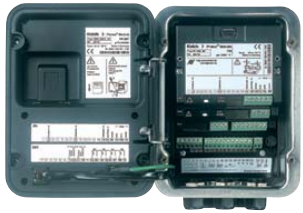
Measuring Module M700® pH 2700i(X)

For Simultaneous Measurement of pH Values, ORP, and Temperature



METTLER TOLEDO

74763

Warranty

Defects occurring within 1 year from delivery date shall be remedied free of charge at our plant (carriage and insurance paid by sender). Sensors, fittings, and accessories: 1 year.

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

The following registered trademarks are used in this instruction manual without further marking

SMARTMEDIA®
is a registered trademark of Toshiba Corp., Japan

FOUNDATION FIELDBUS™
is a trademark of Fieldbus Foundation, Austin, USA

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Subject to technical changes.

CE

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Bank | Credit Suisse First Boston, Zürich (Acc. 0835-370501-21-90)

Declaration of conformity
Konformitätserklärung
Déclaration de conformité

CE

We/ Wir/Nous

Mettler-Toledo GmbH, Process Analytics
Im Hackacker 15
8902 Urdorf
Switzerland

declare under our sole responsibility that the product,
erklären in alleiniger Verantwortung, dass dieses Produkt,
déclarons sous notre seule responsabilité que le produit,

Description
Beschreibung/Description

pH 2700i
to which this declaration relates is in conformity with the following standard(s) or other normative document(s).
auf welches sich diese Erklärung bezieht, mit der/den folgenden Norm(en) oder Richtlinie(n) übereinstimmt.
auquel se réfère cette déclaration est conforme à la (aux) norme(s) ou au(x) document(s) normative(s).

EMC Directive/
EMV-Richtlinie/
Directive concernant la CEM

89/336/EWG

Low-voltage directive/
Niederspannungs-Richtlinie/
Directive basse tension

73/23/EWG

Place and Date of issue/
Ausstellungsort/ - Datum
Lieu et date d'émission

Urdorf, September 15, 2005

Mettler-Toledo GmbH, Process Analytics

Waldemar Rauch
General Manager PO Urdorf

Thomas Hösli
Head of Operations and R&D

Norm/ Standard/ Standard

EN 61326 / VDE 0843 Teil 20
EN 61010-1 / VDE 0411 Teil 1

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Declaration of conformity
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Déclaration de conformité

CE 0344

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Switzerland

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Explosion protection
Explosionsschutzrichtlinie
Prot. contre les explosions

94/9/EG
KEMA 04 ATEX 2056
NL-6812 AR Arnhem, KEMA 0344

EMC Directive/
EMV-Richtlinie/
Directive concernant la CEM

89/336/EWG

Low-voltage directive/
Niederspannungs-Richtlinie/
Directive basse tension

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Lieu et date d'émission

Urdorf, October 31, 2005

Mettler-Toledo GmbH, Process Analytics

Waldemar Rauch
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Head of Operations and R&D

Norm/ Standard/ Standard

EN 50014 **EN 50281-1-1**
EN 50020 **EN 50284**
EN 61326 / VDE 0843 Teil 20
EN 61010-1 / VDE 0411 Teil 1

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CE_M700_Modul_pH_2700i_X.doc

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Intended Use

The module is used for simultaneous pH, ORP, and temperature measurement with glass electrodes, ISFET sensors, or ISM sensors (Intelligent Sensor Management). The use of ISFET sensors requires an additional function which can be enabled by a separately orderable TAN.

The pH 2700iX 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 M700(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:
pH 2700iX Module

When using the pH 2700iX module, the stipulations for electrical installations in hazardous areas (EN 60079-14) must be observed. When installing the device outside the range of applicability of the 94/9/EC directive, the appropriate standards and regulations in the country of use must be observed. The module has been developed and manufactured in compliance with the applicable European guidelines and standards.

Compliance with the European Harmonized Standards for use in hazardous locations is confirmed by the EC-Type-Examination Certificate.
Compliance with the European guidelines and standards is confirmed by the EC Declaration of Conformity.

There is no particular direct hazard caused by the operation of the device in the specified environment.

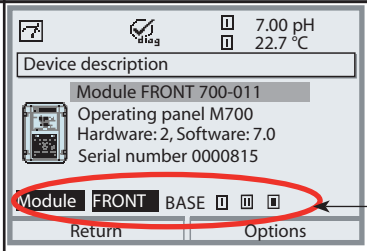
Software Version

pH 2700i(X) Module

Device Software M 700(X)
The pH 2700i module is supported by software version 6.0 or higher.
The pH 2700iX module is supported by software version 6.0 or higher.

Module Software pH 2700i(X)
Software version 2.x

Query Actual Device/Module Software
When the analyzer is in measuring mode:
Press **menu** key, open Diagnostics menu.

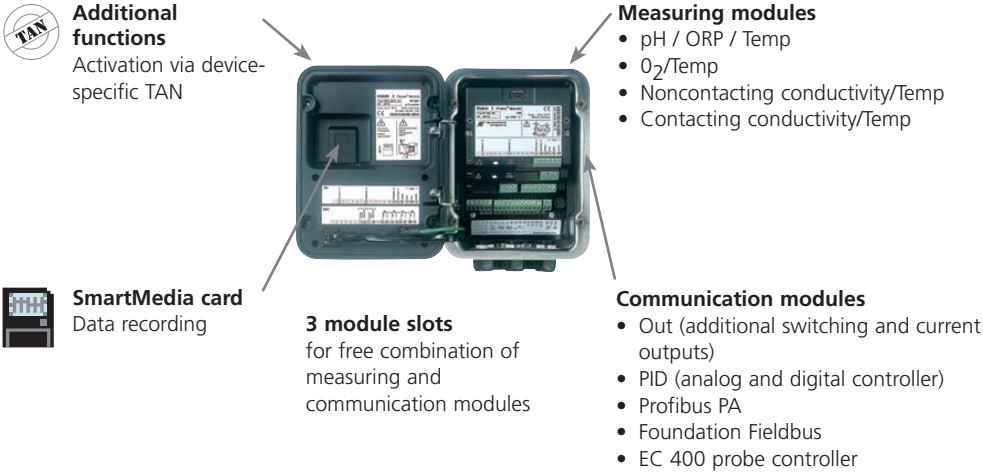
Menu	Display	Device description
diag		Provides information about all modules installed: Module type and function, serial number, hardware and software version and device options. Select the different modules (FRONT, BASE, slots 1 - 3) using the arrow keys.

Modular Concept

Basic Unit, Measuring Module, Additional Functions

The M 700(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.

M 700(X) Modular Process Analysis System



Documentation

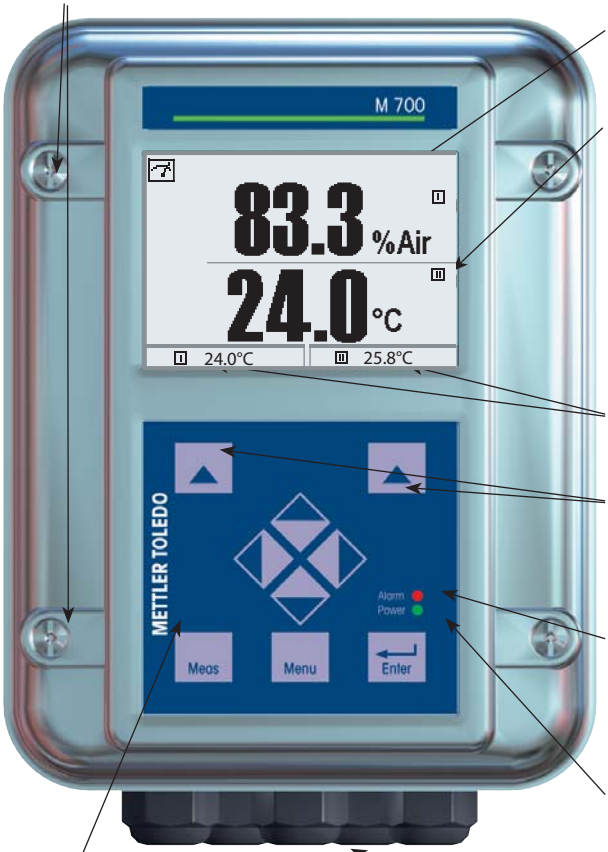
The basic unit is accompanied by a CD-ROM containing the complete documentation.
Latest product information as well as instruction manuals for earlier software releases are available at **www.mt.com/pro**.

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, and 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.

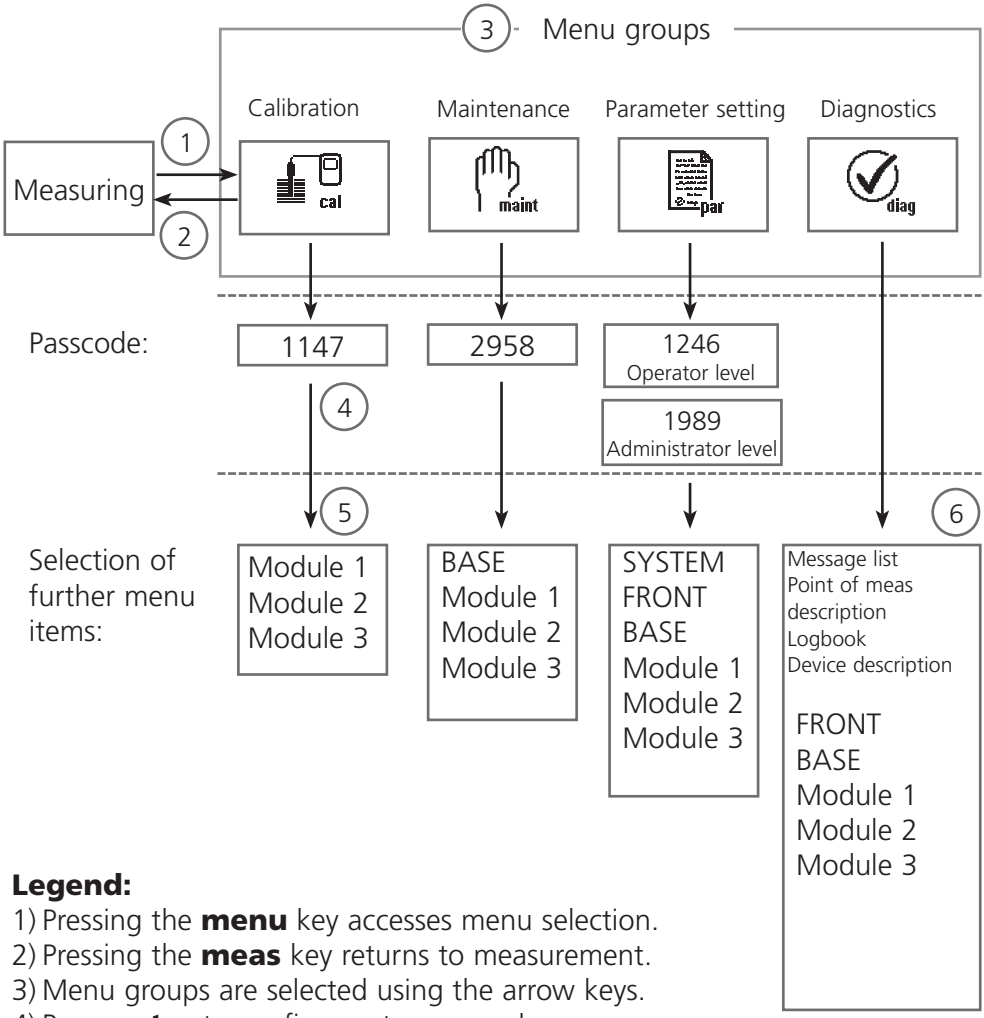
Green LED
Voltage supply okay

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

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:

