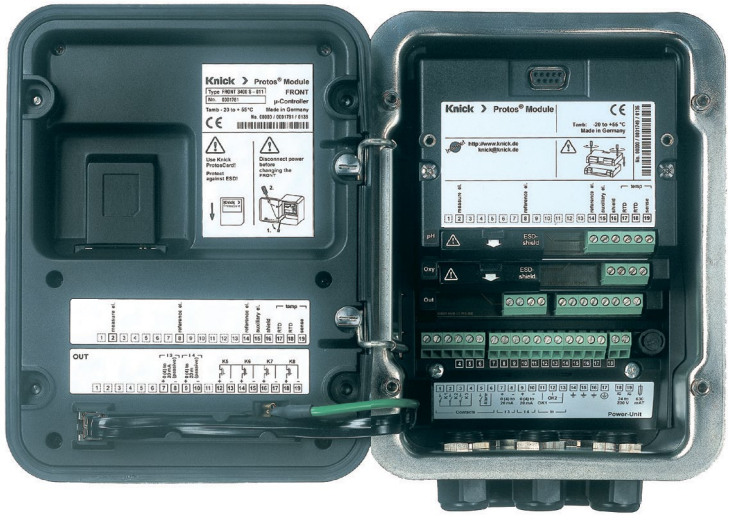
The Art of Measuring.

Knick

User Manual
English

Protos 3400(X)
Process Analysis System

Protos PHU 3400(X)-110 Communication Module
For Actuating Probe Controllers (Unical / Uniclean)
-Automatic pH Measurement-



Latest Product Information: www.knick.de

Return of products under warranty

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 fluids, it must be decontaminated/disinfected before shipment. In that case, please attach a corresponding certificate, for the health and safety of our service personnel.

Disposal

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

Trademarks

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Protos PHU 3400(X)-110 Module

Intended Use

The module is used for simultaneous pH, ORP, and temperature measurement with glass electrodes. It allows connection of the Unical 9000(X) probe controller for fully automated pH measurement, cleaning, and calibration or the Uniclean 900(X) for fully automated pH measurement.
The PHU 3400X-110 module is intended for operation in locations subject to explosion hazards which require equipment of Group II, device category 2(1), gas/dust.

Conformity with FDA 21 CFR Part 11

In their directive "Title 21 Code of Federal Regulations, 21 CFR Part 11, Electronic Records; Electronic Signatures" the US American health agency FDA (Food and Drug Administration) regulates the production and processing of electronic documents for pharmaceutical development and production. This results in requirements for measuring devices used for corresponding applications. The following features ensure that the Protos 3400(X) modular process analysis system meets the demands of FDA 21 CFR Part 11:

Electronic Signature
Access to the device functions is regulated and limited by individually adjustable codes – "Passcodes". This prevents unauthorized modification of device settings or manipulation of the measurement results. Appropriate use of these passcodes makes them suitable as electronic signature.

Audit Trail Log
Every change of device settings can be automatically recorded and documented in the Audit Trail Log on the SmartMedia card. The recording can be encrypted.

Safety Information

Application in Hazardous Locations

Caution!
Never try to open the module! If a repair should be required, return the module to our factory.

If the specifications in the instruction manual are not sufficient for assessing the safety of operation, please contact the manufacturer to make sure that your intended application is possible and safe.

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.
- Observe correct shielding: To avoid interferences, the cable shielding must be completely covered by the ESD shielding cap.

Application in Hazardous Locations: PHU 3400X-110 Module
The module is approved for operation in hazardous locations.
Observe all applicable local codes and standards for the installation of electrical equipment in hazardous locations. For orientation, please refer to
IEC 60079-14, EU directives 2014/34/EU and 1999/92/EC (ATEX), NFPA 70 (NEC), ANSI/ISA-RP12.06.01.

- When installing the device in a hazardous location, observe the specifications of the EC-Type-Examination Certificate and, if applicable, of the Control Drawing (download: www.knick.de).
- Before commissioning you must prove that the device may be connected with other equipment, such as a supply unit including cables and wires.
- In hazardous locations the device shall only be cleaned with a damp cloth to prevent electrostatic charging.
- Devices and modules which have already been used shall be subjected to a professional routine test before they may be operated in another zone or another type of protection.

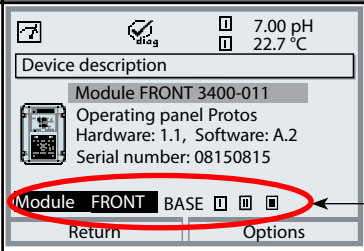
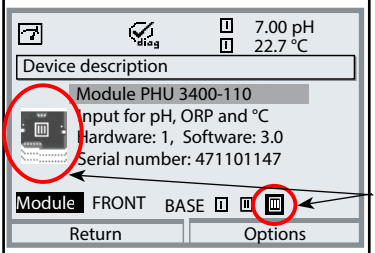
Software Version

PHU 3400(X)-110 Module

Device Software Protos 3400(X)
The PHU 3400(X)-110 module is supported by software version 5.0 or higher.

Module Software PHU 3400(X)-110
Software version 3.x

Query actual device/module software
When the analyzer is in measuring mode:
Press **menu** key, open Diagnostics menu: Device description

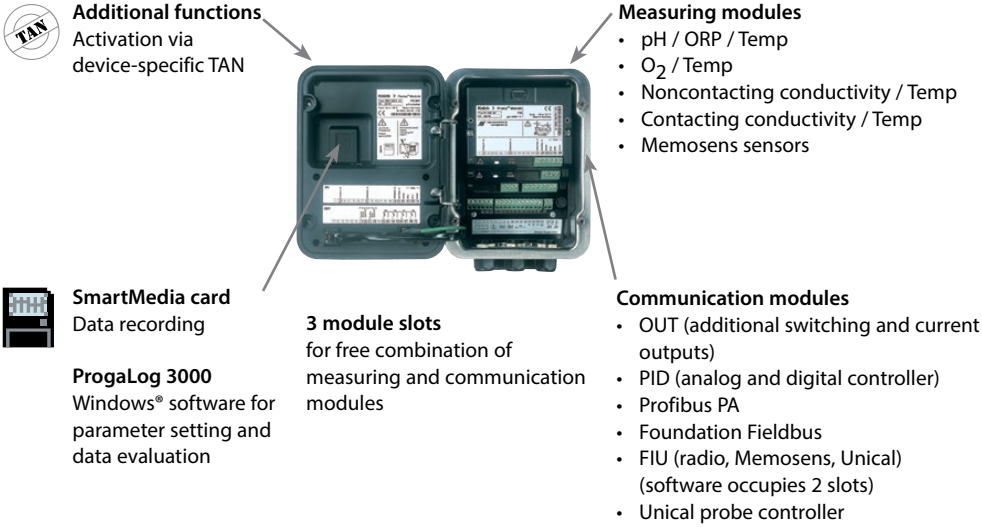
Menu	Display	Device description
diag		**Device hardware and software version** Provides information on all modules installed: Module type and function, serial number, hardware and software version and device options. Select the different modules (FRONT, BASE, slots 1 - 3) using the arrow keys.
		**Query module software** Module PHU 3400-110, hardware and software version, serial number – here installed in slot 3.

Modular Concept

Basic unit, measuring modules, additional functions

The Protos 3400(X) is an expandable modular process analysis system. The basic unit (FRONT and BASE modules) provides three slots which can be equipped by the user with any combination of measuring or communication modules. The software capabilities can be expanded by additional functions (options). Additional functions must be ordered separately. They are supplied with a device-specific TAN for function release.

Protos 3400(X) Modular Process Analysis System



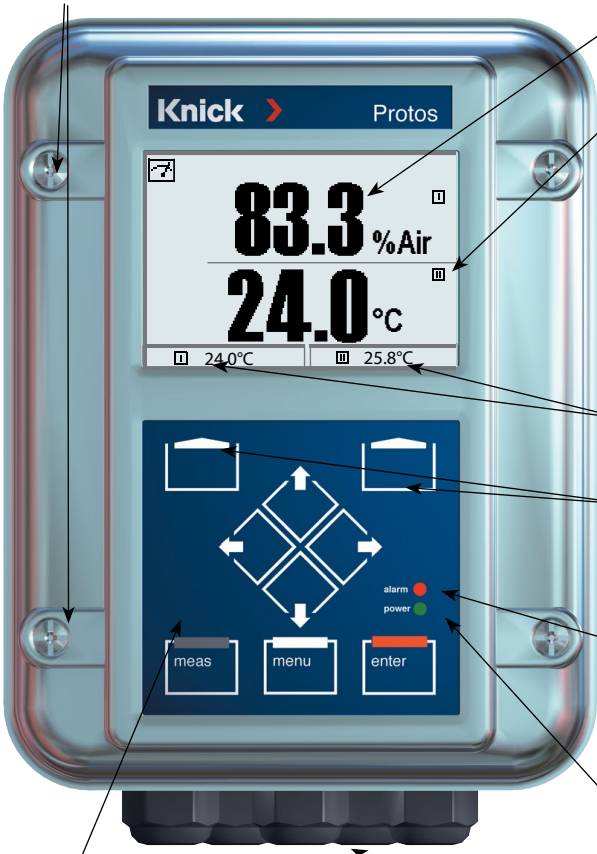
Documentation

The basic unit is accompanied by a CD-ROM containing the complete documentation.
Latest product information as well as user manuals for earlier software releases are available at
www.knick.de.

Short Description

Short Description: FRONT Module

4 captive screws
for opening the analyzer
(**Caution!** Make sure that the gasket between FRONT and BASE is properly seated and clean!)



Transflective LC graphic display
(240 x 160 pixels)
white backlighting, high resolution and high contrast.

Measurement display

User interface
with plaintext menus as recommended by NAMUR.
Menu texts can be switched to: German, English, French, Italian, Swedish/Portuguese or Spanish.
Intuitively acquirable menu logic, based on Windows standards.

Secondary displays

2 softkeys
with context-sensitive functions.

Red LED
signals failure (On) or maintenance request/function check (flashing) according to NE 44.

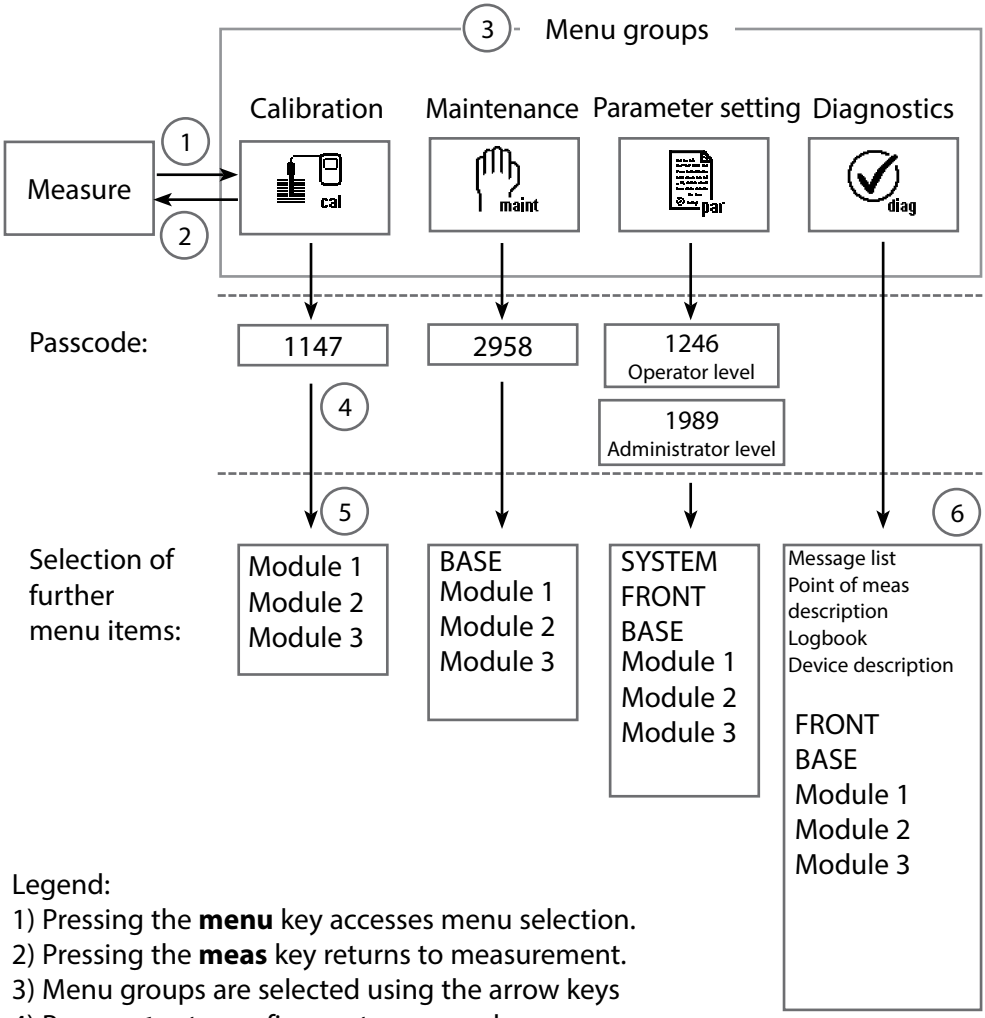
Green LED
Voltage supply okay

Control panel
3 function keys
(menu, meas, enter)
and 4 arrow keys for menu selection and data entry

5 self-sealing cable glands
M20 x 1.5
for entry of voltage supply and signal lines

Short Description: Menu Structure

Basic functions: Calibration, Maintenance, Parameter setting, Diagnostics



Legend:

1) Pressing the **menu** key accesses menu selection.
2) Pressing the **meas** key returns to measurement.
3) Menu groups are selected using the arrow keys
4) Press **enter** to confirm, enter passcode
5) Further menu items are displayed
6) Selected functions of the Diagnostics menu can be recalled via softkey even when in measuring mode

Short Description: FRONT Module

View into the open device (FRONT module)

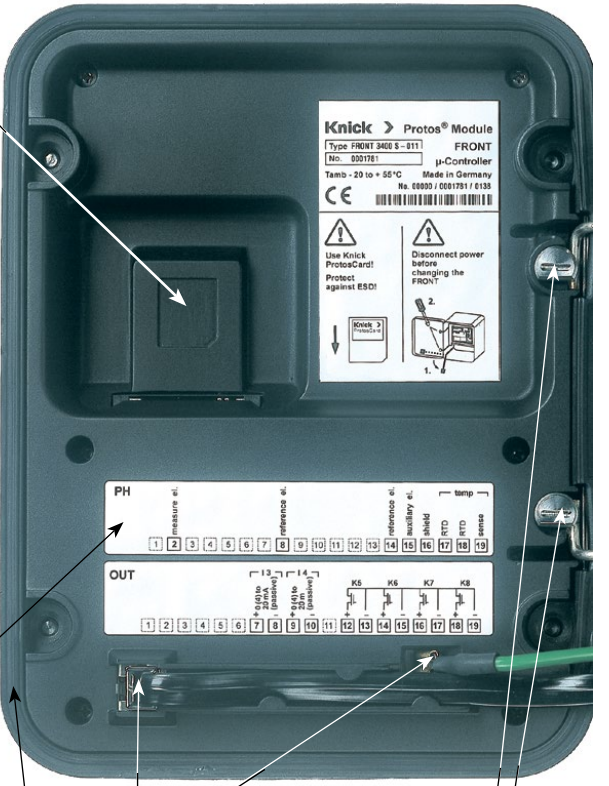
Slot for SmartMedia card

- Data recording
  The SmartMedia card expands the measurement recorder capacity to > 50000 records.

- Exchange of parameter sets
  5 parameter sets can be stored on the SmartMedia card, 2 of them can be loaded simultaneously to the analyzer and be switched by remote control. Parameter sets can be transmitted from one analyzer to the other.

- Function expansions
  are possible with additional software modules, which are released using transaction numbers (TAN).

- Software updates



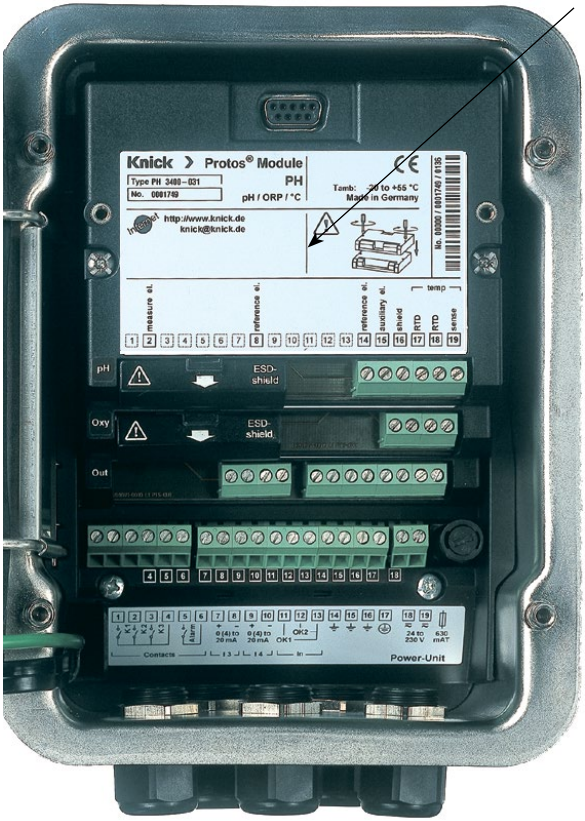
Terminal plates of "hidden" modules
Each module comes with an adhesive label containing the contact assignments. This label should be sticked to the inner side of the front (as shown). Then, the terminal assignments remain visible even if further modules are inserted.

Replacing the front module
Pull off power cord and ground wire. To separate the FRONT module from the BASE module, turn the retaining screws of the pivot hinge by 90°.

The circumferential sealing
guarantees IP 65 protection and allows spray cleaning / disinfection.
NOTICE! Keep clean!

Short Description: BASE Module

View into the open device (BASE module, 3 function modules installed)



Module equipment
Module identification: Plug & Play.
Up to 3 modules can be combined as desired. Several input and communication modules are available.

Note
Only <u>one</u> module can be connected in addition to a FIU 3400(X)-140/141 module.

BASE module
2 current outputs (free assignment of process variable) and 4 relay contacts,
2 digital inputs.
VariPower broad-range power supply unit, 20 ... 265 V AC/DC, suitable for all public mains supplies in the world.

Power supply units, Ex version:
100 ... 230 V AC or
24 V AC/DC

WARNING!
Do not touch the terminal compartment, there may be dangerous contact voltages!

Important notice concerning SmartMedia Card
The SmartMedia card may be inserted or replaced with the power supply switched on. Before a memory card is removed, it must be "closed" in the maintenance menu. When closing the device, make sure that the sealing is properly seated and clean.

Overview of the System Components

Fully Automated Process Analysis System

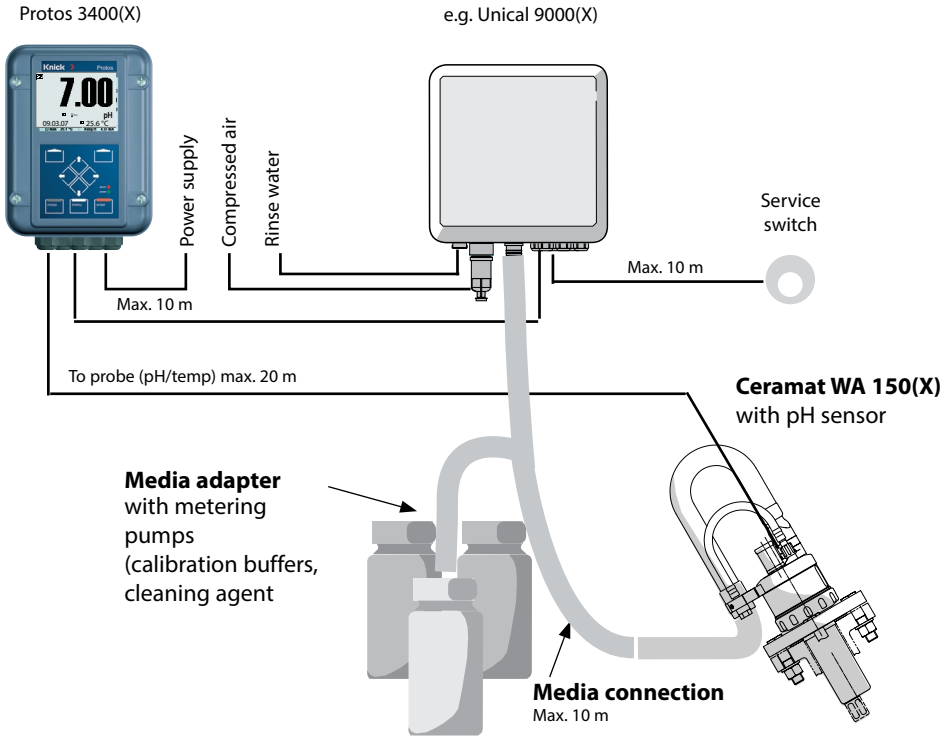
The fully automated process analysis system consists of the following components

- Protos 3400(X) (modular process analysis system)
- Unical 9000(X) / Uniclean 900(X) (automatic control of retractable fittings)
- Ceramat WA 150(X) (retractable fitting with ceramic sealing to the process)

The system is operated from the Protos 3400(X). Four operating modes are provided: calibration, parameter setting, maintenance, diagnostics.

The PHU 3400(X)-110 module consists of 2 functional groups:

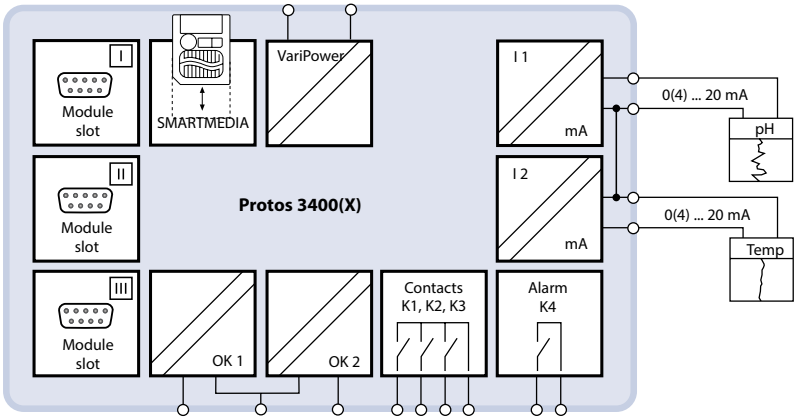
- PHU 3400(X)-110 (measuring circuit)
- Unical 9000(X) / Uniclean 900(X) (probe control)



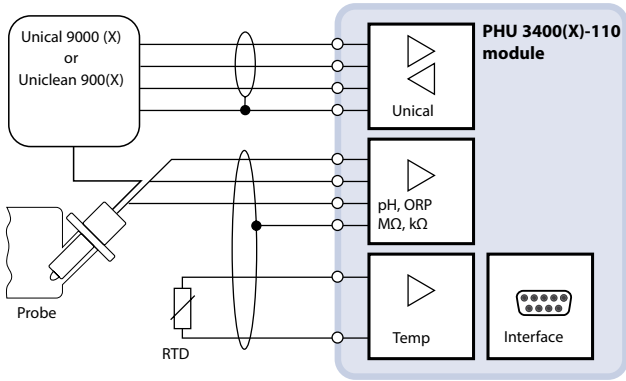
Overview of the System Components

Protos 3400(X) Basic Unit and Controller Module for Retractable Fittings
PHU 3400(X)-110 and Unical 9000(X) / Uniclean 900(X) Probe Controller

Protos 3400(X) basic unit.
The PHU 3400(X)-110 module is located in one of the 3 module slots available.



PHU 3400(X)-110 controller module for retractable fittings
and Unical 9000(X) / Uniclean 900(X) probe controller:



PHU 3400(X)-110 Module

Measuring Circuit and Probe Control Function Blocks

For a direct access to the function descriptions related to the Unical 9000(X)/ Uniclean 900(X) probe controller, please refer to the overview on the back page of this manual.

You can document your specific settings for the Unical 9000(X) / Uniclean 900(X) probe controller in the Excel spreadsheet from the CD-ROM (supplied with Protos 3400(X) or as download at www.knick.de)

Measuring Circuit and Probe Control Function Blocks

Probe Controller
The PHU 3400(X)-110 module allows connection of the Unical 9000(X) probe controller for fully automated pH measurement, cleaning, and calibration or the Uniclean 900(X) probe controller for fully automated pH measurement.

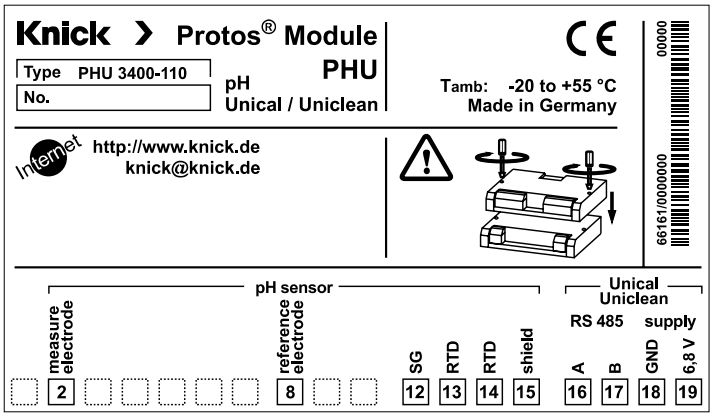
Measuring Circuit
Even without the Unical 9000(X) / Uniclean 900(X), the PHU 3400(X)-110 module is a fully fledged pH measuring module for simultaneous pH, ORP and temperature measurement with glass electrodes.
This instruction manual describes the whole functionality of the PHU 3400(X)-110 module corresponding to the following menu groups:
- Calibration
- Maintenance
- Parameter setting
- Diagnostics

The Protos 3400(X) is an expandable modular process analysis system.
For latest product information, please refer to:

www.knick.de

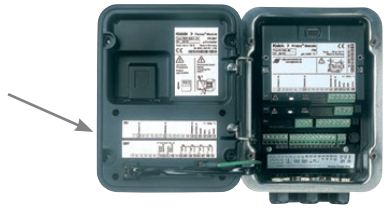
Terminal Plate PHU 3400(X)-110 Module

Terminal Plate PHU 3400-110 Module:



Attaching the Terminal Plates

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



Inserting the Module

Note: Be sure to connect the shielding properly!

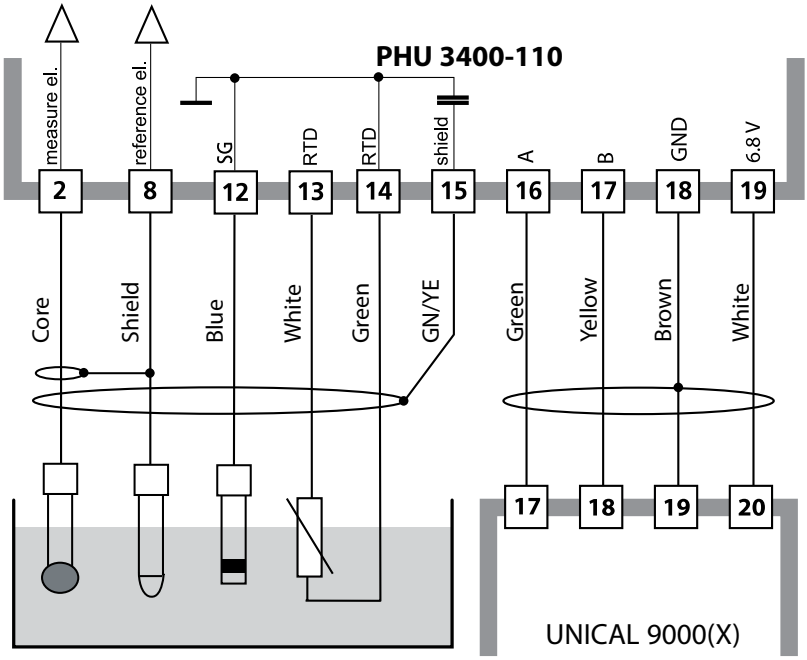
The terminals 2 and 8 are covered by an ESD shield. To connect the sensor cable, just pull it back.

Make sure that the cable glands are tightly closed to protect against humidity.

1. Switch off power supply
2. Open the device (loosen the 4 screws at the front)
3. Place module in slot (D-SUB connector)
4. Tighten fastening screws of the module
5. Open ESD shielding cap (covering terminals 2 and 8)
6. Connect sensor cable.
   To avoid interferences, the cable shielding must be completely covered by the ESD shielding cap.
7. Close ESD shielding cap (covering terminals 2 and 8)
8. Connect RS 485 interface to probe controller (terminals 16 ... 19)
9. Close device, tighten screws at the front
10. Switch on power supply
11. Set parameters

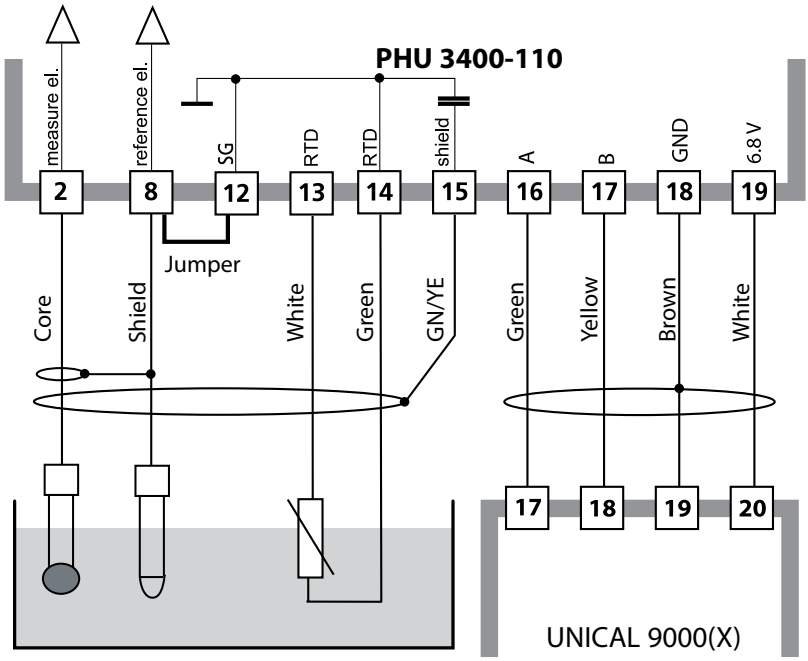
Wiring Example 1

Wiring Example VP and SixPlug
Multisense electrode (pH/ORP/temp) with solution ground (SG)



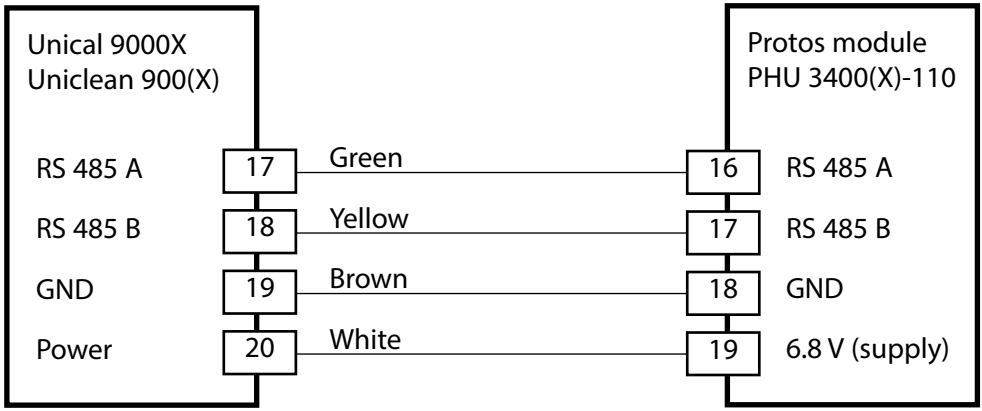
Wiring Example 2

Wiring Example VP and SixPlug
Electrode (pH/temp) without solution ground (SG)



Connecting the Probe Controller

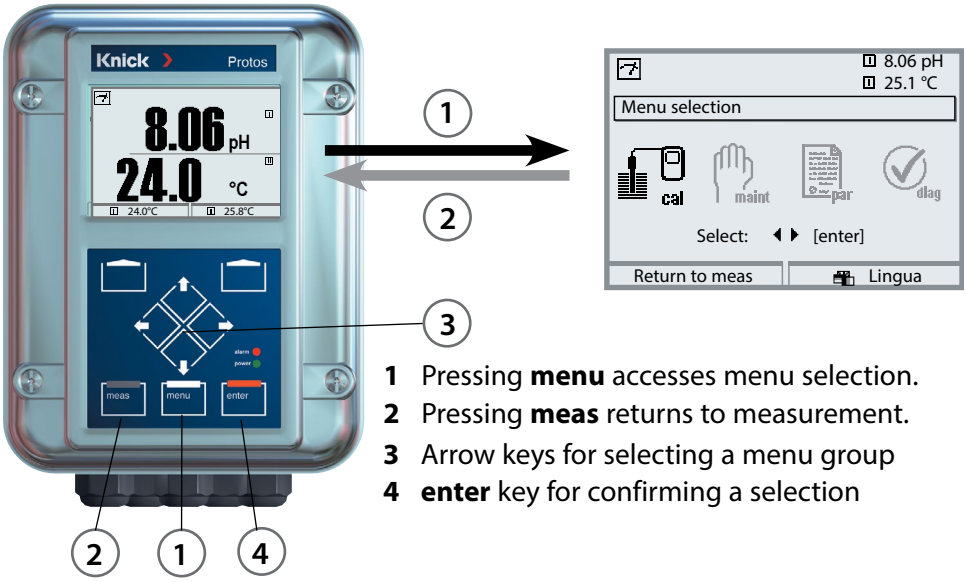
Probe Controller for Fully Automated Measurement, Cleaning and Calibration



Unical 9000(X) / Uniclean 900(X) Controller
The Unical 9000(X) / Uniclean 900(X) probe controllers come with installation manuals, free download at **www.knick.de**.

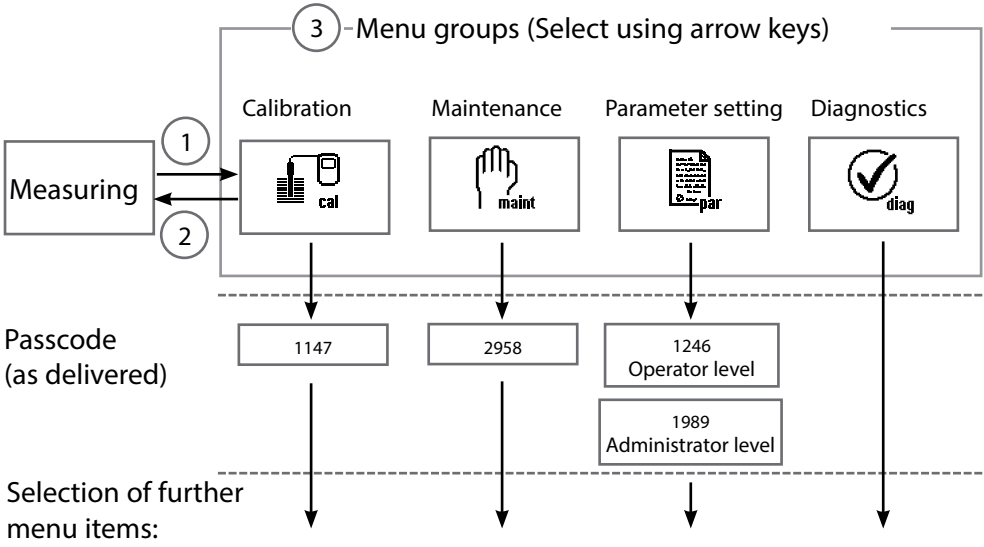
Menu Selection

After switching on, the analyzer performs an internal test routine and automatically detects the number and type of modules installed.
Then, the analyzer goes to measuring mode.



1 Pressing **menu** accesses menu selection.
2 Pressing **meas** returns to measurement.
3 Arrow keys for selecting a menu group
4 **enter** key for confirming a selection

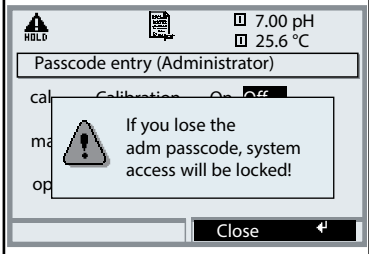
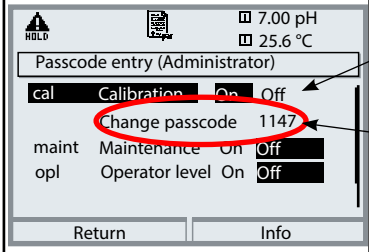
Menu Structure



Passcode Entry

To enter a passcode
Select the position using the left/right keys,
then edit the number using the up/down keys.
When all numbers have been entered, press **enter** to confirm.

