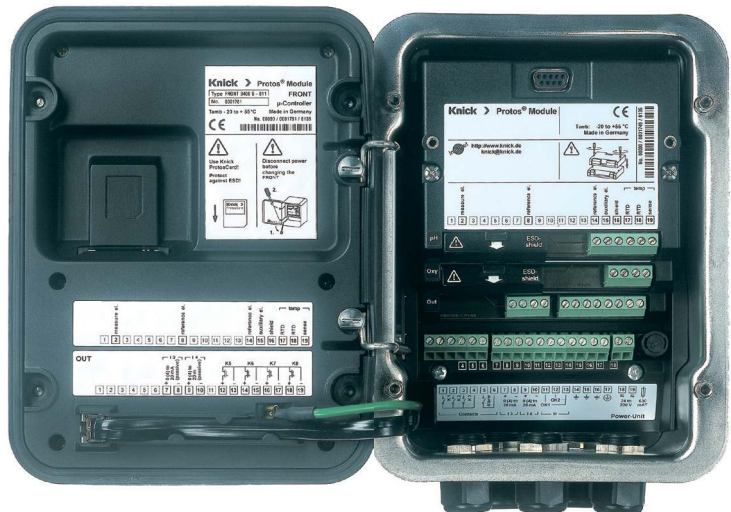


Protos II 4400(X) / Protos 3400(X) Process Analysis System

User Manual

**Protos LDO 4400-170 / LDO 3400-170
Measuring Module**

For Optical Oxygen Measurement
in Liquids and Gases



Returns

Please contact our Service Team before returning a defective device. Ship the cleaned device to the address you have been given.

If the device has been in contact with process medium, it must be decontaminated/disinfected before shipment. In this case, place a Declaration of Contamination in the consignment to prevent any risk to the health and safety of our service personnel. The declaration is available at:



<https://www.knick-international.com/en/service/repairs/>

Disposal

Please observe the applicable local or national regulations concerning the disposal of "waste electrical and electronic equipment".

Trademarks

The following trademarks are used in this document without further marking:

Calimatic®, Protos®, Sensocheck®, Sensoface®, Unical®, VariPower®, Ceramat®, SensoGate® are registered trademarks of Knick Elektronische Messgeräte GmbH & Co. KG, Germany

Memosens®

is a registered trademark of

Endress+Hauser Conducta GmbH & Co. KG, Germany

Knick Elektronische Messgeräte GmbH & Co. KG, Germany

Table of Contents

Protos LDO 3400-170 / 4400-170 Module

Returns	2
Disposal	2
Trademarks	2
Intended Use	5
Safety Information	5
Firmware Version	6
Terminal Plate	7
Installing the Module	8
Wiring	9
Calibration / Adjustment	10
Recommendations for Calibration	11
HOLD Function During Calibration	12
Automatic Calibration in Water	14
Automatic Calibration in Air	16
Product Calibration (Calibration with Sampling)	18
Zero Correction	20
Parameter Setting	21
Parameter Setting: Operating Levels	22
Administrator Level	22
Operator Level	22
Viewing Level	22
Parameter Setting: Locking a Function	23
Activating Parameter Setting	24
Setting the Sensor Data Parameters	25
Sensoface	29
Logbook, Factory Setting	30
Setting the Message Parameters	31
Current Outputs	32
Configuring a Current Output	32
Current Outputs: Characteristics	33
Current Outputs: Output Filter	35
Maintenance	36

Table of Contents

Protos LDO 3400-170 / 4400-170 Module

Diagnostic Functions	37
Point of Meas Description.....	37
Logbook.....	37
Device Description	38
FRONT Module	38
BASE Module.....	38
Sensor Monitor.....	39
Cal Record	40
Sensor Diagram	40
CIP/SIP Cycles, Autoclaving Counter.....	41
Setting Diagnostics Messages as Favorite	42
Message List.....	44
Messages	45
Specifications.....	52
Appendix:.....	55
Minimum Spans for Current Outputs.....	55
Overview	56
Overview of Parameter Setting.....	56
Index.....	60

Intended Use

The module is used to measure oxygen in liquids and gases using an SE 740 series optical sensor. It measures the partial pressure of oxygen, air pressure, and temperature simultaneously. It is also able to calculate and display the oxygen saturation and concentration as well as volume concentration in gases. The LDO 3400-170 / LDO 4400-170 module is not intended for operation in locations subject to explosion hazards.

Safety Information

NOTICE! Potential damage

Never try to open the module. Protos modules cannot be repaired by the user. For inquiries regarding module repair, please contact Knick Elektronische Messgeräte GmbH & Co. KG at www.knick.de.

Be sure to observe during installation:

- Switch off power supply before replacing or inserting a module.
- Protect the signal inputs of the modules against electrostatic discharge.
- Before commissioning it must be proved that the device may be connected with other equipment.

Firmware Version

Module compatibility	Protos 3400 FRONT firmware version A.0 or higher	Protos II 4400 FRONT firmware version 01.00.00 or higher
Protos LDO 3400-170 module	x ¹⁾	x ²⁾
Protos LDO 4400-170 module	-	x ³⁾

1) Module firmware version 01.00.00 or higher


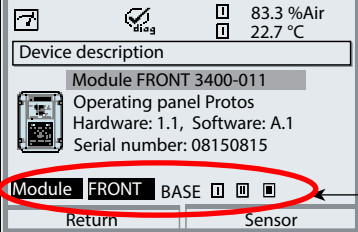
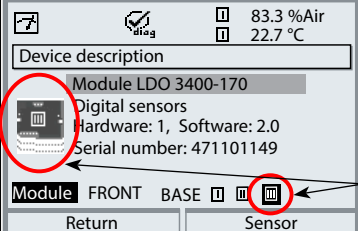
2) Module firmware version 02.00.00 or higher

3) Module firmware version 01.00.00 or higher

Query Current Device Firmware/Module Firmware

When the device is in measuring mode:



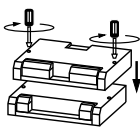
Press **menu** key, open Diagnostics menu: Device Description

Menu	Display	Device description
		<p>Device hardware and firmware version</p> <p>Provides information on all modules installed: Module type and function, serial number, hardware and firmware version, and device options. Select the different modules (FRONT, BASE, slots 1 - 3) using the arrow keys.</p>
		<p>Query module firmware</p> <p>Here: LDO 3400-170 module hardware and firmware version, serial number – here installed in slot 3.</p>

Note: The display may vary depending on the device version.



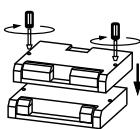
Terminal Plate

Terminal Plate of LDO 3400-170 / LDO 4400-170 Module:

Knick > Protos [®] Module		CE																									
Type LDO 3400-170	LDO		Tamb: -20 to +55 °C																								
No. _____			Made in Germany																								
 http://www.knick.de knick@knick.de		 																									
<table border="0"> <tr> <td colspan="2">LDO</td> <td colspan="2">Input</td> <td colspan="2">Input</td> </tr> <tr> <td colspan="2"></td> <td colspan="2">0(4) to 20 mA</td> <td colspan="2"></td> </tr> <tr> <td>shield</td> <td>A</td> <td>B</td> <td>GND</td> <td>PWR out</td> <td></td> </tr> </table>		LDO		Input		Input				0(4) to 20 mA				shield	A	B	GND	PWR out		<table border="0"> <tr> <td>+</td> <td>n.c.</td> <td>-</td> <td>control</td> <td>n.c.</td> <td>control</td> </tr> </table>		+	n.c.	-	control	n.c.	control
LDO		Input		Input																							
		0(4) to 20 mA																									
shield	A	B	GND	PWR out																							
+	n.c.	-	control	n.c.	control																						
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19									

87708/000000/jjww



Knick > Protos II Module		CE																									
Type LDO 4400-170	LDO		Tamb: -20 to +55 °C																								
No. _____			Made in Germany																								
 www.knick.de		 																									
<table border="0"> <tr> <td colspan="2">LDO</td> <td colspan="2">Input</td> <td colspan="2">Input</td> </tr> <tr> <td colspan="2"></td> <td colspan="2">0(4) to 20 mA</td> <td colspan="2"></td> </tr> <tr> <td>Shield</td> <td>A</td> <td>B</td> <td>GND</td> <td>Power Out</td> <td></td> </tr> </table>		LDO		Input		Input				0(4) to 20 mA				Shield	A	B	GND	Power Out		<table border="0"> <tr> <td>+</td> <td>N.C.</td> <td>-</td> <td>Control</td> <td>N.C.</td> <td>Control</td> </tr> </table>		+	N.C.	-	Control	N.C.	Control
LDO		Input		Input																							
		0(4) to 20 mA																									
Shield	A	B	GND	Power Out																							
+	N.C.	-	Control	N.C.	Control																						
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19									

95174/000000/jjww



Attaching the Terminal Plates

The terminal plates of the lower modules can be stuck to the inner side of the door. This facilitates maintenance and service.



Installing the Module

⚠ CAUTION! Electrostatic discharge (ESD).

The modules' signal inputs are sensitive to electrostatic discharge. Take measures to protect against ESD before inserting the module and wiring the inputs.

Note: Strip the insulation from the wires using a suitable tool to prevent damage.



NOTICE! Moisture ingress.

The cable glands must be tightly sealed.

If necessary, use suitable filler plugs or sealing plugs.

- 1) Switch off the power supply to the device.
- 2) Open the device (loosen the 4 screws on the front).
- 3) Plug the module into the slot (D-SUB connector), see figure.
- 4) Tighten the module's fastening screws.
- 5) Connect the sensor cable.
- 6) Close the device by tightening the screws on the front.
- 7) Switch on the power supply

Note: Only one LDO module can be connected to the Protos.

Wiring

Cable, e.g. CA/M12-005N485

Color	Assignment	Terminal number
Cable strand		LDO 3400-170 module

White	PWR OUT (+)	6
-------	-------------	---

Brown	GND (-)	5
-------	---------	---

Pink	RS 485 B	4
------	----------	---

Gray	RS 485 A	3
------	----------	---

Black	Schirm	2
-------	--------	---

The signal from an external pressure transmitter can be fed in through the external current input (terminals 8 and 10, see terminal plate on page 7). This allows pressure correction of the oxygen measurement.

Calibration / Adjustment

Note: The function check (HOLD) mode is active for the currently calibrated module, the current outputs behave as configured.

Adjustment:

The sensor adjusts itself. Adjustment is started and monitored via Protos.

NOTICE!

Without adjustment every oxygen meter delivers an imprecise or wrong output value! After replacing the sensor or the sensor membrane, you must perform an adjustment.

Procedure

Every oxygen sensor has its individual slope (Stern-Volmer constant cvs) and its individual zero point (phase angle). Both values are altered, for example, by aging.

For sufficiently high accuracy of oxygen measurement, the analyzer must be regularly adjusted for the sensor data (adjustment).