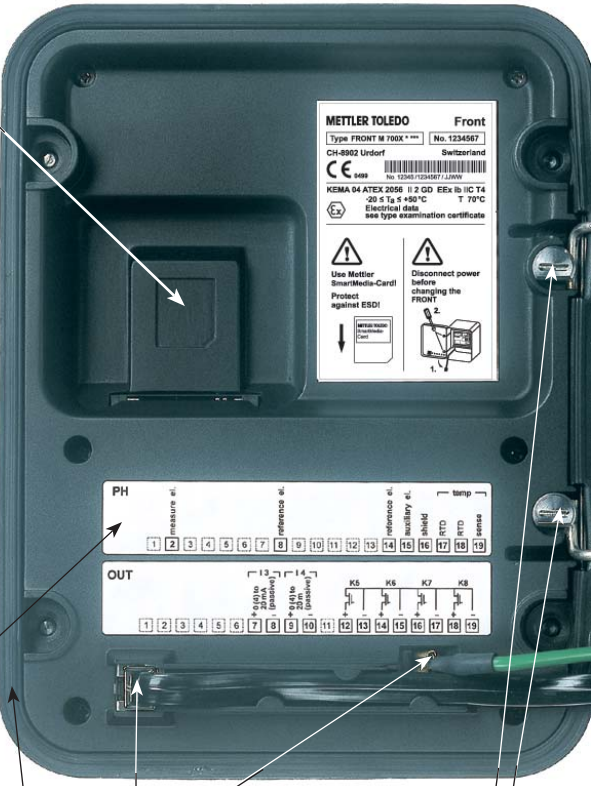
1) Pressing the **menu** key accesses menu selection.
2) Pressing the **meas** key returns to measurement.
3) Menu groups are selected using the arrow keys.
4) Press **enter** to confirm, enter passcode.
5) Further menu items are displayed.
6) Selected functions of the Diagnostics menu can be recalled 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. The 2 internal parameter sets can be switched by remote control.
  Configurations 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



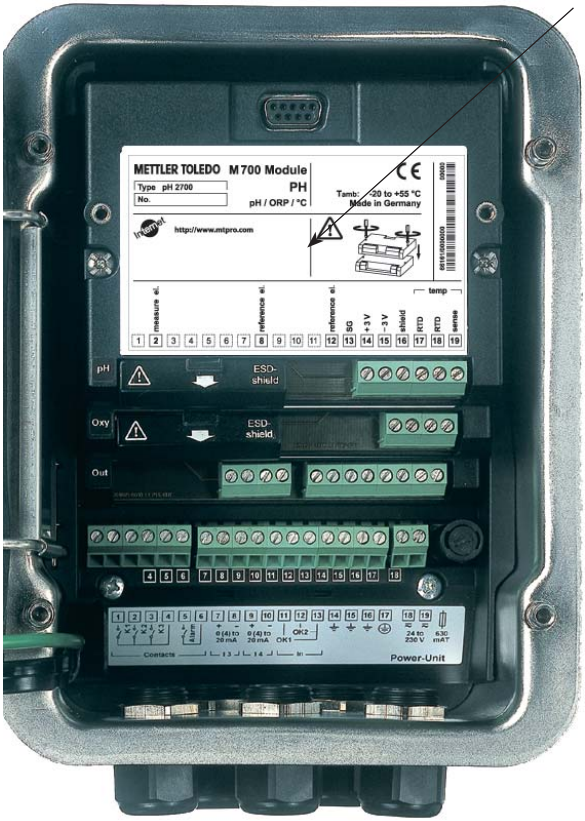
Terminal plates of "hidden" modules
Each module comes with an adhesive label containing the contact assignments. This label should be sticked to the inner side of the front (as shown). Then, the terminal assignments remain visible even if further modules are inserted.

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.
Caution! 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.

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

Power supply units, IS 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.

ISM - Intelligent Sensor Management

The pH 2700i(X) module allows the connection of ISM sensors.
ISM is an open system that is compatible to existing connection systems (VP 8 or K8S for digital sensors) and permits the use of conventional sensors. The system is not restricted to pH measurement. Sensors from different manufacturers can be connected. During pH measurement it is still possible to continuously monitor the glass and reference electrode.

ISM sensors have an "electronic datasheet" which allows the storage of additional operating parameters such as calibration date and settings directly in the sensor.
An ISM sensor is immediately identified due to the "Plug & Measure" concept. This ensures the clear assignment of a sensor to a measuring point. The risk of confusing the sensors is eliminated. The sensors can be precalibrated in the lab. On-site calibration/adjustment is no more required.

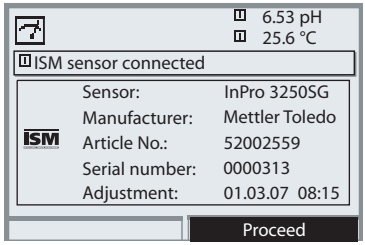
Information Available in the ISM Sensor

Each sensor is clearly identified by the unalterable factory data (manufacturer, sensor description).
Data for predictive maintenance can be transferred from the meter to the sensor (for example the maximally permitted number of CIP/SIP cycles).
Statistical data inform on the product life cycle of the sensor: data of the last 3 calibrations, cal record, buffer values, voltages, temperature, response time, glass and reference impedance.
This allows a comprehensive diagnostic:
- Wear indication
- Adaptive calibration timer

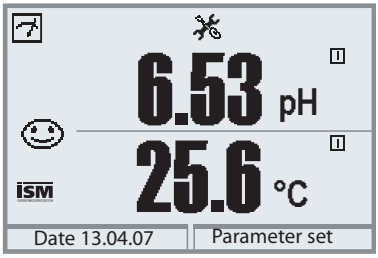
Taking over the Minimum/Maximum Temperature

The maximum temperature range is stored in the ISM sensor.
When "Sensor monitoring Auto" has been selected, the value pair for the maximum + minimum temperature is automatically taken over from the sensor.

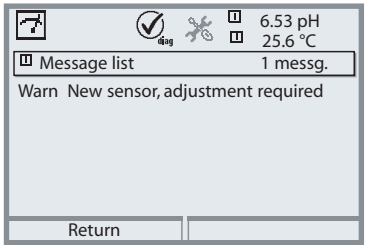
Thanks to the "Plug & Measure" method, an ISM sensor is immediately identified after being connected:



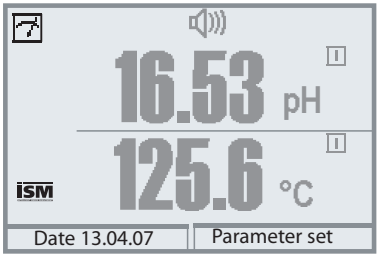
All sensor-typical parameters are automatically sent to the analyzer.
These are, for example, the measurement range, zero and slope of the sensor, but also the type of temperature probe. Without any further parameter setting, measurement starts at once, the measuring temperature is simultaneously detected.
With "Plug&Measure", premeasured ISM sensors can immediately be used for measurement without previous calibration.



The ISM logo is displayed as long as an ISM sensor is connected.
When the ISM sensor has not been adjusted, the "maintenance request" icon is displayed.

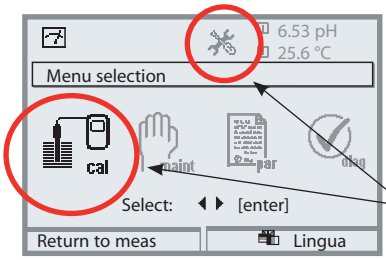


A new entry is added to the message list of the Diagnostics menu:
Warn New sensor, adjustment required



Failure Message (incorrect meas. values)
Measured value, alarm icon, and module slot identifier are flashing.
The flashing means:
Caution! The displayed value is no "valid" measured value!

Prior to first use, an ISM sensor must be calibrated:

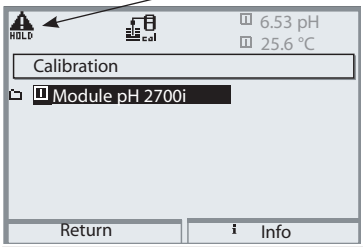


To call up calibration
Press **menu** key to select menu.
The measured values (upper right corner) and the "alarm" and "calibration" icons are flashing. (The analyzer classifies the values as "invalid" because of the missing calibration).

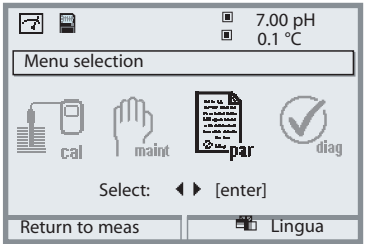
Select calibration using arrow keys, confirm with **enter**. Passcode: 1147.
(To change passcode, select: Parameter setting/ System control/Passcode entry).
After passcode entry, the system is in "HOLD" mode: Current outputs and relay contacts behave as configured* and supply either the last measured value or a fixed value until the Calibration menu is exited.

* The current outputs / relay contacts are configured in the BASE module or the communication modules (Out).

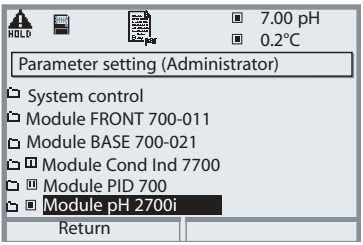
The HOLD mode is indicated by the "Hold" icon (upper left of display).



Select module using arrow keys, confirm with **enter**.

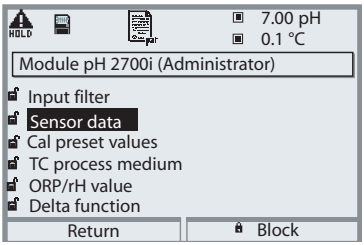


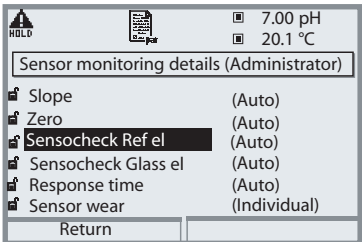
Configuring an ISM sensor is considerably safer and easier than configuring a conventional sensor. Since ISM sensors have an "electronic datasheet", many parameters are already provided by the sensor and automatically taken over by the analyzer.