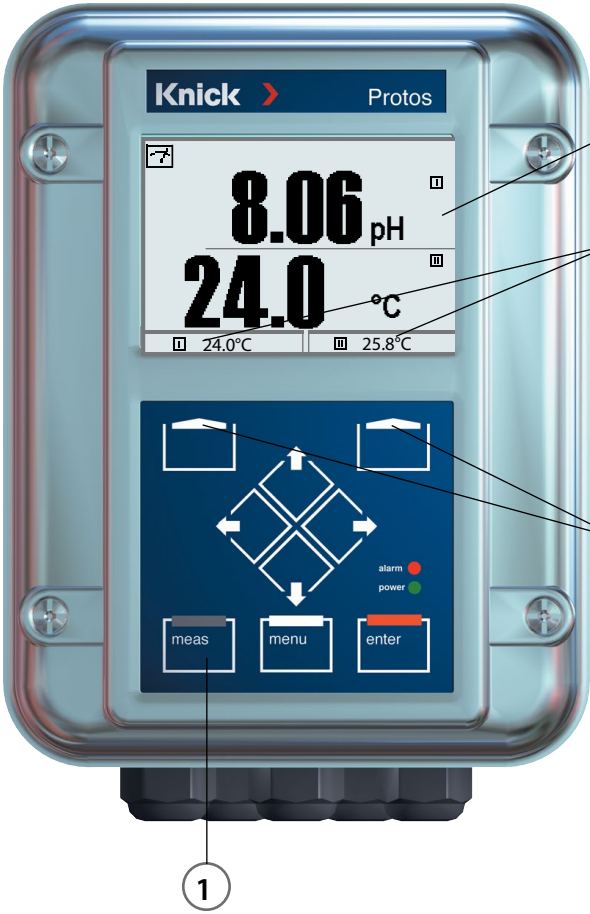
To change a passcode
- Open the menu selection (**menu**)
- Select parameter setting
- Administrator level, enter passcode
- Select System control: Passcode entry

Menu	Display	System control: Passcode entry
par		**Changing a passcode "Passcode entry" menu** When this menu is opened, the analyzer displays a warning (Fig.). Passcodes (factory settings): Calibration 1147 Maintenance 2958 Operator level 1246 Administrator level 1989 **If you lose the passcode** for the Administrator level, system access will be locked! Please consult our technical support!
		**To change a passcode** Select "On" using arrow keys, confirm with **enter**. Select the position using the **left/right** keys, then edit the number using the **up/down** keys. When all numbers have been entered, confirm with **enter**.

Configuring the Measurement Display

Select menu: Parameter setting/Module FRONT/Measurement display

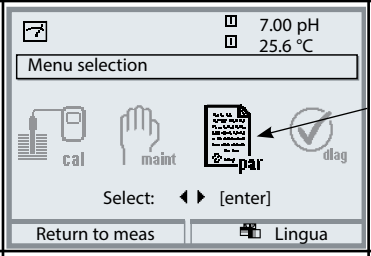
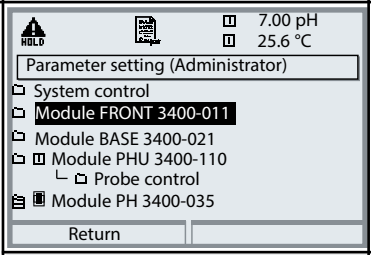
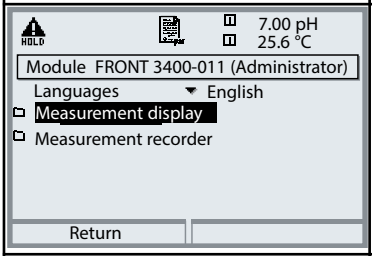
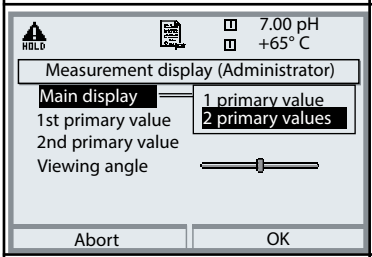
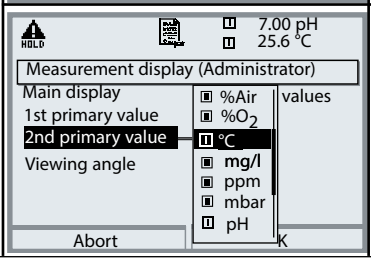
Pressing **meas** (1) returns the analyzer to the measuring mode from any function.
All process variables coming from the modules can be displayed.
The table on the next page describes how to configure the measurement display.



Measurement display
Typical measurement display

Secondary displays
Additional values, also date and time, can be displayed depending on the modules installed.

Softkeys
In measuring mode, the softkeys allow selection of values for the secondary displays or control of functions (user defined).

Menu	Display	Configure measurement display
		**Configure measurement display** Press **menu** key to select menu. Select parameter setting using arrow keys, confirm with **enter**. Select: "Administrator level": Passcode 1989 (default setting).
par		Parameter setting: Select "Module FRONT"
		Front module: Select "Measurement display"
		Measurement display: Set the number of primary values (large display) to be displayed
		Select process variable(s) to be displayed and confirm by pressing **enter**. To return to measurement: press **meas**

Prerequisite
Mechanical and electrical installation of the components has been performed according to the separately enclosed operating and installation instructions (free download at **www.knick.de**):

- Protos 3400(X)
- Unical 9000(X) or Uniclean 900(X)
- Ceramat WA 150(X) (or other retractable fittings)

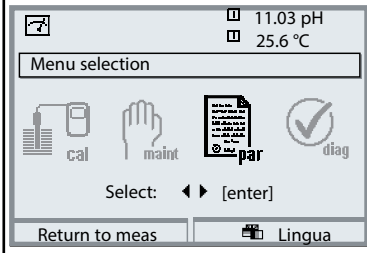
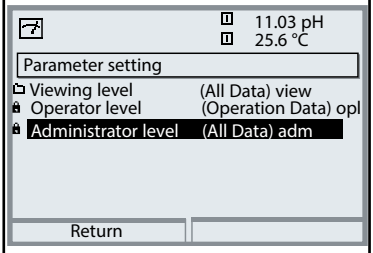
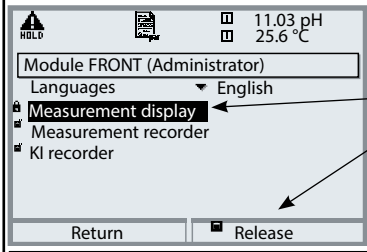
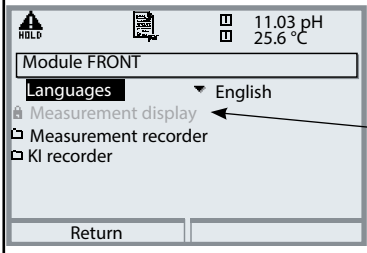
Warning!
Before working on the retractable fitting, it must be moved into SERVICE position. Be sure to read and observe the user manual of the retractable fitting!

Caution!
Be sure to execute the following steps in the specified order!

1) Insert the PHU 3400(X)-110 module (see Page 22)
2) Connect sensor cable and probe controller (see Pages 23...25)
3) Configure the PHU 3400(X)-110 module (Page 34)

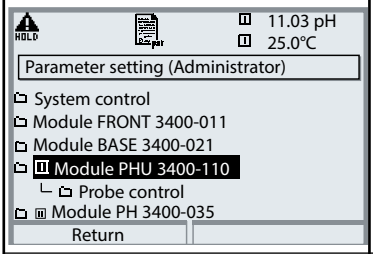
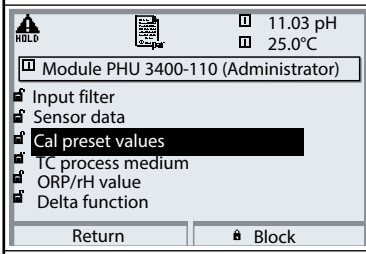
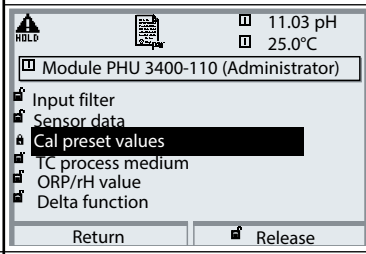
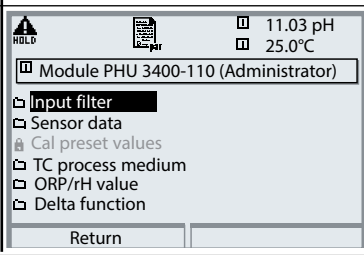
Parameter Setting: Operating Levels

Viewing level, Operator level, Administrator level
Note: HOLD mode (Setting: BASE module)

Menu	Display	Viewing level, Operator level, Administrator level
par		**Open parameter setting** From the 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 a function for access from the Operator level.
		Functions which can be blocked for the Operator level are marked with the "lock" symbol. The functions are released or blocked using the softkey.
		**Operator level** Access to all functions which have been released at the Administrator level. Blocked functions are displayed in gray and cannot be edited (Fig.). **Viewing level** Display of all settings. No editing possible!

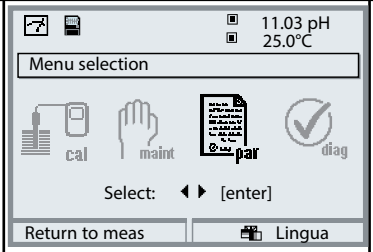
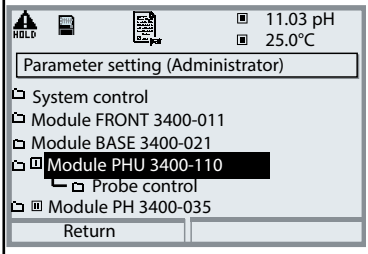
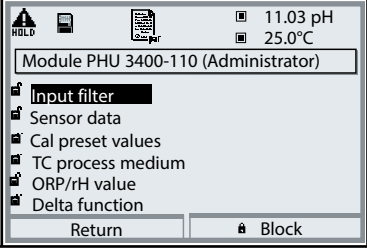
Parameter Setting: Locking a Function

Administrator level: Enabling/locking functions for Operator level
Note: HOLD mode (Setting: BASE module)

Menu	Display	Administrator level: Enabling / locking a function
par		**Example:** Blocking access to the calibration adjustments from the Operator level **Open parameter setting** Select Administrator level. Enter passcode (1989). Select "Module PHU" (for example) using arrow keys, press **enter** to confirm.
		Select "Cal preset values" using arrow keys, "Block" with softkey.
		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".
par		**Open parameter setting** Select Operator level, passcode (1246). Select "Module PHU" (for example). Now, the locked function is displayed in gray and marked with the "lock" icon.

Parameter Setting for PHU 3400(X)-110

Activating parameter setting

Menu	Display	Parameter setting
par		**Activating Parameter Setting** From the measuring mode: Press **menu** key to select menu. Select parameter setting using arrow keys, press **enter** to confirm. Passcode as delivered: 1989
		Select "Module PHU 3400-110", press **enter** to confirm.
		Select parameter using arrow keys, press **enter** to confirm.

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

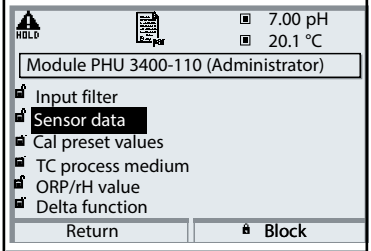
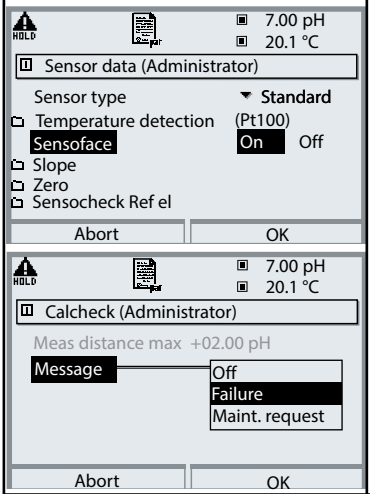
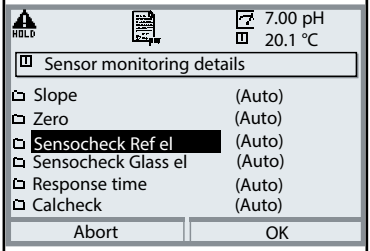
Settings of Sensor Data

With "Auto", the tolerance limits for the monitoring criteria are determined by the analyzer. They are displayed in gray. These values cannot be edited.
With "Individual", the tolerances can be adjusted.
Note: HOLD mode active.

Parameter	Default	Selection / Range / Notes
Input filter		
• Pulse suppression	Off	Off, On (suppression of fast transients at the input)
Sensor data		
• Sensor type	Standard	Standard, ISFET (ISFET: Insert PH 3400-032 module)
• Temperature detection		
- Temperature probe	Pt 1000	Pt100, Pt1000, NTC 8.55 kΩ, NTC30kΩ (sensor)
- Measuring temp	Manual	Auto, manual: Default +25.0 °C (entry)
- Cal temp	Manual	Auto, manual: Default +25.0 °C (entry)
• Sensoface	Default	Default, Individual
• Sensor monitoring details		
- Slope	Auto	Auto, Individual
Nominal	59.2 mV/pH	Can only be set with "Individual" selected
Min	53.3 mV/pH	
Max	61.0 mV/pH	
Message	Maint. request	Off, failure, maintenance request
- Zero point	Auto	Auto, Individual
Nominal	07.00 pH	Can only be set with "Individual" selected
Min	06.00 pH	
Max	08.00 pH	
Message	Maint. request	Off, failure, maintenance request
- Sensocheck Ref el	Auto	Auto, Individual
Nominal	5.0 kΩ	Can only be set with "Individual" selected
Min	3.1 kΩ	
Max	100.0 kΩ	
Message	Off	Off, failure, maintenance request
- Sensocheck Glass el	Auto	Auto, Individual (not for sensor type ISFET)
Nominal	120.0 MΩ	Can only be set with "Individual" selected
Min	28.6 MΩ	
Max	350.0 MΩ	
Message	Off	Off, failure, maintenance request
- Response time	Auto	Auto, Individual
Response time Max	0000 sec	
Message	Off	Off, failure, maintenance request
- Calcheck		Calcheck: checks the difference between calibration buffers and measured values
	Auto	Auto, Individual
Meas distance Max	3.20 pH	
Message	Off	Off, failure, maintenance request

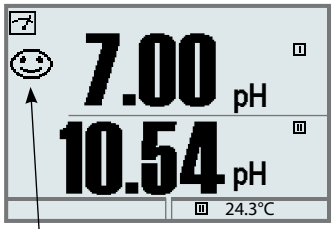
Parameter Setting of PHU 3400(X)-110

Note: HOLD mode active

Menu	Display	Parameter selection
par		**Sensor data** Sensor data are preset depending on the sensor type. Gray display lines cannot be edited. Sensoface provides information on the sensor condition (evaluating the sensor data). Great deviations are signaled. Sensocheck can be switched off. The following parameters are monitored: Slope, zero, reference impedance (for ISFET sensors), glass impedance (pH electrodes), response time, CalCheck. The tolerance limits are displayed in gray. Limit violations can be signaled by a message (either "failure" or "maintenance request").
		
		**Sensor monitoring details** With “Auto” selected, the limits calculated by the analyzer are used (displayed in gray). With “Sensor monitoring Individual”, the tolerance limits for the parameters are displayed in black and can be set.

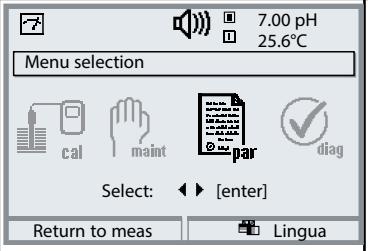
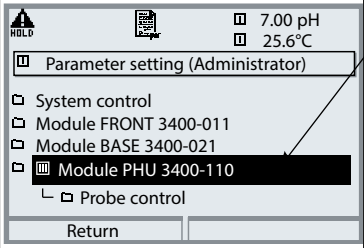
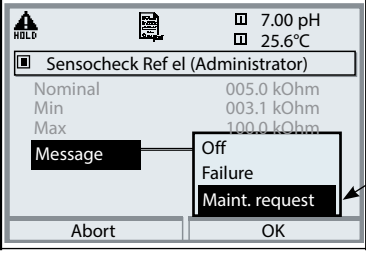
Sensoface

Sensoface is a graphical indication of the sensor condition –
Sensocheck must have been activated during parameter setting.



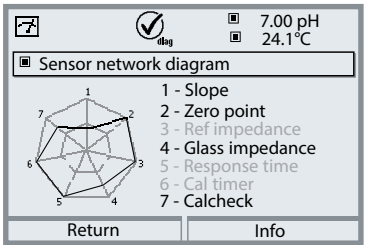
Sensocheck:
Automatic monitoring of glass and reference electrode

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

Menu	Display	Activate Sensocheck
par		**Open menu selection** Select parameter setting Enter passcode (Administrator)
		Select ("PHU") module. Confirm with **enter**
		Select "Sensor data". Confirm with **enter**. Then select "Sensocheck Ref el". (Fig.) Assign function and confirm with **enter**.

Sensoface is “sad” ...

The “Diagnostics / Module PHU / Sensor network diagram” shows all current sensor parameters in a graphic diagram.



Sensor Network Diagram
“Diagnostics / Module PHU / Sensor network diagram”.
Tolerance limit violations can be seen at a glance. Critical parameters (inner circle) are flashing. Parameters displayed in gray have been disabled during parameter setting or do not apply to the currently selected sensor.

Sensoface Criteria

Parameter	Standard*	Critical range
Slope	59.2	< 53.3 or > 61
Zero	7.00	< 6.00 or > 8.00
Reference impedance	Rcal **	< 0.6 Rcal or > 100 kΩ + 0.5 Rcal
Glass impedance	Rcal **	< 0.3 Rcal or > 3.5 Rcal
Response time Fine Standard Coarse		 120 sec 80 sec 60 sec
Calibration timer		When 80 % expired
Calcheck		Difference meas. value / buffer > 3.2 pH

* Applies to standard electrodes with pH = 7.00
** Rcal is determined during calibration

Parameter Setting of PHU 3400(X)-110

Cal preset values
Note: HOLD mode active

Cal Preset Values

Parameter	Choices (default in bold print)	
• Calimatic buffer	**Knick:**	**2.00 4.01 7.00 9.21**
	Merck/Riedel:	2.00 4.00 7.00 9.00 12.00
	DIN 19267:	1.09 4.65 6.79 9.23 12.75
	NIST standard:	4.006 6.865 9.180
	NIST technical:	1.68 4.00 7.00 10.01 12.46
	Hamilton:	2.00 4.01 7.00 10.01 12.00
	Kraft:	2.00 4.00 7.00 9.00 11.00
	Hamilton A:	2.00 4.01 7.00 9.00 11.00
	Hamilton B:	2.00 4.01 6.00 9.00 11.00
	Hach:	4.01 7.00 10.00
	Ciba:	2.06 4.00 7.00 10.00
	Reagecon:	2.00 4.00 7.00 9.00 12.00
• Drift check	Fine:	1.2 mV/min (Abort after 180 sec)
	Standard:	**2.4 mV/min (Abort after 120 sec)**
	Coarse:	3.75 mV/min (Abort after 90 sec)
• Calibration timer		
Monitoring	**Auto**, Off, Individual	
Calibration timer	**0168h**	Entry with "Individual"; Off = 0000
Adaptive cal timer	**Off**, On	
• Cal tolerance band	Tolerance band check:	**Off**, On
	Tolerance Zero	+00.20 pH (entry)
	Tolerance Slope	+002.0 mV/pH (entry)
• ORP check	Test period:	**010 s** (entry)
	Test difference:	**0010 mV** (entry)

Tolerance Adjustment

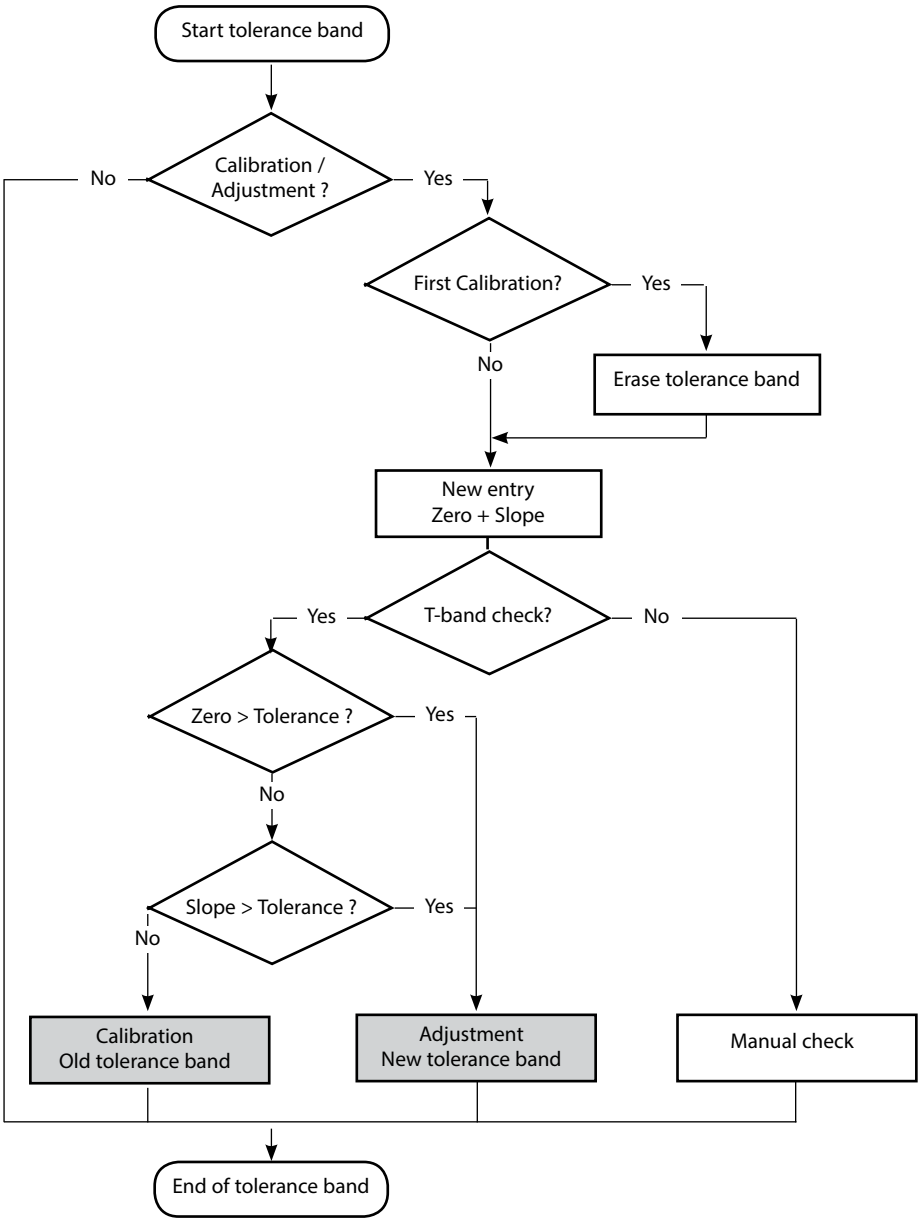
(Additional function SW 3400-005)
During calibration this function checks the zero and slope values and automatically performs an adjustment when the tolerance band is exceeded. The parameters are stored in the tolerance band recorder (Diagnostics menu).

Control via Probe Controller

(Parameter setting / Probe control / Cal preset values / Cal mode / Adjustment)
With "Cal tolerance band check" switched on, data are only taken over when they exceed the limits defined by the tolerance band.

SW 3400-005: Tolerance Adjustment

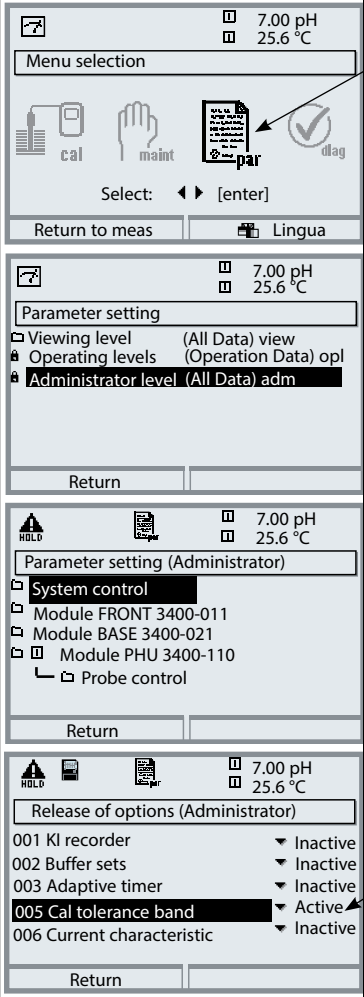
Program Flow



Activating the Cal Tolerance Band

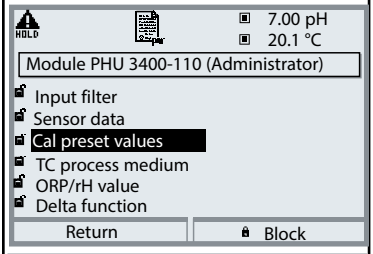
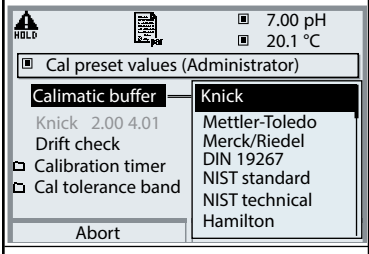
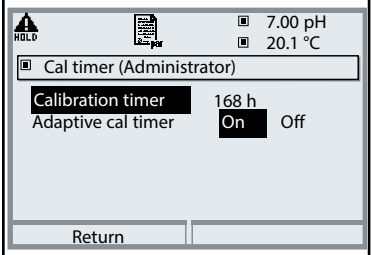
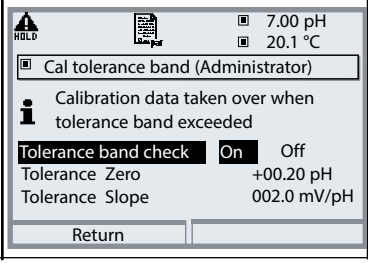
Select menu: Parameter setting/System control/Release of options

Note: The TAN for releasing an additional function is only valid for the device with the corresponding serial number!

Menu	Display	Activating an additional function
par		**Menu selection** Open parameter setting. From the measuring mode: Press **menu** key to select menu. Select parameter setting using arrow keys, confirm with **enter**. **Parameter setting** Select Administrator level using arrow keys, confirm with **enter**. Enter passcode and confirm (Passcode as delivered: 1989). Select system control using arrow keys, confirm with **enter**. Then select Release of options using arrow keys, confirm with **enter**. **Release of options** Select the additional function to be released (“Cal tolerance band”). Set option to “active”. Enter the TAN at the prompt. (Note: The TAN is only valid for the device with the corresponding serial number, see previous page.) The option is available after the TAN has been entered.

Parameter Setting of PHU 3400(X)-110

Cal preset values: Calimatic buffer, Cal timer, Cal tolerance band
Note: HOLD mode active

Menu	Display	Cal preset values
par		**Calimatic buffer** For automatic calibration, you must define the buffer set you want to use. For calibration, you must then use buffer solutions from this buffer set. The order does not matter. The selected buffer set with the nominal values of the individual buffer solutions is displayed in gray. The "Calimatic buffer" menu shows all buffer sets available. Select buffer set with **enter**.
		
		**Calibration timer** Entry of the time interval until the next due calibration. **Adaptive calibration timer** Automatically reduces the time until the next due calibration when the electrode is exposed to high stress (temperature, extreme pH values).
		**Tolerance adjustment** If the measured value leaves the tolerance band specified here for zero and slope, an adjustment is automatically performed during calibration.

Parameter Setting of PHU 3400(X)-110

TC process medium, ORP/rH value, delta function:
Default settings and selection range

Parameter	Choices (default in bold print)
• TC process medium	**Off**, linear, ultrapure water, table Linear: enter temperature factor +XX.XX %/K
• ORP/rH value	
Reference electrode	**Ag/AgCl, KCl 1 mol/l** Ag/AgCl,KCl 3mol/l Hg, Tl/TlCl, KCl 3.3 mol/l Hg/Hg_2SO_4, K_2SO_4 sat
ORP conversion to SHE	**No**, Yes
Calculate rH with factor	**No**, entry of factor
• Delta function	**Off**, pH, mV+ORP or rH: entry of delta value

Temperature compensation of process medium

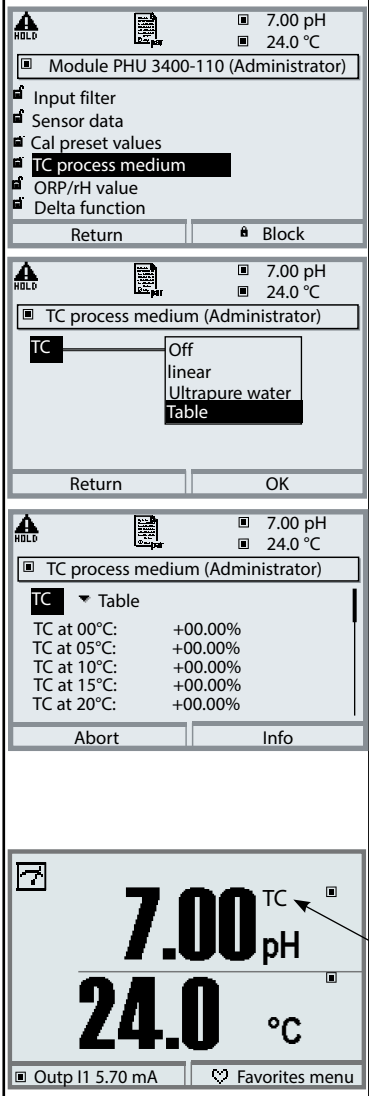
Linear temperature compensation, reference temp fixed at 25 °C

$$pH_{(25\,°C)} = pH_M + TC/100\ \%\ (25\,°C - T_M)$$

$pH_{(25\,°C)}$ = pH value compensated to 25 °C
pH_M = Measured pH value (temp-corrected)
TC = Temperature factor [%/K]
T_M = Measured temperature [° C]

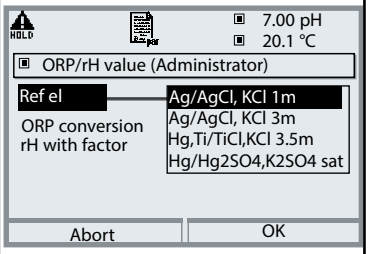
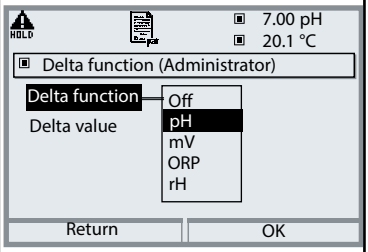
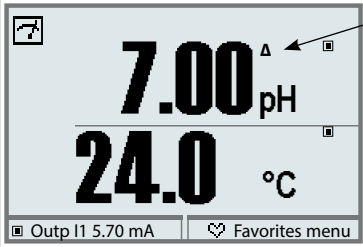
Parameter Setting of PHU 3400(X)-110

TC process medium
Note: HOLD mode active

Menu	Display	TC process medium
par		**TC process medium** You can choose from: • Linear (entry of TC coefficient) • Ultrapure water • Table When measuring media with a known temperature behavior, the output pH value can be corrected using a table. TC can be entered in 5 °C steps for temperatures between 0 and +95 °C. Then, the output pH value is corrected by the corresponding TC value depending on the measuring temperature. Intermediate values are linearly interpolated. In the case of lower or higher temperatures (< 0 °C or > +95 °C), the last table value is used for calculation. If the delta function has been activated (see Pg 42) simultaneously with temperature compensation, the temperature is compensated first and then the delta value is subtracted. When the TC correction for process medium is switched on, "TC" appears in the display in measuring mode.

Parameter Setting of PHU 3400(X)-110

ORP/rH value, delta function
Note: HOLD mode active

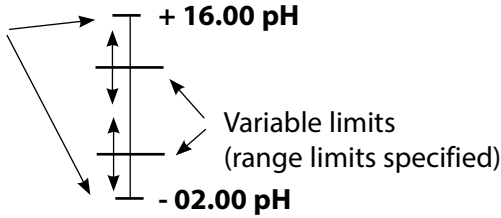
Menu	Display	ORP/rH value, delta function
par		**ORP/rH value** • Select type of reference electrode: Ag/AgCl, KCl 1 mol/l (silver/silver chloride) Ag/AgCl, KCl 3 mol/l (silver/silver chloride) Hg, Tl/TlCl, KCl 3.3 mol/l (Thalamid) Hg/Hg_2SO_4, K_2SO_4 saturated (mercury sulfate) • ORP conversion to SHE • Calculate rH with factor
		**Delta function** When a delta value is entered, the system calculates the difference. Output value = measured value – delta value The output value controls all outputs and is shown on the display. When the delta function has been activated simultaneously with temperature compensation, the temperature is compensated first and then the delta value is subtracted.
		When delta function is switched on, "Δ" appears in the display in measuring mode.

Parameter Setting of PHU 3400(X)-110

Messages: Default settings and selection range

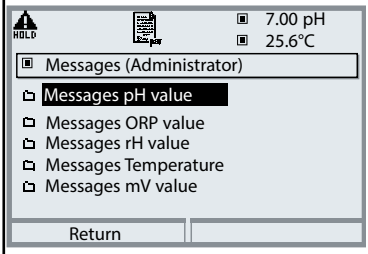
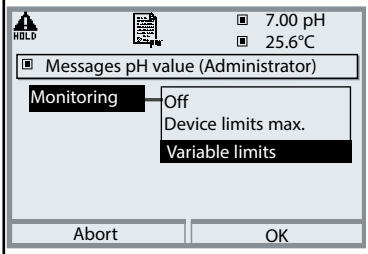
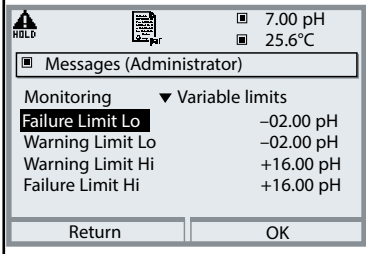
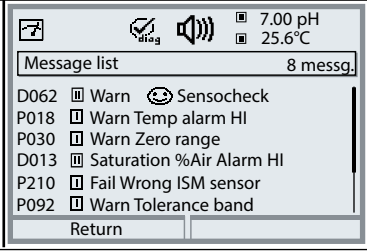
Parameter	Choices (default in bold print)	
• pH value	Off, **device limits max.**,	Variable limits: - Failure Limit LO - Warning Limit LO - Warning Limit HI - Failure Limit HI
• ORP value	**Off**, device limits max.,	Variable limits: - Failure Limit LO - Warning Limit LO - Warning Limit HI - Failure Limit HI
• rH value	**Off**, device limits max.,	Variable limits: - Failure Limit LO - Warning Limit LO - Warning Limit HI - Failure Limit HI
• Temperature	Off, **device limits max.**,	Variable limits: - Failure Limit LO - Warning Limit LO - Warning Limit HI - Failure Limit HI
• mV value	**Off**, device limits max.,	Variable limits: - Failure Limit LO - Warning Limit LO - Warning Limit HI - Failure Limit HI

Device limits max.
(maximum range of measuring module)



Parameter Setting of PHU 3400(X)-110

Messages
Note: HOLD mode active

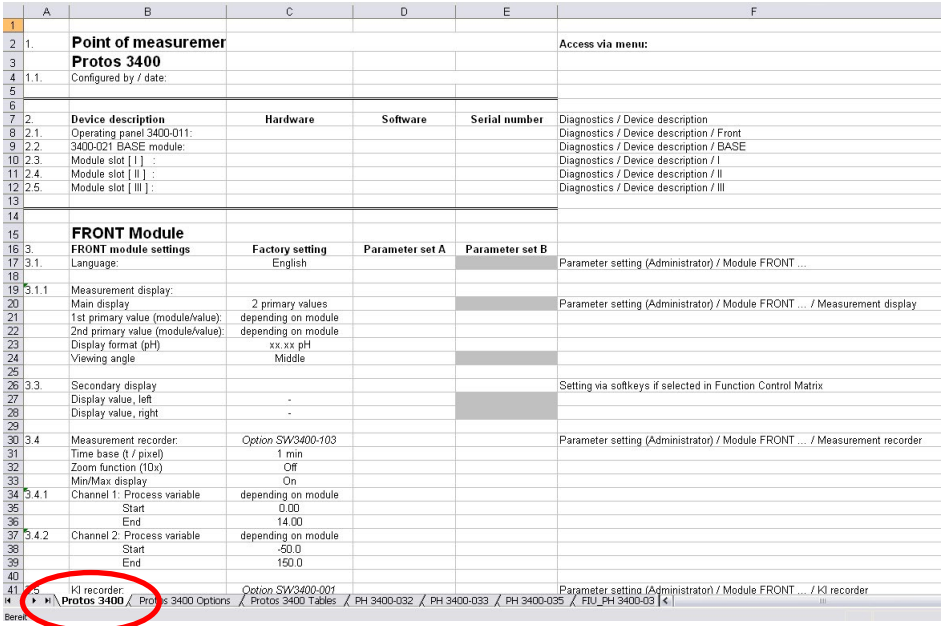
Menu	Display	Messages
par	  	**Messages** All parameters determined by the measuring module can generate messages. **Device limits max.** Messages are generated when the process variable (e.g. pH) is outside the measurement range. The "Failure" icon is displayed, the NAMUR failure contact is activated (BASE module, factory setting: contact K4, N/C contact). The current outputs can signal a 22 mA message (user defined). **Variable limits** For the "failure" and "warning" messages you can define upper and lower limits for message generation. **Message icons** Failure (Failure limit HiHi/LoLo) Maintenance (Warning limit Hi/Lo) Limit indication (here: lower range)
diag		**Diagnostics menu** When the "Maintenance" or "Failure" icons are flashing in the display, you should call the Diagnostics menu. The messages are displayed in the "Message list".

Documenting Parameter Setting

You must reproducibly document all parameter settings in the device to achieve a high level of system and device security according to GLP. For that purpose, an Excel file is provided (on the CD-ROM shipped with the basic device) to enter the parameter settings.

The Excel file provides one worksheet for each module with columns for the following parameters: Factory settings, parameter set A, parameter set B. Enter your settings as parameter set A or B.
The gray cells in the parameter set B column cannot be modified since they contain sensor-specific values which cannot be changed by parameter set switchover. Here, the values listed under parameter set A apply.