Calibration/Adjustment Methods

- Automatic calibration in water/air
- Product calibration (saturation/concentration/partial pressure)
- Zero correction

Calibration / Adjustment

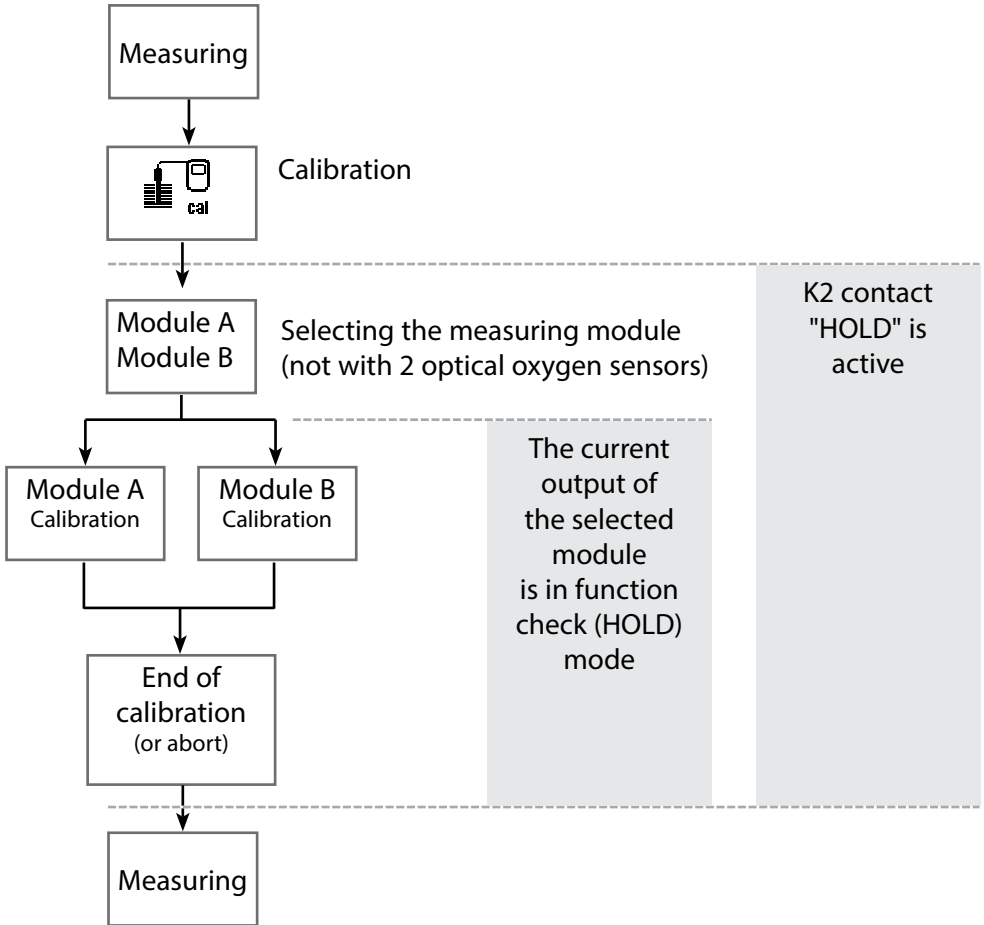
Recommendations for Calibration

It is always recommended to calibrate in air. Compared to water, air is a calibration medium which is easy to handle, stable, and thus safe. In the most cases, however, the sensor must be removed for a calibration in air. In certain processes the sensor cannot be removed for calibration. Here, calibration must be performed directly in the process medium (e.g. by means of a product calibration).


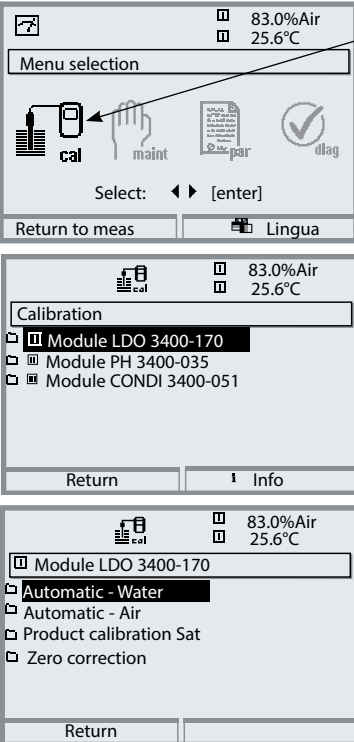
If there is a temperature difference between the calibration medium and the measured medium, you must keep the sensor in the respective medium for several minutes before and after calibration in order to achieve stable measured values. The type of calibration pressure detection is preset during parameter setting.

HOLD Function During Calibration

Behavior of the signal and relay outputs during calibration



Note: The display may vary depending on the device version.

Menu	Display	Selecting a calibration method
		<p>Opening the Calibration Menu Press menu key to select menu. Select calibration using arrow keys, press enter to confirm, passcode 1147 (To change passcode, select: Parameter setting / System control / Passcode entry)</p> <p>Calibration: Select LDO module</p> <p>Select a calibration method:</p> <ul style="list-style-type: none">• Automatic - Water• Automatic - Air• Product calibration Sat (concentration/partial pressure)• Zero correction <p>When you access calibration, the analyzer automatically proposes the previous calibration method. If you do not want to calibrate, "Return" with the left softkey.</p> <p>During calibration the module is in function check (HOLD) mode. Current outputs and relay contacts of the module behave as configured (BASE module).</p>

Calibration / Adjustment

Automatic Calibration in Water

Automatic Calibration in Water


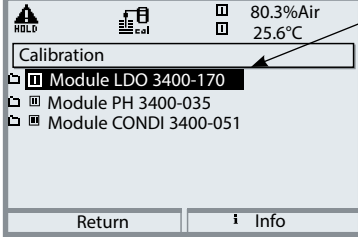
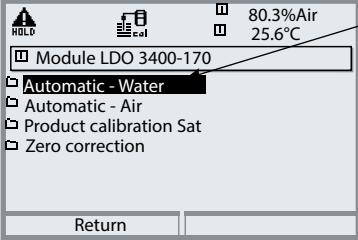
The slope is corrected using the saturation value (100 %) of water in equilibrium with air.

During calibration the module is in function check (HOLD) mode.

Current outputs and relay contacts of the module behave as configured (BASE module).


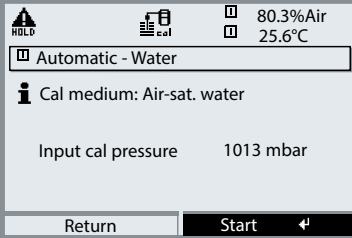
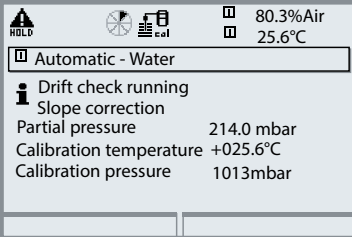
NOTICE!

The calibration medium must be in equilibrium with air. Oxygen exchange between water and air is very slow. Therefore, it takes a relatively long time until water is saturated with atmospheric oxygen. If there is a temperature difference between calibration medium and measured medium, you must keep the sensor in the respective medium for several minutes before and after calibration.

Menu	Display	Selecting a calibration mode
		Select module: The module is in function check (HOLD) mode. The assigned current outputs and relay contacts behave as configured (BASE). Press enter to confirm.
		Select "Automatic - Water" calibration method. Remove sensor and immerse it in cal medium (air-saturated water). Press enter to confirm.

Note: The display may vary depending on the device version.

Note: The display may vary depending on the device version.

Menu	Display	Automatic calibration in water
	 <p>The display shows the 'Automatic - Water' calibration menu. At the top, it displays '80.3% Air' and '25.6°C'. Below this, it says 'Automatic - Water' and 'Cal medium: Air-sat. water'. The 'Input cal pressure' is set to '1013 mbar'. At the bottom, there are 'Return' and 'Start' softkeys.</p>	<p>Display of selected calibration medium (Air-sat. water) Enter cal pressure if “manual” has been configured. Start with softkey or enter</p>
	 <p>The display shows the 'Automatic - Water' calibration menu during a drift check. It displays '80.3% Air' and '25.6°C'. Below this, it says 'Automatic - Water' and 'Drift check running'. The status includes 'Slope correction', 'Partial pressure 214.0 mbar', 'Calibration temperature +025.6°C', and 'Calibration pressure 1013mbar'. There are empty softkey slots at the bottom.</p>	<p>Drift check. Display during calibration</p> <ul style="list-style-type: none"> • Partial pressure • Calibration temperature • Calibration pressure <p>If the signal or the measured temperature fluctuate greatly, the calibration procedure is aborted. You must re-start the calibration. If successful, place sensor in process, exit calibration using softkey or enter.</p>

Calibration / Adjustment

Automatic Calibration in Air

Automatic Calibration in Air


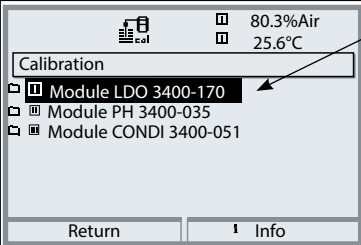
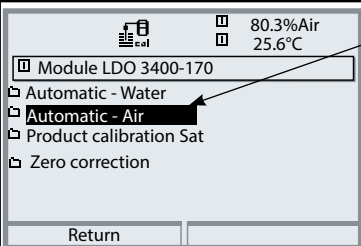
The slope is corrected using the saturation value (100 %), similar to air saturation of water. Since this analogy only applies to water-vapor saturated air (100 % relative humidity) and often the calibration air is less humid, the relative humidity of the calibration air must also be specified. If you do not know the exact value of the relative humidity of the calibration air, you can take the following reference values for a sufficiently precise calibration:

- Ambient air: 50 % rel. humidity (average)
- Bottled gas (synthetic air): 0 % rel. humidity


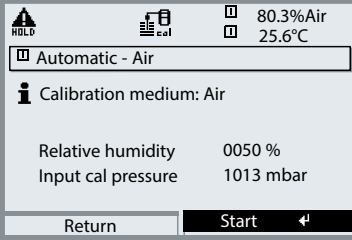
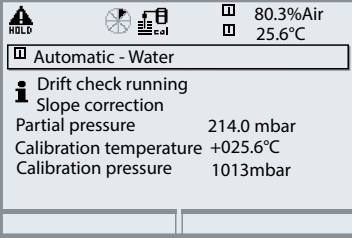
NOTICE!

The sensor membrane must be dry. Be sure to keep temperature and pressure constant during calibration. If there is a temperature difference between calibration medium and measured medium, you must keep the sensor in the respective medium for several minutes before and after calibration.

Note: The display may vary depending on the device version.

Menu	Display	Selecting a calibration mode
	 <p>80.3%Air 25.6°C</p> <p>Calibration</p> <ul style="list-style-type: none">Module LDO 3400-170Module PH 3400-035Module CONDI 3400-051 <p>Return Info</p>	<p>Select module: The module is in function check (HOLD) mode. The assigned current outputs and relay contacts behave as configured (BASE). Press enter to confirm.</p>
	 <p>80.3%Air 25.6°C</p> <ul style="list-style-type: none">Module LDO 3400-170Automatic - WaterAutomatic - AirProduct calibration SatZero correction <p>Return</p>	<p>Select "Automatic - Air" calibration method Remove sensor and place it in air. Press enter to confirm.</p>

Note: The display may vary depending on the device version.

