manual or products described herein.

On request, this manual is available in other languages as well as in digital format (Acrobat® Reader 7.0 required).

Our products are being continuously improved. Technical data is subject to change without notice.

Essen, July 2009

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1 Using the instruction manual

1.1 Validity of the instruction manual

This instruction manual is valid for optek-converter C4101.

Follow the instruction manual for every operation. If the converter is not used as described in this instruction manual, your safety and the converter function could be affected.

To keep up reliability of the product, enhance its life cycle and avoid down times, you have to follow the instructions given in this manual.

Depending on the option, the following instruction manuals shall be observed for converters of the Control 4000 series:

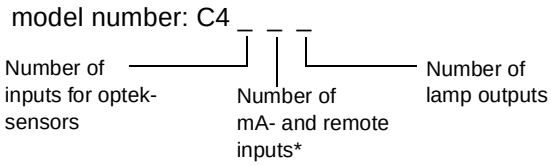
Tab. 1 Overview of instruction manuals

Product		**Instruction manual (manual) overview**
Converter of the Control 4000 series		Manual of corresponding converter
Option:	C4000 PC-Transfer software (Basic or Advanced version)	manual C4000 PC-Transfer software
Option:	Control 4000 PROFIBUS® PA	manual PROFIBUS® PA
Option:	Control 4000 EX EN-D	manual C4000-EX EN-D
Option:	Control 4000 EX FM-D	manual C4000-EX FM-D
Option:	Control 4000 ATEX EEx d	manual C4000-EX ATEX EEx d

Furthermore, please follow the existing accident prevention and environmental protection instructions, as well as recognized technical instructions for safe and professional working.

1.2 Explanation of the converter model number

The model number is set up as follows:



* 0 = no inputs; 2 = 2 mA und 7 remote inputs

Converter C4222 is thus a C4000 series converter with inputs for two sensors as well as 2 mA-inputs, 7 remote inputs and 2 lamp outputs.

The model number indicates the hardware configuration of your converter.

Note!
On PROFIBUS® PA converters, there is a PROFIBUS® PA interface provided instead of mA- and remote inputs! Model number is C4_5_.

1.3 Pictograms and signal words

Important information in this instruction manual is marked with the following pictograms:

Danger!
This pictogram indicates immediate danger to life and health of persons.
The text next to the symbol gives information on how to avoid bodily injuries.

If the possible cause of risk can be specified, the corresponding pictogram precedes instructions:

Danger!
Electrical voltage.
This pictogram indicates danger due to electrical voltage.

Caution!
This pictogram indicates information on how to avoid material damage.

Note!
This pictogram indicates instructional or general advice.

Pictograms on the converter

The following pictogram is on the back of the converter.
It indicates possible and unapparent dangers.
Read this instruction manual prior to initial commissioning.

2 Intended use

The converter is to be used exclusively for optek-sensors according to the technical data.
In combination with inline sensors for turbidity, concentration, color and UV absorbance, the converter is used for displaying and processing measuring results.
The converter may only be interfaced with sensors listed in the "Technical data".

The converter is to be installed in control cabinets with external switch, which allows the user to disconnect power. Please refer to the "Technical data" chapter.

This converter is not intended for use in explosion-proof areas.

Tampering or unauthorized substitution of parts or changes of the converter or its software may affect the performance and result in unsafe operation.

The manufacturer is not liable for damage resulting from use contrary to the intended use.

Following this instruction manual is part of the intended use.

3 Safety

3.1 General safety instructions

Only operate the converter when free from defects and in accordance with the instructions provided in this manual.

Read this instruction manual prior to initial commissioning. This applies especially to persons only operating the converter occasionally, such as maintenance staff.

Observe all safety and information labels on the product and keep them in readable condition.

Inspect the product for signs of physical damage. Report any damage immediately and do not commission the product until corrective actions have been taken.

Protect the converter from impacts causing corrosion or preventing components from working properly.

Have faulty parts of the measuring system replaced immediately.

Spare parts must comply with the technical requirements defined by optek. This is always guaranteed when using original spare parts.

For maintenance and repair activities, attach a warning sign to the external release device to prevent re-commissioning of the converter.

When malfunctioning, take the product out of operation. Repair the malfunctions immediately by a qualified electrician.

The safety instructions are to be supplemented with the current national regulations on accident prevention.

3.2 Safety instructions for works on electrical equipment

Work on electrical equipment has to be carried out by qualified electricians only.

The power line connection of the converter must be specified correctly to prevent overload.

Disconnect the voltage supply before connecting the power line. Only connect the power line when voltage-free. Do not use the clamp socket for release since no first-to-mate last-to-break protective ground contact is provided.

Do not work on live active parts of the electrical equipment. When working on the electrical equipment, observe the following safety regulations:

1. Switch voltage-free.
2. Protect against re-commissioning.
3. Check if voltage-free.
4. Cover live parts.
5. Ground and short-circuit.

In case of faults in the power supply, disconnect the converter immediately.

In case of a short-circuit, there is a danger of sparking and fire.

Use only original fuses with specified current and triggering characteristics! When a fuse has to be exchanged, first try to detect the cause and clear the fault before exchanging the fuse.

When work on live parts is necessary, use insulated tools only.

4 Description of the converter

The converter is a universal converter designed for process monitoring and control using one or several optek-sensors.

Fig. 1 Surface Control 4000

One optek-sensor can be connected to converters C4101, C4121 and C4151, up to two sensors can be connected to converters C4201, C4202, C4221, C4222, C4251 and C4252, up to three sensors to converters C4322 and C4352, and up to four optek-sensors can be connected to the converters C4422 and C4452. The exact number depends on the sensor.
Converters with several sensor inputs allow redundant measurements and simultaneous monitoring of several parameters.

In measuring mode the converter processes up to four customized measuring results as text, bar graphs or trend values.

The software features include calculation capabilities, linearization and compensation functions for product change, ranging, zero point and hold. Converters with mA-inputs (C4121, C4221, C4222, C4322 and C4422) feature remote control functions for the control via an external control system. Converters C4151, C4251, C4252, C4352 and C4452 are also equipped with a PROFIBUS® PA interface and can therefore be interconnected with only one cable and integrated into a control system.

The integrated data logger can capture vital process information for quality assurance and plant control records. The data is easily transferred to a PC via an RS-232 port.

Analog and digital inputs and outputs allow for comprehensive sensor measurement as well as signal processing from other measuring devices. Furthermore, the converter is capable of using up to four optek inline sensors and / or probes simultaneously.

With the help of product change, the converter can be switched to another measuring range and a completely different measuring method. This is useful when the process medium is changed or the batch process is switched. When the product is changed, new limit values, measuring ranges, physical units and measuring results processings are taken into account. You can define different product parameters for each output in 8 different files.

The data logger records the four measuring ranges in a selectable time period and displays them graphically on the display. This way, you can monitor the process and compare changes to the measuring results. This provides the opportunity to detect existing correlations and thus to define new parameters for process control and monitoring.

The system provides access protection by means of passwords protecting operating levels for monitoring, routine settings and experts.

The converter fulfills the highest security standards. The device complies with the requirements of the EMC Directive in accordance with CE and NAMUR.

The self-diagnostics system monitors converter as well as sensor processes.

4.1 Front view converter C4000

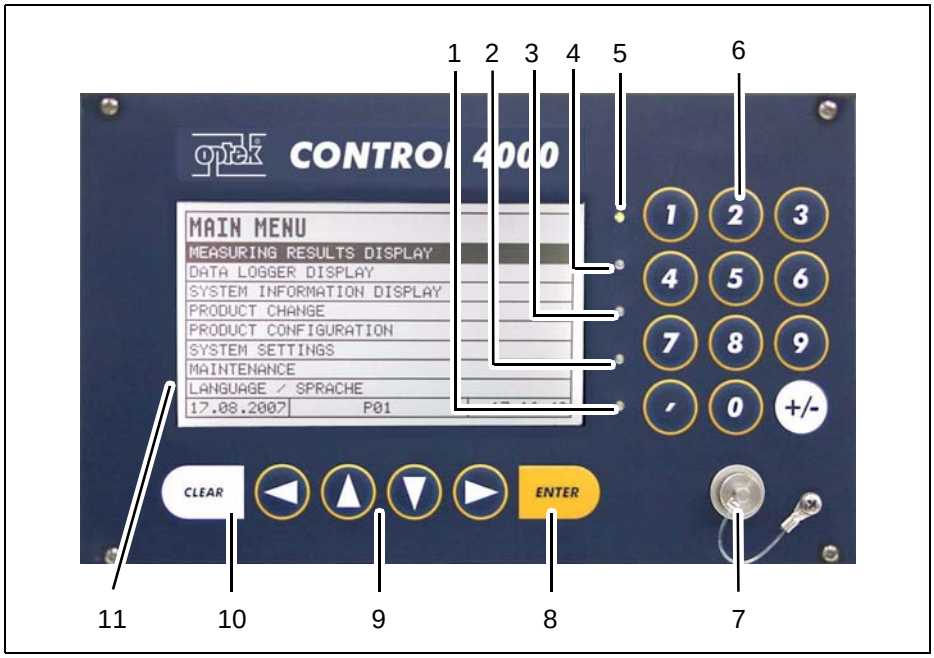


Fig. 2 Front panel converter C4000

Numbers stand for:

1. LED (flashes red), indicates lamp failure or system failure
2. LED (yellow), switch indicator for alarm 3 when a value exceeds or falls below a limit value
3. LED (yellow), switch indicator for alarm 2 when a value exceeds or falls below a limit value
4. LED (yellow), switch indicator for alarm 1 when a value exceeds or falls below a limit value
5. LED (green), indicates readiness for operation
6. Numerical keyboard (single assignment)
7. Connection for RS-232 (control-connect cable)
8. ENTER key (confirmation of entries)
9. Cursor key (moving in the menus and entries)
10. CLEAR key (rejecting entries, returning to previous menu)
11. Display

4.2 Rear view converter C4101

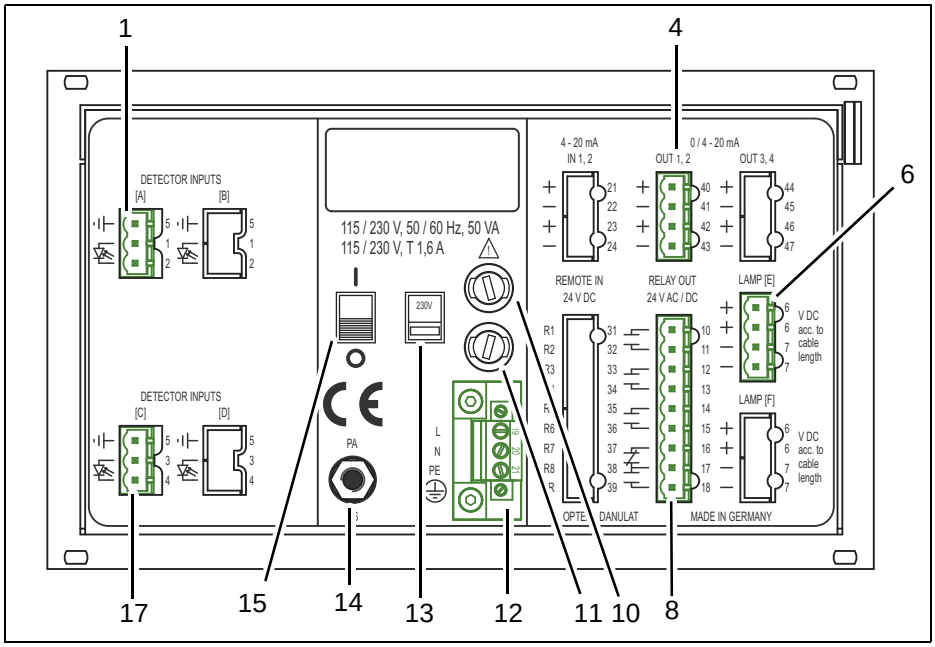


Fig. 3 Rear view converter C4101

Numbers stand for:

1. Detector input A (only for optek-sensors)
2. -
3. -
4. mA-output 1, mA-output 2 (0/4 - 20 mA)
5. -
6. Lamp output E (only for optek-sensors)
7. -
8. Relay outputs 1, 2, 3 for limit values or system status feedback, system relay (enabled)
9. -
10. Fuse I 115 / 230 V AC T 1.6 A (option 24 V AC / DC: T 3.15 A)
11. Fuse II 115 / 230 V AC T 1.6 A (option 24 V AC / DC: T 3.15 A)
12. Power supply (fixed)
13. Selector switch for voltage (factory setting 230 V AC) - (does not apply for a 24 V AC / DC version)
14. Potential equalization (in the non-ex-proof version, only necessary in extreme EMC requirements)
15. ON / OFF switch
16. -
17. Detector input C (inactive)

5 Technical data

Tab. 2 Technical data C4101

Housing:	19"-version for mounting in control cabinets (front IP40 / rear IP20, mains supply secured against accidental touching) 3 U / 42 HP
Housing material:	stainless steel / polyester / silicone / glass / diverse plastics
Display:	LCD graphic display (240 x 128 pixel), LED background illuminated display update: 0.5 seconds 1 LED (green): power on 3 LEDs (yellow): alarm I, II, III 1 LED (red-flashing): lamp failure
Data logger:	4 parallel measuring values approx. 25,000 data points (resolution max. 1/second) ring buffer
System clock:	accuracy approx. 1 minute/month battery life approx. 15 years
Operation:	18-button keyboard with embossing
mA-inputs:	-
Remote-inputs:	-
PROFIBUS®PA interface (2-wire):	-
Relay outputs:	3 independent software-configurable relay contacts (0 - 50 V AC, 0 - 75 V DC, 0 - 2 A) with LED status indicators for limit value indication and / or system status feedback indication initiation delay configurable from 0 to 999 seconds
Failsafe:	1 SPDT contact to alarm in case of lamp or system failure (active)
mA-outputs:	2 x 0 - 20 mA / 4 - 20 mA (NAMUR) functionally galvanically isolated for connection to SELV / PELV, min. 500 V DC accuracy: < 0.5 % resolution: < 0.05 % load: 0 - 600 ohms
Lamp outputs:	lamp supply (4.5 – 8.5 V DC) for optek-sensors
Ambient conditions:	during operation (no direct sunlight): - converter: -10 - 55 °C (14 - 131 °F) - with housing S19-42: -20 - 45 °C (-4 - 113 °F) - with housing B19-42: -10 - 40 °C (14 - 104 °F) - transport: -20 - 70 °C (-4 - 158 °F) EN 61010-1 / 2002-08 / pollution class 2 EN 61010-1 / 2002-08 / overload category II relative humidity 80 % for temperatures up to 31 °C (87 °F), linear decrease at a relative humidity of 50 % at 40 °C (104 °F) (no dew) fault immunity according to EN 61326, industrial field, additional limit value according to table F1: 10 % of the smallest measuring range
Internal operating temperature:	-20 - 75 °C (-4 - 167 °F)
Power supply (fixed, secured against accidental touching):	115 / 230 V AC, selectable (93.5 - 132 / 187 - 264 V AC, 47 - 64 Hz) or 24 V AC / DC (AC: 20.4 - 26.4 V AC, 47 - 64 Hz; DC: 20.4 - 28.8 V DC) (SELV / PELV) consider an external release device
Power consumption:	max. 50 VA
Cable length:	depends on sensor
Responding behavior:	
optek-detector inputs:	1 mA to 500 pA
Linearity (converter):	typically < 0.1 %, max. 0.5 %
Accuracy (converter):	typically < 0.3 %, max. 0.5 %
Options:	power supply (fixed) 24 V AC / DC (AC: 20.4 - 26.4 V AC, 47 - 64 Hz) (DC: 20.4 - 28.8 V DC) (SELV / PELV) B19-42 for mounting on a wall, plastic, IP66 S19-42 for mounting on a wall, stainless steel, IP65 IP65-version for front panel mounting with gasket IP65 (front)

Tab. 2 Technical data C4101

Number of inputs and outputs:	
Inputs for optek-sensors	1
Relay outputs	3
Failsafe (active)	1
mA-outputs	2
Lamp outputs for optek-sensors	1
Fuses for C4101 converter 115 / 230 V AC	2 x T 1.6 A (5 x 20 mm), same fuses for 115 and 230 V AC, factory setting
Fuses for C4101 converter 24 V AC / DC	2 x T 3.15 A (5 x 20 mm)

Tab. 3 Converter weights

Converter	**115 / 230 V AC**	**24 V AC / DC**
C4000	4.1 kg	3.0 kg
C4000 with B19-42	6.8 kg	5.7 kg
C4000 with S19-42	12.1 kg	11.0 kg

5.1 Possible sensors

One or more of the following optek-sensors can be connected to the converter:

Tab. 4 Connectable sensors

Sensor options	AF16-F / N	AS16-F / N*	AS16-BT-N*	AS56-F / N
HT	x			
VA	x			
HT-VA	x			
VB	x	x	x	
HT-VB	x			
PV	x			
HT-PV	x			
VA-PV	x			
HT-VA-PV	x			
VB-PV	x			
HT-VB-PV	x			

*. Two insertion depths available: OPL + 35 mm (1.38") with port length 60 mm (2.36")
OPL + 135 mm (5.31") with port length 60 mm (2.36")

Connecting flameproof sensors to the converter is prohibited without EX design.
The meaning of the sensor options is described in the sensor manuals.

5.2 Dimensions Control 4000

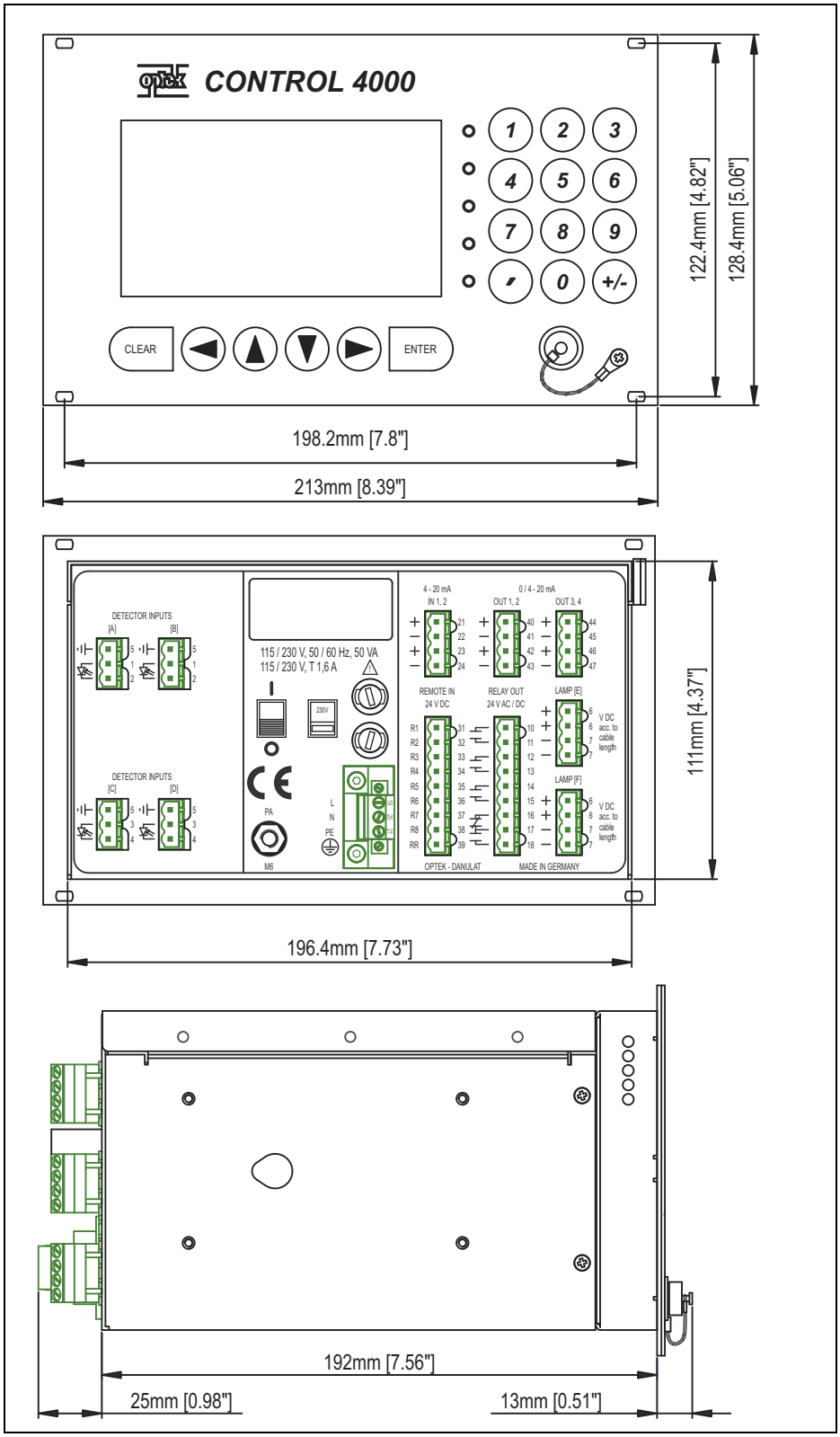


Fig. 4 Dimensions Control 4000

5.2.1 Front panel mounting IP65 (option)

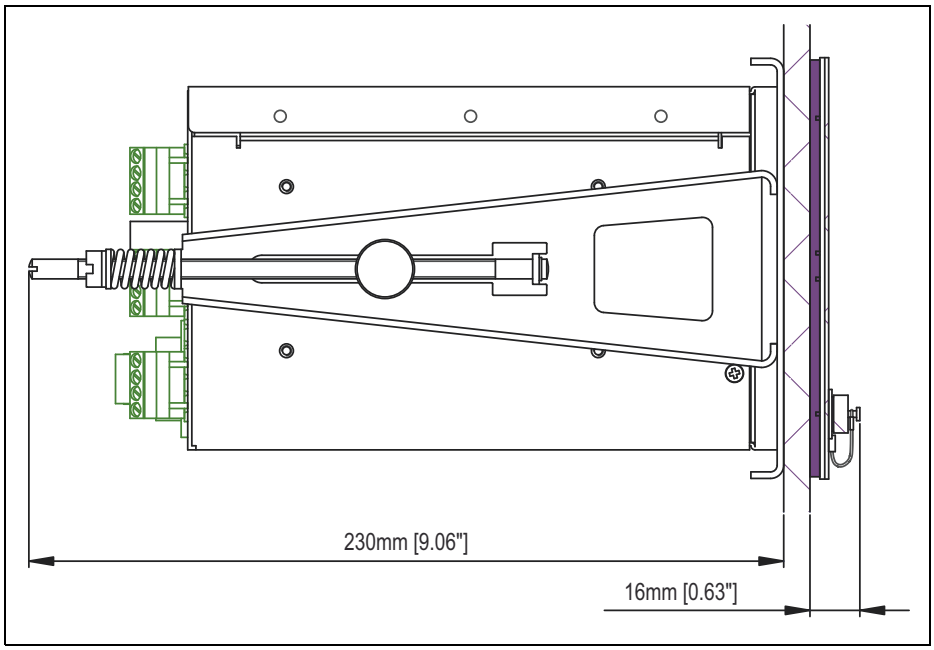


Fig. 5 Dimensions front panel mounting IP65 (option) - side view

5.2.2 Dimensions for additional housing B19-42 - plastic - IP66 (option)

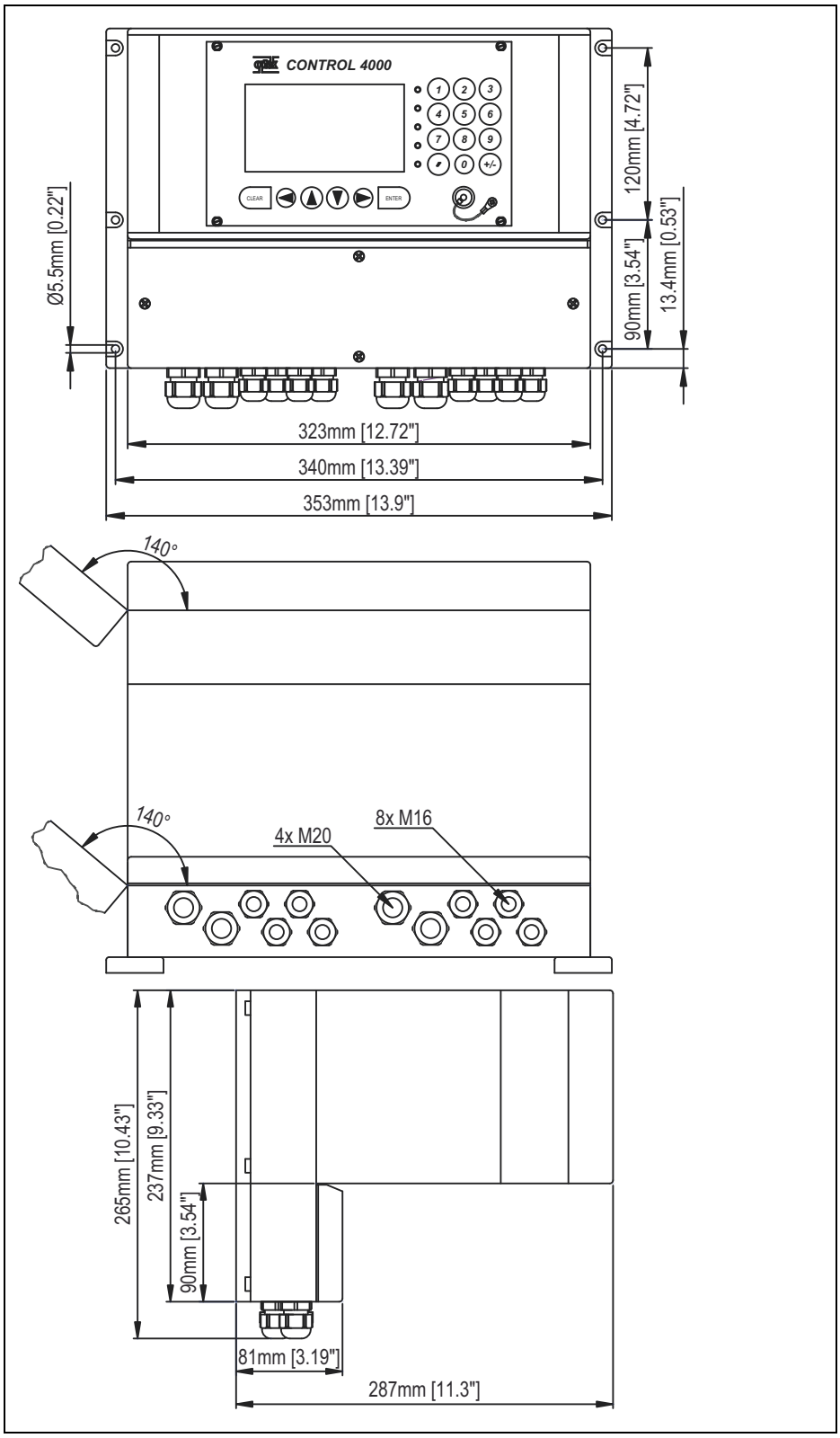


Fig. 6 Dimensions Control 4000 with additional housing B19-42 - plastic - IP66

5.2.3 Additional housing S19-42 - stainless steel 1.4301 / SS304 - IP65 (option)

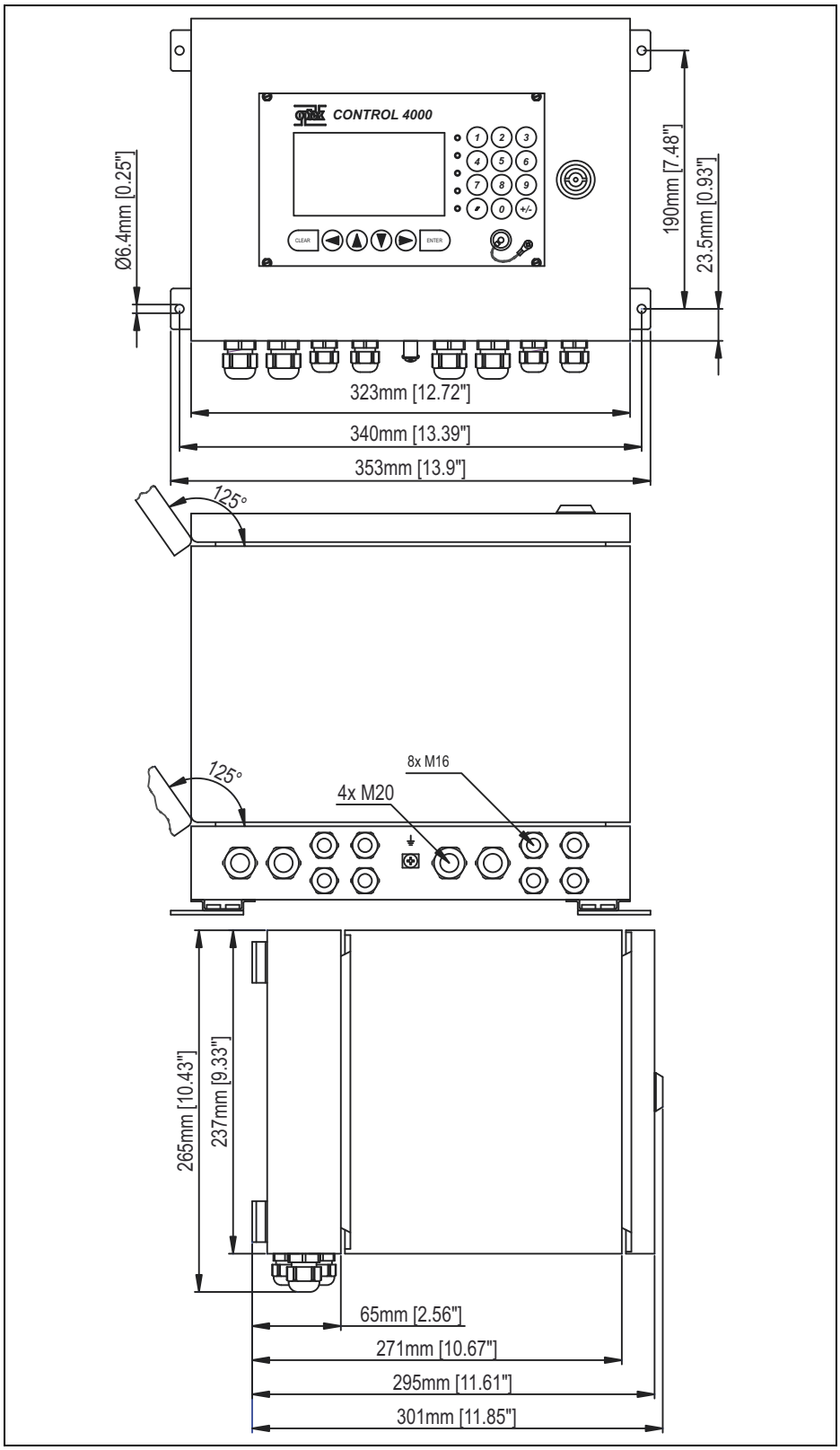


Fig. 7 Dimensions converter with additional housing S19-42 - stainless steel 1.4301 / SS304 - IP65

6 Installation of the converter

Check the whole scope of supply for completeness. Check if there is any detectable damage to the delivery. If you detect any damage or fault, contact our customer service. See preliminary note for our contact data.

6.1 Installation site requirements for standard installation

- A control cabinet with a cutout for the converter as well as 4 drill holes M2.5 for fixing must be provided.
  Dimensioning details of the converter are given in the technical data.
- An external release device on the control cabinet must be close to the converter. With this device the converter can be switched voltage-free.

Tool

- Screw driver ⊕

6.2 Standard installation

1. Insert the converter into the cutout in the control cabinet.
2. Fasten the four screws M2.5 x 11 (20, fig. 8) of the converter.

Fig. 8 Front view with screws

6.3 Installation for IP65 (option)

1. After removing the protective foil, push the gasket, with the adhesive side ahead, over the back of the converter towards the front and place it on the front panel.

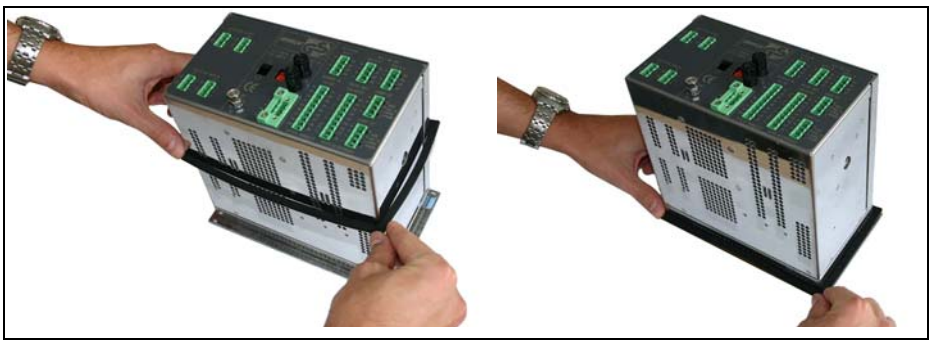


Fig. 9 Gasket on converter

2. Insert the converter with the gasket from the front into the control cabinet.
3. Push the support frame from the back onto the converter.

Fig. 10 Support frame

4. Engage the fixing clips in the holes at the sides of the converter housing.
5. Fasten the fastening screws of the support brackets.

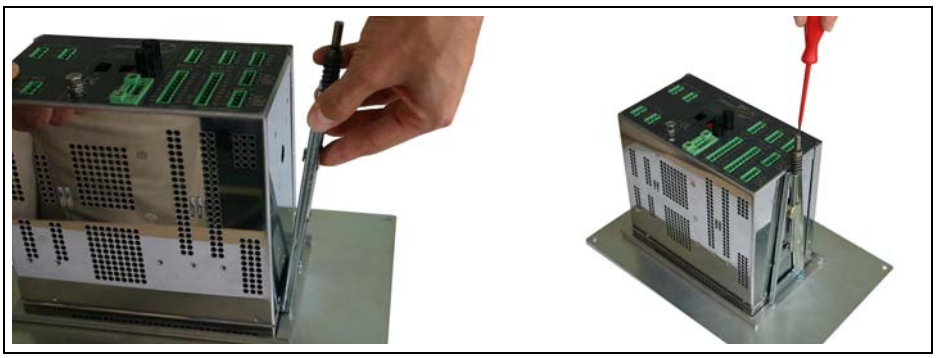


Fig. 11 Fixing clips

7 Wiring

7.1 General advice on wiring

Danger!
Electrical voltage!
Before connecting, switch the converter power switch (15) to O (OFF) position!
Install electrical connections only by qualified electricians!

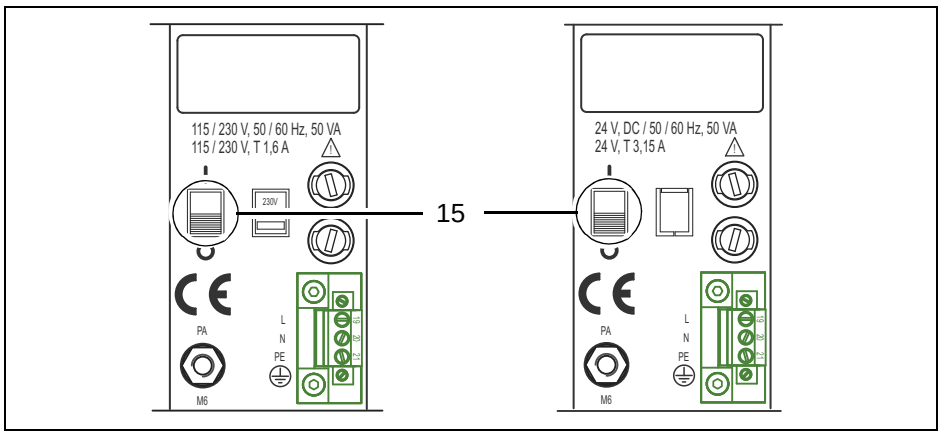


Fig. 12 Power switch on converter 115 / 230 V (left) 24 V (right)

- The power switch is only protected against accidental touching. That is why the converter has to be installed in a control cabinet (refer to chapter "Installation of the converter").
- The power supply socket is not provided with a first-to-mate last-to-break protective ground contact. You must therefore provide an external release device.
- The converter is designed for continuous operation and has only to be switched voltage-free for maintenance purposes.

7.2 Connecting the voltage supply 115 or 230 V AC

Danger!
Electrical voltage!
Switch the converter voltage-free before connecting the sensor!
Install electrical connections only by qualified electricians!

Tool

- Screw driver ⊖

1. Flip the selector switch (13) to the provided voltage supply (115 or 230 V AC).
2. Connect the power supply to the power supply socket (12).

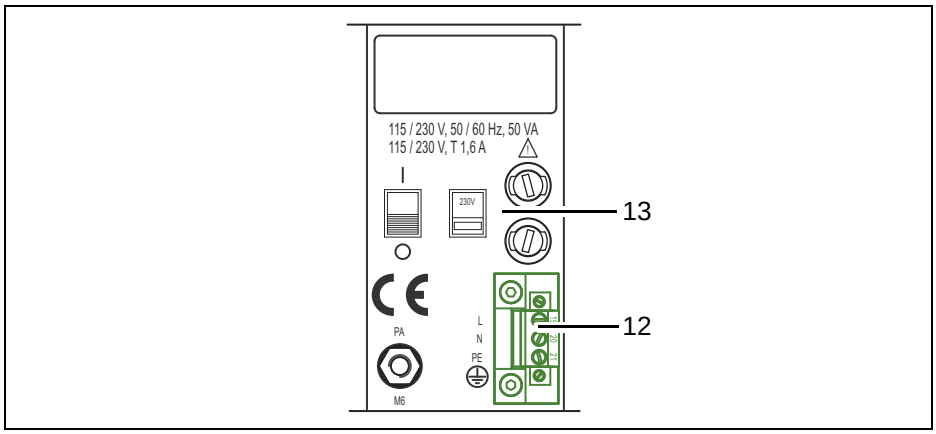


Fig. 13 Connecting the power supply 115 or 230 V AC

7.3 Connecting the voltage supply 24 V AC / DC (option)

Danger!
Electrical voltage!
Switch the converter voltage-free before connecting the sensor!
Install electrical connections only by qualified electricians!