Documenting Parameter Setting



	A	B	C	D	E	F
1						
2	1.	**Point of measuremer**				**Access via menu:**
3		**Protos 3400**				
4	1.1.	Configured by / date:				
5						
6						
7	2.	**Device description**	**Hardware**	**Software**	**Serial number**	Diagnostics / Device description
8	2.1.	Operating panel 3400-011:				Diagnostics / Device description / Front
9	2.2.	3400-021 BASE module:				Diagnostics / Device description / BASE
10	2.3.	Module slot [I] :				Diagnostics / Device description / I
11	2.4.	Module slot [II] :				Diagnostics / Device description / II
12	2.5.	Module slot [III] :				Diagnostics / Device description / III
13						
14						
15		**FRONT Module**				
16	3.	**FRONT module settings**	**Factory setting**	**Parameter set A**	**Parameter set B**	
17	3.1.	Language:	English			Parameter setting (Administrator) / Module FRONT ...
18						
19	3.1.1	Measurement display:				
20		Main display	2 primary values			Parameter setting (Administrator) / Module FRONT ... / Measurement display
21		1st primary value (module/value):	depending on module			
22		2nd primary value (module/value):	depending on module			
23		Display format (pH)	xx.xx pH			
24		Viewing angle	Middle			
25						
26	3.3.	Secondary display				Setting via softkeys if selected in Function Control Matrix
27		Display value, left	-			
28		Display value, right	-			
29						
30	3.4	Measurement recorder:	*Option SW3400-103*			Parameter setting (Administrator) / Module FRONT ... / Measurement recorder
31		Time base (t / pixel)	1 min			
32		Zoom function (10x)	Off			
33		Min/Max display	On			
34	3.4.1	Channel 1: Process variable	depending on module			
35		Start	0.00			
36		End	14.00			
37	3.4.2	Channel 2: Process variable	depending on module			
38		Start	-50.0			
39		End	150.0			
40						
41	3.5.	KI recorder:	*Option SW3400-001*			Parameter setting (Administrator) / Module FRONT ... / KI recorder

Protos 3400 / Protos 3400 Options / Protos 3400 Tables / PH 3400-032 / PH 3400-033 / PH 3400-035 / FIU_PH 3400-03

From the application window of the Excel file, select the worksheet for the module the parameter settings of which you want to document.
Set the parameters of the respective module and enter the selected values in the corresponding cells of the module worksheet.

NOTICE!

Display	The "HOLD" mode is active during parameter setting.
HOLD	**HOLD**. The NAMUR "HOLD" contact (function check) is active (factory setting: Module BASE, Contact K2, N/O contact). Current output response is user-defined: • Current meas.: The currently measured value appears at the current output • Last usable value: The last measured value is held at the current output • Fixed 22 mA: The output current is at 22 mA

ProgaLog 3000 Software (Option) for Configuration and Documentation

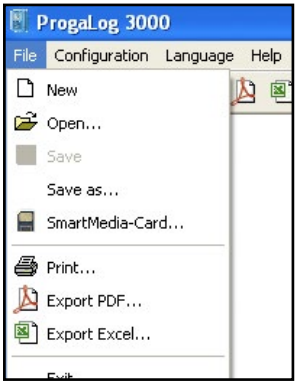
The ProgaLog 3000 software is available for convenient configuration of the Protos 3400(X) process analysis system. The user interface can be switched to the Protos display languages English, German, French, Spanish, Italian, Swedish or Portuguese. The software comes on CD-ROM. It runs under Windows® 8 / 7 / XP. A card reader for SmartMedia cards is required for transferring the configuration files between PC and Protos 3400.

Configuration with ProgaLog 3000
Insert a SmartMedia card formatted as "memory card" into the analyzer. First, the configuration data are written to the SmartMedia card. These data can then be read and edited by the ProgaLog 3000 software.

1. Save the configuration data at the Protos 3400(X)
Parameter setting/System control/Copy configuration.
With “Save“ configuration, the complete device configuration (except the passcodes) is written on the memory card.

2. Close and remove the SmartMedia card
Select "Maintenance / Close memory card", then remove the card.

3. Read out SmartMedia card with "ProgaLog 3000"



Open the "File / SmartMediaCard" menu of the ProgaLog 3000 software to read out the configuration data stored on the SmartMedia card.
Now, you can edit all parameters at your PC.
Save the edited configuration file to the SmartMedia card. Then, insert the SmartMedia card into the Protos 3400(X) analyzer.

Fig.: ProgaLog 3000 menu: File

4. Edit configuration data using ProgaLog 3000

When the configuration data have been loaded, the software lists the connected modules with all available configuration parameters:

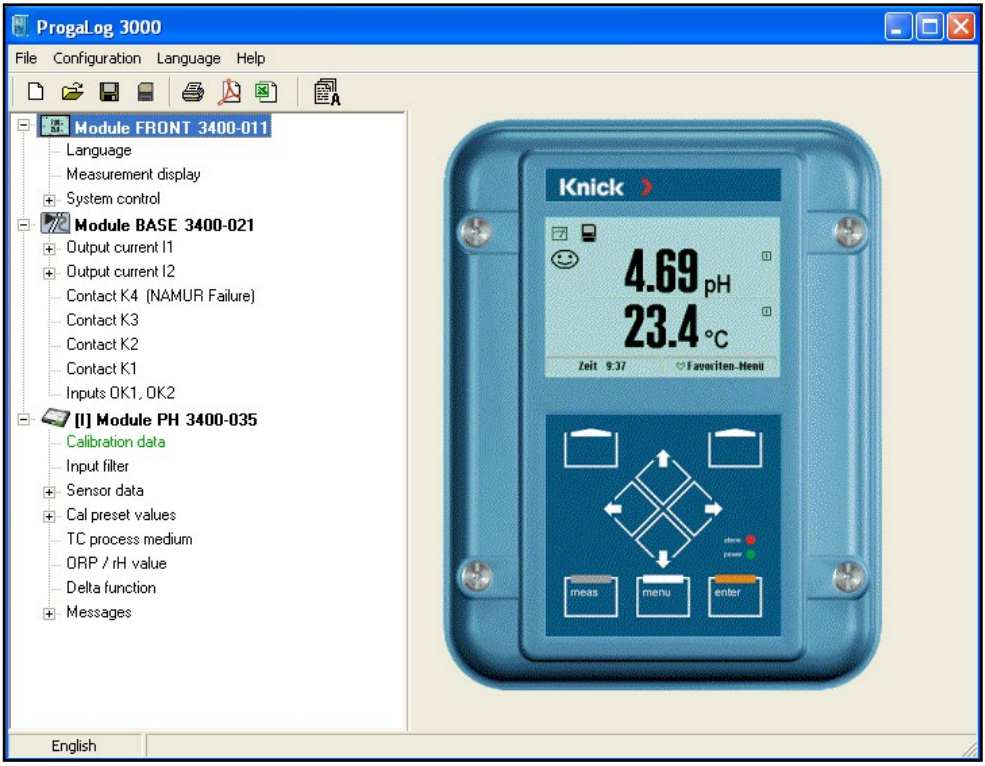


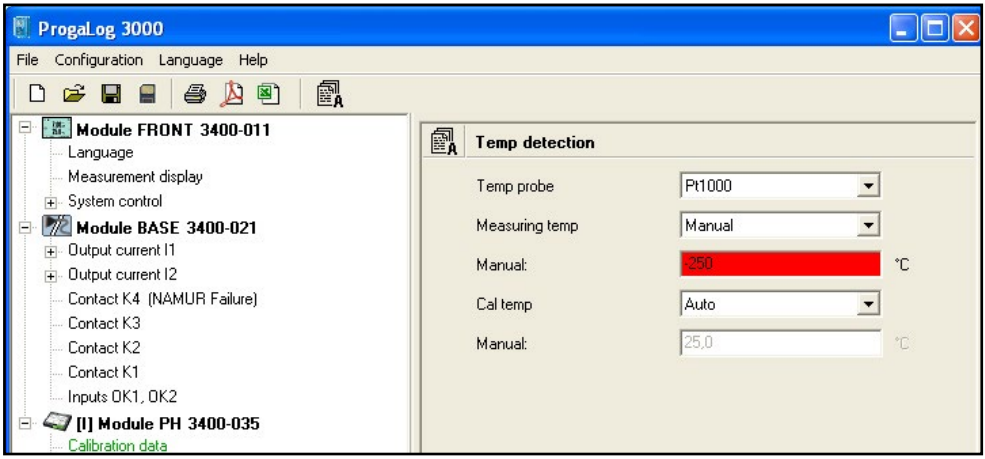
Fig.: ProgaLog 3000 configuration data

The parameters are listed according to the modular device structure.
All configuration parameters (except the "Sensor data details", which are determined by digital sensors) can be edited at the PC.
After having finished the configuration, save the data to the SmartMedia card.

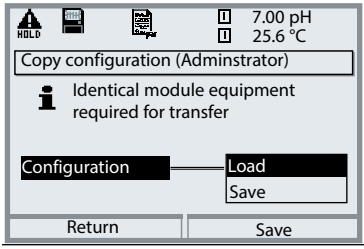
ProgaLog 3000 Software for Configuration and Documentation

Configuring the parameters, e.g. relay contact usage:

Input errors are indicated by red highlighting:



5. Save the configuration data to SmartMedia card



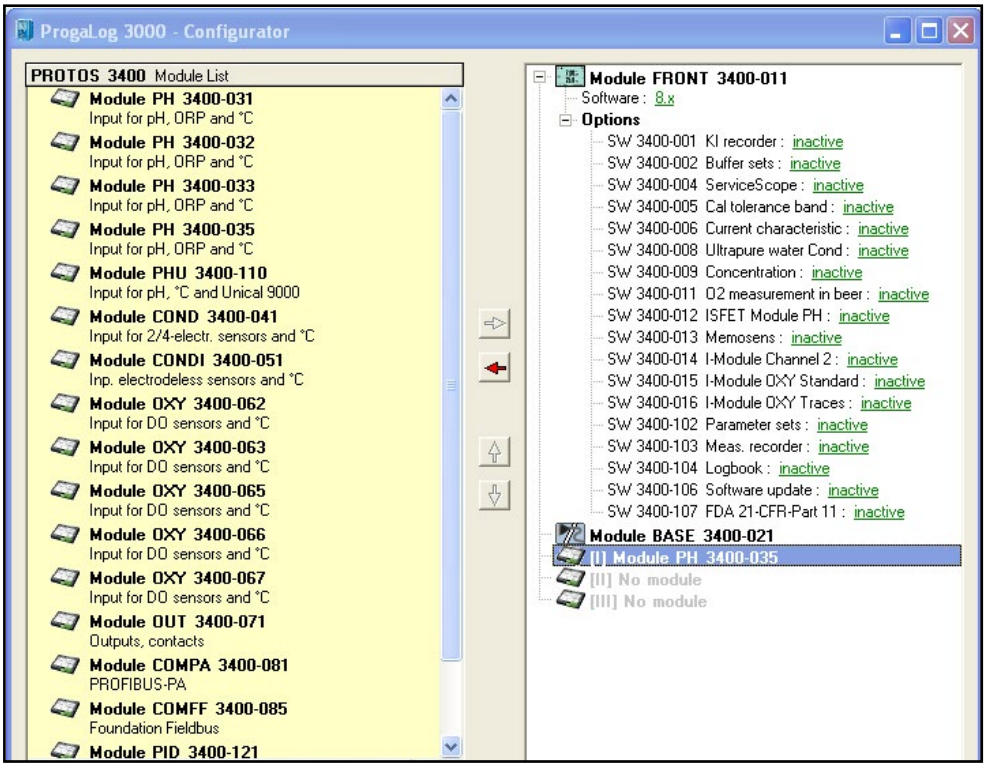
6. Load the configuration data to the Protos 3400(X)

Parameter setting / System control / Copy configuration.

Select "Load configuration" to write the complete device configuration (except the passcodes) to the Protos 3400(X).

ProgaLog 3000 Software for Configuration and Documentation

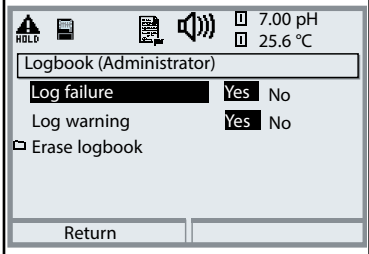
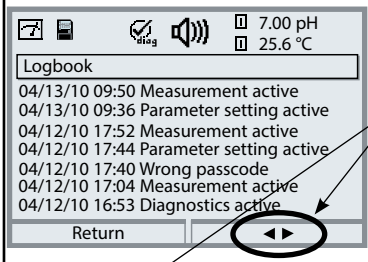
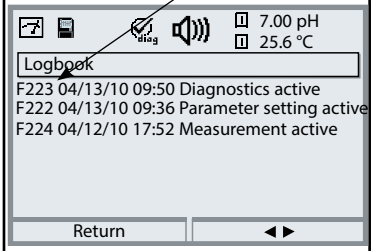
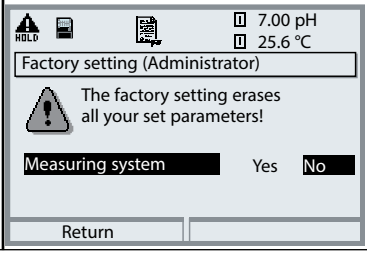
Configuration using "ProgaLog 3000"
In the "Configurator" menu you can preconfigure a complete Protos 3400(X) process analysis system with up to 3 modules at your PC.



1. Select your configuration from the modular system components offered in the left-hand field.
2. Click the right arrow (-->) to add the components or remove components by clicking (<--).
3. Now configure the parameters for the selected system components.
4. Save the configuration.
   You can save the configuration to a memory card that has been pre-formatted in the Protos 3400(X) and transfer them to analyzers with identical module configurations.

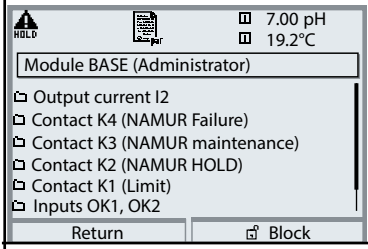
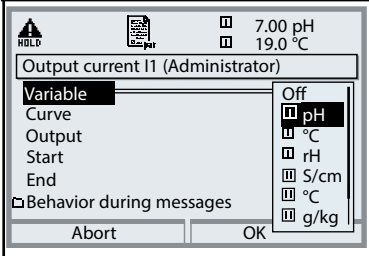
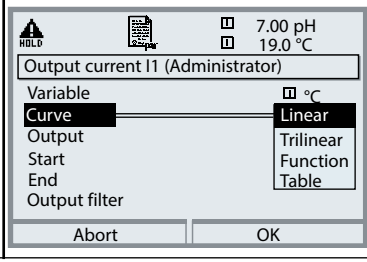
Logbook, Factory Setting

Parameter setting/System control/Logbook
Note: HOLD mode

Menu	Display	Logbook, Factory setting
par		**Logbook** Select which messages are to be logged in the logbook. The last 50 events are recorded with date and time. This permits quality management documentation to ISO 9000 et seq.
		The logbook can be called from the diagnostics menu (Fig.). Pressing the right softkey displays the message identifier.
		Additional function SW 3400-104: Extended logbook for recording data on SmartMedia card (TAN).
		**Factory Setting** Allows resetting the parameters to their factory setting. When this menu is opened, the analyzer displays a warning (Fig.).

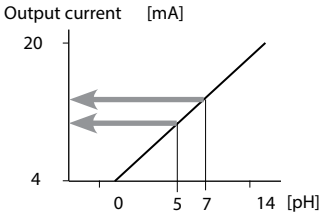
Current Outputs, Contacts, OK Inputs

Select menu: Parameter setting/Module BASE
Note: HOLD mode active

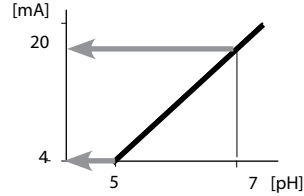
Menu	Display	Parameter setting BASE module
par		**Configuring a Current Output** • Call up parameter setting • Enter passcode • Select "Module BASE" • Select "Output current ..."
		• Select measured variable
		• Select Curve, e.g. "linear": The measured variable is represented by a linear output current 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 pH 0 - 14



Example 2: Range pH 5 - 7
Advantage: Higher resolution in range of interest

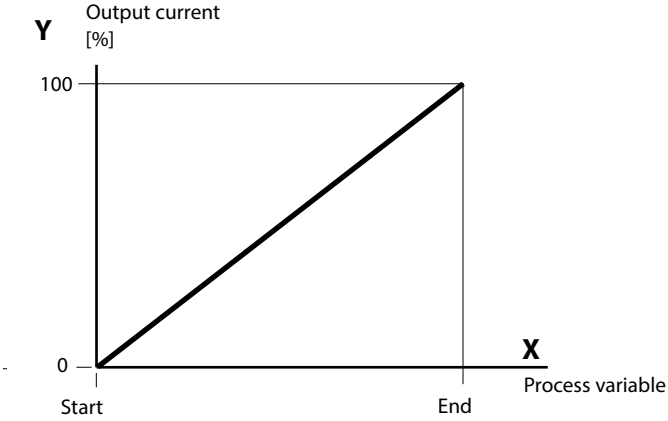


Current Outputs: Characteristics

Select menu: Parameter setting/Module BASE

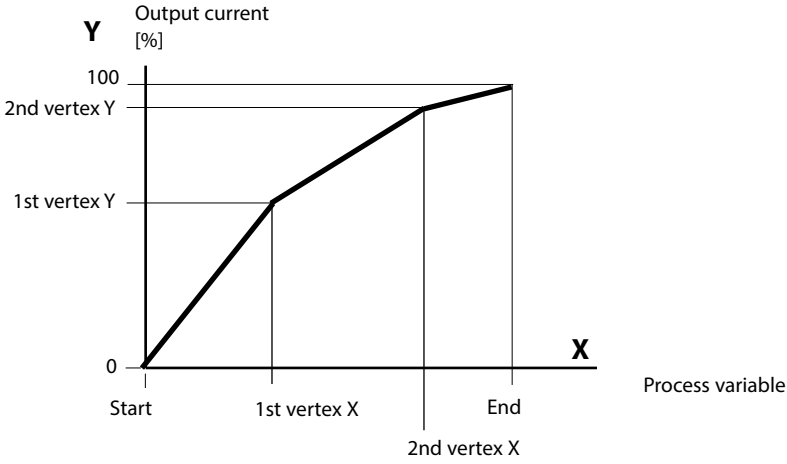
- **Linear characteristic**

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



- **Trilinear characteristic**

  Two additional vertices must be entered:



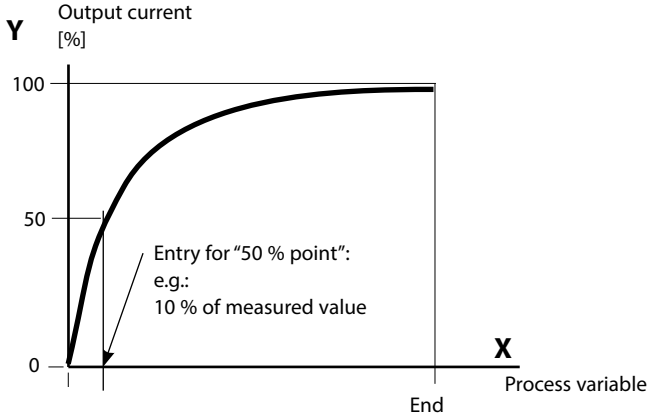
- **Note: Bilinear characteristic**

  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

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

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

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

Output Filter

Time interval

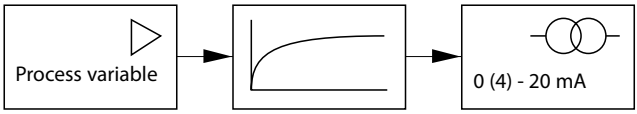
Time averaging filter

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!

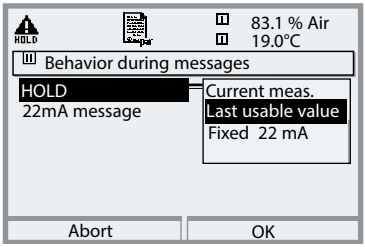


Time interval 0 ... 120 sec

NAMUR Signals: Current Outputs

Behavior during messages: HOLD, 22mA signal

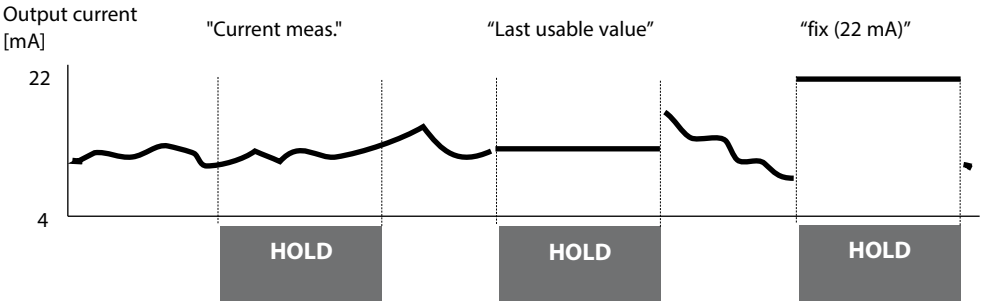
Behavior during messages



Depending on the configuration ("Messages") the current outputs switch to:

- Currently measured value
- Last measured value (HOLD function)
- Fixed value (22 mA)

In the case of a fault a 22 mA signal can be generated for the selected process variable (1st primary value).



Message when the current range is exceeded

As delivered, the "Maintenance request" (Warn) message is generated when the current range is exceeded (< 3.8 mA or > 20.5 mA).
This setting can be changed in the Parameter setting menu of the respective measuring module at "Messages".

To generate a "Failure" message, the limit value monitoring must be set to "Variable limits":
Parameter setting - <measuring module> - Messages - Variable limits - Failure limit ...

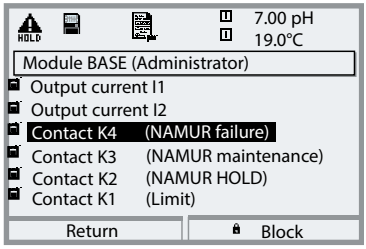
Enter the same values for the failure limits as for the current output:
Parameter setting - Module BASE - Output current - Variable Start / End.

NAMUR Signals: Relay Contacts

Failure, maintenance request, HOLD (function check)

As delivered, the floating relay outputs of the BASE module are assigned to the NAMUR signals:

Failure	Contact K4, normally closed (signaling current failure)
Maintenance request	Contact K3, normally open contact
HOLD	Contact K2, normally open contact



NAMUR signals: Factory setting of contacts
- Select parameter setting
- Administrator level
- Select "Module BASE" (Fig.)
  You can define a delay time for "Maintenance request" and "Failure", resp.
  If an alarm message is released, the contact will only be activated after expiry of this delay time.

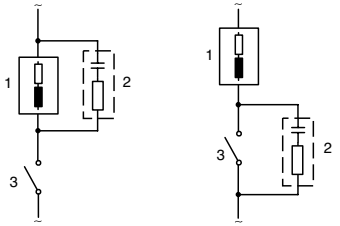
Failure is active
when a value has exceeded (or fallen below, resp.) a preset "Failure Limit Hi" or "Failure Limit Lo", when the measured value is out of range, or in the event of other failure messages. That means that the equipment no longer operates properly or that process parameters have reached a critical value.
Failure is disabled during "HOLD" (Function check).

Maintenance request is active
when a value has exceeded (or fallen below, resp.) a preset "Warning Limit Hi" or "Warning Limit Lo", or when other warning messages have been activated. That means that the equipment is still operating properly but should be serviced, or that process parameters have reached a value requiring intervention.
Warning is disabled during "HOLD" (function check).

HOLD is active:
- during calibration
- during maintenance (current source, meas. point maintenance)
- during parameter setting at the Operator level and the Administrator level
- during an automatic rinsing cycle

Relay Contacts: Protective Wiring

Protective wiring of relay contacts
Relay contacts are subject to electrical erosion. Especially with inductive and capacitive loads, the service life of the contacts will be reduced. For suppression of sparks and arcing, components such as RC combinations, nonlinear resistors, series resistors and diodes should be used.



Typical AC applications with inductive load

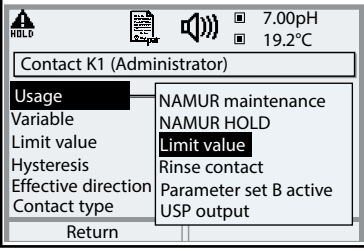
1 Load
2 RC combination, e.g. RIFA PMR 209
Typical RC combinations
e.g.
capacitor 0.1 µF
resistor 100 ohms / 1 W
3 Contact

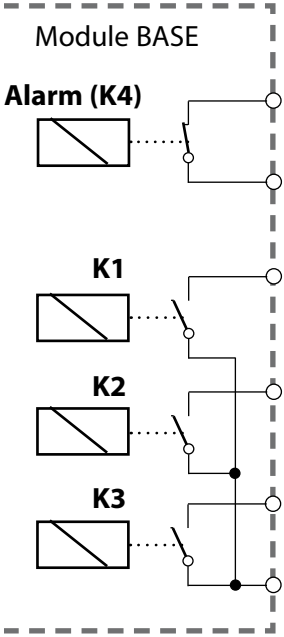
Caution!
Make sure that the maximum ratings of the relay contacts are not exceeded even during switching!

Information concerning relay contacts
As delivered, the relay contacts are suitable for low signal currents (down to approx. 1 mA). If currents above approx. 100 mA are switched, the gold plating is destroyed during the switching process. After that, the contacts will not reliably switch low currents.

Relay Contacts

Parameter setting/Module BASE/Relay contacts

Menu	Display	Setting the relay contacts
		**Relay Contacts, Usage** • Open parameter setting • Enter passcode • Select "Module BASE" • Select "Contact ..." • "Usage" (Fig.)



Contact assignment:
See terminal plate of BASE module

The BASE module provides 4 relay contacts (max. AC/DC rating 30 V / 3 A each).
Contact K4 is provided for failure message. The switching behavior (normally open or normally closed), as well as a switch-on or switch-off delay can be defined.

Default settings of the user-definable relay contacts of the BASE module:

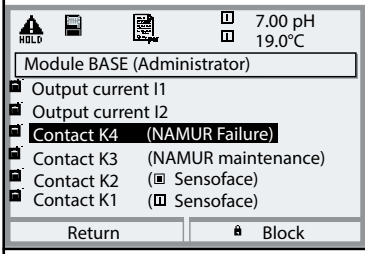
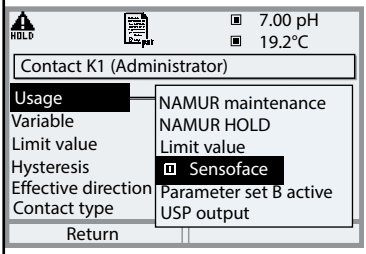
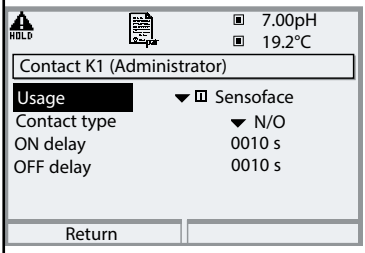
K3: NAMUR maintenance request
K2: NAMUR HOLD (function check)
K1: Limit value

K1-K3 are user definable ("Usage"):

- NAMUR maintenance
- NAMUR HOLD
- Limit value
- Rinse contact
- Parameter set B active
- USP output (COND module only)
- KI rec. active
- Sensoface
- Alarm control

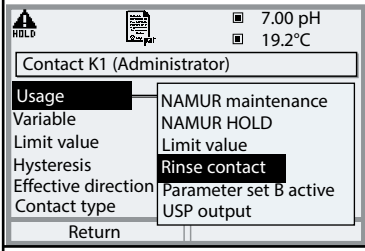
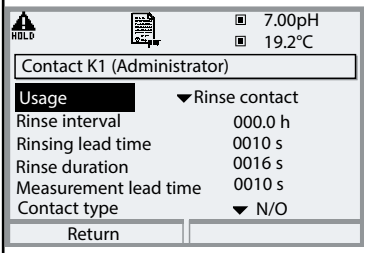
Relay Contacts: Sensoface Messages

Parameter setting/Module BASE/Relay contacts/Usage/Sensoface

Menu	Display	Parameter setting (Sensoface)
par		**Assign Sensoface messages to relay contacts** When more than one measuring module is used, the Sensoface messages of the modules can be assigned to different contacts.
		**Relay contacts, usage** • Open parameter setting • Enter passcode • Select "Module BASE" • Select contact e.g. K1) • Assign Sensoface message of desired measuring module to selected relay contact
		**Set contact parameters** • (e.g. "N/O") • Set ON / OFF delay.

Rinse Contact

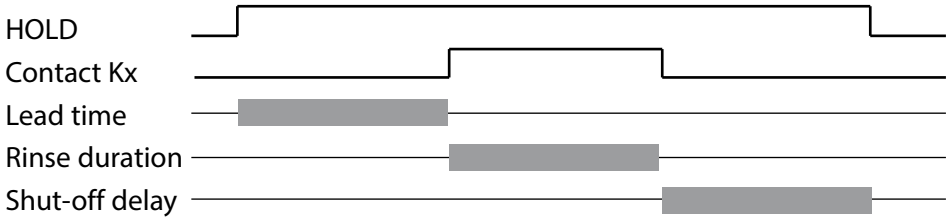
Parameter setting/Module BASE/Relay contacts/Usage/Rinse contact

Menu	Display	Configuring the rinse contact
par		**Relay contacts, usage** • Open parameter setting • Enter passcode • Select “Module BASE” • Select contact e.g. K1) • “Rinse contact” (Fig.)
		**Set rinse contact parameters** • Set rinse interval • Set rinse duration • During the defined "lead time" the "HOLD" mode is active. • Select contact type (e.g. "N/O")

Please note when configuring the "Rinse contact" function

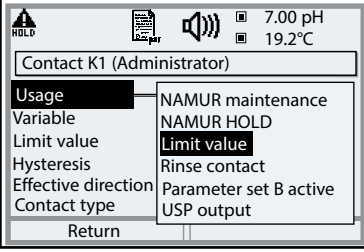
- "HOLD" mode (e.g. during parameter setting) delays the execution of the "Rinse contact" function.
- Up to 3 rinse functions (contacts K1 ... K3) can be configured independently.
- The individual rinse functions are not synchronized with each other.

Time response

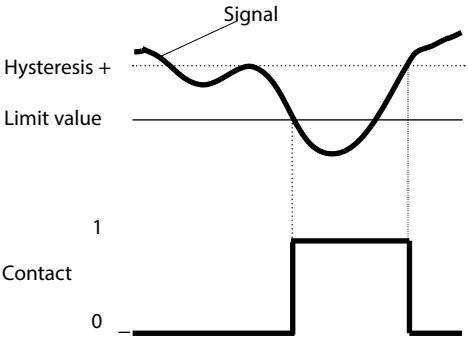


Limit Value, Hysteresis, Contact Type

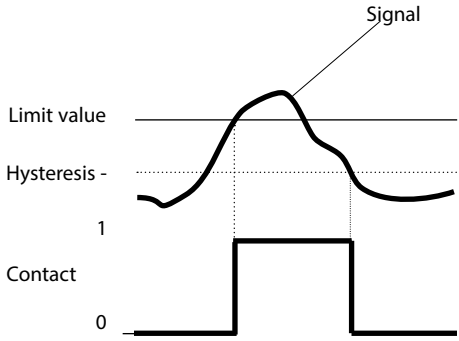
Parameter setting/Module BASE/Relay contacts/Usage

Menu		Usage as limit value
		**Relay output: Limit value** • Open parameter setting • Enter passcode • Select "Module BASE" • Select "Contact ..." • "Usage: Limit" (Fig.)

Limit value ▼
Effective direction min



Limit value ▲
Effective direction max



Icons in the Measurement Display

Measured value exceeds limit: ▲ Measured value falls below limit: ▼

Hysteresis

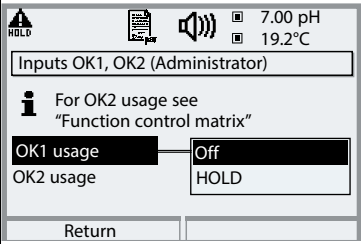
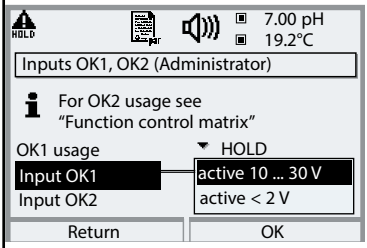
Tolerance band around the limit value, within which the contact is not actuated. Serves to obtain appropriate switching behavior at the output and suppress slight fluctuations of the measured variable (Fig.)

Contact type

Specifies whether the active contact is closed (N/O) or open (N/C).

OK1, OK2 Inputs: Specify Level

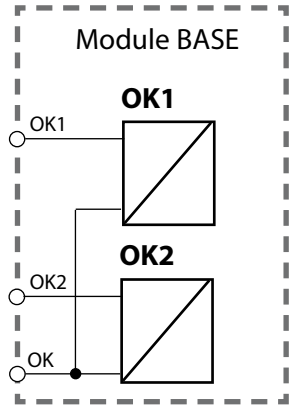
Parameter setting/Module BASE/Inputs OK1, OK2
Note: HOLD mode (Setting: BASE module)

Menu	Display	Setting the OK inputs
par		**OK1 usage** • Open parameter setting • Enter passcode • Select "Module BASE" • Select "Inputs OK1/OK2" • Select "OK1 usage"
		**OK1/OK2 switching level** • Open parameter setting • Enter passcode • Select "Module BASE" • Select "Inputs OK1/OK2" • Specify active switching level

The BASE module provides 2 digital inputs (OK1, OK2). The following functions (depending on the parameter setting) can be started via a control signal:

- OK1: "Off" or "HOLD"
- OK2: Select: System control / Function control matrix. ("Off", "Parameter set A/B", "Start KI recorder")

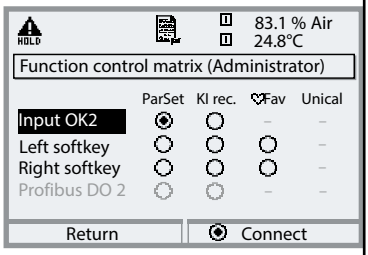
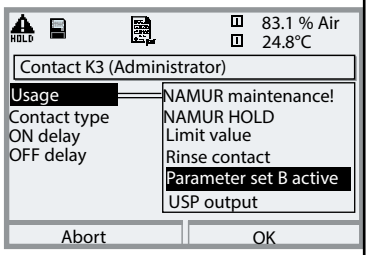
You must specify the switching level for the control signal:
(active 10...30 V or active < 2 V).



Switching Parameter Sets via OK2

Parameter setting / System control / Function control matrix
Note: HOLD mode (Setting: BASE module)

Parameter Sets
2 complete parameter sets (A, B) can be stored in the analyzer.
You can switch between the parameter sets using the OK2 input.
The currently activated set can be signaled by a relay contact.
An icon in the measurement display shows which parameter set is active:
A or B

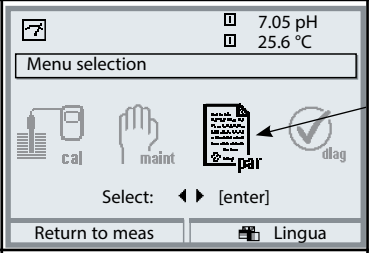
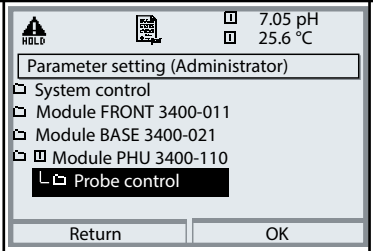
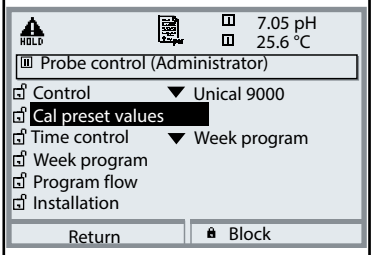
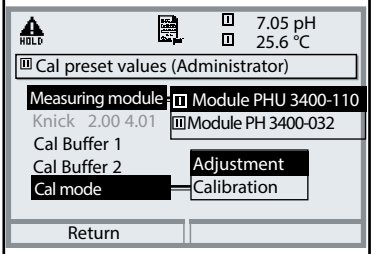
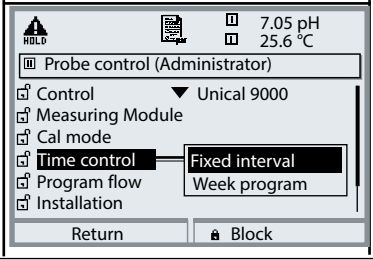
Menu	Display	Parameter sets
par		**Selecting Parameter Set (A, B) via OK2 Input** • Open parameter setting • System control • Function control matrix • Select "OK2" • Connect "Parameter set A/B"
		**Signaling Active Parameter Set via Relay Contact** • Open parameter setting • BASE module • Select contact • Usage: "Parameter set ...".

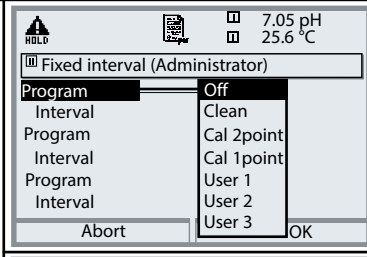
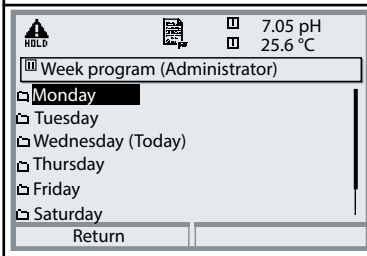
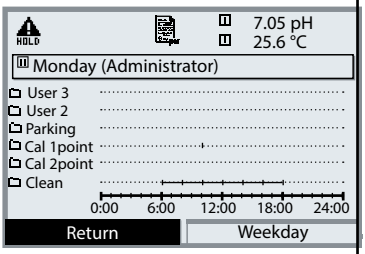
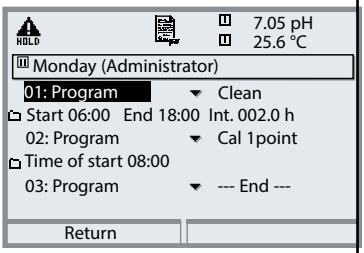
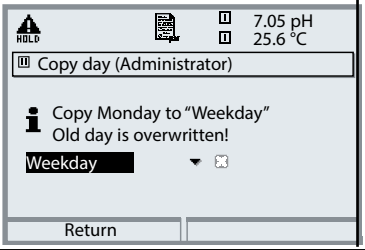
Note
The selection has no effect when working on SmartMedia card with SW 3400-102.