Menu	Display	Automatic calibration in air
	 <p>The screenshot shows the 'Automatic - Air' calibration screen. At the top, there are icons for 'HOLD', 'cal', and a battery level indicator. The top right corner displays '80.3% Air' and '25.6°C'. The main title is 'Automatic - Air'. Below it, an information icon is followed by 'Calibration medium: Air'. Two data fields are shown: 'Relative humidity 0050 %' and 'Input cal pressure 1013 mbar'. At the bottom, there are two buttons: 'Return' and 'Start' with a right-pointing arrow.</p>	<p>Calibration medium: Air Select: First calibration Enter relative humidity, e.g.:</p> <ul style="list-style-type: none">• Ambient air: 50 %• Bottled gas: 0 % <p>Enter cal pressure if “manual” has been configured. Start with softkey or enter</p>
	 <p>The screenshot shows the 'Automatic - Water' drift check screen. At the top, there are icons for 'HOLD', a fan, 'cal', and a battery level indicator. The top right corner displays '80.3% Air' and '25.6°C'. The main title is 'Automatic - Water'. Below it, an information icon is followed by 'Drift check running' and 'Slope correction'. Three data fields are shown: 'Partial pressure 214.0 mbar', 'Calibration temperature +025.6°C', and 'Calibration pressure 1013mbar'. At the bottom, there are two empty rectangular boxes.</p>	<p>Drift check. Display during calibration</p> <ul style="list-style-type: none">• Partial pressure• Calibration temperature• Calibration pressure <p>If the signal or the measured temperature fluctuate greatly, the calibration procedure is aborted. You must re-start the calibration. If successful, place sensor in process, exit calibration using softkey or enter.</p>

Calibration / Adjustment

Product Calibration (saturation/concentration/partial pressure [hPa, mmHg])
 Preset in: Parameter setting / Cal preset values

Product Calibration (Calibration with Sampling)

When the sensor cannot be removed – e.g. for sterility reasons – its slope can be determined with “sampling”. To do so, the currently measured process value is saved by the Protos. Directly afterwards, you determine a reference value using a portable meter, for example. Then, you enter this reference value into the process analysis system.


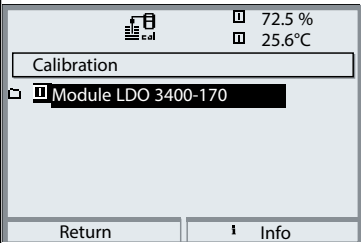
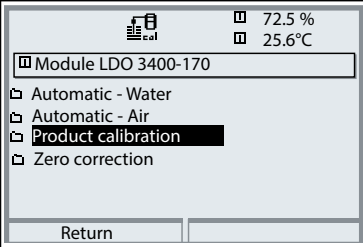
During calibration the module is in function check (HOLD) mode.

Current outputs and relay contacts of the module behave as configured (BASE module).


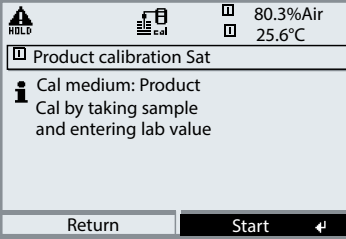
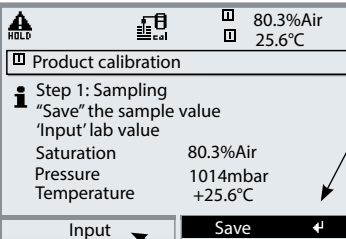
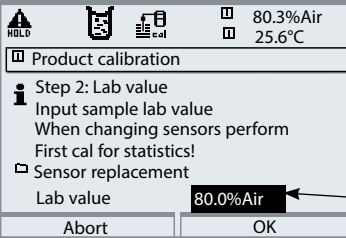
NOTICE!

The reference value must be measured at temperature and pressure conditions similar to those of the process.

Note: The display may vary depending on the device version.

Menu	Display	Product calibration
 cal		Select module: The module is in function check (HOLD) mode. The assigned current outputs and relay contacts behave as configured (BASE). Press enter to confirm.
		Select “Product calibration” calibration method. Sat (or Conc, p’) is preset in Parameter setting / Cal preset values. Press enter to confirm.

Note: The display may vary depending on the device version.


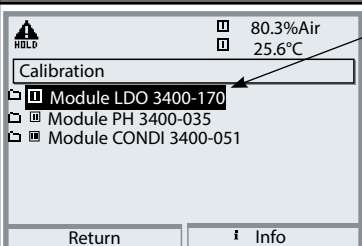
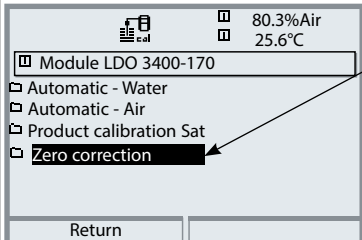
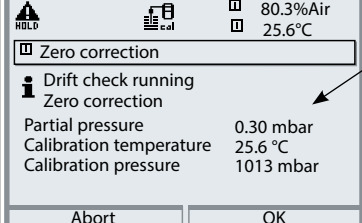
Menu	Display	Product calibration
	 <p>Product calibration Sat</p> <p>Cal medium: Product Cal by taking sample and entering lab value</p> <p>Return Start</p>  <p>Product calibration</p> <p>Step 1: Sampling "Save" the sample value 'Input' lab value</p> <p>Saturation 80.3%Air Pressure 1014mbar Temperature +25.6°C</p> <p>Input Save</p>	<h3>Product Calibration</h3> <p>Product calibration is performed in 2 steps.</p> <p>Prepare reference measurement (e.g. using a portable meter), start with softkey or enter.</p> <h4>Step 1</h4> <p>Take sample. Save measured value and temperature at the moment of sampling ("Save" softkey or enter). Press meas to return to measurement.</p> <p>Exception: Sample value can be measured on the site and be entered immediately. To do so, press "Input" softkey.</p>
	 <p>Product calibration</p> <p>Step 2: Lab value Input sample lab value When changing sensors perform First cal for statistics! Sensor replacement</p> <p>Lab value 80.0%Air</p> <p>Abort OK</p>	<h4>Step 2</h4> <p>Lab value has been measured.</p> <p>When you open the Product calibration menu again, the display shown on the left appears:</p> <p>Enter reference value ("Lab value"). Confirm with "OK".</p>

Calibration / Adjustment

Zero Correction

Zero Correction

For trace measurements below 500 ppb, the zero point should be calibrated. If you want to perform a zero correction, then you should keep the sensor in the calibration medium (eg, N₂ or sulfite solution) until the measured value has stabilized. This may well take several minutes. After that, you can start the calibration process.

Menu	Display	Zero correction
 Note: The display may vary depending on the device version.	 <p>80.3%Air 25.6°C</p> <p>Calibration</p> <ul style="list-style-type: none">Module LDO 3400-170Module PH 3400-035Module CONDI 3400-051 <p>Return Info</p>	Select module: The module is in function check (HOLD) mode. The assigned current outputs and relay contacts behave as configured (BASE). Press enter to confirm.
	 <p>80.3%Air 25.6°C</p> <p>Module LDO 3400-170</p> <ul style="list-style-type: none">Automatic - WaterAutomatic - AirProduct calibration SatZero correction <p>Return</p>	Select "Zero correction" calibration method. Press enter to confirm.
	 <p>80.3%Air 25.6°C</p> <p>Zero correction</p> <p>Drift check running Zero correction</p> <p>Partial pressure 0.30 mbar Calibration temperature 25.6 °C Calibration pressure 1013 mbar</p> <p>Abort OK</p>	Zero correction: Display of partial pressure, calibration temperature and pressure. Confirm with "OK".

Parameter Setting


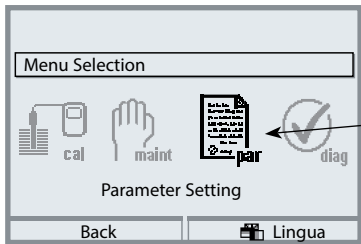
⚠ CAUTION!

Incorrect parameter setting, calibration or adjustment may result in incorrect measurements being recorded. Protos must therefore be commissioned by a system specialist, all its parameters must be set, and it must be fully adjusted.

NOTICE!

The "function check" (HOLD) mode is active during parameter setting. The behavior of the current outputs depends on the parameter setting, i.e., they may be frozen at the last measurement or set to a fixed value. The red "Alarm" LED blinks.

Measurement operations must not be carried out while the Protos is in the function check (HOLD) mode, as this may put the user at risk due to unexpected system behavior.


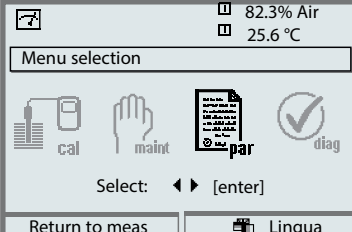
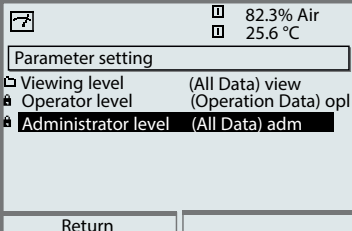
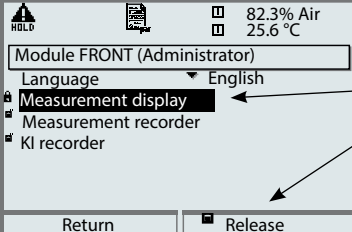
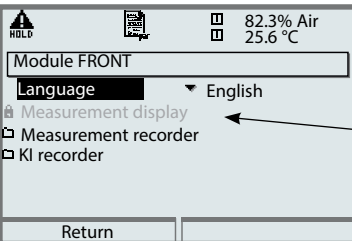
Menu	Display	Action
		Open the Parameter Setting menu From the measuring mode: Press menu key to select menu. Select parameter setting using arrow keys, press enter to confirm

Parameter Setting: Operating Levels

Viewing level, Operator level, Administrator level

Note: Function check (HOLD) mode active (Setting: BASE module)

Note: The display may vary depending on the device version.


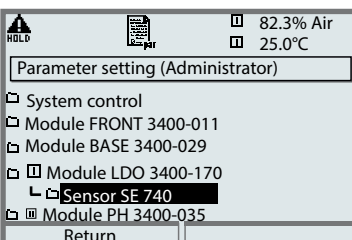
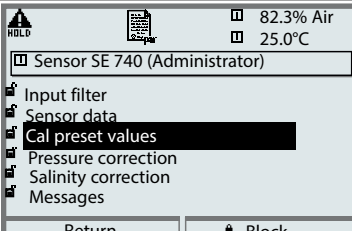
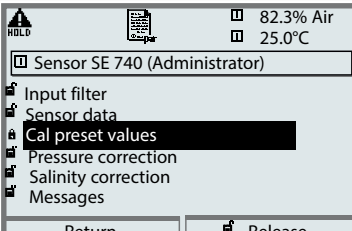

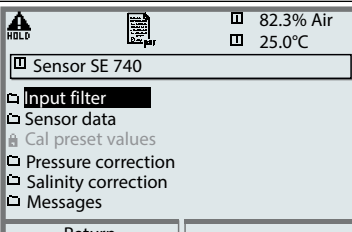
Menu	Display	Viewing level, Operator level, Administrator level
		<p>Opening the Parameter Setting Menu</p> <p>From the measuring mode: Press menu key to select menu. Select parameter setting using arrow keys, press enter to confirm.</p>
		<p>Administrator Level</p> <p>Access to all functions, also passcode setting. Releasing or blocking functions for access from the Operator level.</p>
		<p>Functions which can be blocked for the Operator level are marked with the "lock" icon. The functions are released or blocked using the softkey.</p>
		<p>Operator Level</p> <p>Access to all functions which have been released at the Administrator level. Blocked functions are displayed in gray and cannot be edited (Fig.).</p> <p>Viewing Level</p> <p>Display of all settings. No editing possible!</p>

Parameter Setting: Locking a Function

Administrator level: Enabling / locking functions for Operator level

Note: Function check (HOLD) mode active (Setting: BASE module)


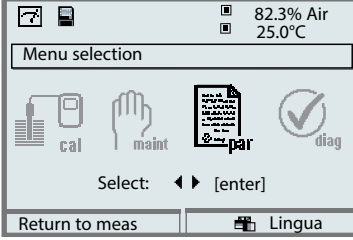
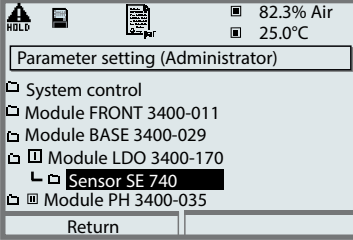
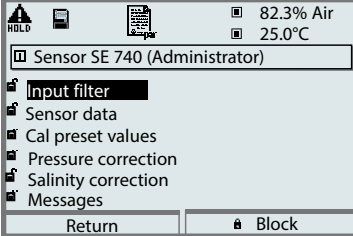
Note: The display may vary depending on the device version.