To enter the process-related parameters, select:

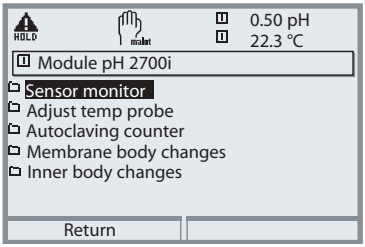
- Parameter setting
- Module selection
- Sensor data





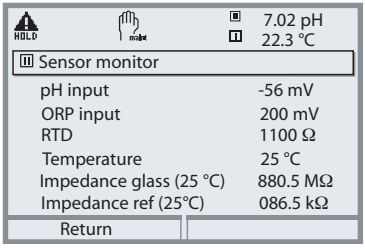
Sensor Monitoring Details

When an ISM sensor is connected, the values for slope, zero, reference and glass impedance (pH electrodes), response time, and max./min. temperatures are automatically read by the module. Individual specifications are not overwritten by the ISM data. Additional specifications are required for sensor wear, CIP/SIP counter, autoclaving counter, and sensor operating time. The tolerance limits are displayed in gray.



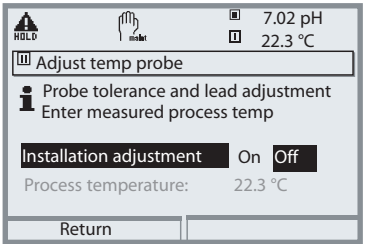
ISM sensors provide important tools for predictive maintenance.
The settings are made in the

- Maintenance menu / Module selection



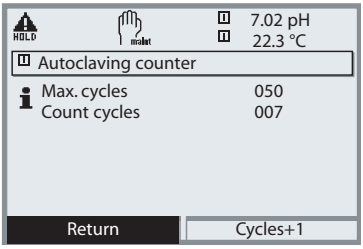
Sensor Monitor

for validation of sensor and complete measured-value processing.



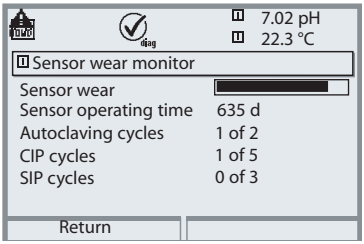
Temp Probe Adjustment

This function is used for compensating for the individual tolerance of the temperature probe and the influence of the lead resistances.
Adjustment may only be carried out after 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!



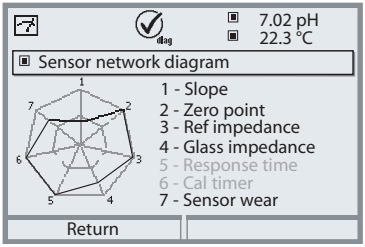
Autoclaving Counter (ISM only)

When setting the sensor data, the maximum number of autoclaving procedures permitted must be specified. Then, each cycle can be recorded in the Maintenance menu. This shows how many autoclaving cycles are still permitted.



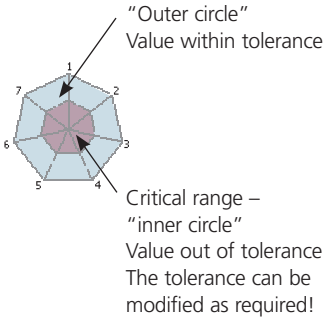
Sensor Wear Monitor (ISM only)

The Diagnostics menu provides single-glance information on the current sensor wear.
In addition, the sensor operating time as well as the number of executed autoclaving, CIP, or SIP cycles are indicated.

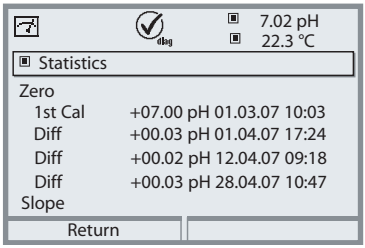


Sensor Network Diagram

- Slope
- Zero
- Reference impedance
- Glass impedance
- Response time
- Calibration timer
- Sensor wear



The measured values are continuously monitored during the measurement process. The sensor network diagram provides at-a-glance information about critical parameters.
If a tolerance limit has been exceeded, the respective parameter is flashing.
Values in gray: Monitoring switched off.



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).

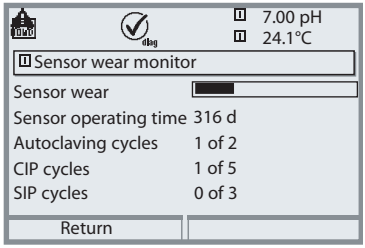
For ISM, the data are stored in the sensor.

CIP/SIP Cycles

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

CIP/SIP cycles are used for cleaning or sterilizing the process-wetted parts in the process. They are performed for biotech applications, for example. Depending on the application, one (alkaline solution, water) or more chemicals (alkaline solution, water, acidic solution, water) are used.
The temperatures for CIP are around 80 °C, for SIP around 110 °C.
These procedures extremely stress the sensors.
ISM sensors can release a message when a preset number of CIP/SIP cycles is exceeded. This allows replacing the sensor in time.

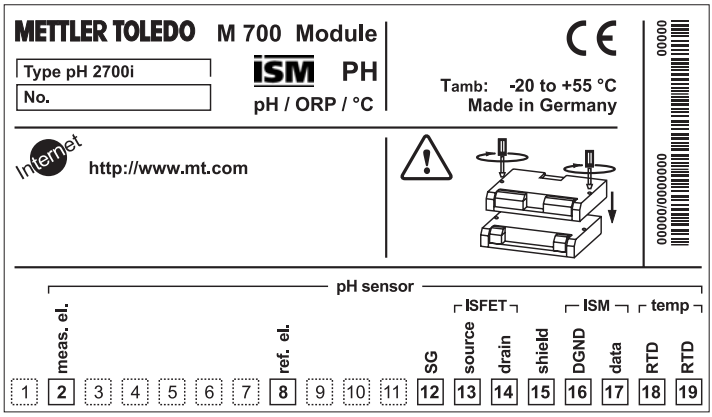
Example of CIP Cycle:
The device automatically recognizes the CIP and SIP cycles and correspondingly increments the counter. The user can specify the max. number of cycles and decide whether a message is to be generated when this number is exceeded.
These data are not overwritten even after sensor replacement.
The number of CIP cycles is shown in the sensor wear monitor of the Diagnostics menu when an individual max value has been specified.



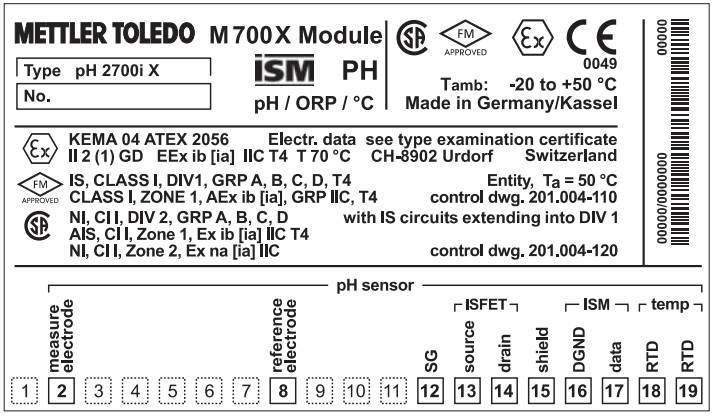
Notice:
The counters are incremented no earlier than 2 hours after start of the cycle, even if the cycle itself has already been terminated.

Terminal Plate pH 2700i(X) Module

Terminal Plate pH 2700i Module:



Terminal Plate pH 2700iX 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!

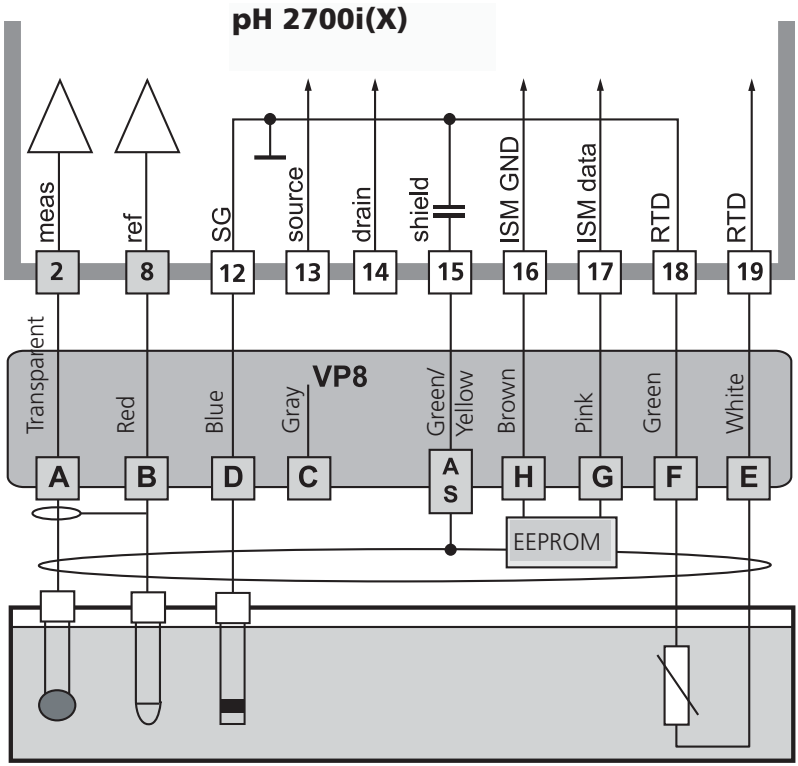
The terminals 2 and 8 are covered by an ESD shield. To connect the sensor cable, just pull it back.