Tool

- Screw driver ⊖

1. Check if the voltage is 24 V AC / DC.
2. Connect the power supply to the power supply socket (12).

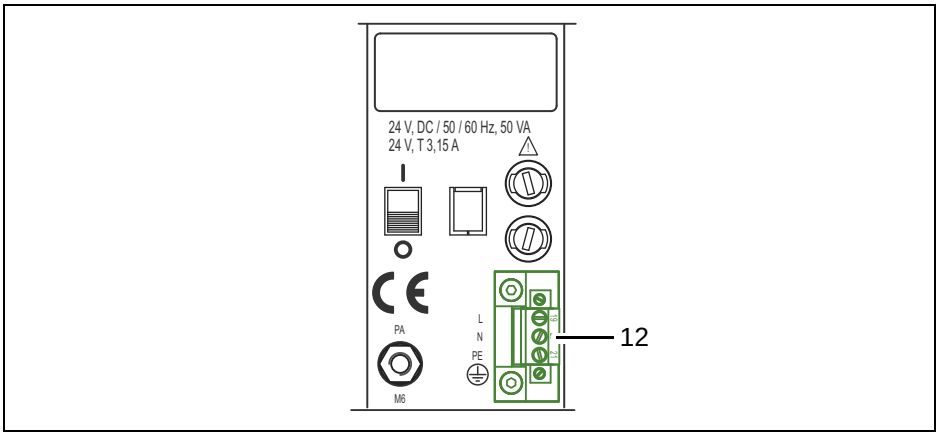


Fig. 14 Connecting the power supply 24 V AC / DC

7.4 Connecting the sensors

Danger!
Electrical voltage!
Switch the converter voltage-free before connecting the sensor!
Install electrical connections only by qualified electricians!

Connection to the converter

The following connections are on the back of the converter:

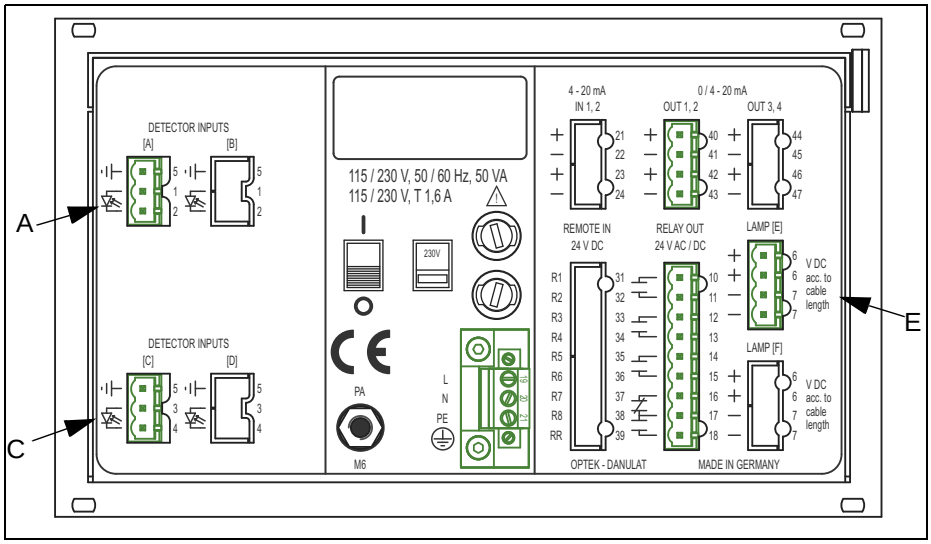


Fig. 15 Detector inputs and lamp outputs

Letters stand for

- A, C detector inputs (C is inactive at C4101)
- E connection for lamp output

Tab. 5 Connections

Number of sensors sensor type	Detector input	Lamp output	Cable set standard length up to
1 sensor AF16	A	E	100 m / 328 ft.*
1 sensor AS16 / AS16-BT	A	E	50 m / 164 ft.
1 sensor AS56	A	E	50 m / 164 ft.

*. Cable sets length > 100 m (328 ft.) on request.

Tool

- Screw driver

To be able to allocate the end splices unequivocally to the clamps of the converter, each end splice is marked with the number of the correct clamp:

Detector cable to sensor
1 = white (A1) 2 = brown (A2) 5 = black (A5)

Lamp cable to sensor
6 = white or blue (6) 7 = brown (7)

Caution!
Lamp voltage must be adjusted to the cable length in order to compensate voltage loss in the cable. Too low lamp voltage can lead to wrong measuring results. Too high lamp voltage reduces the life of the lamp module considerably.

7.4.1 Wiring plan AF16 to C4101 or C4201

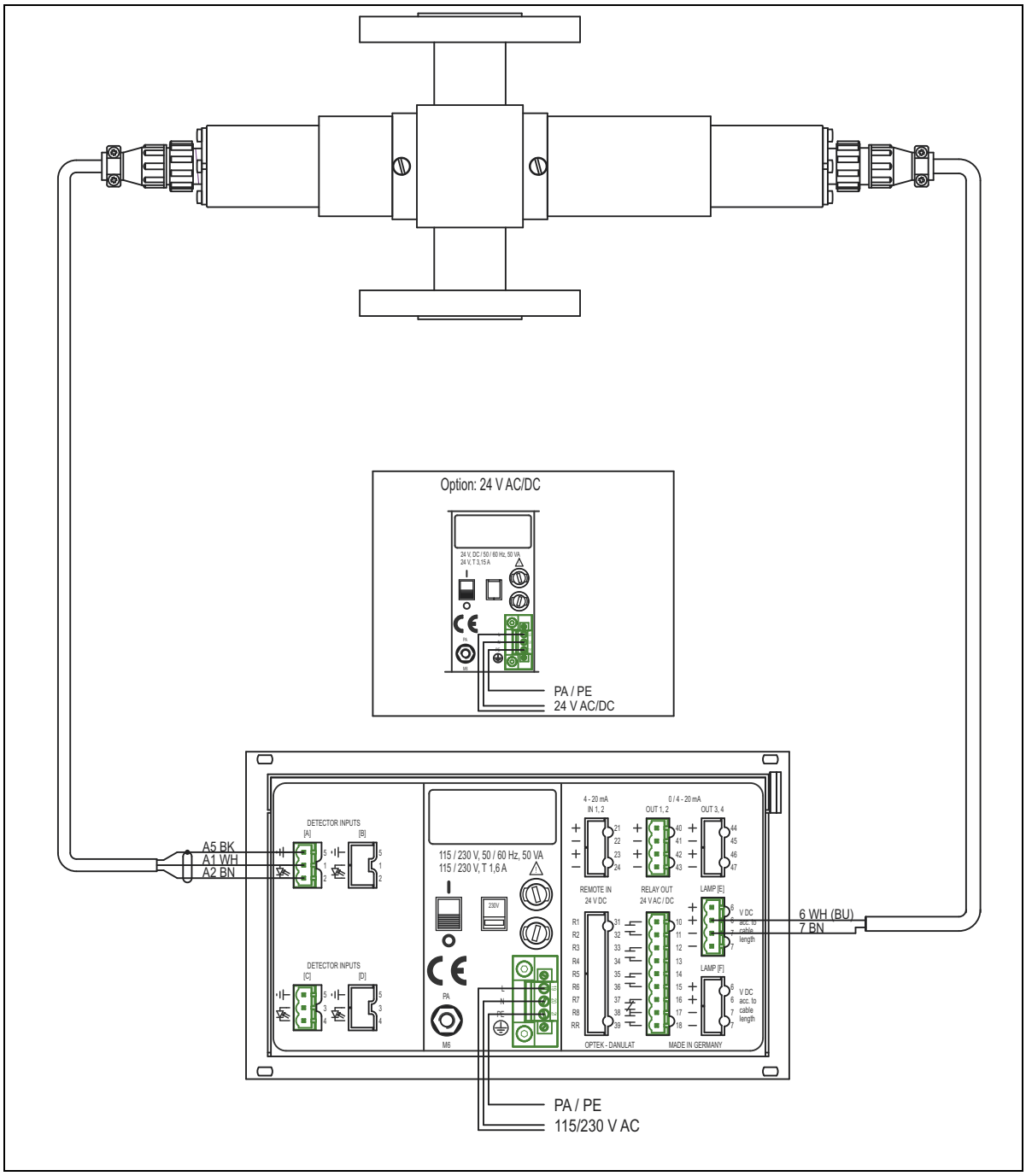


Fig. 16 Wiring plan AF16 to C4101 or C4201

7.4.2 Wiring plan AS16 or AS56 to C4101 or C4201

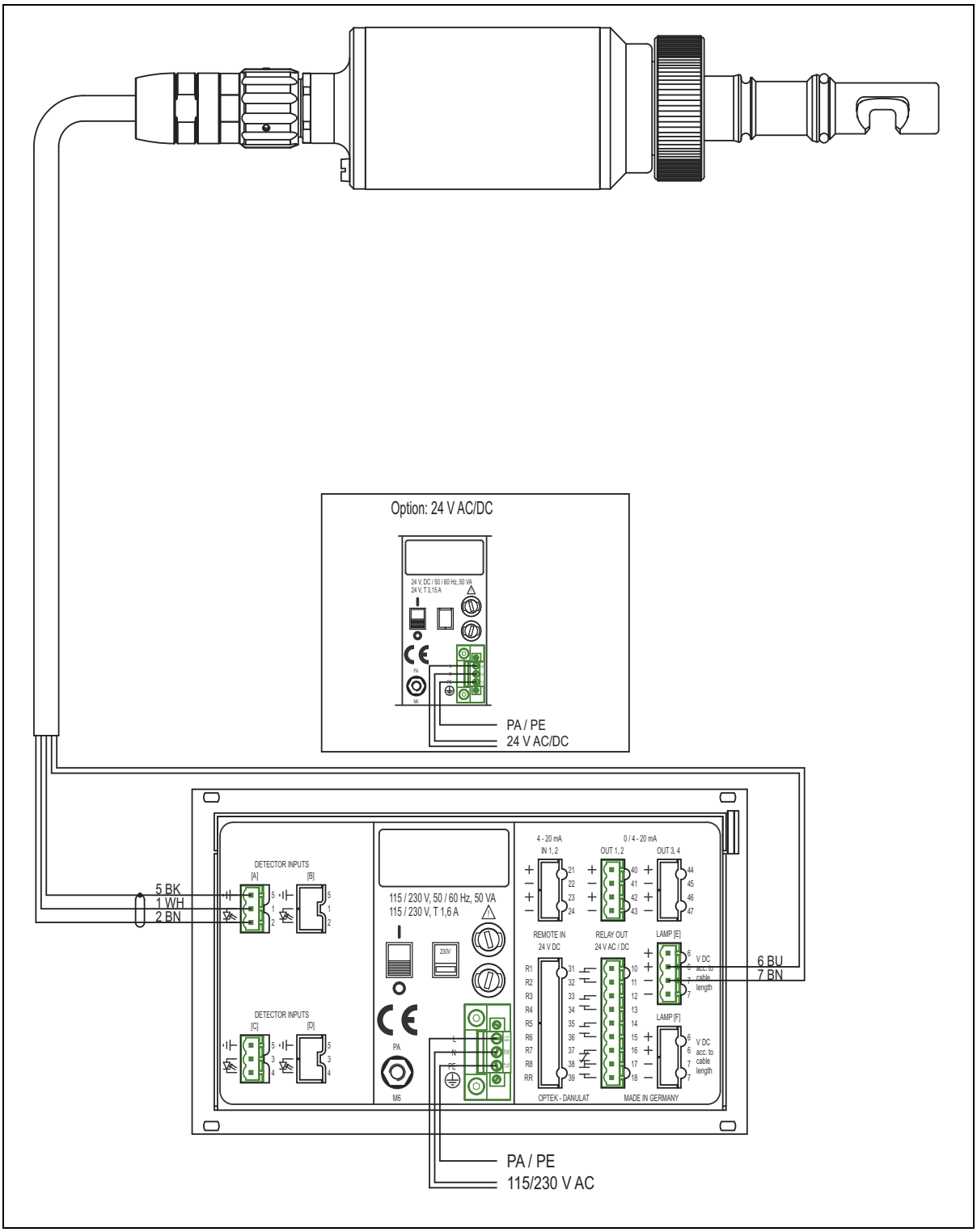


Fig. 17 Wiring plan AS16 or AS56 to C4101 or C4201

7.4.3 Wiring plan AS16-BT to C4101 or C4201

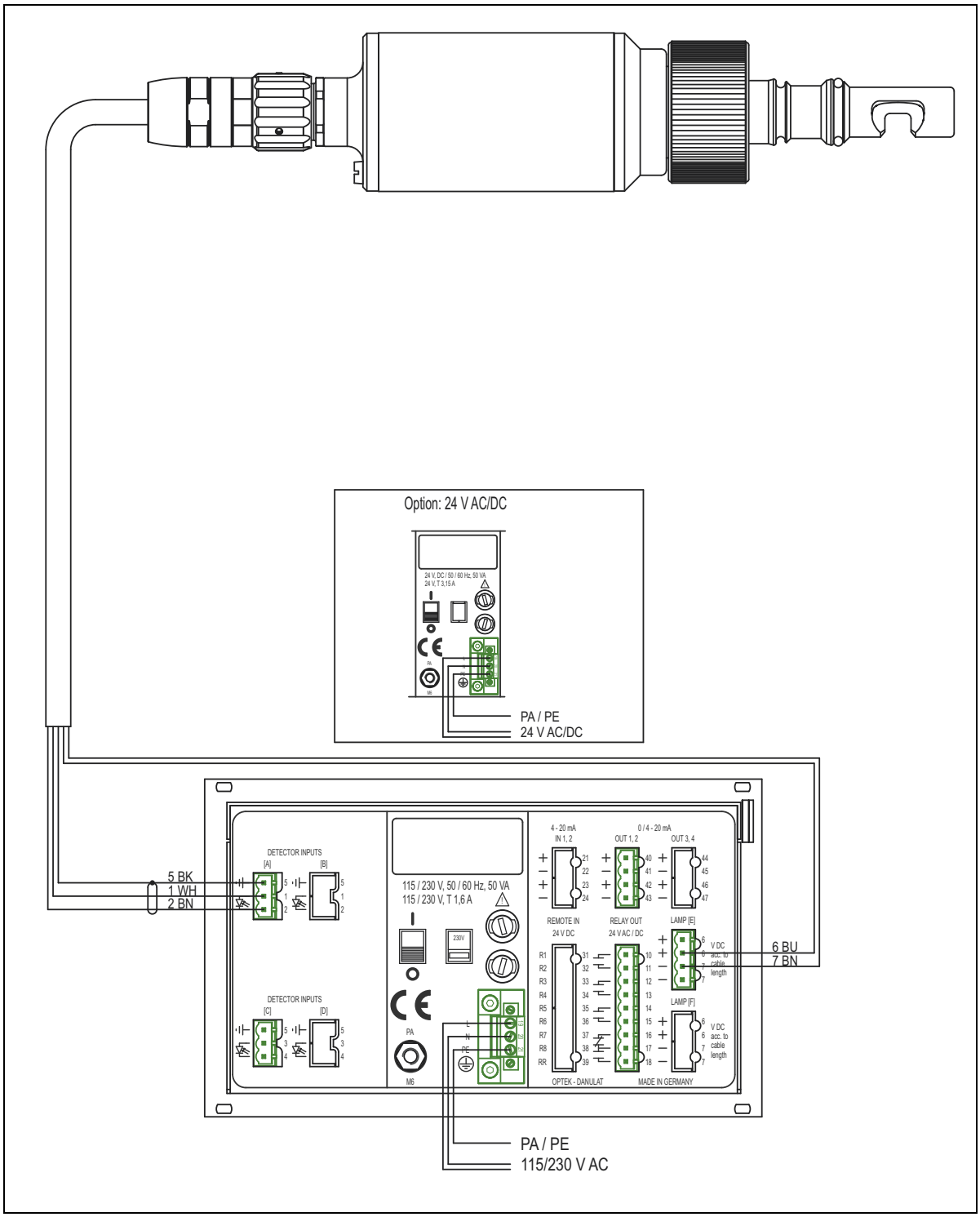


Fig. 18 Wiring plan AS16-BT to C4101 or C4201

7.5 Connecting the relay outputs

Danger!
Electrical voltage!
Switch the converter voltage-free before connecting!
Install electrical connections only by qualified electricians!

Tool

- Screw driver

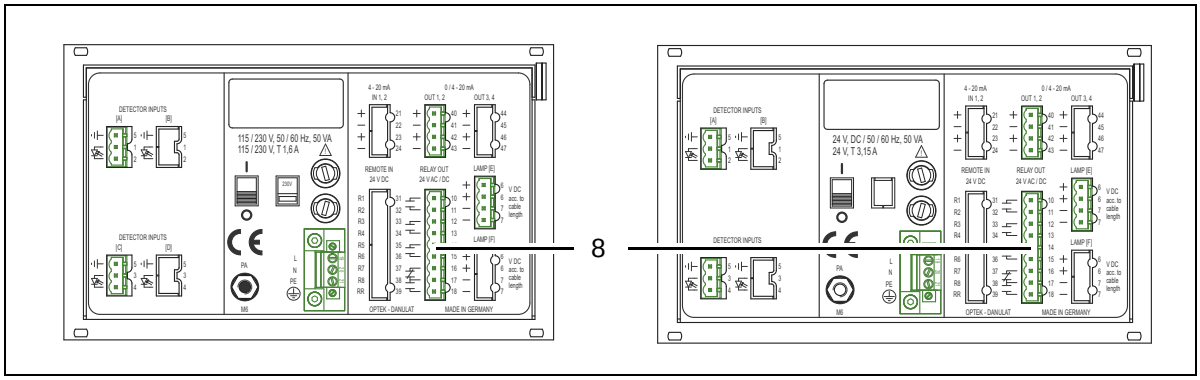


Fig. 19 Relay outputs

The converter is equipped with four relay outputs (8, fig. 19):

- Relay output 1 clamps 10 / 11
- Relay output 2 clamps 12 / 13
- Relay output 3 clamps 14 / 15
- Relay output 4 clamps 16 / 17 / 18 (active)

Note!
Observe the admissible relay output loads (see “Technical data”, chapter 5, page 11).

You can adjust the function of the relay outputs 1, 2, 3 via the converter software. The following settings are possible:

- Contacts normal OPEN or normal CLOSED
- Limit value relay or system status feedback

Relay output 4 is a system relay and cannot be configured. It is designed for indicating system errors.

Relay outputs 1, 2, 3 as limit value relays

Each relay can be assigned a different limit value for each product configured:

- Relay output 1 limit value 1
- Relay output 2 limit value 2
- Relay output 3 limit value 3

The yellow limit value LEDs on the front panel indicate with a time delay of 0.5 seconds whether a value exceeds or falls below the set limit value. When the limit value falls below or exceeds the set value again, the LED goes off. This happens independently of the preset relay time delay in the software. Thus, it is not the switching state of the relays which is indicated, but whether a value falls below or exceeds the set limit value.

7.6 Connecting the mA-outputs

Danger!
Electrical voltage!
Switch the converter voltage-free before connecting!
Install electrical connections only by qualified electricians!

Tool

- Screw driver ⊖

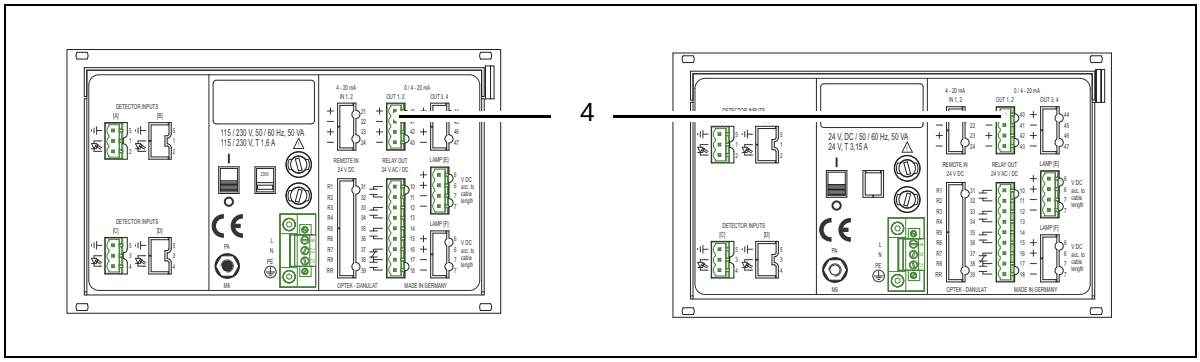


Fig. 20 mA-outputs

The converter is equipped with two independent mA-outputs (4, fig. 20), which can be both switched between 0 - 20 mA and 4 - 20 mA in the software:

- mA-output 1 clamps 40 + / 41 -
- mA-output 2 clamps 42 + / 43 -

Note!
Observe the measuring results allocation on the corresponding mA-outputs (M01 to mA-output 1, M02 to mA-output 2).

8 Commissioning

8.1 Requirements for commissioning

Before commissioning the converter or the whole measuring system, carry out the following activities:

- Install the armature (see instruction manual of armature).
- Check the pipeline with the armature for leaks.
- Check armature windows. They must not be dirty.
- Install the sensor (see instruction manual of the sensor).
- Ensure that the converter is mounted correctly (chapter 6).
- Verify correct wiring of the converter (chapter 7).

8.2 Switching the converter on

1. Flip the converter power switch (15) to I (ON) position.

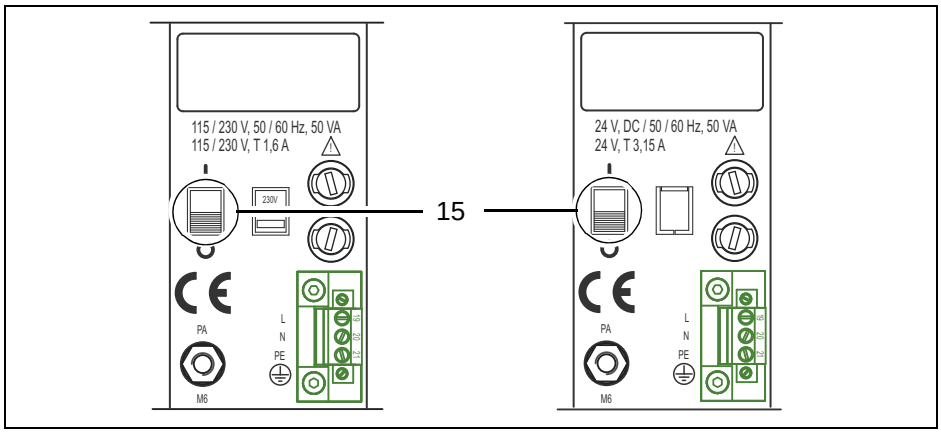


Fig. 21 Converter power switch

2. Switch on the external release device.
3. Wait for approx. 15 minutes, until the system has reached the operating temperature.

8.3 Adjusting lamp voltage

Lamp voltage must be adjusted to the cable length in order to compensate voltage loss in the cable. Too low voltage can lead to wrong measuring results. Too high lamp voltage reduces the life span of the lamp module considerably.

1. Let the lamp module of the sensor operate for at least 3 minutes. During this time the voltage at the lamp output clamps of the converter adjusts depending on the load.

Caution!
The lamp voltage at the converter must not exceed 8.5 V DC or the system will overheat!

2. Adjust the lamp voltage at the converter in the SYSTEM SETTINGS / LAMP VOLTAGE menu (see chapter 9.4.3).

Lamp voltage depends on cable length and sensor type. During operation, lamp voltage at the lamp module has to be constant at 4.8 V (or 7.0 V when using AF45 or AF46). The values in the following table apply to original cable sets only!

Tab. 6 Lamp voltage depending on cable length

Cable set lengths standard*		Lamp voltage [V] depending on connected sensor and cable cross section				
		AF16, AF26, TF16-N	AS16, AS16-BT	AS56	AF45, AF46	
m	ft.	1.5 mm^2	1.5 mm^2	1.5 mm^2	1.5 mm^2	2.5 mm^2
0	0	4.80	4.80	4.80	7.00	
2	7	4.84	4.84	4.82	7.04	
3	10	4.86	4.86	4.83	7.06	
5	16	4.90	4.90	4.86	7.11	
10	33	4.99	4.99	4.91	7.22	
15	49	5.09	5.09	4.97	7.33	
20	66	5.18	5.18	5.02	7.44	
25	82	5.28	5.28	5.08	7.55	
30	98	5.38	5.38	5.13	7.66	
35	115	5.47	5.47	5.19	7.77	
40	131	5.57	5.57	5.24	7.88	
45	148	5.66	5.66	5.30	7.99	
50	164	5.76	5.76	5.35	8.10	
60	197	5.95				7.74
70	230	6.14				7.87
80	262	6.34				7.99
90	295	6.53				8.11
100	328	6.72				8.24
Lamp voltage =		4.80 + 0.0192/m	4.80 + 0.0192/m	4.80 + 0.011/m	7.00 + 0.0192/m	7.00 + 0.0108/m
Resistance =		12.8 ohms/ 1000 m	12.8 ohms/ 1000 m	12.8 ohms/ 1000 m	12.8 ohms/ 1000 m	7.2 ohms/ 1000 m

*. Cable sets length > 100 m (328 ft.) on request.

Standard cross section for lamp cables is 1.5 mm^2. With longer cable sets, the following lamp cables are used to minimize voltage losses:

- AF16, AF26, TF16-N > 150 m (820 ft.): 2.5 mm^2
  (lamp voltage = 4.80 + 0.0108/m; resistance = 7.2 ohms/1000 m)
- AF45, AF46 > 50 m (164 ft.): 2.5 mm^2

Caution!
When cable sets are later shortened, prior to connecting the lamp module, lamp voltage has to be reduced to the corresponding value to avoid overload.

8.4 Other activities when commissioning

1. Check the system's zero point in the converter software (either at the converter in the MAINTENANCE menu chapter 9.11.2, page 135 or via the control system chapter 9.12, page 164).
2. Enter the system settings (see chapter 9.4, page 43).
3. Enter the product settings (see chapter 9.5, page 51).
4. Document your settings using the form (see chapter 12.1, page 192).
5. Check measuring results with regard to plausibility.
6. If settings and measuring results are correct, enable measuring.

9 Software Version C

All converters are provided with software with the entire function scope. Some converter models are provided with certain software functions only to a limited extent due to the converter's hardware configuration. This instruction manual describes the entire function scope of the software, even if some functions, such as the remote function in the C4XYZ series (Y = 0, 5), are not available with your converter model.
Before using the software, check which converter model you use. You find the necessary information on your system data sheet.

9.1 Starting the software

After switching on the converter, the optek menu appears (fig. 23). Meanwhile, the software is loaded, internal communication is checked and the configuration is identified.

Fig. 22 Loading of software

Afterwards, the MEASUREMENT DISPLAY menu automatically pops up on the display if this menu was active when the measuring system was switched off the last time.
Otherwise, the MAIN MENU appears after switching on the system.

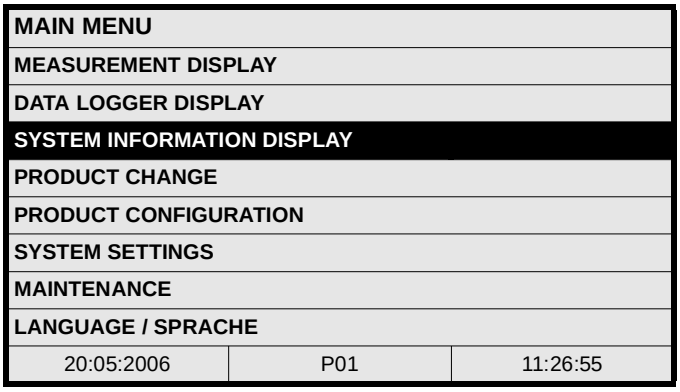


Fig. 23 Main menu

If the converter was in measuring mode when switched off, it automatically returns to the measuring mode with the settings of the product used last. The measuring results are displayed in the MEASUREMENT DISPLAY.
In order to change from the measurement display to the main menu, press [CLEAR].

9.2 General software information

9.2.1 General information on operating the software

Each menu consists of:

- menu name in the headline (21)
- menu items (22)
- status bar in the last line (23)

If there are more menu items than can be displayed, this is indicated by an ▲ **or** ▼ arrow on the right side of the display.

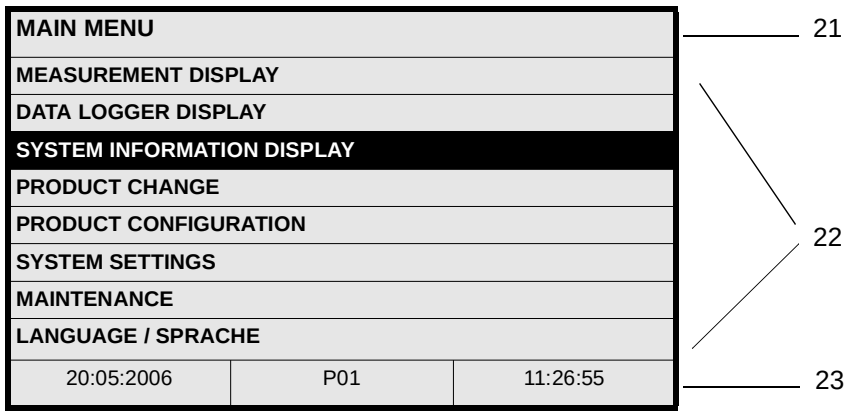


Fig. 24 Main menu

Scrolling within a menu

To scroll from one line or menu item to the next, press the arrow keys ▲ or ▼ below the display. The selected menu item is highlighted as light text on dark background.

Changing the menu

To select a menu item or to change to another menu, select the desired menu item and press [ENTER].
To return to the last menu, press [CLEAR].

Selecting options

There are three different ways of entering options:

- choosing from list
- entering figures
- entering text

In some menus you can choose a parameter by selecting from several options from a list.

- Select the menu item and press [ENTER]. The list appears (fig. 25).
- Press the arrow key ▼ to change to another option, e. g. to ASYMMETRIC. This option is displayed as light text on dark background.
- Press [ENTER] to enable the selected option.

SYSTEM SETTINGS		
ALL MEASURING RESULTS ARE DAMPED AS FOLLOWS:		
DAMPING		SYMMETRIC
		ASYMMETRIC
DAMPING (SEC)		1.0
REJECT	P01	SAVE

Fig. 25 Damping list

Entering figures

In some menus you can change parameters by entering figures via the numerical keyboard next to the display on the right side:

- Select the menu item and press [ENTER]. The cursor is located in the entry field, e. g. in the entry field SET DATE (fig. 26).
- Enter the new figure via the numerical keyboard, in this example the current date.
- Press [ENTER] to enable the selected option.

SYSTEM SETTINGS		
DATE / TIME SETTINGS		
FORMAT DATE:		DD.MM.YYYY
SET DATE:		_._._. _ _ _ _
FORMAT TIME:		23:59:59
SET TIME:		
REJECT	P01	SAVE

Fig. 26 Entering values / figures by means of the date example

Entering text

In some menu items you can enter text:

ABCDEFGHIJKLMNOPQ RSTUVWXYZ() + - / *0123456789.%			
<<<	>>>	DEL	OK

<= alpha / numerical entry + special characters

<= control field (cursor, delete, entry)

Note!

In the Russian menu navigation, an additional field for switching to Cyrillic characters has been implemented underneath the control field.

- Select the menu item and press [ENTER]. A character field pops up with letters, calculation operators, figures and brackets in which the letter A is selected (fig. 27).
- Press the arrow keys ◀ or ▶ below the display to change between the characters.
- Press [ENTER] to accept the selected character. The first character appears in the entry field.
- Press the arrow keys ◀ or ▶ again.
- Press [ENTER] to accept the selected character as second character in the entry field.

- If you have entered a wrong character, you can add a new one before the wrong one:
  - Go to the control field using the arrow key ▼.
  - Use the arrow key ◀ to go to <<<.
  - Press [ENTER] several times. Each time you press [ENTER] the cursor moves one character to the left.
  - Use the arrow key ▶ to go to >>>.
  - Press [ENTER] several times. Each time you press [ENTER] the cursor moves one character to the right.

- If you have entered a wrong character, you can delete the character:
  - Go to the control field using the arrow key ▼.
  - Use the arrow key ◀ to go to <<<.
  - Press [ENTER] several times to place the cursor in front of the character to be deleted.
  - Use the arrow key ▶ to go to DEL. Press [ENTER] to delete the character in the entry field.

- When the text is entered, use the arrow key ▶ to go to OK. Press [ENTER] to close the character field.

SYSTEM SETTINGS				
SYSTEM DATA SENSOR 2				
MODEL				
SERIAL NO				
OPL	ABCDEFGHIJKLMNOPQ RSTUVWXYZ() + - / *0123456789.%			
WAVELENGTHS				
OPTEK INPUTS	<<<	>>>	DEL	OK
CABLE LENGTH				
LAMP OUTPUT				
REJECT	P01		**SAVE**	

Fig. 27 Entering text by means of the system data sensor 2 example

Saving entries

To select and enable changed menu items and / or parameters you must first save them.

- To do this, go to the SAVE field using the arrow keys ▼ and ▶.
- Press [ENTER].
- The previous menu appears automatically.

SYSTEM SETTINGS		
DATE / TIME SETTINGS		
FORMAT DATE:		DD.MM.YYYY
SET DATE:		25.07.2006
FORMAT TIME:		23:59:59
SET TIME:		16:17:32
REJECT	P01	**SAVE**

Fig. 28 Saving entries by means of the date example

Rejecting entries

To reject a selected menu item and / or parameter proceed as follows:

- Go to the REJECT field using the arrow key ▼.
- Press [ENTER].
- The previous menu appears automatically.

SYSTEM SETTINGS		
DATE / TIME SETTINGS		
FORMAT DATE:		DD.MM.YYYY
SET DATE:		25.07.2006
FORMAT TIME:		23:59:59
SET TIME:		16:17:32
REJECT	P01	**SAVE**

Fig. 29 Rejecting entries by means of the date example

9.2.2 Information on the measuring mode

The measuring system normally is in the measuring mode, updating the four measuring results for the current product every 1.0 seconds.

This measuring mode runs automatically in the MAIN MENU, the language selection and in the three menus MEASUREMENT DISPLAY, DATA LOGGER DISPLAY, SYSTEM INFORMATION DISPLAY.

The measuring mode is interrupted for three seconds for manual or Remote In product change.

The measuring mode is switched off during product configuration, system settings or maintenance. Measuring mode is restarted upon return to the main menu.

In the measuring mode, the data logger is periodically updated with the four measuring results. When the measuring mode is switched off, the data logger records "Hold" or "No Data"; the mA-outputs continue displaying the last valid results. This way, it is always guaranteed that the data of the measurement display and the data logger in the converter is consistent with the mA-output as well as with external data recording.

9.3 Choosing the language

To change the software language, proceed as follows:

1. Select LANGUAGE / SPRACHE from the main menu and press [ENTER].

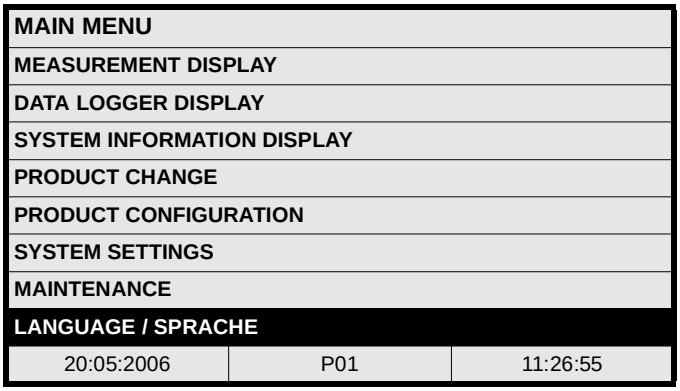


Fig. 30 Main menu, choosing Language / Sprache

2. Select your language from the LANGUAGE / SPRACHE menu and press [ENTER]. The main menu appears.

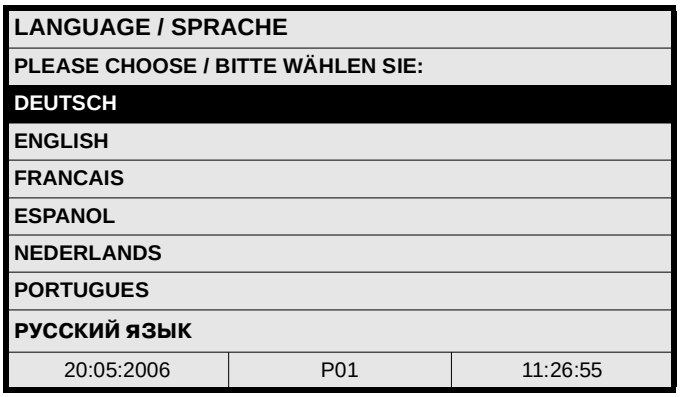


Fig. 31 Menu Language / Sprache

9.4 Carrying out system settings prior to initial commissioning

Carry out or check the following system settings prior to initial commissioning:

- system settings - display
- system settings - date / time
- system settings - lamp voltage
- system settings - optek inputs
- system settings - mA-inputs

Note!
The measuring mode is switched off for parameterization regarding system settings. Measuring mode is restarted upon return to the main menu.

9.4.1 System settings - display

With this function, you can set contrast, brightness and temperature compensation of the converter display. Brightness and contrast range between 0 and 40 units, temperature compensation between -20 to +20 units.

1. Select SYSTEM SETTINGS from the main menu and press [ENTER].
2. Select DISPLAY and press [ENTER].

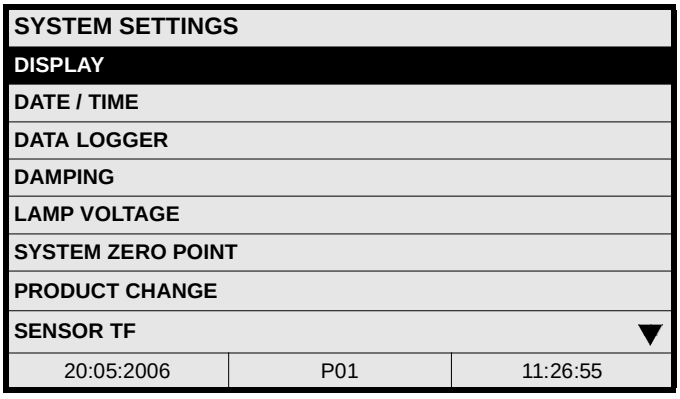


Fig. 32 Menu system settings, choosing display

3. Select CONTRAST and press [ENTER].
4. Press ◀ or ▶ to set the contrast. Press [ENTER]. The cursor moves to BRIGHTNESS.