Menu	Display	Administrator level: Enabling / locking functions
		<p>Example: Blocking calibration adjustments for the Operator level</p> <p>Open the parameter setting menu Select Administrator level. Enter passcode (1989). Select "Sensor SE 740" using arrow keys, press enter to confirm.</p>
		<p>Select "Cal preset values" using arrow keys, "Block" with softkey.</p>
		<p>Now, the "Cal preset values" line is marked with the "lock" icon. This function cannot be accessed from the Operator level any more. The softkey function changes to "Release".</p>
		<p>Open the parameter setting menu Select Operator level, passcode (1246), Select "Sensor SE 740", for example. Now, the locked function is displayed in gray and marked with the "lock" icon.</p>

Activating Parameter Setting

Opening the parameter setting menu

Note: The display may vary depending on the device version.

Menu	Display	Parameter setting
		<p>Opening the Parameter Setting Menu</p> <p>From the measuring mode: Press menu key to select menu. Select parameter setting using arrow keys, press enter to confirm. Passcode as delivered: 1989</p>
		<p>Select "Sensor SE 740", press enter to confirm.</p>
		<p>Select parameter using arrow keys, press enter to confirm.</p>


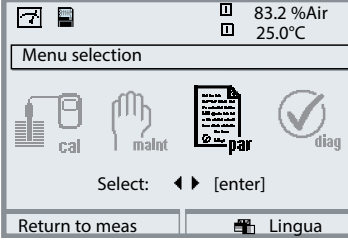
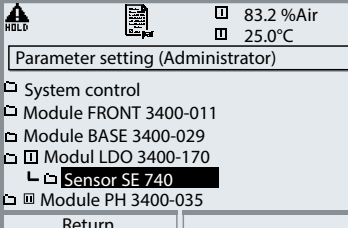
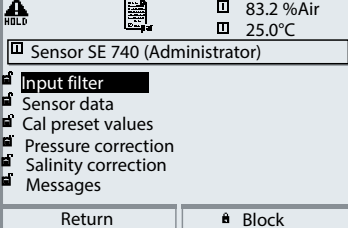
During parameter setting the analyzer is in function check (HOLD) mode:
 Current outputs and relay contacts behave as configured (BASE module).

Setting the Sensor Data Parameters

Opening the parameter setting menu

Note: Function check (HOLD) mode active

Note: The display may vary depending on the device version.


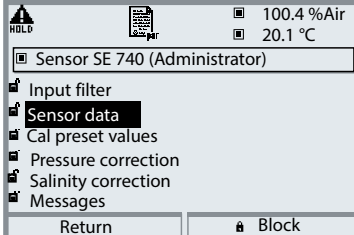
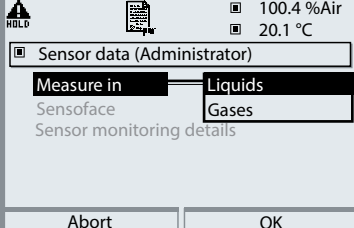
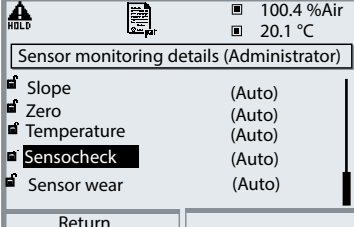
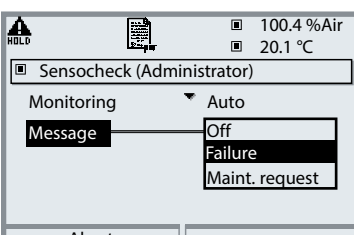
Menu	Display	Parameter setting
		<p>Opening the Parameter Setting Menu</p> <p>From the measuring mode: Press menu key to select menu. Select parameter setting using arrow keys, press enter to confirm. Passcode 1989 (To change passcode: Parameter setting / System control / Passcode entry)</p>
		<p>HOLD</p> <p>During parameter setting the analyzer is in function check (HOLD) mode. Current outputs and relay contacts behave as configured (BASE module).</p> <p>Select "Sensor SE 740". Press enter to confirm.</p>
		<p>Select using arrow keys, press enter to confirm.</p>

Setting the Sensor Data Parameters

Sensor data: Sensor monitoring details

Note: Function check (HOLD) mode active

Note: The display may vary depending on the device version.

Menu	Display	Parameter selection
		<p>Sensor Data (see following page) Sensor data are preset depending on the sensor type. Gray display lines cannot be edited.</p>
		<p>Sensoface provides information on the sensor condition. Great deviations are signaled. Sensoface can be switched off.</p>
		<p>Sensor Monitoring Details The following parameters are monitored: slope, zero, temperature, sensor wear, CIP/SIP counter, O₂ measurement with CIP/SIP, autoclaving counter and sensor operating time. For "Auto", the tolerance limits are displayed in gray. For "Individual", the settings can be specified by the user.</p>
		<p>Messages Sensocheck can generate a message for failure or maintenance request. It can be seen in the Message list of the Diagnostics menu.</p>

Note: The menus may vary depending on the device version.

Parameter	Choices (default in bold print)
Input filter	
Pulse suppression	Off , Weak, Medium, Strong
Input filter	xxx s (10 s)
Sensor data	
Measure in	Liquids , Gases
Sensoface	On / Off
Sensor monitoring details (all messages: Off , Maint. request, Failure)	
Slope	Auto
Zero	Auto
Temperature	Auto , Individual
Sensocheck	Off , Auto
Sensor wear	Off, Auto
Sensor operating time*	Off , Individual
CIP counter*	Off , Individual
SIP counter*	Off , Individual
O ₂ measurement with CIP/SIP	Auto , Individual Auto-off function for O ₂ measurement: When the preset cut-off temperature is exceeded, the sensor automatically stops the oxygen measurement to extend the life of the membrane. The measured oxygen value is frozen, the temperature continues to be measured.
Autoclaving counter*	Off , Individual
Cal preset values	
Product calibration	Sat , Conc/p'(mbar)/p'(mmHg)
Cal concentration	mg/l, µg/l , ppm, ppb
Cal timer	
- Monitoring	Off , Auto, Individual
- Cal timer	xxx h (720 h)

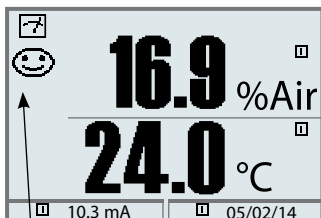
* Data is stored in the sensor

Note: The display may vary depending on the device version.

Parameter	Choices (default in bold print)
Pressure correction	
Ext. pressure transmitter	
I input	0 ... 20 mA / 4 ... 20 mA
Start 0(4) mA	xxxx mbar (0000)
End (20 mA)	xxxx mbar (9999)
Pressure during meas	Manual xxxx mbar / External
Pressure during cal	Manual xxxx mbar / External
Salinity correction	
Entry	Salinity , Chlorinity, Conductivity xx.xx g/kg (00.00)
Messages	
Messages Saturation %Air	Off , Variable limits
Messages Saturation %O ₂	Off , Variable limits
Messages Concentration	Off , Variable limits
Messages Partial pressure	Off , Variable limits

Sensoface

Sensoface is a graphic indication of the sensor condition.



The “smileys” provide information on wear and required maintenance of the sensor (“friendly” - “neutral” - “sad”).

Sensoface Criteria

Slope (Stern-Volmer constant)	Permitted range: 0.0100 ... 0.0350
Zero point (phase angle)	Permitted range: 62° ... 75°
Sensocheck	Sensor defective (first remedy: remove and reconnect the sensor or replace the sensor cap)
Response time	> 1200 sec
Calibration timer	Reminds you to calibrate
Sensor wear	Try replacing the sensor cap

Sensocheck:


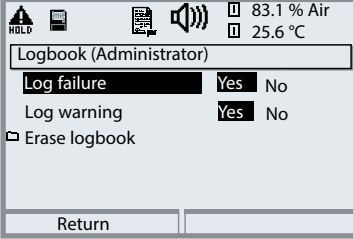
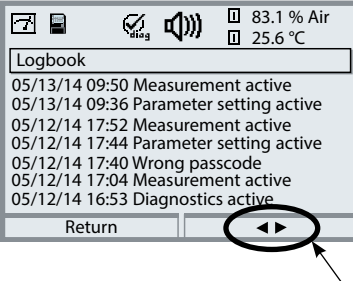

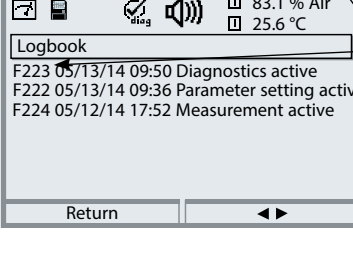

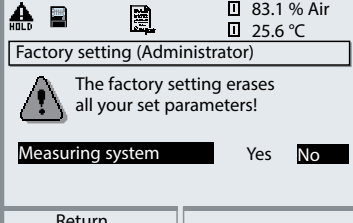
The error information is taken from the sensor.

Logbook, Factory Setting

Parameter setting/System control

Note: Function check (HOLD) mode active

Note: The display may vary depending on the device version.


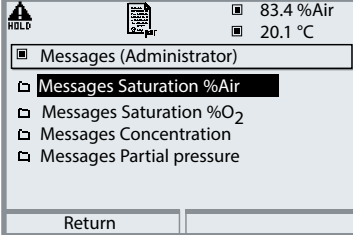
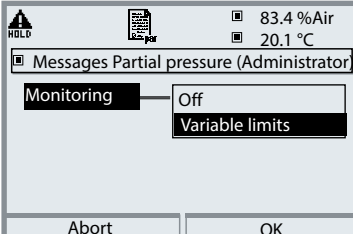
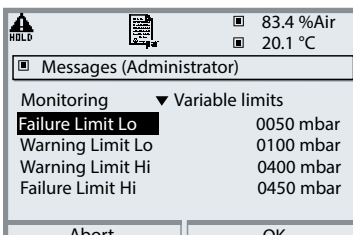



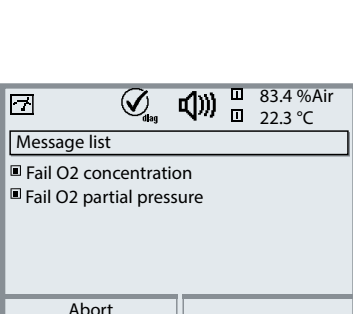
Menu	Display	Logbook, factory setting
	 <p>Logbook (Administrator)</p> <p>Log failure <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>Log warning <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>Erase logbook</p> <p>Return</p>	<h3>Logbook</h3> <p>Select which messages are to be recorded in the logbook.</p> <p>The logbook directly displays the last 50 events (Protos 3400) or 100 events (Protos II 4400) with date and time, e.g. calibrations, warning and failure messages, power failure.</p>
	 <p>Logbook</p> <p>05/13/14 09:50 Measurement active</p> <p>05/13/14 09:36 Parameter setting active</p> <p>05/12/14 17:52 Measurement active</p> <p>05/12/14 17:44 Parameter setting active</p> <p>05/12/14 17:40 Wrong passcode</p> <p>05/12/14 17:04 Measurement active</p> <p>05/12/14 16:53 Diagnostics active</p> <p>Return</p> 	<p>In addition, the add-on function SW3400-104/FW4400-104 allows max. 50,000 entries (with Protos 3400 and SmartMedia Card) or min. 20,000 entries (with Protos II 4400 and Data Card) to be saved on a memory card. The logbook entries can be called from the Diagnostics menu (Fig.).</p>
	 <p>Logbook</p> <p>F223 05/13/14 09:50 Diagnostics active</p> <p>F222 05/13/14 09:36 Parameter setting activ</p> <p>F224 05/12/14 17:52 Measurement active</p> <p>Return</p> 	<p>Pressing the right softkey displays the message identifier.</p>
	 <p>Factory setting (Administrator)</p> <p>The factory setting erases all your set parameters!</p> <p>Measuring system <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>Return</p>	<h3>Factory Setting</h3> <p>Allows resetting the parameters to their factory setting.</p>

Setting the Message Parameters

Messages

Note: Function check (HOLD) mode active (Setting: BASE module)

Note: The display may vary depending on the device version.