Unical 9000(X) Parameter Setting

Functional Capabilities

Setting	Adjustable parameters		Page
• Control	**Off**, Unical 9000, Uniclean 900		**Pg 68**
• Cal preset values	Buffer set as configured in the PHU 3400-110		
Cal Buffer 1	Calimatic (automatic) or selection of a buffer		
Cal Buffer 2	Calimatic (automatic) or selection of a buffer		
Cal mode	**Adjustment**, Calibration		
Cal timer program	Off, Cleaning, Cal 2pt, Cal 1pt, Parking, User1, User2		
• Time control	**Fixed interval**, Week program:		**Pg 69**
	Fixed interval:	Select program, interval	
	Week program:	Configuration of program flows	
• Program flow	Individual adaptation of program steps for: Cleaning, Cal 2point, Cal 1point, Service, Parking, User 2, User 1		**Pg 70**
• Installation			
External control (DCS)	**Off**, On		**Pg 81**
	DCS inputs (36...39)	**active 10...30 V** or active < 2 V	**Pg 82**
	M/S input (42/43)	**active 10...30 V** or active < 2 V	
	A/M input (40/41)	**active 10...30 V** or active < 2 V	
	Output DCS 34	**Measuring**, Alarm	
	DCS outputs (31…34)	**N/O**, N/C	
• Sensor detection	On, **Off**		
• Immersion lock	**Off**, Sensocheck Glass el		
• Access manual control	Access code required. All valves can be actuated separately.		
• Probe	Probe type (Ceramat, SensoGate, InTrac, Others)		
Move time max.	Adjustable; default setting 0015 s		
Sealing water	On, **Off**		
Cavity rinsing	**Off**, Interval, Continuous		
Check interval	On, **Off** (On: Entry: Check after x travels)		
Maintenance interval	On, **Off** (On: Entry: Maintenance after x travels)		
• Rinse water	Monitoring: **Off**, Process value, Temperature		
• Media adapter (I ... III) (up to 3 metering pumps)	Each: Medium, Displaced volume, Residual volume, Monitoring of medium (Off / Process value / Temperature)		
• Additional media (1...2)	Monitoring of medium (Off, Process value, Temperature)		
• Start-up	Yes, **No**		**Pg 87**
• System forecast	On, **Off**		**Pg 88**

Menu	Display	Unical 9000 parameter setting
		**Open parameter setting** From the measuring mode: Press **menu** key to select menu. Select parameter setting using arrow keys, press **enter** to confirm.
par		Select "Probe control / Unical 9000". Icons to assign the measured values displayed: I specifies module slot I II specifies module slot II
		**Cal Preset Values Unical 9000** Select pH module: (only if equipped with more than 1 pH module). **Select cal mode** • Adjustment: The values determined by a calibration are taken over. • Calibration: The values determined by a calibration are logged but not taken over.
		**Cal timer program** Starts the selected program after cal timer expiry.
		**Time Control** • Fixed interval (3): Specify times (000.0 h ... xxx.x h) (Please note: 000.1 h = 6 min) • Week program: Specify weekday

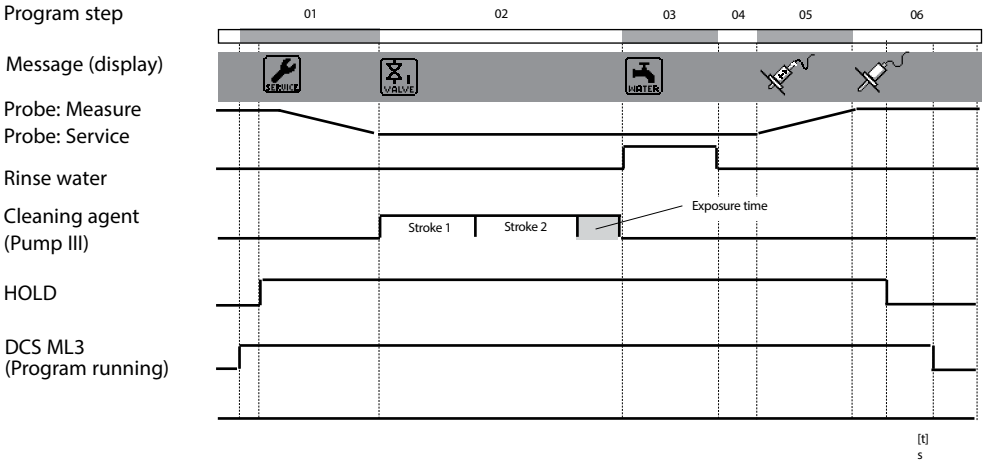
Menu	Display	Time control configuration
par		**Time control: Fixed interval** The "Fixed interval" menu allows selection of up to three programs. An individual time interval an be assigned to each program.
		**Time control: Week program** In this menu you can View, Edit, and Copy.
		View shows the configured program sequences over the day
		Edit allows selection of up to 10 programs per day and you can choose between "Individual start" or "Interval" (the program is executed within a start and an end time at a specified interval).
		Copy allows taking over a configured program for another weekday. (Further editing is possible.)

Parameter Setting: Program Flows

Cleaning (Continuous), Media Monitoring Off

Display text	Time [s]
01: Probe in SERVICE	
02: Cleaning agent	0020 s
03: Rinse water ON	0060 s
04: Rinse water OFF	0002 s
05: Probe in MEASURE	0005 s
06: Program end	

Cleaning (continuous) can also be started via a DCS input signal at input BIN1 of the Unical 9000 probe controller.

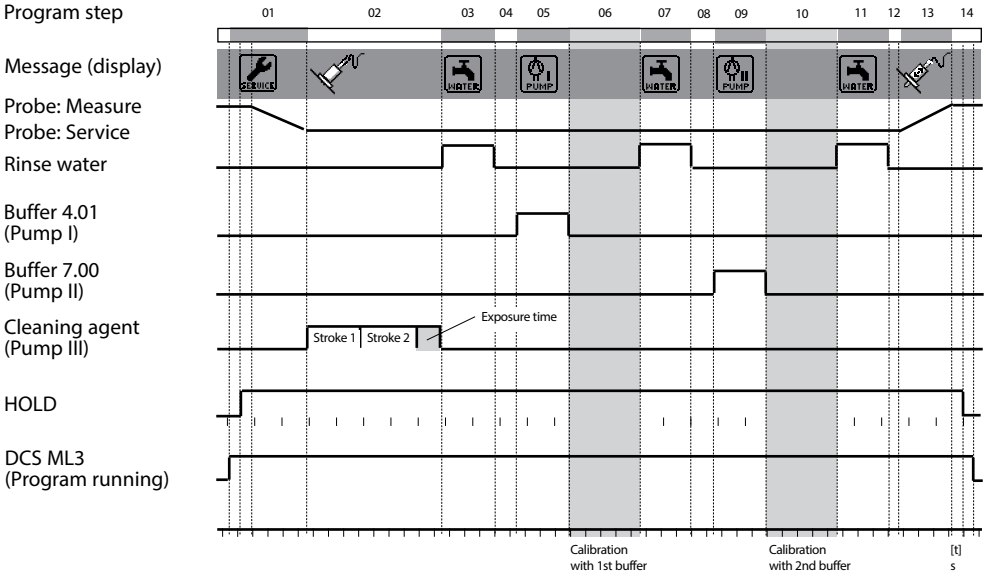


Parameter Setting: Program Flows

Cal 2point (Continuous), Media Monitoring Off

Display text	Time [s]
01: Probe in SERVICE	
02: Cleaning agent	0020 s
03: Rinse water ON	0060 s
04: Rinse water OFF	0002 s
05: Buffer I	0000 s
06: Cal Buffer 1	
07: Rinse water ON	0010 s
08: Rinse water OFF	0002 s
09: Buffer II	0000 s
10: Cal Buffer 2	
11: Rinse water ON	0010 s
12: Rinse water OFF	0002 s
13: Probe in MEASURE	0005 s
14: Program end	

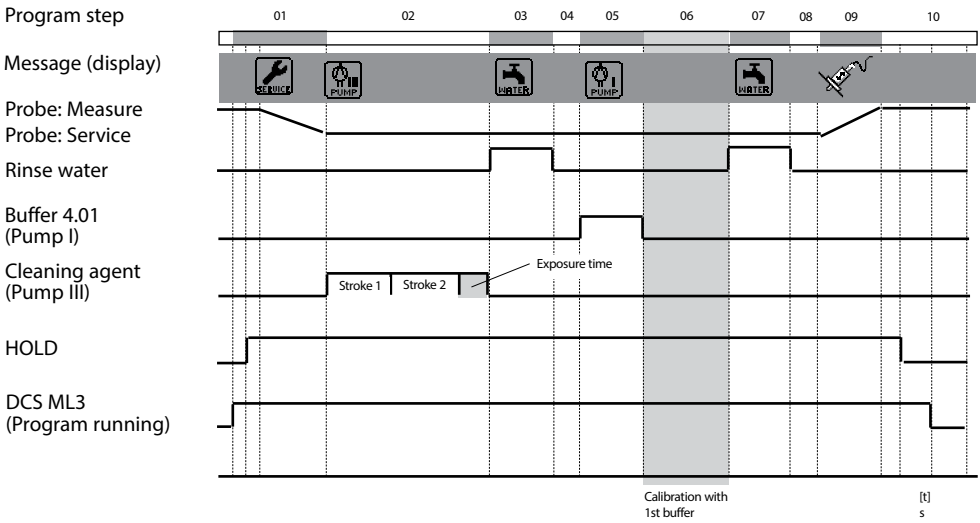
Cal 2point (continuous) can also be started via a DCS input signal at input BIN2 of the Unical 9000 probe controller.



Parameter Setting: Program Flows

Cal 1point (Continuous), Media Monitoring Off

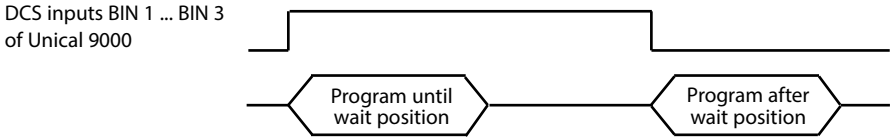
Display text	Time [s]
01: Probe in SERVICE	
02: Cleaning agent	0003 s
03: Rinse water	0010 s
04: Rinse water	0002 s
05: Buffer I	0000 s
06: Cal buffer 1 (pH 4.01)	
07: Rinse water	0010 s
08: Rinse water	0002 s
09: Probe in MEASURE	
10: Program end	



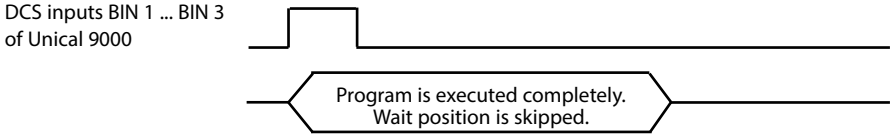
Park Program: Wait Position

The park program includes the programming step "Wait position".
When the program is started via the DCS inputs BIN 1 ... BIN 3 on the Unical 9000, the program will be executed until the "Wait position" is reached. There it remains until the signal status at the DCS inputs changes.

- The program is started via the DCS inputs and remains in "Wait position" until the assignment of the DCS inputs changes:



- The program is started by a short signal at the DCS inputs:
  Wait position is skipped.



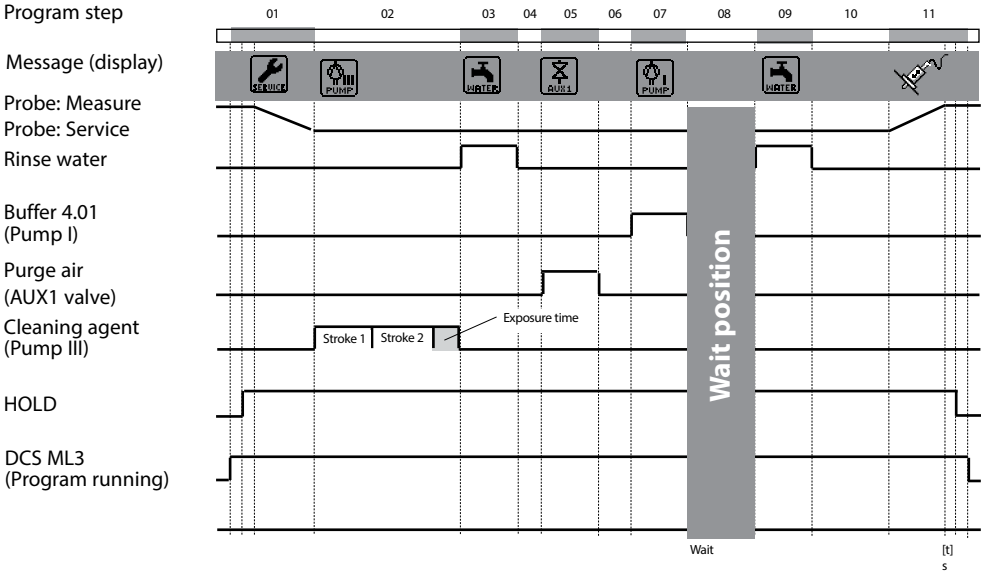
Notice:
If the programs are started by the Protos 3400(X) from the Calibration or Maintenance menu, the wait position will be skipped.

Parameter Setting: Program Flows

Parking

Display text	Time [s]
01: Probe in SERVICE	
02: Cleaning agent	0020 s
03: Rinse water ON	0060 s
04: Rinse water OFF	0002 s
05: Purge air ON	0010 s
06: Purge air OFF	0002 s
07: Cal buffer 1 (pH 4.01)	
08: Wait position	> Position will be held until next command (e.g., DCS)
09: Rinse water ON	0010 s
10: Rinse water OFF	0002 s
11: Probe in MEASURE	0005 s
12: Program end	

Parking is started via a DCS input signal at input BIN3
of the Unical 9000 probe controller.

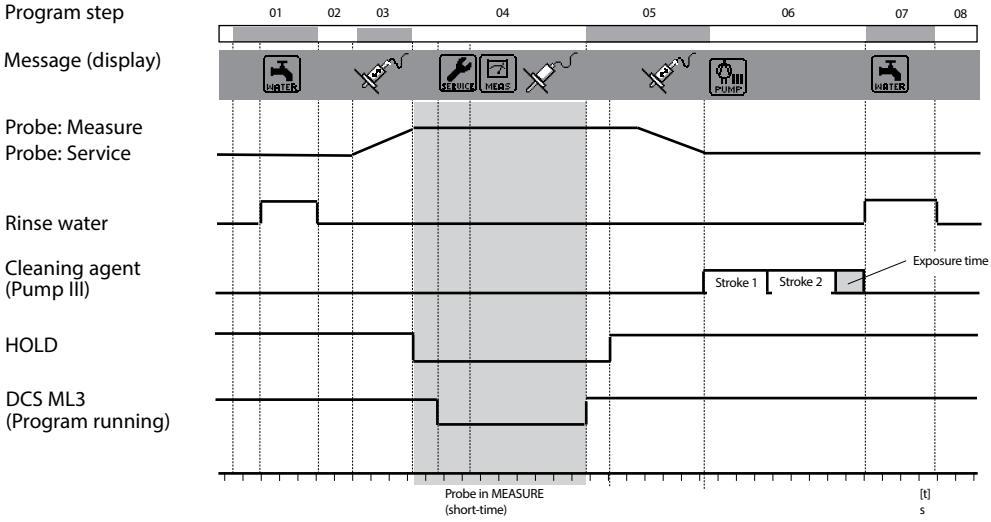


Parameter Setting: Program Flows

Measurement (Short-Time), Media Monitoring Off

Display text	Time [s]
01: Rinse water ON	0010 s
02: Rinse water OFF	0002 s
03: Probe in MEASURE	0005 s
04: Meas duration	0030 s
05: Probe in SERVICE	
06: Cleaning agent	0020 s
07: Rinse water ON	0060 s
08: Rinse water OFF	0002 s
09: Program end	

Measurement (short-time) can also be started via a DCS input signal at input BIN1 of the Unical 9000 probe controller.

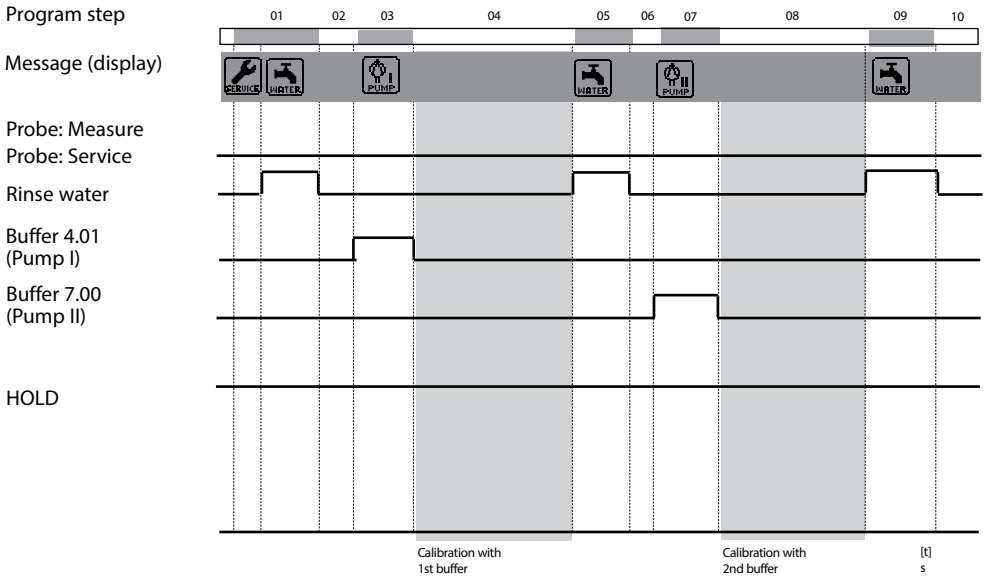


Parameter Setting: Program Flows

Cal 2point (Short-Time), Media Monitoring Off

Display text	Time [s]
01: Rinse water ON	0010 s
02: Rinse water OFF	0002 s
03: Buffer I	0000 s
04: Cal Buffer 1	
05: Rinse water ON	0010 s
06: Rinse water OFF	0002 s
07: Buffer II	0000 s
08: Cal Buffer 2	
09: Rinse water ON	0010 s
10: Rinse water OFF	0002 s
11: Program end	

Cal 2point (short-time) can also be started via a DCS input signal at input BIN2 of the Unical 9000 probe controller.

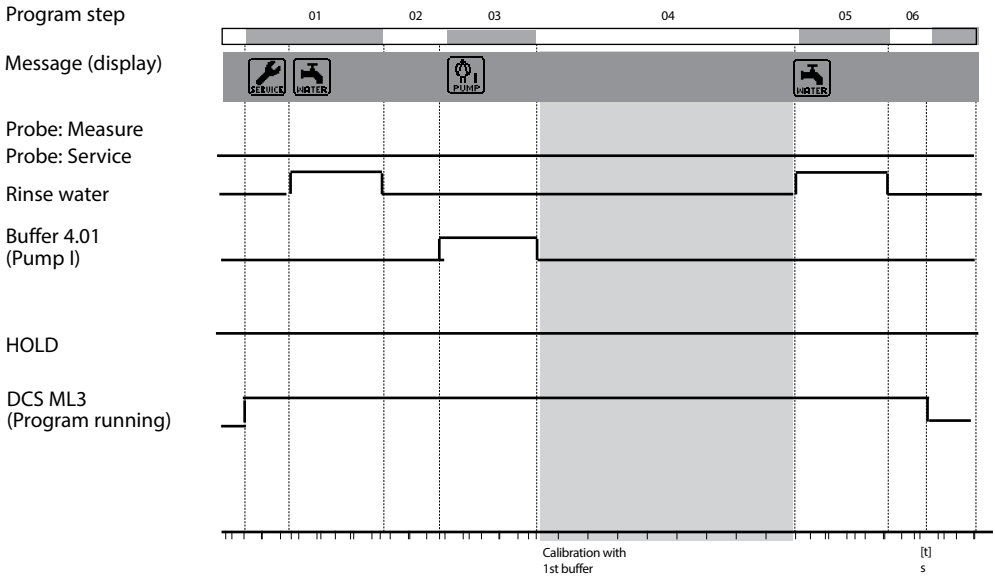


Parameter Setting: Program Flows

Cal 1point (Short-Time), Media Monitoring Off

Display text	Time [s]
01: Rinse water ON	0010 s
02: Rinse water OFF	0002 s
03: Buffer I	0000 s
04: Cal buffer 1 (pH 4.01)	
05: Rinse water ON	0010 s
06: Rinse water OFF	0002 s
07: Program end	

Cal 1point (short-time)

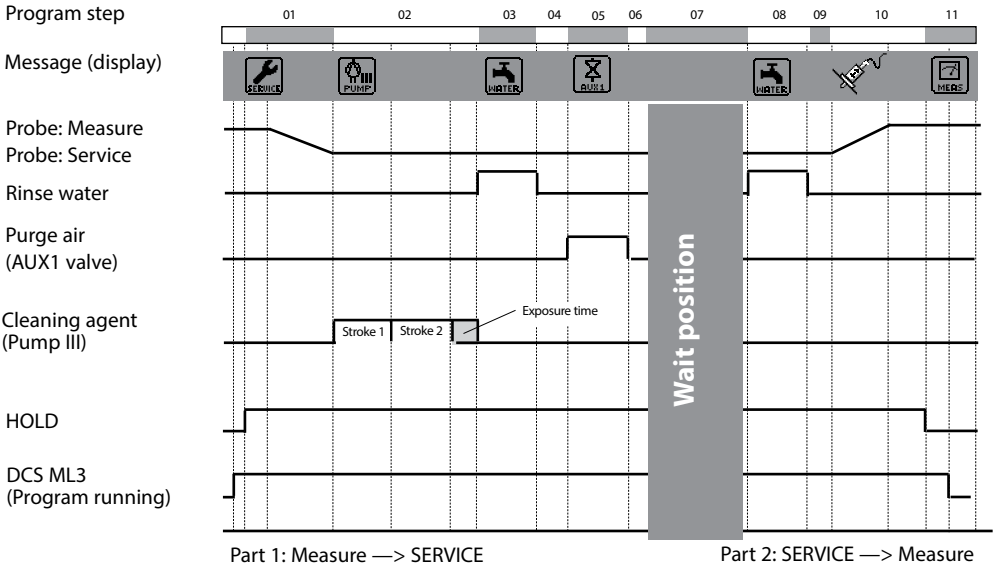


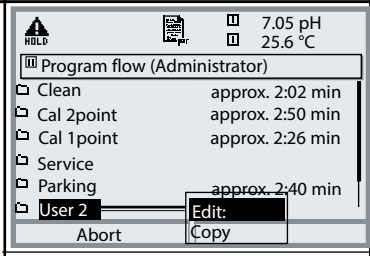
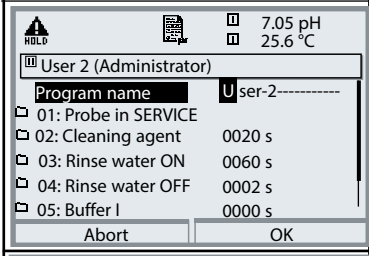
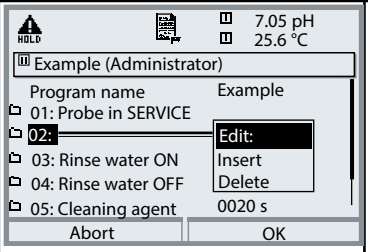
Parameter Setting: Program Flows

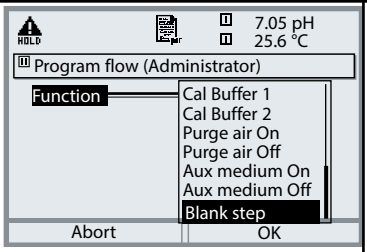
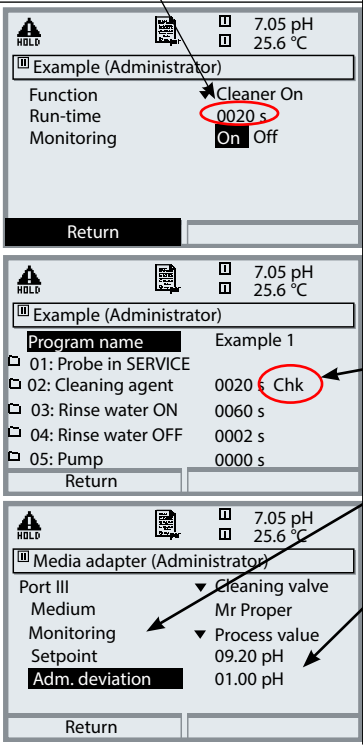
Service

Display text	Time [s]	
01: Probe in SERVICE		
02: Cleaning agent	0020 s	Measure -> Service
03: Rinse water ON	0060 s	
04: Rinse water OFF	0002 s	
05: Purge air ON	0005 s	
06: Purge air OFF	0002 s	
07: Wait position		Service position
08: Rinse water ON	0010 s	
09: Rinse water OFF	0002 s	
10: Probe in MEASURE	0005 s	Service -> Measuring
11: Program end		

Service can also be is started via a DCS input signal at input M/S of the Unical 9000 probe controller.



Menu	Display	Parameter setting Program flow
par		**Configuring the Program Flow** Parameter setting / Probe control / Program flow / User 2: Select "Edit" using arrow keys, confirm with **enter**
		**Entering a Program Name** A new program name can be entered using the arrow keys. Confirm the name with **enter**
		**Editing a Program Step** Select the program step you want to edit using the arrow keys. Press **enter**: Now you can choose between "Edit, Insert, Delete". • **Edit:** Allows selecting a function • **Insert:** Inserts an empty step above the selected program step and then allows selecting a function by "editing" the empty step. Allows selecting a function • **Delete:** The program step is deleted.

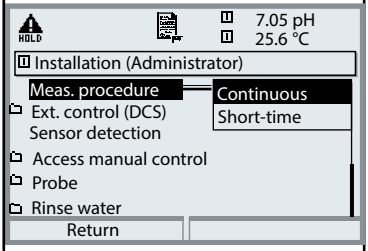
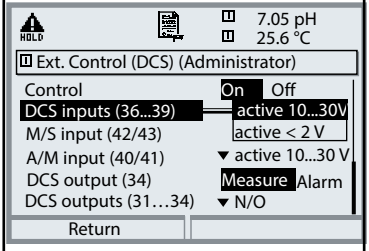
Menu	Display	• Configure function • Activate monitoring
par	 For valve functions the run time must be specified, for pumps the exposure time.	**Configuring a Function** Select a function using arrow keys, confirm with **enter** Program end Probe in SERVICE Probe in MEASURE Rinse water On Rinse water Off Wait time Buffer I - - - Text can be edited during installation Buffer II - - Text can be edited Cleaning agent - Text can be edited Cal Buffer 1 Cal Buffer 2 Purge air On - Text can be edited Purge air Off - Text can be edited Aux medium On - Text can be edited Aux medium Off - Text can be edited Wait position Goto line ORP check
		**Activating Monitoring** **(see "Media monitoring")** With several functions you can monitor the media used in the calibration chamber ("Monitoring: On") (e.g. cleaning agent, buffers, rinse water, ...). The respective program step is then marked with "Chk". In any case it is necessary that you select the monitoring function for the respective medium in the "Installation" menu and specify valid tolerance limits for temperature or process value, otherwise the respective line is not displayed.

Parameter Setting: Installation

Configuration of Unical 9000 Functions

Installation	Default setting	Adjustable parameters
• Measurement procedures	Continuous	(Short-time)
• Ext. control (DCS)		(Polarity / Output settings)
- Signal level of inputs DCS (36 ... 39) M/S (42, 43) A/M (40, 41)	Active: 10 ... 30 V	(Active: 10 ... 30 V / active < 2V)
- DCS output (34)	Measure	Alarm
- Signal level of outputs DCS (31 ... 34)	N/O	(N/O / N/C)
• Sensor detection	Off	On
• Immersion lock	Off	Sensocheck Glass el
• Access manual control	Access code for manual control (Maintenance menu) Default: 2598	
• Probe		
- Probe type	Ceramat	(SensoGate, InTrac, Other)
- Max. move time	0015 s	
- Safety valve	No	(Yes)
- Sealing water	Off	(On)
- Cavity rinsing	Off	(Off, Interval, Continuous: Default for interval: 0001.0 h, Rinse duration: 05 s)
- Check interval	Off	On (Check after travels)
- Maintenance interval	Off	On (Maintenance after travels)
• Rinse water		
- Monitoring	Off	(Process value/Temperature)
- Setpoint	+07.00 pH	
- Adm. deviation	01.00 pH	
• Media adapter		
- Port I ... III	Off*	"Pump" or "Off"
- Medium:	---	(e.g. "Buffer I")
- Displaced volume	25 ml	(50 / 75 / 100 ml)
- Residual volume	250 ml	(0 / 250 / 500 ml)
- Monitoring	Off	(Process value/Temperature)
- Setpoint	07.00 pH	(Process medium or temp)
- Adm. deviation	0.50 pH	
• Additional media		
- Additional medium 1	Off	(On - with monitoring)
- Additional medium 2	Off	(On - with monitoring)
• Start-up	No	Yes/No
• System forecast	Off	Off / On: Monitors the probe travels for predictive maintenance of Ceramat und SensoGate

*Automatic adjustment by "Plug & Play" in: System control / Factory setting Probe control

Menu	Display	• Meas. procedure • External control via DCS
par		**Selecting the Measurement Procedure** • Continuous measurement: With continuous measurement the pH electrode is located in the process medium and is retracted for calibration or cleaning. • Short-time measurement: (interval measurement, sampling, sample mode ...) The pH electrode is only momentarily moved into the process medium. This method is applied when measuring aggressive or thermally demanding process media which require short measurement times with long rest periods.
		**External Control via DCS** • DCS inputs: Inputs for selecting the control programs. Here, the active signal level is specified. (< 2 V or 10 ... 30 V). • M/S input: Control of probe movement • A/M input: Intervals automatic / blocked • DCS output (34): Specify output signal for terminal 34: - Measuring or - Alarm • DCS outputs (31 … 34): Specify contact type (N/O, N/C)

Control via Process Control Cystem (DCS)

Inputs/Outputs of Unical 9000(X)

No.	Designation	I / O	Level	Function
42	Measuring/ Service	I	0	Probe moves to measure position *
43			1	Probe moves to service position
40	Auto / Manual	I	0	Automat. interval control from Unical *
41			1	Automat. intervals locked
37	Bin 3	I		Program selection and start, manual / DCS * **
38	Bin 2			(Program 1 ... 6 - see next page)
39	Bin 1			
34	Measuring*** (user-defined: "Alarm")	O	0	
			1	Probe in "MEASURE" position *
33	Service	O	0	
			1	Probe in "SERVICE" position *
32	Program runs	O	0	
			1	Program running *

* Passive contacts,
24 V must be supplied externally or via DCS

** Signal duration at least 2 s (passing contacts)

*** As delivered, the signal output DCS 34 serves for probe position feedback – as shown. However, you can also program this output as "Alarm". Then it sends a signal to the DCS in the event of calibration errors or faulty probe movement.

Control Programs and Meas. Procedures

Factory Settings

Control Programs of Unical 9000(X)

6 programs and one service program can be started. 5 program flows are preset. 2 further programs can be entered by the user (User 1, User 2).
The programs are started ...

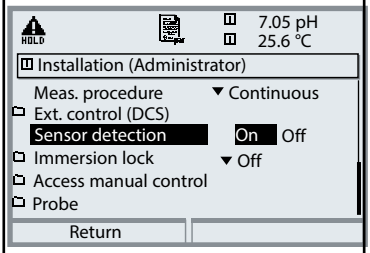
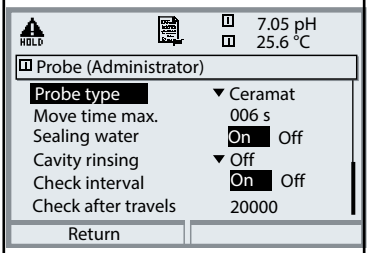
- for manual operation via Protos 3400(X)
- remotely via DCS or switch with passive inputs Bin 1 ... 3
  (24 V must be externally supplied, see Specifications)

Program	Description	Bin 3	Bin 2	Bin 1
1	Cleaning	0	0	1
2	Two-point calibration (Cal 2point)	0	1	0
3	One-point calibration (Cal 1point)	0	1	1
4	Park position	1	0	0
5	User-programmable (User 1)	1	0	1
6	User-programmable (User 2)	1	1	0
7	Service program	Request via M/S		

The service program (7) stops all other running programs (1 - 6) immediately and erases stored requests. For programs 1-6 the following applies:
When you start a new program, the remaining steps of a currently running program are executed first. Further requests are stored and executed subsequently. When you control the Unical 9000(X) via Protos 3400(X), you can block the Bin 1, Bin 2, Bin 3 signal lines as well as M/S and A/M to prevent conflicts (Parameter setting / Probe control / Installation / Ext. control (DCS): Off)

Measurement Procedures

- Continuous measurement: After cleaning / calibration the probe moves into the process for measurement
- Short-time measurement (interval measurement, sampling, sample mode ...): After cleaning / calibration the probe remains in the calibration chamber and only moves into the process for measurement upon request.

Menu	Display	• Sensor detection • Probe
par		**Sensor Detection** Sensor detection "On" prevents accidental probe movement when the electrode has been removed. This is done by checking whether the temperature detector integrated in the sensor is connected.
		**Probe** Selecting the retractable fitting. Here, the max. move time is automatically adjusted (depending on model). **Sealing Water** Sealing water is switched on shortly before the probe movement is started to keep the rinsing chamber free from medium. This is important for processes containing fibrous or adhering media. The sealing water pressure must be higher than the medium pressure. Intrusion of medium is prevented by the counter-pressure in the rinsing chamber which is caused by the sealing water. **Check Interval, Maintenance Interval** Permits specifying the max. admissible number of move cycles until a message is generated, factory setting: Check after travels: 20000 Maintenance after travels: 100000

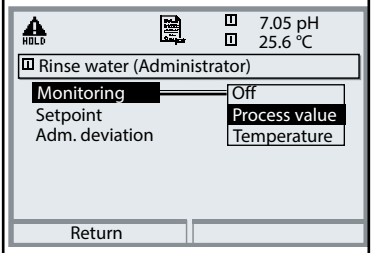
Configuring Media Monitoring

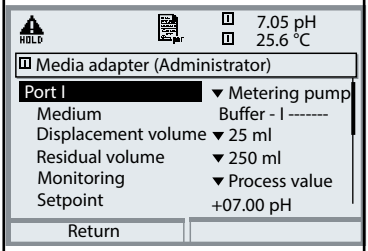
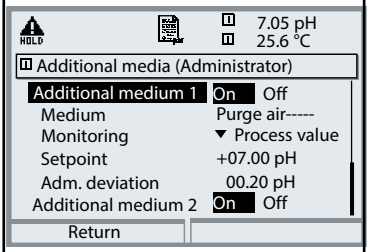
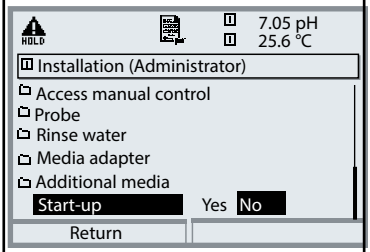
Media Monitoring

For perfect system control, the pH value (or temperature) of the media used (buffer solutions, cleaning solution, rinsing water ...) can be checked against a specified value in the calibration chamber. This ensures that only correct media are used in the calibration chamber of the probe. Exchanged or contaminated media or media with a wrong temperature are recognized.
In that case a message will be released. If faulty media are recognized before a calibration step, that step will not be performed.

NOTICE!

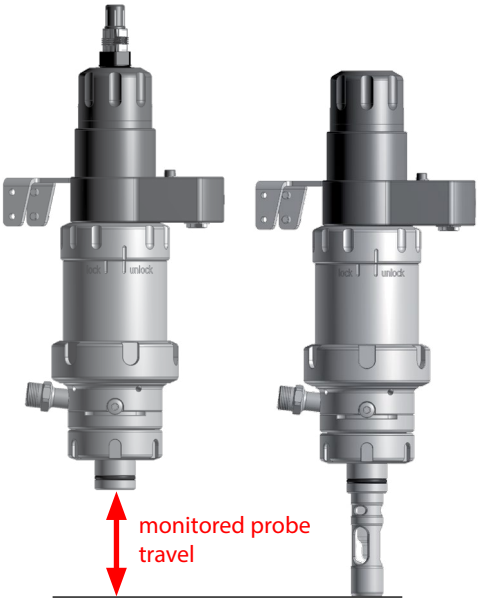
When monitoring the pH value of a medium, the zero and slope deviations of the electrode must be taken into account. Therefore the value specified for "adm. deviation" must not be too low!

Menu	Display	Configuring the media monitoring
par		Media monitoring can be configured in the "Parameter setting / Probe control / Installation" menu for: • Rinse water • Media at media adapter (... in the "Media adapter" menu) • Additional media The process value or temperature of the media can be monitored. Please note that the value specified for "Adm. deviation" should not be too low. The minimum response time is automatically taken into account when configuring the user programs.

Menu	Display	• Media adapter, Additional media • Start-up
par		**Media Adapter** • Specifying the equipment (Metering pump, Off, or Cleaner) • Designation of medium • Specifying the displaced volume depending on model, e.g.: Ceramat 25 ml InTrac 77Xe 50 ml InTrac 797e 75 ml InTrac 798e 100 ml) • Residual volume • Monitoring (Process value/Temp) • Setpoint
		**Additional Media (2)** • Specifying the equipment (On, Off) • Designation of medium, • Monitoring (Process value/Temp) • Setpoint
		**Start-Up** At the end of the parameter-setting procedure, a “Start-up” line appears in the “Installation” menu. When you are sure to have set all parameters, select “Yes” to confirm. Now the pumps perform the number of stroke movements required for filling the media tubes completely. The necessary rinsing cycles are automatically started.