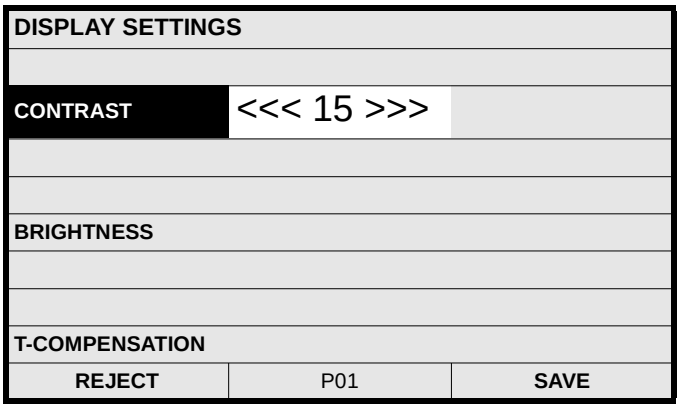


Fig. 33 Setting contrast

5. Press [ENTER]. You can set the brightness with ◀ or ▶. Press [ENTER]. The cursor moves to T-COMPENSATION.
6. Press [ENTER]. Set the temperature compensation with ◀ or ▶ and press [ENTER].
7. Save the entry. The SYSTEM SETTINGS menu appears.

Contrast and brightness can be set in a range of 0 to 40 units by using the arrow keys ◀ and ▶.
Temperature compensation for the contrast of the graphic display employed can be optimally adjusted to the operating conditions. Temperature compensation can be set in a range of -20 to +20 units by using the arrow keys ◀ and ▶.

9.4.2 System settings - date / time

1. Select SYSTEM SETTINGS from the main menu and press [ENTER].
2. Select DATE / TIME and press [ENTER].

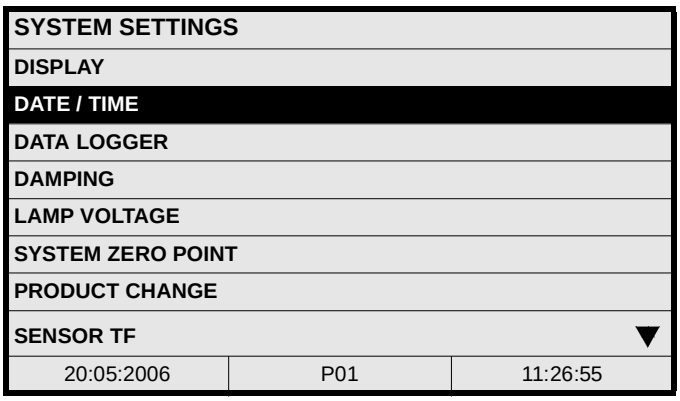


Fig. 34 Menu system settings, choosing date / time

3. Select FORMAT DATE and press [ENTER]. A list appears. Select the desired format TT.MM.JJJJ or MM/DD/YYYY from the list.
4. Press [ENTER]. The cursor automatically moves to SET DATE.
5. Press [ENTER], type in the date via the numerical keyboard (from 1998 to 2050) and press [ENTER]. The cursor automatically moves to FORMAT TIME.
6. Select the desired time format 23:59:59 or 12:59:59PM.
7. Press [ENTER]. The cursor automatically moves to SET TIME.
8. Press [ENTER], type in the time via the numerical keyboard and press [ENTER].
9. Save the entry. The SYSTEM SETTINGS menu appears.

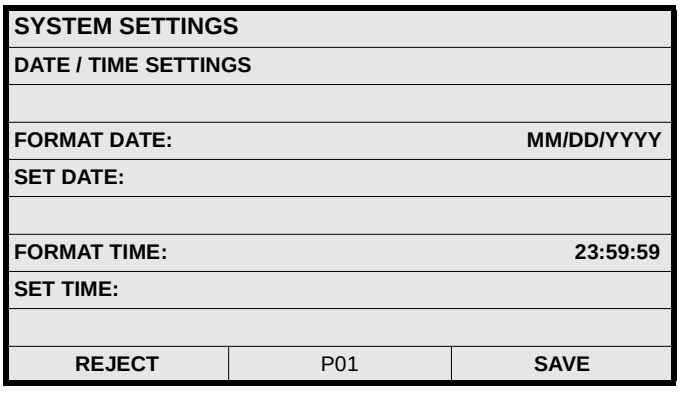


Fig. 35 Entering date / time

Note!
Changes of date and / or time lead to a new storage sector in the data logger and trend!

9.4.3 System settings - lamp voltage

Also observe the notes in chapter 8.3, page 32.
Lamp voltage depends on sensor and cable length.

1. Select SYSTEM SETTINGS from the main menu and press [ENTER].
2. Select LAMP VOLTAGE and press [ENTER].

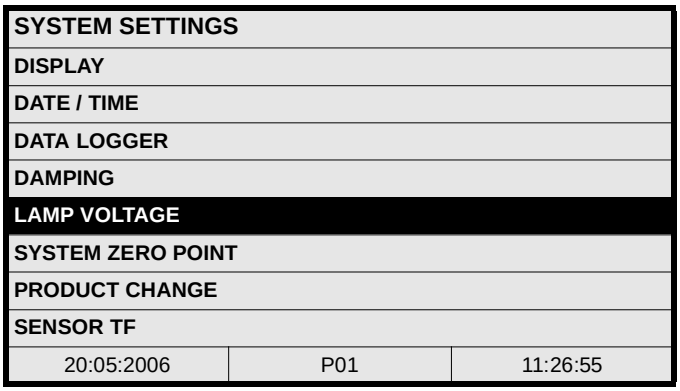


Fig. 36 Menu system settings, choosing lamp voltage

3. Select LAMP E (VDC) and press [ENTER].
4. Type in a direct voltage of 0 to 8.5 via the numerical keyboard next to the display and press [ENTER]. The cursor automatically moves to the next menu item.
5. For converters C4202, C4222, C4322, C4422, C4252, C4352 and C4452, enter a direct voltage for LAMP F (VDC). Set to 0.00 if no sensor is connected.

Caution!
The output E is always assigned to sensor 1, which is always assigned to the detector input A or A and C. One sensor can be connected to each output. The probes AS56 are the only ones of which two can be parallelly connected to one lamp output.
Outputs E and F must not be mixed up when installing 2 sensors of a different lamp voltage or cable length.

6. Press [ENTER] in the NUMBER OF SENSORS AT E menu item.
7. Type in the number of sensors at output E via the menu and press [ENTER]. The cursor automatically moves to the next menu item in the last line.
8. For converters C4202, C4222, C4322, C4422, C4252, C4352 and C4452, type in the number of sensors at output F and press [ENTER]. The cursor automatically moves to the last line.
9. Save the entry. The SYSTEM SETTINGS menu appears.

SYSTEM SETTINGS		
ADJUST LAMP VOLTAGE:		
LAMP E (VDC):		
LAMP F (VDC):	7.00	
SWITCH LAMP OFF WITH INPUT< 4.5 (VDC)		
NUMBER OF SENSORS AT E: 1		
NUMBER OF SENSORS AT F: 1		
REJECT	P01	SAVE

Fig. 37 Entering lamp voltage

Note!
The lamp voltage measurement is carried out at the backplate of the measuring amplifier at the clamps 6 and 7.

To switch off the lamp outputs without changing the lamp voltage set here, proceed as described in chapter 9.11.8.2.1, page 151.
You can check the lamp voltage and the lamp current in the LAMP MONITOR menu.

Note!
In case of overload, the lamp outputs are switched off after a short while to minimize thermal damage.

After correcting a possible error, you must switch on the lamp outputs in the lamp monitor again (see chapter 9.11.8.2.1, page 151).

9.4.4 System settings - optek inputs

Here, you can select the optek detector inputs which you want to use for measurement.
With the settings described in the following section, the converter can perform corresponding tests and reliably create or ignore error messages. A faulty sensor can stay connected to the system physically until repaired without disturbing the entire system's operation.

1. Select SYSTEM SETTINGS from the main menu and press [ENTER].
2. Select OPTEK INPUTS and press [ENTER].

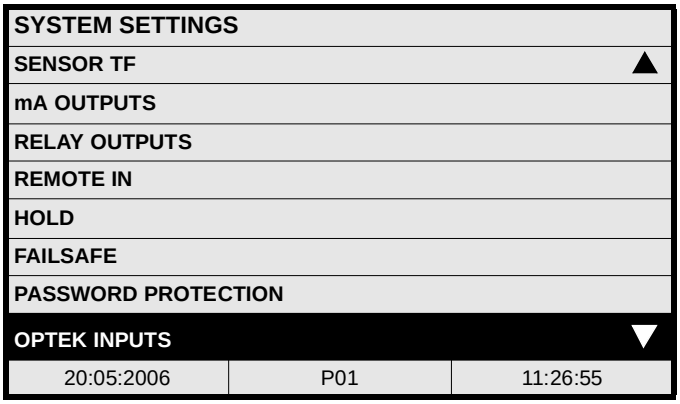


Fig. 38 Menu system settings, choosing optek inputs

3. The cursor is located in the CHANNEL A menu item. Press [ENTER] and select YES or NO. When connecting one single channel sensor or one dual channel sensor, select YES.
4. Press [ENTER] again.

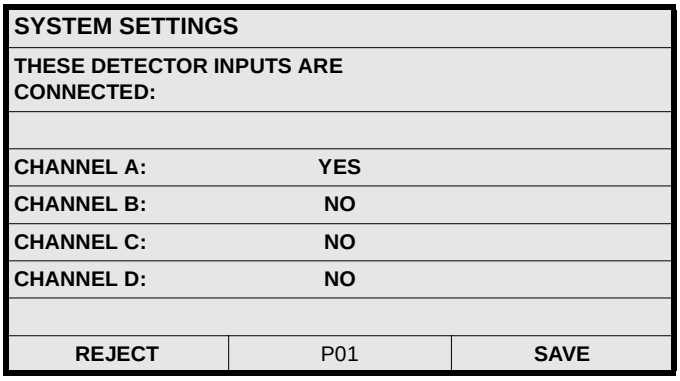


Fig. 39 Choosing optek inputs

5. Select CHANNEL B and press [ENTER]. Select YES or NO and press [ENTER]. When connecting one single channel sensor or one dual channel sensor, select NO.
6. Press [ENTER] again.
7. Select CHANNEL C and press [ENTER]. Select YES or NO. Select NO for one single channel sensor. Select YES for one dual channel sensor.
8. Press [ENTER] again.
9. Select CHANNEL D and press [ENTER]. Select YES or NO. When connecting one single channel sensor or one dual channel sensor, select NO.
10. Press [ENTER] again.
11. Save the entry. The SYSTEM SETTINGS menu appears.

SYSTEM SETTINGS		
THESE DETECTOR INPUTS ARE CONNECTED:		
CHANNEL A:	**YES**	
CHANNEL B:	**NO**	
CHANNEL C:	**NO**	
CHANNEL D:	**NO**	
REJECT	P01	**SAVE**

Fig. 40 Choosing optek inputs

9.4.5 System settings - mA-inputs

This menu only applies to converters C4121, C4221, C4222, C4322, and C4422.
In this menu you can select the mA-inputs (clamps 21-24) you want to connect.

1. Select SYSTEM SETTINGS from the main menu and press [ENTER].
2. Select mA INPUTS and press [ENTER].

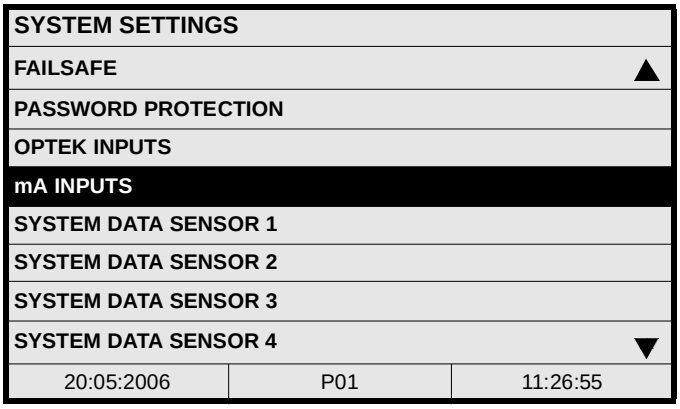


Fig. 41 Menu system settings, choosing mA-inputs

3. The cursor is located in the menu item mA INPUT 1. Press [ENTER], select YES or NO and press [ENTER] again.
4. The cursor is located in the menu item mA INPUT 2.
   Press [ENTER], select YES or NO, and press [ENTER] again.
5. Save the entry. The SYSTEM SETTINGS menu appears.

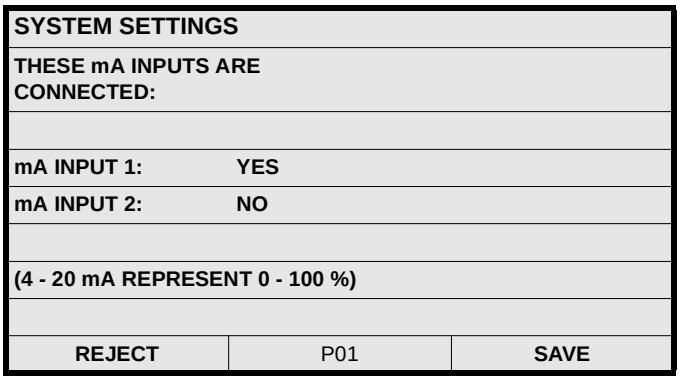


Fig. 42 Choosing condition of mA-inputs

9.5 Entering products in the software

After having carried out the system settings according to chapter 9.4, page 43, you must create the products to be measured. You can define four measuring results for up to eight products. A product can be for example the process medium to be measured, a detergent medium or a medium occurring when changing the charge of the system.
Enter a maximum of 32 different names for the measuring results M01 to M04 of the products P01 to P08.
When entering the products, carry out the following steps:

- Product configuration
- Define product name
- Define measuring result
- Define linearization
- Define offset + slope set
- Define limit values
- Define display

9.5.1 Product configuration

With this function, you can set the products and their application-specific measuring results.

Note!
Measuring mode is switched off during product configuration. Measuring mode is restarted upon return to the main menu.

1. Select PRODUCT CONFIGURATION from the main menu and press [ENTER].

MAIN MENU		
MEASUREMENT DISPLAY		
DATA LOGGER DISPLAY		
SYSTEM INFORMATION DISPLAY		
PRODUCT CHANGE		
PRODUCT CONFIGURATION		
SYSTEM SETTINGS		
MAINTENANCE		
LANGUAGE / SPRACHE		
20:05:2006	P01	11:26:55

Fig. 43 Main menu, choosing product configuration

2. Select a product (P01 - P08) in the PRODUCT CONFIGURATION menu and press [ENTER]. The name of the selected product (P02 in fig. 45) appears in the center of the status bar below.

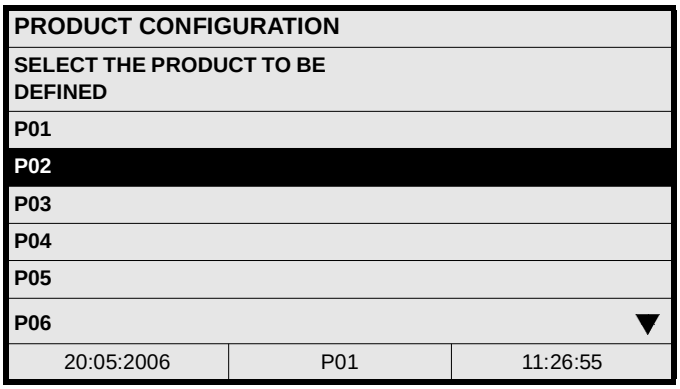


Fig. 44 Choosing a product

3. The menu of the selected product appears. Here it is the PRODUCT P02 menu.

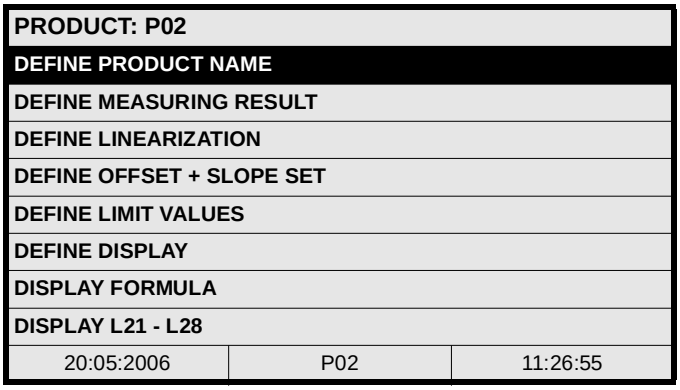


Fig. 45 Choosing define product name

9.5.2 Define product name

With this function, you can change the preset product name of P01 – P08 to a name of your choice. To do this, you can use 12 characters maximum.

1. Select the DEFINE PRODUCT NAME menu item in the PRODUCT menu and press [ENTER].

PRODUCT: P02		
DEFINE PRODUCT NAME		
DEFINE MEASURING RESULT		
DEFINE LINEARIZATION		
DEFINE OFFSET + SLOPE SET		
DEFINE LIMIT VALUES		
DEFINE DISPLAY		
DISPLAY FORMULA		
DISPLAY L21 - L28		
20:05:2006	P02	11:26:55

Fig. 46 Choosing define product name

2. The DEFINE PRODUCT NAME menu appears. The NEW NAME menu item is marked. Press [ENTER].
3. Enter a new name via the character field (see chapter 9.2, page 37).
4. Save the new name.
5. After saving the name, the previous menu with the new product name appears.

DEFINE PRODUCT NAME				
CURRENT NAME:				
P02				
NEW NAME	**P02 A**			
	ABCDEFGHIJKLMNOPQ RSTUVWXYZ () + - / *0123456789 .%			
	<<<	>>>	DEL	OK
REJECT	P02		**SAVE**	

Fig. 47 Define product name

9.5.3 Define measuring results

With this function, you can define the measuring results, e. g. measuring range, unit and figure format for the selected product. You can specify up to four measuring results.

You can determine all configurations for the first measuring result of the currently selected product with the function M01.

The mA-outputs 1 to 4 and the results 1 to 4 in the data logger are assigned to the measuring results M01 to M04. Measuring result M01 is assigned to mA-output 1, measuring result M02 is assigned to mA-output 2 etc.

The measuring result is calculated as follows:

1. Calculation of the selected measuring function for evaluating the detector signals.
2. Multiplication with one or several sensor adaptations as far as they are selected in the SENSOR ADAPTATION menu (see "Sensor adaptation", chapter 9.11.4, page 140).
3. Multiplication with the mA input, as far as it is selected in the MEASURING RESULTS menu (see "Measuring result - multiplication with mA-input", chapter 9.5.3.3, page 63).
4. Multiplication with one of the 16 linearizations, as far as it is selected in the MEASURING RESULTS menu (see "Measuring result - multiplication with linearization", chapter 9.5.3.4, page 64).
5. Multiplication with the slope from the offset + slope set, as far as it is selected in the MEASURING RESULTS menu (see "Measuring result - multiplication with slope + offset", chapter 9.5.3.5, page 65).
6. Addition of the shift from the offset + slope set, as far as it is selected in the MEASURING RESULTS menu (see "Measuring result - multiplication with slope + offset", chapter 9.5.3.5, page 65).

1. Select the DEFINE MEASURING RESULT function in the PRODUCT menu and press [ENTER].

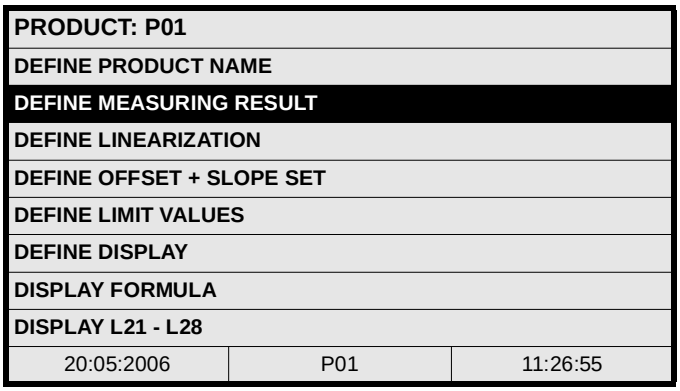


Fig. 48 Choosing define measuring result

2. The DEFINE MEASURING RESULT menu appears. Select a measuring result (M01 – M04) and press [ENTER].

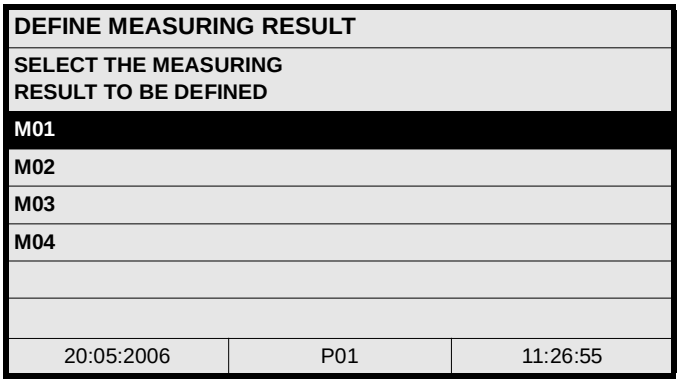


Fig. 49 Choosing a measuring result to be defined

Note!
If only mA-outputs 1 and 2 are available, only the measuring results M01 and M02 can be sent to the control system.
You can always display M03 and M04 locally and record them on the data logger!

3. The menu of the selected measuring result appears. Here it is the MEASURING RESULT M01 menu.

MEASURING RESULT: M01			
DEFINE NAME	M01		
FUNCTION	ABS -CU (A)		
X mA INPUT	---		
X LINEARIZATION	---		
X SLOPE + OFFSET	---		
RANGE BEGIN / END		0.0	5.0
UNIT	CU		
FORMAT	+99.99		
REJECT	P02	SAVE	

Fig. 50 Menu measuring result M01

9.5.3.1 Define measuring result name

With this function, you can change the preset name of the measuring result M01 to M04 to a name of your choice. To do this, you can use 12 characters maximum.

1. Select the DEFINE NAME menu item in the MEASURING RESULT menu and press [ENTER].
2. The character field appears.

MEASURING RESULT: M01				
DEFINE NAME:	**M01**			
FUNCTION	ABCDEFGHIJKLMNOPQ			
X mA INPUT	RSTUVWXYZ ()			
X LINEARIZATION	+ - / *0123456789 .%			
X SLOPE + OFFSET	<<<	>>>	DEL	OK
RANGE BEGIN / END			**0.0**	**5.0**
UNIT	**CU**			
FORMAT	**+99.99**			
REJECT	P01		**SAVE**	

Fig. 51 Choosing define measuring result name

3. Enter a new name via the character field (see chapter 9.2, page 37).
4. Save the new name of the measuring result.
5. After saving, the character field is closed and the FUNCTION menu item in the MEASURING RESULT_ _ _ menu is marked.

9.5.3.2 Measuring result - define function

With this function, you can define, specifically to application, the measuring function for evaluating the detector signals in the MEASURING RESULT menu.

1. Select FUNCTION and press [ENTER].
2. A list appears. Select a function. The choice of function depends on the converter model, on the number and type of sensors connected to the converter and on the measuring tasks in the application. In table 7, "Measuring functions for evaluating detector signals" on page 59 all possibilities are listed.
   Abbreviations mean the following:
   - ABS absorbance
   - TRANSM transmission
   - TURB turbidity
   - A, B, C, D detector input to which the sensor is connected
   - CU concentration units
   - PROD product (also see table 19 on page 174)

   The data in brackets describe the processing of signals according to the used optek inputs.

3. Save and press [ENTER]. The menu item X mA INPUT is marked.

MEASURING RESULT: M01		
DEFINE NAME:		
FUNCTION		ABS -CU (A) ABS -CU (B) ABS -CU (C) ... PROD_FEEDBACK
X mA INPUT		
X LINEARIZATION		
X SLOPE + OFFSET		
RANGE BEGIN / END	0.0	5.0
UNIT		
FORMAT		
REJECT	P01	SAVE

Fig. 52 Choosing define function

4. Save the new function.

Tab. 7 Measuring functions for evaluating detector signals

Converter	SENSOR 1 (LAMP E)	SENSOR 2 (LAMP F)	SENSOR 1 connected to:		SENSOR 2 connected to:		Admissible function selection
			Meas.	Ref.	Meas.	Ref.	
C4101 C4121 C4151	AF16 AS16 / AS16-BT AS56		A				ABS - CU (A) % TRANSM (A) PROD-FEEDBACK 4 - 20 mA (1)* 4 - 20 mA (2)*
C4201 C4202 C4221 C4222 C4322 C4422 C4251 C4252 C4352 C4452	AF26 2 x AS56		A	C			ABS -CU (A) ABS -CU (C) ABS -CU (A-C) % TRANSM (A) % TRANSM (C) % TRANSM (A/C) PROD-FEEDBACK 4 - 20 mA (1)* 4 - 20 mA (2)*
C4201 C4202 C4221 C4222 C4322 C4422 C4251 C4252 C4352 C4452	AF45		A	C			ABS -CU (A) ABS -CU (C) ABS -CU (A-C) % TRANSM (A) % TRANSM (C) % TRANSM (A/C) PROD-FEEDBACK 4 - 20 mA (1)* 4 - 20 mA (2)*
C4201 C4202 C4221 C4222 C4322 C4422 C4251 C4252 C4352 C4452	TF16-N		A	C			TURB (A/C) ABS -CU (C) % TRANSM (C) PROD-FEEDBACK 4 - 20 mA (1)* 4 - 20 mA (2)*
C4202 C4222 C4322 C4422 C4252 C4352 C4452	AF16 AS16 / AS16-BT AS56	AF16 AS16 / AS16-BT AS56	A		C		ABS -CU (A) ABS -CU (C) ABS -CU (A-C) % TRANSM (A) % TRANSM (C) % TRANSM (A/C) PROD-FEEDBACK 4 - 20 mA (1)* 4 - 20 mA (2)*
C4322 C4422 C4352 C4452	AF26 2 x AS56	AF16 AS16 / AS16-BT AS56	A	C	B		ABS -CU (A) ABS -CU (C) ABS -CU (B) ABS -CU (A-C) % TRANSM (A) % TRANSM (C) % TRANSM (B) % TRANSM (A/C) PROD-FEEDBACK 4 - 20 mA (1)* 4 - 20 mA (2)*

Tab. 7 Measuring functions for evaluating detector signals (cont.)

Converter	SENSOR 1 (LAMP E)	SENSOR 2 (LAMP F)	SENSOR 1 connected to:		SENSOR 2 connected to:		Admissible function selection
			Meas.	Ref.	Meas.	Ref.	
C4322 C4422 C4352 C4452	AF45	AF16 AS16 / AS16-BT AS56	A	C	B		ABS -CU (A) ABS -CU (C) ABS -CU (B) ABS -CU (A-C) % TRANSM (A) % TRANSM (C) % TRANSM (B) % TRANSM (A/C) PROD-FEEDBACK 4 - 20 mA (1)* 4 - 20 mA (2)*
C4322 C4422 C4352 C4452	TF16-N	AF16 AS16 / AS16-BT AS56	A	C	B		ABS -CU (C) ABS -CU (B) % TRANSM (C) % TRANSM (B) TURB (A/C) PROD-FEEDBACK 4 - 20 mA (1)* 4 - 20 mA (2)*
C4422 C4452	AF26 2 x AS56	AF26 2 x AS56	A	C	B	D	ABS -CU (A) ABS -CU (C) ABS -CU (B) ABS -CU (D) ABS -CU (A-C) ABS -CU (B-D) A-CU (A-C)-(B-D) % TRANSM (A) % TRANSM (C) % TRANSM (B) % TRANSM (D) % TRANSM (A/C) % TRANSM (B/D) % TR (A/C)/(B/D) PROD-FEEDBACK 4 - 20 mA (1)* 4 - 20 mA (2)*
C4422 C4452	AF26	AF45	A	C	B	D	ABS -CU (A) ABS -CU (C) ABS -CU (B) ABS -CU (D) ABS -CU (A-C) ABS -CU (B-D) A-CU (A-C)-(B-D) % TRANSM (A) % TRANSM (C) % TRANSM (B) % TRANSM (D) % TRANSM (A/C) % TRANSM (B/D) % TR (A/C)/(B/D) PROD-FEEDBACK 4 - 20 mA (1)* 4 - 20 mA (2)*

Tab. 7 Measuring functions for evaluating detector signals (cont.)

Converter	SENSOR 1 (LAMP E)	SENSOR 2 (LAMP F)	SENSOR 1 connected to:		SENSOR 2 connected to:		Admissible function selection
			Meas.	Ref.	Meas.	Ref.	
C4422 C4452	AF26 2 x AS56	TF16-N 2 xAS56	A	C	B	D	ABS -CU (A) ABS -CU (C) ABS -CU (D) ABS -CU (A-C) % TRANSM (A) % TRANSM (C) % TRANSM (D) % TRANSM (A/C) TURB (B/D) PROD-FEEDBACK 4 - 20 mA (1)* 4 - 20 mA (2)*
C4422 C4452	AF45	AF45	A	C	B	D	ABS -CU (A) ABS -CU (C) ABS -CU (B) ABS -CU (D) ABS -CU (A-C) ABS -CU (B-D) A-CU (A-C)-(B-D) % TRANSM (A) % TRANSM (C) % TRANSM (B) % TRANSM (D) % TRANSM (A/C) % TRANSM (B/D) % TR (A/C)/(B/D) PROD-FEEDBACK 4 - 20 mA (1)* 4 - 20 mA (2)*
C4422 C4452	AF45	TF16-N	A	C	B	D	ABS -CU (A) ABS -CU (C) ABS -CU (D) ABS -CU (A-C) % TRANSM (A) % TRANSM (C) % TRANSM (D) % TRANSM (A/C) TURB (B/D) PROD-FEEDBACK 4 - 20 mA (1)* 4 - 20 mA (2)*
C4422 C4452	TF16-N	TF16-N	A	C	B	D	TURB (A/C) TURB (B/D) TURB (A/C)-(B/D) ABS -CU (C) ABS -CU (D) % TRANSM (C) % TRANSM (D) PROD-FEEDBACK 4 - 20 mA (1)* 4 - 20 mA (2)*

Tab. 7 Measuring functions for evaluating detector signals (cont.)

Converter	SENSOR 1 (LAMP E)	SENSOR 2 (LAMP F)	SENSOR 1 connected to:		SENSOR 2 connected to:		Admissible function selection
			Meas.	Ref.	Meas.	Ref.	
C4422 C4452	AF46		A	C	B	D	ABS -CU (A) ABS -CU (C) ABS -CU (B) ABS -CU (D) ABS -CU (A-C) ABS -CU (B-D) A-CU (A-C)-(B-D) % TRANSM (A) % TRANSM (C) % TRANSM (B) % TRANSM (D) % TRANSM (A/C) % TRANSM (B/D) % TR (A/C)/(B/D) PROD-FEEDBACK 4 - 20 mA (1)* 4 - 20 mA (2)*

* This function selection only applies to converter with mA inputs.

Note!

Sensor AF16 can be replaced by probe AS16 (not EX).
You can connect two probes AS56 to each lamp output. Before doing so, you must configure the lamp output for two sensors in the SYSTEM SETTINGS \ LAMP VOLTAGE menu.

Measuring functions 4 - 20 mA

The 4 - 20 mA (1) and 4 - 20 mA (2) measuring functions may be scaled directly in correspondence with transmitter settings.
Zero point setting for these two functions has to be carried out externally!

9.5.3.3 Measuring result - multiplication with mA-input

This menu is available on converters C4121, C4221, C4222, C4322, C4422, C4151, C4251, C4252, C4352 and C4452.
With this function, you can multiply the selected measuring function for evaluating detector signals with one of the two mA-input values. Here, 4 - 20 mA represent 0 - 100 % = 0 - 1. When "- - -" is selected, the measuring result does not change.

1. Select X mA INPUT and press [ENTER].
2. A list appears. Select a mA-input value. Abbreviations mean the following:
   - --- multiplication by 1
   - IN01 multiplication by a value from 0 to 100 % depending on the mA-signal result entering at mA-input 1
   - IN02 multiplication by a value from 0 to 100 % depending on the mA-signal result entering at mA-input 2

Additionally, you can scale the mA signal value with a linearization table. Choose e. g. IN01 x L15. The linearizations can be defined according to the instructions in chapter 9.5.4, page 69.

MEASURING RESULT: M01		
DEFINE NAME:		
FUNCTION		ABS -CU (A)
X mA INPUT		--- IN01 (0-100 %) IN02 (0-100 %) IN01 x L15 IN02 x L16 1 + IN01 x L15 1 + IN02 x L16
X LINEARIZATION		
X SLOPE + OFFSET		
RANGE BEGIN / END		
UNIT		
FORMAT		
REJECT	P01	SAVE

Fig. 53 Setting measuring result - multiplication with mA-input

3. Save and press [ENTER]. The menu item X LINEARIZATION is marked.
4. Save the new setting.

Note!
The mA-inputs are designed for the basic setting 4 - 20 mA according to the NAMUR recommendation NE 43!
Use the values of the connected devices between 3.6 and 21.0 mA!
Measuring results below 3.6 or above 21.0 mA trigger the error message "Signal loss mA", if the mA-input is used.

9.5.3.4 Measuring result - multiplication with linearization

With this function, you can additionally multiply the selected measuring function by one of the 16 linearization tables to evaluate the detector signals. Prior to this, the linearization tables must be defined. To do this, proceed as described in chapter 9.5.4, page 69.
When "- - -" is selected, the measuring result does not change.
The linearizations can be defined according to the instructions in chapter 9.5.4, page 69.

1. Select X LINEARIZATION and press [ENTER].
2. A list with linearization tables appears. Select an option.

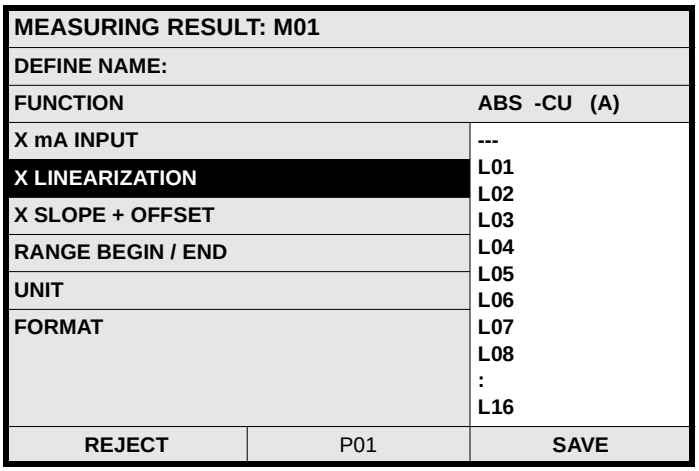


Fig. 54 Setting measuring result - multiplication with linearization

3. Press [ENTER]. The menu item X SLOPE + OFFSET is marked.
4. Save the new setting.

9.5.3.5 Measuring result - multiplication with slope + offset

With this function, you can additionally multiply the selected measuring function by one of the eight slope + offset sets (SUF01-SUF08) to evaluate the detector signals. The tables contain one value for the slope and one value for offset and have to be defined first. To do this, proceed as described in chapter 9.5.5.2, page 75.
When "- - -" is selected, the measuring result does not change. Default values are 1.0000 for the slope and 0.0000 for the offset.

1. Select X SLOPE + OFFSET and press [ENTER].
2. A list with tables appears. Select an option.

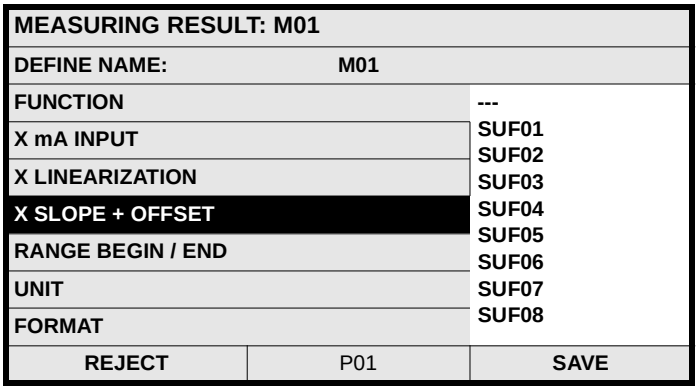


Fig. 55 Setting measuring result - multiplication with slope + offset

3. Press [ENTER]. The RANGE BEGIN / END menu item is marked.
4. Save the new setting.

9.5.3.6 Measuring result - measuring range beginning and end

With this function, you can define the beginning and the end of the measuring range. The measuring range begin can also be a negative value. When the starting value is positive, a negative output value is produced after the system's zero point is read in. This can result in error messages in the control system. It is recommended to set the starting value to 0.

1. Select RANGE BEGIN / END and press [ENTER].
2. Type in the measuring range beginning via the numerical keyboard and press [ENTER].

MEASURING RESULT: M01			
DEFINE NAME:			
FUNCTION		ABS -CU (A)	
X mA INPUT	- - -		
X LINEARIZATION	- - -		
X SLOPE + OFFSET	- - -		
RANGE BEGIN / END		0.0	5.0
UNIT	CU		
FORMAT	+99.99		
REJECT	P01	SAVE	

Fig. 56 Setting range begin

3. Afterwards, enter the range end and press [ENTER]. The UNIT menu item is marked.

MEASURING RESULT: M01			
DEFINE NAME:			
FUNCTION		ABS -CU (A)	
X mA INPUT	- - -		
X LINEARIZATION	- - -		
X SLOPE + OFFSET	- - -		
RANGE BEGIN / END		0.0	5.0
UNIT	CU		
FORMAT	+99.99		
REJECT	P01	SAVE	

Fig. 57 Setting range end

4. Save the new setting.

Note!
Observe the definition of the limit values in (see chapter 9.5.6.2, page 79).

9.5.3.7 Measuring result - measuring range, unit and format

With these functions you can define the unit (max. 5 characters) and the format of the measuring result.

1. Select UNIT and press [ENTER].

MEASURING RESULT: M01			
DEFINE NAME:			
FUNCTION		ABS -CU (A)	
X mA INPUT	- - -		
X LINEARIZATION	- - -		
X SLOPE + OFFSET			
RANGE BEGIN / END		0.0	5.0
UNIT	CU		
FORMAT	+99.99		
REJECT	P01	SAVE	

Fig. 58 Entering the measuring result unit

2. Enter a new unit via the character field (see chapter 9.2, page 37).
3. The FORMAT menu item is marked.

MEASURING RESULT: M01			
DEFINE NAME:			
FUNCTION		ABS -CU (A)	
X mA INPUT	- - -		
X LINEARIZATION	- - -		
X SLOPE + OFFSET			
RANGE BEGIN / END		0.0	5.0
UNIT	CU		
FORMAT	+99.99		
REJECT	P01	SAVE	

Fig. 59 Entering the measuring result format

4. Press [ENTER]. A list with different formats appears. Options mean the following:
   - +9999 entering measuring result in thousands.
   - +999.9 entering measuring result in hundreds to one decimal place.
   - +99.99 entering measuring result in tens to two decimal places.
   - +9.999 entering measuring result in unit to three decimal places.
   - +9.9999 entering measuring result in unit to four decimal places.