Menu	Display	Messages
		<p>Messages</p> <p>All parameters determined by the measuring module can generate messages.</p>
		<p>Variable limits:</p> <p>For the “failure” and “warning” messages you can define upper and lower limits for message generation.</p>
		<p>Message icons:</p> <ul style="list-style-type: none">  Failure (Failure limit HiHi/LoLo)  Maintenance (Warning limit Hi/Lo)
		<p>Diagnostics menu</p> <p>When the “Maintenance” or “Failure” icons are blinking in the display, you should access the Diagnostics menu. The messages are displayed in the “Message list”.</p>

Current Outputs

Select menu: Parameter setting/Module BASE

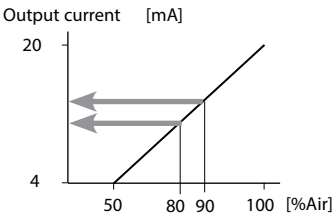
Note: Function check (HOLD) mode active (Setting: BASE module)

Note: The display may vary depending on the device version.

Menu	Display	Parameter setting BASE module
		<p>Configuring a Current Output</p> <ul style="list-style-type: none"> • Open parameter setting • Enter passcode • Select "Module BASE" • Select "Output current ..."
		<ul style="list-style-type: none"> • Select process variable <p>Liquids: ppm/ppb (gases: % vol/ppm vol): Start and end of current output can be set to the other process variable because also the measured value switches automatically. The decimal point can be moved using the arrow keys.</p>
		<ul style="list-style-type: none"> • Select Curve, e.g. "linear": The process variable is represented by a linear output current curve. The desired range of the measured variable is specified by the values for "Start" and "End".

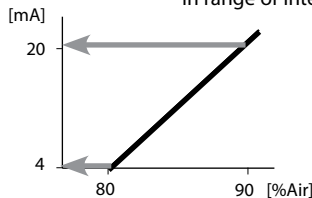
Assignment of measured values: Start (4 mA) and end (20 mA)

Example 1: Range %Air 50 ... 100



Example 2: Range %Air 80 ... 90

Advantage: Higher resolution in range of interest



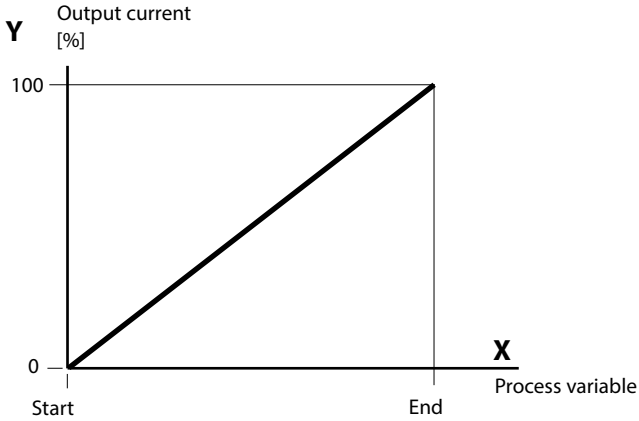
Current Outputs: Characteristics

Select menu: Parameter setting/Module BASE

Note: Function check (HOLD) mode active

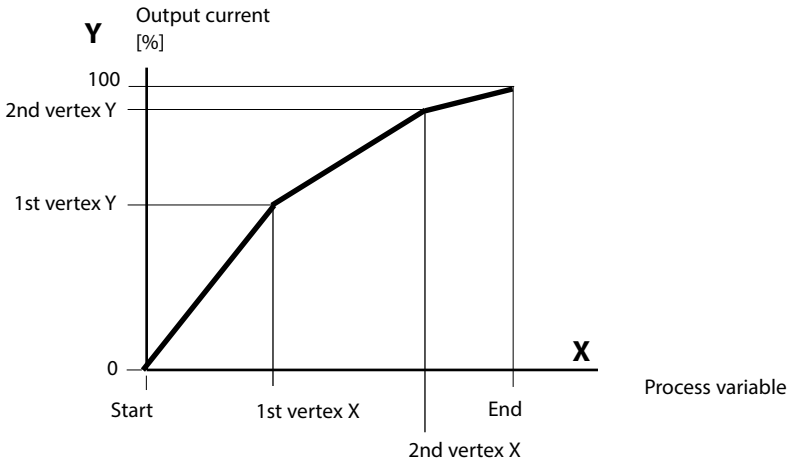
- **Linear characteristic**

The process variable is represented by a linear output current curve.



- **Trilinear characteristic**

Two additional vertices must be entered:



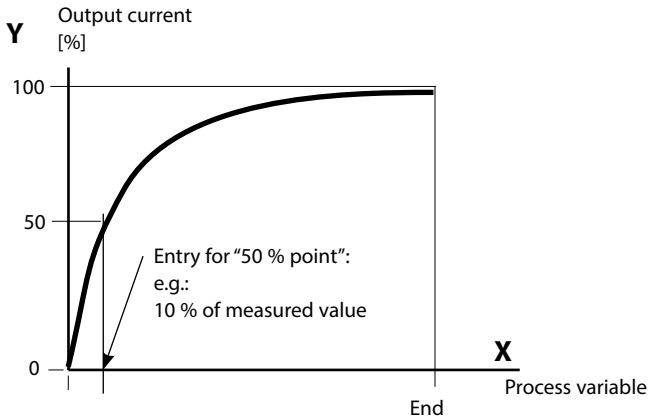
- **Note: Bilinear characteristic**

For a bilinear characteristic, identical parameters are entered for the two vertices (1st vertex, 2nd vertex).

• Function characteristic

Nonlinear output current characteristic: allows measurements over several decades, e.g. measuring very low values with a high resolution and high values with a low resolution.

Required: Entering a value for 50 % output current.



Equation

$$\text{Output current (4 to 20 mA)} = \frac{(1+K)x}{1+Kx} 16 \text{ mA} + 4 \text{ mA}$$

$$K = \frac{E + S - 2 * X50\%}{X50\% - S} \qquad x = \frac{M - S}{E - S}$$

S: Start value at 4 mA

X50%: 50% value at 12 mA (output current range 4 to 20 mA)

E: End value at 20 mA

M: Measured value

Logarithmic output curve over one decade:

S: 10 % of maximum value

X50%: 31.6 % of maximum value

E: Maximum value

Logarithmic output curve over two decades:

S: 1 % of maximum value

X50%: 10 % of maximum value

E: Maximum value

Current Outputs: Output Filter

Select menu: Parameter setting/Module BASE/Output current I.../Output filter

Note: Function check (HOLD) mode active

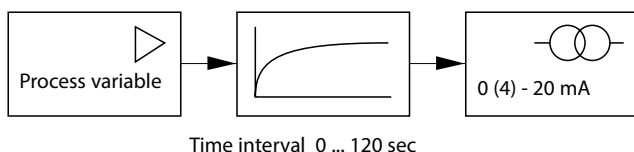
Time averaging filter

To smoothen the current output, a low-pass filter with adjustable time interval can be switched on. When there is a jump at the input (100 %), the output level is at 63 % after the time interval has been reached.

The time interval can be set from 0 to 120 sec. If the time interval is set to 0 sec, the current output follows the input.

Note:

The filter only acts on the current output and the current value of the secondary display, not on the measurement display, the limit values or the controller!



Note:


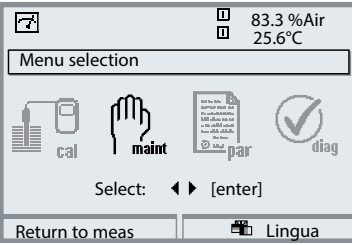
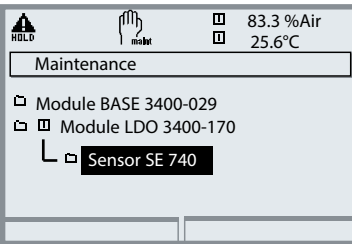
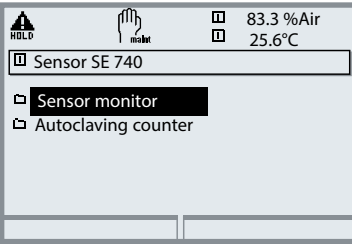
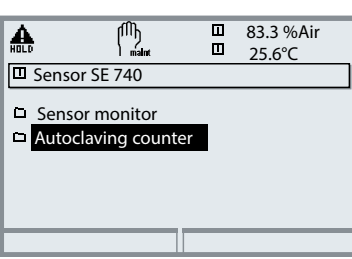
For further BASE module settings (behavior during messages, contacts, opto-coupler inputs) refer to the user manual of the basic device.

Maintenance

Sensor monitor, autoclaving counter

Note: Function check (HOLD) mode active (Setting: BASE module)

Note: The display may vary depending on the device version.