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. Close device, tighten screws at the front
9. Switch on power supply
10. Set parameters

Wiring Example 1

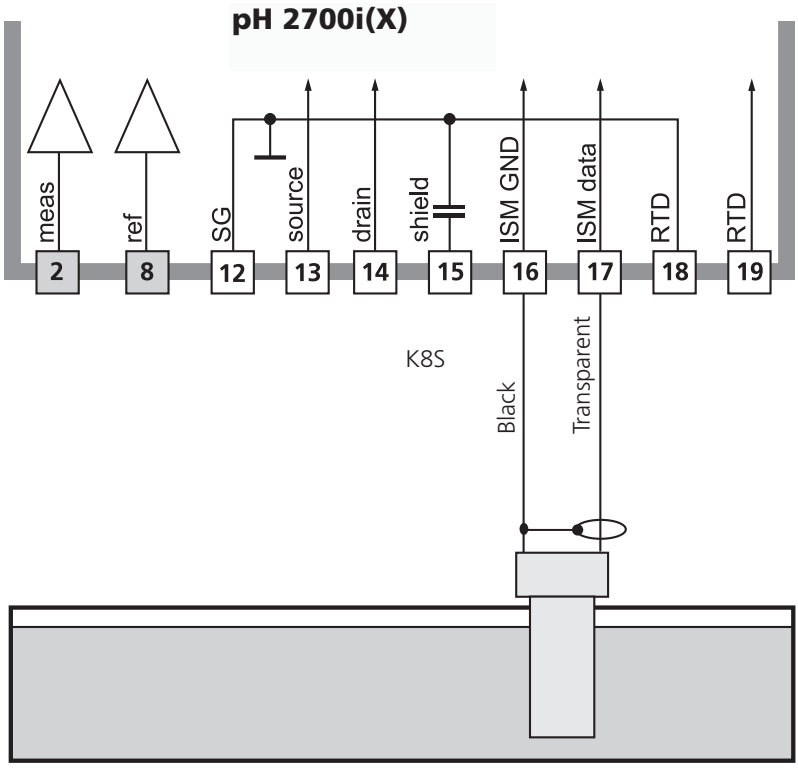
pH/ORP measurement with glass electrode and ISM
VP connection, Sensocheck of glass and reference electrode



Notice:
Compatible to VP6 connection (without ISM functionality).

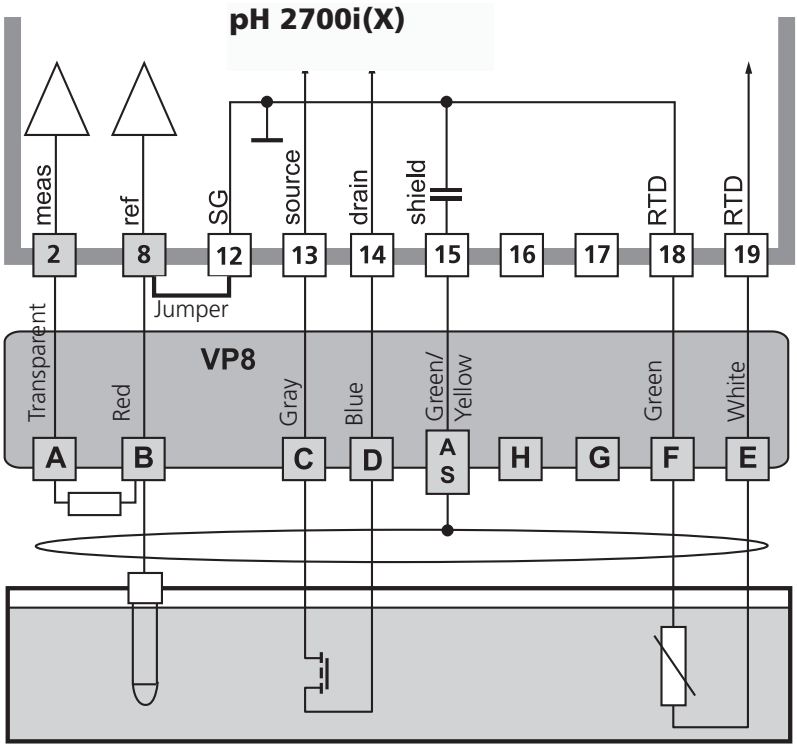
Wiring Example 2

Digital ISM sensors, K8S connection



Wiring Example 3

pH measurement with InPro 3300 ISFET sensor



Notice:

Each time a new sensor is connected, you must perform an ISFET zero adjustment to adjust the operating point.

After that, you should perform one of the following calibration methods:

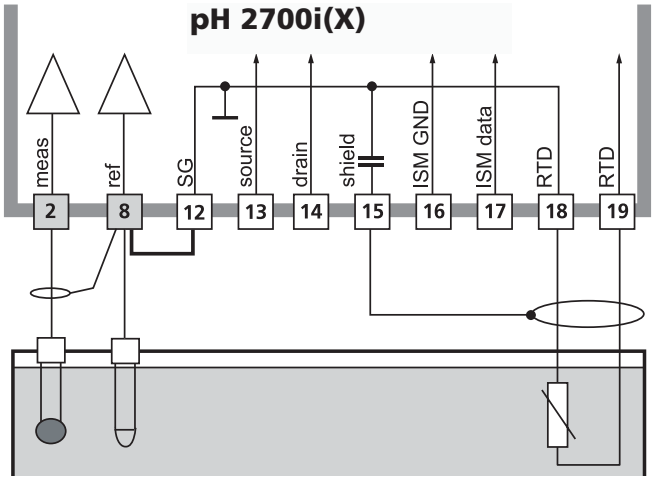
- Calimatic: automatic calibration
- Manual entry of buffer values
- Data entry: premeasured electrodes

Wiring Examples

Note: Be sure to connect the shielding properly!

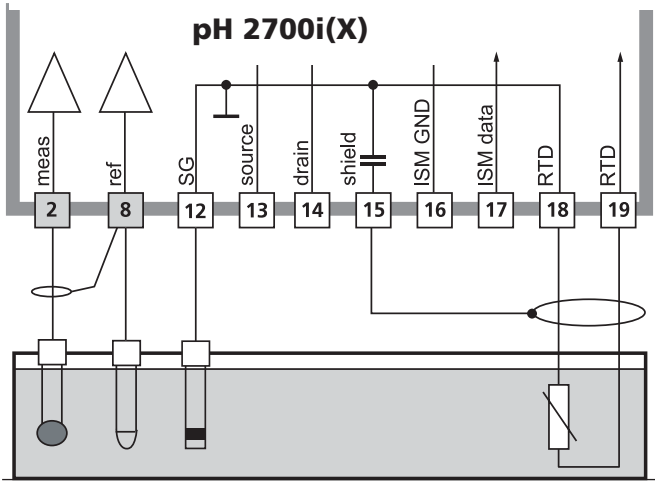
Wiring Example 4

pH measurement with Sensocheck of glass electrode



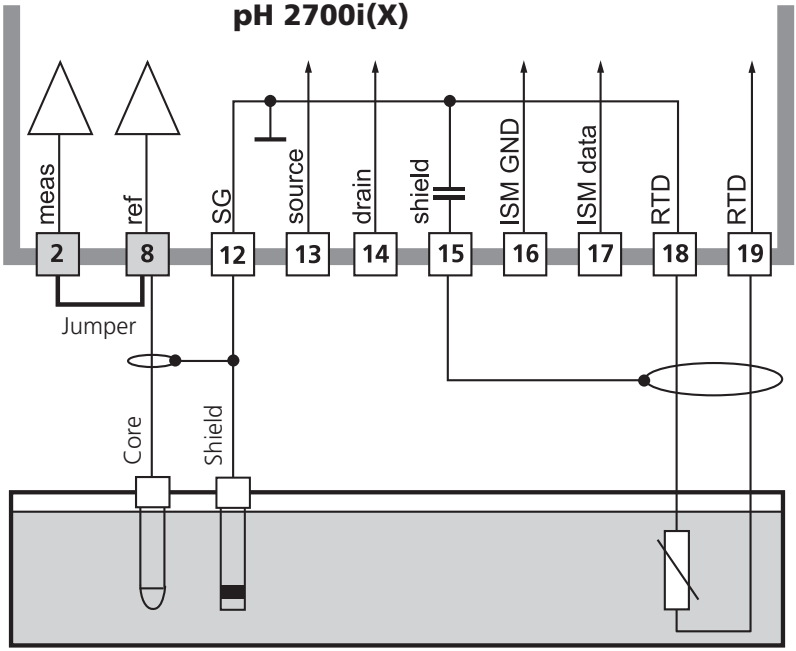
Wiring Example 5

Simultaneous pH and ORP measurement
with Sensocheck of glass and reference electrode



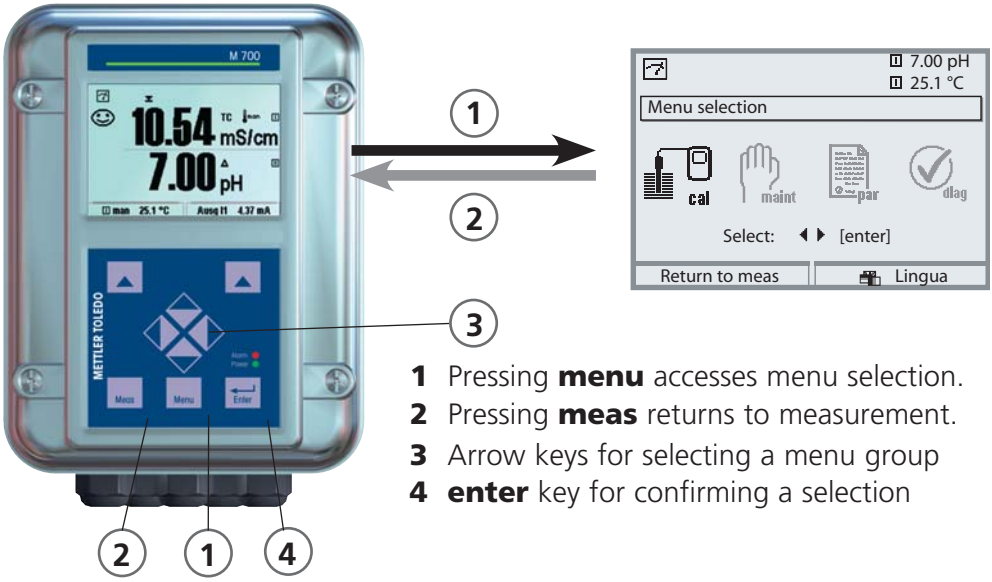
Wiring Example 6

Wiring example ORP measurement
with Sensocheck of reference electrode



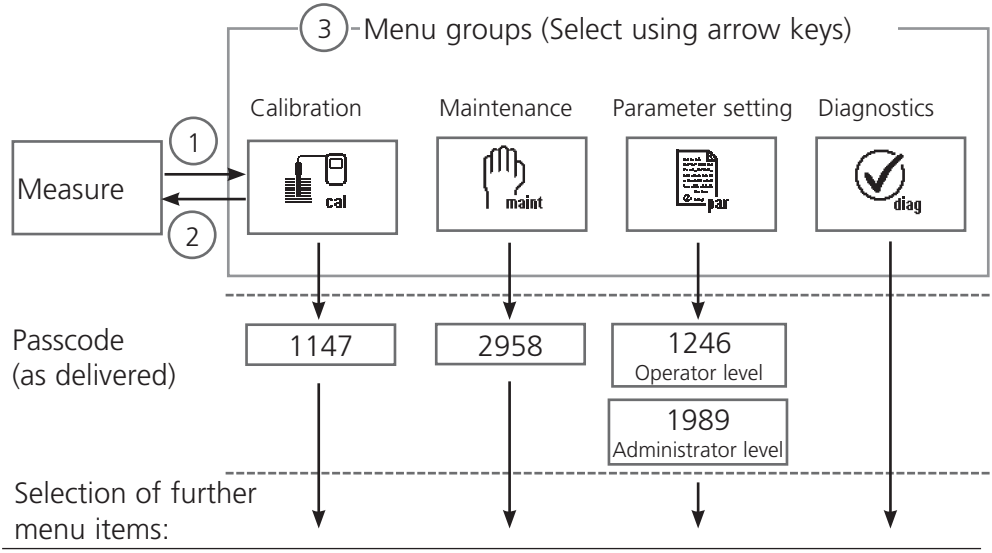
Menu Selection

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

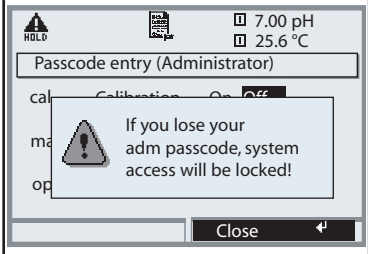
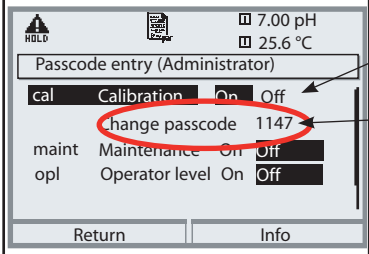
Menu Structure



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, confirm with **enter**.