System Forecast (Ceramat, SensoGate)

Monitoring the probe travel behavior of retractable fittings
(with Unical 9000(X) software version 4.3 or higher)



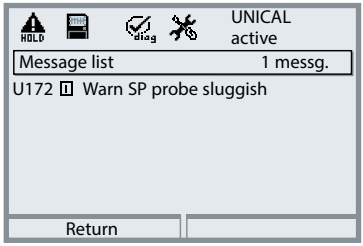
SensoGate in Service position...

... and in Process position

The "System Forecast" function enables monitoring of the probe travel behavior of the Ceramat or SensoGate retractable fittings. Possible signs of wear are detected in good time to prevent failure or down-times ("predictive maintenance").

Fittings frequently display signs of wear as a change in their travel behavior. The travel time can increase significantly, for example, if aggressive media or critical processes cause the retractable fitting to become sticky or seals to swell. The switching behavior of control elements such as piezo valves also changes in the course of time, particularly with long dwell times in one position.

The opening and closing times as well as the passing capacity of these valves can then be significantly changed. Over time, pneumatically-controlled valves are also subject to changed switching times as a result of increasing friction, fatty deposits or other influences. The "System Forecast" determines whether the probe movement is continuous or jerky, which, for example, would indicate resinified fat. These changes can be recorded in a probe travel profile.



By comparing with reference times, an expert can draw conclusions on the status of the separate components, and the system itself can generate appropriate messages, see example (menu "Diagnostics / Message list").

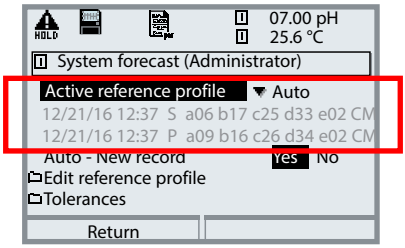
System Forecast: Probe Travel Profiles

Reference / Probe Travel Profiles

Following installation of a system or after a repair, several cycles are run by calling the "System forecast / Edit reference profile" function. The travel behavior (probe travel profile) detected is saved as a "reference profile" with time and date. A distinction is made here between retraction behavior S (service) and insertion behavior P (process).

Creation of a Probe Travel Profile and Presentation in Protos

Menu: Parameter setting / Probe control / Installation / System forecast



The active reference profile contains the following parameters:

12/21/16 12:37 S a06 b17 c25 d33 e02 CM

CM/SG probe type
CM: Ceramat, SG: SensoGate

aXX … eXX Records of separate travel times

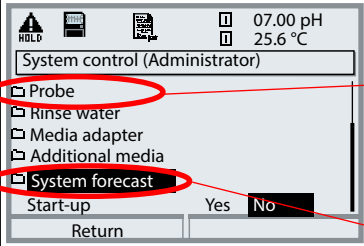
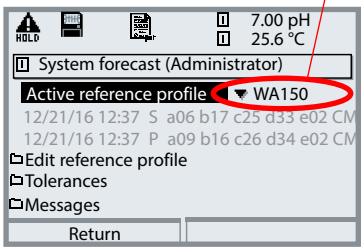
aXX: Time [1/10 s] from run command to response of air sensor.
bXX: Time [1/10 s] from run command until drop-out of the exit limit position.
cXX: Time [1/10 s] from run command to response of desired limit position.
dXX: Time [1/10 s] from run command to drop-out of air sensor.
eXX: Counter: number of air current interruptions during a travel cycle.

S/P: Direction of travel
S: Service position
P: Process position

Date and time of profile creation

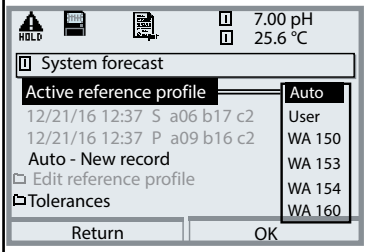
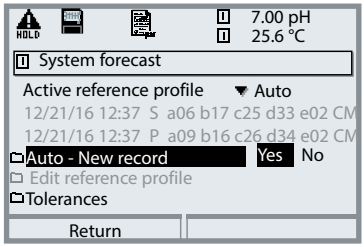
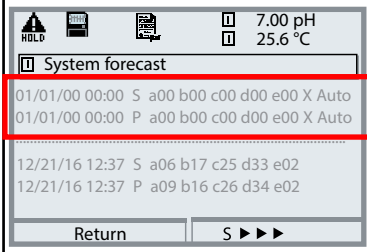
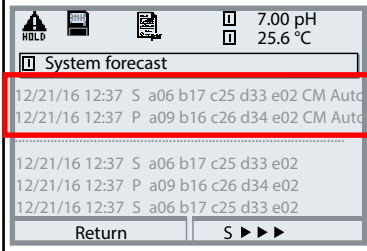
Setting the System Forecast Parameters

Menu: Parameter setting / Probe control / Installation / System forecast

Menu	Display	System forecast
		**Setting the system forecast parameters** (only Ceramat and SensoGate types) Select a Ceramat or SensoGate retractable fitting from within the "Probe" menu item. Further parameters can then be set under "System forecast".
	Note: Clicking on "System forecast" brings up the following message: "Please wait! Function is executed". Protos initially reads the data for the reference profile saved in the Unical. This can take some time.	**Active reference profile** Reference profiles are preinstalled by default for the following probes: Ceramat WA150 Ceramat WA160 SensoGate WA130S (short) SensoGate WA130L (long) These profiles can be selected under "Active reference profile". They are based on the following process conditions: Process pressure: 3 bar Compressed air: 5 bar Unical hose length: 5 m Temperature: 20 °C In the event of greater deviations in the process conditions, you should create an individual "User" reference profile.
		

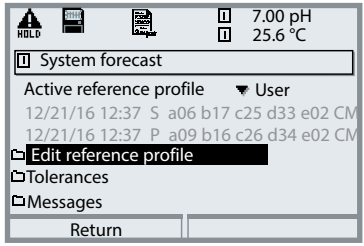
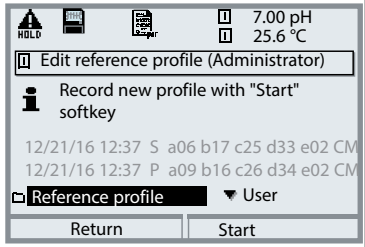
System Forecast: Reference Profile

Menu: Parameter setting / Probe control / Installation / System forecast

Menu	Display	System forecast: Active reference profile
par		**Active reference profile "Auto"** A reference profile is recorded in the background during the first probe movements (at least 20 probe movements).
		**Auto - New record** The old reference profile is deleted and and a new one is recorded.
		While recording is in progress, all values are set to "0" and the "Auto" remark is active.
		**"Auto" reference profile created** After 20 probe movements the reference values are created. They are followed by the probe identifier (CM=Ceramat, SG=SensoGate) and "Auto" for the reference profile.

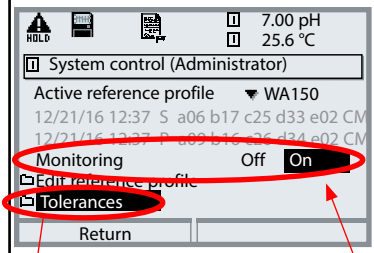
System Forecast: Creating a Reference Profile

Menu: Parameter setting / Probe control / Installation / System forecast

Menu	Display	System forecast: Active reference profile: "User"
par	 	**Creating a "User" reference profile** By selecting "Edit reference profile", you can create an individual "User" reference profile. Use the **Start** softkey to record a reference profile. For this purpose, six probe movements are executed. The reference profile is the average of the recorded values. **Auto, User reference profiles: Setting tolerances** For monitoring during operation, permissible deviations in the separate travel times can be set in the "Tolerances" menu. The tolerances a ... e are permissible deviations from the active reference profile. – See next page The name "User" cannot be modified by the user. The new profile is identifiable by the date and time of its recording.

System Forecast: Tolerance Specifications

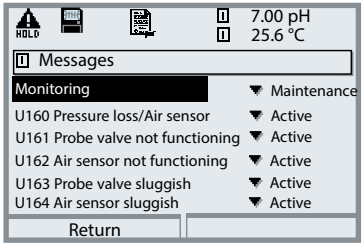
Menu: Parameter setting / Probe control / Installation / System forecast

Menu	Display	System forecast: Tolerances
par		**Tolerance specifications** For monitoring during operation, permissible deviations in the separate travel times can be set in the "Tolerances" menu. The tolerances "a ... e" are permissible deviations from the active reference profile. If monitoring is set to "on", the icon is displayed in measuring mode if a tolerance limit is exceeded – the corresponding message text can be viewed under "Diagnostics / Messages".

Tolerances (tol.)		Input range
a	Probe valve switching time (tol.+)	00 ... 99 [1/10 s]
b	Exit of limit position (tol.+)	00 ... 99 [1/10 s]
c	Achievement of limit position (tol.+)	00 ... 99 [1/10 s]
d	Air sensor deactivated (tol.+)	00 ... 99 [1/10 s]
	Air sensor deactivated (tol.–)	00 ... 99 [1/10 s]
e	Air current interruptions (tol.+)	01 ... 09 [number]
Reference profile tolerance		00 ... 99 %

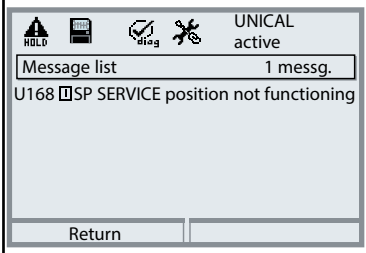
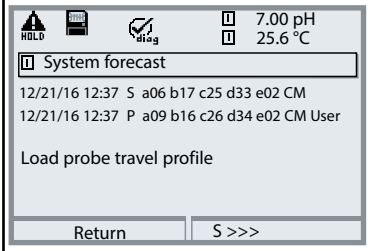
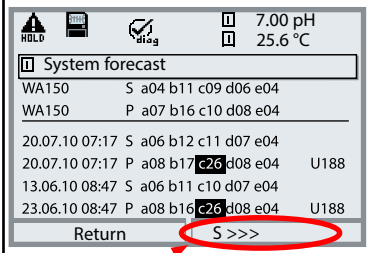
System Forecast: Reference Profiles, Messages

Menu: Parameter setting / Probe control / Installation / System forecast

Menu	Display	System forecast
		**Reference profiles, messages** Monitoring allows forecast messages to be switched off (“Off”) or to be output as maintenance message (“Maintenance”) or as failure message (“Failure”). The corresponding message text can be viewed under "Diagnostics / Messages". The individual messages can be set to “active” or “inactive” (switched off). With “Maintenance” selected, the icon is shown in measuring mode when a tolerance is exceeded. With “Failure” selected, the icon is shown in measuring mode when a tolerance is exceeded.

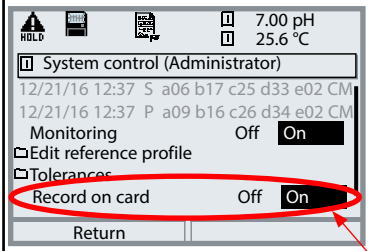
System Forecast: Diagnostic Messages

Menu: Diagnostics / System forecast

Menu	Display	System forecast: Diagnostics
par	   For better comparability, the travel cycles can be displayed using the right softkey: - in Service “S“ and Process “P“ directions - in Service "S" direction only - in Process "P" direction only	**Message list** When you have activated "Monitoring On" in the System forecast menu, a violation of a preset tolerance will generate a message text. These texts can be viewed in the message list. **System forecast** In operation, travel times are saved for every cycle (max. 200) and are compared with the active reference profile. If "System forecast" is selected in the diagnostics menu, the active reference profile and probe profiles already recorded are displayed (this may take some time). If tolerance limits are exceeded in the probe travel profile, the error number is displayed after the probe profile. **NOTICE** In the Protos/Unical system, the last 200 travel cycles are recorded in volatile memory, i.e. the data is lost when the supply voltage is switched off. Recording on a SmartMedia card is therefore recommended – see following page.

System Forecast:
Recording on SmartMedia Card

Menu: Parameter setting / Probe control / Installation / System forecast

Menu	Display	System forecast: SmartMedia card
		**Record on SmartMedia card** If a SmartMedia card is installed, probe travel times can be saved on it (ASCII). The recording capacity is limited only by the amount of memory on the card. For this function, use the final menu item in the system forecast – "Record on card".

System Forecast: Messages

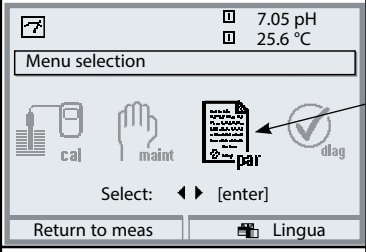
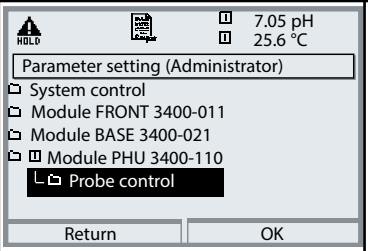
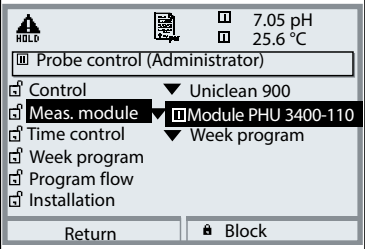
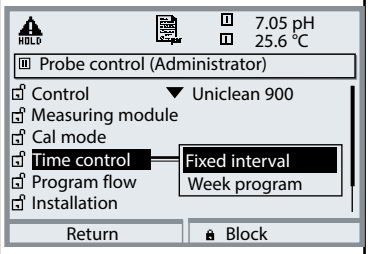
No.	"System forecast" message	Cause
U160	SP Pressure loss/Air sensor	Air leaking uncontrolled – air sensor defective
U161	SP Probe valve not functioning	Pilot valve does not switch; probe valve possibly does not switch
U162	SP Air sensor not functioning	Air sensor does not switch
U163	SP Probe valve sluggish	Pilot valve switches late; probe valve possibly switches late
U164	SP Air sensor sluggish	Air sensor switches late
U165	SP Limit positions interrupted	Both limit positions do not switch (e.g. GND missing)
U166	SP Limit positions short-circuited	Both limit switches are actuated (short-circuited)
U170	SP Probe stopped between end positions	Probe is stuck between the limit positions
U171	SP PROCESS position sluggish	Limit switch (PROCESS) reacts too late after start of probe travel
U172	SP Probe sluggish	Probe sluggish (limit position is reached)
U173	SP Probe is stuck during probe travel	Probe is stuck during probe travel (limit position is not reached)
U174	SP SERVICE position not functioning	Limit switch (SERVICE) does not react after end of probe travel
U175	SP PROCESS position not functioning	Limit switch (PROCESS) does not react after end of probe travel
U176	SP SERVICE position sluggish	Limit switch (SERVICE) reacts too late after end of probe travel
U177	SP SERVICE position not functioning	Limit switch (SERVICE) not functioning
U178	SP PROCESS position not functioning	Limit switch (PROCESS) not functioning
U179	SP Probe instantly got stuck	Probe is stuck in limit position
U188	SP General error	Error not clearly assignable

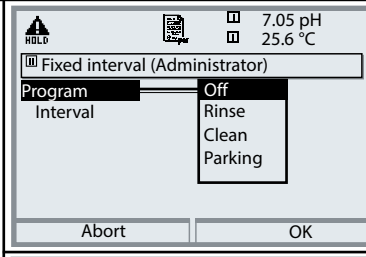
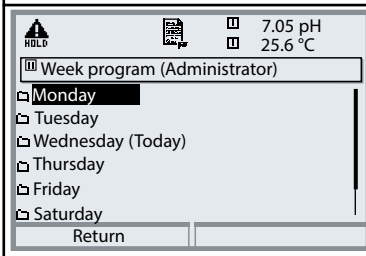
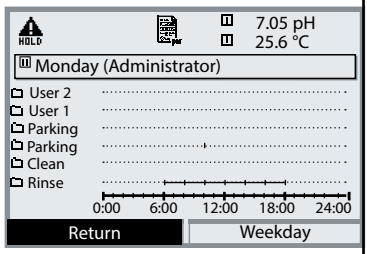
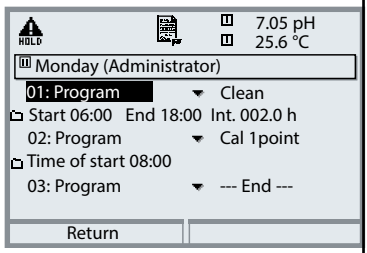
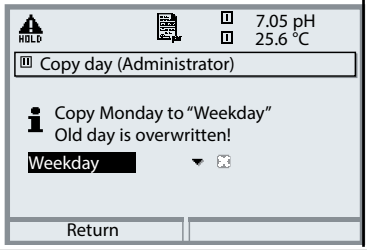
Messages are automatically reset after two correct probe movements.

Uniclean 900(X) Parameter Setting

Functional Capabilities

Setting	Adjustable parameters	Page
• Control	**Off**, Unical 9000, Uniclean 900	**Pg 99**
• Time control	**Fixed interval**, Week program: Fixed interval: Select program, interval Week program: Configuration of program flows	
• Program flow	Individual adaptation of program steps for: Rinsing, Cleaning, Parking, Service	**Pg 100**
• Installation		**Pg 108**
Meas. procedures	Continuous / Short-time	
External control (DCS)	**Off**, On	
	DCS inputs (36...39) **active 10...30 V** or active < 2 V	
	M/S input (42/43) **active 10...30 V** or active < 2 V	
	A/M input (40/41) **active 10...30 V** or active < 2 V	
	Output DCS 34 **Measuring**, Alarm	
	DCS outputs (31…34) **N/O**, N/C	
• Sensor detection	On, **Off**	
• Immersion lock	**Off**, Sensocheck Glass el	
• Access manual control	Access code required. All valves can be actuated separately.	
• Probe	Probe type (SensoGate, Ceramat, others)	
Move time max.	Adjustable; default setting 0015 s	
Sealing water	On, **Off**	
Cavity rinsing	**Off**, Interval, Continuous	
Check interval	On, **Off** (On: Entry: Check after x travels)	
Maintenance interval	On, **Off** (On: Entry: Maintenance after x travels)	
• Media adapter (I ... III) (up to 3 metering pumps)	Each: Pump (On, Off), Medium, Displaced volume, Residual volume	
• Add. media (1 ... 2)	Monitoring of medium (On, Off, Medium)	
• Start-up	Yes, **No**	**Pg 113**
• System forecast	On, **Off**	**Pg 88**

Menu	Display	Uniclean 900 parameter setting
		**Open parameter setting** From the measuring mode: Press **menu** key to select menu. Select parameter setting using arrow keys, press **enter** to confirm.
par		Select "Probe control / Uniclean 900". Icons to assign the measured values displayed: I specifies module slot I II specifies module slot II
		**Measuring Module** Select measuring module: Select the pH module for evaluation with the Uniclean 900 controller (only if equipped with more than 1 pH module).
		**Time Control** • Fixed interval: Specify times (000.0 h ... xxx.x h) (Please note: 000.1 h = 6 min) • Week program: Specify weekday

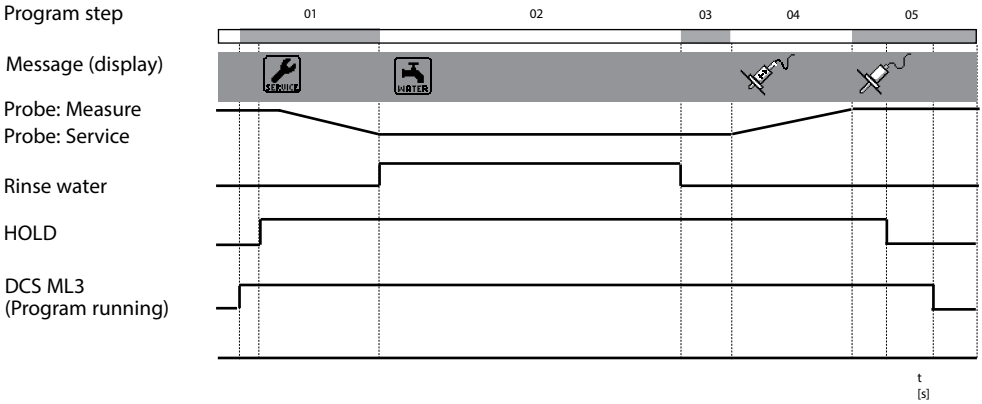
Menu	Display	Time control configuration
par		**Time control: Fixed interval** The “Fixed interval” menu allows selection of up to three programs. An individual time interval an be assigned to each program.
		**Time control: Week program** In this menu you can View, Edit, and Copy.
		View shows the configured program sequences over the day.
		Edit allows selection of up to 10 programs per day and you can choose between “Individual start” or “Interval” (the program is executed within a start and an end time at a specified interval).
		Copy allows taking over a configured program for another weekday. (Further editing is possible.)

Parameter Setting: Program Flows

Rinsing (Continuous)

Display text	Time [s]
01: Probe in SERVICE	
02: Rinse water ON	0060 sec
03: Rinse water OFF	0002 sec
04: Probe in MEASURE	0005 sec
05: Program end	

Cleaning (continuous) can also be started via a DCS input signal at input BIN1 of the Uniclean 900 probe controller.

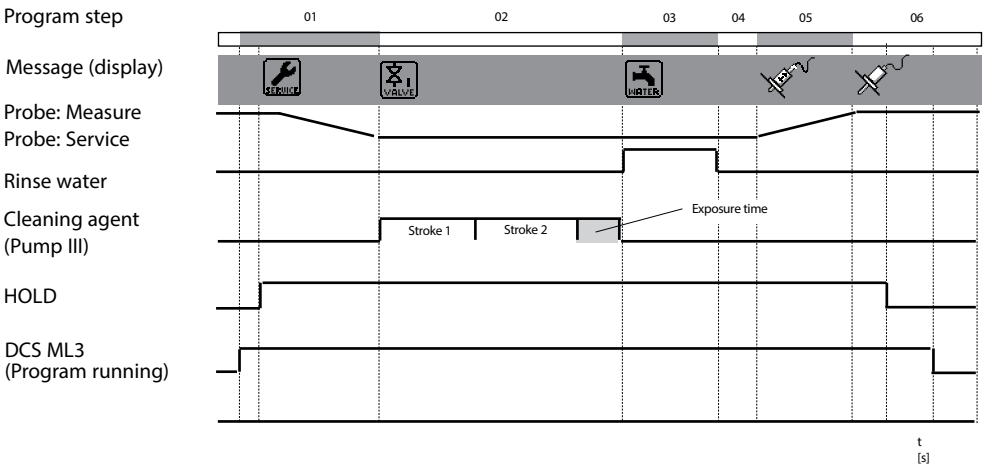


Parameter Setting: Program Flows

Cleaning (Continuous)

Display text	Time [s]
01: Probe in SERVICE	
02: Cleaning agent	0020 sec
03: Rinse water ON	0060 sec
04: Rinse water OFF	0002 sec
05: Probe in MEASURE	0005 sec
06: Program end	

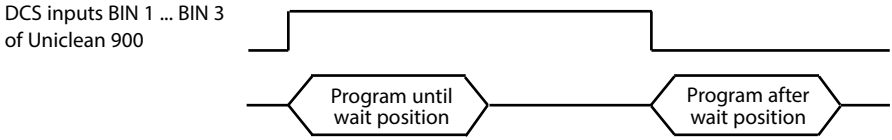
Cleaning (continuous) can also be started via a DCS input signal at input BIN1 of the Uniclean 900 probe controller.



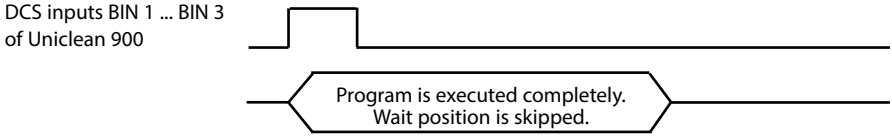
Park Program: Wait Position

The park program includes the programming step "Wait position".
When the program is started via the DCS inputs BIN 1 ... BIN 3 on the Uniclean 900, the program will be executed until the "Wait position" is reached. There it remains until the signal status at the DCS inputs changes.

- The program is started via the DCS inputs and remains in "Wait position" until the assignment of the DCS inputs changes:



- The program is started by a short signal at the DCS inputs: Wait position is skipped.



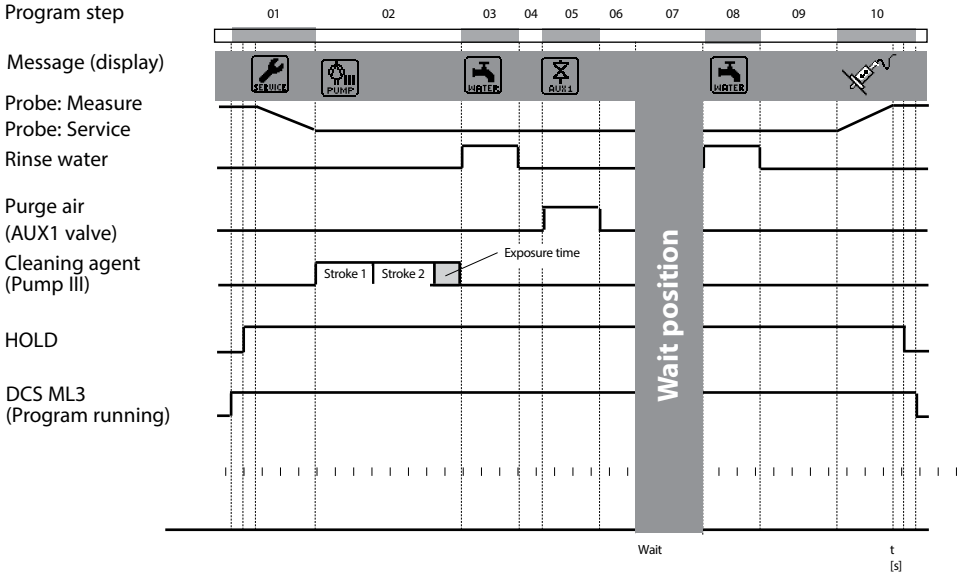
Note:
If the programs are started by the Protos 3400(X) from the Calibration or Maintenance menu, the wait position will be skipped.

Parameter Setting: Program Flows

Parking

Display text	Time [s]
01: Probe in SERVICE	
02: Cleaning agent	0020 sec
03: Rinse water ON	0060 sec
04: Rinse water OFF	0002 sec
05: Purge air ON	0010 sec
06: Purge air OFF	0002 sec
07: Wait position	> position will be held until next command (e.g., DCS)
08: Rinse water ON	0010 sec
09: Rinse water OFF	0002 sec
10: Probe in MEASURE	0005 sec
11: Program end	

Parking is started via a DCS input signal at input BIN3
of the Uniclean 900 probe controller.

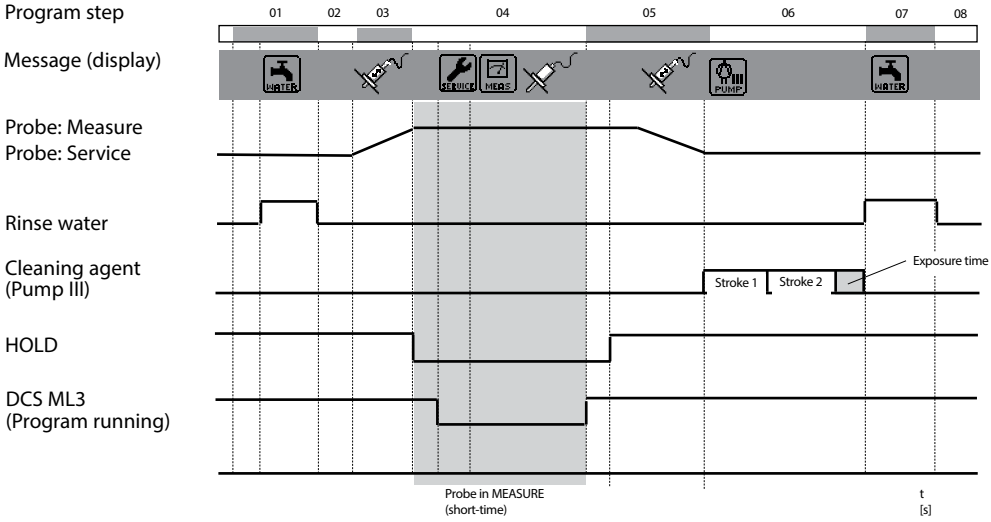


Parameter Setting: Program Flows

Measuring (Short-Time)

Display text	Time [s]
01: Rinse water ON	0010 sec
02: Rinse water OFF	0002 sec
03: Probe in MEASURE	0005 sec
04: Meas duration	0030 sec
05: Probe in SERVICE	
06: Cleaning agent	0020 sec
07: Rinse water ON	0060 sec
08: Rinse water OFF	0002 sec
09: Program end	

Measurement (short-time) can also be started via a DCS input signal at input BIN1 of the Uniclean 900 probe controller.

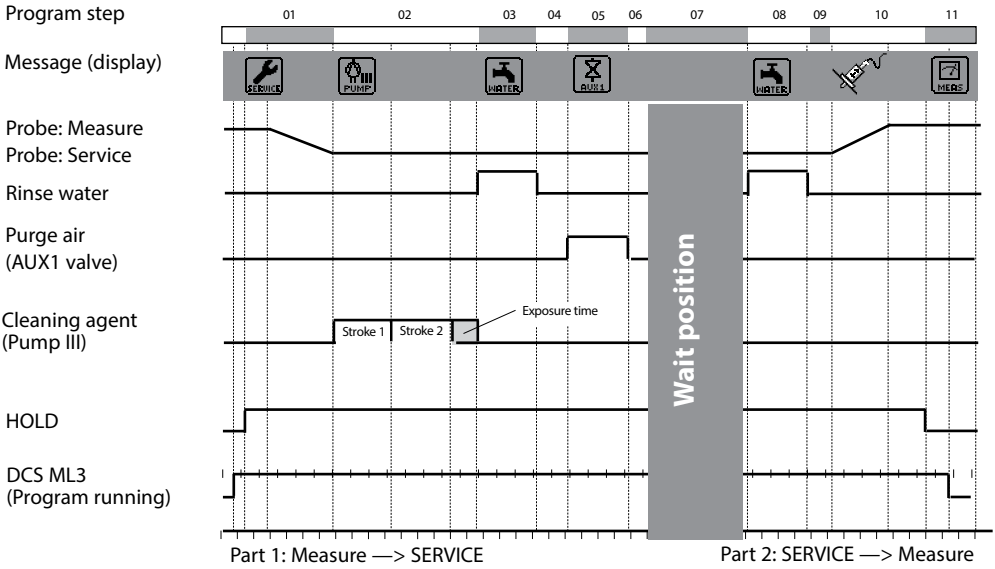


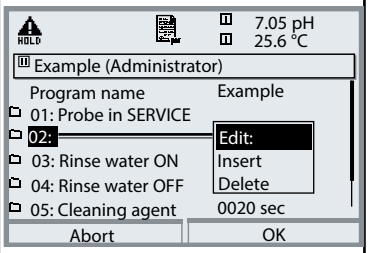
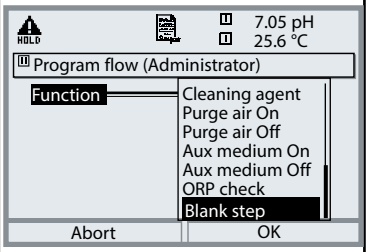
Parameter Setting: Program Flows

Service

Display text	Time [s]	
01: Probe in SERVICE		
02: Cleaning agent	0020 sec	Measure -> Service
03: Rinse water ON	0060 sec	
04: Rinse water OFF	0002 sec	
05: Purge air ON	0005 sec	
06: Purge air OFF	0002 sec	
07: Wait position		Service position:
08: Rinse water ON	0010 sec	
09: Rinse water OFF	0002 sec	
10: Probe in MEASURE	0005 sec	Service -> Measuring
11: Program end		

Service can also be started via a DCS input signal at input M/S of the Uniclean 900 probe controller.



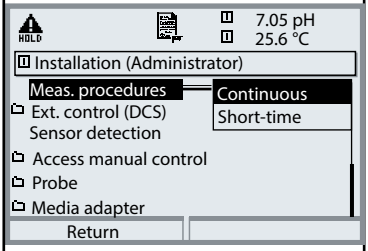
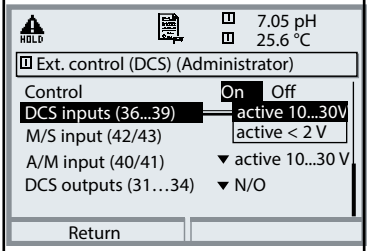
Menu	Display	Program flow Function
par		**Editing a Program Step** Select the program step you want to edit using the arrow keys. Press **enter**: Now you can choose between "Edit, Insert, Delete". • **Edit:** Allows selecting a function (see below) • **Insert:** Inserts an empty step above the selected program step and then allows selecting a function by "editing" the empty step. • **Delete:** The program step is deleted.
par		**Configuring a Function** Select a function using arrow keys, confirm with **enter** Program end Probe in SERVICE Probe in MEASURE Rinse water On Rinse water Off Wait time Buffer I - - - Text can be edited during installation Buffer II - - Text can be edited during installation Cleaning agent - Text can be edited Cal Buffer 1 Cal Buffer 2 Purge air On - Text can be edited Purge air Off - Text can be edited Aux medium On - Text can be edited Aux medium Off - Text can be edited ORP check Blank step

Parameter Setting: Installation

Configuration of Uniclean 900 Functions

Installation	Default setting	Adjustable parameters
• Measurement procedures	Continuous	(Continuous / Short-time)
• Ext. control (DCS)		(Polarity / Output settings)
- Signal level of inputs DCS (36 ... 39) M/S (42, 43) A/M (40, 41)	Active: 10 ... 30 V	(Active: 10 ... 30 V / active < 2V)
- Signal level of outputs DCS (31 ... 34)	N/O	(N/O / N/C)
• Sensor detection	Off	On
• Immersion lock	Off	Sensocheck Glass el
• Access manual control	Access code for manual control (Maintenance menu) Default: 2958	
• Probe		
- Probe type	Ceramat	(SensoGate, Other)
- Max. move time	0015 sec	
- Sealing water	Off	(On)
- Cavity rinsing	Off	(Off, Interval, Continuous)
- Check interval	Off	On (Check after travels)
- Maintenance interval	Off	On (Maintenance after travels)
• Media adapter		
- Metering pump	Off*	"On" or "Off"
- Medium:	---	(e.g. "Cleaning agent A")
- Displaced volume	50 ml	(25 / 50 / 75 / 100 ml)
- Residual volume	250 ml	(0 / 250 / 500 ml)
• Additional media		
- Additional medium 1	Off	(On - then enter designation)
- Additional medium 2	Off	(On - then enter designation)
• Start-up	No	Yes/No
• System forecast	Off	Off / On: Monitors the probe travels for predictive maintenance of Ceramat und SensoGate See "System Forecast (Ceramat, SensoGate)" on page 88 for description.

*Automatic adjustment by "Plug & Play" in: System control / Factory setting Uniclean

Menu	Display	• Meas. procedure • External control via DCS
par		**Selecting a Measurement Procedure** • Continuous measurement: With continuous measurement the pH electrode is located in the process medium and is retracted for calibration or cleaning. • Short-time measurement: (interval measurement, sampling, sample mode ...) The pH electrode is only momentarily moved into the process medium. This method is applied when measuring aggressive or thermally demanding process media which require short measurement times with long rest periods.
		**External Control via DCS** • DCS inputs: Inputs for selecting the control programs. Here, the active signal level is specified. (< 2 V or 10 ... 30 V). • M/S input: Control of probe movement • A/M input: Intervals automatic / blocked • DCS outputs (31 … 34): Specifying the contact type (N/O, N/C)

Control via Process Control System (DCS)

Inputs/Outputs of Uniclean 900(X)

No.	Designation	I / O	Level	Function
42	Measuring/ Service	I	0	Probe moves to measure position *
43			1	Probe moves to service position
40	Auto / Manual	I	0	Automatic interval control from Uniclean *
41			1	Automatic intervals locked
37	Bin 3	I		Program selection and start, manual / DCS * **
38	Bin 2			(Program 1 ... 3 - see next page)
39	Bin 1			
34	Measuring*** (user-defined: "Alarm")	O	0	
			1	Probe in "MEASURE" position *
33	Service	O	0	
			1	Probe in "SERVICE" position *
32	Program runs	O	0	
			1	Program running *

* Passive contacts,
24 V must be supplied externally or via DCS

** Signal duration at least 2 sec (passing contacts)

*** As delivered, the signal output DCS 34 serves for probe position feedback – as shown. However, you can also program this output as "Alarm". Then it sends a signal to the DCS in the event of calibration errors or faulty probe movement.

Control Programs and Meas. Procedures

Factory Settings

Control Programs of Uniclean 900(X)

3 programs and one service program can be started.
3 program flows are preset.

The programs are started ...