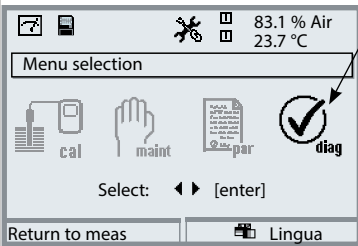
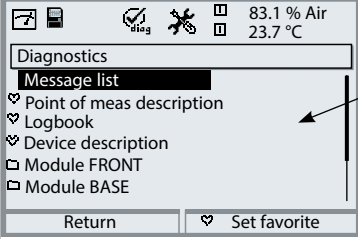
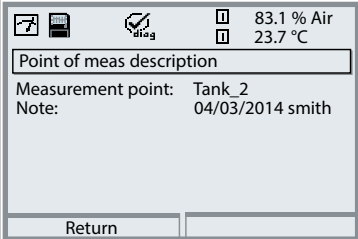
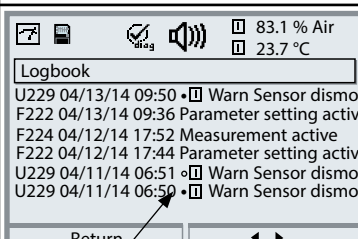
Menu	Display	Maintenance
	   	<p>Opening the Maintenance Menu</p> <p>From the measuring mode: Press menu key to select menu. Select Maintenance (maint) using arrow keys, press enter to confirm. Passcode 2958 (The passcode can be edited by the administrator.)</p> <p>Then select "Sensor SE 740".</p> <p>Sensor Monitor</p> <p>You can use the sensor monitor to validate the sensor by immersing it in a solution with known oxygen concentration, for example, and then checking the values measured.</p> <p>Autoclaving Counter</p> <p>After having completed an autoclaving process, you must manually increment the autoclaving count.</p>

Diagnostic Functions


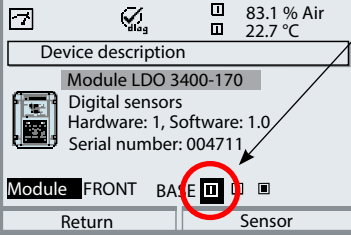
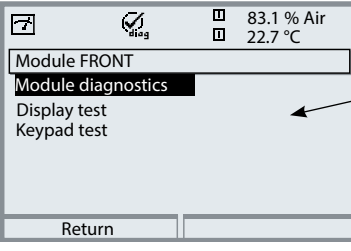
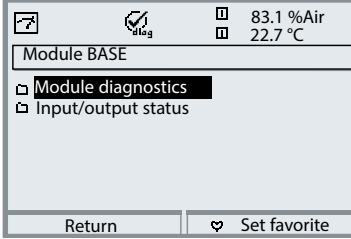
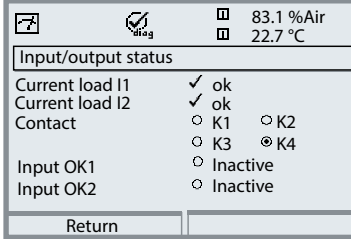
General status information of the measuring system

Select menu: Diagnostics

Note: The display may vary depending on the device version.

Menu	Display	Diagnostic functions
		<p>Opening the Diagnostics Menu</p> <p>From the measuring mode: Press menu key to select menu. Select diagnostics using arrow keys, confirm by pressing enter.</p>
		<p>The "Diagnostics" menu gives an overview of all functions available. Functions which have been set as "Favorite" can be directly accessed from the measuring mode.</p>
		<p>Point of Meas Description</p> <p>Allows entering a tag number and a note. Select position: left/right arrow key, select character: up/down arrow key. Press enter to confirm the entry.</p>
		<p>Logbook</p> <p>The logbook directly displays the last 50 events (Protos 3400) or 100 events (Protos II 4400) with date and time, e.g. calibrations, warning and failure messages, power failure. For parameter setting, see p. 30.</p>
	<p>Module concerned:</p> <ul style="list-style-type: none"> • Message activated ◦ Message deactivated 	

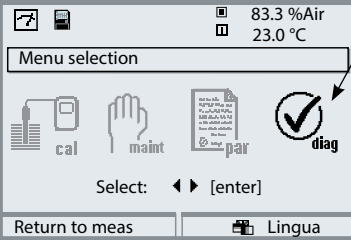

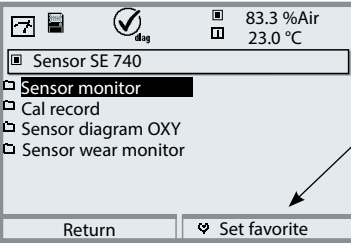
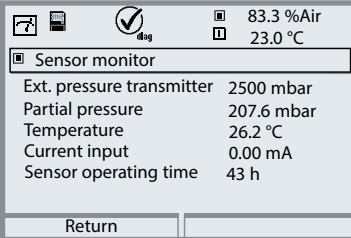
Note: The display may vary depending on the device version.

Menu	Display	Diagnostic functions
		<p>Device Description</p> <p>Select module using arrow keys: Provides information on all modules installed: Function, serial number, hardware and software version, and device options.</p>
		<p>FRONT Module</p> <p>The module contains the display and keypad control. Test possibilities:</p> <ul style="list-style-type: none"> • Module diagnostics • Display test • Keypad test
	 	<p>BASE Module</p> <p>The module generates the standard output signals. Test possibilities:</p> <ul style="list-style-type: none"> • Module diagnostics • Input/output status <p>Example: Module BASE, input/output status.</p>


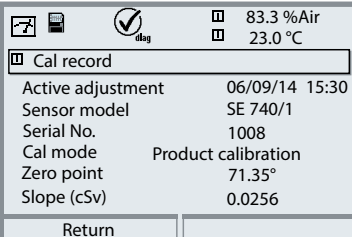
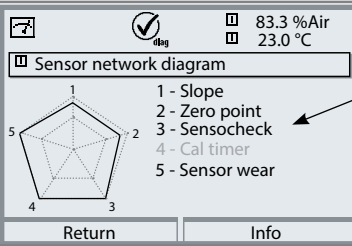
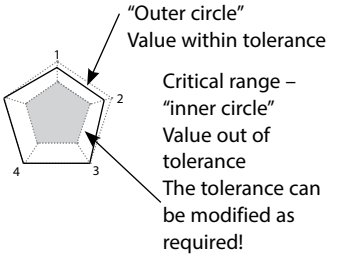
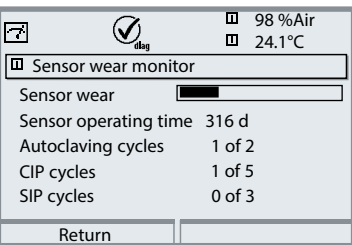
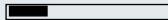
Module Diagnostics

Diagnostics / Module LDO ...

Note: The display may vary depending on the device version.

Menu	Display	Sensor monitor
		<p>Opening the Diagnostics Menu</p> <p>From the measuring mode: Press menu key to select menu. Select diagnostics using arrow keys, confirm by pressing enter. Then select the LDO module.</p>
		<p>The Diagnostics menu gives an overview of all diagnostics functions available. <u>Messages</u> set as “Favorite” can be called directly from the measuring mode using a softkey.</p> <p>To configure, select: Parameter setting / System control / Function control matrix.</p>
		<p>Sensor Monitor</p> <p>Shows the data provided by the sensor.</p> <p>Important function for diagnostics and validation!</p>

Note: The display may vary depending on the device version.

Menu	Display	Cal record, Sensor diagram, Sensor wear monitor
	 <p>Cal record</p> <p>Active adjustment 06/09/14 15:30 Sensor model SE 740/1 Serial No. 1008 Cal mode Product calibration Zero point 71.35° Slope (cSv) 0.0256</p> <p>Return</p>	<p>Cal Record</p> <p>Data of last calibration, suitable for documentation to ISO 9000 and GLP</p>
	 <p>Sensor network diagram</p> <p>1 - Slope 2 - Zero point 3 - Sensocheck 4 - Cal timer 5 - Sensor wear</p> <p>Return Info</p>  <p>"Outer circle" Value within tolerance</p> <p>Critical range – "inner circle" Value out of tolerance</p> <p>The tolerance can be modified as required!</p>	<p>Sensor Diagram</p> <p>The measured values are continuously monitored during the measurement process. The sensor network diagram provides at-a-glance information about critical parameters.</p> <p>If a tolerance limit has been exceeded, the respective parameter is flashing. Values in gray: Monitoring switched off.</p>
	 <p>Sensor wear monitor</p> <p>Sensor wear </p> <p>Sensor operating time 316 d Autoclaving cycles 1 of 2 CIP cycles 1 of 5 SIP cycles 0 of 3</p> <p>Return</p>	<p>Sensor Wear Monitor</p> <p>In addition to the current sensor wear, the sensor operating time is displayed. The numbers of autoclave, CIP, and SIP cycles are displayed when you have entered corresponding maximum values in the "Sensor monitoring details" menu.</p>

CIP/SIP Cycles, Autoclaving Counter

CIP (Cleaning in Place) / SIP (Sterilization in Place)

CIP/SIP cycles are used for cleaning or sterilizing the process-wetted parts in the process. They are performed for biotech applications, for example. Depending on the application, one (alkaline solution, water) or more chemicals (alkaline solution, water, acidic solution, water) are used. The temperatures for CIP are around 80 °C, for SIP around 110 °C. These procedures extremely stress the sensors.

The device automatically recognizes the CIP and SIP cycles and correspondingly increments the counter. The user can specify the max. number of cycles in the "Sensor monitoring details" menu and decide whether a message is to be generated when this number is exceeded. These data are not stored in the sensor and cannot be reset. The number of cycles is shown in the sensor wear monitor of the Diagnostics menu when an individual max value has been specified.

Autoclaving Counter

After reaching a specified limit value, the autoclaving counter generates a Sensoface message. As soon as the counter has reached the specified value, Sensoface is getting "sad". After each autoclaving process, you must manually increment the autoclaving counter in the Maintenance menu.

Setting Diagnostic Messages as Favorite

Select menu: Parameter setting / System control / Function control matrix

Secondary Displays (1)

Here, additional values are displayed in the measuring mode according to the factory setting. When the respective softkey (2) is pressed, the process variables measured by the modules plus date or time are displayed. In addition, you can use the **softkeys (2)** to control functions.

To assign a function to a softkey, select

Parameter setting/System control/ Function control matrix

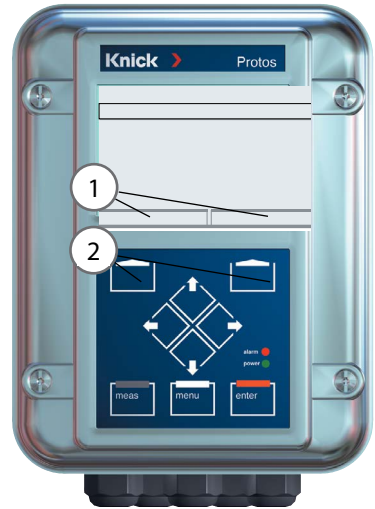
Function which can be controlled by softkeys:

- Parameter set selection
- KI recorder Start/Stop¹⁾
- Favorites
- Unical (fully automated probe controller)²⁾

Favorites

Selected Diagnostics functions can be called directly from the measuring mode using a softkey.

The table on the next page explains how to select favorites.



	ParSet	KI rec.	Fav	Unical
Input OK2	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Left softkey	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Right softkey	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
Profibus DO 2	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Return Connect

Example:
"Favorites" to be selected with
"Right softkey"

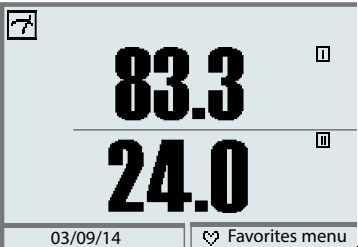

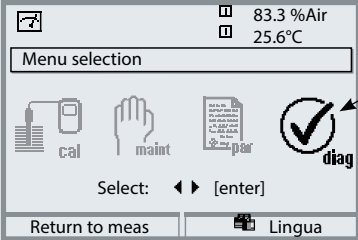
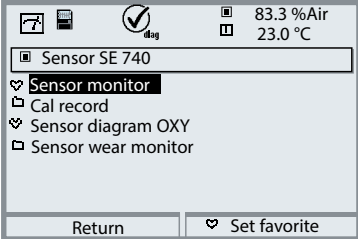
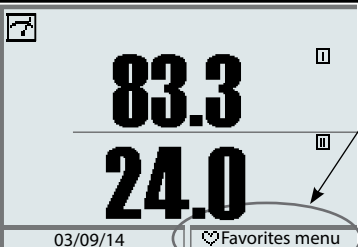
To select a softkey function:
Select desired function
using arrow keys,
press "Connect" softkey
and confirm with **enter**.

To deselect a function:
Press "Disconnect" softkey,
confirm with **enter**.