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

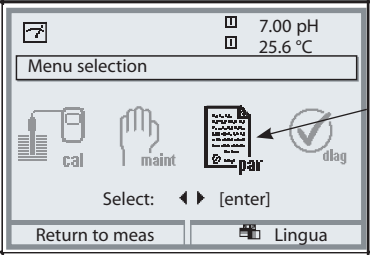
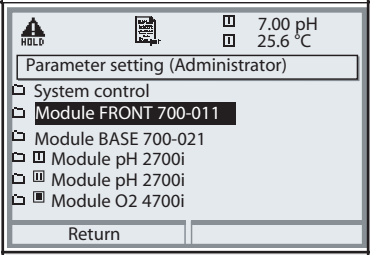
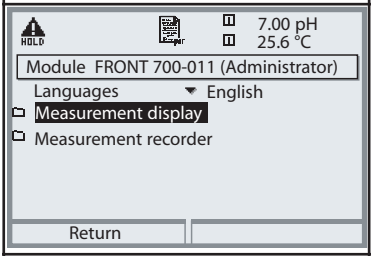
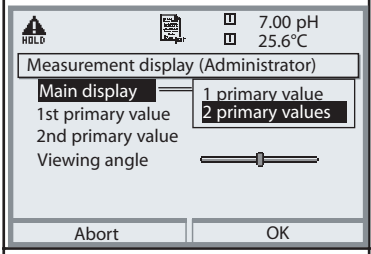
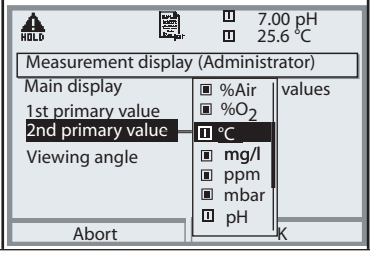
Select menu: Parameter setting/Module FRONT/Measurement display

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 display for
2 pH measurement points.

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 Menu selection 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 with **enter**. Pressing the **meas** key returns to measurement.

Calibration / Adjustment

Note: HOLD mode active for the currently calibrated module
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

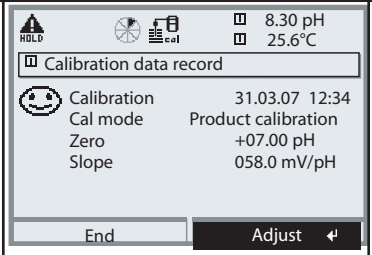
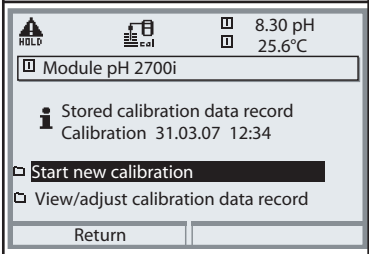
Zero is the pH value at which the pH electrode outputs the voltage 0 mV. It is different for each electrode and changes with age and wear.

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 pH 2700i(X) 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 700-107 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 M 700. 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 M 700. 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.

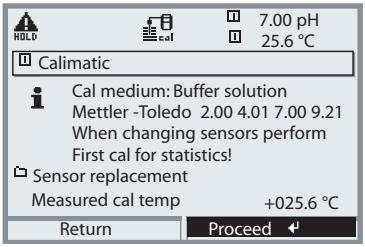
Sensor Replacement (First Calibration)

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

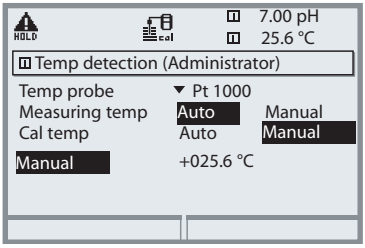
There are two important reasons for determining the temperature of the buffer solution:
The slope of the pH electrode is temperature-dependent. Therefore the measured voltage must be corrected by the temperature influence.
The pH value of the buffer solution is temperature-dependent. For calibration, 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 M700 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 M 700 must be in the buffer solution! Otherwise, you must select manual entry of calibration temperature. When "Cal temp automatic" is set, "Measured cal temp" appears in the menu.

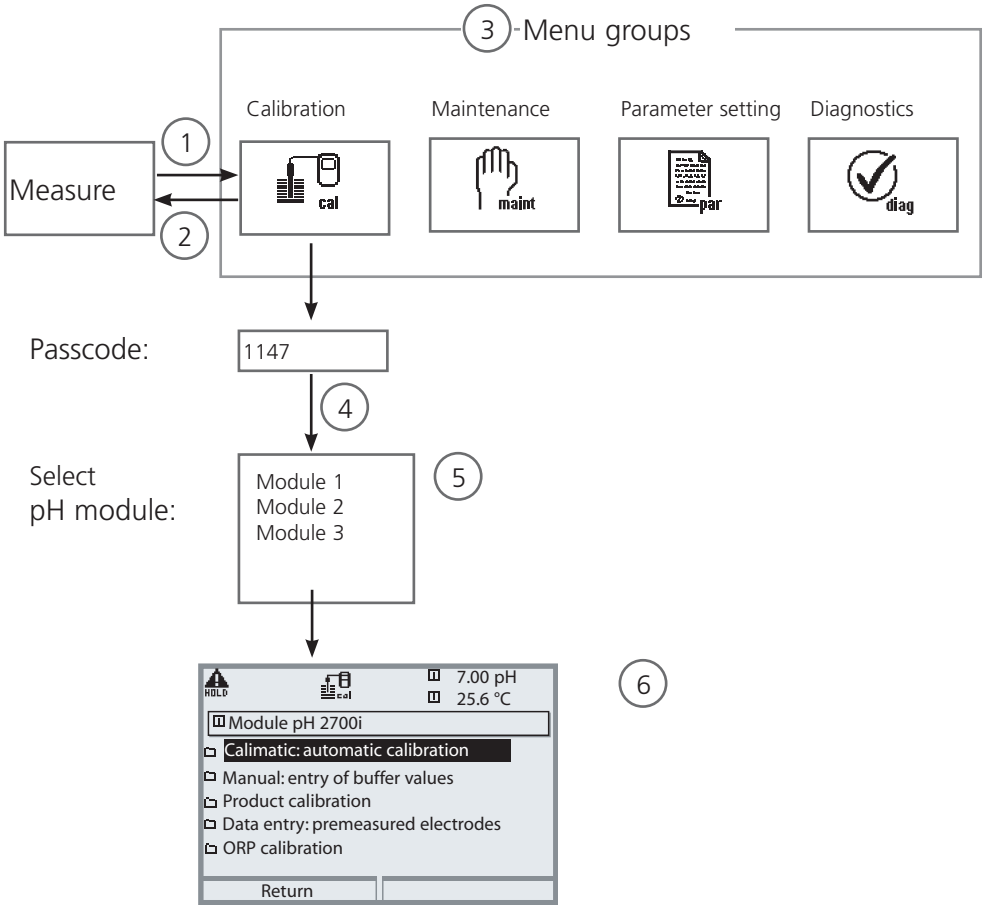
Manual Temperature Compensation



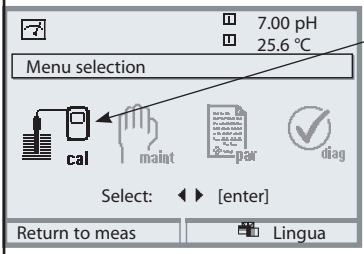
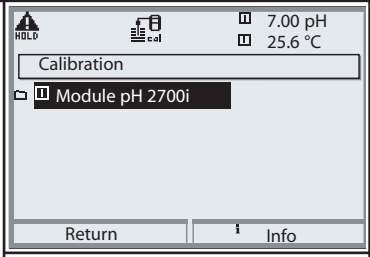
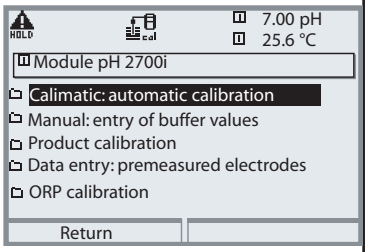
The temperature of the buffer solution must be entered manually in the Parameter setting menu at "Parameter setting / <pH module> / Sensor data / Temp detection / Cal temp --> manual". Temperature measurement is performed using a glass thermometer, for example.

Calibration / Adjustment

Selecting a Calibration Method
The HOLD mode is active for the currently calibrated module,
the current outputs behave as configured.



To calibrate a pH module: Select a calibration method
(1) Press **menu** key to access menu selection
(2) Pressing the **meas** key returns to measurement
(3) Select Calibration menu group using the arrow keys
(4) Press **enter** to confirm, enter passcode
(5) Select pH module, confirm with **enter**.
(6) Select calibration method

Menu	Display	Select calibration method (pH)
		**To call up 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) After passcode entry, the system is in HOLD mode: Current outputs and relay contacts of the currently calibrated module behave as configured (BASE) until the Calibration menu is exited.
cal		Calibration: Select "Module pH"
		Select calibration method: • Automatic buffer recognition • Manual entry of buffer values • Product calibration (Calibration with sampling) • Data entry of premeasured electrodes • 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.