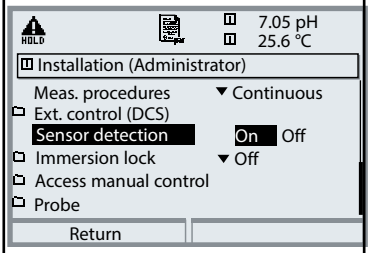
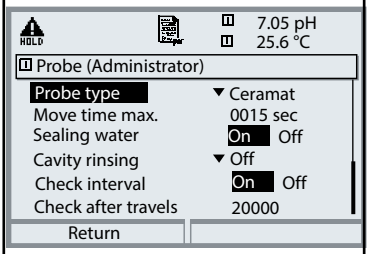
- for manual operation via Protos 3400(X)
- remotely via DCS or switch with passive inputs Bin 1 ... 3
  (24 V must be externally supplied, see Specifications)

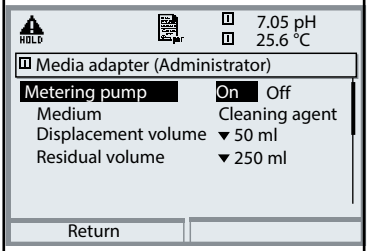
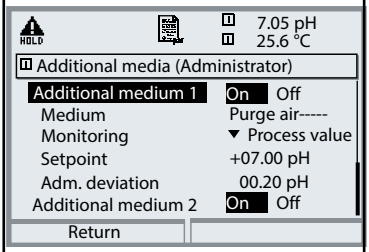
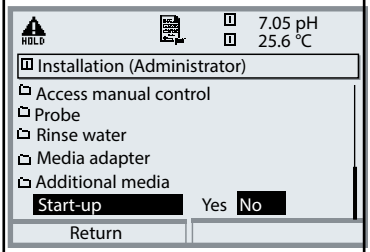
Program	Description	Bin 3	Bin 2	Bin 1
1	Rinse	0	0	1
2	Clean	0	1	0
3	Parking	1	0	0
4	Service program	Request via M/S		

The service program (4) stops all other running programs (1 - 3) immediately and erases stored requests. For programs 1-3 the following applies:
When you start a new program, the remaining steps of a currently running program are executed first. Further requests are stored and executed subsequently.
When you control the Uniclean 900(X) via Protos 3400(X), you can block the Bin 1, Bin 2, Bin 3 signal lines as well as M/S and A/M to prevent conflicts (Parameter setting / Uniclean 900 / Installation / Ext. control (DCS): Off)

Measurement Procedures

- Continuous measurement:
  After cleaning / calibration the probe moves into the process for measurement
- Short-time measurement (interval measurement, sampling, sample mode ...)
- After cleaning / calibration the probe remains in the calibration chamber and only moves into the process for measurement upon request.

Menu	Display	• Sensor detection • Probe
par		**Sensor Detection** Sensor detection "On" prevents accidental probe movement when the electrode has been removed. This is done by checking whether the temperature detector integrated in the sensor is connected.
		**Probe** Selecting the retractable fitting. Here, the max. move time is automatically adjusted (depending on model). **Sealing Water** Sealing water is switched on shortly before the probe movement is started to keep the rinsing chamber free from medium. This is important for processes containing fibrous or adhering media. The sealing water pressure must be higher than the medium pressure. Intrusion of medium is prevented by the counter-pressure in the rinsing chamber which is caused by the sealing water. **Check Interval, Maintenance Interval** Permits specifying the max. admissible number of move cycles until a message is generated, factory setting: Check after travels: 20000 Maintenance after travels: 100000

Menu	Display	• Media adapter, Additional media • Start-up
par		**Media Adapter** • Metering Pump (On, Off) • Designation of medium, • Specifying the displaced volume depending on model, e.g.: Ceramat 25 ml) • Residual volume
		**Additional Media (2)** • Specifying the equipment (On, Off) • Designation of medium, • Monitoring (Process value/Temp) • Setpoint
		**Start-Up** At the end of the parameter-setting procedure, a "Start-up" line appears in the "Installation" menu. When you are sure to have set all parameters, select "Yes" to confirm. Now the pumps perform the number of stroke movements required for filling the media tubes completely. The necessary rinsing cycles are automatically started.

Calibration / Adjustment

Note: HOLD mode active
Current outputs and relay contacts behave as configured

- **Calibration:** Detecting deviations without readjustment
- **Adjustment:** Detecting deviations with readjustment

Caution:
Without adjustment every pH meter delivers an imprecise or wrong output value! Every pH electrode has its individual zero point and its individual slope. Both values are altered by aging and wear.
To determine the correct pH value, the pH meter must be adjusted to the electrode. The analyzer corrects the voltage delivered by the electrode with regard to electrode zero and slope and displays it as the pH value.

Be sure to perform an adjustment after having replaced the electrode!

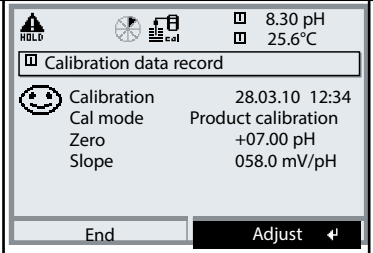
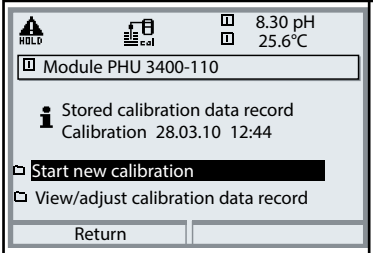
Procedure
First, a calibration is performed to detect the deviations of the electrode (zero, slope). To do so, the electrode is immersed in buffer solutions whose pH value is exactly known. The measuring module measures the electrode voltages and the buffer solution temperature and automatically calculates the electrode zero and slope. These data are stored in a calibration record. By "Adjustment" the determined calibration data can be used for correction (see following page).

Parameters Determined by Calibration

Zero	is the pH value at which the pH electrode outputs the voltage 0 mV. It is different for each electrode and changes with age and wear.
Temperature	of the process solution must be detected since pH measurement is temperature-dependent. Many electrodes have an integrated temperature probe.
Slope	of an electrode is the voltage change per pH unit. For an ideal pH electrode, it lies at -59.2 mV/pH.

Adjustment

Adjustment means that the values determined by a calibration are taken over. The values determined for zero and slope are entered in the calibration record. (Cal record can be called up in the Diagnostics menu for the PHU 3400(X)-110 module). These values are only effective for calculating the measured variables when the calibration has been terminated with an adjustment. A passcode ensures that an adjustment can only be performed by an authorized person (Administrator). The Operator can check the current sensor data by a calibration and inform the Administrator when there are deviations. You can use the additional function SW 3400-107 for granting access rights (passcodes) and for AuditTrail (continuous data recording and backup according to FDA 21 CFR Part 11).

Menu	Display	Adjustment after calibration
cal		**Administrator** With the corresponding access rights, the device can immediately be adjusted after calibration. The calibration values are taken over for calculating the measured variables.
		**Operator (without administrator rights)** After calibration, change to measuring mode. Inform Administrator. When opening the menu (Calibration, respective module), the Administrator sees all data of the last calibration and can take over the values or perform a new calibration.

Calibration / Adjustment

Calibration Methods

One-Point Calibration
The electrode is calibrated with one buffer solution only.
Here, only the electrode zero point is detected and taken into account by the Protos. One-point calibration is appropriate and permissible whenever the measured values lie near the electrode zero point so that slope changes do not have much of an impact.

Two-Point Calibration
The electrode is calibrated with two buffer solutions.
In that case, zero point and slope of the electrode can be detected and taken into account by the Protos. Two-point calibration is required if

- the electrode has been replaced
- the measured pH values cover a wide range
- there is great difference between the measured pH value and the electrode zero
- the pH measurement must be very accurate,
- the electrode is exposed to extreme wear.

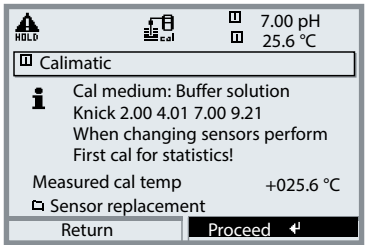
Three-Point Calibration
The electrode is calibrated with three buffer solutions.
Zero and slope are calculated using a line of best fit according to DIN 19268.

Sensor Replacement (First Calibration)
A First Calibration must be performed each time the electrode is replaced.
During First Calibration, the electrode data together with the electrode type and serial number are stored as reference values for electrode statistics.
The "Statistics" menu of Diagnostics shows the deviations of zero, slope, glass and reference electrode impedance, and response time of the last three calibrations with respect to the reference values of the First Calibration.
This allows evaluation of the drift behavior and aging of the electrode.

Temperature Compensation During Calibration

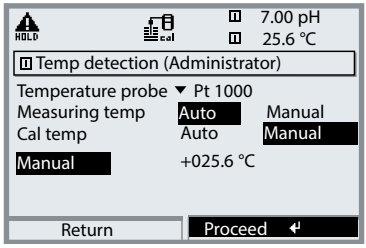
There are two important reasons for determining the temperature of the buffer solution:
The slope of the pH electrode is temperature-dependent. Therefore the measured voltage must be corrected by the temperature influence.
The pH value of the buffer solution is temperature-dependent. For calibration, the buffer solution temperature must therefore be known in order to choose the actual pH value from the buffer table.
During parameter setting you define whether cal temperature is measured automatically or must be entered manually:

Automatic Temperature Compensation



For automatic cal temp detection, the Protos measures the temperature of the buffer solution with a temperature probe (Pt 100/Pt 1000/ NTC 30 kΩ/NTC 8.55 kΩ). If you work with automatic temperature compensation during calibration, a temperature probe connected to the temperature input of the Protos must be in the buffer solution! Otherwise, you must select manual entry of calibration temperature.

Manual Temperature Compensation



The temperature of the buffer solution must be entered manually in the Parameter setting menu at "Parameter setting / <pH module> / Sensor data / Temp detection / Cal temp --> manual". Temperature measurement is performed using a glass thermometer, for example.

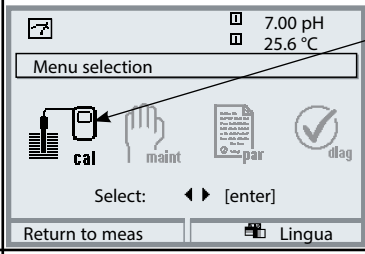
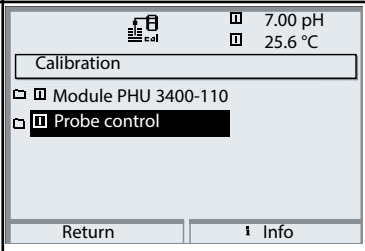
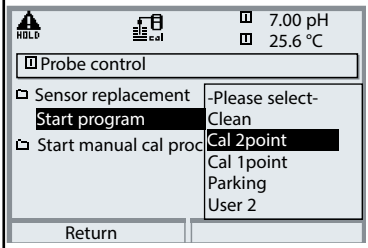
Automatic Calibration

Probe Control

Calibration Procedures
The probe controller (e.g. Unical 9000) allows automatic execution of calibrations either at fixed intervals or time-controlled according to a week program.
The week program is defined in the "Parameter setting" menu.
It can automatically start up to 10 programs flows for each weekday.

Program Flows for One- and Two-Point Calibration
The program flows for one- and two-point calibrations are preset but can be modified in the "Parameter setting" menu.

Probe Controller: Start Programs
The programs can be started directly from the "Calibration" menu.

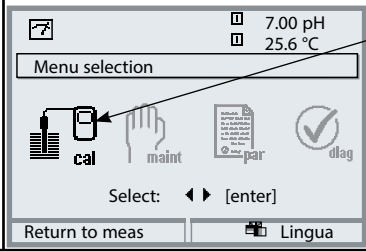
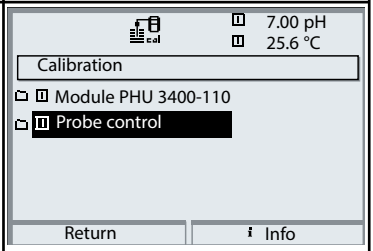
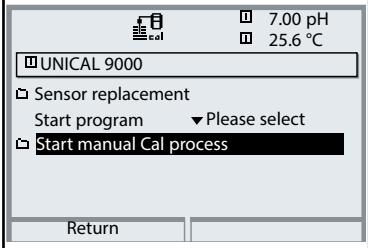
Menu	Display	Probe control - Start program
		**Open calibration** Press **menu** key to select menu. Select calibration using arrow keys, press **enter** to confirm, passcode 1147 (To change passcode, select: Parameter setting/System control/ Passcode entry). Select "Probe control".
		
		"Start program" opens a pull-down menu with different programs which have been defined in the "Parameter setting" menu. **During calibration the module is in HOLD mode**. Current outputs and relay contacts of the module behave as configured (BASE module).

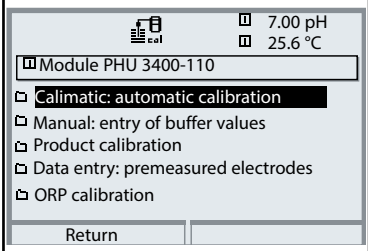
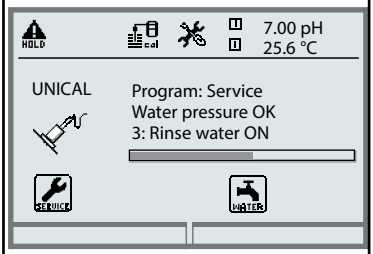
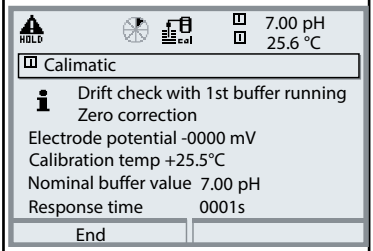
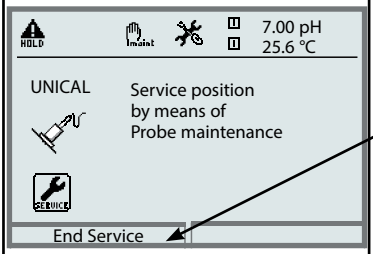
Manual Electrode Calibration

Probe Control

Manual electrode calibration (zero, slope) must be performed with the electrode removed. For that purpose, the sensor lock-gate automatically moves into SERVICE position when the calibration menu is opened.
Electrode located in the process medium.

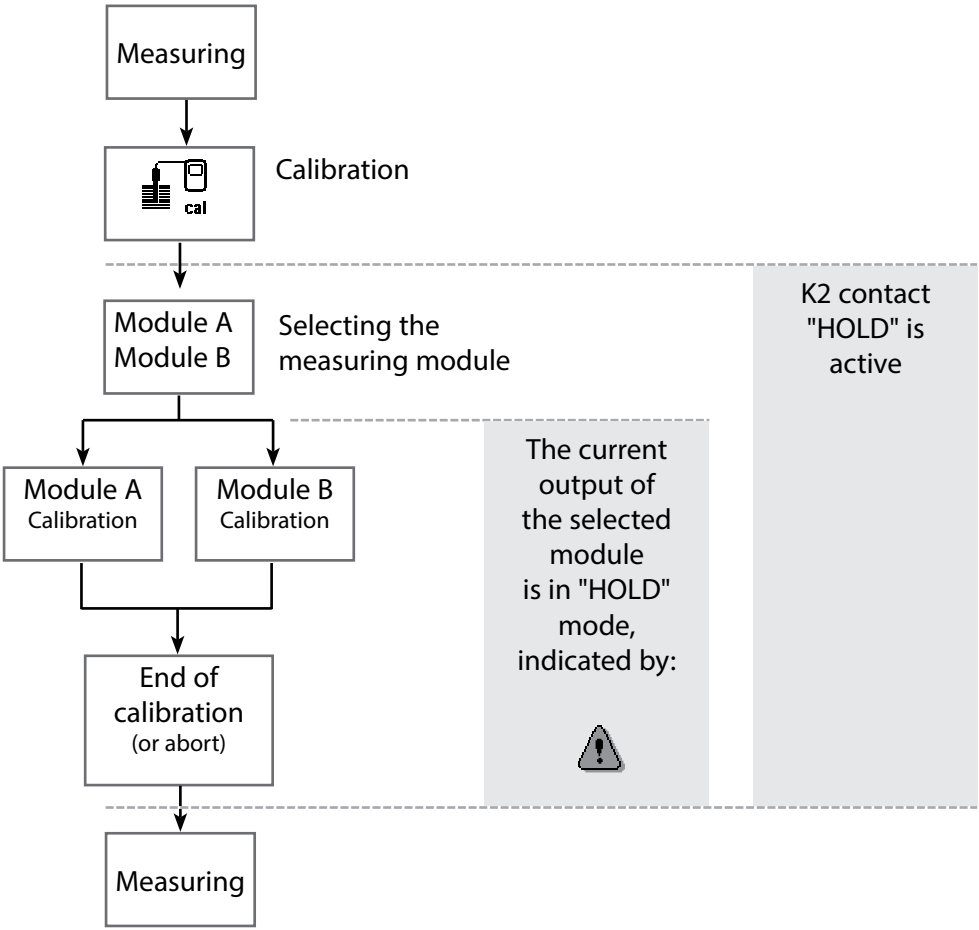
Warning!
Before working on the sensor lock-gate, it must be moved into SERVICE position. Be sure to read and observe the user manual of your sensor lock-gate (retractable probe)!

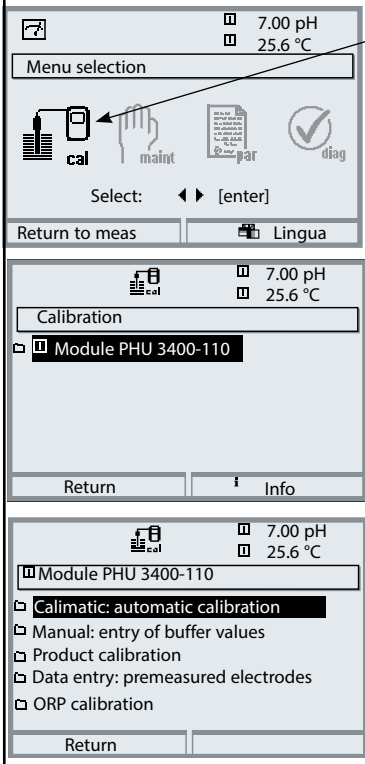
Menu	Display	Start manual Cal proc
		**Open calibration** Press **menu** key to select menu. Select calibration using arrow keys, confirm with **enter**, passcode 1147 (To change passcode, select: Parameter setting/System control/ Passcode entry).
cal		
		Pressing **enter** at "Start manual cal process" allows the selection of a calibration method. **During calibration the module is in HOLD mode**. Current outputs and relay contacts of the module behave as configured (BASE module).

Menu	Display	Probe in SERVICE position
cal		**Select calibration method:** (For descriptions see Pg 124 et seq.) When you open the Calibration menu, the Protos automatically proposes the previous calibration method. (If you do not want to calibrate, press the "Return" softkey or the **meas** key.)
		**Probe in SERVICE position** With the "SERVICE" program, the probe is moved into SERVICE position. The program steps are indicated in the display.
		**Remove electrode** Make sure that the probe is in SERVICE position. Then proceed as described in the user manual of the retractable probe. **Start calibration** Follow the instructions given in the display. After end of calibration reinstall the electrode.
maint		**End calibration** Open the Maintenance menu (Probe control / Probe maintenance). After having terminated the servicing work, press the "End Service" softkey to move the probe back to "MEASURE" position (PROCESS).

HOLD Function During Calibration

Behavior of the signal and relay outputs during calibration



Menu	Display	Select calibration method (pH)
cal		**Open calibration** Press **menu** key to select menu. Select calibration using arrow keys, confirm with **enter**, passcode 1147 (To change passcode, select: Parameter setting/System control/ Passcode entry). Calibration: Select "PHU" module. **Selecting a Calibration Method** • Automatic buffer recognition • Manual entry of buffer values • Product calibration (Calibration with sampling) • Entry of previously measured calibration data • ORP calbration/adjustment • ISFET zero adjustment When you open the Calibration menu, the analyzer automatically proposes the previous calibration method. If you do not want to calibrate, press the "Return" softkey or the **meas** key. **During calibration the module is in HOLD mode**. Current outputs and relay contacts of the module behave as configured (BASE module).

Calibration / Adjustment

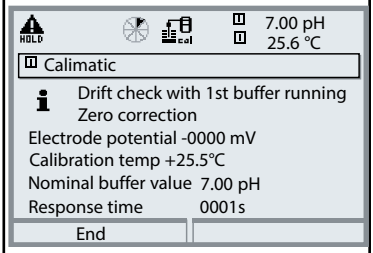
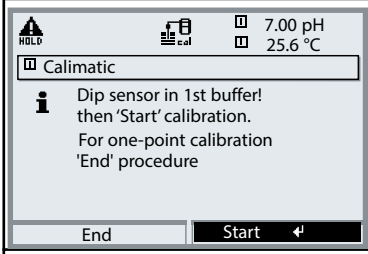
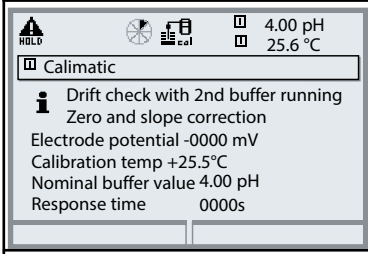
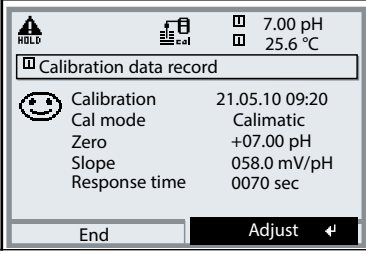
Calimatic Automatic Buffer Recognition

Automatic Buffer Recognition (Calimatic)
Automatic calibration using Knick Calimatic is performed with one, two, or three buffer solutions. Protos automatically detects the nominal buffer value on the basis of the electrode potential and the measured temperature.
Any sequence of buffer solutions is possible, but they must belong to the buffer set defined during parameter setting.
The Calimatic takes the temperature dependence of the buffer value into account. All calibration data is converted using a reference temperature of 25 °C.

During calibration the module is in HOLD mode. Current outputs and relay contacts of the module behave as configured (BASE module).

Caution!
Only ever use fresh, undiluted buffer solutions which belong to the selected buffer set!

Menu	Display	Automatic buffer recognition
cal	HOLD 7.00 pH 25.6 °C Calimatic Cal medium: Buffer solution Knick 2.00 4.01 7.00 9.21 When changing sensors perform First cal for statistics! Measured cal temp +025.6 °C Sensor replacement Return Proceed	**Select: Calimatic** • Display of selected buffer set • Display of measured cal temp. • Select sensor replacement Proceed with softkey or **enter**
	HOLD 7.00 pH 25.6 °C Calimatic Dip sensor in 1st buffer! then 'Start' calibration. Return Start	Remove and rinse the electrode (**Caution:** Do not rub! Electrostatic hazard!), then immerse it in the first buffer solution. Start with softkey or **enter**

Menu	Display	Automatic buffer recognition
cal		Display of nominal buffer value. You can press "End" to reduce the waiting time before stabilization of the electrode potential (reduced accuracy of calibration values). From the response time, you see how much time the electrode needs for the potential to stabilize. If the electrode potential or the measured temperature fluctuate greatly, the calibration procedure is aborted after 2 min.
		For a one-point calibration, press "End" softkey. For two-point calibration: Rinse electrode thoroughly! Immerse electrode in the second buffer solution. Start with softkey or **enter**
		Calibration is performed with the second buffer. Three-point calibration is performed correspondingly with the third buffer.
		**Adjustment** Press "Adjust" to take over the values determined during calibration for calculating the measured variables.

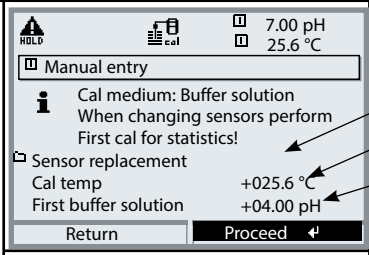
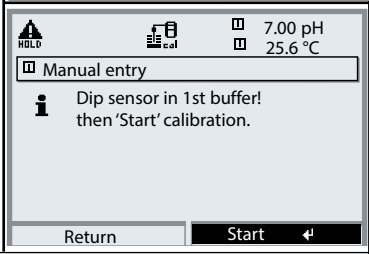
Calibration / Adjustment

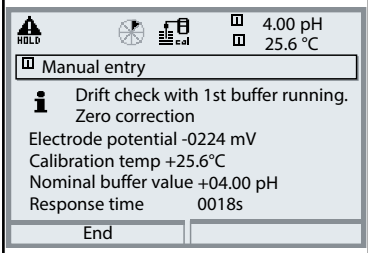
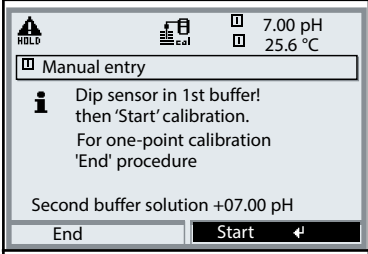
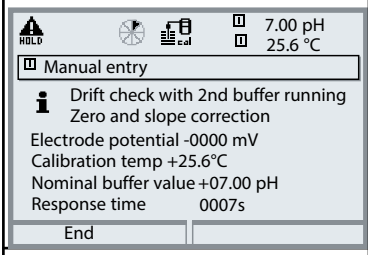
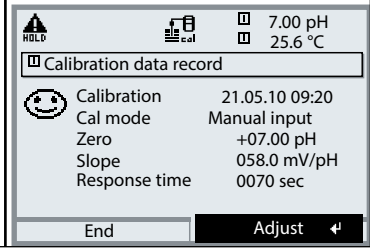
Calibration with Manual Entry of Buffer Values

Calibration with Manual Entry of Buffer Values
Calibration with manual entry of buffer values is performed with one, two, or three buffer solutions.
Protos displays the measured temperature.
You must then enter the temperature-corrected buffer values. To do so, refer to the buffer table (e.g. on the bottle) and enter the buffer value belonging to the displayed temperature.
Intermediate values must be interpolated.
All calibration data is converted using a reference temperature of 25 °C.

During calibration the module is in HOLD mode. Current outputs and relay contacts of the module behave as configured (BASE module).

Caution!
Only ever use fresh, undiluted buffer solutions!

Menu	Display	Manual entry
cal		**Select: Manual entry** Select: Sensor replacement Display: calibration temp Enter first buffer value Proceed with softkey or **enter**
		Remove and rinse the electrode (**Caution:** Do not rub! Electrostatic hazard!), then immerse it in the first buffer solution. Start with softkey or **enter**

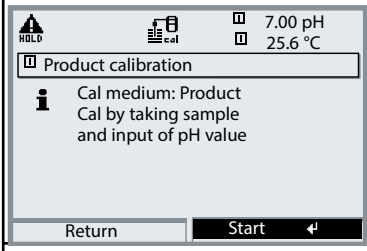
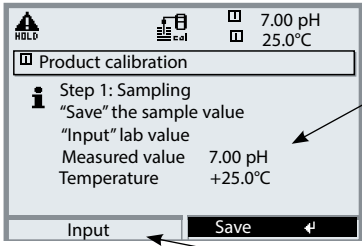
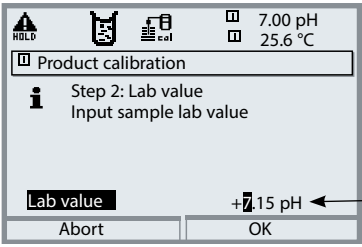
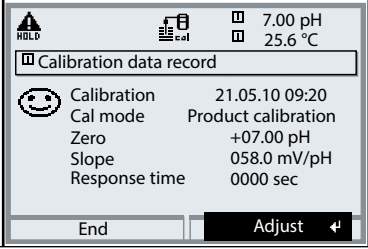
Menu	Display	Manual entry
cal		Calibration with first buffer solution. You can press "End" to reduce the waiting time before stabilization of the electrode potential (reduced accuracy of calibration values). From the response time, you see how much time the electrode needs for the potential to stabilize. If the electrode potential or the measured temperature fluctuate greatly, the calibration procedure is aborted after 2 min.
		One-point calibration: "End". Two-point calibration: Rinse electrode thoroughly! Enter 2nd buffer value for correct temperature. Immerse electrode in the second buffer solution. Start with softkey or **enter**
		Calibration is performed with the second buffer. Three-point calibration is performed correspondingly with the third buffer.
		**Adjustment** Press "Adjust" to take over the values determined during calibration for calculating the measured variables.

Product Calibration (Calibration with Sampling)
When the electrode cannot be removed – e.g. for sterility reasons – its zero point can be determined with "sampling". To do so, the currently measured process value is stored by the Protos. Immediately afterwards, you take a sample from the process. The pH value of the sample is measured in the lab or directly on the site using a portable pH meter. The reference value is entered into the measuring system. From the difference between measured value and reference value, the Protos calculates the electrode zero point (this method only allows one-point calibration).

During calibration the module is in HOLD mode. Current outputs and relay contacts of the module behave as configured (BASE module).

Caution! The pH value of the sample is temperature-dependent. Therefore, the reference measurement should be performed at the sample temperature shown in the display. Transport the sample in an insulated container. The pH value may also be altered due to escaping of volatile substances.

Menu	Display	Product calibration
cal	7.00 pH 25.6 °C Calibration Module PHU 3400-110 Return Info	**Select module: PHU 3400-110** The module is in HOLD mode. The assigned current outputs and relay contacts behave as configured (BASE). Confirm with **enter**.
	7.00 pH 25.6 °C Module PHU 3400-110 Calimatic: automatic calibration Manual: entry of buffer values Product calibration Data entry: premeasured electrodes ORP calibration Return	Select calibration mode "Product calibration" Confirm with **enter**.

Menu	Display	Product calibration
cal		**Product calibration** Product calibration is performed in 2 steps. Prepare sampling, Start with softkey or **enter**.
		**Step 1** Take sample. Save measured value and temperature at the moment of sampling ("Save" softkey or **enter**) Press **meas** to return to measurement. **Exception:** Sample value can be measured on the site and be entered immediately. To do so, press "Input" softkey.
		**Step 2** Lab value has been measured. When you open the Product calibration menu again, the display shown on the left appears: Enter reference value ("Lab value"). Confirm with OK or repeat calibration.
		**Adjustment** Press "Adjust" to take over the values determined during calibration for calculating the measured variables.

Calibration / Adjustment

Calibration by Entering Data from Premeasured Electrodes

Data Entry of Premeasured Electrodes
Entry of values for zero point, slope, and isothermal potential of a pH electrode. The values must be known, e.g. determined beforehand in the laboratory.

Caution! Input of an isothermal potential V_{iso} also applies to the calibration methods
- Calimatic
- Manual input and
- Product calibration.

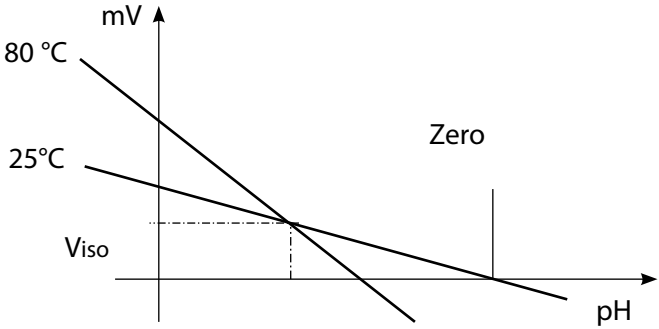
For an explanation of the isothermal potential, refer to Pg 131.

During calibration the module is in HOLD mode. Current outputs and relay contacts of the module behave as configured (BASE module).

Menu	Display	Data entry
cal	HOLD 7.00 pH 25.6°C Data entry When changing sensors perform First cal for statistics! Sensor replacement Zero +07.00pH Slope 058.0 mV/pH Isothermal potential +0000 mV Return	**Select: Data entry of premeasured electrodes** Remove electrode and connect premeasured electrode. Call up "Sensor replacement". Enter the values for • Zero • Slope • Isothermal potential Return with softkey. Return to measurement with **meas**

Isothermal Potential
The isothermal intersection point is the point of intersection between two calibration lines at two different temperatures. The potential difference between the electrode zero point and this intersection point is the isothermal potential "Viso".
It may cause measurement errors depending on the temperature.
These errors can be compensated for by defining the "Viso" value.

- Measurement errors are avoided by calibrating at measuring temperature or at a controlled and stable temperature.



Monitoring Functions for Calibration
Protos provides comprehensive functions for monitoring proper calibration performance and the electrode condition. This allows documentation for quality management to ISO 9000 and GLP/GMP.

- Sensocheck monitors the electrode condition by measuring the glass and reference electrode impedances.
- Regular calibration can be monitored by the cal timer.
- Adaptive cal timer - automatically reduces the calibration interval when the electrode is subjected to high stress
- The calibration record (GLP/GMP) provides all relevant data of the last calibration and adjustment.
- The statistics show the behavior of the electrode parameters during the last three calibrations compared to the First Calibration.
- The logbook shows the time and date of a performed calibration.

ORP calbration/adjustment

ORP Calbration/Adjustment
The potential of a redox electrode is calibrated using a redox (ORP) buffer solution. In the course of that, the difference between the measured potential and the potential of the calibration solution is determined. This potential difference is printed on the calibration solution bottle and is defined as the voltage across the redox electrode and a reference electrode.

Examples:	220 mV	Pt against Ag/AgCl, KCl 3 mol/l
	427 mV	Pt against SHE

During measurement this difference is added to the measured potential.

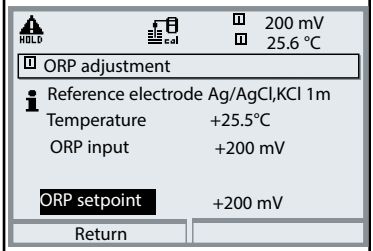
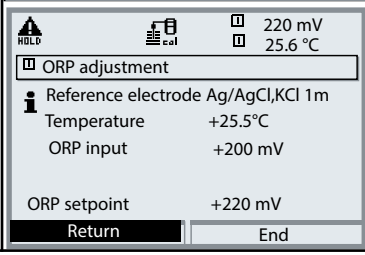
$mV_{ORP} = mV_{meas} + \Delta mV$

mV_{ORP} = displayed oxidation-reduction potential (measured ORP)
mV_{meas} = direct electrode potential (ORP input, see Sensor monitor)
ΔmV = delta value, determined during calibration

ORP related to the standard hydrogen electrode (SHE)
The oxidation-reduction potential can also be calibrated automatically with respect to the standard hydrogen electrode (SHE). To do so, you must first select the reference electrode used (see Parameter setting).
The temperature behavior of the reference electrode is automatically taken into account.

You can choose from the following types of reference electrodes:

Ag/AgCl, KCl 1 mol/l	(silver/silver chloride)
Ag/AgCl, KCl 3 mol/l	(silver/silver chloride)
Hg, Tl/TlCl, KCl 3.3 mol/l	(Thalamid)
Hg/Hg_2SO_4, K_2SO_4 saturated	(mercury sulfate)

Menu	Display	ORP adjustment
		The type of reference electrode is selected during parameter setting. Immerse electrode in calibration medium and wait until the ORP value has stabilized. Enter the nominal ORP value (bottle). **Be sure to observe the correct reference!** (as configured) Press "**OK**" to confirm.
		End adjustment by pressing softkey or **enter**.

Temperature dependence of commonly used reference systems measured against SHE

Temperature [°C]	Ag/AgCl/KCl 1 mol/l [ΔmV]	Ag/AgCl/KCl 3 mol/l [ΔmV]	Thalamid [ΔmV]	Mercury sulfate [ΔmV]
0	249	224	-559	672
10	244	217	-564	664
20	240	211	-569	655
25	236	207	-571	651
30	233	203	-574	647
40	227	196	-580	639
50	221	188	-585	631
60	214	180	-592	623
70	207	172	-598	613
80	200	163	-605	603

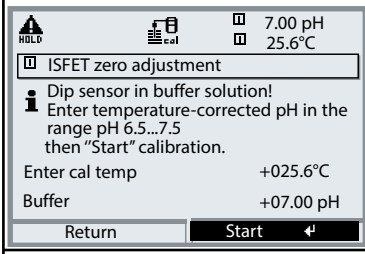
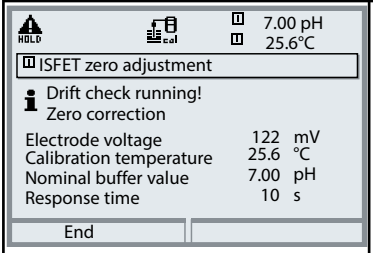
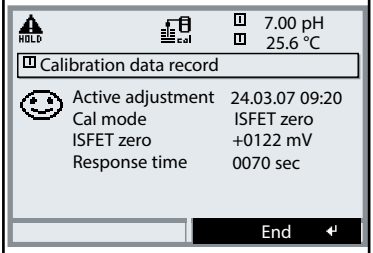
ISFET Zero Adjustment

Notice:
The PHU 3400(X)-110 module does not supply the power for operating the ISFET adapter.

When measuring with an ISFET sensor (Durafet, InPro 3300), the nominal zero point must be adjusted each time a new sensor is connected (to adjust the operating point). The adjustment for that sensor remains stored in the analyzer. Afterwards, you should perform a two-point calibration using one of the following methods:

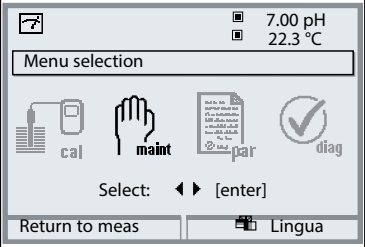
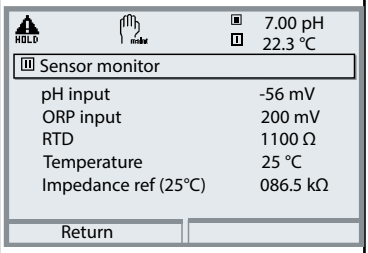
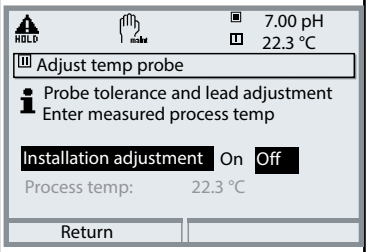
- Calimatic: automatic calibration
- Manual entry of buffer values
- Data entry: premeasured electrodes

During calibration the module is in HOLD mode. Current outputs and relay contacts of the module behave as configured (BASE module).

Menu	Display	ISFET zero adjustment
cal		Immerse sensor in a zero point buffer (6.5 ... 7.5). Enter temperature-corrected pH value (see buffer table). Start zero adjustment.
		To abort, you can press the "End" softkey. However, this reduces adjustment accuracy. (Zero error of sensor up to max. ±200 mV possible)
		At the end of the adjustment procedure the ISFET zero (based on 25 °C) is displayed. This is not the real sensor value! The actual value must be determined afterwards by a complete two-point calibration.