5. Select a format and press [ENTER].

6. Save the new settings.
7. After saving, the previous DEFINE MEASURING RESULT menu appears.
8. Repeat the entries for the other measuring results M02 to M04 as described in chapter 9.5.3, page 54.
9. After defining all measuring results, return to the PRODUCT menu.

9.5.4 Define linearization

With this function, you can define up to 16 different linearizations, which can be assigned to each measuring result of the eight products. To assign a linearization to a measuring result, proceed as described in chapter 9.5.3.4, page 64.
Here you can define all data for linearization.

1. Select the DEFINE LINEARIZATION function in the PRODUCT menu and press [ENTER].

PRODUCT: P01		
DEFINE PRODUCT NAME		
DEFINE MEASURING RESULT		
DEFINE LINEARIZATION		
DEFINE OFFSET + SLOPE SET		
DEFINE LIMIT VALUES		
DEFINE DISPLAY		
DISPLAY FORMULA		
DISPLAY L21 - L28		
20:05:2006	P01	11:26:55

Fig. 60 Choosing define linearization

2. Select a linearization table (L01 – L16) and press [ENTER].

DEFINE LINEARIZATION		
SELECT LINEARIZATION TABLE TO BE DEFINED		
L01		
L02		
L03		
L04		
L05		
L06		
20:05:2006	P01	11:26:55

Fig. 61 Choosing a linearization table to be defined

9.5.4.1 Linearization - define table name

With this function, you can change the preset linearization table name from L01 – L16 to a name of your choice. To do this, you can use 12 characters maximum.

1. Select the DEFINE NAME menu item in the LINEARIZATION menu and press [ENTER].
2. The character field appears.

LINEARIZATION: M01				
DEFINE NAME:			**L01**	
	ABCDEFGHIJKLMNOPQ RSTUVWXYZ () + - / *0123456789 .%			
	<<<	>>>	DEL	OK
01:	**0.0000**		**0.0000**	
02:	**1.0000**		**1.0000**	
03:				
REJECT	P01		**SAVE**	

Fig. 62 Define linearization table names

3. Enter a new name via the character field (see chapter 9.2, page 37).
4. Select OK and press [ENTER]. The character field is closed. The menu item 01: is marked.
5. Save the new name of the linearization or enter the linearization points.

9.5.4.2 Linearization - define tables

With this function, you can define the linearization in a table with up to 11 sets of points.
The points are linked by straight lines thus defining the shape of linearization. The distance of the points can be varied so as to optimally adjust the linearization to the requirements. With this function, you can convert measuring results measured in concentration units (CU) to your desired units.

1. Select the menu item 01: for the first point in the LINEARIZATION menu and press [ENTER].

LINEARIZATION: 01		
DEFINE NAME:		L01
	IN	OUT
01:	0.0000	0.0000
02:	1.0000	1.0000
03:		
REJECT	P01	SAVE

Fig. 63 Linearization – define tables

2. Via the numerical keyboard, enter the in value of the first point to be corrected in the first line "01". Press [ENTER]. The cursor moves to the out value of the first point.
3. Enter in the first line "01" the out value via the numerical keyboard. This is the value to which the in value is to be converted. Press [ENTER].
4. Enter the IN and OUT values for the remaining products.

Note!
The curve shape must increase or decrease continuously! You can enter the points in an arbitrary order since the software automatically sorts the entries if necessary.
Horizontal, vertical or zigzag curves are not permitted. After confirming every out value, the software checks all points. If a value pair is not correct, the error message "Input causes undefined result" appears. Close the error message by pressing [CLEAR]. The entry changes to the value pair which has triggered the error message.

5. Type in the correct values via the numerical keyboard and press [ENTER].
6. If you do not wish to enter all 11 value pairs, end this process by pressing [ENTER] twice in an empty line.
7. To delete a value pair, select the desired line with the arrow keys ▲ or ▼, press [CLEAR], then [ENTER] and then [CLEAR] and [ENTER] again. The software deletes the selected value pair, sorts the linearization table again and calculates the new linearization.
8. Save the new settings.

The linearization table can later be specified in some areas. To do this, it is not necessary to enter all points again. Only supplementary value pairs are entered.

9.5.5 Define offset + slope set

This function allows you to define eight different sets with one value each for slope and one value for offset, which can be assigned to every measuring result of the eight products. To assign a set to a measuring result, proceed as described in chapter 9.5.3.5, page 65.
Here you can define all data for the base line.

1. Select the DEFINE OFFSET + SLOPE SET function in the PRODUCT menu and press [ENTER].

PRODUCT: P01		
DEFINE PRODUCT NAME		
DEFINE MEASURING RESULT		
DEFINE LINEARIZATION		
DEFINE OFFSET + SLOPE SET		
DEFINE LIMIT VALUES		
DEFINE DISPLAY		
DISPLAY FORMULA		
DISPLAY L21 - L28		
20:05:2006	P01	11:26:55

Fig. 64 Choosing define offset + slope set

2. Select an X OFFSET+ SLOPE SET (SUF01 - SUF08) and press [ENTER].

PRODUCT: P01		
SELECT OFFSET + SLOPE SET TO BE DEFINED		
SUF01		
SUF02		
SUF03		
SUF04		
SUF05		
SUF06		
20:05:2006	P01	11:26:55

Fig. 65 Choosing an offset and slope set to be defined

9.5.5.1 Offset + slope - define set name

With this function, you can change the preset names of the offset and slope sets SUF01 - SUF08 to a name of your choice. To do this, you can use 12 characters maximum.

1. Select the DEFINE NAME menu item in the OFFSET + SLOPE menu and press [ENTER].
2. The character field appears.

OFFSET + SLOPE SUF01				
DEFINE NAME:			**SUF01**	
	ABCDEFGHIJKLMNOPQ RSTUVWXYZ () + - / *0123456789 .%			
OFFSET	<<<	>>>	DEL	OK
SLOPE				
REJECT	P02		**SAVE**	

Fig. 66 Define offset + slope set name

3. Enter a new name via the character field (see chapter 9.2, page 37).
4. Select OK and press [ENTER]. The character field is closed. The OFFSET menu item is marked.
5. Save the new name of the offset + slope set.

9.5.5.2 Determine offset + slope

With this function you can define the value for offset + slope.

1. Select the OFFSET menu item in the OFFSET + SLOPE menu and press [ENTER].

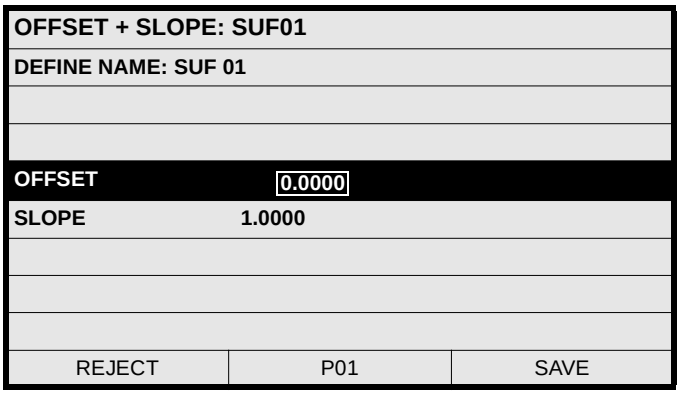


Fig. 67 Offset - define figure

2. Type in the value for OFFSET via the numerical keyboard.
3. Press [ENTER]. The SLOPE menu item is marked.

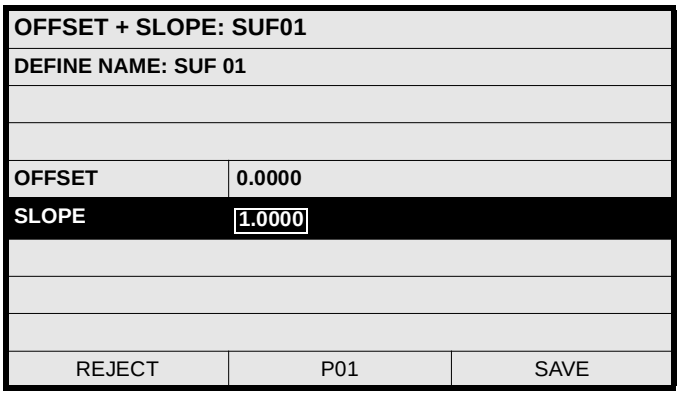


Fig. 68 Slope - define figure

4. Type in the value for SLOPE via the numerical keyboard.
5. Save the new settings.

9.5.6 Define limit values

With this function, three limit values can be defined separately for each product. When a value falls below these set limit values or exceeds it, an alarm is triggered. The limit values are always displayed in the MEASUREMENT DISPLAY and the yellow LEDs on the front panel of the converter indicate the alarm!

The limit values (G01 to G03) are assigned to the following relay outputs (REL):

- G01 => REL 01 - clamps 10 / 11
- G02 => REL 02 - clamps 12 / 13
- G03 => REL 03 - clamps 14 / 15

Note!
To function as limit value alarm devices, the relay outputs must be defined as limit values in the SYSTEM SETTINGS menu. Proceed according to the instructions in chapter 9.10.10, page 115.

To define limit values, proceed as follows:

1. Select the DEFINE LIMIT VALUES function in the PRODUCT menu and press [ENTER].

PRODUCT: P01		
DEFINE PRODUCT NAME		
DEFINE MEASURING RESULT		
DEFINE LINEARIZATION		
DEFINE OFFSET + SLOPE SET		
DEFINE LIMIT VALUES		
DEFINE DISPLAY		
DISPLAY FORMULA		
DISPLAY L21 - L28		
20:05:2006	P01	11:26:55

Fig. 69 Choosing define limit values

2. Select a limit value (G01 – G03) and press [ENTER].

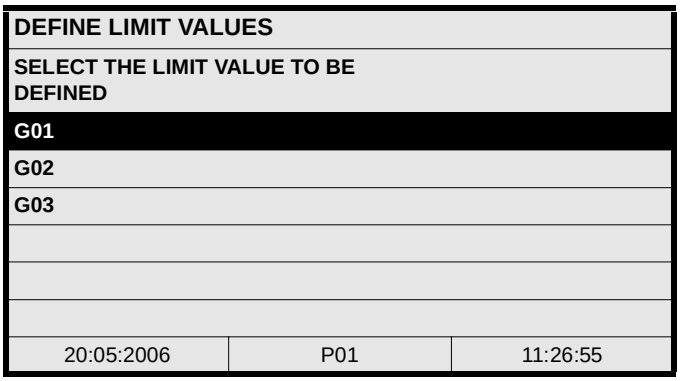


Fig. 70 Define limit values

3. The LIM. VALUE menu appears.

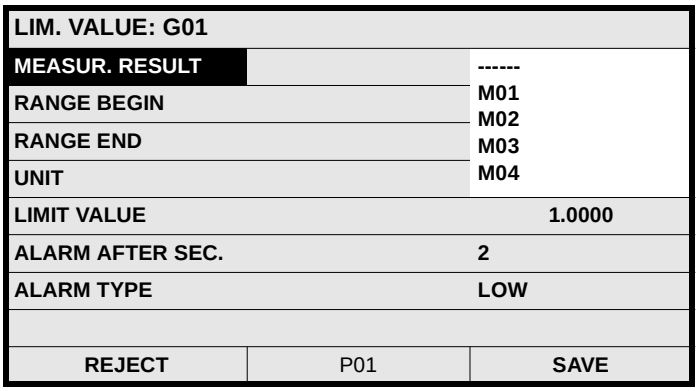


Fig. 71 Limit value – choosing measuring result

Note!

Limit values are always indicated as arrows ◀ , ▶ for HIGH and LOW above the bargraph in the "measurement" display. The yellow LEDs on the front panel indicate the alarm.

9.5.6.1 Limit value - selecting measuring result

With this function, you can define the limit values for each measuring result. A measuring result is chosen for which the limit value is valid.

1. Select MEASUR. RESULT and press [ENTER].
2. A list of the four measuring results appears. Select a measuring result (M01 – M04) and press [ENTER].
   The system automatically shows the values for the measuring range beginning and the measuring range end as well as the unit of the selected measuring result. These three values cannot be changed in this menu. The menu item LIMIT VALUE is marked.

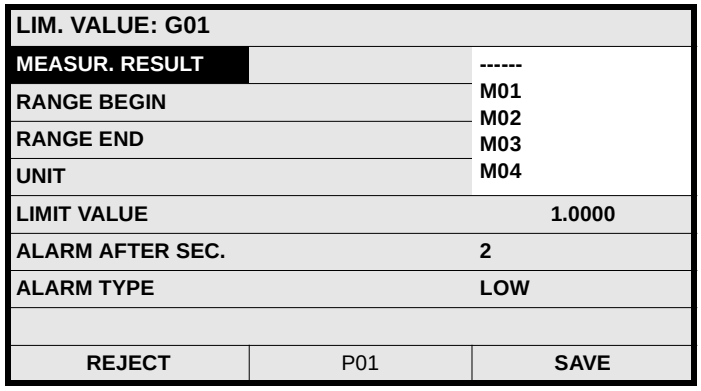


Fig. 72 Limit value – choosing measuring result

3. To deactivate a current limit value setting, select - - - - - from the list and press [ENTER]. The software automatically deactivates all settings for this limit value.
4. Save the new settings.

9.5.6.2 Limit value - define limit value

With this function, you can enter the limit value. Only figures from the displayed measuring range are admissible.

1. Select the LIMIT VALUE menu item in the LIM. VALUE menu and press [ENTER].

LIM. VALUE: G01		
MEASUR. RESULT		M01
RANGE BEGIN		0.0000
RANGE END		5.0000
UNIT		CU
LIMIT VALUE		1.0000
ALARM AFTER SEC.		2
ALARM TYPE		LOW
REJECT	P01	SAVE

Fig. 73 Limit value – define figure

2. Type in the limit value via the numerical keyboard.

Note!
Observe that this limit value must not exceed the RANGE END value. When the entry is not within the measuring range, the "Unacceptable input" error message appears. Close the error message by pressing [CLEAR] and enter a correct value.

3. Press [ENTER]. The ALARM AFTER SEC. menu item is marked.
4. Save the new settings.

Note!
The software automatically opens the LIM. VALUE menu if, due to later change of the measuring range, the set limit value does not lie within the measuring range.

Due to internal data processing, a calculated limit value lying within the measuring range is provided. During saving, this value is adopted, when rejecting, the old limit value is used.
Check this limit value and redefine it, if necessary.

9.5.6.3 Limit value - define delay time

This function triggers the alarm when values fall below or exceed limit values and can be delayed within a time span from 0 to 999 seconds. The delay time is only applied to the limit value output. The front status LED for the limit value responds immediately.

1. Select the ALARM AFTER SEC. menu item in the LIM. VALUE menu and press [ENTER].

LIM. VALUE: G01		
MEASUR. RESULT		M01
RANGE BEGIN		0.0000
RANGE END		5.0000
UNIT		CU
LIMIT VALUE		1.0000
ALARM AFTER SEC.		2
ALARM TYPE		LOW
REJECT	P01	SAVE

Fig. 74 Limit value – define delay time

2. Type in a delay time via the numerical keyboard and press [ENTER]. The ALARM TYPE menu item is marked.
3. Save the settings.

9.5.6.4 Limit value - define alarm type

With this function, you can define the alarm type. "High" triggers the alarm when the limit value is exceeded, "Low" triggers the alarm when the value falls below the limit value.

In case of "HIGH", the hysteresis slows down the triggering of the relay until the measuring result falls below the set limit value by more than 2 % of the measuring range.

In case of "LOW", the hysteresis slows down the triggering of the relay until the measuring result exceeds the set limit value by more than 2 % of the measuring range.

1. Select the ALARM TYPE menu item in the LIM. VALUE menu and press [ENTER].
2. Select HIGH or LOW from the list and press [ENTER].

LIM. VALUE: G01		
MEASUR. RESULT		M01
RANGE BEGIN		0.0000
RANGE END		5.0000
UNIT		CU
LIMIT VALUE		1.0000
ALARM AFTER SEC.		2
ALARM TYPE		HIGH LOW
REJECT	P01	SAVE

Fig. 75 Limit value – define alarm type

3. Save the setting.

If the limit values are defined, they are indicated as arrowheads on the measuring range bar on the measuring result display.

▶ = HIGH ALARM is triggered when the measuring result on the measuring range bar exceeds the limit value from the left!

◀ = LOW ALARM is triggered when the measuring result on the measuring range bar falls below the limit value from the right!

9.5.7 Define display

With this function, you can configure how the measuring results are displayed.

1. Select the DEFINE DISPLAY menu item in the PRODUCT menu and press [ENTER].

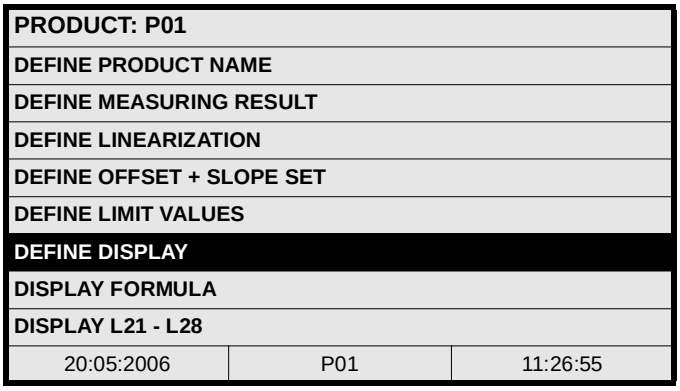


Fig. 76 Choosing define display

2. Select the desired type of display. The following options are possible:
   - 1 x 888.8 1 figure display with bargraph
   - 2 x 888.8 2 figure displays with bargraph
   - 4 x 888.8 4 figure displays with bargraph
   - 1 x 888.8 1 x 1 figure display and 1 trend chart right
   - 3 x 888.8 1 x 3 figure displays and 1 trend chart lower right
   - 2 x 888.8 2 x 2 figure displays and 2 trend charts lower left and lower right

   The current setting is indicated with an arrow <-- at the right-hand edge.

3. Press [ENTER].

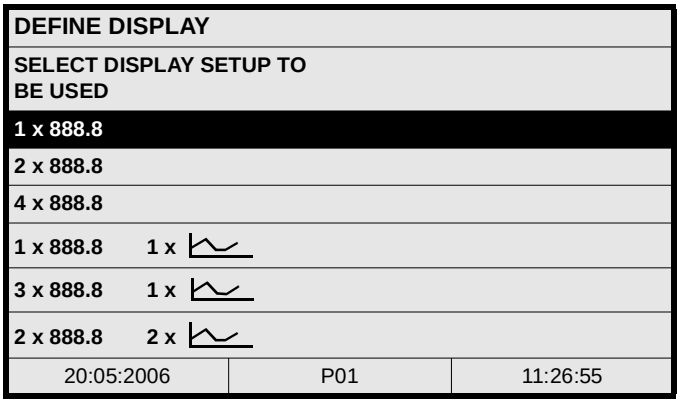


Fig. 77 Define display

4. The DISPLAY X RESULT appears. Select the desired display position of the measuring result / measuring results on the display and press [ENTER].
5. A list appears. Select the measuring result, for which the display position is valid and press [ENTER].

DISPLAY SINGLE RESULT		
SELECT WHERE THE MEASURING RESULTS ARE DISPLAYED		
CENTERED	:	M01 M02 M03 M04
REJECT	P01	SAVE

Fig. 78 Menu display single result

DISPLAY QUAD RESULT		
SELECT WHERE THE MEASURING RESULTS ARE DISPLAYED		
UPPER LEFT	:	M01 M02 M03 M04
UPPER RIGHT	:	
LOWER LEFT	:	
LOWER RIGHT	:	
REJECT	P01	SAVE

Fig. 79 Menu display quad result

6. Repeat the entries for the other display positions if necessary.
   - In dual display the figure display is displayed on the left and the trend chart on the right.
   - In quad display the figure displays are displayed on the top and the trend charts on the bottom.

7. Save the setting.

Note!
The time resolution of the trend chart corresponds to the intervals of the data recording in the data logger (see chapter 9.10.3, page 102 and chapter 9.8, page 89).
Trends will not be displayed if the data logger has been disabled in the SYSTEM SETTINGS menu (interval is set to "- - -").

9.5.8 Display formula

This function gives you a brief overview, which formulas you have used for RES1 to RES4.
Entering the formula is carried out with the C4000 PC-Transfer Advanced software which is separately available at optek. Read the corresponding pages in the C4000 PC-Transfer software manual.

1. Select the DISPLAY FORMULA menu item in the PRODUCT menu and press [ENTER].

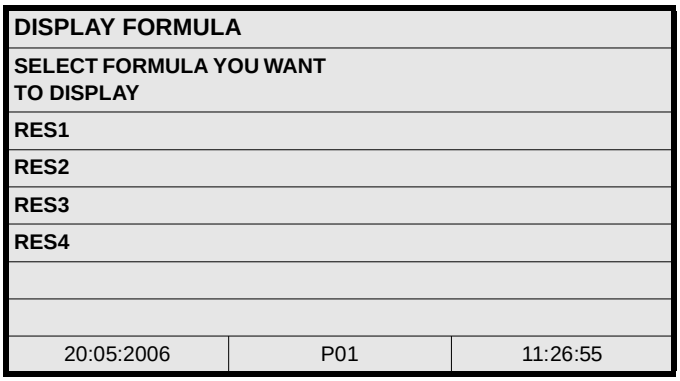


Fig. 80 Display formula display

2. Choose a formula (RES1 - RES4) and press [ENTER]. The chosen formula is displayed.

Note!
If you have not entered a formula via the C4000 PC-Transfer Advanced software, the message "Formula not defined!" appears.

9.5.9 Display L21 - L28

This function gives you an overview on how you have defined the linearization tables L21 - L28 in combination with the formulas RES01 - RES04.
These linearization tables are entered with the C4000 PC-Transfer Advanced software which is separately available at optek. Read the corresponding pages in the C4000 PC-Transfer software manual.

1. Select the DISPLAY L21 - L28 menu item in the PRODUCT menu and press [ENTER].

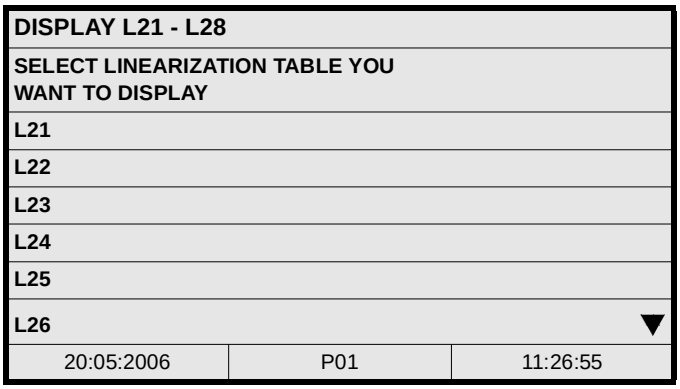


Fig. 81 Display L21 - L28

2. Select a linearization table (L21 – L28) and press [ENTER]. The chosen linearization table is displayed.

9.6 Product change

With this function, you can change the product you currently want to measure and / or display. The currently selected product is displayed in the center of the status bar on the converter.
Follow the instructions in this section to change the product manually. At converters C4121, C4221, C4222, C4322 and C4422, the product can also be changed via remote mode. At converters C4151, C4251, C4252, C4352 and C4452, it can be changed with the fieldbus. Whether you can change a product manually or in remote mode depends on the entries in the PRODUCT CHANGE menu item in the SYSTEM SETTINGS menu. For more information see chapter 9.10.7, page 108.

Note!
During product change, the converter is inoperable for three seconds. All outputs are frozen during this time!

To change a product manually, proceed as follows:

1. Select PRODUCT CHANGE from the main menu and press [ENTER].

MAIN MENU		
MEASUREMENT DISPLAY		
DATA LOGGER DISPLAY		
SYSTEM INFORMATION DISPLAY		
PRODUCT CHANGE		
PRODUCT CONFIGURATION		
SYSTEM SETTINGS		
MAINTENANCE		
LANGUAGE / SPRACHE		
20:05:2006	P02	11:26:55

Fig. 82 Choosing product change

When the manual product change is disabled, the "Product change locked" message or the "Product change only remote" message for converters with remote input appears.
When the manual product change is enabled, the PRODUCT CHANGE menu appears.

2. Select a product you want to measure / display and press [ENTER].

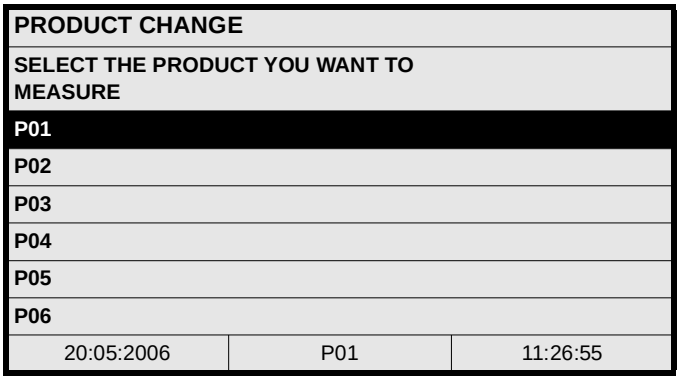


Fig. 83 Choosing a product

3. The selection menu appears again. Save the setting. The main menu appears and the enabled product is displayed in the center of the status bar.

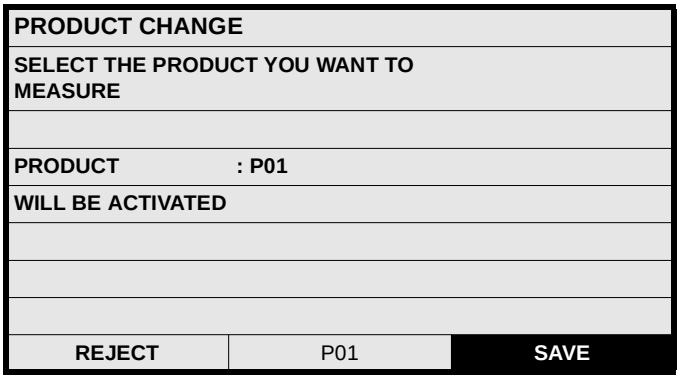


Fig. 84 Confirming product change

9.7 Measurement display

9.7.1 Selecting display mode

With this function, the current measurement / measurements can be displayed.

1. Select MEASUREMENT DISPLAY from the main menu and press [ENTER].

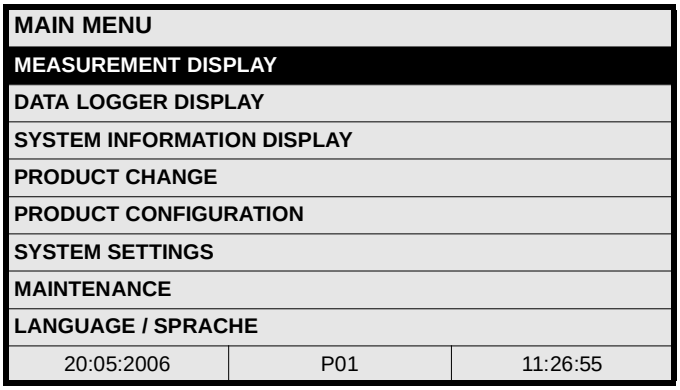


Fig. 85 Choosing measurement display

2. The current measurement(s) status is displayed. Depending on the entry you have made in the DEFINE DISPLAY menu (see chapter 9.5.7, page 82) the results of one or more measurements appear.

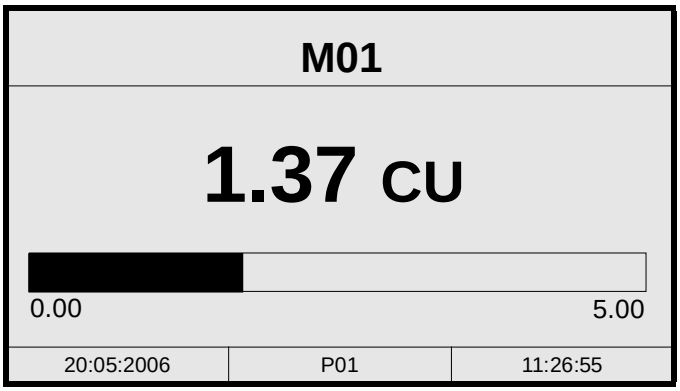


Fig. 86 Measurement display

3. Press [CLEAR] to return to the main menu.

When you switch off the measuring system while the measuring results are displayed, the measurement display appears after switching the converter on again.

9.8 Data logger display

9.8.1 Operating principle of the data logger

The data logger records the four measuring results in a selectable time period and displays them graphically on the display. This way, you can monitor the process and compare changes to the measuring results. This provides the opportunity to detect existing correlations and thus to define new parameters for process control and monitoring.

When one of the three display modes is enabled, the system operates in the measuring mode. The converter updates the four measuring results for the selected product every 0.1 seconds. The system interrupts the measuring mode as soon as the PRODUCT CONFIGURATION, SYSTEM SETTINGS and MAINTENANCE menus are enabled.
During the interruption of the measuring mode, the data logger records "Hold". The mA-outputs continue displaying the last valid results. This way, the data from the measurement display and from the data logger is consistent with the mA-output and external data recording.
When a "Hold" function is enabled, the data logger displays "Hold" instead of the measuring results. When the "Failsafe" function is enabled, the data logger records "Failsafe".

At each point the data logger records all four measuring results of the selected product. The system derives the information for the measuring results from the PRODUCT CONFIGURATION function and records it in the header of the storage sector. With each product change and each change in product configuration for the currently measured product, the system automatically creates a new storage sector with an updated header. New headers can also be automatically created by the system without external interference when a new data sector begins.

With each header change in the data logger, the system starts displaying trends on the MEASURING RESULTS.
The trends in the MEASUREMENT DISPLAY are of the same time resolution as the data recording in the data logger.

Note!
Due to the storage requirement in the data logger, the resolution of the stored values is limited to 10 e^{-4} * the difference of measuring range beginning and measuring range end.
Changing the product name affects all data points already available in the data logger.

Note!
The ring buffer allows for storing at least 25,000 to 30,000 data points with all four measuring results. When there is not enough storage left, the system overwrites the oldest data sector.

Tab. 8 Storage time at different storage intervals

Storage time at 28,800 data points			
Interval	Hours	Days	Weeks
01 SEC	8	0.3	--
05 SEC	40	1.6	--
10 SEC	80	3.3	--
30 SEC	240	10	1.4
01 MIN	480	20	2.8
05 MIN	2,400	100	14.3
10 MIN	4,800	200	28.6
30 MIN	14,400	600	85.7
60 MIN	28,800	1200	171.4

9.8.2 Displaying the data logger

With this function, the measuring results from the data logger ring buffer

1. Select DATA LOGGER DISPLAY from the main menu and press [ENTER].

Note!
You have no access when you have set the interval in the SYSTEM SETTINGS \ DATA LOGGER menu to "- - -". To enable the data logger, set a time for the interval.

MAIN MENU		
MEASUREMENT DISPLAY		
DATA LOGGER DISPLAY		
SYSTEM INFORMATION DISPLAY		
PRODUCT CHANGE		
PRODUCT CONFIGURATION		
SYSTEM SETTINGS		
MAINTENANCE		
LANGUAGE / SPRACHE		
20:05:2006	P01	11:26:55

Fig. 87 Choosing data logger display

2. Select a measuring result and press [ENTER].
   The M01 - M04 TO PC function makes it possible to display trends of all four measuring results simultaneously online on your PC with an interval of one second.

DATA LOGGER DISPLAY		
SELECT MEASURING RESULT TO BE DISPLAYED		
M01		
M02		
M03		
M04		
M01-M04 TO PC		
20:05:2006	P01	11:26:55

Fig. 88 Data logger display – choosing measuring results

3. The DATA LOGGER display appears.

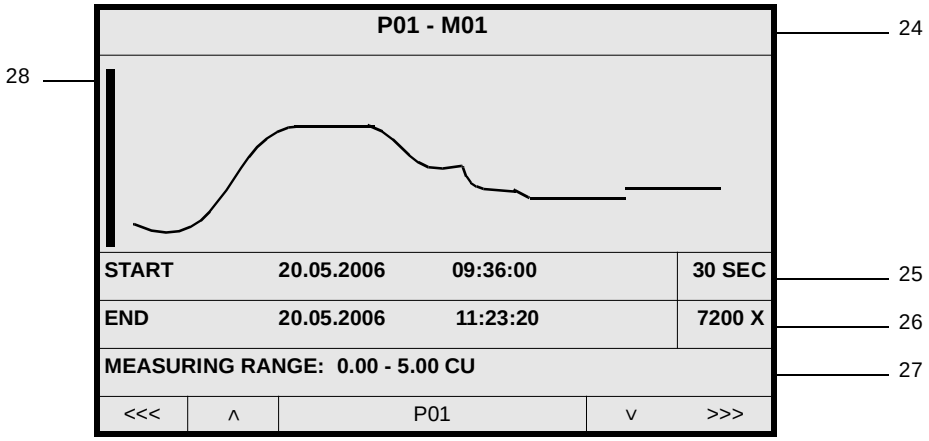


Fig. 89 Data logger display

The status bar with the product as well as the measuring result name of the currently shown measuring result is located in the header (24 in fig. 89).
The vertical bar (28) indicates the start of measurement or product change.
Start and end of storage, the storage interval (25) for the currently displayed measuring results (30 seconds in fig. 89) and the resolution (26) of the display (7200 X in fig. 89) are displayed below the graph.
The measuring range (27) indicates the measuring range beginning and end as well as the unit (0.00 - 5.00 CU in fig. 89).

When selecting the DATA LOGGER DISPLAY, the measuring result trend of 7,200 time intervals is shown. Here, the current measuring result is virtually located on the right-hand side. If there are less than 7,200 measuring points since the beginning of the storage sector, the trend display starts on the left-hand side. Shortly after the (re-) start of the data logger, results can be located on the right-hand side of the visible sector.

Borders between storage sectors are static. One measuring result is shown in one sector. If a measuring result or a product has been in measuring mode only shortly, the display is marked from both sides to visualize the borders of the sectors. Moving the display is impossible in this case.

Product changes automatically lead to an update of the upper status bar and the measuring range shown in the lower part.

In this menu, you can move the display and adjust the resolution.

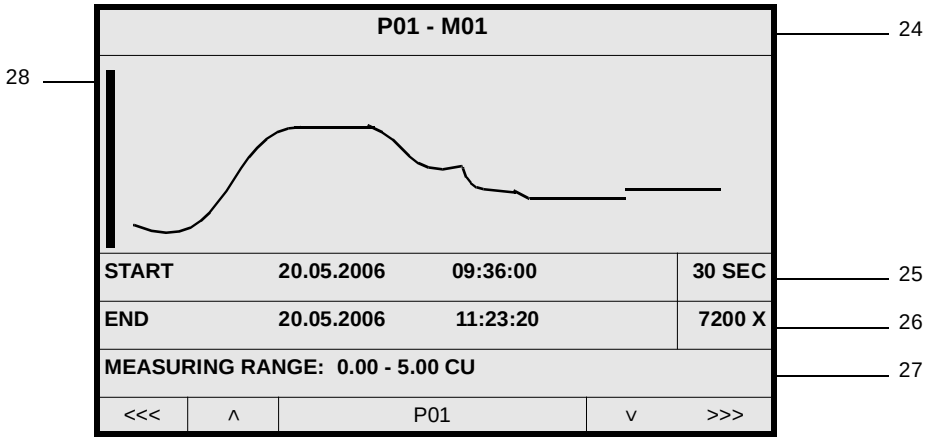


Fig. 90 Data logger display

- To move the display in its current resolution by half of its width, press arrow key ◀ or ▶ below the display. For example, a display of 7,200 X resolution is moved by 3,600 time intervals, corresponding to one hour at an interval of 01 SEC.
- To adjust the resolution, press arrow key ▲ or ▼**.**
  You can vary the resolution between 60 X, 720 X, and 7,200 X time intervals. When increasing the resolution, the enlarged part always referring to the center of the current display opens. It may be necessary to "flip pages" at the increased resolution to display the desired part.
- To enable the zoom function, set the resolution to 60 X time intervals and press the arrow key ▲. To disable the zoom function, press the arrow key ▼. In the zoom function (see fig. 91) the following is displayed:
  - exact measuring result with unit
  - date
  - time

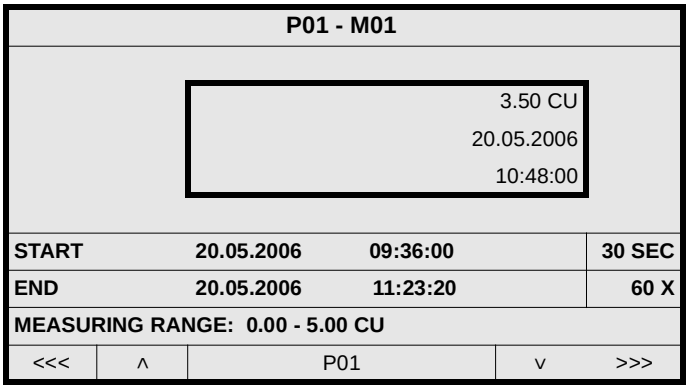


Fig. 91 Zoom function

Displaying measuring results

The data logger display illustrates measuring results on the x-axis with a physical resolution of 240 pixels for 60 to 7,200 data points, and on the y-axis with a resolution of 53 pixels for -3 % to +103 % of the measuring range.
Measuring results > 103.1 % of the measuring range are displayed with ↑ - ↑ - ↑ !
Measuring results < - 1.25 % of the measuring range are displayed with ↓- ↓- ↓!

9.8.3 Erasing the data logger

To erase all data from the data logger, proceed as follows:

1. Select SYSTEM SETTINGS from the main menu and press [ENTER].
2. Select DATA LOGGER and press [ENTER].
3. Select RESET and press [ENTER]. During erase operation (approx. 2 sec.), no new data is recorded.

9.8.4 Switching off the data logger

To switch off the data logger, proceed as follows:

1. Select SYSTEM SETTINGS from the main menu and press [ENTER].
2. Select DATA LOGGER and press [ENTER].
3. Select INTERVAL and press [ENTER]. A list appears.
4. Select the "- - -" option. Press [ENTER].
5. Save the setting.

The system erases existing data.
This option has been added to address FDA CFR 21 Part 11.

Note!
When the data logger is switched off and the DATA LOGGER menu in SYSTEM SETTINGS is individually protected with a password (third level), the converter does not record any data and the consistency of an external data recording is provided.