Calibration / Adjustment

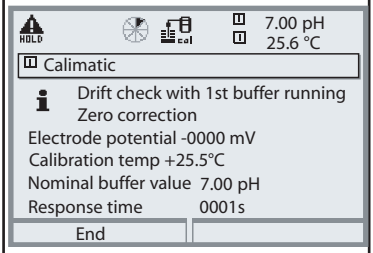
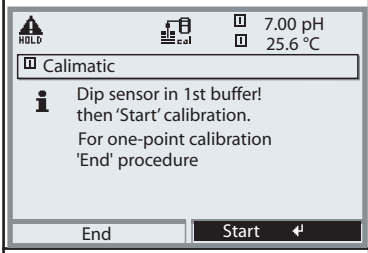
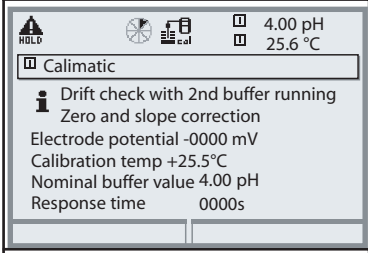
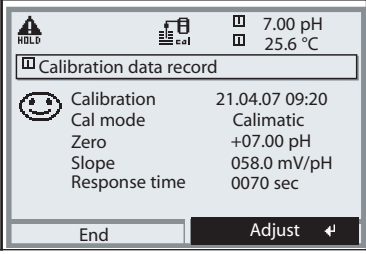
Calimatic Automatic Buffer Recognition

Automatic Buffer Recognition (Calimatic)
Automatic calibration ("Calimatic") is performed with one, two, or three buffer solutions. The M 700 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 Mettler -Toledo 2.00 4.01 7.00 9.21 When changing sensors perform First cal for statistics! Sensor replacement Enter cal temp +025.6 °C Return Proceed	**Select: Calimatic** Display of selected buffer set Select: Sensor replacement Enter: calibration temp 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

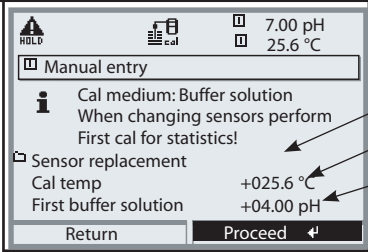
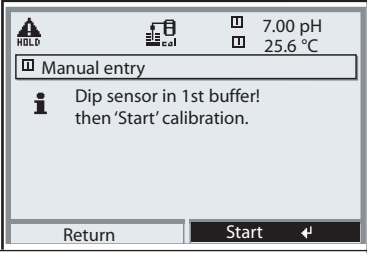
Calibration with Manual Entry of Buffer Values

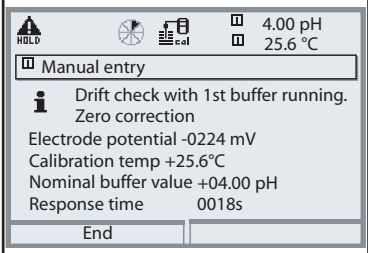
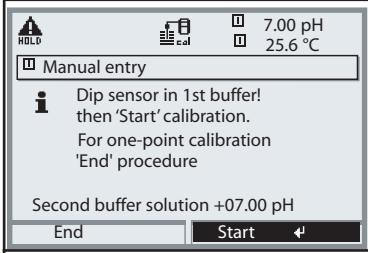
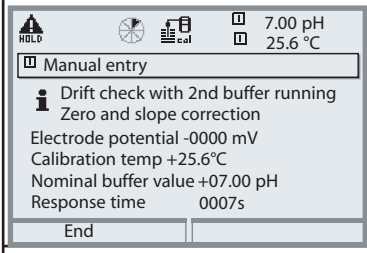
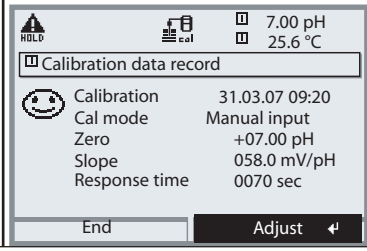
Calibration with manual entry of buffer values is performed with one, two, or three buffer solutions.
M 700 displays the measured temperature.
You must then enter the temperature-corrected buffer values. To do so, refer to the buffer table (e.g. on the bottle) and enter the buffer value belonging to 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!

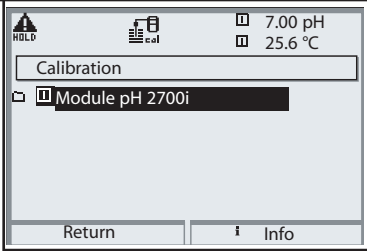
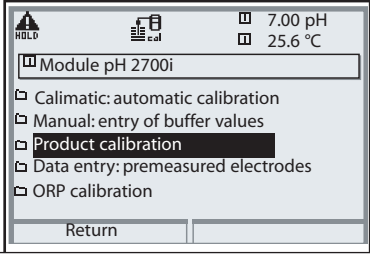
Menu	Display	Manual entry
cal		**Select: Manual entry** Select: Sensor replacement Display: calibration temp Enter first buffer value Proceed with softkey or **enter**
		Remove and rinse the electrode (**Caution:** Do not rub! Electrostatic hazard!), then immerse it in the first buffer solution. Start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

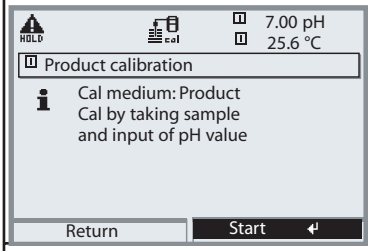
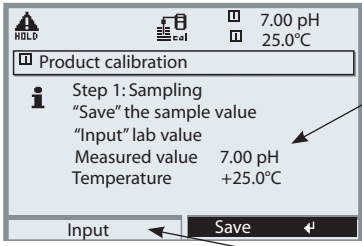
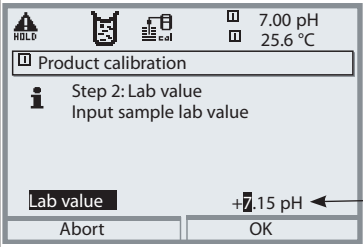
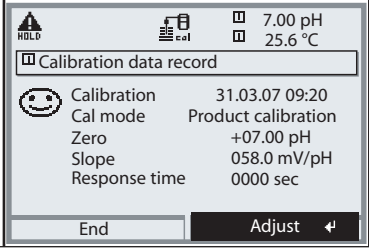
Menu	Display	Manual entry
cal		Calibration with first buffer solution. You can press "End" to reduce the waiting time before stabilization of the electrode potential (reduced accuracy of calibration values). From the response time, you see how much time the electrode needs for the potential to stabilize. 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 M 700. 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 M 700 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).

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		**Select module: pH 2700i** The module is in HOLD mode. The assigned current outputs and relay contacts behave as configured (BASE). Confirm with **enter**.
		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. Store 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

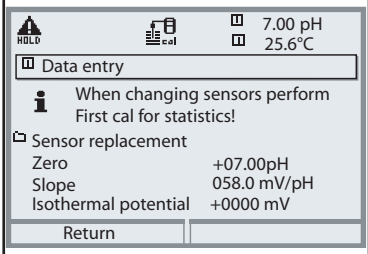
Calibration by Entering Data from Premeasured Electrodes

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 51.

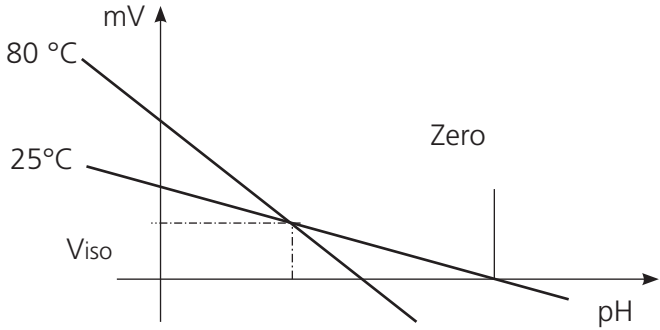
During calibration the module is in HOLD mode. Current outputs and relay contacts of the module behave as configured (BASE).

Menu	Display	Manual entry
		**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

The M 700 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

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)

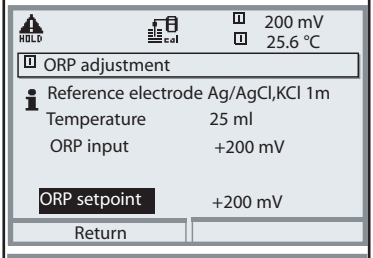
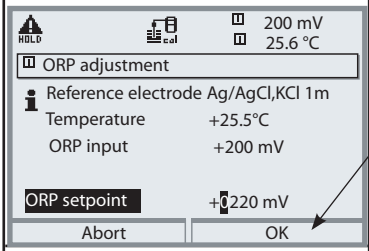
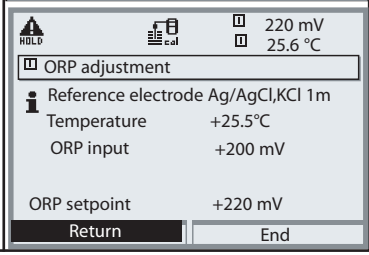
ΔmV = delta value, determined during calibration

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
cal		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) Confirm with "**OK**".
		
		End adjustment with 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

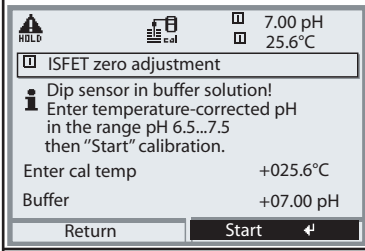
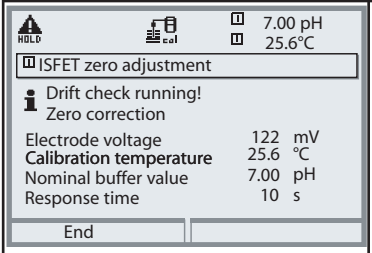
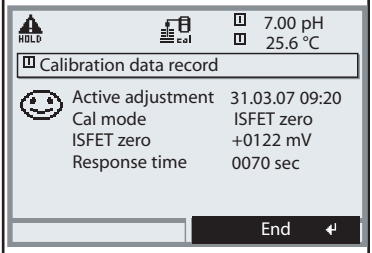
When measuring with an ISFET sensor (Durafet, InPro 3300), the nominal zero point must be adjusted each time a new sensor is connected (to adjust the operating point). The adjustment for that sensor remains stored in the analyzer.