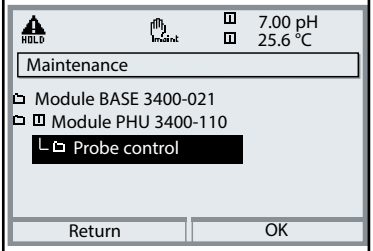
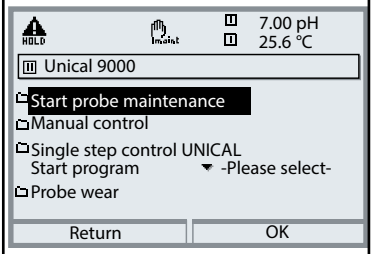
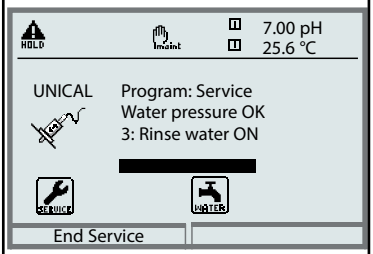
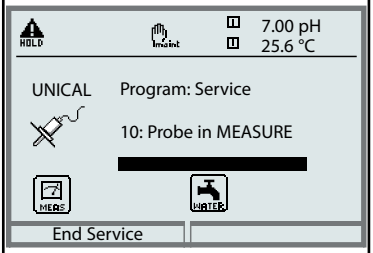
Maintenance of PHU 3400(X)-110

Sensor monitor, Temp probe adjustment
Note: HOLD mode is active.

Menu	Display	Maintenance
maint		**Open Maintenance** From the measuring mode: Press **menu** key to select menu. Select Maintenance (maint) using arrow keys, confirm with **enter**. Passcode as delivered: 2958 Then select "Module PHU".
		**Sensor Monitor** for validation of sensor and complete measured-value processing.
		**Temp Probe Adjustment** This function allows you to compensated for the individual temperature probe tolerance and the influence of the lead resistances to increase accuracy of temperature measurement. Adjustment may only be carried out when the process temperature is precisely measured using a calibrated reference thermometer! The measurement error of the reference thermometer should be less than 0.1 °C. Adjustment without precise measurement might result in considerable deviations of the measured value display!

Probe Maintenance via Protos 3400(X)

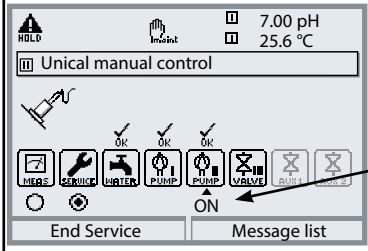
"Maintenance / Probe control" Menu

Menu	Display	Maintenance
maint		**Select "Probe control".** The maintenance menu shows the probe controller as a component of the PHU 3400(X)-110 module. Select using arrow keys, confirm with **enter**
		**Probe maintenance** With the Unical "SERVICE" program, the probe is moved into SERVICE position. The individual program steps are indicated in the display:
		
		After end of servicing work the probe moves back to "Measuring" position (PROCESS).

01: Probe in SERVICE	
02: Cleaning agent	0020 sec
03: Rinse water ON	0060 sec
04: Rinse water OFF	0002 sec
05: Purge air ON	0005 sec
06: Purge air OFF	0002 sec
07: Wait position	
08: Rinse water ON	0010 sec
09: Rinse water OFF	0002 sec
10: Probe in MEASURE	0005 sec
11: Program end	

Manual Control via Protos 3400(X)

"Maintenance / Probe control" Menu

Menu	Display	Maintenance
maint		**Manual control** (requires access code*) Select function using arrow keys. Symbol flashes, activate with **enter** – "On" appears below the icon. End with **enter**. ("ON" disappears again.) * The access code is specified in the "Parameter setting / Installation" menu. Default: 2958.

Warning for Use of Manual Control!

Make sure that the probe is separated from the process!
Manual control via Protos 3400(X) allows actuating the probe controller for servicing.
Rinsing water, media supply, and valve functions can be tested individually.

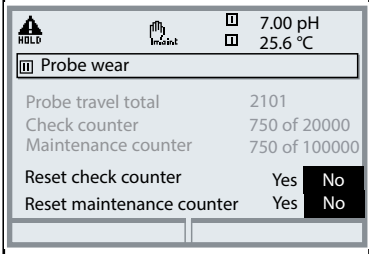
Single Step Control

"Maintenance / Probe control" Menu

Menu	Display	Maintenance
maint		**Single step control UNICAL** Each program can be executed in single-step mode. A safety prompt is displayed before the program starts. The individual program steps are indicated in the display. A "Cleaning" program might be displayed as follows: 01: Probe in SERVICE 02: Cleaner 0020 sec 03: Rinse water ON 0060 sec 04: Rinse water OFF 0002 sec 05: Probe in MEASURE 0005 sec 06: Program end **Start program** Here you can select a program for test purposes: Clean Cal 2point Cal 1point Parking User 2 User 3

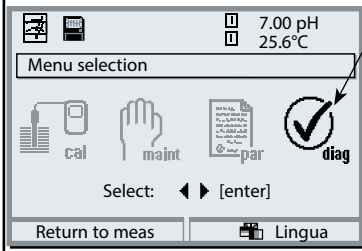
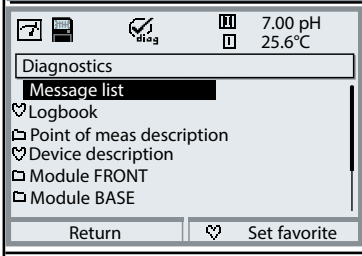
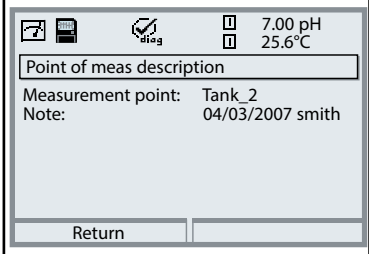
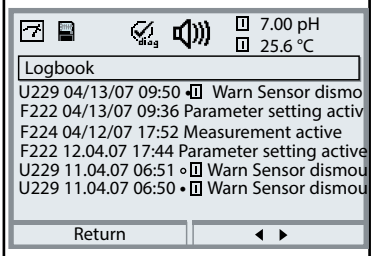
Probe Wear

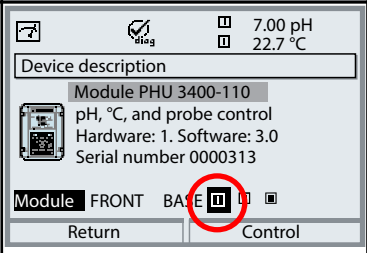
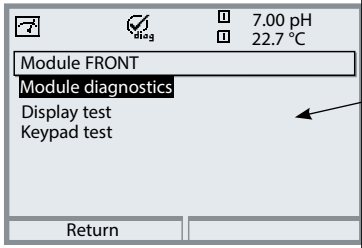
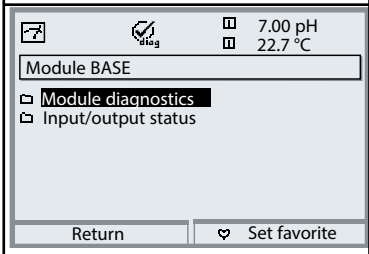
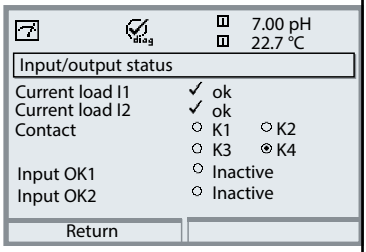
"Maintenance / Probe control" Menu

Menu	Display	Maintenance
maint		**Probe wear** There are 2 counters: • Check counter • Maintenance counter In the menu • Parameter setting • Probe control • Installation • Probe you can switch each counter on or off and set an individual interval for each counter. After expiry of this interval, a message is generated. You can reset the counters in the maintenance menu.

Diagnostics Functions

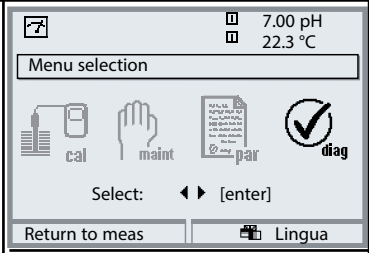
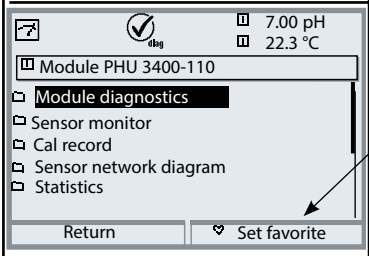
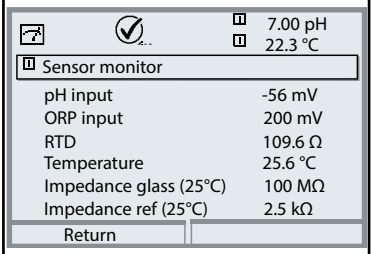
General status information of the measuring system
Select menu: Diagnostics - Logbook

Menu	Display	Diagnostics functions
diag		**Open diagnostics** From the measuring mode: Press **menu** key to select menu. Select diagnostics using arrow keys, confirm with **enter**.
		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.
		**Point of Meas Description** Allows entering a tag number and a note. Select position: left/right arrow key, select character: up/down arrow key. Confirm the entry with **enter**.
		**Logbook** The last 50 events are recorded with message identifier, date, time, and module concerned. This permits quality management documentation to ISO 9000 et seq. Extended logbook: SmartMedia card (SW 3400-104)

Menu	Display	Diagnostics functions
diag		**Device Description** Select module using arrow keys: Provides information on all modules installed: Function, serial number, hardware and software version, and device options.
		**FRONT module** The module contains the display and keypad control. Test possibilities: • Module diagnostics • Display test • Keypad test
		**BASE module** The module generates the standard output signals. Test possibilities: • Module diagnostics • Input/output status
		Example: Module BASE, input/output status.

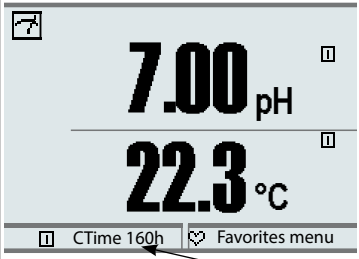
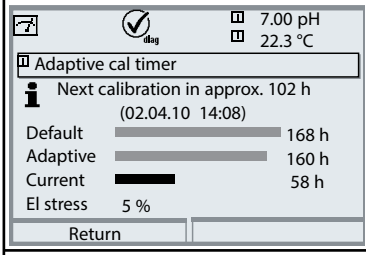
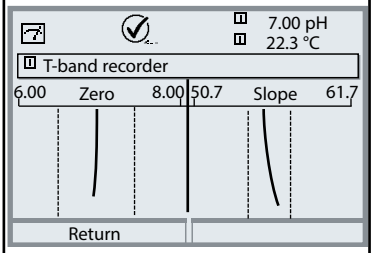
Diagnostics of PHU 3400(X)-110

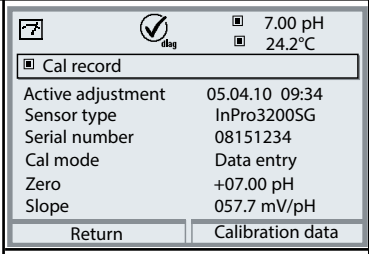
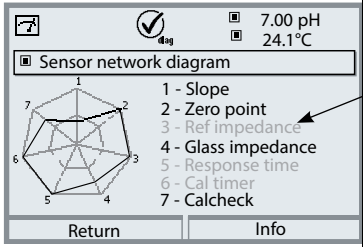
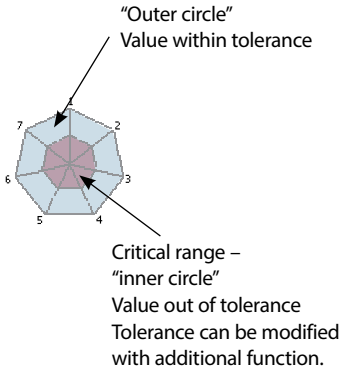
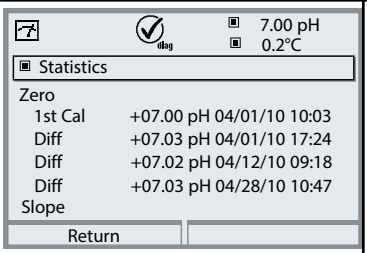
Module diagnostics / Sensor monitor

Menu	Display	Module diagnostics / Sensor monitor
		**Open diagnostics** From the measuring mode: Press **menu** key to select menu. Select diagnostics using arrow keys, confirm with **enter**. Then select "Module PHU".
diag		The Diagnostics menu gives an overview of all diagnostics functions available. Messages set as "Favorite" can be called directly from the measuring mode using a softkey. To configure: Parameter setting / System control / Function control matrix.
		Module Diagnostics Internal function test.
		**Sensor Monitor** Shows the values currently measured by the sensor. Important function for diagnostics and validation!

Diagnostics of PHU 3400(X)-110

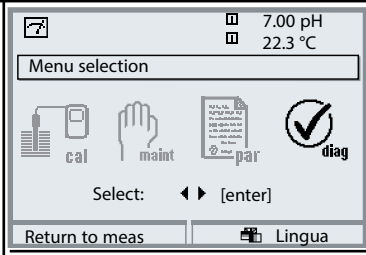
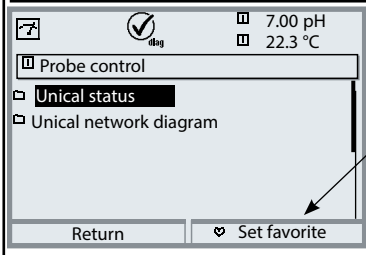
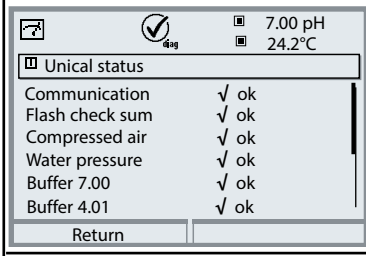
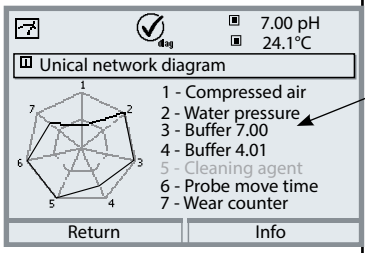
Calibration timer, Tolerance band recorder, Cal record, Sensor network diagram, Statistics

Menu	Display	Cal timer, Tolerance band recorder
		**Calibration Timer** After expiration of a presettable interval (Parameter setting, Module PHU, Cal preset values), the calibration timer generates a warning message as a reminder that calibration is required. The remaining time can be indicated in the measuring mode by pressing a softkey (secondary display: "CTime").
diag		**Adaptive Calibration Timer** The time until the next due calibration is automatically reduced depending on the electrode stress (temperature, pH value).
		**Tolerance Adjustment** Records the tolerance ranges for zero and slope over the time. If the values determined by a calibration exceed the tolerance limits, an adjustment can be executed automatically. Display can be graphical or as a listing. The tolerance band for zero and slope is configured during parameter setting (Module PHU 3400-110, Cal preset values).

Menu	Display	Cal record, Sensor network diagram, Statistics
diag		**Cal Record** Data of last adjustment/calibration, suitable for documentation to ISO 9000 and GLP/GMP (Date, time, calibration method, zero and slope, isothermal potential, information concerning calibration buffers and response times)
		**Sensor Network Diagram** Graphical representation of the sensor parameters. Tolerance limit violations can be seen at a glance. Critical parameters are flashing. Parameters displayed in gray have been disabled during parameter setting or do not apply to the currently selected sensor. The tolerance limits (radius of "inner circle") can be modified as desired. For more detailed information, press "Info" softkey.
		
		**Statistics** Indication of sensor data for the First Calibration (adjustment) and the last 3 calibrations compared to the First Calibration. (Date and time of First Calibration, zero and slope, impedance of glass and reference electrode, response time)

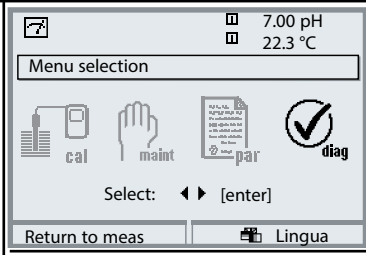
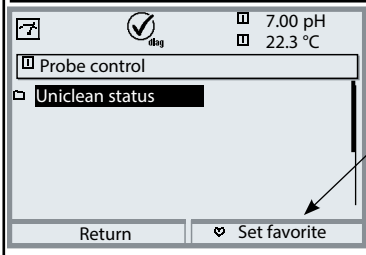
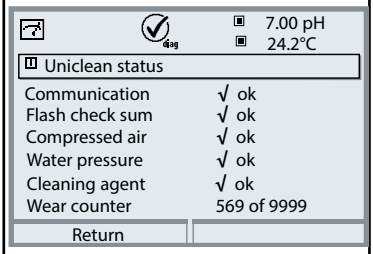
Diagnostics of Unical 9000(X)

Unical status, Unical network diagram

Menu	Display	Unical status, Unical network diagram
diag		**Open diagnostics** From the measuring mode: Press **menu** key to select menu. Select diagnostics using arrow keys, confirm with **enter**. Then select Probe control.
		The Diagnostics menu gives an overview of all diagnostics functions available. Messages set as "Favorite" can be called up directly from the measuring mode using a softkey. To configure: Parameter setting / System control / Function control matrix.
		**Unical Status** The media / ports at the media adapter are checked. During installation, you can enter texts specifying the media (here, for example "Buffer 7.00")
		**Unical Network Diagram** Graphical representation of the parameters. Tolerance limit violations can be seen at a glance. For principle of function, see "Sensor network diagram".

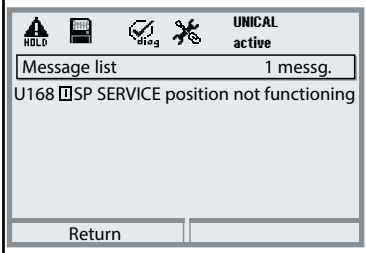
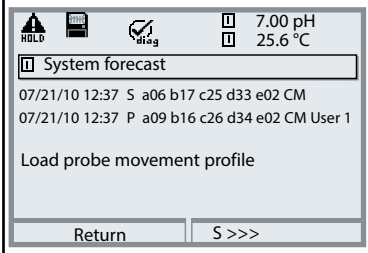
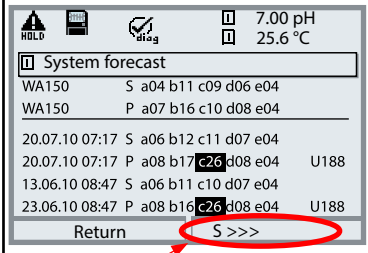
Diagnostics of Uniclean 900(X)

Uniclean Status

Menu	Display	Uniclean status
diag		**Open diagnostics** From the measuring mode: Press **menu** key to select menu. Select diagnostics using arrow keys, confirm with **enter**. Then select Probe control.
		The Diagnostics menu gives an overview of all diagnostics functions available. Messages set as "Favorite" can be called directly from the measuring mode using a softkey. To configure: Parameter setting / System control / Function control matrix.
		**Uniclean Status** The media / ports at the media adapter are checked. During installation, you can enter texts specifying the media (here, for example "Cleaning agent")

Diagnostic Messages of System Forecast

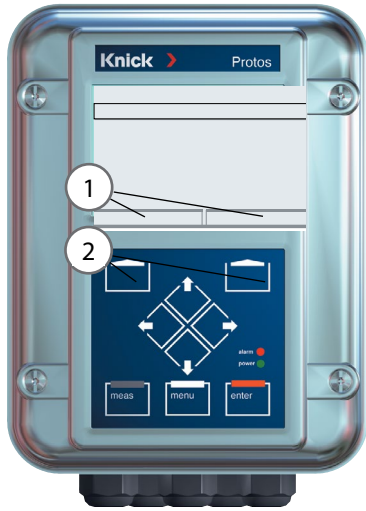
Menu: Diagnostics / System forecast

Menu	Display	System forecast: Diagnostics
par		**Message List** When you have activated "Monitoring On" in the System forecast menu, a violation of a preset tolerance will generate a message text. These texts can be viewed in the message list.
		**System Forecast** In operation, travel times are saved for every cycle (max. 200) and compared with the active reference profile. If "System forecast" is selected in the diagnostics menu, the active reference profile and probe profiles already recorded are displayed (this may take some time). If tolerance limits are exceeded in the probe travel profile, the error number is displayed after the probe profile.
	 For better comparability, the travel cycles can be displayed using the right softkey: - in Service "S" and Process "P" directions - in Service "S" direction only - in Process "P" direction only	**NOTICE** In the Protos/Unical system, the last 200 travel cycles are recorded in non-volatile memory, i.e. the data are lost when the supply voltage is switched off. Recording on a SmartMedia card is therefore recommended – see following page.

Setting Diagnostics Messages as Favorite

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

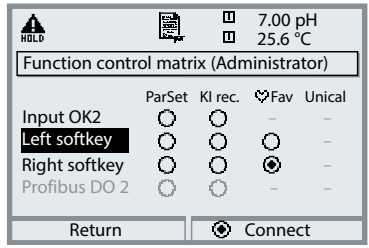
Secondary displays (1)
Here, additional values are displayed in the measuring mode according to the factory setting. When the respective softkey (2) is pressed, the process variables measured by the modules plus date or time are displayed. In addition, you can use the **softkeys (2)** to control functions. 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/Stop
- Favorites
- Unical (fully automated probe controller)

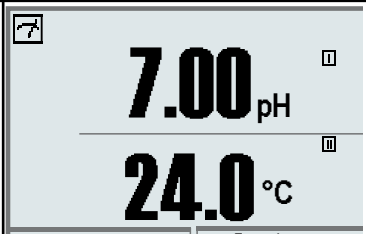
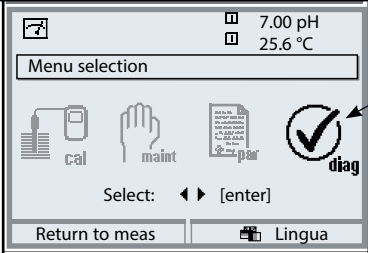
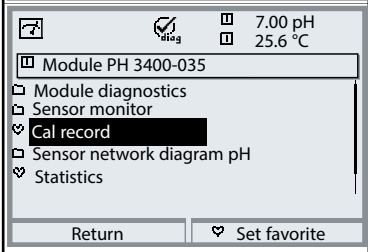
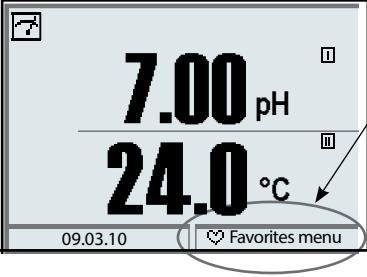


Example:
"Favorites" to be selected with "Right softkey"

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**.

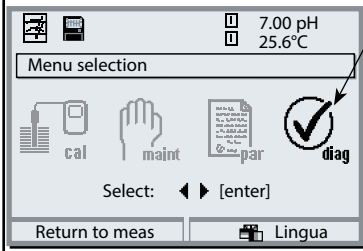
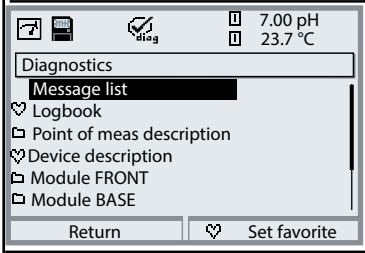
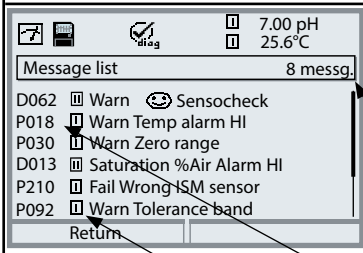
Favorites
Selected Diagnostics functions can be called directly from the measuring mode using a softkey.
The table on the next page explains how to select favorites.

Menu	Display	Select favorites
		**Favorites menu** Diagnostics functions can be called directly from the measuring mode using a softkey. The "Favorites" are selected in the Diagnostics menu.
diag		**Select favorites** Press **menu** key to select menu. Select diagnostics using arrow keys, confirm with **enter**. Then select module and confirm with **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").

Notice:
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.

Diagnostics Functions

General status information of the measuring system
Select menu: Diagnostics - Message list

Menu	Display	Diagnostics functions
diag		**Opening the diagnostics menu** From the measuring mode: Press **menu** key to select menu. Select diagnostics using arrow keys, confirm by pressing **enter**.
		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.
		**Message List** Shows the currently activated warning or failure messages in plain text. **Number of messages** When there are more than 7 messages, a vertical scrollbar appears. Scroll with the up/down arrow keys. **Message identifier** See message list for description. **Module identifier** Specifies the module that has generated the message.

FRONT 3400-011 Module
FRONT 3400(X)-015 Module

No.	FRONT messages	Message type
F008	Meas. processing (factory settings)	FAIL
F009	Module failure (Firmware Flash check sum)	FAIL
F060	KI process window exceeded (acknowledgeable message)	User-defined
F061	KI recorder parameter	WARN
F080	ComFu®-E Channel 1 – [1] No sensor	
F081	ComFu®-E Channel 1 – [2] No sensor	
F082	ComFu®-E Channel 1 – [1] Communication interrupted	
F083	ComFu®-E Channel 1 – [2] Communication interrupted	
F084	ComFu®-E Channel 1 – [1] Sensor connection	
F085	ComFu®-E Channel 1 – [2] Sensor connection	
F086	ComFu®-E Channel 1 – [1] Battery empty	
F087	ComFu®-E Channel 1 – [2] Battery empty	
F090	ComFu®-E Channel 2 – [2] No sensor	
F091	ComFu®-E Channel 2 – [3] No sensor	
F092	ComFu®-E Channel 2 – [2] Communication interrupted	
F093	ComFu®-E Channel 2 – [3] Communication interrupted	
F094	ComFu®-E Channel 2 – [2] Sensor connection	
F095	ComFu®-E Channel 2 – [3] Sensor connection	
F096	ComFu®-E Channel 2 – [2] Battery empty	
F097	ComFu®-E Channel 2 – [3] Battery empty	
F200	CRC error PAR	FAIL
F201	Communications error (system bus)	FAIL
F202	System failure	FAIL
F210	Device diagnostics (Self test signals error)	WARN
F211	Card error (SmartMedia)	WARN
F212	Time/date	WARN
F213	Module temperature (range exceeded)	WARN
F215	Memory card full	WARN

No.	FRONT messages	Message type
F216	AuditTrail card	FAIL
F220	Calibration active	Text
F221	Maintenance active	Text
F222	Parameter setting active	Text
F223	Diagnostics active	Text
F225	Measurement active	Text
F226	Power supply OFF	Text
F227	Power supply ON	Text
F228	Software update	Text
F229	Wrong passcode	Text
F230	Factory setting	Text
F231	Configuration changed	Text
F232	Module equipment Ex/non-Ex	FAIL
F233	Module equipment Ex	FAIL

BASE 3400-021 Module
BASE 3400(X)-025/VPW Module
BASE 3400(X)-026/24V Module

No.	BASE messages	Message type
B008	Meas. processing (factory settings)	FAIL
B009	Module failure (Firmware Flash check sum)	FAIL
B070	Current I1 Span	WARN
B071	Current I1 <0/4 mA	WARN
B072	Current I1 > 20 mA	WARN
B073	Current I1 Load error	FAIL
B074	Current I1 Parameter	WARN
B075	Current I2 Span	WARN
B076	Current I2 <0/4 mA	WARN
B077	Current I2 > 20 mA	WARN
B078	Current I2 Load error	FAIL
B079	Current I2 Parameter	WARN
B200	Rinsing program active	Text
B254	Module reset	Text

PHU 3400(X)-110 Module

No.	pH messages	Message type
P008	Meas. processing (factory settings)	FAIL
P009	Module failure (Firmware Flash check sum)	FAIL
P010	pH range	FAIL
P011	pH Alarm LO_LO	FAIL
P012	pH Alarm LO	WARN
P013	pH Alarm HI	WARN
P014	pH Alarm HI_HI	FAIL
P015	Temperature range	FAIL
P016	Temperature Alarm LO_LO	FAIL
P017	Temperature Alarm LO	WARN
P018	Temperature Alarm HI	WARN
P019	Temperature Alarm HI_HI	FAIL
P020	ORP range	FAIL
P021	ORP Alarm LO_LO	FAIL
P022	ORP Alarm LO	WARN
P023	ORP Alarm HI	WARN
P024	ORP Alarm HI_HI	FAIL
P025	rH range	WARN
P026	rH Alarm LO_LO	FAIL
⁋ P027	rH Alarm LO	WARN
P028	rH Alarm HI	WARN
P029	rH Alarm HI_HI	FAIL
P030	Zero range	WARN
P035	Slope range	WARN
P040	Isotherm potential Uis range	WARN
P045	mV range	WARN
P046	mV Alarm LO_LO	FAIL

No.	pH messages	Message type
P047	mV Alarm LO	WARN
P048	mV Alarm HI	WARN
P049	mV Alarm HI_HI	FAIL
P050	man. Temperature range	FAIL
P060	SENSOFACE SAD: Slope	User-defined
P061	SENSOFACE SAD: Zero	User-defined
P062	SENSOFACE SAD: Ref impedance (Sensocheck)	User-defined
P063	SENSOFACE SAD: Glass impedance (Sensocheck)	User-defined
P064	SENSOFACE SAD: Response time	User-defined
P065	SENSOFACE SAD: Calibration timer	WARN
P066	SENSOFACE SAD: Calcheck	User-defined
P069	SENSOFACE SAD: Calimatic (Zero/slope)	WARN
P070	SENSOFACE SAD: Sensor wear	User-defined
P071	SENSOFACE SAD: ISFET leakage current	User-defined
P090	Buffer offset (specifiable buffer table)	WARN
P091	Zero offset ORP	WARN
P092	Tolerance band	WARN
P110	CIP counter	User-defined
P111	SIP counter	User-defined
P112	Autoclaving counter	User-defined
P113	Sensor operating time (duration of use)	User-defined
P114	ISFET characteristic	User-defined
P115	Membrane body changes	User-defined
P120	Wrong ISM sensor	FAIL
P121	ISM sensor (error in factory settings/characteristics)	FAIL
P122	ISM sensor memory (error in cal data records)	WARN
P123	New sensor, adjustment required	WARN
P130	SIP cycle counted	Text
P131	CIP cycle counted	Text
P200	Noise level at pH input	FAIL
P201	Cal temp	WARN

Messages

No.	pH messages	Message type
P202	Cal: Buffer unknown	Text
P203	Cal: Identical buffers	Text
P204	Cal: Buf interchanged	Text
P205	Cal: Sensor unstable	Text
P206	Cal: Slope	WARN
P207	Cal: Zero	WARN
P208	Cal: Sensor failure (ORP check)	FAIL
P254	Module reset	Text

No.	Calculation Block PH / PH messages	Message type
A010	pH-Diff Range	FAIL
A011	pH-Diff Alarm LO_LO	FAIL
A012	pH-Diff Alarm LO	WARN
A013	pH-Diff Alarm HI	WARN
A014	pH-Diff Alarm HI_HI	FAIL
A015	Temperature-Diff Range	FAIL
A016	Temperature-Diff Alarm LO_LO	FAIL
A017	Temperature-Diff Alarm LO	WARN
A018	Temperature-Diff Alarm HI	WARN
A019	Temperature-Diff Alarm HI_HI	FAIL
A020	ORP-Diff Range	FAIL
A021	ORP-Diff Alarm LO_LO	FAIL
A022	ORP-Diff Alarm LO	WARN
A023	ORP-Diff Alarm HI	WARN
A024	ORP-Diff Alarm HI_HI	FAIL

Unical 9000 with PHU 3400(X)-110 Module

No.	Probe control messages	Message type
U190	Probe control Buffer I almost empty	WARN
U191	Probe control Buffer II almost empty	WARN
U192	Probe control Cleaner almost empty	WARN
U194	Probe control Buffer I empty	FAIL
U195	Probe control Buffer II empty	FAIL
U196	Probe control Cleaner empty	FAIL
U219	Firmware Probe control	WARN
U220	Probe control Switch compressed air	FAIL
U221	Sensor dismounted	FAIL
U222	Undefined security status	FAIL
U224	Probe control flooded	FAIL
U225	Probe control Probe valve defective	FAIL
U226	Probe Limit position switch	FAIL
U227	Probe Limit position SERVICE	FAIL
U228	Probe cylinder untight	WARN
U229	Sensor dismount guard defective	WARN
U230	Probe Limit position MEASURE	FAIL
U231	Probe Move time MEASURE	WARN
U233	Probe control Switch water pressure	WARN
U234	Probe move time SERVICE	WARN
U235	Probe control Safety valve defective	WARN
U236	Probe control No pump I	WARN
U237	Probe control No pump II	WARN
U238	Probe control No pump III	WARN
U239	Probe control No aux. valve 1	WARN
U240	Probe control No aux. valve 2	WARN
U241	Check rinse water	WARN
U242	Check buffer I	WARN

No.	Probe control messages	Message type
U243	Check buffer II	WARN
U244	Check cleaner	WARN
U245	Check Add. medium 1	WARN
U246	Check Add. medium 2	WARN
U248	Probe control Water valve	WARN
U249	Proble check counter	WARN
U250	Proble maintenance counter	WARN
U251	Probe control Calibration error	WARN
U252	Probe control Communication error	WARN
U253	Probe control	WARN

System Forecast Messages

No.	"System forecast" message	Cause
U160	SP Pressure loss/Air sensor	Air leaking uncontrolled – air sensor defective
U161	SP Probe valve not functioning	Pilot valve does not switch; probe valve possibly does not switch
U162	SP Air sensor not functioning	Air sensor does not switch
U163	SP Probe valve sluggish	Pilot valve switches late; probe valve possibly switches late
U164	SP Air sensor sluggish	Air sensor switches late
U165	SP Limit positions interrupted	Both limit positions do not switch (e.g. GND missing)
U166	SP Limit positions short-circuited	Both limit switches are actuated (short-circuited)
U170	SP Probe stopped between end positions	Probe is stuck between the limit positions
U171	SP PROCESS position sluggish	Limit switch (PROCESS) reacts too late after start of probe travel
U172	SP Probe sluggish	Probe sluggish (limit position is reached)
U173	SP Probe is stuck during probe travel	Probe is stuck during probe travel (limit position is not reached)
U174	SP SERVICE position not functioning	Limit switch (SERVICE) does not react after end of probe travel
U175	SP PROCESS position not functioning	Limit switch (PROCESS) does not react after end of probe travel
U176	SP SERVICE position sluggish	Limit switch (SERVICE) reacts too late after end of probe travel
U177	SP SERVICE position not functioning	Limit switch (SERVICE) not functioning
U178	SP PROCESS position not functioning	Limit switch (PROCESS) not functioning
U179	SP Probe instantly got stuck	Probe is stuck in limit position
U188	SP General error	Error not clearly assignable

Messages are automatically reset after two correct probe movements.

Error Messages of Unical 9000(X)

NAMUR class	Protos contacts			DCS34	Message (PROTOS)	
	Fct.chk	Failure	Maint req.	Alarm		
MAINT REQ.			active		Probe move time SERVICE (U234)	
MAINT REQ.			active		Probe Move time MEASURE (U231)	
FAIL		active		active	Probe limit position SERVICE (U227)	
FAIL		active		active	Probe Limit position MEASURE (U230)	
FAIL		active		active	Compressed air switch (U220)	
FAIL		active		active	UNICAL Probe valve defective (U225)	
FAIL		active		active	UNICAL flooded (U224)	

	Cause	System reaction	Reset	Remark
	– Low air pressure – Probe sluggish – Filter choked – Move time too long	None, message only	By next smooth probe movement	Limit position not reached at the first trial.
	– Low air pressure – Probe sluggish – Filter choked – Move time too long	None, message only	By next smooth probe movement	Limit position not reached at the first trial.
	– Probe defective – Probe sticky – SERVICE limit switch defective – Probe valve defective * – Pilot valve defective *	None, message only	By next smooth probe movement	SERVICE limit position was not reached even after several trials
	– Probe defective – Probe sticky – MEASURE limit switch defective – Probe valve defective * – Pilot valve defective *	None, message only	By next smooth probe movement	MEASURE limit position was not reached even after several trials
	– Media adapter untight – Failure in compressed-air supply – Pressure too low – P/E converter defective – Safety valve defective (shut)	None, message only	Automatic as soon as pressure is provided	
	– Pilot valve or probe valve defective *	None, message only	By next smooth probe movement	Distinction cannot be made between pilot valve and probe valve. Redundancy of pilot valves not provided any more. Can only be noticed with "SERVICE switch" function
	– Tubings untight – Hose/tube torn off – Water valve leaking – Water stop defective	None, message only	- SERVICE request	Water has been stopped

Error Messages of Unical 9000(X)

NAMUR class	Protos contacts			DCS34	Message (PROTOS)	
	Fct.chk	Failure	Maint req.	Alarm		
FAIL	active				Sensor dismounted (U221)	
FAIL		active		active	Undefined security status (U222)	
MAINT REQ.			active		Safety valve defective (U235)	
MAINT REQ.			active		Sensor dismount guard defective (U229)	
MAINT REQ.			active		Buffer almost empty Err text from medium description (U190/U191)	
FAIL		active		active	Buffer empty Err text from medium description (U194/U195)	
MAINT REQ.			active		Cleaner almost empty Err text from medium description (U192)	
FAIL		active		active	Cleaner empty Err text from medium description (U196)	

	Cause	System reaction	Reset	Remark
	– Sensor dismounted – Probe cylinder untight – Probe lines untight – Dismount guard defective	Probe does not move into MEAS position, Message	- When sensor has been remounted	Message can only appear in SERVICE position Sensor can only be removed in SERVICE position
	– Voltage interruption while SERVICE switch is activated	Red LED at service switch is lit	- Switch SERVICE switch on/off Caution! Probe moves into the process	The system could not unequivocally determine whether a safe status has been achieved
	– Safety valve does not close *	None, message only		Redundancy of pilot valves not provided any more. Can only be noticed with "SERVICE switch" function
	– Flow sensor defective – Air leak in probe cylinder – Probe lines untight	None, message only	- Replace flow sensor or eliminate other cause of defect	
	– Filling level below minimum – Float switch stuck – Check-back error (line interrupted or short-circuited) – Bottle untight	None, message only	Automatic when buffer solution is topped up above min. level	Start immediately when intervals have expired
	– Residual bottle contents used up – Float switch stuck – Check-back error (line interrupted or short-circuited)	All programs requiring buffer solution are blocked	Automatic when buffer solution is topped up above min. level	Start immediately when intervals have expired
	– Filling level below minimum – Float switch stuck – Check-back error (line interrupted or short-circuited) – Bottle untight	None, message only	Automatic when cleaning solution is topped up above min. level	Start immediately when intervals have expired
	– Residual bottle contents used up – Float switch stuck – Check-back error (line interrupted or short-circuited)	All programs requiring cleaning solution are blocked	Automatic when cleaning solution is topped up	Start immediately when intervals have expired

Error Messages of Unical 9000(X)

NAMUR class	Protos contacts			DCS34	Message (PROTOS)	
	Fct.chk	Failure	Maint req.	Alarm		
MAINT REQ.			active		UNICAL Switch Water pressure (U220)	
MAINT REQ.			active		Probe cylinder untight (U228)	
MAINT REQ.			active		Proble check counter / Proble maintenance counter (U249 / U250)	
MAINT REQ.			active		Media monitoring Err texts from medium description (U241 ... U246)	
MAINT REQ.			active	active	UNICAL Calibration error (U251)	

* Can only be detected with “SERVICE switch“ function.