9.8.5 PC-Transfer

When the data logger is disabled, you can access TREND ONLINE only as follows:

1. Select MAINTENANCE from the main menu and press [ENTER].
2. Select SERVICE and press [ENTER].
3. Select PC TRANSFER and press [ENTER].

To read out the data logger, see chapter 9.11.8.3, page 161.

9.9 System information display

In this menu, you can view information on the entire system:

- converter configuration
- current settings
- system data of the sensors installed

9.9.1 Viewing configuration

In this menu, you can view information on the converter configuration. Here, you can only view the data but not change it.

1. Select SYSTEM INFORMATION DISPLAY from the main menu and press [ENTER].

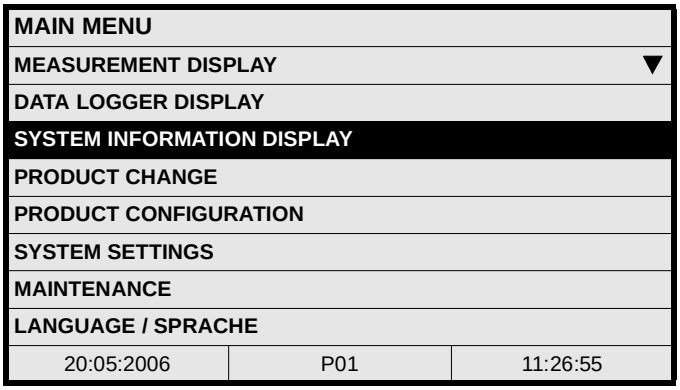


Fig. 92 Main menu, choosing system information display

2. Select the CONFIGURATION menu item in the SYSTEM INFORMATION DISPLAY menu and press [ENTER].

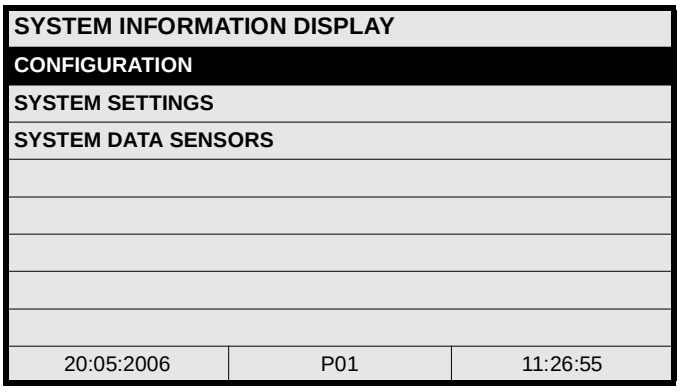


Fig. 93 Menu system information, choosing configuration

3. The SYSTEM INFORMATION menu appears. Lines 001 - 112 contain all information necessary for operation of your converter. Scroll up or down to view the remaining information.

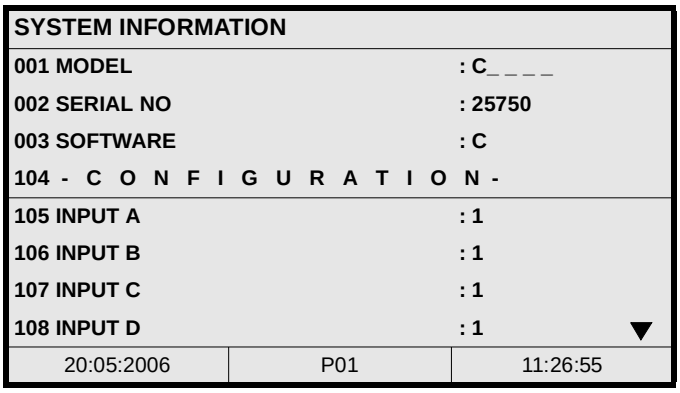


Fig. 94 Menu system information - configuration

The description of the optek inputs in lines 105 to 108 discriminates two cases:

- 0 = not installed
- 1 = installed

4. Press [CLEAR] to return to the previous menu.

9.9.2 System settings display

In this menu, you can view information on the current system settings. Here, you can only view the data but not change it.

1. Select the SYSTEM SETTINGS menu item in the SYSTEM INFORMATION DISPLAY menu and press [ENTER].

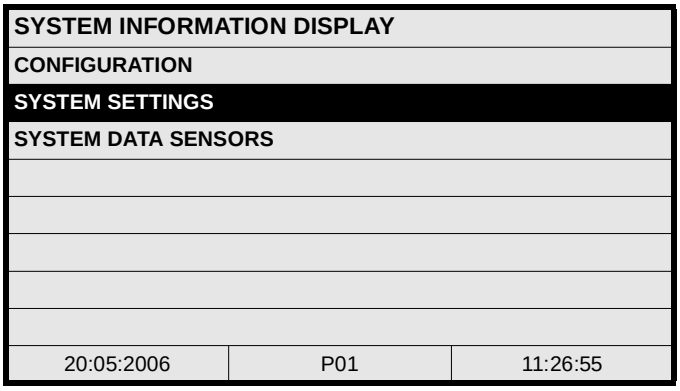


Fig. 95 Menu system information display, choosing system configuration

2. The SYSTEM INFORMATION menu appears. Scroll up or down to view the remaining information.

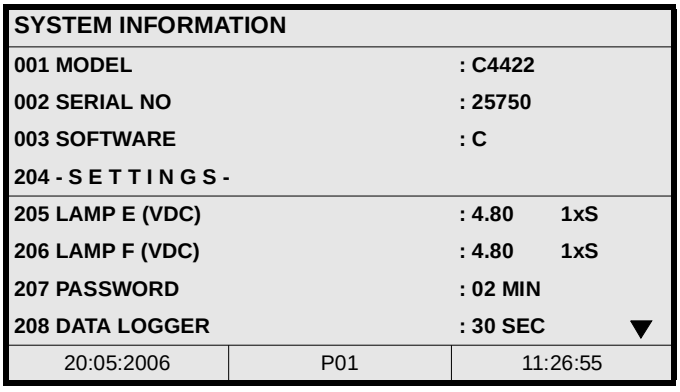


Fig. 96 Menu system information - settings

The following settings are displayed:

*Tab. 9 Settings in the system information menu**

204 - S E T T I N G S -		
205 LAMP E (VDC)	:	4.90
206 LAMP F (VDC)	:	4.90
207 PASSWORD	:	05 MIN
208 DATA LOGGER	:	10 SEC
209 DAMPING	:	SYMMETRIC
210 DAMPING (SEC)	:	1.0
211 ZERO POINT	:	MANUALLY
212 ZERO POINT	:	REMOTE
213 PRODUCT CHANGE	:	MANUALLY
214 PRODUCT CHANGE	:	REMOTE
215 RELAY	:	OPEN
216 RELAY FOR	:	ALARMS
217 REMOTE IN	:	IN 1
218 HOLD	:	HOLD 1
219 HOLD	:	MANUALLY
220 HOLD	:	REMOTE
221 mA OUTPUTS	:	4 - 20 mA
222 FAILSAFE	:	+110 %
223 mA IN 1	:	IN USE
224 mA IN 2	:	IN USE
225 INPUT A	:	IN USE
226 INPUT B	:	IN USE
227 INPUT C	:	IN USE
228 INPUT D	:	IN USE
229 INTERNAL DATA		
230 INTERNAL DATA		
231 INTERNAL DATA		
232		

*. The table shows exemplary settings.

3. Press [CLEAR] to return to the previous menu.

9.9.3 Sensor data display

In this menu, you can view information on the sensors installed. Here, you can only view the data but not change it.

1. Select the SYSTEM DATA SENSORS menu item in the SYSTEM INFORMATION DISPLAY menu and press [ENTER].

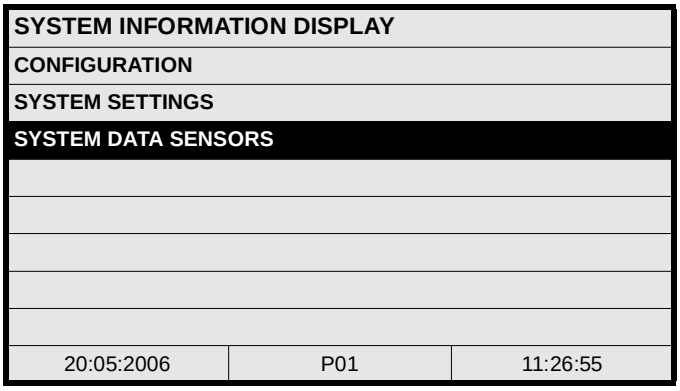


Fig. 97 Menu system information display, choosing system data sensors

2. The SYSTEM INFORMATION DISPLAY - SYSTEM DATA SENSOR 1 menu appears. Scroll up or down to view information on other sensors if connected to your converter.
   You can enter and update sensor data in the SYSTEM SETTINGS menu.

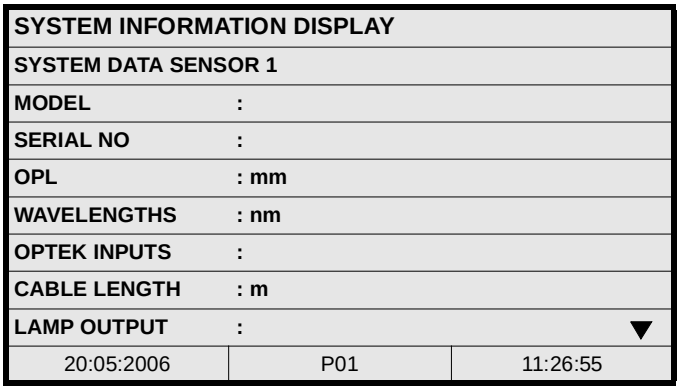


Fig. 98 Menu system information - settings

3. Press [CLEAR] to return to the previous menu.

9.10 System settings

System settings allow optimal adjustments of the hardware to the business requirements.

Note!
The measuring mode is switched off for parameterization regarding system settings. Measuring mode is restarted upon return to the main menu.

1. Select SYSTEM SETTINGS from the main menu and press [ENTER].

MAIN MENU		
MEASUREMENT DISPLAY		
DATA LOGGER DISPLAY		
SYSTEM INFORMATION DISPLAY		
PRODUCT CHANGE		
PRODUCT CONFIGURATION		
SYSTEM SETTINGS		
MAINTENANCE		
LANGUAGE / SPRACHE		
20:05:2006	P01	11:26:55

Fig. 99 Main menu, choosing system settings

2. The SYSTEM SETTINGS menu appears:

SYSTEM SETTINGS		
DISPLAY		
DATE / TIME		
DATA LOGGER		
DAMPING		
LAMP VOLTAGE		
SYSTEM ZERO POINT		
PRODUCT CHANGE		
SENSOR TF		
mA OUTPUTS		
RELAY OUTPUTS		
REMOTE IN		
HOLD		
FAILSAFE		
PASSWORD PROTECTION		
OPTEK INPUTS		
mA INPUTS		
SYSTEM DATA SENSOR 1		
SYSTEM DATA SENSOR 2		
SYSTEM DATA SENSOR 3		
SYSTEM DATA SENSOR 4		
FIELDBUS		
20:05:2006	P01	11:26:55

Fig. 100 Menu system settings

9.10.1 Display

This menu is described in chapter 9.4.1, page 43.

9.10.2 Date / time

This menu is described in chapter 9.4.2, page 45.

Instruction Manual

optek-converter C4101

Version 07.2009_1.2US

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Section 2 of 2

9.10.3 Data logger

With this function, you can set the measuring results storage interval and the time resolution of the trend chart or reset the data logger. You find notes regarding the data logger display in chapter 9.8, page 89.

1. Select SYSTEM SETTINGS from the main menu and press [ENTER].
2. Select DATA LOGGER and press [ENTER].

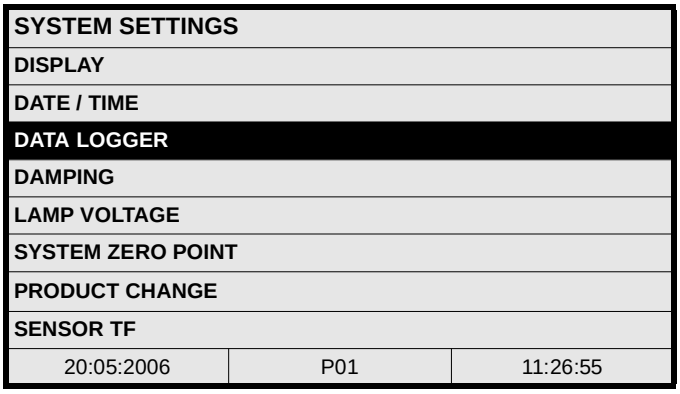


Fig. 101 Menu system settings, choosing data logger

3. Select INTERVAL and press [ENTER]. A list appears.

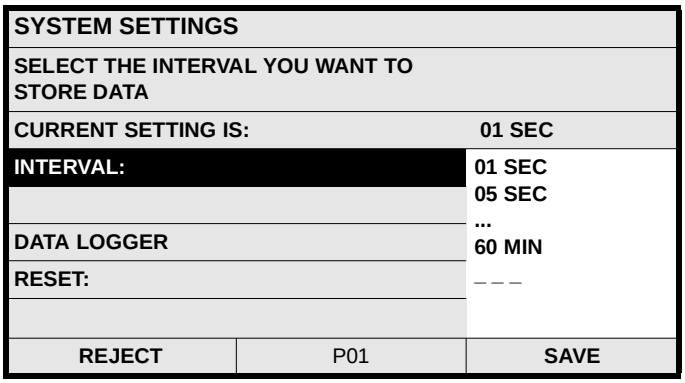


Fig. 102 Entering the storage interval

Note!
When selecting "- - -", the DATA LOGGER function and the trend display are switched off. All data is erased!

4. Select one interval from the given times and press [ENTER].
   The cursor moves to DATA LOGGER RESET.
5. Press [ENTER]. A list appears.
6. If you select YES, all previous data is erased, if you select NO, new data recording is not started.
7. Save the setting. The SYSTEM SETTINGS menu appears.

SYSTEM SETTINGS		
SELECT THE INTERVAL YOU WANT TO STORE DATA		
CURRENT SETTING IS:		01 SEC
INTERVAL:		
DATA LOGGER		
RESET		
REJECT	P01	SAVE

Fig. 103 Resetting the data logger

9.10.4 Damping

With this function, you can set the damping type and damping integration time. You can choose between symmetric and asymmetric damping:

- Symmetric damping:
  Equally damps increasing and decreasing measuring results with regard to integration time.
- Asymmetric damping:
  Damps increasing measuring results with regard to integration time, decreasing measuring results, however, only at 1/10 of the time. A quick sequence of very high measuring results (peaks) can be damped in its increase without the results adding up like with symmetric damping.

1. Select SYSTEM SETTINGS from the main menu and press [ENTER].
2. Select DAMPING and press [ENTER].

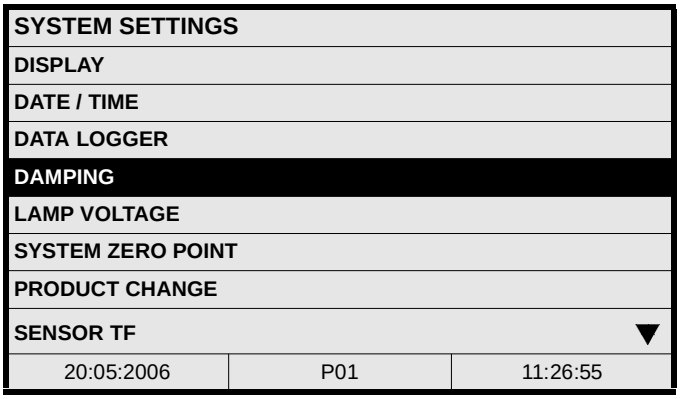


Fig. 104 Menu system settings, choosing damping

3. Select DAMPING and press [ENTER]. A list appears. Select the SYMMMETRIC or the ASYMMETRIC function and press [ENTER]. The cursor moves to the DAMPING (SEC) menu item.

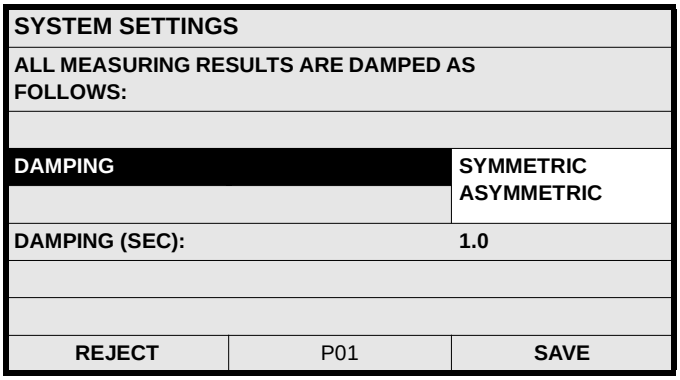


Fig. 105 Choosing the damping type

4. Press [ENTER] and type in the integration time via the numerical keyboard. Times from 0.0 to 99.9 seconds are possible.

Note!
When you type in 0.0 for integration time, damping is switched off!

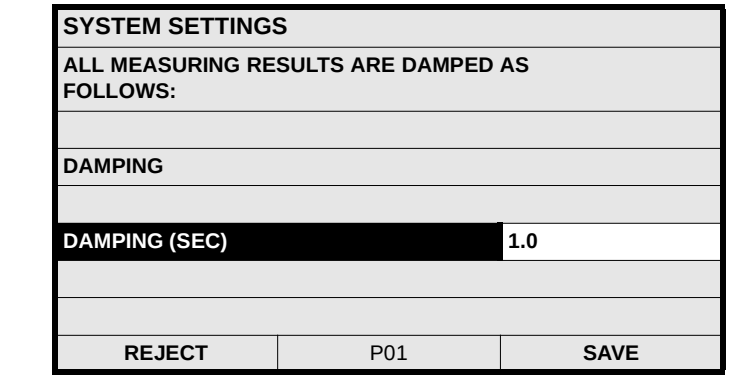


Fig. 106 Entering the integration time for damping

5. Save the setting. The SYSTEM SETTINGS menu appears.

9.10.5 Lamp voltage

This menu is described in chapter 9.4.3, page 46.

9.10.6 System zero point

With this function, you can determine whether the system zero point is set manually and / or via an external control system (remote) on converters C4121, C4221, C4222, C4322 and C4422 or via PROFIBUS® on converters C4151, C4251, C4252, C4352 and C4452.

1. Select SYSTEM SETTINGS from the main menu and press [ENTER].
2. Select SYSTEM ZERO POINT and press [ENTER].

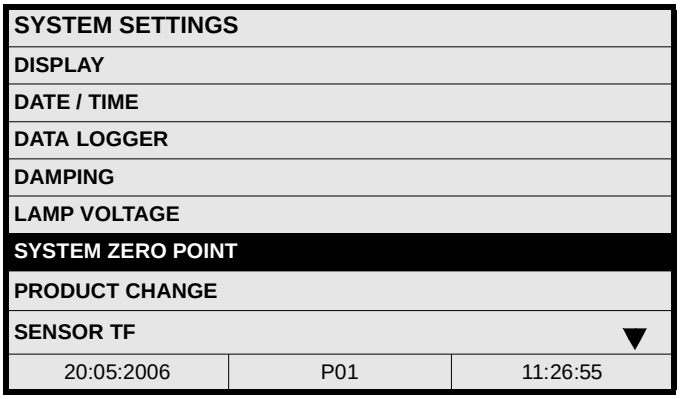


Fig. 107 Menu system settings, choosing system zero point

Note!

- To prevent a change of setting, set MANUAL and REMOTE to NO.
- If zero point setting for converters C4121, C4221, C4222, C4322, C4422, C4151, C4251, C4252, C4352 and C4452 shall only be possible at the control system, set MANUAL to NO and REMOTE to YES.

3. Select MANUALLY and press [ENTER]. Select YES or NO and press [ENTER]. The cursor moves to the next menu item.
4. Press [ENTER]. Select YES or NO and press [ENTER].

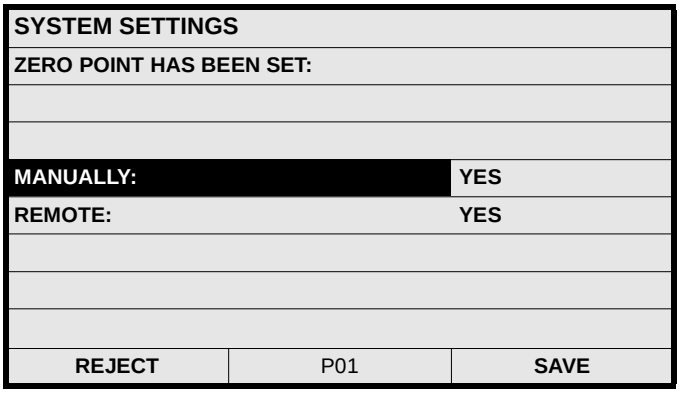


Fig. 108 Zero point setting

5. Save the setting. The SYSTEM SETTINGS menu appears.

Note!

- When you set MANUALLY to NO, the "Set zero point with Remote In only" or the "Zero point locked" message appears in the MAINTENANCE menu!
- When you set REMOTE to NO, no message appears in the MAINTENANCE menu.
- For more information on setting the zero point via the external control system, read chapter 9.12.1, page 164.

9.10.7 Product change

With this function, you can determine whether product change is carried out manually or via an external control system (remote) on converters C4121, C4221, C4222, C4322 and C4422 or via PROFIBUS® on converters C4151, C4251, C4252, C4352 and C4452.

1. Select SYSTEM SETTINGS from the main menu and press [ENTER].
2. Select PRODUCT CHANGE and press [ENTER].

SYSTEM SETTINGS		
DISPLAY		
DATE / TIME		
DATA LOGGER		
DAMPING		
LAMP VOLTAGE		
SYSTEM ZERO POINT		
PRODUCT CHANGE		
SENSOR TF		
20:05:2006	P01	11:26:55

Fig. 109 Menu system settings, choosing product change

Note!

- To prevent a change of product setting, set MANUAL and REMOTE to NO.
- If you want the product change to be solely possible via the control system, set MANUALLY to NO and REMOTE to YES.

3. Select MANUALLY and press [ENTER]. Select YES or NO and press [ENTER].
   The cursor moves to the REMOTE menu item.
4. Press [ENTER]. Select YES or NO and press [ENTER].

SYSTEM SETTINGS		
PRODUCT CHANGE CONFIRMED:		
MANUALLY:		YES
REMOTE:		YES
REJECT	P01	SAVE

Fig. 110 Setting the product change mode

5. Save the settings. The SYSTEM SETTINGS menu appears.

Note!
When you set MANUALLY to NO, the "Product change remote only" or "Product change locked" messages appear in the PRODUCT CHANGE menu.
When you set REMOTE to NO, no message appears in the PRODUCT CHANGE menu.

9.10.8 Sensor TF

With this function, you can optimally adjust the converter to the TF sensor.

Note!
The entry of the scattered light parameter (see "Calibration scattered light", chapter 9.11.5, page 142) in the MAINTENANCE \ CALIBRATION SCATTERED LIGHT menu directly affects the SENSOR TF menu. Therefore, always enter the scattered light parameter in the MAINTENANCE \ CALIBRATION SCATTERED LIGHT menu before adjusting the settings in the SENSOR TF menu.

1. Select SYSTEM SETTINGS from the main menu and press [ENTER].
2. Select SENSOR TF and press [ENTER].

SYSTEM SETTINGS		
DISPLAY		
DATE / TIME		
DATA LOGGER		
DAMPING		
LAMP VOLTAGE		
SYSTEM ZERO POINT		
PRODUCT CHANGE		
SENSOR TF		
20:05:2006	P01	11:26:55

Fig. 111 System settings menu, choosing sensor TF

3. Select FUNCTION and press [ENTER]. A list appears.

SYSTEM SETTINGS		
FUNCTION		TURB A/C TURB B/D
SENSOR		
MEDIUM		
ZERO POINT		
REJECT	P01	SAVE

Fig. 112 Entering function

4. Select one of the given functions and press [ENTER]. The cursor moves to SENSOR.
5. Press [ENTER]. A list appears. The sensor is automatically assigned correctly when entering the scattered light parameter and does not need to be selected here (see "Calibration scattered light", chapter 9.11.5, page 142). TF16-OPL40 and TF16-OPL50 are reserved for the future.

SYSTEM SETTINGS		
FUNCTION		TURB A/C
SENSOR		TF16 TF16-OPL40 TF16-OPL50
MEDIUM		
ZERO POINT		
REJECT	P01	SAVE

Fig. 113 Entering the sensor

6. Press [ENTER]. The cursor moves to MEDIUM.
7. Press [ENTER]. A list appears.

SENSOR TF		
FUNCTION		TURB A/C
SENSOR		TF16
MEDIUM		PPM (DE) FTU EBC
ZERO POINT		
REJECT	P01	SAVE

Fig. 114 Entering the medium

8. Select one of the given media and press [ENTER]. The cursor moves to ZERO POINT.
9. Press [ENTER]. A list appears.
10. Select the zero setting mode FACTORY or USER and press [ENTER].

SENSOR TF		
FUNCTION		TURB A/C
SENSOR		TF16
MEDIUM		FTU
ZERO POINT		FACTORY USER
REJECT	P01	SAVE

Fig. 115 Zero point setting mode

Note!
The FACTORY zero point should be selected, if low turbidities are to be measured exactly but no appropriate medium is available for zero point setting in the process (user).
The factory zero point can be reactivated at any time.
The user's zero point is not deleted when changing from the factory zero point and is maintained until the zero point is imported again by the user.

11. Save the setting. The SYSTEM SETTINGS menu appears.

9.10.9 mA-outputs

With this function, you can determine the basic settings for mA-outputs.
Choose between the two basic settings:

- The basic setting of 4 - 20 mA corresponds to the NAMUR recommendation NE 43. Measuring results between 3.8 and 20.5 mA are transferred.
- Measuring results between 0 and 20.6 mA are transferred at the basic setting 0 - 20 mA.

Failsafe error level is calculated depending on the definition of failsafe state in the SYSTEM SETTINGS menu (see table 10, page 121).

The basic setting is valid for all mA-outputs, clamps 40-43 for mA-outputs 1 and 2, and clamps 44-47 for mA-outputs 3 and 4 (optional).

1. Select SYSTEM SETTINGS from the main menu and press [ENTER].
2. Select mA OUTPUTS and press [ENTER].

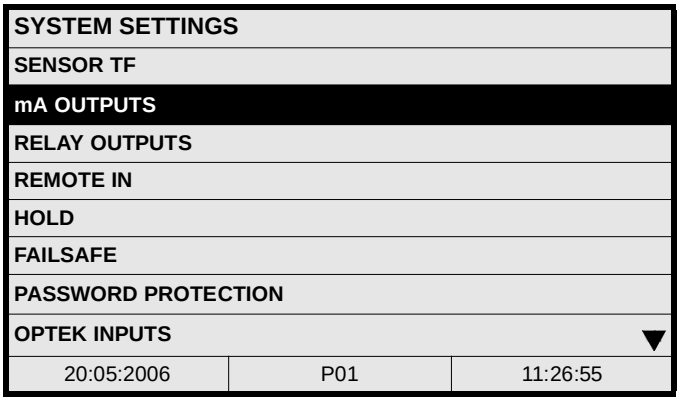


Fig. 116 Menu system settings, choosing mA-outputs

3. The cursor is located on the BASIC SETTING menu item in the mA OUTPUTS menu. Press [ENTER]. A list appears. Select the desired setting.
4. Press [ENTER].

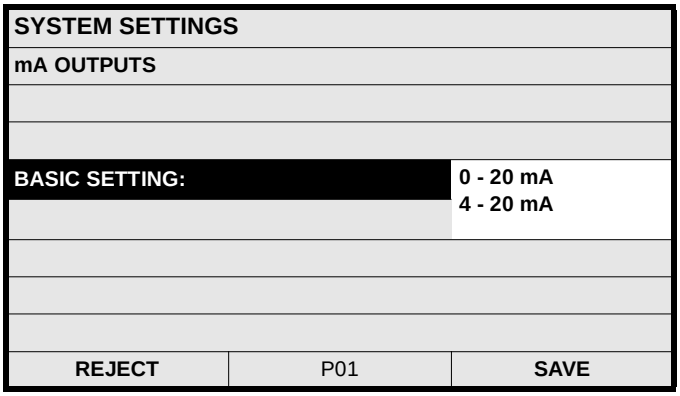


Fig. 117 Basic setting for mA-outputs

5. Save the setting. The SYSTEM SETTINGS menu appears.

Carry out mA-output calibration in the CALIBRATION mA OUTPUTS menu item in the MAINTENANCE menu (see chapter 9.11.7, page 146).

9.10.10 Relay outputs

With this function, you can determine the basic settings for relay outputs. You can determine whether you want to use the relay outputs 1 to 3 for limit value indication or status feedback.

The converter is equipped with four relay outputs:

- Relay output 1 clamps 10 / 11
- Relay output 2 clamps 12 / 13
- Relay output 3 clamps 14 / 15
- Relay output 4 clamps 16 / 17 / 18 (active)

In this menu, you can switch between the relay outputs 1, 2, and 3. The following settings are possible:

- contacts normal OPEN or normal CLOSED
- as outputs for ALARMS (limit value relay) or for Remote Out 1, 2 or 3 (status feedback).

Relay output 4 is a system relay and cannot be switched.

1. Select SYSTEM SETTINGS from the main menu and press [ENTER].
2. Select RELAY OUTPUTS and press [ENTER].

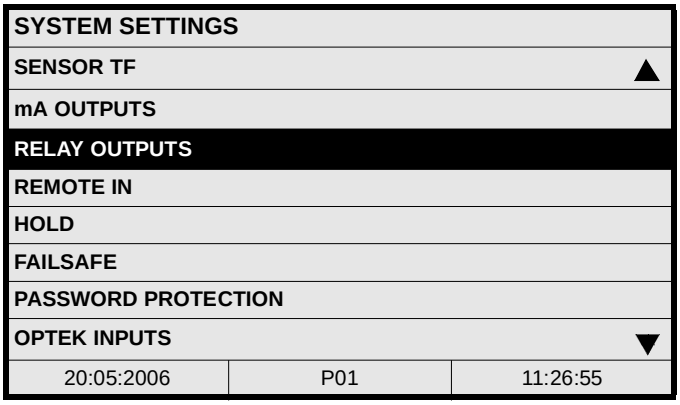


Fig. 118 Menu system settings, choosing relay outputs

3. The cursor is located on the CONTACTS NORMAL menu item. Press [ENTER]. A list appears. Select the desired setting.

SYSTEM SETTINGS		
HOW DO YOU WANT TO USE RELAY 1 - 3?		
CONTACTS NORMAL:		OPEN CLOSED
OUTPUTS FOR:		ALARMS
SYSTEM RELAY 4 IS ALWAYS ACTIVE!		
REJECT	P01	SAVE

Fig. 119 Choosing the initial state of relays (open / closed)

4. Press [ENTER]. The cursor moves to the OUTPUTS FOR menu item. Select the desired setting and press [ENTER].

SYSTEM SETTINGS		
HOW DO YOU WANT TO USE RELAY 1 - 3?		
CONTACTS NORMAL:		
OUTPUTS FOR:		ALARMS REMOTE OUT 1 REMOTE OUT 2 REMOTE OUT 3
SYSTEM RELAY 4 IS ALWAYS ACTIVE!		
REJECT	P01	SAVE

Fig. 120 Choosing the allocation of relay outputs

5. Save the setting. The SYSTEM SETTINGS menu appears.

Further information regarding Remote Out 1, Remote Out 2 and Remote Out 3 functions is given in chapter 9.12.2, page 169.

9.10.11 Remote In

The converters C4121, C4221, C4222, C4322, and C4422 can be controlled via the control system. 24 V DC control cables connected to the applicable remote input clamps are used to activate different converter functions. (e.g. using PLC). With this function, you can define how the remote inputs are to be implemented on the converter. There are two possible settings: Remote In 1 or Remote In 2. These settings allow a zeroing of the system, which is either global or specific to measuring results.

- In Remote In 1 all inputs R1 to R7 are equal.
  Product change and system zeroing can be carried out virtually simultaneously. Here, zeroing is carried out globally, i.e. inputs A and D are set to "0" simultaneously for all measuring results in all products.
- In Remote In 2 all inputs R1 to R4 are different. Here, zeroing is selective, i.e. inputs A to D are only set to "0" when they are allocated to selected measuring results of the current product.
  If R6 = LOW, all other inputs are treated as in Remote In 1.
  If R6 = HIGH, inputs R1 to R4 are used to selectively zero measuring results M01 to M04.

Note!
Remote In 1 requires setting of the current product in R1 to R3, otherwise zeroing with R6 results in a product change to P01!
Remote In 2 uses R1 to R4 for measuring result selection if R6 = HIGH (see chapter 9.12.1, page 164)!

1. Select SYSTEM SETTINGS from the main menu and press [ENTER].
2. Select REMOTE IN and press [ENTER].

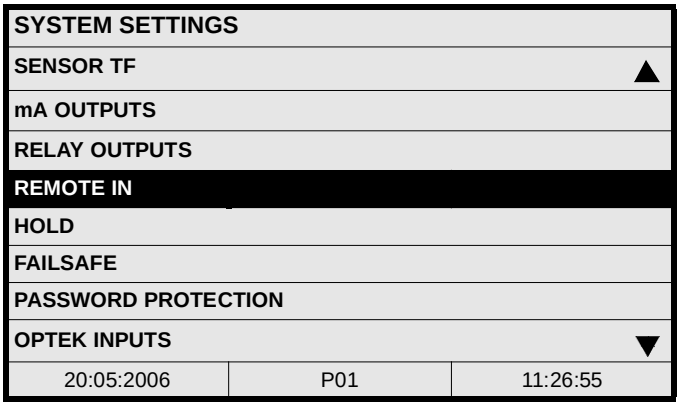


Fig. 121 Menu system settings, choosing Remote In

Note!
If this function is not available (C4101, C4201, C4202, C4151, C4251, C4252, C4352, C4452) the "Remote In requires PCB IO-12 (optional)" message appears.

3. A new menu appears. Press [ENTER], select the desired setting, and press [ENTER] again.
4. Save the setting. The SYSTEM SETTINGS menu appears.

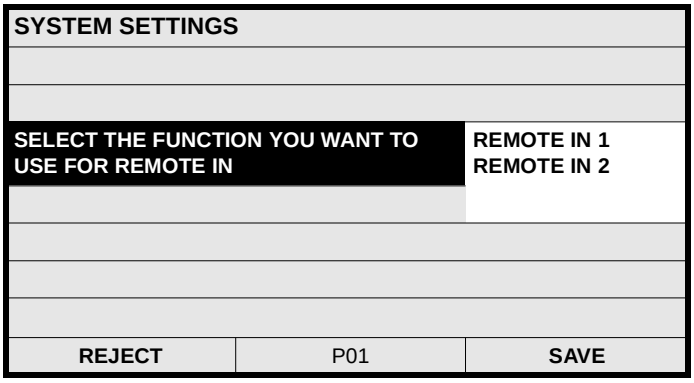


Fig. 122 Choosing the remote input function

9.10.12 Hold

With this function, you can determine the measuring system behavior when the hold function in the MAINTENANCE menu is switched on. The hold functions freeze outputs and displays:

- HOLD 1 freezes the measurement display, all LEDs, the data logger and all mA-outputs of the converter.
- HOLD 2 only freezes the data logger and the mA-outputs of the converter. All local displays remain active (are updated for maintenance). Thus, HOLD 2 allows maintenance at the site with measuring results.
- Both hold functions freeze alarms when the relay outputs were set to ALARM (see chapter 9.10.10, page 115).
- Both hold functions do not freeze the status feedback when the relay outputs were set to Remote Out (see chapter 9.10.10, page 115).
- Both hold functions do not affect the system relay.
- When the hold function is enabled, a product change is possible.

1. Select SYSTEM SETTINGS from the main menu and press [ENTER].
2. Select HOLD and press [ENTER].

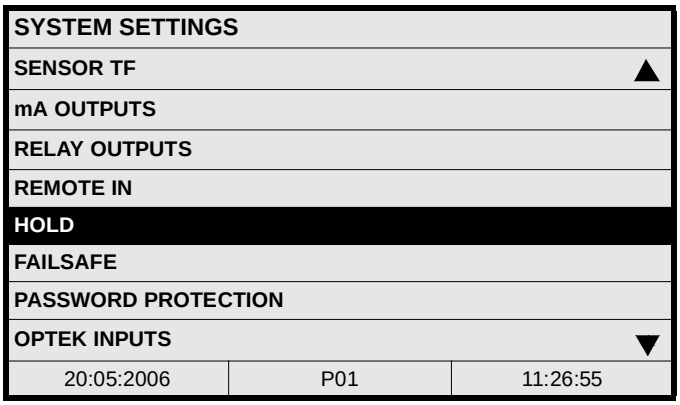


Fig. 123 Menu system settings, choosing hold

3. A new menu appears. The cursor is located on the function selection for "Hold". Press [ENTER]. A list appears. Select HOLD 1 or HOLD 2 and press [ENTER].
4. The cursor moves to the HOLD ENABLED MANUALLY menu item. Press [ENTER], select YES or NO, and press [ENTER] again. If switching on the hold function at the converter shall be possible, select YES.
5. The cursor moves to the menu item HOLD ENABLED REMOTE for converters C4121, C4221, C4222, C4322, C4422, C4151, C4251, C4252, C4352 and C4452. Press [ENTER], select YES or NO, and press [ENTER] again. If switching on the hold function at the control system shall be possible, select YES.
6. The cursor moves to the HOLD MESSAGE ON MEASUREMENT DISPLAY menu item. Press [ENTER], select YES or NO, and press [ENTER] again. If you want the HOLD message to appear in the measurement display, select YES. If you have selected the HOLD 1 function, we recommend to select YES in this case.
   Additionally, the time when HOLD was enabled is displayed. To delete the HOLD message, press [CLEAR]. The HOLD message appears again after 30 seconds.
7. Save the setting. The SYSTEM SETTINGS menu appears.

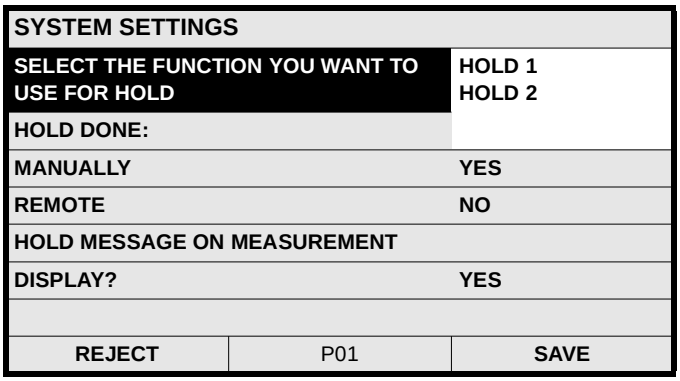


Fig. 124 Choosing the hold function

For more information on enabling the hold function via the external control system read chapter 9.12.1, page 164.