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

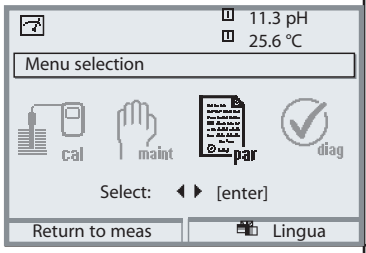
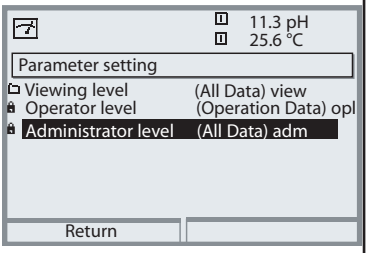
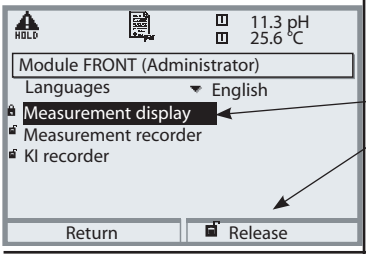
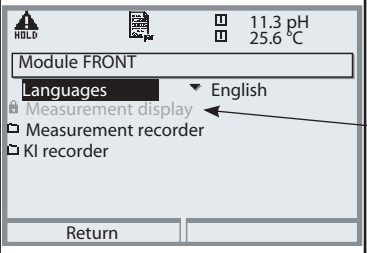
During calibration the module is in HOLD mode.

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 values must be determined afterwards by a complete two-point calibration.

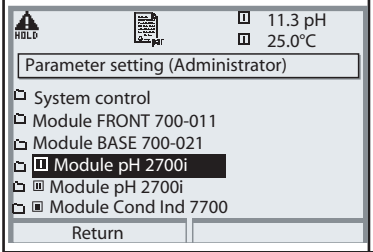
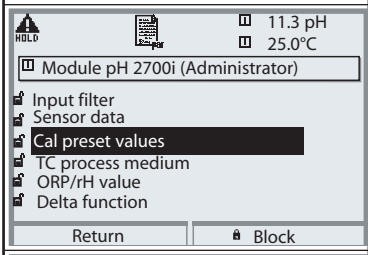
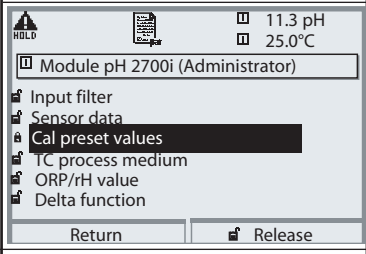
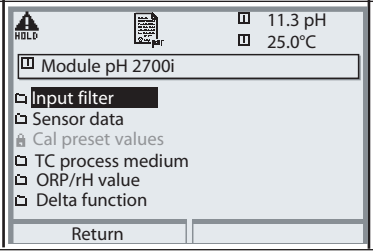
Parameter Setting: Operating Levels

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

Menu	Display	Viewing level, Operator level, Administrator level
par		**Call up parameter setting** From the 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 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!

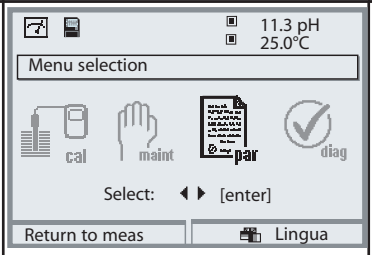
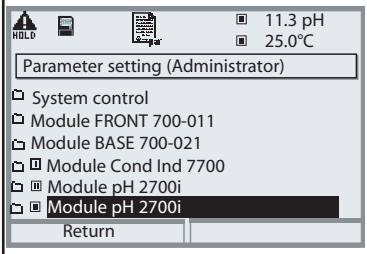
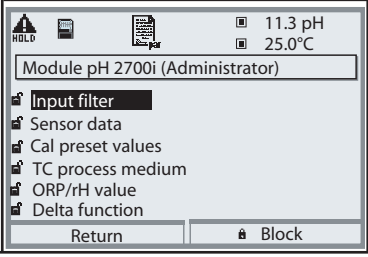
Parameter Setting: Lock Functions

Administrator level: Enable / lock functions for Operator level
Note: HOLD mode (Setting: BASE module)

Menu	Display	Administrator level: Enable / lock functions
par		**Example:** Blocking access to the calibration adjustments from the Operator level **Call up parameter setting** Select Administrator level. Enter passcode (1989). Select "Module pH" (e.g.) using arrow keys, confirm with **enter**.
		
		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		**Call up parameter setting** Select Operator level, passcode (1246). Select "Module pH" (e.g.). Now, the locked function is displayed in gray and marked with the "lock" icon.

Activating Parameter Setting

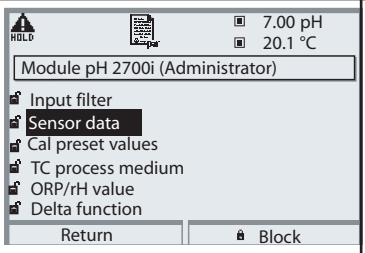
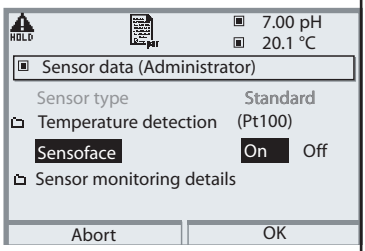
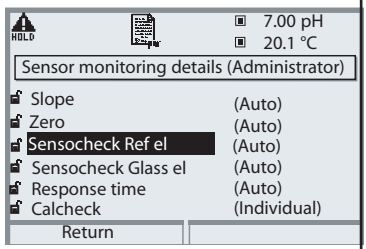
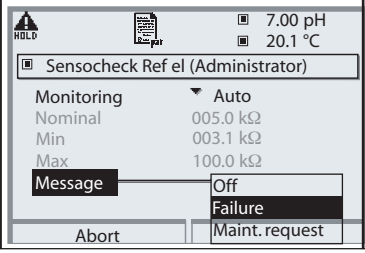
Call up parameter setting

Menu	Display	Parameter setting
par		**Call up parameter setting** From the measuring mode: Press **menu** key to select menu. Select parameter setting using arrow keys, confirm with **enter**. Passcode as delivered: 1989
		Select module, confirm with **enter**. (In the Figure, the Module "pH" is selected, for example.)
		Select parameter using arrow keys, confirm with **enter**.

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

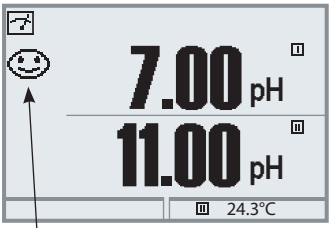
Settings of Sensor Data

Sensor data. pH sensor monitoring adjustable
Note: HOLD mode active

Menu	Display	Parameter selection
par		**Sensor data** (also see opposite page) 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. Sensoface can be switched off.
		**Sensor monitoring details** The following parameters are monitored: Slope, zero, reference impedance, glass impedance (pH electrodes), and response time, for ISM sensors also sensor wear, CIP/SIP counter, autoclaving counter, and sensor operating time. For "Auto", the tolerance limits are displayed in gray. For "Individual", the settings can be specified by the user.
		ISM sensors automatically provide most of the default settings. Individual settings are not overwritten by the ISM. **Message:** See Pg 61.

Sensoface ☺

Sensoface is a graphic indication of the sensor condition.
Prerequisite: 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").

Sensoface Criteria

Parameter	Standard*	Critical range
Slope	59,2	< 53.3 or > 61
Zero	7.00	< 6.00 or > 8.00
Reference impedance	Rcal **	< 0.3 Rcal or > 3.5 Rcal
Glass impedance	Rcal **	< 0.6 Rcal or > 100 KΩ+ 0.5 Rcal
Response time Fine Standard Coarse		 120 sec 80 sec 60 sec
Calibration timer		when 80 % expired
Sensor wear		as specified (ISM sensors only)

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

Settings of Sensor Data

With "Auto", the tolerance limits for the monitoring criteria are determined by the analyzer. They are displayed in gray.
With "Individual", these tolerances can be adjusted.

Note:
HOLD mode active. Gray values (display) cannot be edited.

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, Other, ISFET (SW 700-012), ISM (automatically recognized)
• Temperature detection		
Temperature probe	Pt 1000	Pt100, Pt1000, NTC30 kΩ, NTC 8,55 kΩ, Balco 3 kΩ
Sensor monitoring details		
• Slope		
Monitoring	Auto	Auto, Individual
Nominal	59.2 mV/pH	
Min	53.3 mV/pH	
Max	61.0 mV/pH	
Message	Maint. request	Off, Failure, Maint. request
• Zero		
Monitoring	Auto	Auto, Individual
Nominal	06.95 pH	
Min	05.95 pH	
Max	07.95 pH	
Message	Maint. request	Off, Failure, Maint. request
• Sensocheck Ref el		
Monitoring	Auto	Auto, Individual
Nominal	025.5 kΩ	
Min	015.9 kΩ	
Max	112.8 kΩ	
Message	Off	Off, Failure, Maint. request
• Sensocheck Glass el		
Monitoring	Auto	Auto, Individual
Nominal	305.0 MΩ	
Min	087.1 MΩ	
Max	999.9 MΩ	
Message	Off	Off, Failure, Maint. request
• Response time		(not for sensor type ISFET)
Monitoring	Auto	Auto, Individual
Response time Max	0080 sec	
Message	Off	Off, Failure, Maint. request

Parameter	Default	Selection / Range / Notes
• Sensor wear*		
Monitoring	Auto	Off, Auto, Individual
Measurement quality	Normal	High, Normal, Low
Message	Maint. request	Off, Failure, Maint. request
• CIP counter*		
Monitoring	Off	Off, Individual
Max. cycles	000	
Message	Maint. request	Off, Failure, Maint. request
• SIP counter*		
Monitoring	Off	Off, Individual
Max. cycles	000	
Message	Maint. request	Off, Failure, Maint. request
• Autoclaving counter*		
Monitoring	Off	Off, Individual
Max. cycles	000	
Message	Maint. request	Off, Failure, Maint. request
• Sensor operating time*		
Monitoring	Off	Off, Individual
Max. operating time	0000 d	
Message	Maint. request	Off, Failure, Maint. request
• ISFET leakage current**		
Monitoring	Auto	Auto, Individual
Max.	1000 nA	(For ISM: default value from electrode)
Message	Maint. request	Off, Failure, Maint. request

ISM ISM sensors automatically provide most of the default settings. Individual entries are not overwritten by the ISM sensor.