	Cause	System reaction	Reset	Remark
	– No water – Water pressure too low	All programs requiring water are blocked	Automatic as soon as water pressure OK	Start immediately when intervals have expired
	– Probe cylinder untight – Probe lines untight	None, message only	Automatic as soon as cause of trouble removed	Probe cylinder or probe lines untight Maintenance required
	– Counter expired	None, message only	Manual reset in maintenance menu	
	– Wrong medium – Wrong medium temp. – Media mixed – System untight – Probe untight	None, message only	Automatic as soon as medium OK	
	– Buffers interchanged – Identical buffers – Buffer unknown – Cal temp – Sensor unstable – Zero too low/high – Slope too low/high	Calibration aborted	Automatically after next fault-free calibration	

Error Messages of Uniclean 900(X)

NAMUR class	Protos contacts			DCS34	Message (PROTOS)	
	Fct.chk	Failure	Maint req.	Alarm		
MAINT REQ.			active		Probe move time SERVICE (U234)	
MAINT REQ.			active		Probe move time MEASURE (U231)	
FAIL		active		active	Probe limit position SERVICE (U227)	
FAIL		active		active	Probe limit position MEASURE (U230)	
FAIL		active		active	Compressed air switch (U220)	
FAIL		active		active	Probe valve defective (U225)	
FAIL		active		active	UNICLEAN flooded (U224)	

	Cause	System reaction	Reset	Remark
	- Low air pressure - Probe sluggish - Filter choked - Move time too long	None, message only	By next smooth probe movement	Limit position not reached at the first trial.
	- Low air pressure - Probe sluggish - Filter choked - Move time too long	None, message only	By next smooth probe movement	Limit position not reached at the first trial.
	- Probe defective - Probe sticky - SERVICE limit switch defective - Probe valve defective * - Pilot valve defective *	None, message only	By next smooth probe movement	SERVICE limit position was not reached even after several trials
	- Probe defective - Probe sticky - MEASURE limit switch defective - Probe valve defective * - Pilot valve defective *	None, message only	By next smooth probe movement	MEASURE limit position was not reached even after several trials
	- Media adapter untight - Failure in compressed-air supply - Pressure too low - P/E converter defective - Safety valve defective (shut)	None, message only	Automatic as soon as pressure is provided	
	- Pilot valve or probe valve defective *	None, message only	By next smooth probe movement	Distinction cannot be made between pilot valve and probe valve. Redundancy of pilot valves not provided any more. Can only be noticed with "SERVICE switch" function
	- Hose/tube untight - Hose/tube torn off - Water valve leaking - Water stop defective	None, message only	- SERVICE request	Water has been stopped

Error Messages of Uniclean 900(X)

NAMUR class	Protos contacts			DCS34	Message (PROTOS)	
	Fct.chk	Failure	Maint req.	Alarm		
FAIL	active				Sensor dismounted (U221) (Message with Ceramat only!)	
MAINT REQ.			active		Sensor dismount guard defective (U229) (Message with Ceramat only!)	
MAINT REQ.			active		Cleaner almost empty (U192)	
FAIL		active		active	Cleaner empty (U196)	
MAINT REQ.			active		UNICLEAN switch Water pressure (U220)	
MAINT REQ.			active		Probe cylinder untight (U228)	
MAINT REQ.			active		Proble check counter / Proble maintenance counter (U249 / U250)	

	Cause	System reaction	Reset	Remark
	- Sensor dismounted - Probe cylinder untight - Probe lines untight - Dismount guard defective	Probe does not move into MEAS position, Message	- When sensor has been remounted	Message can only appear in SERVICE position Sensor can only be removed in SERVICE position
	- Flow sensor defective - Air leak in probe cylinder - Probe lines untight	None, message only	- Replace flow sensor or eliminate other cause of defect	
	- Filling level below minimum - Float switch stuck - Check-back error (line interrupted or short-circuited) - Bottle untight	None, message only	Automatic when cleaning solution is topped up above min. level	Start immediately when intervals have expired
	- Residual bottle contents used up - Float switch stuck - Check-back error (line interrupted or short-circuited)	All programs requiring cleaning solution are blocked	Automatic when cleaning solution is topped up	Start immediately when intervals have expired
	- No water - Water pressure too low	All programs requiring water are blocked	Automatic as soon as water pressure OK	Start immediately when intervals have expired
	- Probe cylinder untight - Probe lines untight	None, message only	Automatic as soon as cause of trouble removed	Probe cylinder or probe lines untight Maintenance required
	- Counter expired	None, message only	Manual reset in maintenance menu	

Specifications

Specifications of PHU 3400(X) 110 Module

pH/ORP input	Simultaneous measurement of pH and ORP		
(Ex ia IIC)	with glass electrode or ISFET		
	Input for glass electrode or ISFET		
	Input for reference electrode		
	Input for redox (ORP) electrode or auxiliary electrode		
Measuring range (MR)	pH value	-2.00 ... +16.00	
	ORP value	-2000 ... +2000 mV	
	rH value	0.0 ... 42.5	
Adm. voltage ORP + pH [mV]	2000 mV		
Adm. cable capacitance	< 2 nF		
Glass electrode input **	Input resistance	> 1 x 10^{12} Ω	
	Input current	< 1 x 10^{-12} A ****	
	Impedance range	0.5 ... 1000 MΩ	
Reference electrode input **	Input resistance	> 1 x 10^{10} Ω	
	Input current	< 1 x 10^{-10} A ****	
	Impedance range	0.5 ... 200 kΩ	
Measurement error ***	pH value	< 0.02	TC < 0.001 pH/K
(display)	ORP value	< 1 mV	TC < 0.05 mV/K
Temperature input	Pt 100/Pt 1000/NTC 30 kΩ/NTC 8.55 kΩ		
(Ex ia IIC)	2-wire connection, adjustable		
Measuring range (MR)	-20 ... +150 °C (Pt 100 / Pt 1000 / NTC 30 kΩ)		
	-10 ... +130 °C (NTC 8.55 kΩ, Mitsubishi)		
Resolution	0.1 °C		
Measurement error ***	0.2 % meas.val. + 0.5 K (< 1 K with NTC > 100 °C)		
Temp compensation	Reference temp 25 °C		
media-dependent	– Linear temperature coefficient, user-defined from -19.99 to 19.99 % / K		
	– Ultrapure water 0 ... 150 °C		
	– Table 0 ... 95 °C, user-defined in 5 K steps		
Power output	for the operation of UNICAL 9000		
(Ex ia IIC)	Vo = +7.2 V	Io = 200 mA	Ri = 20 Ω
	Operating data: 6.8 V (±10%) / 15 mA		
ORP *)	Automatic conversion to standard hydrogen electrode SHE when type of reference electrode is entered		
ORP sensor standardization *)	Zero adjustable from -200 to +200 mV		

Specifications

pH sensor standardization *	1-/2-/3-point calibration (best fit line) Operating modes: – Calimatic automatic buffer recognition – Input of individual buffer values – Product calibration – Data entry of premeasured electrodes
Drift check*:	Fine / standard / coarse
Calimatic buffer sets: *	– Fixed buffer sets:

Knick/Mettler-Toledo	2.00 / 4.01 / 7.00 / 9.21
Merck/Riedel	2.00 / 4.00 / 7.00 / 9.00 / 12.00
DIN 19267	1.09 / 4.65 / 6.79 / 9.23 / 12.75
NIST Standard	4.006 / 6.865 / 9.180
Technical buffers to NIST	1.68 / 4.00 / 7.00 / 10.01 / 12.46
Hamilton	2.00 / 4.01 / 7.00 / 10.01 / 12.00
Kraft	2.00 / 4.00 / 7.00 / 9.00 / 11.00
Hamilton buffers A	2.00 / 4.01 / 7.00 / 9.00 / 11.00
Hamilton buffers B	2.00 / 4.01 / 6.00 / 9.00 / 11.00
HACH	4.01 / 7.00 / 10.00
Ciba	2.06 / 4.00 / 7.00 / 10.00
Reagecon	2.00 / 4.00 / 7.00 / 9.00 / 12.00

	– Manually enterable buffer set with max. three buffer tables (Additional function SW3400-002)
Nom. zero *	pH 0 ... 14; calibration range ΔpH = ± 1
Nom. slope (25 °C) *	25 ... 61 mV/pH; calibration range 80 ... 103 %
V_{iso} *	-1000 ... +1000 mV
Calibration record	Recording of: zero, slope, V_{iso}, response time, calibration method with date and time
Statistics	Recording of: Zero, slope, V_{iso}, response time, glass and reference impedance with date and time of the last three calibrations and the First Calibration
Sensocheck	Automatic monitoring of glass and reference electrode, message can be disabled
Sensoface	Provides information on the sensor condition: zero/slope, response time, calibration interval, Sensocheck, CalCheck, can be switched off
CalCheck (DE 195 36 315 C2)	Monitoring of electrode calibration range during measurement

Specifications

Sensor network diagram	Graphic representation of the current sensor parameters in a network diagram on the display: slope, zero, reference impedance, glass impedance, response time, calibration timer, deviation from calibration range (CalCheck)
Sensor monitor	Direct display of measured values from sensor for validation, pH input, ORP input, glass el. impedance / ref. el. impedance, RTD, temperature
KI recorder (Additional function SW3400-001)	Adaptive representation of a process flow with monitoring and signaling of critical parameters
Adaptive cal timer *	Automatic adjustment of calibration interval (Sensoface signal), depending on measured values
Tolerance band recorder (Additional function SW3400-005)	Tolerant calibration/adjustment, tolerance limits adjustable graphical recording of zero point and slope of the last 40 calibrations/adjustments
Sensor monitoring adjustable	Criteria for sensor network diagram, Sensoface and NAMUR messages individually adjustable
RS 485 (Ex ia IIC)	Vo/Vi = 5 V Io/Ii = 250 mA Ri = 20 Ω
Transfer rate	1200 Bd for UNICAL 8 data bits / 1 stop bit / parity odd
Record	HART Rev. 5
Unical controller	Manual, interval and time-controlled activation of calibration and rinsing programs
Programs	7 programs can be called up • 3 programs with preset sequences, modifiable • 3 freely configurable programs, 1 service program
Diagnostics	UNICAL network diagram, graphical representation of UNICAL status
Maintenance	Control of the individual valves and pumps with status indicators

* User-defined

** To IEC 746 Part 1, at nominal operating conditions

*** ± 1 count, plus sensor error

**** At 20 °C, doubles every 10 K

Specifications

General data

Explosion protection (Ex module only)	See www.knick.de
EMC	NAMUR NE 21 and EN 61326-1 EN 61326-2-3
Emitted interference	Class B (residential area)
Immunity to interference	Industry
Lightning protection	EN 61000-4-5, Installation Class 2
Nominal operating conditions	Ambient temperature: –20 ... +55 °C (Ex: max. +50 °C) Rel. humidity: 10 ... 95 % not condensing
Transport/Storage temperature	–20 ... +70 °C
Screw clamp connector	Single wires and flexible leads up to 2.5 mm^2

Appendix:

Minimum Spans for Current Outputs

The PHU 3400(X)-110 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.

PHU 3400(X)-110 Module

pH	1.00
ORP	100.0
°C	10.0
mV	100.0
rH	1.00
°F	10.0

Calculation Block PH/PH

Diff pH	1.00
Diff ORP	100.0
Diff °C	10.0

Appendix:

Buffer Table "Mettler-Toledo"

°C	pH			
0	2,03	4,01	7,12	9,52
5	2,02	4,01	7,09	9,45
10	2,01	4,00	7,06	9,38
15	2,00	4,00	7,04	9,32
20	2,00	4,00	7,02	9,26
25	**2,00**	**4,01**	**7,00**	**9,21**
30	1,99	4,01	6,99	9,16
35	1,99	4,02	6,98	9,11
40	1,98	4,03	6,97	9,06
45	1,98	4,04	6,97	9,03
50	1,98	4,06	6,97	8,99
55	1,98	4,08	6,98	8,96
60	1,98	4,10	6,98	8,93
65	1,99	4,13	6,99	8,90
70	1,99	4,16	7,00	8,88
75	2,00	4,19	7,02	8,85
80	2,00	4,22	7,04	8,83
85	2,00	4,26	7,06	8,81
90	2,00	4,30	7,09	8,79
95	2,00	4,35	7,12	8,77

Appendix:

Buffer Table "Knick CaliMat"

°C	pH				
Order No.	CS-P0200A/...	CS-P0400A/...	CS-P0700A/...	CS-P0900A/...	CS-P1200A/...
0	2.01	4.05	7.09	9.24	12.58
5	2.01	4.04	7.07	9.16	12.39
10	2.01	4.02	7.04	9.11	12.26
15	2.00	4.01	7.02	9.05	12.13
20	**2.00**	**4.00**	**7.00**	**9.00**	**12.00**
25	2.00	4.01	6.99	8.95	11.87
30	2.00	4.01	6.98	8.91	11.75
35	2.00	4.01	6.96	8.88	11.64
40	2.00	4.01	6.96	8.85	11.53
50	2.00	4.01	6.96	8.79	11.31
60	2.00	4.00	6.96	8,73	11.09
70	2.00	4.00	6.96	8,70	10.88
80	2.00	4.00	6.98	8,66	10.68
90	2.00	4.00	7.00	8,64	10.48

Appendix:

Buffer Table "DIN 19267"

°C	pH				
0	1,08	4,67	6,89	9,48	13,95*
5	1,08	4,67	6,87	9,43	13,63*
10	1,09	4,66	6,84	9,37	13,37
15	1,09	4,66	6,82	9,32	13,16
20	1,09	4,65	6,80	3,27	12,96
25	**1,09**	**4,65**	**6,79**	**9,23**	**12,75**
30	1,10	4,65	6,78	9,18	12,61
35	1,10	4,65	6,77	9,13	12,45
40	1,10	4,66	6,76	9,09	12,29
45	1,10	4,67	6,76	9,04	12,09
50	1,11	4,68	6,76	9,00	11,98
55	1,11	4,69	6,76	8,96	11,79
60	1,11	4,70	6,76	8,92	11,69
65	1,11	4,71	6,76	8,90	11,56
70	1,11	4,72	6,76	8,88	11,43
75	1,11	4,73	6,77	8,86	11,31
80	1,12	4,75	6,78	8,85	11,19
85	1,12	4,77	6,79	8,83	11,09
90	1,13	4,79	6,80	8,82	10,99
95	1,13*	4,82*	6,81*	8,81*	10,89*

* extrapoliert / extrapolated / extrapolée

Appendix:

Buffer Table "NIST Standard" (DIN 19266: 2000-01)

°C	pH			
0				
5	1.668	4.004	6.950	9.392
10	1.670	4.001	6.922	9.331
15	1.672	4.001	6.900	9.277
20	1.676	4.003	6.880	9.228
25	**1.680**	**4.008**	**6.865**	**9.184**
30	1,685	4.015	6.853	9.144
37	1,694	4.028	6.841	9.095
40	1.697	4.036	6.837	9.076
45	1.704	4.049	6.834	9.046
50	1.712	4.064	6.833	9.018
55	1.715	4.075	6.834	9.985
60	1.723	4.091	6.836	8.962
70	1.743	4.126	6.845	8.921
80	1.766	4.164	6.859	8.885
90	1.792	4.205	6.877	8.850
95	1.806	4.227	6.886	8.833

Notice:
The pH(S) values of the individual charges of the secondary reference materials are documented in a certificate of an accredited laboratory. This certificate is supplied with the respective buffer materials. Only these pH(S) values shall be used as standard values for the secondary reference buffer materials. Correspondingly, this standard does not include a table with standard pH values for practical use. The table above ony provides examples of pH(PS) values for orientation.

Appendix:

Buffer Table "Techn. Buffers to NIST"

°C	pH		
0	4.00	7.14	10.30
5	4.00	7.10	10.23
10	4.00	7.04	10.11
15	4.00	7.04	10.11
20	4.00	7.02	10.05
25	4.01	7.00	10.00
30	4.01	6.99	9.96
35	4.02	6.98	9.92
40	4.03	6.98	9.88
45	4.05	6.98	9.85
50	4.06	6.98	9.82
55	4.07	6.98	9.79
60	4.09	6.99	9.76
65	4.09 *	6.99 *	9.76 *
70	4.09 *	6.99 *	9.76 *
75	4.09 *	6.99 *	9.76 *
80	4.09 *	6.99 *	9.76 *
85	4.09 *	6.99 *	9.76 *
90	4.09 *	6.99 *	9.76 *
95	4.09 *	6.99 *	9.76 *

* Values complemented

Appendix:

Buffer Table "Hamilton"

°C	pH				
0	1,99	4,01	7,12	10,19	12,46
5	1,99	4,01	7,09	10,19	12,46
10	2,00	4,00	7,06	10,15	12,34
15	2,00	4,00	7,04	10,11	12,23
20	2,00	4,00	7,02	10,06	12,11
25	**2,00**	**4,01**	**7,00**	**10,01**	**12,00**
30	1,99	4,01	6,99	9,97	11,90
35	1,98	4,02	6,98	9,92	11,80
40	1,98	4,03	6,97	9,86	11,70
45	1,97	4,04	6,97	9,83	11,60
50	1,97	4,06	6,97	9,79	11,51
55	1,97	4,08	6,98	9,77	11,51
60	1,97	4,10	6,98	9,75	11,51
65	1,97	4,13	6,99	9,74	11,51
70	1,97	4,16	7,00	9,73	11,51
75	1,97	4,19	7,02	9,73	11,51
80	1,97	4,22	7,04	9,73	11,51
85	1,97	4,26	7,06	9,74	11,51
90	1,97	4,30	7,09	9,75	11,51
95	1,97	4,35	7,09	9,75	11,51

Appendix:

Buffer Table "Kraft"

°C	pH				
0	2.01	4.05	7.13	9.24	11.47*
5	2.01	4.04	7.07	9.16	11.47
10	2.01	4.02	7.05	9.11	11.31
15	2.00	4.01	7.02	9.05	11.15
20	**2.00**	**4.00**	**7.00**	**9.00**	**11.00**
25	2.00	4.01	6.98	8.95	10.85
30	2.00	4.01	6.98	8.91	10.71
35	2.00	4.01	6.96	8.88	10.57
40	2.00	4.01	6.95	8.85	10.44
45	2.00	4.01	6.95	8.82	10.31
50	2.00	4.00	6.95	8.79	10.18
55	2.00	4.00	6.95	8.76	10.18*
60	2.00	4.00	6.96	8.73	10.18*
65	2.00	4.00	6.96	8.72	10.18*
70	2.01	4.00	6.96	8.70	10.18*
75	2.01	4.00	6.96	8.68	10.18*
80	2.01	4.00	6.97	8.66	10.18*
85	2.01	4.00	6.98	8.65	10.18*
90	2.01	4.00	7.00	8.64	10.18*
95	2.01	4.00	7.02	8.64	10.18*

* Values complemented

Appendix:

Buffer Table "Hamilton A"

°C	pH				
0	1.99	4.01	7.12	9.31	11.42
5	1.99	4.01	7.09	9.24	11.33
10	2.00	4.00	7.06	9.17	11.25
15	2.00	4.00	7.04	9.11	11.16
20	2.00	4.00	7.02	9.05	11.07
25	**2.00**	**4.01**	**7.00**	**9.00**	**11.00**
30	1.99	4.01	6.99	8.95	10.93
35	1.98	4.02	6.98	8.90	10.86
40	1.98	4.03	6.97	8.85	10.80
45	1.97	4.04	6.97	8.82	10.73
50	1.97	4.05	6.97	8.78	10.67
55	1.98	4.06	6.98	8.75	10.61
60	1.98	4.08	6.98	8.72	10.55
65	1.98	4.10	6.99	8.70	10.49
70	1.99	4.12	7.00	8.67	10.43
75	1.99	4.14	7.02	8.64	10.38
80	2.00	4.16	7.04	8.62	10.33
85	2.00	4.18	7.06	8.60	10.28
90	2.00	4.21	7.09	8.58	10.23
95	2.00	4.24	7.12	8.56	10.18

Appendix:

Buffer Table "Hamilton B"

℃	pH				
0	1.99	4.01	6.03	9.31	11.42
5	1.99	4.01	6.02	9.24	11.33
10	2.00	4.00	6.01	9.17	11.25
15	2.00	4.00	6.00	9.11	11.16
20	2.00	4.00	6.00	9.05	11.07
25	**2.00**	**4.01**	**6.00**	**9.00**	**11.00**
30	1.99	4.01	6.00	8.95	10.93
35	1.98	4.02	6.00	8.90	10.86
40	1.98	4.03	6.01	8.85	10.80
45	1.97	4.04	6.02	8.82	10.73
50	1.97	4.05	6.04	8.78	10.67
55	1.98	4.06	6.06	8.75	10.61
60	1.98	4.08	6.09	8.72	10.55
65	1.98	4.10	6.11	8.70	10.49
70	1.99	4.12	6.13	8.67	10.43
75	1.99	4.14	6.15	8.64	10.38
80	2.00	4.16	6.18	8.62	10.33
85	2.00	4.18	6.21	8.60	10.28
90	2.00	4.21	6.24	8.58	10.23
95	2.00	4.24	6.27	8.56	10.18

Appendix:

Buffer Table "HACH"

T [°C]	pH		
0	4,00	7,118	10,30
5	4,00	7,087	10,23
10	4,00	7,059	10,17
15	4,00	7,036	10,11
20	4,00	7,016	10,05
25	**4,01**	**7,000**	**10,00**
30	4,01	6,987	9,96
35	4,02	6,977	9,92
40	4,03	6,970	9,88
45	4,05	6,965	9,85
50	4,06	6,964	9,82
55	4,07	6,965	9,79
60	4,09	6,968	9,76
65	4,10	6,980	9,71
70	4,12	7,000	9,66
75	4,14	7,020	9,63
80	4,16	7,040	9,59
85	4,18	7,060	9,56
90	4,21	7,090	9,52
95	4,24	7,120	9,48

Appendix:

Buffer Table "Ciba"

°C	pH			
0	2,04	4,00	7,10	10,30
5	2,09	4,02	7,08	10,21
10	2,07	4,00	7,05	10,14
15	2,08	4,00	7,02	10,06
20	2,09	4,01	6,98	9,99
25	2,08	4,02	6,98	9,95
30	2,06	4,00	6,96	9,89
35	2,06	4,01	6,95	9,85
40	2,07	4,02	6,94	9,81
45	2,06	4,03	6,93	9,77
50	2,06	4,04	6,93	9,73
55	2,05	4,05	6,91	9,68
60	2,08	4,10	6,93	9,66
65	2,07*	4,10*	6,92*	9,61*
70	2,07	4,11	6,92	9,57
75	2,04*	4,13*	6,92*	9,54*
80	2,02	4,15	6,93	9,52
85	2,03*	4,17*	6,95*	9,47*
90	2,04	4,20	6,97	9,43
95	2,05*	4,22*	6,99*	9,38*

* Extrapolated

Appendix:

Buffer Table "Reagecon"

°C	pH				
0°C	*2,01	*4,01	*7,07	*9,18	*12,54
5°C	*2,01	*4,01	*7,07	*9,18	*12,54
10°C	2,01	4,00	7,07	9,18	12,54
15°C	2,01	4,00	7,04	9,12	12,36
20°C	2,01	4,00	7,02	9,06	12,17
25°C	**2,00**	**4,00**	**7,00**	**9,00**	**12,00**
30°C	1,99	4,01	6,99	8,95	11,81
35°C	2,00	4,02	6,98	8,90	11,63
40°C	2,01	4,03	6,97	8,86	11,47
45°C	2,01	4,04	6,97	8,83	11,39
50°C	2,00	4,05	6,96	8,79	11,30
55°C	2,00	4,07	6,96	8,77	11,13
60°C	2,00	4,08	6,96	8,74	10,95
65°C	*2,00	*4,10	*6,99	*8,70	*10,95
70°C	*2,00	*4,12	*7,00	*8,67	*10,95
75°C	*2,00	*4,14	*7,02	*8,64	*10,95
80°C	*2,00	*4,16	*7,04	*8,62	*10,95
85°C	*2,00	*4,18	*7,06	*8,60	*10,95
90°C	*2,00	*4,21	*7,09	*8,58	*10,95
95°C	*2,00	*4,24	*7,12	*8,56	*10,95

* Values complemented

SW 3400-002: Specifiable Buffer Sets

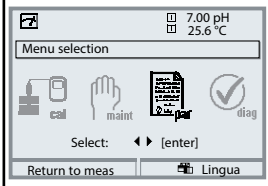
Select menu: Parameter setting/System control/Buffer table
Individual buffer set (with 3 buffer solutions) for pH measurement

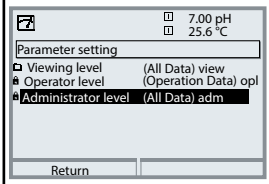
Buffer Table
You can enter an individual buffer set (with 3 buffer solutions). To do so, you enter the nominal buffer values for the correct temperature (range 0 ... 95 °C, 5°C steps. Min. distance between buffers in the whole temperature range: 1 °C). Then this buffer set is available in addition to the permanently set standard buffer solutions in the "Calimatic buffer" menu (select "Table").

Menu	Display	Buffer table: Entering values
par	HOLD 7.20 pH 25.6 °C System control (Administrator) Calculation Blocks Point of measurement Release of options Logbook Buffer table Concentration table Return	**Enter buffer set** • Open parameter setting • System control • Select "Buffer table"
	HOLD 7.10 pH 25.6 °C Buffer table (Administrator) Buffer 1 Buffer 2 Buffer 3 Return	• Select buffer to be entered
	HOLD 7.10 pH 25.6 °C Buffer 1 (Administrator) Nominal buffer value +04.00 pH pH value at 00 °C +04.00 pH pH value at 05 °C +04.00 pH pH value at 10 °C +04.00 pH pH value at 15 °C +04.00 pH pH value at 20 °C +04.00 pH Return	• Enter nominal buffer value and all other values for the correct temperature (right/left arrow keys to select position, up/down arrow keys to edit number, confirm with **enter**.)

The special buffer set is selected as follows:
Parameter setting/Module pH/Cal preset values/Calimatic buffer/Table.

Overview of Parameter Setting





Parameter setting

Activated from measuring mode: Press **menu** key to select menu. Select parameter setting using arrow keys, confirm with **enter**.

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) • Record logbook • Register recorder • Decimal separator • Card full • Format	Menu only appears with SmartMedia Card inserted. Make sure that it is a memory card, not an update card. Commercially available SmartMedia cards must be formatted in the analyzer before they can be used as memory card.
Copy configuration	The complete configuration of an analyzer can be written on a SmartMedia card. This allows transferring all device settings to other devices with identical equipment (exception: options and passcodes).
Parameter sets • Load • Save	2 parameter sets (A,B) are available in the analyzer. The currently active parameter set is read on 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 SmartMedia card (Option) is used.
Function control matrix • Input OK2 • Left softkey • Right softkey	Selecting the control element for the following functions: - Parameter set selection - KI recorder (start/stop) - Favorites menu (selected diagnostics functions) - Unical (fully automated probe controller)
Time/date	Selecting the display format, entry
Point of meas description	Can be called from the diagnostics menu.
Release of options	A TAN is required to release an Option.
Software update	Software update from SmartMedia card (update card)
Logbook	Selecting events to be recorded
Buffer table	Entering own buffer set for automatic calibration
Factory setting	Resetting all parameters to factory setting
Passcode entry	Editing the passcodes

Parameter Setting Menu

Display settings: FRONT module

Languages

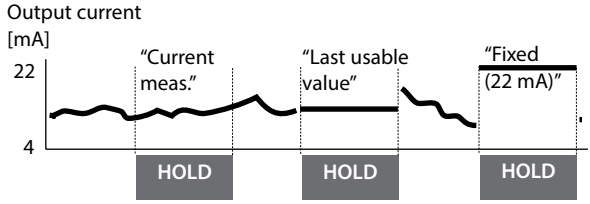
Measurement display • Main display • Display format • Viewing angle	Representation of measured values on the display: - Selecting the number of primary values displayed (one or two) - Decimal places
Measurement recorder • Time base • Zoom function • Min/Max display	Option: 2-channel, selection of process variable, start and end
KI recorder	Option: See more detailed "Options" manual

Signal outputs and inputs, contacts: BASE module

Output current I1, I2
- Variable
- Curve
- Output (0/4 - 20 mA)
- Output filter
- Behavior during messages
  - HOLD
  --- Current meas.
  --- Last usable value
  --- Fixed 22 mA
  - 22 mA message

2 current outputs, separately adjustable

Behavior during messages



Contact K4
- Contact type
- ON delay
- OFF delay

NAMUR failure

Contacts K3, K2, K1
- Usage
- Maintenance request
- HOLD (function check)
- Limit value (adjustable)
- Rinse contact (adjustable)
- Parameter set B active
- USP output
- KI recorder active
- Sensoface
- Controller alarm (alarm output Unical/Uniclean)
- Contact type / ON/OFF delay

Factory setting:
K3: Maintenance request, K2: HOLD, K1: Limit

- Variable, limit value, hysteresis, effective direction, ...
- Rinsing interval, lead times, rinse duration, logbook entry, ...

Inputs OK1, OK2
- OK1 usage
  - Signal level

Optocoupler - signal inputs
Off, HOLD (function check)
active level switchable from 10 to 30 V or < 2 V, resp.
For OK2 see System control/Function control matrix

Parameter Setting Menu

PHU 3400(X)-110 Module

Input filter

Sensor data • Sensor type • Temperature detection • Sensoface • Sensor monitoring Details - Slope - Zero point - Sensocheck ref. el. - Sensocheck glass el. - Response time - Calcheck	Representation of measured values on the display: - Select - Selection for Measurement / Calibration
Cal preset values • Calimatic buffer - Knick - Mettler Toledo - Merck/Riedel - DIN 19267 - NIST standard / technical - Hamilton - Kraft - Hamilton A / B - HACH - Ciba - Reagecon - Table • Drift check • Cal timer • Cal tolerance band • ORP check	
TC process medium	Select: Off, linear, ultrapure water, table
ORP/rH value • Reference electrode • ORP conversion to SHE • Calculate rH with factor	
Delta function	
Messages • pH value • ORP value • rH value • Temperature • mV value	

Parameter Setting Menu

Unical 9000

Control	On / Off (automatic calibration)
Cal preset values	Select calibration method for automatic control
• Measuring module	- Select measuring module
• Cal buffer 1	- Menu entry depending on selected sensor type
• Cal buffer 2	
• Cal mode	Check / Adjustment
• Cal timer program	Automatic program start when cal timer has expired
Time control	
• Fixed interval	Select program (Cleaning, Cal 2point, ..., Off) and interval
• Week program	Select up to 10 programs per weekday, adjustable for each program are: mode (individual start / interval), start and end time. Programmed weekdays can be copied.
Program flow	Configuring the detailed program sequences (Cleaning, Cal 1point calibration, Cal 2point calibration, Parking, User1 ... 2 - for free programming)
Installation	For first start-up or change of configuration
• Meas. procedure	Continuous (probe always in the process) / Short-time
• External control (DCS)	When external controllers such as SiMatic® are used Setting the active signal level (10 ... 30 V or < 2 V)
- DCS inputs (36/39)	Control inputs
- M/S input (42/43)	Control input Measuring / Service
- A/M input (40/41)	
- DCS output 34	Measuring / Alarm
- DCS outputs (31...34)	Select switch function (N/O or N/C)
• Sensor detection	Monitoring as a dismount guard
• Immersion lock	
• Access manual control	4-digit access code; access from maintenance menu
• Probe	
- Probe type	
- Max. move time	
- Sealing water	
- Cavity rinsing	
- Check interval	
- Maintenance interval	
• Rinse water	
- Monitoring	Off / Process value / Temperature
• Media adapter	
- Port I	Usage: Metering pump / Off
- Medium	Buffer 7.00
- Displaced volume	25 / 50 / 75 / 100 ml
- Residual volume	0 / 250 / 500 ml
- Monitoring	Process value / Temperature / Off
- Setpoint	7.00 pH (default)
- Adm. deviation	00.50 pH (default)

Parameter Setting Menu

Unical 9000

• Media adapter	
- Port II	Usage: Metering pump / Off
- Medium	Buffer 4.01
- Displaced volume	25 / 50 / 75 / 100 ml
- Residual volume	0 / 250 / 500 ml
- Monitoring	Process value / Temperature / Off
- Setpoint	7.00 pH (default)
- Adm. deviation	00.50 pH (default)
- Port III	Usage: Cleaning valve / Metering pump / Off
- Medium	Cleaning agent
- Displaced volume	25 / 50 / 75 / 100 ml
- Residual volume	0 / 250 / 500 ml
- Monitoring	Process value / Temperature / Off
- Setpoint	9.21 pH (default)
- Adm. deviation	00.50 pH (default)
• Additional media	
- Additional medium 1	On/Off
- Medium	Purge air _ _ _ _ _
- Monitoring	Process value / Temperature / Off
- Setpoint	7.00 pH (default)
- Adm. deviation	00.50 pH (default
- Additional medium 2	On/Off
- Medium	Aux Medium _ _ _ _ _
- Monitoring	Process value / Temperature / Off
- Setpoint	7.00 pH (default)
- Adm. deviation	00.50 pH (default)
• Start-up	Yes/No Makes sure that the tubings between media adapter and probe are filled with calibration medium
• System forecast	Off/On: Monitors the probe travel for predictive maintenance of Ceramat und SensoGate

Calibration Menu (Manual)

PHU 3400(X)-110 Module

Calimatic
Entry of buffer values
Product calibration
Data entry
ORP calibration

Maintenance Menu

BASE Module

Current source	Output current definable 0 ... 22 mA

PHU 3400(X)-110 Module

Sensor monitor	pH / ORP input, RTD, Temp, Impedance glass + ref. el.
Temp probe adjustment	Compensating for lead length

Probe control

Start probe maintenance	Service program is executed, Cal starts are possible
Manual control	Access to all control elements, passcode required (Admin. level / Parameter setting / Unical 9000 / Installation)
Single step control	Possibility to test the program flows
Probe wear	Reset check counter / maintenance counter

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

PHU 3400(X)-110 Module

Module diagnostics	Internal function test
Sensor monitor	Shows the values currently measured by the sensor
Cal record	Data of last adjustment / calibration
Cal record ORP	Data of last ORP adjustment / calibration
Sensor network diagram PH	Graphical representation of the sensor parameters
Statistics	Displays first calibration and deviations of last 3 calibrations

Unical 9000

Unical status
Unical network diagram
System forecast

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Icon	Explanation of icons important for the PHU 3400(X)-110 module
	The analyzer is in measuring mode.
	The analyzer is in calibration mode. HOLD mode active for currently calibrated module.
	The analyzer is in maintenance mode. HOLD mode active.
	The analyzer is in parameter setting mode. HOLD mode active.
	The analyzer is in diagnostics mode.
NAMUR signals 	HOLD. The NAMUR "HOLD" contact is active (factory setting: Module BASE, Contact K2, N/O contact). Current outputs as configured: • Current meas.: The currently measured value appears at the current output • Last usable value: The last measured value is held at the current output • Fixed 22 mA: The output current is at 22 mA
	Failure. The NAMUR "failure" contact is active (factory setting: Module BASE, Contact K4, N/C contact). To view error message, call up: Diagnostics menu/Message list
	Maintenance. The NAMUR "maintenance request" contact is active (factory setting: Module BASE, Contact K2, N/O contact). To view error message, call: Diagnostics menu/Message list
 man	Temperature by manual input
	Calibration is performed (progress display)
	Calibration - Step 1 of product calibration has been executed. The analyzer is waiting for the sample values.
TC	Temperature compensation for process medium is active (Linear/Ultrapure water/Table)
Δ	Delta function is active (Output value = measured value – delta value)
	In the plaintext display in front of a menu line: Access to next menu level with **enter**
	In the plaintext display in front of a menu line when it has been blocked by the Administrator against access from the Operator level.
	Designates the module slot (1, 2, or 3), allowing the clear assignment of measured-value/ parameter displays in the case of identical module types.
	Indicates the active parameter set .(The analyzer provides two parameter sets A and B. Up to 5 sets can be added using additional functions and SmartMedia card.)

Icon	Explanation of icons important for the probe controller
	The probe is in MEASURE position (“PROCESS”)
	The probe is in SERVICE position
	Rinse water active
	Metering pump at media adapter port I active.
	Metering pump at media adapter port II active.
	Metering pump at media adapter port III active.
	Additional medium 1 activated
	Additional medium 2 activated
	Valve at port III active
	Probe in SERVICE position
	Probe changes position
	Probe in MEASURE position (“PROCESS”)

Menu Selection

PHU 3400(X)-110 Module

Quick Access

Functions for Uniclean 900(X) Controller

Quick Access

Functions for Unical 9000(X) Controller
(For Uniclean 900(X) probe controller, see previous page.)

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