9.10.13 Failsafe

If there is a fault, Failsafe guides operation into a safe operating mode. Under this function, the state of the measuring system is defined in case of a fault. The settings for Failsafe refer to each mA output.

"Failsafe" can be triggered by signal loss at one or several optek inputs A, B, C and / or D or at the mA-inputs 1 or 2. Lamp failure usually causes signal loss!

1. Select SYSTEM SETTINGS from the main menu and press [ENTER].
2. Select FAILSAFE and press [ENTER].

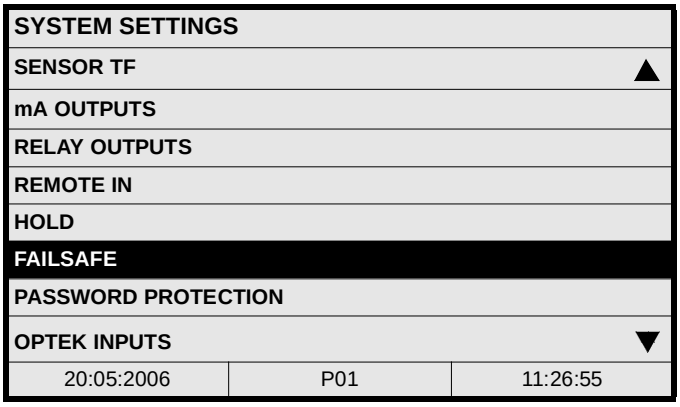


Fig. 125 Menu system settings, choosing failsafe

3. The cursor is located in the STATE menu item. Press [ENTER]. A list appears. Select the desired setting.

Tab. 10 mA signals to the control system in fault condition

Definition of the mA-outputs in the SYSTEM SETTINGS menu	**FAILSAFE SIGNAL**					
	- 10 %	**- 1.25 %**	**-0.0 %**	**+ 100.00 %**	**+103.1 %**	**+110 %**
4.0 - 20 mA	2.4 mA	3.8 mA	4 mA	20 mA	20.5 mA	21.6 mA
0.0 - 20 mA	0 mA	0 mA	0 mA	20 mA	20.6 mA	22.0 mA

- Apart from the classic Failsafe level according to Namur recommendations (-10 % or 110 %) the user has four other Failsafe levels (-1.25 %, 0.0 %, 100 % und 103.1%) (e. g. when starting filtration processes).

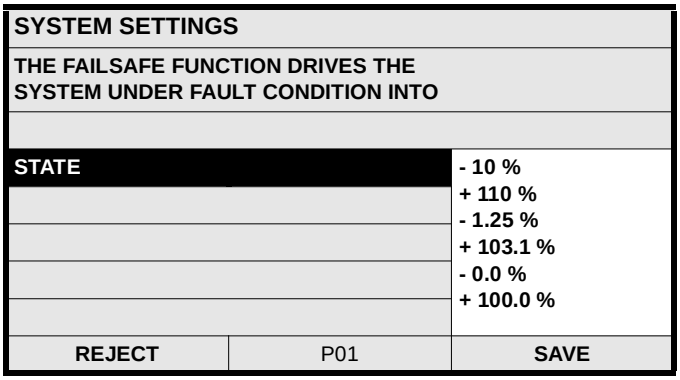


Fig. 126 Choosing the fault condition

4. Select and press [ENTER].
5. Save the setting. The SYSTEM SETTINGS menu appears.

When the failsafe function is triggered, the measuring result FAILSAFE is displayed in the data logger. The "SIGNAL LOSS" error message appears in the MEASUREMENT DISPLAY overwriting measuring results and trend charts. The Failsafe function is triggered in case of a communication fault with the MA-11 (optek detector input board) and the IO-12 (optek mA and remote input board), if the mA input is part of the measuring function.
Communication faults with IO-13, IO-14 or IO-16 do not trigger Failsafe.

9.10.14 Password protection

With this function, you can protect different converter functions with a password.
Four password levels are provided: --, 1, 2, 3.
Password level -- allows access without entering a password.

1. Select SYSTEM SETTINGS from the main menu and press [ENTER].
2. Select PASSWORD PROTECTION and press [ENTER].

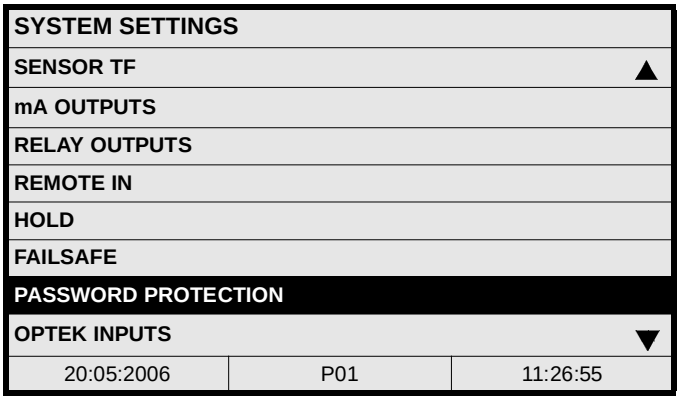


Fig. 127 Menu system settings, choosing password protection

9.10.14.1 Password definition

With this function, you can allocate passwords to the three levels 1, 2, and 3.
Enter a maximum of 8 figures between 0 and 9 for each password.

1. Select PASSWORD DEFINITION and press [ENTER].

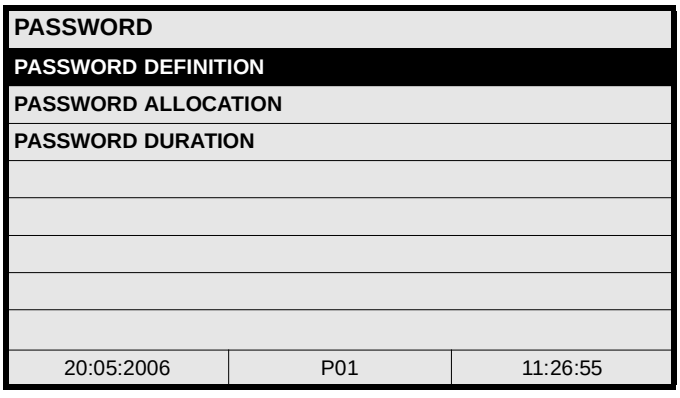


Fig. 128 Choosing password definition

2. Select PASSWORD LEVEL 1 and press [ENTER]. Type in a password via the numerical keyboard and press [ENTER]. The cursor moves to the PASSWORD LEVEL 2 menu item.

PASSWORD		
PLEASE DEFINE YOUR PASSWORDS HERE		
PASSWORD LEVEL 1:		11111111
PASSWORD LEVEL 2:		222
PASSWORD LEVEL 3:		333
NOTE YOUR PASSWORD -3-		
REJECT	P01	SAVE

Fig. 129 Defining the password levels 1 to 3

3. Press [ENTER] and type in a password. Press [ENTER]. The cursor moves to the PASSWORD LEVEL 3 menu item.
4. Press [ENTER] and type in a password. Press [ENTER]. The cursor moves to the REJECT menu item.
5. To delete the settings, press [ENTER].
6. To save the new passwords, press SAVE and [ENTER]. The PASSWORD menu appears.

Note!
Note the password and keep it in a safe place.
The higher password level automatically releases the lower password level.

9.10.14.2 Password allocation

Here you can determine which password ("1", "2" or "3") protects which function or software setting. Password level "--" allows access without entering a password.

1. Select the PASSWORD ALLOCATION menu item in the PASSWORD menu and press [ENTER]. All menu items which can be protected by a password appear.

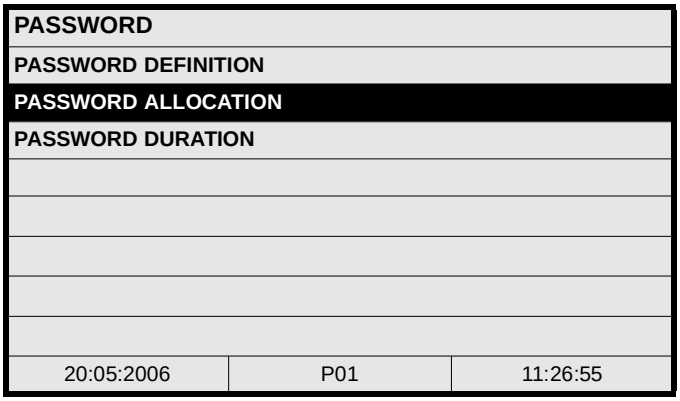


Fig. 130 Choosing password allocation

2. Select menu items that you want to protect one after the other and press [ENTER]. A list with password levels appears.

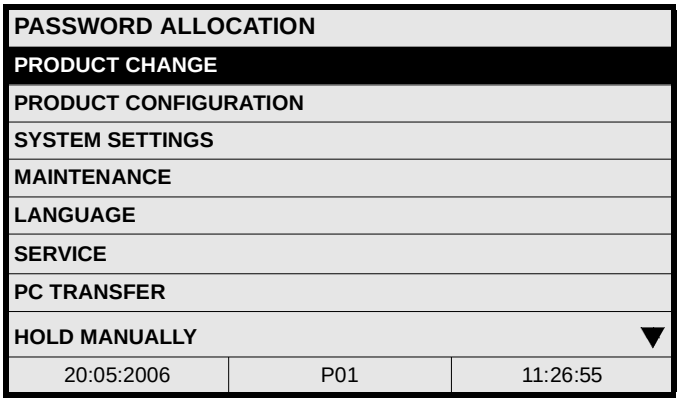


Fig. 131 Menu password allocation

3. Select a password level ("--", "1", "2" or "3") and press [ENTER].

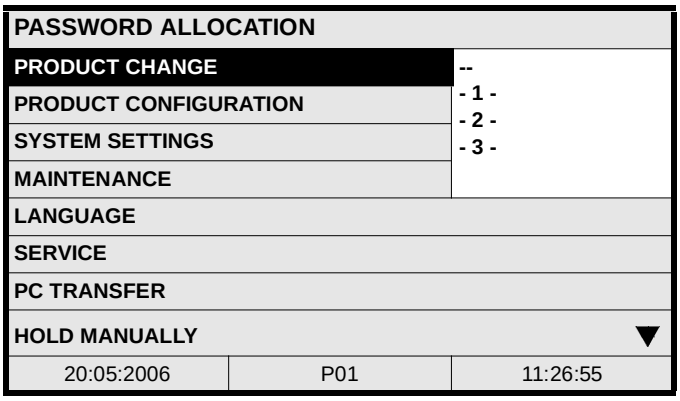


Fig. 132 Allocating a password level

4. Repeat the entries for all menu items.
5. Allocate and press [CLEAR] to return to the PASSWORD menu.

When you have entered and allocated passwords, these passwords are valid the very moment you leave the PASSWORD ALLOCATION menu.
After entering a password, you can access all functions and menu items protected by this password level or the lower password levels.

Note!

- To protect the PASSWORD PROTECTION menu item in the system settings, the PASSWORD menu item has to be protected by a password.
- When using the PC transfer software, the menu item PC TRANSFER must be protected with a password to prevent unauthorized persons from accessing. Keep your parameter set in a safe place.

9.10.14.3 Password duration

This function sets up the duration of time the menu items can be accessed once a valid password is entered. When this period is over, all menu items are blocked and the password must be entered again.

1. Select the PASSWORD DURATION menu item in the PASSWORD menu and press [ENTER].

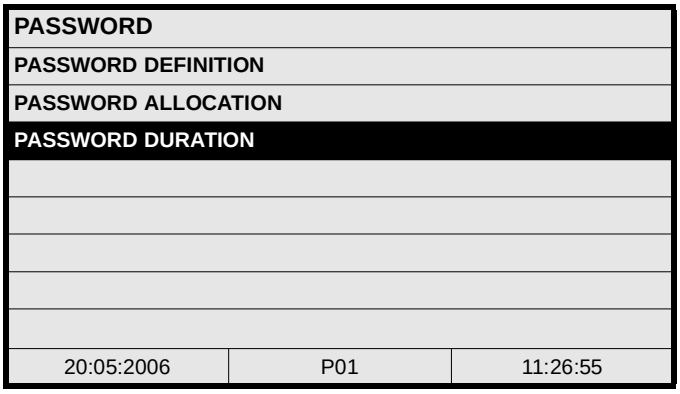


Fig. 133 Choosing password duration

2. The PASSWORD DURATION menu appears. The cursor is located on the DURATION menu item. Press [ENTER]. A list with different times appears.

3. Select a time and press [ENTER].

PASSWORD DURATION		
SELECT TIME INTERVAL FOR PASSWORD TO ALLOW ACCESS		
CURRENT SETTING IS: 02 MIN		
DURATION		02 MIN 05 MIN ... 90 MIN
REJECT	P01	SAVE

Fig. 134 Entering interval for access duration

4. Save the setting. The PASSWORD menu appears.
5. The new duration for the password is not saved until you press [CLEAR] to quit the PASSWORD menu. Now, the new time is applied for the password.

Note!
If you forgot one of the passwords, there is an encoded password displayed in the SYSTEM INFORMATION DISPLAY under SYSTEM SETTINGS. Please contact us and tell us the encoded password. We will then give out your forgotten password as quickly as possible.

SYSTEM INFORMATION		
001 MODEL		
002 SERIAL NO.		
003 SOFTWARE		
204 - SETTINGS -		
229 INTERNAL DATA		
230 INTERNAL DATA		
231 INTERNAL DATA		
232		
20:05:2006	P01	11:26:55

Fig. 135 System information display, system settings

9.10.15 optek inputs

This menu is described in chapter 9.4.4, page 48.

9.10.16 mA-inputs

This menu is described in chapter 9.4.5, page 50.

9.10.17 System data sensors 1 to 4

With this function, you can document the system. The entries made here do not affect the measurement.
You can recall data stored here anytime via the SYSTEM INFORMATION DISPLAY in the main menu without interrupting the measuring process.

1. Select SYSTEM SETTINGS from the main menu and press [ENTER].
2. Select SYSTEM DATA SENSOR 1 and press [ENTER].

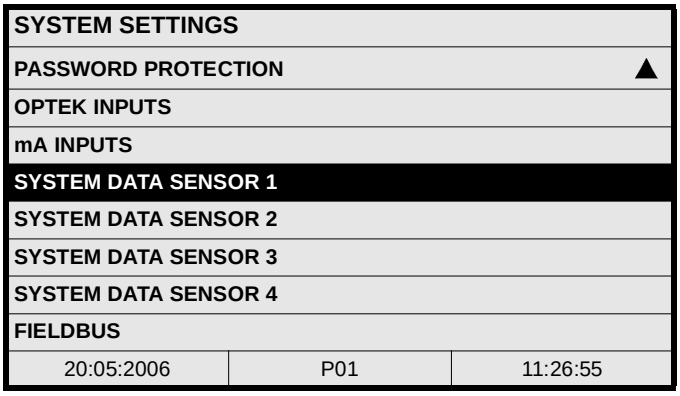


Fig. 136 Menu system settings, choosing system data sensor 1

3. Select the MODEL menu item and press [ENTER]. The character field appears.

SYSTEM SETTINGS		
SYSTEM DATA SENSOR 1		
MODEL		
SERIAL NO		
OPL		
WAVELENGTH		
OPTEK INPUTS		
CABLE LENGTH		
LAMP OUTPUT		
REJECT	P01	SAVE

Fig. 137 Entering system data sensor 1

4. Enter the model.
5. After entering the text, select OK and press [ENTER]. The cursor moves to the next menu item.
6. Make entries in all menu items.
7. Save the settings. The SYSTEM SETTINGS menu appears.
8. If more sensors are connected, repeat the entries for the SYSTEM DATA SENSOR 2 to 4.

Note!
These entries serve for documentation purposes only. They do not affect measurement.

9.10.18 Fieldbus

In this menu you can define the device description for converters C4151, C4251, C4252, C4352 and C4452. The description can then also be transferred via PROFIBUS® PA.

1. Select the FIELDBUS menu item in the SYSTEM SETTINGS menu and press [ENTER].

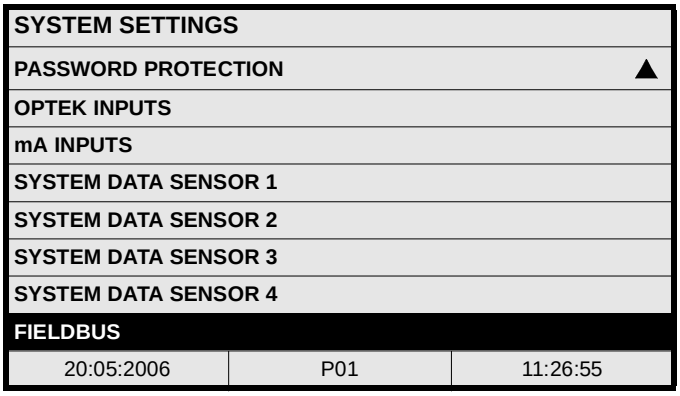


Fig. 138 System settings menu, choosing fieldbus

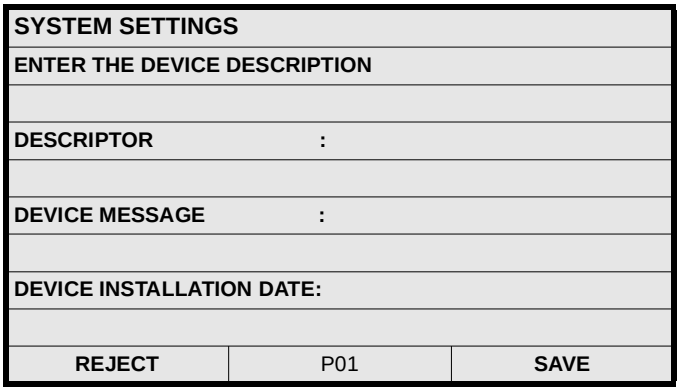


Fig. 139 Enter the device description

2. Select DESCRIPTOR and press [ENTER]. The character field appears.
3. Via the character field, enter a new name for the DESCRIPTOR. It is saved with the relative index 20 of the physical block (see instruction manual PROFIBUS® PA).
4. After entering the text, select OK and press [ENTER].
   The character field is closed and the cursor moves to the DEVICE MESSAGE menu item.
5. Press [ENTER].
   The character field appears.

6. Via the character field, enter a new name for the DEVICE MESSAGE. It is saved with the relative index 21 of the physical block (see instruction manual PROFIBUS® PA).
7. After entering the text, select OK and press [ENTER].
   The character field is closed and the cursor moves to the DEVICE INSTALLATION DATE menu item.
8. Press [ENTER].
   The character field appears.
9. Via the character field, enter a date as the DEVICE INSTALLATION DATE. It is saved with the relative index 22 of the physical block (see instruction manual PROFIBUS® PA).
10. Save the settings.
    The SYSTEM SETTINGS menu appears.

Note!
The entries serve to describe the field device and can be read out with the corresponding indices of the physical block of the field device (see instruction manual PROFIBUS® PA).

9.11 Maintenance

Note!
Measuring mode is switched off during maintenance. Measuring mode is restarted upon return to the main menu.

9.11.1 Hold manually

With this function, the "Hold" function defined in the SYSTEM SETTINGS menu is enabled and disabled. This may be necessary during maintenance if you wish to retain a fix signal and do not want to forward faulty results to an external system (e.g. PLC).

1. Select MAINTENANCE from the main menu and press [ENTER].

MAIN MENU		
MEASUREMENT DISPLAY		
DATA LOGGER DISPLAY		
SYSTEM INFORMATION DISPLAY		
PRODUCT CHANGE		
PRODUCT CONFIGURATION		
SYSTEM SETTINGS		
MAINTENANCE		
LANGUAGE / SPRACHE		
20:05:2006	P01	11:26:55

Fig. 140 Main menu, choosing maintenance

2. Select HOLD MANUALLY and press [ENTER]. The definitions of the hold function (chapter 9.10.12, page 119) appear on the display.

Note!
If you have chosen the HOLD 1 function in the SYSTEM SETTINGS menu, the converter freezes displays and outputs; if you have chosen the HOLD 2 function, the converter only freezes outputs.

MAINTENANCE		
HOLD MANUALLY		
ZERO POINT SETTING MANUALLY		
SYSTEM DIAGNOSTICS		
SENSOR ADAPTATION		
CALIBRATION SCATTERED LIGHT		
CALIBRATION mA INPUTS		
CALIBRATION mA OUTPUTS		
SERVICE		
20:05:2006	P01	11:26:55

Fig. 141 Menu maintenance, choosing hold manually

3. The "Activate hold with enter" message pops up.

HOLD MANUALLY		
HOLD FREEZES		
DISPLAY		: NO
OUTPUTS		: YES
HOLD MESSAGE ON MEASUREMENT		
DISPLAY		: YES
ACTIVATE HOLD WITH ENTER		
20:05:2006	P01	11:26:55

Fig. 142 Menu hold manually

4. Press [ENTER] to enable HOLD. A message with date and time appears.
5. Press [CLEAR] to acknowledge the message. The previous menu appears.

If HOLD is already enabled, the "Deactivate hold with enter" message appears. Press [ENTER] to disable HOLD. The previous menu appears.
When HOLD is enabled, the "Hold" message in the status bar appears alternately instead of date and time.

9.11.2 Setting system zero point

9.11.2.1 System zero point manually

During commissioning, and routine checks, after lamp change or maintenance, always check the system zero point. To check or set the system zero point correctly, proceed as follows:

- Clean the windows of the sensor body or the probe.
- Fill the sensor body with clean particle-free water.
- There must not be any gas bubbles in the medium.
- Remove gas bubbles from the windows.
- Cover the sensor body so as to prevent direct sunlight from penetrating.
- Let the system work for at least 15 minutes before checking the system zero point.

1. Select a product you wish to zero the measuring results for (here, P01 preselected).
2. Select MAINTENANCE from the main menu and press [ENTER].

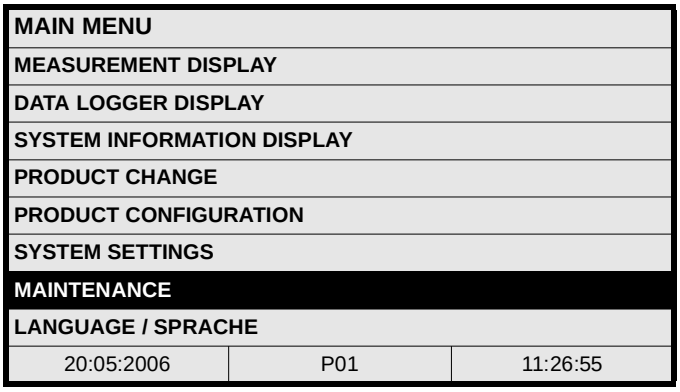


Fig. 143 Main menu, choosing maintenance

3. Select ZERO POINT SETTING MANUALLY and press [ENTER]. The measuring results of the current product appear. If a faulty entry is used for a measuring result, a "SIGNAL LOSS" message appears instead of the measuring result. You cannot perform a zero point check for these inputs.

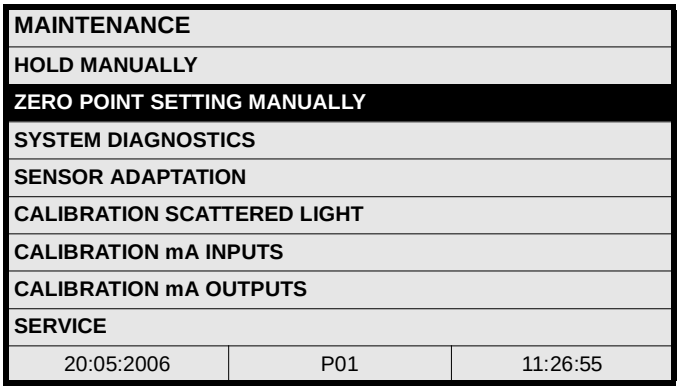


Fig. 144 Menu maintenance, choosing zero point setting manually

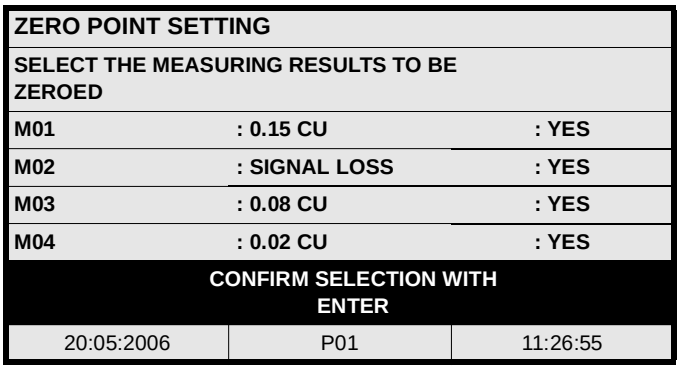


Fig. 145 Confirming zero point selection

4. Select a measuring result and press [ENTER]. Select YES if you want to perform a zero point check for this measuring result, and NO if you do not wish to do this.
5. If the NO option was selected for a measuring result, which is connected to another measuring result, the "Check input assignment!" error message appears. For checking, go to the MEASURING RESULT MONITOR menu (see chapter 9.11.8.2.3, page 155).
6. Press [CLEAR].
7. After selecting all measuring results you want to zero, select the CONFIRM SELECTION WITH ENTER menu item and press [ENTER].
8. The "TO SET NEW ZERO POINT PRESS ENTER" message pops up.
9. Press [ENTER].

Note!
In case of using several sensors, the system zero point can be set independently!

10. After setting the system zero point, all measuring results are 0.00 or 100 % for transmission measurements (format and unit correspond to the set product).
    If linearization table or slope + offset functions are used to change the zero point the calculated value will be displayed.
11. Press [CLEAR] twice to return to the main menu.

Note!
Zeroing is carried out for optek inputs, which are used for the measuring result marked with YES!

The system displays the input assignments of all products in the MEASURING RESULT MONITOR (see chapter 9.11.8.2.3, page 155)!

Zeroing is not possible for functions using the factory zero point.

9.11.3 System diagnostics

With this function, the converter can perform a self test. The self test lasts approx. 1 to 2 minutes, depending on the number of inputs to be checked. During the self test, the current hardware configuration is checked and compared to the configuration found upon booting of the converter. Compliance is indicated by a check mark.

The following components are checked or tested:

- Communication between the various microcontrollers at the converter
- Memory for calibration data and system parameters
- Inputs A to D, if available, regarding leakage current and calibration

A successfully completed self test verifies that the system is working properly. If a fault is found, a corresponding error message including fault number appears (also see chapter 9.14, page 177).

1. Select MAINTENANCE from the main menu and press [ENTER].
2. Select SYSTEM DIAGNOSTICS and press [ENTER].

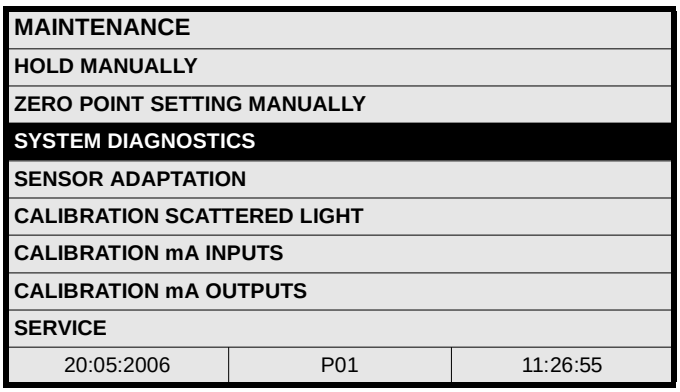


Fig. 146 Menu maintenance, choosing system diagnostics

3. To start the self test, press [ENTER]. The progress of the individual tests and checks is displayed graphically, a successfully completed test is indicated by a check mark.

SYSTEM DIAGNOSTICS		
THE SYSTEM PERFORMS AN AUTOMATIC SELF TEST		
START SELF TEST WITH ENTER		
20:05:2006	P01	11:26:55

Fig. 147 System diagnostics

SYSTEM DIAGNOSTICS		
THE SYSTEM PERFORMS AN AUTOMATIC SELF TEST		
CONFIGURATION	✔	
MC02 I2C-Bus	✔	
SLAVES EEPROMs	✔	
SENSOR INPUTS	A✔ C✔ B✔ D✔	
RETURN WITH CLEAR		
20:05:2006	P01	11:26:55

Fig. 148 Display during system diagnostics

4. Press [CLEAR] to return to the previous menu.

9.11.4 Sensor adaptation

With this function, each measuring result can be corrected by one factor. This is useful when, for example, two sensors of different optical path lengths (window distance) or different filters are to display the same results without resorting to the linearization function.

1. Select MAINTENANCE from the main menu and press [ENTER].
2. Select SENSOR ADAPTATION and press [ENTER].

MAINTENANCE		
HOLD MANUALLY		
ZERO POINT SETTING MANUALLY		
SYSTEM DIAGNOSTICS		
SENSOR ADAPTATION		
CALIBRATION SCATTERED LIGHT		
CALIBRATION mA INPUTS		
CALIBRATION mA OUTPUTS		
SERVICE		
20:05:2006	P01	11:26:55

Fig. 149 Menu maintenance, sensor adaptation

3. Select FUNCTION and press [ENTER]. A list appears. Select the function you want to adapt and press [ENTER].
   In table 7 "Measuring functions for evaluating detector signals" on page 59 all possibilities are listed.

SENSOR ADAPTATION		
APPLY FACTOR FOR ADAPTATION OF FACTORY CALIBRATION		ABS -CU (A)
		ABS -CU (B)
FUNCTION :		ABS -CU (C)
		ABS -CU (D)
FACTOR (0.6 - 1.4) : 1.000		ABS -CU (A-C)
		ABS -CU (B-D)
		A-CU (A-C)-(B-D)
FACTORY SETTINGS		%TRANSM (A)
FACTOR =		%TRANSM (B)
20:05:2006	P01	11:26:55

Fig. 150 Choosing factor for adaptation of measuring function

4. The cursor moves to the FACTOR menu item. Press [ENTER], type in a factor within the range of 0.600 to 1.400 via the numerical keyboard and press [ENTER].
   The factor applies directly for the selected measuring function.
   Consequently, all measuring results in all products which use this measuring function are multiplied by this factor.

Note!
Proceed with caution!

SENSOR ADAPTATION		
APPLY FACTOR FOR ADAPTATION OF FACTORY CALIBRATION		
FUNCTION : ABS -CU (A)		
FACTOR (0.6 - 1.4) : 1.000		
FACTORY SETTING DONE WITH		
FACTOR = 1.000		
20:05:2006	P01	11:26:55

Fig. 151 Choosing the measuring function to be adapted

- Measuring functions such as ABS-CU (A-C) or %TRANSM (A/C) are composed of the basic functions ABS-CU (A) and ABS-CU (C) or %TRANSM (A) and %TRANSM (C). Thus, they can be adapted by 3 factors.
- With A-CU (A-C)-(B-D), up to 7 factors are possible.
- Measuring functions such as TURB (A/C)-(B/D) are composed of basic functions TURB (A/C) and TURB (B/D). Thus, they can be adapted by 3 factors.

5. Save the setting. The MAINTENANCE menu appears.

Note!
You can enter the factors for various functions one after another. You can save and use all factors for calculation at a time.

9.11.5 Calibration scattered light

This chapter only applies to converters C4201, C4202, C4221, C4222, C4322, C4422, C4251, C4252, C4352 and C4452 since one or two scattered light sensors can be connected to them.
With this function, you can enter calibration factors for two model TF16 scattered light sensors. Sensor 1 is assigned to inputs A and C and sensor 2 is assigned to inputs B and D.

1. Select MAINTENANCE from the main menu and press [ENTER].
2. Select CALIBRATION SCATTERED LIGHT and press [ENTER].

MAINTENANCE		
HOLD MANUALLY		
ZERO POINT SETTING MANUALLY		
SYSTEM DIAGNOSTICS		
SENSOR ADAPTATION		
CALIBRATION SCATTERED LIGHT		
CALIBRATION mA INPUTS		
CALIBRATION mA OUTPUTS		
SERVICE		
20:05:2006	P01	11:26:55

Fig. 152 Menu maintenance, choosing calibration scattered light

3. Select SENSOR TF16 and press [ENTER]. A list appears.

CALIBRATION SCATTERED LIGHT		
CHOOSE YOUR SENSOR		
SENSOR TF16		SENSOR1 (A/C) NEW SENSOR2 (B/D) NEW SENSOR1 (A/C) OLD SENSOR2 (B/D) OLD
PARAMETER INPUT		
REJECT	P01	SAVE

Fig. 153 Calibration scattered light menu, choosing sensor

Note!
SENSOR (A/C) or (B/D) NEW: Uses the new scattered light parameter (18 digits) provided with sensors shipped after 1st December 2007. The 18-digit scattered light parameter contains the data of the calibration factor, the medium and the sensor type.

SENSOR (A/C) or (B/D) OLD: Uses the old scattered light parameter (6 digits) provided with sensors shipped before 1st December 2007.
Select your sensor accordingly and press [ENTER].

4. Press [ENTER] again. Parameters for calibration are displayed. Enter the parameters via the numerical keyboard and press [ENTER].

CALIBRATION SCATTERED LIGHT		
CHOOSE YOUR SENSOR		
SENSOR:		SENSOR 1 (A/C) NEW
PARAMETER INPUT:		
100000000000100046		
REJECT	P01	**SAVE**

Fig. 154 Calibration scattered light menu, parameter input

5. Repeat the entries for the other sensor if necessary.
6. Save the setting.

Note!
To be able to use new sensors with old converters (delivery before the 1st December 2007), the old 6-digit scattered light parameter is still provided next to the new 18-digit scattered light parameter. The value can be entered the usual way into old converters.

If a sensor, which was calibrated with the old 6-digit scattered light parameter before the 1st December 2007, is to be operated with a new converter (delivery after 1st December 2007), choose SENSOR (A/C) or (B/D) OLD and enter the 6-digit scattered light factor via the numeric keyboard the usual way.

9.11.6 Calibration mA-inputs

This chapter only applies to converters C4121, C4221, C4222, C4322, and C4422, since they are equipped with mA-inputs. With this function, you can calibrate mA-inputs anew. The calibration of the 4 - 20 mA-input is carried out at 4.00 mA = 0 % and 16.80 mA = 80 % of the input range.

Calibration with factory settings

1. Select MAINTENANCE from the main menu and press [ENTER].
2. Select CALIBRATION mA INPUTS and press [ENTER].

MAINTENANCE		
HOLD MANUALLY		
ZERO POINT SETTING MANUALLY		
SYSTEM DIAGNOSTICS		
SENSOR ADAPTATION		
CALIBRATION SCATTERED LIGHT		
CALIBRATION mA INPUTS		
CALIBRATION mA OUTPUTS		
SERVICE		
20:05:2006	P01	11:26:55

Fig. 155 Menu maintenance, choosing calibration mA-inputs

3. Press [ENTER] in the CALIBRATION mA INPUTS menu. A list appears. Select the mA-input which is connected or which you want to calibrate (IN1 or IN2). Press [ENTER].

CALIBRATION mA INPUTS			
mA INPUT	**: IN 1**		
CALIBRATION	**: NEW**		
		SETPOINT	**ACTUAL**
0 %	**:**	**4.00**	**0.025**
80 %	**:**	**16.80**	**0.025**
REJECT	P01		**SAVE**

Fig. 156 Calibration mA-inputs - choosing the mA-input

4. The cursor moves to the CALIBRATION menu item. Press [ENTER]. A list appears. Select FACTORY SETTINGS and press [ENTER].
5. Save the setting.

Performing new calibration

1. Perform point 1 to point 3 mentioned above.
2. Select the NEW value in the CALIBRATION menu item and press [ENTER]. The cursor moves to the 0 % menu item.
3. Connect the power source. The converter displays the measured value in the ACTUAL column.
4. Set the power source to 4.00 mA and press [ENTER] after 5 seconds. The value 0 % is assigned to the actual value.
5. The cursor moves to the 80 % menu item.
6. Set the power source to 16.80 mA and press [ENTER] after 5 seconds. The value 80 % is assigned to the actual value.
7. The converter calculates new calibration data.
8. For checking the calibration items, you can use the ▲ or ▼ arrow keys.
9. Save the setting.

If the system zero point deviates by more than 1 mA and slope by more than 15 %, a hardware failure may have occurred and saving is impossible. Reset calibration to the factory settings.

9.11.7 Calibration mA-outputs

With this function, you can calibrate the mA-outputs anew. The calibration of mA-outputs is carried out at 0 % and 80 % of the range.
When the mA-outputs are set to the basic setting of 4 - 20 mA (in the mA OUTPUT menu item in SYSTEM SETTINGS see chapter 9.10.9, page 113), the calibration range of 0 % and 80 % represents the values 4.00 and 16.80 mA.
When the mA-outputs are set to the the basic setting 0-20 mA, the calibration range of 0 % and 80 % represents the values 0.00 and 16.00 mA.

Calibration with factory settings

1. Select MAINTENANCE from the main menu and press [ENTER].
2. Select CALIBRATION mA OUTPUTS and press [ENTER].

MAINTENANCE		
HOLD MANUALLY		
ZERO POINT SETTING MANUALLY		
SYSTEM DIAGNOSTICS		
SENSOR ADAPTATION		
CALIBRATION SCATTERED LIGHT		
CALIBRATION mA INPUTS		
CALIBRATION mA OUTPUTS		
SERVICE		
20:05:2006	P01	11:26:55

Fig. 157 Menu maintenance, choosing calibration mA-outputs

3. Press [ENTER] in the CALIBRATION mA OUTPUTS menu. A list appears. Select an output you want to calibrate. Press [ENTER].

CALIBRATION mA OUTPUTS			
mA OUTPUT	: OUT 1		
RANGE	: 4 - 20 mA		
CALIBRATION	: NEW		
	SETPOINT	ACTUAL	
0 %	: 4.00		
80 %	: 16.80		
REJECT	P01	SAVE	

Fig. 158 Calibration mA-outputs - choosing the mA-output

4. The cursor moves to the CALIBRATION menu item. Press [ENTER]. A list appears. Select FACTORY SETTINGS and press [ENTER].
5. Save the setting.