1) With Protos 3400(X)

2) With Protos II 4400(X) from firmware version 2.

Note: The display may vary depending on the device version.

Menu	Display	Selecting a favorite
		Favorites Menu Diagnostics functions can be called directly from the measuring mode using a softkey. The "Favorites" are selected in the Diagnostics menu.
		Selecting a Favorite Press menu key to select menu. Select Diagnostics using arrow keys, press enter to confirm. Then select the module and confirm by pressing enter .
		Set/delete favorite: "Set favorite" allows activation of the selected diagnostic function directly from the measuring mode via softkey. The menu line is marked with a heart icon.
		Pressing the meas key returns to measurement. When the softkey has been assigned to "Favorites", "Favorites menu" is read in the secondary display (see "Function control matrix").

Note:

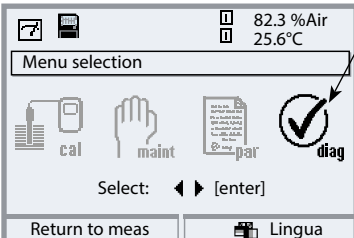

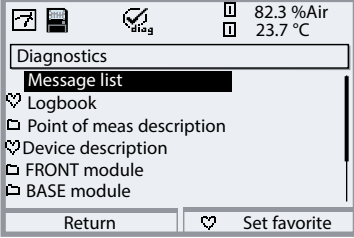
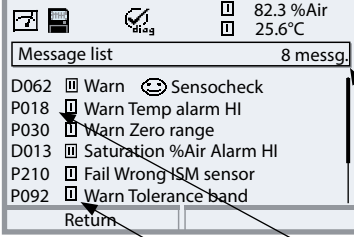
When one of the softkeys has been assigned to the "Favorites menu" function, diagnostic functions which have been set as "Favorite" can be directly called from the measuring mode.

Diagnostic Functions

General status information of the measuring system

Select menu: Diagnostics - Message list

Note: The display may vary depending on the device version.

Menu	Display	Diagnostic functions
		<p>Opening the Diagnostics Menu</p> <p>From the measuring mode: Press menu key to select menu. Select diagnostics using arrow keys, press enter to confirm.</p>
		<p>The "Diagnostics" menu gives an overview of all functions available. Functions which have been set as "Favorite" can be directly accessed from the measuring mode.</p>
		<p>Message List</p> <p>Shows the currently activated warning or failure messages in plain text.</p> <p>Number of messages</p> <p>When there are more than 7 messages, a vertical scrollbar appears. Scroll with the up/down arrow keys.</p> <p>Message identifier</p> <p>See message list for description.</p> <p>Module identifier</p> <p>Specifies the module that has generated the message.</p>

Messages

Messages with Protos 3400

No.	OXY messages	Message type
D008	Meas. processing (factory settings)	FAIL
D009	Module failure (Firmware Flash check sum)	FAIL
D010	Saturation %Air Range	FAIL
D011	Saturation %Air Alarm LO_LO	FAIL
D012	Saturation %Air Alarm LO	WARN
D013	Saturation %Air Alarm HI	WARN
D014	Saturation %Air Alarm HI_HI	FAIL
D015	Temp measurement	FAIL
D016	Temperature Alarm LO_LO	FAIL
D017	Temperature Alarm LO	WARN
D018	Temperature Alarm HI	WARN
D019	Temperature Alarm HI_HI	FAIL
D020	Concentration range	FAIL
D021	Concentration Alarm LO_LO	FAIL
D022	Concentration Alarm LO	WARN
D023	Concentration Alarm HI	WARN
D024	Concentration Alarm HI_HI	FAIL
D025	Part. pressure range	FAIL
D026	Part. press. Alarm LO_LO	FAIL
D027	Part. press. Alarm LO	WARN
D028	Part. press. Alarm HI	WARN
D029	Part. press. Alarm HI_HI	FAIL
D030	Zero range	WARN
D035	Slope range	WARN

Messages

No.	OXY messages	Message type
D045	Saturation %O2 Range	FAIL
D046	Saturation %O2 Alarm LO_LO	FAIL
D047	Saturation %O2 Alarm LO	WARN
D048	Saturation %O2 Alarm HI	WARN
D049	Saturation %O2 Alarm HI_HI	FAIL
D060	Sad Sensoface: Slope	WARN
D061	Sad Sensoface: Zero	WARN
D062	Sad Sensoface: Sensocheck	User-defined
D063	Sad Sensoface: Response time	WARN
D064	Sad Sensoface: Cal timer	WARN
D070	Sad Sensoface: Sensor wear	User-defined
D071	Sad Sensoface: Membrane wear	User-defined
D080	Range (sensor current)	WARN
D081	O2 measurement OFF (temp)	Text
D090	Vol% range (measurement in gases)	WARN
D091	Vol% Alarm LO_LO (measurement in gases)	FAIL
D092	Vol% Alarm LO (measurement in gases)	WARN
D093	Vol% Alarm HI (measurement in gases)	WARN
D094	Vol% Alarm HI_HI (measurement in gases)	FAIL
D095	ppm range (measurement in gases)	FAIL
D096	ppm Alarm LO_LO (measurement in gases)	FAIL
D097	ppm Alarm LO (measurement in gases)	WARN
D098	ppm Alarm HI (measurement in gases)	WARN
D099	ppm Alarm HI_HI (measurement in gases)	FAIL
D100	No sensor	FAIL
D101	Communication interrupted	FAIL
D102	Sensor connection	FAIL

Messages

No.	OXY messages	Message type
D110	CIP counter	User-defined
D111	SIP counter	User-defined
D112	Autoclaving counter	User-defined
D113	Sensor operating time (duration of use)	User-defined
D130	SIP cycle counted	Text
D131	CIP cycle counted	Text
D200	Temp O2 conc/SAT	WARN
D201	Cal temp	Text
D203	Cal: Identical media	Text
D204	Cal: Media interchanged	Text
D205	Cal: Sensor unstable	Text
D254	Module reset	Text

No.	Calculation Block OXY/OXY Messages	Message type
H010	%AIR-Diff Range	FAIL
H011	%AIR-Diff Alarm LO_LO	FAIL
H012	%AIR-Diff Alarm LO	WARN
H013	%AIR-Diff Alarm HI	WARN
H014	%AIR-Diff Alarm HI_HI	FAIL
H015	Temperature-Diff Range	FAIL
H016	Temperature-Diff Alarm LO_LO	FAIL
H017	Temperature-Diff Alarm LO	WARN
H018	Temperature-Diff Alarm HI	WARN
H019	Temperature-Diff Alarm HI_HI	FAIL
H020	Concentration-Diff Range	FAIL
H021	Concentration-Diff Alarm LO_LO	FAIL

Messages

No.	Calculation Block OXY/OXY Messages	Message type
H022	Concentration-Diff Alarm LO	WARN
H023	Concentration-Diff Alarm HI	WARN
H024	Concentration-Diff Alarm HI_HI	FAIL
H045	%O2-Diff Range	FAIL
H046	%O2-Diff Alarm LO_LO	FAIL
H047	%O2-Diff Alarm LO	WARN
H048	%O2-Diff Alarm HI	WARN
H049	%O2-Diff Alarm HI_HI	FAIL
H090	Vol%-Diff range (measurement in gases)	WARN
H091	Vol%-Diff Alarm LO_LO (measurement in gases)	FAIL
H092	Vol%-Diff Alarm LO (measurement in gases)	WARN
H093	Vol%-Diff Alarm HI (measurement in gases)	WARN
H094	Vol%-Diff Alarm HI_HI (measurement in gases)	FAIL
H095	ppm-Diff range (measurement in gases)	FAIL
H096	ppm-Diff Alarm LO_LO (measurement in gases)	FAIL
H097	ppm-Diff Alarm LO (measurement in gases)	WARN
H098	ppm-Diff Alarm HI (measurement in gases)	WARN
H099	ppm-Diff Alarm HI_HI (measurement in gases)	FAIL

Messages

Messages with Protos II 4400

 Failure
  Out of Specification
  Maintenance Required

No.	Message Type	OXY Messages
D008	Failure	Meas. Processing (Factory Settings)
D009	Failure	Firmware Error
D010	Failure	Saturation %air range
D011	Failure	Saturation %Air Alarm LO_LO
D012	Out of Specification	Saturation %Air Alarm LO
D013	Out of Specification	Saturation %Air Alarm HI
D014	Failure	Saturation %Air Alarm HI_HI
D015	Failure	Temperature Range
D016	Failure	Temperature Alarm LO_LO
D017	Out of Specification	Temperature Alarm LO
D018	Out of Specification	Temperature Alarm HI
D019	Failure	Temperature Alarm HI_HI
D020	Failure	Concentration Range
D021	Failure	Concentration Alarm LO_LO
D022	Out of Specification	Concentration Alarm LO
D023	Out of Specification	Concentration Alarm HI
D024	Failure	Concentration Alarm LO_LO
D025	Failure	Partial Pressure Range
D026	Failure	Partial Pressure Alarm LO_LO
D027	Out of Specification	Partial Pressure Alarm LO
D028	Out of Specification	Partial Pressure Alarm HI
D029	Failure	Partial Pressure Alarm HI_HI
D045	Failure	Saturation %O2 Range
D046	Failure	Saturation %O2 Alarm LO_LO
D047	Out of Specification	Saturation %O2 Alarm LO
D048	Out of Specification	Saturation %O2 Alarm HI
D049	Failure	Saturation %O2 Alarm HI_HI
D060	Failure/Maintenance Required	Sad Sensoface: Slope
D061	Failure/Maintenance Required	Sad Sensoface: Zero Point
D062	User-defined	Sad Sensoface: Sensocheck
D063	Maintenance Required	Sad Sensoface: Response Time
D064	Maintenance Required	Sad Sensoface: Calibration timer
D070	User-defined	Sad Sensoface: Sensor Wear

Messages

No.	Message Type	OXY Messages
D071	User-defined	Sad Sensoface: Membrane Wear
D080	Maintenance Required	Sensor Current Range
D081	Failure	O2 Measurement OFF (Temp)
D110	User-defined	CIP Counter
D111	User-defined	SIP Counter
D112	User-defined	Autoclaving Counter
D113	User-defined	Sensor Operating Time
D124	Maintenance Required	Sensor Date
D130	Info	SIP Cycle Counted
D131	Info	CIP Cycle Counted
D200	Maintenance Required	Temp O2 Conc/Sat
D201	Maintenance Required	Cal Temperature
D203	Info	Cal: Identical Media
D204	Info	Cal: Cal: Media Interchanged
D205	Info	Cal: Sensor Unstable
D254	Info	Module Reset

Messages

No.	Message Type	Calculation Block OXY / OXY Messages
H010	Failure	Saturation %AIR Diff Range
H011	Failure	Saturation %AIR Diff Alarm LO_LO
H012	Out of Specification	Saturation %AIR Diff Alarm LO
H013	Out of Specification	Saturation %AIR Diff Alarm HI
H014	Failure	Saturation %AIR Diff Alarm HI_HI
H015	Failure	Temperature Diff Range
H016	Failure	Temperature Diff Alarm LO_LO
H017	Out of Specification	Temperature Diff Alarm LO
H018	Out of Specification	Temperature Diff Alarm HI
H019	Failure	Temperature Diff Alarm HI_HI
H020	Failure	Concentration (Liquid) Diff Range
H021	Failure	Concentration (Liquid) Alarm LO_LO
H022	Out of Specification	Concentration (Liquid) Diff Alarm LO
H023	Out of Specification	Concentration (Liquid) Diff Alarm HI_HI
H024	Failure	Concentration (Liquid) Diff Alarm HI_HI
H045	Failure	%O2 Diff Range
H046	Failure	%O2 Diff Alarm LO_LO
H047	Out of Specification	%O2 Diff Alarm LO
H048	Out of Specification	%O2 Diff Alarm HI
H049	Failure	%O2 Diff Alarm HI_HI
H090	Failure	Vol% Diff Range (Measurement in Gases)
H091	Failure	Vol% Diff Alarm LO_LO (Measurement in Gases)
H092	Out of Specification	Vol% Diff Alarm LO (Measurement in Gases)
H093	Out of Specification	Vol% Diff Alarm HI (Measurement in Gases)
H094	Failure	Vol% Diff Alarm HI_HI (Measurement in Gases)
H200	Maintenance Required	Calculation Block Configuration