Performing new calibration

1. Perform point 1 to point 3 mentioned above.
2. Select the NEW value in the CALIBRATION menu item and press [ENTER]. The cursor moves to the 0 % menu item.
3. Connect the digital multimeter (DMM) to the mA-output to be calibrated.
4. Enter the measuring result of the DMM in the ACTUAL column and press [ENTER].
5. The value 0 % is assigned to the actual value.
6. The cursor moves to the 80 % menu item.
7. Enter the measuring result of the DMM as ACTUAL and press [ENTER].
8. The value 80 % is assigned to the actual value.
9. The converter calculates new calibration data.
10. For checking the calibration items, you can use the ▲ or ▼ arrow keys.
11. Save the setting.

If the zero point deviates by more than 1 mA and slope by more than 15 %, a hardware failure may have occurred and saving is impossible. Reset calibration to the factory settings.

9.11.8 Service

The SERVICE menu provides various menu items, which display internal system parameters and settings to support fault finding.

1. Select MAINTENANCE from the main menu and press [ENTER].
2. Select SERVICE and press [ENTER]. The SERVICE menu appears.

MAINTENANCE		
HOLD MANUALLY		
ZERO POINT SETTING MANUALLY		
SYSTEM DIAGNOSTICS		
SENSOR ADAPTATION		
CALIBRATION SCATTERED LIGHT		
CALIBRATION mA INPUTS		
CALIBRATION mA OUTPUTS		
SERVICE		
20:05:2006	P01	11:26:55

Fig. 159 Maintenance menu, choosing service

Amongst others, the following functions are provided:

- ENTER PASSWORD is used for entering and changing a password.
- Under MONITORS you can view all system monitors, e.g. lamp monitor, detector monitor or subassembly monitor.
- PC TRANSFER allows you to establish communication between the converter and a PC via an RS-232 port.
- RESET CONVERTER resets your converter to delivery state.

SERVICE		
ENTER PASSWORD		
MONITORS		
PC TRANSFER		
RESET CONVERTER		
20:05:2006	P01	11:26:55

Fig. 160 Menu service, choosing enter password

9.11.8.1 Entering password

With this function, you can enter or disable a password.

1. Select the function ENTER PASSWORD in the SERVICE menu and press [ENTER].
2. Enter a password of 8 digits max. By doing this, the password is displayed with the ⋆-character instead of the figures.
3. Press [ENTER]. To disable an active password, only press [ENTER] without entering any figures. In both cases the SERVICE menu appears.

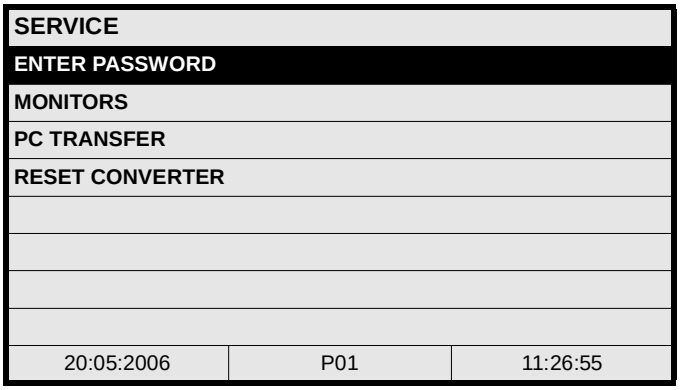


Fig. 161 Menu service, choosing enter password

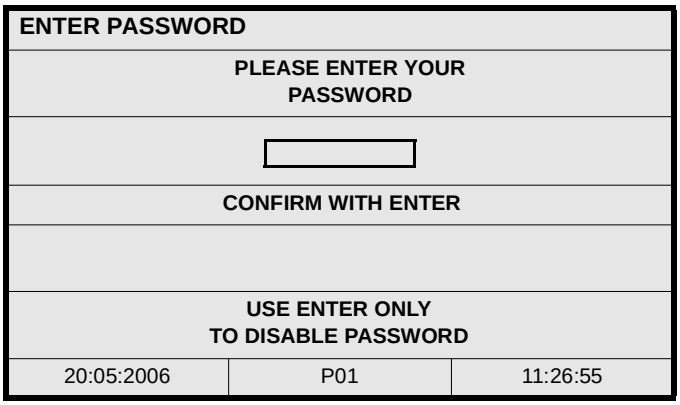


Fig. 162 Entering a password

9.11.8.2 Monitors

The MONITORS menu offers a series of menu items displaying internal system parameters and settings to support you in your search for errors. The following monitors are available:

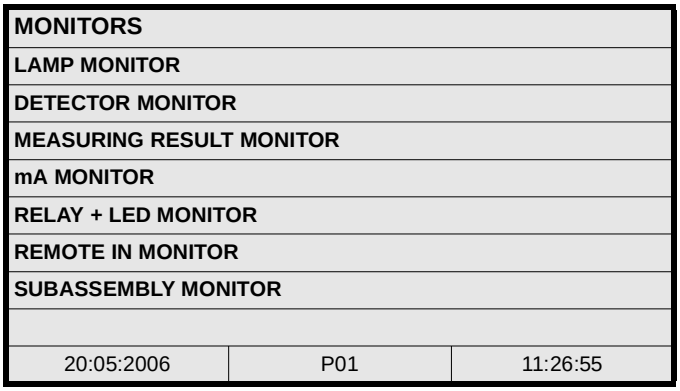


Fig. 163 Menu service, choosing monitors

9.11.8.2.1 Lamp monitor

This function shows the set lamp voltage and the measured lamp current.

1. Select the LAMP MONITOR function in the MONITORS menu and press [ENTER].

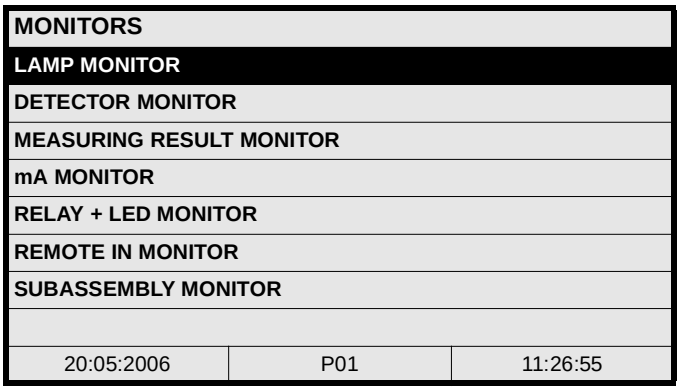


Fig. 164 Menu service, choosing lamp monitor

2. Select LAMP OUTPUT. A list appears. Select a lamp output (e. g. lamp E) and press [ENTER].

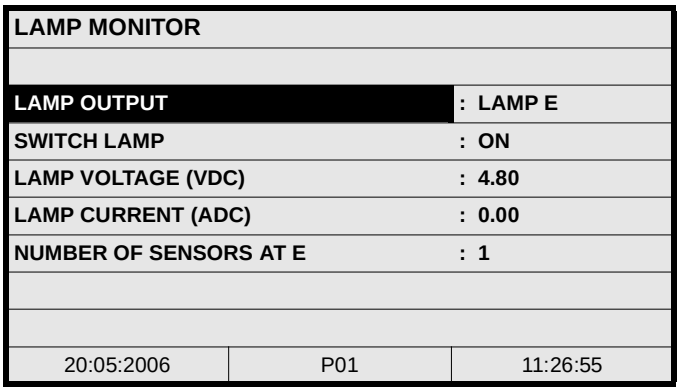


Fig. 165 Lamp monitor

3. The cursor moves to the SWITCH LAMP menu item. Press [ENTER]. A list appears. Choose if you want to switch the lamp output on or off and press [ENTER]. When the lamp output is switched off, the system sets the lamp voltage to 0.00 VDC. The current measured falls under 0.05 ADC.
4. Press [CLEAR] to return to the previous menu.

Note!
Switching off the lamp triggers error message 1003 "Failure lamp E", if a lamp is connected to the system. The LAMP MONITOR menu engages in the system settings via the user contrary to all other monitors.

Note!
After maintenance switch the lamp outputs on again!
For the LAMP CURRENT menu item, observe the following:

- When lamps fails in the sensors AF16, AS16, AS56, AF26, and TF16-N, lamp current falls under 0.05 ADC!
- When lamps fails in the sensors AF45 and AF46, lamp current falls to 0.15 - 0.25 ADC if the voltage transformer in the sensor works properly.
- Typical lamp currents for the sensors AF16, AS16, AF26, and TF16-N are approx. 0.75 ADC!
- Typical lamp currents for the sensors AS56 are approx. 0.43 ADC!
- Typical lamp currents for the sensors AF45, and AF46 are approx. 0.85 ADC!

9.11.8.2.2 Detector monitor

With this function, the real-time detector currents and the currents measured at the last zero point setting can be displayed in nanoampere (1/1000000 mA).

1. Select the DETECTOR MONITOR function in the MONITORS menu and press [ENTER].

MONITORS		
LAMP MONITOR		
DETECTOR MONITOR		
MEASURING RESULT MONITOR		
mA MONITOR		
RELAY + LED MONITOR		
REMOTE IN MONITOR		
SUBASSEMBLY MONITOR		
20:05:2006	P01	11:26:55

Fig. 166 Menu service, choosing detector monitor

2. Select DETECTOR INPUT. A list appears. Select a detector input (e. g. CHANNEL A). You can only select installed and enabled optek inputs.
3. Press [ENTER]. The converter calculates the CU value for the current PHOTO CURRENT (CU) with and without sensor adaptation and the MAX. RANGE in CU.
4. Press [CLEAR] to return to the previous menu.

DETECTOR MONITOR		
DETECTOR INPUT	:	CHANNEL A
PHOTO CURRENT (nA)	:	0.010
ZERO CURRENT (nA)	:	557863.200
PHOTO CURRENT (CU)	:	7.747
INCL.SEN.ADAPTATION (CU)		
MAX. RANGE (CU)	:	6.048
20:05:2006	P01	11:26:55

Fig. 167 Detector monitor

Note!

- The system calculates a negative CU value for the photo current when the actual photo current is higher than the photo current at the last zero point setting. In this case, you should check the absorbance and transmission measurements.
- Turbidity causes the detector current to rise in channel A or B at sensor TF16-N.
- Turbidity causes the detector current to fall in channel C or D at sensor TF16-N.
- The measuring range should not exceed the MAX. RANGE.
- If necessary, increase the optical path length (OPL) or change the measuring wavelength.
- If measuring results in CU exceed MAX. RANGE (detector current approx. 0.25 nA), the system enables FAILSAFE and triggers the SIGNAL LOSS error message.

9.11.8.2.3 Measuring result monitor

With this function, the measuring functions, mA-inputs, linearization and slope + offset functions as well as the occupied optek inputs for all selected products and measuring results can be displayed.

1. Select the MEASURING RESULT MONITOR function in the MONITORS menu and press [ENTER].

MONITORS		
LAMP MONITOR		
DETECTOR MONITOR		
MEASURING RESULT MONITOR		
mA MONITOR		
RELAY + LED MONITOR		
REMOTE IN MONITOR		
SUBASSEMBLY MONITOR		
20:05:2006	P01	11:26:55

Fig. 168 Menu service, choosing measuring result monitor

2. Select PRODUCT. A list appears. Select a product (e.g. P01) and press [ENTER]. Measuring results, measuring functions and the necessary inputs are displayed for this product.
3. Press [CLEAR] to return to the previous menu.

MEASURING RESULT MONITOR		
PRODUCT	: P01	
MEAS. RESULT	FUNCTION	
M01	: ABS -CU (A)	
M02	: ABS -CU (A)	
M03	: ABS -CU (A)	
M04	: ABS -CU (A)	
20:05:2006	P01	11:26:55

Fig. 169 Menu measuring result monitor

Note!
Functions are only symbolically displayed and not with the user-defined name.

9.11.8.2.4 mA Monitor

This function allows you to display mA outputs and mA inputs in mA and %.

1. Select the mA MONITOR function in the MONITORS menu and press [ENTER].

MONITORS		
LAMP MONITOR		
DETECTOR MONITOR		
MEASURING RESULT MONITOR		
mA MONITOR		
RELAY + LED MONITOR		
REMOTE IN MONITOR		
SUBASSEMBLY MONITOR		
20:05:2006	P01	11:26:55

Fig. 170 Menu service, choosing mA monitor

2. The mA MONITOR menu appears. The system display mA outputs and mA inputs in mA and %.

mA MONITOR		
	[mA]	[%]
mA OUTPUT 1	21.60	110.00
mA OUTPUT 2	21.60	110.00
mA OUTPUT 3	21.60	110.00
mA OUTPUT 4	21.60	110.00
mA INPUT 1	0.02	-24.83
mA INPUT 2	0.03	-24.77
20:05:2006	P01	11:26:55

Fig. 171 mA monitor menu

3. Press [CLEAR] to return to the previous menu.

Note!
If inputs or outputs are not available, no values are displayed.

9.11.8.2.5 Relay + LED monitor

With this function, the current status of the light emitting diodes, the calculated switching status of the LEDs and the contact status of the relays are displayed.

1. Select the RELAY + LED MONITOR function in the MONITORS menu and press [ENTER].

MONITORS		
LAMP MONITOR		
DETECTOR MONITOR		
MEASURING RESULT MONITOR		
mA MONITOR		
RELAY + LED MONITOR		
REMOTE IN MONITOR		
SUBASSEMBLY MONITOR		
20:05:2006	P01	11:26:55

Fig. 172 Menu service, choosing relay + LED monitor

2. The RELAY + LED MONITOR menu appears. If the displays do not correspond to the current LED or relay status, a hardware failure has probably occurred.
3. Press [CLEAR] to return to the previous menu.

RELAY + LED MONITOR				
			CONTACT	LED
POWER ON		:	- - -	GREEN
RELAY 1	10-11	:	OPEN	OFF
RELAY 2	12-13	:	OPEN	OFF
RELAY 3	14-15	:	OPEN	OFF
RELAY 4	16-17	:	NOT ACTIVE	OFF
20:05:2006		P01		11:26:55

Fig. 173 Menu relay + LED monitor

Note!

- LEDs and relays are independent of each other when the relay outputs are set to Remote Out in the SYSTEM SETTINGS menu (see chapter 9.10.10, page 115).
- The switching status of a LED is determined by limit value, alarm type and current measuring result.
- The update is not synchronous with the red status LED.
- The Relay + LED Monitor shows a snapshot, because measuring operation is not carried out (see "Information on the measuring mode", chapter 9.2.2, page 41).

Note!

- The relays 1 to 3 can be set for limit values or status feedback.
- The relays 1 to 3 can be defined normally open or normally closed.
- The system relay 4 provides two active contacts. It changes the switching status as soon as voltage is applied to the converter. It opens, if a system error occurs. It closes when the measuring mode is o.k.

9.11.8.2.6 Remote In monitor

This menu is described in chapter 9.12.1.1, page 164.

9.11.8.2.7 Subassembly monitor

With this function, the installed subassemblies can be displayed.

1. Select the SUBASSEMBLY MONITOR function in the MONITORS menu and press [ENTER].

MONITORS		
LAMP MONITOR		
DETECTOR MONITOR		
MEASURING RESULT MONITOR		
mA MONITOR		
RELAY + LED MONITOR		
REMOTE IN MONITOR		
SUBASSEMBLY MONITOR		
20:05:2006	P01	11:26:55

Fig. 174 Menu service, choosing subassembly monitor

2. The SUBASSEMBLY MONITOR menu appears. The system displays the exact board names including the revision codes for hardware and software. If the displays do not correspond to the present subassemblies, a hardware failure has probably occurred. "Address" signifies internal addresses on the bus board.

SUBASSEMBLY MONITOR					
		BOARD	HW	SW	DC
FRONT PANEL	:	MC-02	C1	A2	5R0✔
ADDRESS 1	:	MA-11-2	A2	A1	5T1✔
ADDRESS 2	:	MA-11-2	A2	A1	5T1✔
ADDRESS 3	:	IO-12	A2	A2	3R5✔
ADDRESS 4	:	IO-13	A2	A3	3R3✔
ADDRESS 5	:	IO-14	A2	A3	5T2✔
20:05:2006		P01		11:26:55	

Fig. 175 Subassembly monitor menu

Note!
The "Subassembly monitor menu" figure (fig. 175) shows the assemblies of a completely equipped converter.

Column "DC" contains variable specifications.

3. Press [CLEAR] to return to the previous menu.

Note!

- If the internal system communication is erroneous, information on one or several addresses can be missing.
- If a check mark at the end of a line is missing, the system has detected missing or questionable calibration data in this subassembly.
- When the circuit cards are changed, error message 1021 "Inconsistency in configuration" appears. Enter the SUBASSEMBLY MONITOR menu and save the configuration with [ENTER].

9.11.8.3 PC transfer

With this function, you can establish communication between the converter and a PC via an RS-232 interface. With a PC and the CONTROL 4000 PC-TRANSFER software, sold separately, you can perform the following functions:

Reading out the converter to a PC (read-out)

- Trend online for all 4 measuring results
- Data logger
- Parameter set
- Password protection and password allocation
- Formula set
- Calibration data scattered light

Reading in data from the PC to the converter (read-in)

- Parameter set
- Product configuration
- Linearization
- System settings
- Password protection and password allocation
- Formula set
- Calibration data scattered light
- Software update

System requirements for PC transfer:

486 or Pentium® with Windows® - 95, - 98, - NT, - 2000, -XP or Vista.

Note!

- Copy the present data set from the converter to the PC before transferring a new parameter set from the PC to the converter. This way, you can save all old data sets!
- At the beginning of a transfer to the converter, the system automatically replaces all existing parameters with default values.
- When the transfer is interrupted, the data sets are incomplete. Parameters which have not been transferred are automatically replaced with default values. In this case, repeat the transfer.

1. Select the PC TRANSFER function in the SERVICE menu and press [ENTER].

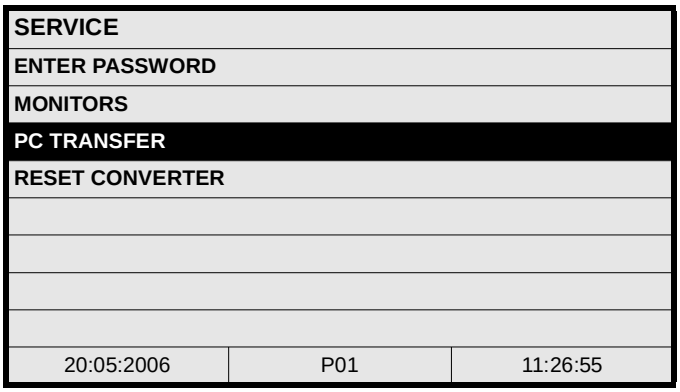


Fig. 176 Service menu, choosing PC transfer

2. The PC TRANSFER menu appears. You are asked to select the desired function from your PC.

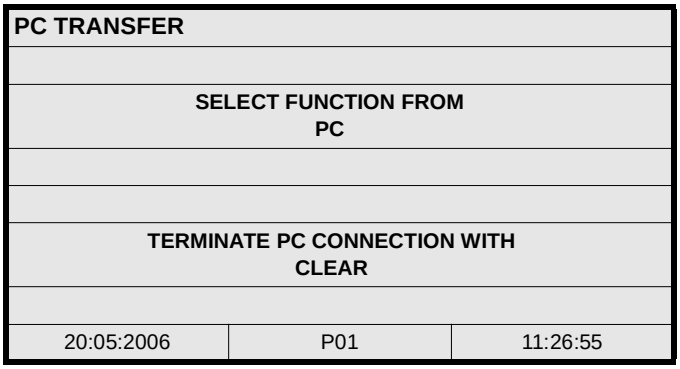


Fig. 177 PC transfer menu

3. Prior to commissioning the system, check the parameters at the converter.
4. Press [CLEAR] to return to the previous menu.

Note!

- The transfer times for all functions except for the data logger amount to only few seconds!
- Data transfer during read-out of the data logger amounts to 2-5 minutes for all 10,000 data points at 115 Kbits/s depending on the PC system.

9.11.8.4 Reset converter

This function allows you to reset your converter to delivery state.

1. Select the RESET CONVERTER function in the SERVICE menu and press [ENTER].

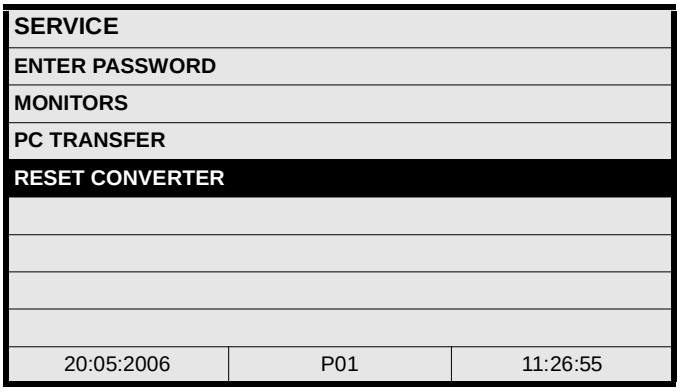


Fig. 178 Menu service, choosing reset converter

2. The RESET CONVERTER menu appears including a security check.

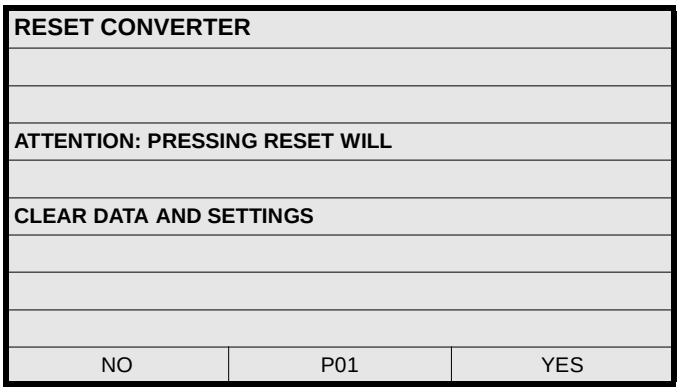


Fig. 179 Reset converter menu

3. Choose NO to return to the previous menu and not carry out a reset.
4. Choose YES to carry out a reset.

Note!
RESET CONVERTER deletes data and settings carried out by you. The converter is reset to its delivery state.
Linearization tables, offset and slope sets and mathematical functions are maintained, but disabled.

9.12 Control via an external control system (Remote)

Converters C4121, C4221, C4222, C4322 and C4422 can be controlled via an external control system.

9.12.1 Input signals from control system - Remote In

24 V DC control cables connected to the applicable remote input clamps are used to activate different converter functions:

- PRODUCT CHANGE
- SYSTEM ZERO POINT
- HOLD

It is required to have the corresponding remote functions enabled in the system settings. See the following chapters to enable the remote functions:

- SYSTEM ZERO POINT chapter 9.10.6, page 106
- PRODUCT CHANGE chapter 9.10.7, page 108
- HOLD chapter 9.10.12, page 119

For more information on the Remote In 1 and 2 functions, read chapter 9.10.11, page 117.

9.12.1.1 Remote In Monitor

With this function, you can display logical states of the control inputs "Remote In", and check the wiring at the "Remote In" inputs.

1. Select the SERVICE menu item in the MAINTENANCE menu and press [ENTER].
2. Select the MONITORS menu item in the SERVICE menu and press [ENTER].
3. Select the REMOTE IN MONITOR function in the MONITORS menu and press [ENTER].

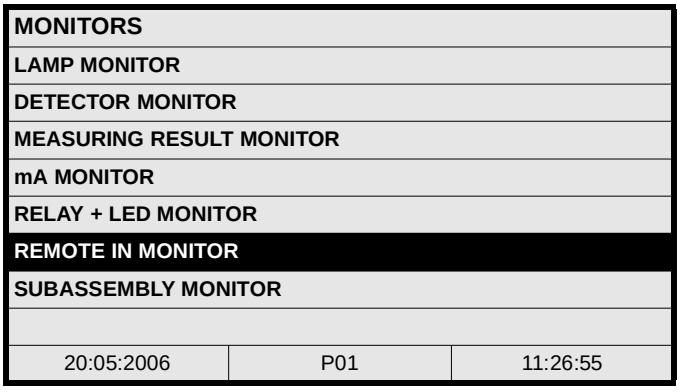


Fig. 180 Menu service, choosing Remote In Monitor

4. The REMOTE IN MONITOR menu appears. If the displays do not correspond to the current levels (wiring at Remote In), a hardware failure has probably occurred. The input R5 is not applied in this software.

REMOTE IN MONITOR		
REMOTE IN R1		: LOW
REMOTE IN R2		: LOW
REMOTE IN R3		: LOW
REMOTE IN R4		: LOW
REMOTE IN R5		: LOW
REMOTE IN RZ		: LOW
REMOTE IN RH		: LOW
REMOTE IN RV		: LOW
20:05:2006	P01	11:26:55

Fig. 181 Menu Remote In Monitor

5. Press [CLEAR] to return to the previous menu.

Note!

- Voltages of 19 - 29 VDC are detected as HIGH and voltages of 0 VDC as LOW.
- With R6 (RZ) = HIGH the system reads in the zero point (ZERO) when HIGH is confirmed by R8 (RV) = HIGH. The zero point is updated as long as R6 and R8 are in the HIGH state.
- With R7 (RH) the system enables or disables HOLD when HIGH is confirmed by R8 (RV) = HIGH. The system remains in this state which is selected by R7 when R8 becomes "LOW".
- When defining RV, the set states are taken over, i. e. product change, system zero point and hold can be triggered in the monitor!

9.12.1.2 Product change, setting the system zero point and the hold function in the Remote In 1 function

To perform a product change, to set the system zero point and the Hold function via the control system, the following signals must be allocated to the inputs "Remote In".
The signals should be allocated for at least one second to trigger a function. Before triggering a function, a confirmation signal (R8 = HIGH = VALID) is always necessary.

Note!
During product change, the converter is inoperable for three seconds since the parameter set of the new product configuration has to be loaded. All outputs with values set so far are frozen during this time!

"Remote In" inputs have the following functions:

- R1 + R2 + R3 = see table 11 = product selection P01 to P08
- R4 + R5 = low = not occupied
- R6 = low = no zeroing
- R6 = HIGH = global zeroing as long as R6 + R8 = HIGH
- R7 = low = do not freeze system
- R7 = HIGH = freeze system as long as R7 and R8 = HIGH
- R8 = HIGH = perform functions according to R1 to R7
- RR = return of signals = returning signals

Tab. 11 Remote signals at Remote In 1

Function	Remote input							
	R1	**R2**	**R3**	**R4**	**R5**	**R6**	**R7**	**R8**
Product change to product 1	low	low	low	low	low	low	low	HIGH
Product change to product 2	low	low	HIGH	low	low	low	low	HIGH
Product change to product 3	low	HIGH	low	low	low	low	low	HIGH
Product change to product 4	low	HIGH	HIGH	low	low	low	low	HIGH
Product change to product 5	HIGH	low	low	low	low	low	low	HIGH
Product change to product 6	HIGH	low	HIGH	low	low	low	low	HIGH
Product change to product 7	HIGH	HIGH	low	low	low	low	low	HIGH
Product change to product 8	HIGH	HIGH	HIGH	low	low	low	low	HIGH
Global zeroing for measuring results M01 to M04 for all products	Current product (see above)					HIGH	low	HIGH
HOLD (show, freeze outputs)						low	HIGH	HIGH
Disable HOLD						low	low	HIGH

Note!
If the signals for global zeroing and for the hold function are simultaneously triggered with R6 = R7 = HIGH, HOLD is enabled first. When HOLD is disabled, the measuring results are calculated with the current zeroing.

9.12.1.3 Product change, setting the system zero point and the hold function in the Remote In 2 function

The Remote In 2 function treats the remote inputs R1-R4 differently in dependence on R6. If R6 = LOW, all other inputs are treated as in Remote In 1. If R6 = HIGH, the inputs R1 - R4 are used to zero the measuring results M01 - M04 selectively, i. e. inputs A to D are only zeroed when occupied with selected measuring results of the current product.

The signals should be allocated for at least one second to trigger a function. Before triggering a function, a confirmation signal is always necessary (R8 = HIGH = VALID).

"Remote In" inputs have the following functions:

- if R6 = low
  - R1 + R2 + R3 = see table 12 = product selection P01 to P08
  - R4 + R5 = low = not occupied

- if R6 = HIGH
  - R1 + R2 + R3 + R4= see table 13 = measuring result selection M01 to M04
  - R5 = low = not occupied

- R7, R8 and RR have the following functions:
  - R7 = low = do not freeze system
  - R7 = HIGH = freeze system as long as R7 + R8 = HIGH
  - R8 = HIGH = perform functions according to R1 to R7
  - RR = return of signals = returning signals

Tab. 12 Remote signals at Remote In 2 if R6 = low

Function	Remote input							
	R1	**R2**	**R3**	**R4**	**R5**	**R6**	**R7**	**R8**
Product change to product 1	low	low	low	low	low	low	low	HIGH
Product change to product 2	low	low	HIGH	low	low	low	low	HIGH
Product change to product 3	low	HIGH	low	low	low	low	low	HIGH
Product change to product 4	low	HIGH	HIGH	low	low	low	low	HIGH
Product change to product 5	HIGH	low	low	low	low	low	low	HIGH
Product change to product 6	HIGH	low	HIGH	low	low	low	low	HIGH
Product change to product 7	HIGH	HIGH	low	low	low	low	low	HIGH
Product change to product 8	HIGH	HIGH	HIGH	low	low	low	low	HIGH
Enables HOLD	Current product (see above)					low	HIGH	HIGH
Disable HOLD						low	low	HIGH

Tab. 13 Remote signals at Remote In 2 when R6 = HIGH

Function	Remote input							
	R1	**R2**	**R3**	**R4**	**R5**	**R6**	**R7**	**R8**
Enable selective zeroing for M01	HIGH	low	low	low	low	HIGH	low	HIGH
Enable selective zeroing for M02	low	HIGH	low	low	low	HIGH	low	HIGH
Enable selective zeroing for M03	low	low	HIGH	low	low	HIGH	low	HIGH
Enable selective zeroing for M04	low	low	low	HIGH	low	HIGH	low	HIGH
Enable selective zeroing for all products	measuring results selection M01 - M04 (see above)				low	HIGH	low	HIGH

Note!

If the signals for selective zeroing and for the hold function are simultaneously triggered with R6 = R7 = HIGH, HOLD is enabled first. When HOLD is disabled, the measuring results are calculated with the current zeroing.

9.12.2 Output signals of the converter - Remote Out

All control lines (24 V) connected to relay outputs permit product status feedback to be sent to the control system.
It is required to have set the relay outputs to Remote Out 1, 2, or 3 in the system settings. See chapter 9.10.10, page 115 for how to set the relay outputs.

9.12.2.1 Status feedback via the Remote Out 1 function

The Remote Out 1 function uses the relay outputs REL01 and REL03 for status feedback, the output REL02 is not used. The relay output REL01 at the clamps 10-11 is only activated when product P01 is used. The relay output REL03 at the clamps 14-15 is only activated in the measuring mode.

The CONTACTS NORMAL can be set to OPEN or CLOSED. The relays switch as follows:

	OPEN	**CLOSED**
Relay 1	closed Product P01 open Product P02 - P08	open Product P01 closed Product P02 - P08
Relay 2	without function	without function
Relay 3	closed measuring mode running • in MEASUREMENT DISPLAY • in DATA LOGGER DISPLAY • in SYSTEM INFORMATION DISPLAY open Measurement currently impossible because of • enabled PRODUCT CHANGE (3 sec.) • enabled PRODUCT CONFIGURATION • enabled SYSTEM SETTINGS • enabled MAINTENANCE • enabled HOLD • enabled PC TRANSFER	open measuring mode running • in MEASUREMENT DISPLAY • in DATA LOGGER DISPLAY • in SYSTEM INFORMATION DISPLAY closed Measurement currently impossible because of • enabled PRODUCT CHANGE (3 sec.) • enabled PRODUCT CONFIGURATION • enabled SYSTEM SETTINGS • enabled MAINTENANCE • enabled HOLD • enabled PC TRANSFER

Tab. 14 Relay information

Note!

- During SIGNAL LOSS, the measuring mode remains active, REL03 remains closed. SIGNAL LOSS is made FAILSAFE.
- During lamp failure, the measuring mode remains active, REL03 remains closed and signal loss occurs. The system relay REL04 responds.
- You can combine Remote Out 1 with PROD_FEEDBACK (product feedback via mA-output).
- If the relays are defined as status feedback, they switch directly according to the current status (see above). A delay time for the limit values is not effected. Set limit values remain valid. It is still indicated by the limit value LEDs on the front panel when values exceed or fall below the set limit values.

Relay output 4 (system relay):

The (active) relay responds and switches as follows when switching on the converter:

Relay 4 (active):	open	SYSTEM ERROR such as: • no voltage supply • lamp failure • communication error • reading error • configuration error
	closed	SYSTEM OKAY

9.12.2.2 Status feedback via the Remote Out 2 function

The Remote Out 2 function enhances the Remote Out 1 function to three products. The relay outputs REL01, REL02, and REL03 are used for status feedback. The relay outputs REL01 and REL02 at the clamps 10-11 and 12-13 are only activated when products P01, P02 or P03 are used.
The relay output REL03 at the clamps 14-15 is only activated in the measuring mode.

When the CONTACTS NORMAL are set to OPEN, the relays switch as follows:

Tab. 15 Relay status in Remote Out 2

Product	P01	P02	P03	P04 to P08
Relay 1	closed	open	closed	open
Relay 2	open	closed	closed	open

Relay 3: closed measuring mode
- in MEASUREMENT DISPLAY
- in DATA LOGGER DISPLAY
- in SYSTEM INFORMATION DISPLAY

open measurement currently impossible because of
- enabled PRODUCT CHANGE (3 sec.)
- enabled PRODUCT CONFIGURATION
- enabled SYSTEM SETTINGS
- enabled MAINTENANCE
- enabled HOLD
- enabled PC TRANSFER

When the CONTACTS NORMAL are set to CLOSED, the relays switch as follows:

Tab. 16 Relay status in Remote Out 2

Product	P01	P02	P03	P04 to P08
Relay 1	open	closed	open	closed
Relay 2	closed	open	open	closed

Relay 3: open measuring mode
- in MEASUREMENT DISPLAY
- in DATA LOGGER DISPLAY
- in SYSTEM INFORMATION DISPLAY

closed measurement currently impossible because of
- enabled PRODUCT CHANGE (3 sec.)
- enabled PRODUCT CONFIGURATION
- enabled SYSTEM SETTINGS
- enabled MAINTENANCE
- enabled HOLD
- enabled PC TRANSFER

Note!
- In case of SIGNAL LOSS, measuring operation is continued, REL01 and REL02 remain in the state according to table 15, REL03 remains closed!
- During lamp failure, the measuring mode remains active, REL01, REL02 remain in the state according to table 15, REL03 remains closed and signal loss occurs. The system relay REL04 responds.
- You can combine Remote Out 2 with PROD_FEEDBACK (product feedback via mA-output).
- If the relays are defined as status feedback, they switch directly according to the current status (see above). A delay time for the limit values is not effected. Set limit values remain valid. It is still indicated by the limit value LEDs on the front panel when values exceed or fall below the set limit values.

Relay output 4 (system relay):
The (active) relay responds and switches as follows when switching on the converter:

Relay 4 (active): open SYSTEM ERROR such as:
- no voltage supply
- lamp failure
- communication error
- reading error
- configuration error

closed SYSTEM OKAY

9.12.2.3 Status feedback via the Remote Out 3 function

The Remote Out 3 function uses the three relay outputs REL01, REL02, and REL03 solely for product feedback. The relays at the clamps 10-11, 12-13, and 14-15 are activated to indicate which of the products P01-P08 is currently used. By doing so, no information on the measuring mode is transferred.
When the CONTACTS NORMAL are set to OPEN, the relays switch as follows:

Tab. 17 Relay status in Remote Out 3

Product	P01	P02	P03	P04	P05	P06	P07	P08
Relay 1	closed	open	closed	open	closed	open	closed	open
Relay 2	open	closed	closed	open	open	closed	closed	open
Relay 3	open	open	open	closed	closed	closed	closed	open

When the CONTACTS NORMAL are set to CLOSED, the relays switch as follows:

Tab. 18 Relay status in Remote Out 3

Product	P01	P02	P03	P04	P05	P06	P07	P08
Relay 1	open	closed	open	closed	open	closed	open	closed
Relay 2	closed	open	open	closed	closed	open	open	closed
Relay 3	closed	closed	closed	open	open	open	open	closed

Note!

- During lamp failure, a signal loss occurs. The system relay REL04 responds.
- Remote Out 3 provides the same information as the PROD_FEEDBACK (product feedback via mA-output) function.
- If the relays are defined as status feedback, they switch directly according to the current status (see above). A delay time for the limit values is not effected. Set limit values remain valid. It is still indicated by the limit value LEDs on the front panel when values exceed or fall below the set limit values.

Relay output 4 (system relay):
The (active) relay responds and switches as follows when switching on the converter:

Relay 4 (active): open — SYSTEM ERROR such as:

- no voltage supply
- lamp failure
- communication error
- reading error
- configuration error

closed — SYSTEM OKAY

9.12.2.4 Status feedback via mA-output

When the PROD_FEEDBACK function is set during definition of the measuring results in the FUNCTION menu item of the PRODUCT CONFIGURATION menu, the current product measured in the "measuring range" 0-16 is displayed. The results are corresponding values in the data logger or at the mA-output:

Tab. 19 Values in the data logger or at the mA-output

Current product	Measuring result PROD.	Data logger	0-20 mA	4-20 mA
Product 1	1 PROD	1 PROD	1.25	5.00
Product 2	2 PROD	2 PROD	2.50	6.00
Product 3	3 PROD	3 PROD	3.75	7.00
Product 4	4 PROD	4 PROD	5.00	8.00
Product 5	5 PROD	5 PROD	6.25	9.00
Product 6	6 PROD	6 PROD	7.50	10.00
Product 7	7 PROD	7 PROD	8.75	11.00
Product 8	8 PROD	8 PROD	10.00	12.00

9.13 Factory settings

9.13.1 Define measuring result menu

The factory settings for the 4 measuring results in the 8 products are set to measuring function ABS-CU (A) in the measuring range from 0 to 5.0 CU. Linearizations, mA-inputs and slope + offset are not active.

MEASURING RESULT: M01			
DEFINE NAME:	M01		
FUNCTION	ABS -CU (A)		
X mA INPUT	---		
X LINEARIZATION	---		
X SLOPE + OFFSET	---		
RANGE BEGIN / END		0.0	5.0
UNIT	CU		
FORMAT	+99.99		
REJECT	P02	SAVE	

Fig. 182 Menu measuring result M01

9.13.2 Lim. value menu

There are no factory settings for limit values.

LIM. VALUE: G01		
MEASUR. RESULT	- - - -	
RANGE BEGIN	- - - -	
RANGE END	- - - -	
UNIT	- - - -	
LIMIT VALUE	- - - -	
ALARM AFTER SEC.	- - - -	
ALARM TYPE	- - - -	
REJECT	P01	SAVE

Fig. 183 Limit value – define figure

9.13.3 Define display menu

The display 1 x 888.8 is set for the measuring result M01 for all products.

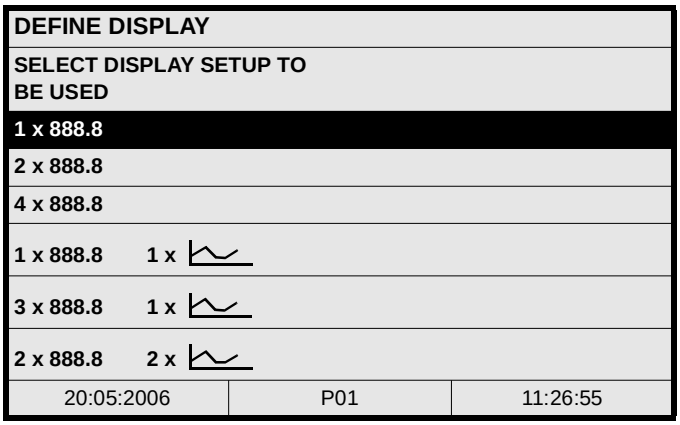


Fig. 184 Define display

9.13.4 Display settings menu

The factory settings CONTRAST, BRIGHTNESS and TEMPERATURE COMPENSATION do not have to be changed. The factory settings for the display are the following:

- contrast: 20
- brightness: 30
- temperature compensation: 5

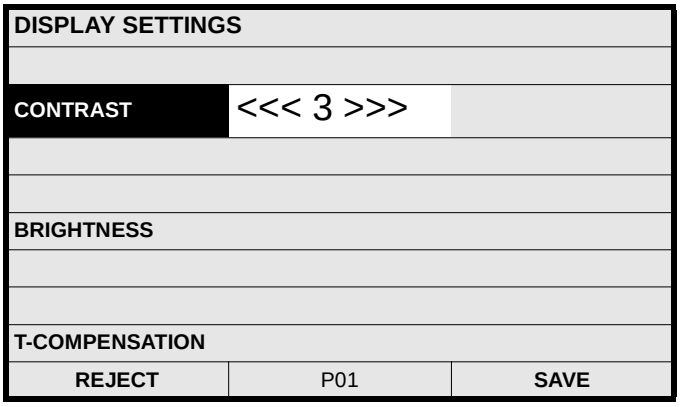


Fig. 185 Setting the display

9.14 Error messages

The error messages "Signal loss", "Lamp failure" and "Communication error" are displayed simultaneously for a maximum of four measuring results. Several error message fields can pop up simultaneously.

Note!
After acknowledging the error messages, it is not guaranteed, that another error message describes the same error number again.

9.14.1 Signal loss

The converter displays the "Signal loss" error message

- for the measuring result M01 of the optek input A,
- and for the measuring result M04 of the inputs B, D and mA-input 1.

The "Signal loss" error message for the optek inputs and / or mA-inputs is displayed for each measuring result independently. The converter pops up the error message when the corresponding input is used for measuring result calculation. The error message automatically disappears, when an error-free state is reached.

The signal loss can trigger failsafe but no system alarm.

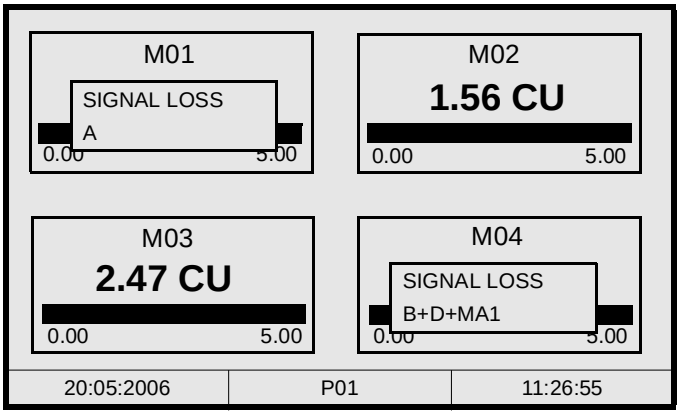


Fig. 186 Error message "Signal loss"

Tab. 20 Causes and remedies in case of signal loss

Signal loss can be caused by:	**Remedy**
Product translucence is too low. (Absorbance is too high.)	Check signals in the DETECTOR MONITOR menu. Check lamp voltage. Reduce optical path length. Change wavelength. Check sensor body window.
Cable break, mixed-up cables	Check installation. Polarity error = signal loss
Lamp failure	Check signals in LAMP MONITOR. Exchange lamp.
Communication error	Perform SYSTEM DIAGNOSTICS. Check SUBASSEMBLY MONITOR. Exchange faulty boards.

9.14.2 Lamp failure

The converter pops up error messages for lamp failures in all menus. They provide precise instructions for rapid troubleshooting.
The system displays the "Lamp failure" error message for output F. Additionally, the "Signal loss" error message has occurred at inputs B and D for the measuring result M04.
There are 11 error messages for lamp outputs indicating the failure of individual lamps as well as overload of lamp power units. The error messages do not pop up when a lamp output is switched off.

Lamp error messages trigger a system alarm (relay) and cause the system LED (5) to flash red.

Lamp error messages have top priority and overwrite other error messages!

Deactivate the error message by pressing [CLEAR]. The converter returns to measuring mode.

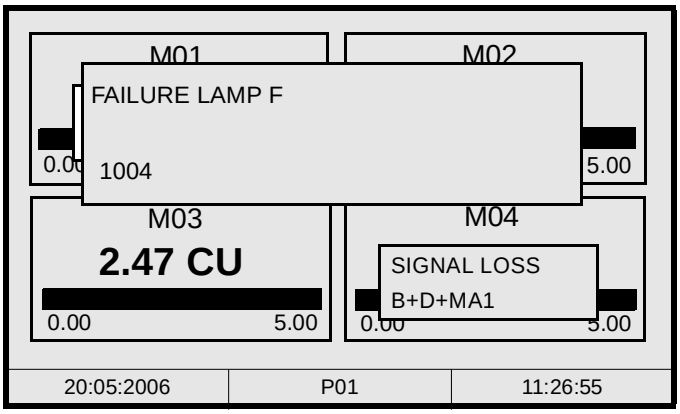


Fig. 187 Error message "Failure lamp"

Tab. 21 Causes and remedies in case of lamp failure

No.	Lamp failure can be caused by:	Cause	Remedy
1001	LAMP CURRENT TOO HIGH	Current output E exceeds limit value (default value: 1.4 A), short-circuit in lamp cable	Check cable length and setting. Check if voltage is applied to the lamp plug. Exchange lamp. Check LAMP MONITOR menu, exchange IO-14 / IO-16.
1002	LAMP CURRENT TOO HIGH	Current output F exceeds limit value (default value: 1.4 A), short-circuit in lamp cable	
1003	FAILURE LAMP E	Current output E falls below limit value (default value: 0.26 A / 0.60 A, one / two lamps), broken lamp, broken lamp output, cable break, cables mixed up (UV lamps)	Exchange lamp. Check high voltage power supply at UV sensors. Check if voltage is applied to the lamp plug. Check wiring, check polarity. Check LAMP MONITOR menu, exchange IO-14 / IO-16.
1004	FAILURE LAMP F	Current output F falls below limit value (default value: 0.26 A / 0.60 A, one / two lamps), broken lamp, broken lamp output, cable break, cables mixed up (UV lamps)	
1005	FAILURE LAMP E	Current output E falls below limit value (default value: 0.26 A), broken lamp, broken lamp output, cable break, cables mixed up (UV lamps)	
1006	FAILURE LAMP F	Current output F falls below limit value (default value: 0.26 A), broken lamp, broken lamp output, cable break, cables mixed up (UV lamps)	
1007	LAMP POWER CONSUMPTION TOO HIGH	Overload at output E, consumption exceeds limit value (default value: 15 VA). wrong lamps connected, too many lamps connected.	See remedy for error no. 1001, 1002. Use optek spare parts only. Check installation.
1008	LAMP POWER CONSUMPTION TOO HIGH	Overload at output F, consumption exceeds limit value (default value: 15 VA), wrong lamps connected, too many lamps connected.	
1011	LAMP POWER CONSUMPTION TOO HIGH	Overload at output E + F, consumption exceeds limit value (default value: 22 VA).	
1009	FAILURE LAMP E	Unacceptable current fluctuations at output E, lamp voltage too high at UV, UV lamp with ignition failures, loose contact with wiring, collapse of voltage supply, broken lamp output.	Check cable length and lamp voltage. Exchange lamp and / or high voltage power supply. Check and repair or exchange wiring. Check stability, use a line filter. Check LAMP MONITOR menu, exchange IO-14 / IO-16.
1010	FAILURE LAMP F	Unacceptable current fluctuations at output E, lamp voltage too high at UV, UV lamp with ignition failures, loose contact with wiring, collapse of voltage supply, broken lamp output.	

When the number of sensors at the lamp output is set to E = 2, error message no. 1003 pops up upon first lamp failure, error message no. 1005 upon second lamp failure!

When the number of sensors at the lamp output is set to F = 2, error message no. 1004 pops up upon first lamp failure, error message no. 1006 upon second lamp failure!

9.14.3 Communication error

The converter pops up messages for internal communication errors in all menus. They provide precise instructions for rapid troubleshooting.
The system displays "No communication" between main computer and the second input card MA-11.
There are 5 error messages for the five individual plugs at the converter.

Error messages regarding internal communication trigger a system alarm (relay) and cause the system LED (5) to flash red. In case of a permanent error, the converter repeats the error message within one minute.

Error messages regarding internal communication have top priority and can overlap other error messages!

Deactivate the error message by pressing [CLEAR]. The converter returns to measuring mode.

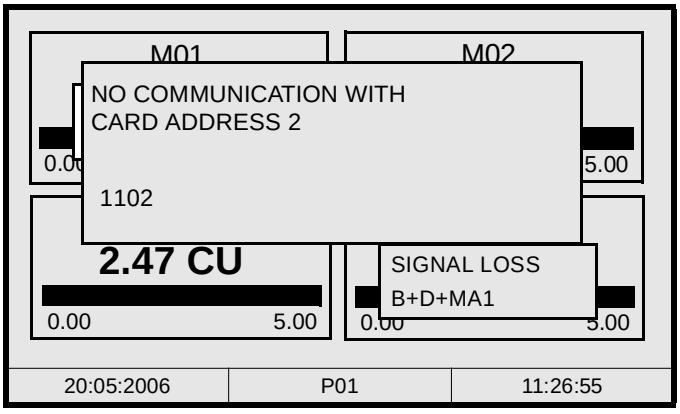


Fig. 188 Error message "No communication..."

Tab. 22 Causes and remedies in case of communication errors

No.	Communication errors can be caused by:	Remedy
1101	Ribbon cable, bus board, plug, detector card MA-11 (inputs [A], [C], address 1) do not respond.	Check ribbon cable, bus board, and plug. Check voltage supply. Two MA-11 with address 1, exchange card. **Exchange MA-11!**
1102	Ribbon cable, bus board, plug, detector card MA-11 (input [B], [D], address 2) do not respond.	Check ribbon cable, bus board, and plug. Check voltage supply. Two MA-11 with address 2, exchange card. **Exchange MA-11!**
1103	Ribbon cable, bus board, plug remote input card IO-12 do not respond.	Check. Check voltage supply. **Exchange IO-12!**
1104	Ribbon cable, bus board, plug relay output card IO-13 do not respond.	Check ribbon cable, bus board, and plug. Check voltage supply. **Exchange IO-13!**
1105	Ribbon cable, bus board, plug lamp output card IO-14 or IO-16 do not respond.	Check ribbon cable, bus board, and plug. Check voltage supply. **Exchange IO-14 or IO-16!**
1101 - 1105	Several communication errors occur simultaneously in case of bus error of main computer.	Check voltage supply. Exchange MC-02. **Exchange converter!**
2011	ERROR 2011	ADC communication error on MA-11-1. Causes zeroing and calibration errors. **Exchange MA-11 for inputs [A], [C]!**
2012	ERROR 2012	ADC communication error on MA-11-2. Causes zeroing and calibration errors. **Exchange MA-11 for inputs [B], [D]!**

9.14.4 Messages triggering system alarm

A system alarm is triggered when a system error can cause imprecise or wrong measuring results. System alarm is also triggered when technically relevant functions cannot be executed properly anymore.

System alarm is triggered by:

- all lamp failures (1001 - 1011)
- communication errors (1101 – 1105, 2011, 2012)
- erroneous or unreadable hardware calibration data (1710 – 1754)
- erroneous or unreadable system settings data (3201 – 3220)
- erroneous or unreadable product configuration data, linearizations and sensor adaptations (3230 – 3250).

Error messages regarding SIGNAL LOSS cannot trigger a system alarm, since it is an admissible operational state in many applications!

9.14.5 Settings error messages

These error messages occur in system settings, product configuration or in settings performed in the MAINTENANCE menu. They pop up in one error message field on the display. The error number and sometimes a short explanation describe the problem.
When numerical entries violate system-related limit values, the converter also displays these limit values.

Deactivate the error message by pressing [CLEAR]. The converter returns to measuring mode.

The unacceptable input is automatically deleted, the desired figure must be entered again.

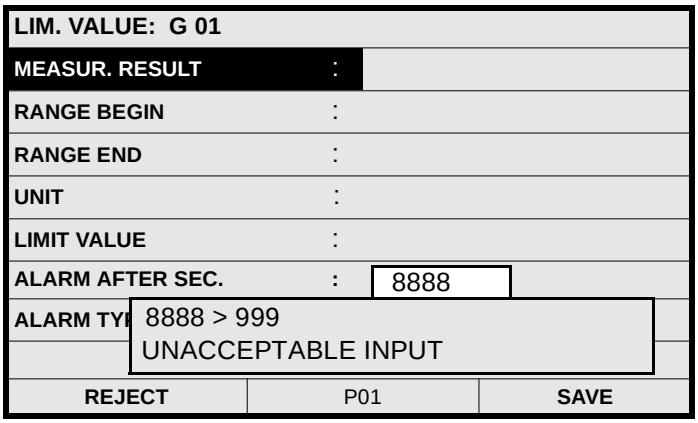


Fig. 189 Error message when entering settings

Tab. 23 Cause for error messages when entering settings

No.	Entry error message	Caused by errors during entry of:
1501	WRONG TIME	Time
1502	WRONG DATE	Date
1503	WRONG TIME OR DATE	Date & time
1504	INPUT CAUSES UNDEFINED RESULT	Supporting points of linearization
1505	NAME ALREADY IN USE	Product name, measuring result name, linearization name
1506	CHECK INPUT ASSIGNMENT	Input check when selectively zeroing
1507	FORMULA ERROR	Formula
1601	CALIBRATION ERROR	Calibration of mA-inputs and mA-outputs

If errors occur during saving of entries or settings, only one error number is displayed in the error message field. You must repeat your entry. If a saving error occurs several times, a hardware failure has probably occurred on board MC-02. In this case, please contact our customer service.

The following table contains rare error messages which pop up during saving.

Tab. 24 Error messages during saving

No.	Error message	Caused by errors during saving of:
1201	ERROR 1201	Display - contrast, brightness, compensation
1202	ERROR 1202	Format date & time
1203	ERROR 1203	Data logger time interval
1204	ERROR 1204	Damping
1205	ERROR 1205	Lamp voltage E
1206	ERROR 1206	Lamp voltage F
1207	ERROR 1207	Number of sensors
1208	ERROR 1208	Zero point remote / manually
1209	ERROR 1209	Active product after product change
1210	ERROR 1210	mA-outputs 0-20 / 4-20
1211	ERROR 1211	Relay 1-3 limit values / remote
1212	ERROR 1212	Remote In
1213	ERROR 1213	Hold
1214	ERROR 1214	Failsafe (-10 % / +110 %)
1215	ERROR 1215	Password name
1216	ERROR 1216	Password allocation
1217	ERROR 1217	Password duration
1218	ERROR 1218	optek inputs
1219	ERROR 1219	mA-inputs (assignment)
1220	ERROR 1220	Sensor data
1221	ERROR 1221	TF sensor data
1230	ERROR 1230	Measuring range data
1231	ERROR 1231	Limit values data
1232	ERROR 1232	Display format
1233	ERROR 1233	Product name
1234	ERROR 1234	Linearization
1235	ERROR 1235	Active product
1236	ERROR 1236	Offset + slope set
1240	ERROR 1240	Sensor adaptation
1250	ERROR 1250	Zero point data
1251	ERROR 1251	Configuration

9.14.6 Switch-on error messages

Immediately after the converter has been switched on, it loads all necessary parameters, checks configuration and returns to the previous operating mode. Error messages appearing during this time pop up in one field on the display. The error number and sometimes a short explanation describe the problem. To delete the error message, press [CLEAR]. If the error message pops up again after switching the converter off and on again, a hardware failure has probably occurred. In this case, please contact our customer service.

Tab. 25 Switch-on error messages and their causes

No.	Error message	Error messages during switch-on caused by:
1021	INCONSISTENCY IN CONFIGURATION	The currently determined hardware configuration does not match the saved configuration. Check subassembly monitor and confirm!
1106	ISB CONFLICT	Two MA-11 input cards with the same address must not be installed in the system. Starting the system is interrupted.
1701	IMPROPER CONFIGURATION A, B EX?	MA-11 input cards are not allowed to be combined regarding ex-protection. Occurs with two MA-11 after exchange. Check subassembly monitor and confirm! Operation of ex-sensors not permitted! Contact optek.
1701	IMPROPER CONFIGURATION C, D EX?	MA-11 input cards are not allowed to be combined regarding ex-protection. Occurs with two MA-11 after exchange. Check subassembly monitor and confirm! Operation of ex-sensors not permitted! Contact optek.
1701	IMPROPER CONFIGURATION A, B, C, D EX?	MA-11 input cards are not allowed to be combined regarding ex-protection. Occurs with two MA-11 after exchange. Check subassembly monitor and confirm! Operation of ex-sensors not permitted! Contact optek.

Tab. 26 Error messages during reading of hardware

No.	Error message	Error messages during reading of hardware data:
1710 - 1716	INCONSISTENCY IN CALIBRATION DATA START SYSTEM DIAGNOSTICS	Calibration data on MA-11-1 (input [A], [C], address 1) optek inputs [A], and [C] not fully functional. Exchange MA-11 for inputs [A], [C]!
1720 - 1726	INCONSISTENCY IN CALIBRATION DATA START SYSTEM DIAGNOSTICS	Calibration data on MA-11-2 (input [B], [D], address 2) optek inputs [B], and [D] not fully functional. Exchange MA-11 for inputs [B], [D]!
1730	INCONSISTENCY IN CALIBRATION DATA, START SYSTEM DIAGNOSTICS	Calibration data IO-12, addr. 3 mA-inputs 1, and 2 not fully functional. Exchange IO-12!
1740	INCONSISTENCY IN CALIBRATION DATA START SYSTEM DIAGNOSTICS	Calibration data IO-13, addr. 4 mA-outputs 1, and 2 not fully functional. Exchange IO-13!
1750 - 1754	INCONSISTENCY IN CALIBRATION DATA START SYSTEM DIAGNOSTICS	Calibration data IO-14, IO-16, addr. 5 mA-outputs 3, and 4 not fully functional. Lamp outputs E, and F not fully functional. Exchange IO-14 and IO-16!

If errors occur during saving, only one error number is displayed in the error message field. You must repeat your entry. If a saving error occurs several times, a hardware failure has probably occurred. In this case, please contact our customer service.

Tab. 27 Saving error messages and their causes

No.	Error message	Caused by errors during reading of:
3201	ERROR 3201	Display - contrast, brightness, compensation
3202	ERROR 3202	Format date & time
3203	ERROR 3203	Data logger time interval
3204	ERROR 3204	Damping
3205	ERROR 3205	Lamp voltage E
3206	ERROR 3206	Lamp voltage F
3207	ERROR 3207	Number of sensors
3208	ERROR 3208	Zero point remote / manually
3209	ERROR 3209	Active product after product change
3210	ERROR 3210	mA-outputs 0-20 / 4-20
3211	ERROR 3211	Relay 1-3 limit values / remote
3212	ERROR 3212	Remote In
3213	ERROR 3213	Hold
3214	ERROR 3214	Failsafe -10 % / +110 %
3215	ERROR 3215	Password name
3216	ERROR 3216	Password allocation
3217	ERROR 3217	Password duration
3218	ERROR 3218	optek inputs
3219	ERROR 3219	mA-inputs (assignment)
3220	ERROR 3220	Sensor data
3221	ERROR 3221	TF sensor data
3230	ERROR 3230	Measuring range data
3231	ERROR 3231	Limit values data
3232	ERROR 3232	Display format
3233	ERROR 3233	Product name
3234	ERROR 3234	Linearization
3235	ERROR 3235	Active product
3236	ERROR 3236	Offset + slope set
3240	ERROR 3240	Sensor adaptation
3250	ERROR 3250	Zero point data
3251	ERROR 3251	Configuration

10 Faults

Among other possibilities, you can detect faults whenever an error message on the converter appears. Try to clear the fault using the following table and the instructions given in the chapter "Software" in the instruction manual of the converter. Should you have any difficulty clearing the fault, feel free to contact our customer service. To solve the problem efficiently, we ask you to have the sheet with system data of your sensor or system at hand.

See preliminary note for our contact data.

Tab. 28 Possible faults and remedies

Possible fault	Possible remarks	Cause	Remedy
Failure of lamp module	• "Lamp failure" LED of converter flashes. • Signal loss	Lamp cable between sensor and converter defective	• Continuity test of lamp cable • Exchange lamp cable for new one.
		Lamp module defective	• Exchange lamp module.
Detector failure	-	Detector cable between sensor and converter defective	• Continuity test of detector cable • Exchange detector cable for new one.
		Detector defective	• Exchange detector.
Condensate formation	Unrealistic, random measuring results	Humidity gets into optical housing and forms condensation deposits on windows.	• Use air purge.
		O-Ring missing or defective	• Disassemble sensor assemblies and check O-Rings, exchange if necessary.
Wrong results	• Results are fluctuating. • Zero point is drifting.	• Sensor body windows are dirty. • Sensor body windows are corroded. • Lamp module near failure, lamp module near the end of its life.	• Clean sensor body window. • Exchange sensor body window for sapphire window. • Exchange lamp module.
Connection error	• No function • No "Lamp failure" LED message	Detector cable between sensor and converter defective	• Continuity test of detector cable • Exchange detector cable for new one.
		Sensor cable incorrectly connected to converter	• Check and revise connections.
Measuring range exceeded	Converter indicates flashing ↑ –↑ –↑ .	Process conditions	• Amplify measuring range. • If the measuring range cannot be amplified, reduce optical path length.
		Wavelength-dependent detector module reduces the dynamic measuring range, optical filters reduce wanted signal.	• Reduce optical path length and / or change measuring wavelength. • Exchange lamp module.
mA-signal (output)	mA-output delivers correct current results if measuring results are low and too low current results if measuring results are high.	Connected load > 600 ohms	• Check resistance of wiring. • Use appropriate mA-input.
	Small deviations given in %	Poor calibration of the receiving mA-input	• Compensation by adjusting calibration of the sending mA-output.
mA-signal (input)	Small deviations given in %	Poor calibration of the sending mA-output	• Compensation by adjusting calibration of the receiving mA-input.
Converter defective	None of the above mentioned errors can be detected.	-	• Send system (converter and sensor) to optek for checking purposes. If necessary, the sensor body can remain in the pipeline so that only the optical arms and the converter have to be sent.

11 Spare parts and accessories

11.1 Accessories converter

Tab. 29 Accessories - housings and mounting kit for front panel

Accessories	Description	Part number
Installation kit C4000	4 x collar screw M2.5 x 11 4 x collar screw plastic sleeve M2.5	1200-3321-0009-00
Front kit (IP65) 1 x C4000 / HC	front panel mounting kit - protection: IP65 (frontside only) for series C4000, Haze Control, Fermenter Control	1200-3321-0001-00
B19-42 (IP66) 1 x C4000 / HC / 2 x X56	wall mount housing B19-42 - material: plastic (ABS) - protection: IP66 for 1 converter C4000, Haze Control or for 2 converters X56 (installation kit B19 PN: 1200-3390-0001-00)	1200-3321-0002-00
S19-42 (IP65) 1 x C4000 / HC / 2 x X56	wall mount housing B19-42 - material: stainless steel 1.4301 / SS304 - protection: IP65 for 1 converter C4000, Haze Control or for 2 converters X56 (incl. installation kit S19 PN: 1200-3390-0003-00)	1200-3321-0003-00
T19-42 1 x C4000 / HC 115 V AC	table top housing T19-42 - 115 V AC - material: aluminum - protection: IP20 for 1 converter C4000, Haze Control (incl. installation kit T19 - 115 V AC PN: 1200-3390-0005-00)	1200-3321-0010-00
T19-42 1 x C4000 / HC 230 V AC	table top housing T19-42 - 230 V AC - material: aluminum - protection: IP20 for 1 converter C4000, Haze Control (incl. installation kit T19 - 230 V AC PN: 1200-3390-0006-00)	1200-3321-0005-00
T19-42 1 x C4000 / HC 24 V AC/DC	table top housing T19-42 - 24 V AC/DC - material: aluminum - protection: IP20 for 1 converter C4000, Haze Control (incl. installation kit T19 - 24 V AC/DC PN: 1200-3390-0007-00)	1200-3321-0007-00

11.2 Small parts fuses

Tab. 30 Spare parts - fuses

10 pieces each	Part number
115 V / 230 V AC 1.6 A	1200-3300-0005-00
24 V AC / DC 3.15 A	1200-3300-0007-00

12 Appendix

12.1 Installation documentation - hardware

Tab. 31 Installation documentation - hardware

Measuring task:				
Installation site:				
Measuring station no.:				
Responsible:				
Phone:				
CONTROL 4000				
Configuration:				
Ser. no.:				
	Sensor 1	**Sensor 2**	**Sensor 3**	**Sensor 4**
Model:				
Ser. no.:				
Process connection:				
Line size:				
Material:				
Gaskets:				
Window material:				
Optical path length (OPL):				
Measurement wavelength:				
Ex-protection:				
Cable length:				
Temperature range:				
Notes:				

12.2 TÜV NORD CERT GmbH "GS-mark"

TÜV NORD

Zertifikat

Certificate

Registrier-Nr.
Registered No.
44 324 09 368311

Zeichen des Auftraggebers *Customer´s reference*	Auftragsdatum *Date of order*	Aktenzeichen *File reference*	Prüfbericht Nr. *Test report no.*
Dr. Platte	13.02.2009	2.4- 857/99 Mas/Büc	09 324 368311 - 001

Name und Anschrift des Auftraggebers
Optek-Danulat GmbH
Emscherbruchalle 2
45356 Essen Bergeborbeck
Name and address of the customer

ist berechtigt, das unten genannte Produkt mit dem abgebildeten Zeichen zu kennzeichnen

TÜV NORD GS geprüfte Sicherheit

is authorized to provide the product mentioned below with the mark as illustrated

Fertigungsstätte
Optek-Danulat GmbH
Emscherbruchalle 2
45356 Essen Bergeborbeck
Manufacturing plant

Geprüft nach
EN 61010-1:2004
Tested in accordance with

Das Produkt entspricht den Anforderungen des Geräte- und Produktsicherheitsgesetzes GPSG § 7(1)
The product is conform with the requirements of the Equipment and Product Safety Act – GPSG § 7(1)

Beschreibung des Produktes (Details s. Anlage 1)
Inline Photometrie Messsystem Control C 4000
Inline Photometric Measuring System Control C 4000
Description of product (Details see Annex 1)

TÜV NORD CERT GmbH
Zertifizierungsstelle für Produktsicherheit

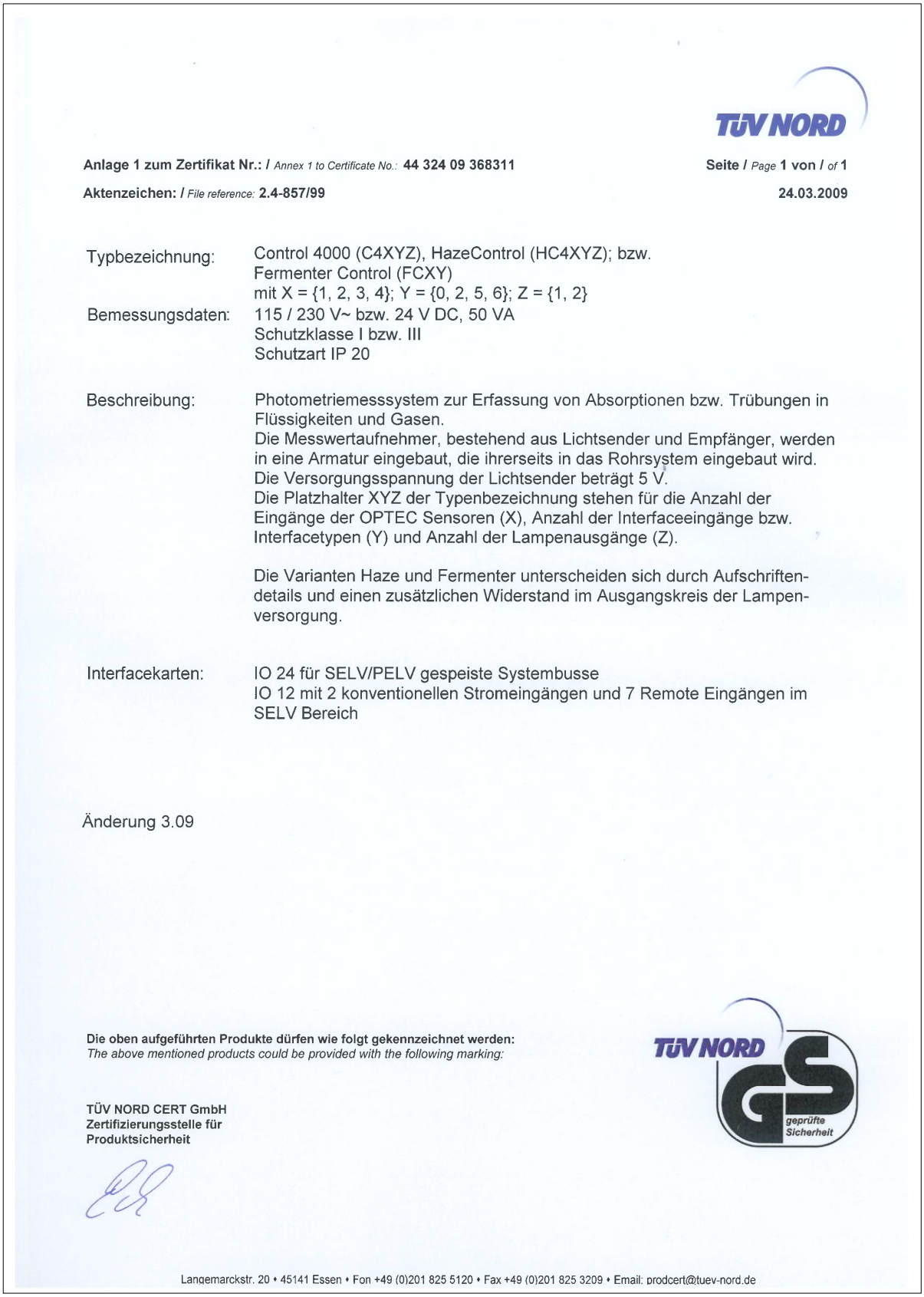
Gültig bis / *Valid until*: **23.03.2014**

Essen, 24.03.2009

Bitte beachten sie auch die umseitigen Hinweise
Please also pay attention to the information stated overleaf

Langemarckstr. 20 • 45141 Essen • Fon +49 (0)201 825 5120 • Fax +49 (0)201 825 3209 • Email: prodcert@tuev-nord.de

Fig. 190 GS-mark



TÜV NORD

Anlage 1 zum Zertifikat Nr.: / *Annex 1 to Certificate No.:* **44 324 09 368311** **Seite /** *Page* **1 von /** *of* **1**

Aktenzeichen: / *File reference:* **2.4-857/99** **24.03.2009**

Typbezeichnung:	Control 4000 (C4XYZ), HazeControl (HC4XYZ); bzw. Fermenter Control (FCXY) mit X = {1, 2, 3, 4}; Y = {0, 2, 5, 6}; Z = {1, 2}
Bemessungsdaten:	115 / 230 V~ bzw. 24 V DC, 50 VA Schutzklasse I bzw. III Schutzart IP 20
Beschreibung:	Photometriemesssystem zur Erfassung von Absorptionen bzw. Trübungen in Flüssigkeiten und Gasen. Die Messwertaufnehmer, bestehend aus Lichtsender und Empfänger, werden in eine Armatur eingebaut, die ihrerseits in das Rohrsystem eingebaut wird. Die Versorgungsspannung der Lichtsender beträgt 5 V. Die Platzhalter XYZ der Typenbezeichnung stehen für die Anzahl der Eingänge der OPTEC Sensoren (X), Anzahl der Interfaceeingänge bzw. Interfacetypen (Y) und Anzahl der Lampenausgänge (Z). Die Varianten Haze und Fermenter unterscheiden sich durch Aufschriftendetails und einen zusätzlichen Widerstand im Ausgangskreis der Lampenversorgung.
Interfacekarten:	IO 24 für SELV/PELV gespeiste Systembusse IO 12 mit 2 konventionellen Stromeingängen und 7 Remote Eingängen im SELV Bereich

Änderung 3.09

Die oben aufgeführten Produkte dürfen wie folgt gekennzeichnet werden:
The above mentioned products could be provided with the following marking:

TÜV NORD GS geprüfte Sicherheit

TÜV NORD CERT GmbH
Zertifizierungsstelle für
Produktsicherheit

Langemarckstr. 20 • 45141 Essen • Fon +49 (0)201 825 5120 • Fax +49 (0)201 825 3209 • Email: prodcert@tuev-nord.de

Fig. 191 GS-mark - annex 1 of the certificate

TRANSLATION FOR INFORMATION PURPOSES ONLY

This translation of Annex 1 to Certificate No: 44 324 09 368311 with file reference 2.4-857/99 is a translation **not authorized** by TÜV NORD CERT GmbH.

Type designation: Control 4000 (C4XYZ), Haze Control (HC4XYZ); or
Fermenter Control (FCXY)
with X = {1, 2, 3, 4}; Y = {0, 2, 5, 6}; Z = {1, 2}

Rating: 115 / 230 V~ or 24 V DC, 50 VA
class I or III
protection I P 20

Description: Photometric measuring system for detecting absorbance or turbidity in liquids and gases.
Sensors, consisting of light transmitter and receiver, are installed in an armature which is then installed in the piping system.
Voltage supply of the light transmitters is 5 V.
XYZ in the type designation stand for number of optek sensor inputs (X), number of interface inputs or interface types (Y) and number of lamp outputs (Z).

Haze and Fermenter variants differ in inscription details and an additional resistance in the output circuit of the lamp supply.

Interface cards: IO 24 for SELV/PELV-supplied system busses
IO 12 with 2 conventional current inputs and 7 remote inputs in the SELV range

Modification 3.09

12.3 QM system certificate

CERTIFICATE

ISO 9001:2000

DEKRA Certification

hereby certifies that the company

Optek®

Optek-Danulat GmbH

business field:
Inline control devices for industrial processes including pressure accessories used in the following fields: chemistry, pharmacy, biotechnics, petrochemistry, food and beverage industry

location:
Emscherbruchallee 2 * D-45356 Essen

has successfully implemented the above mentioned quality management system according to the standard (12/2000) and applies it effectively. The conformity was inspected during the certification audit documented in audit report no. A07081245. This certificate is only valid in connection with the successful performance of the surveillance audits.

Date of the first certification:	02.09.2002	Date of the last recertification:	13.08.2008
This certificate is valid until:	12.08.2011	Certificate registration no.:	50808548 duplicate
Last audit day:	26.06.2008		

DEKRA Certification GmbH
Stuttgart, 13.08.2008

DEKRA Certification GmbH · D-70565 Stuttgart, Handwerkstraße 15 · DEKRA DEKRA Certification

IAF MEMBER OF MULTILATERAL RECOGNITION ARRANGEMENT

TGA TRÄGERGEMEINSCHAFT FÜR AKKREDITIERUNG GERMAN ASSOCIATION FOR ACCREDITATION GMBH

QMS-TGA-ZM-05-91-00

DEKRA Certification GmbH · Handwerkstraße 15 · D-70565 Stuttgart · www.dekra-certification.com

Fig. 192 QM system

12.4 Declaration of conformity

Declaration of conformity
in accordance with the

Directive 2004/108/EG relating to electromagnetic compatibility
of 15 December 2004

and the

Directive 2006/95/EG relating to electrical equipment designed for use within certain voltage limits of 12 December 2006

Herewith we declare that the measuring systems

each comprising one converter of the series
Control 4000 (C4XXX with X=0..5); Fermenter Control (FCXX with X=0..2);
Haze Control (HC 4XXX, X=0..5)

and one or several sensors of the series
AF16, AF26, AF45, AF46, TF16-N, DTF16, ASD19, ASD25, AS16, AS56

have been developed, constructed and manufactured in conformity with the mentioned EC directives.

Harmonized standards applied:

- EN 61326:2006 + Corrigendum 1 / June 2008
- EN 61010-1:2001 + Corrigendum 1 / November 2002
  + Corrigendum 2 / January 2004

Manufacturer: optek-Danulat GmbH, Emscherbruchallee 2, 45356 Essen, Germany

Essen, 2009/01/27

Jürgen Danulat
Managing Director

12.5 Response via fax

to: optek-Danulat GmbH
Emscherbruchallee 2 Phone: +49-201-63409-0
D-45356 Essen Fax: +49-201-63409-999

from	Company:
	Name:
	Department:
	Street:
	ZIP code / city:
	Phone:
	Fax:

Dear Sir or Madam,

Please forward the following information to the office in charge.

O I am interested in inline photometry - please keep me informed on a regular basis.

O Inline photometry is of interest to our employee:

Name: _____

Department: _____

Phone: _____

O I am interested in the following application: _____

O We are already using your measuring systems. Model: _____

O We are currently using the following make: _____

O Please call me.

The instruction manual for the _____ model

is: good O O O O O not good

I have the following improvement suggestions:

_____

_____

_____

Yours faithfully,

Date / signature