Specifications

Input for sensor

SE740 optical oxygen sensor

Display ranges

Saturation (-10 ... 80 °C)

0.0 ... 999.9 % Air

0.00 ... 99.99 % O₂

Concentration (-10 ... 80 °C)

0.00 ... 99.99 mg/l (ppm)

Volume concentration in gas

0.00 ... 99.99 %vol

Partial pressure

0 ... 9999 mbar

Pressure correction *

Air pressure

Manual

0 ... 9999 mbar

External

0 ... 9999 mbar (through current input 0(4) ... 20 mA input)

Salinity correction

0.0 ... 45.0 g/kg

Temperature input

Measuring range

-10 ... 130 °C / 14 ... 266 °F

Resolution

0.1 °C

Measurement error**

0.2 % meas.val. + 0.5 K (< 1 K with NTC > 100 °C)

Current input

Pressure range

0(4) ... 20 mA for absolute or differential pressure transmitter

Current range

0 ... 9999 mbar

0(4) ... 20 mA / 50 ohms

Resolution

Start / end user-defined within pressure range

< 1%

Sensor monitoring *

Sensocheck, monitoring of the sensor

Sensoface

Sensor diagram

provides information on the sensor condition:

Zero, slope, calibration interval,

Sensocheck, wear

Sensor monitor

Direct display of measured values from sensor for validation of partial pressure / temperature / I input

Wear monitor

Display of wear parameters

Sensor wear / sensor operating time / autoclaving cycles / SIP cycles / CIP cycles

Specifications

Sensor standardization *

Operating modes

- Automatic calibration in air-saturated water
- Automatic calibration in air
- Product calibration: Saturation
- Product calibration: Concentration and
Product calibration: Partial pressure
- Zero correction

Calibration record

Recording of:

Zero, slope, calibration method
with date and time of the last three calibrations
and the first calibration

* User-defined

** at rated operating conditions, ± 1 count, plus sensor error

Specifications

General data

RoHS conformity	According to EU directive 2011/65/EU
EMC Emitted interference Interference immunity Lightning protection	EN 61326-1, EN 61326-2-3 NAMUR NE 21 Industrial applications* (EN 55011 Group 1 Class A) Industrial applications to EN 61000-4-5, Installation class 2
Rated operating conditions	Ambient temperature: -20 ... 55 °C / -4 ... 131 °F Relative humidity: 10 ... 95 % non-condensing
Transport/storage temperature	-20 ... 70 °C / -4 ... 158 °F
Screw clamp connector	Single or stranded wires up to 2.5 mm ²

* This equipment is not designed for domestic use, and is unable to guarantee adequate protection of the radio reception in such environments.

Appendix:

Minimum Spans for Current Outputs

The LDO 3400-170/4400-170 module is a measuring module. It does not provide current outputs. Current outputs are provided by the BASE module (basic device) or by communication modules (e.g. OUT, PID). The corresponding parameters must be set there.

The minimum current span shall prevent that the resolution limit of the measurement technology (± 1 count) is seen in the current.

LDO Module

%air	0.1
%O ₂	0.1
°C	10.0
mg/l	2 µg/l
ppm	2 ppb
mbar	1 mbar (partial pressure)
%vol	0.01
ppm	100
°F	10.0

Calculation Block OXY/OXY

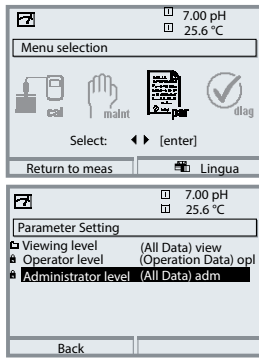
Diff. %air	0.1
Diff. %O ₂	0.1
Diff. mg/l	10 % min. 2.0 µg/l
Diff. ppm	10 % min. 2.0 ppb
Diff °C	10.0
Diff. %vol	0.01
Diff. ppm	100

Overview

Overview of Parameter Setting

Parameter Setting Menu

Note: The menus may vary depending on the device version



Parameter Setting

From measuring mode: Press **menu** key to select menu. Select parameter setting using arrow keys, press **enter** to confirm.

Administrator level

Access to all functions, also passcode setting. Releasing or blocking functions for access from the Operator level.

Operator level

Access to all functions which have been released at the Administrator level. Blocked functions are displayed in gray and cannot be edited.

Viewing level

Only display, no editing possible!

System Control

Memory card (Option)	Menu only appears when a memory card is inserted and the corresponding add-on function has been enabled.
Transfer configuration	The complete configuration of a device can be written on a memory card. This allows transferring all device settings to other devices with identical equipment (exception: options and passcodes).
Parameter set	2 parameter sets (A, B) are available in the device. The currently active parameter set is shown in the display. Parameter sets contain all settings except: sensor type, options, system control settings Up to 5 parameter sets (1, 2, 3, 4, 5) are available when a memory card (Option) is used.
Function control	Select the functions to be controlled via softkeys and OK inputs
Time/date	Time, date, display format
Meas. point description	Free input of a tag number, can be called from the diagnostics menu
Release of options	Option activation via TAN
Reset to default	Reset all parameters to factory setting
Passcode entry	Change passcodes
Firmware update	Update the firmware using an Update Card
Logbook	Select the events to be recorded

Overview

Overview of Parameter Setting

Parameter Setting Menu



FRONT Module: Display Settings

Language	Select the menu language
Units ¹⁾	Select the measurement units
Formats ¹⁾	Select the display format
Measurement display	Representation of measured values on the display
Display	Brightness/contrast, auto-off

BASE Module: Signal Outputs and Inputs, Contacts

Output current I1, I2	Separately adjustable current outputs
Contact K4	Failure signaling
Contacts K3, K2, K1	Separately adjustable relay contacts
Inputs OK1, OK2	Optocoupler signal inputs

Note: The menu may vary depending on the device version

1) Only with Protos II 4400(X)

Parameter Setting Menu

Note: The menus may vary depending on the device version



LDO Module

Input filter

Sensor data

- Measure in
- Sensoface
- Details

Representation of measured values on the display:
Liquids, Gases

Slope, zero, temperature, Sensocheck, sensor wear,
sensor operating time, CIP/SIP counter,
O2 measurement with CIP/SIP, autoclaving counter

Cal preset values

- Cal saturation
- Cal concentration
- Cal timer

mg/l, µg/l, ppm, ppb

Pressure correction

- Ext. pressure transmitter
- Pressure during meas
- Pressure during cal

Salinity correction

- Entry
- Salinity

Salinity, Chlorinity, Conductivity

Messages

- Saturation %Air
- Saturation %O₂
- Concentration
- Partial pressure

Calibration Menu



LDO Module

- Automatic - Water
- Automatic - Air
- Product calibration Sat
- Product calibration Conc
- Product cal Partial pressure
- Zero correction

Maintenance Menu



BASE Module

Current source Output current definable 0 ... 22 mA

LDO Module

Sensor monitor Partial pressure, ext. pressure transmitter, temperature, current input
 Autoclaving counter Entry/Display of autoclaving cycles, display of maximally permitted number of cycles (when previously entered)

Diagnostics Menu



Message list List of all warning and failure messages
 Point of meas description
 Logbook
 Device description Hardware version, serial no., (Module) firmware, options

FRONT Module

Module diagnostics
 Display test
 Keypad test

BASE Module

Module diagnostics
 Input/output status

LDO Module

Module diagnostics Internal function test
 Sensor monitor Shows the values currently measured by the sensor
 Cal record Data of last adjustment / calibration
 Sensor diagram Graphical representation of the sensor parameters
 Sensor wear monitor Display of sensor wear, CIP, SIP, autoclaving counter

Note: The menus may vary depending on the device version

Index

A

- Adjustment 10
- Administrator level 22
- Assigning measured values, start (4 mA) and end (20 mA) 32
- Attaching the terminal plates 7
- Autoclaving counter, description 41
- Autoclaving counter, maintenance 36
- Automatic calibration in air 16
- Automatic calibration in water 14

B

- Behavior during messages 35
- Bilinear characteristic 33

C

- Calibration 10
- Calibration with sampling 18
- Cal record 40
- CIP (Cleaning in Place) 41
- Connecting the module 8
- Connection assignment 9
- Contacts, parameter setting 35
- Current outputs 32
- Current outputs, characteristics 33
- Current outputs, minimum spans 55

D

- Device description 38
- Device firmware 6
- Diagnostic messages 44
- Diagnostic messages as favorite 42
- Diagnostics 37
- Disposal 2

Index

E

Electrostatic discharge (ESD) 8

EMC 54

Error messages 45

F

Factory setting 30

Favorites 42

Firmware version 6

Function control matrix 42

H

Hardware/Firmware version 6

I

Installing the module 8

Intended use 5

L

LDO 5

Linear characteristic 33

Lock icon 23

Locking a function 23

Logarithmic output curve 34

Logbook, diagnostics 37

Logbook, parameter setting 30

M

Maintenance 36

Message icons 31

Message list 44

Messages 31

Messages with Protos 3400 45

Messages with Protos II 4400 49

Module compatibility 6

Module installation 8

Index

N

Nameplate 7

O

Operating levels 22

Operator level 22

Optocoupler inputs 35

Output currents, parameter setting 32

Output filter 35

Overview of parameter setting 56

P

Parameter setting 21, 24

Parameter setting, activating 24

Parameter setting, overview 56

Phase angle, calibration 10

Product calibration 18

R

Rated operating conditions 54

Release (softkey function) 23

Restore factory settings 30

Returns 2

S

Safety information 5

Screw clamp connector 54

Secondary displays 42

Sensocheck 29

Sensoface 26

Sensoface criteria 29

Sensor data 26

Sensor data, parameter setting 25

Sensor diagram 40

Sensor monitor, diagnostics 39

Index

Sensor monitoring details 26
Sensor monitor, maintenance 36
Sensor wear monitor 40
Serial number, display 6
SIP (Sterilization in Place) 41
Specifications 52
Stern-Volmer constant, calibration 10
Stern-Volmer constant, permitted range 29

T

Table of contents 3
Technical data 52
Terminal plate 7
Trademarks 2
Trilinear characteristic 33

V

Variable limits 31
Viewing level 22

W

Wiring 9

Z

Zero correction 20



Knick
Elektronische Messgeräte
GmbH & Co. KG

Headquarters

Beuckestraße 22 • 14163 Berlin

Germany

Phone: +49 30 80191-0

Fax: +49 30 80191-200

info@knick.de

www.knick.de

Local Contacts

www.knick-international.com

Copyright 2019 • Subject to change

Version: 3

This document was published on September 30, 2019.

The latest documents are available for download on our website below the corresponding product description.



095318

TA-201.170-KNE03