* For ISM only

** Only available with ISFET function enabled (SW 700-012)

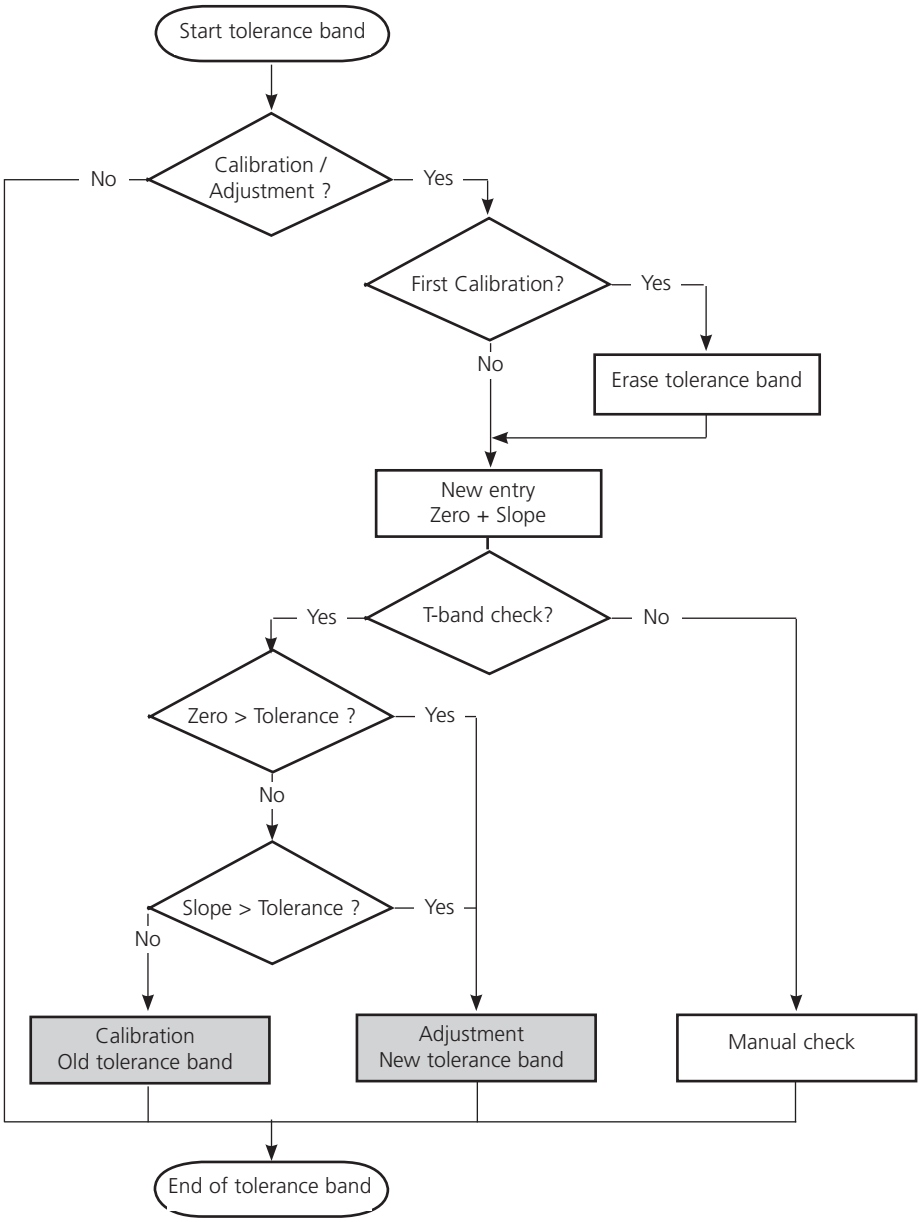
Parameter Setting: Cal Preset Values

Cal preset values
Note: HOLD mode active

Parameter	Default	Selection / Range
Cal preset values		
• Calimatic buffer	Mettler-Toledo	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 NIST technical: 1.68 4.00 7.00 10.01 12.46 Hamilton A: 2.00 4.01 7.00 9.00 11.00 Hamilton B: 2.00 4.01 6.00 9.00 11.00 Kraft: 2.00 4.00 7.00 9.00 11.00
• Drift check	Standard	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)
• Cal timer		
Monitoring	Auto	Auto
Calibration timer	0000h (Off)	Off, entry
Adaptive cal timer	Off	Off, On
• Tolerance band check (SW 700-005)	Off	Tolerance adjustment: Off, On Tolerance band zero +00.20 pH (entry) Tolerance band slope +002.0 mV/pH (entry)

Tolerance adjustment
(additional function SW 700-005)
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).
The additional function SW 700-005 is device-specific. When ordering the additional function, you therefore have to specify the serial number of your M 700 FRONT in addition to the respective order number.
(The M 700 FRONT contains the M 700 system control).
The manufacturer then supplies a TAN (transaction number) to release the additional function in the system control menu.

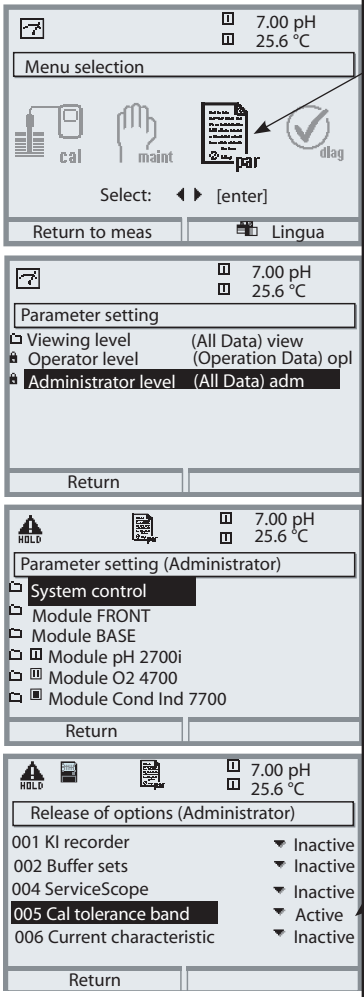
SW 700-005: Tolerance Adjustment: Program Flow



Activating the Tolerance Adjustment

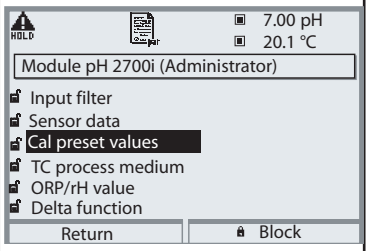
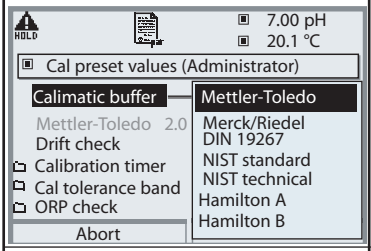
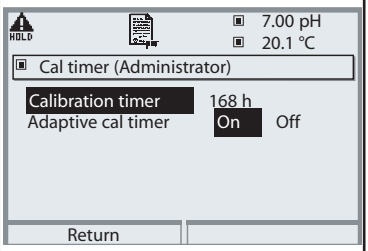
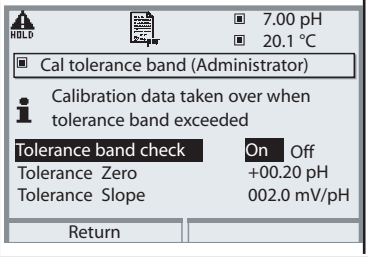
Select menu: Parameter setting/System control/Release of options

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

Menu	Display	Activate additional function
par		**Menu selection** Call up 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 page 63.) The option is available after the TAN has been entered.

Parameter Setting: Cal Preset Values

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 in any order. 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 cal timer** Automatically reduces the time until the next due calibration when the electrode is exposed to high stress (temperature, extreme pH values).
		**Cal tolerance band** If the measured value leaves the tolerance band specified here for zero and slope, an adjustment is automatically performed during calibration.

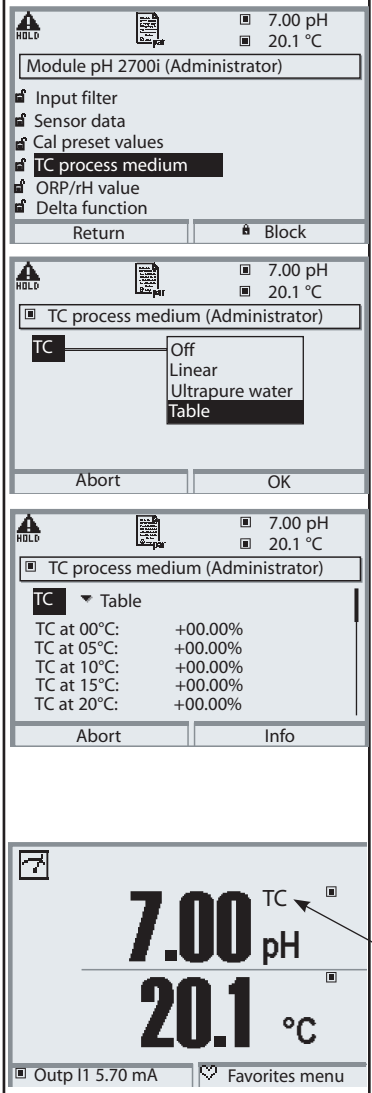
Parameter Setting

Default settings and selection range
Note: HOLD mode active

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

Parameter Setting

TC process medium
Note: HOLD mode active

Menu	Display	TC process medium (Parameter selection Pg 67)
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 chart. 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 chart value is used for calculation. If the delta function has been activated (see Pg 67) 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.

Temperature Compensation of Process Medium

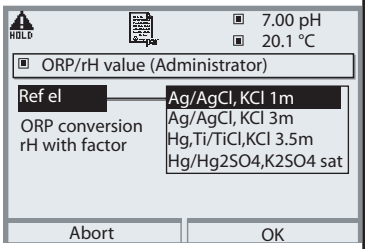
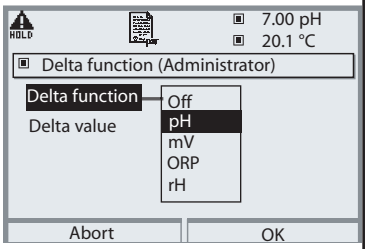
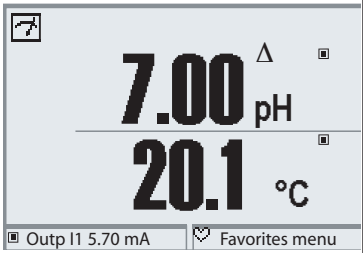
Linear temperature compensation, reference temp fixed at 25 °C

$pH(25\ °C) = pH_M + TC/100\ \%\ (25\ °C - T_M)$

pH(25 °C)	=	pH value compensated to 25 °C
pH_M	=	Measured pH value (temperature-corrected)
TC	=	Temperature factor [%/K]
T_M	=	Measured temperature [° C]

Parameter Setting: ORP/rH Value

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

Menu	Display	ORP/rH value, Delta function (Selection Pg 67)
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.
		

Calculation Blocks

Select menu: Parameter setting/System control/Calculation Blocks
Calculation of new variables from measured variables

Calculation Blocks

Two measuring modules with all their measured values serve as input for the calculation block. In addition, the general device status (NAMUR signals) is taken into account. The difference between the existing values is calculated:

Current Outputs

All current outputs can be set to output the new process variables formed by the Calculation Blocks.

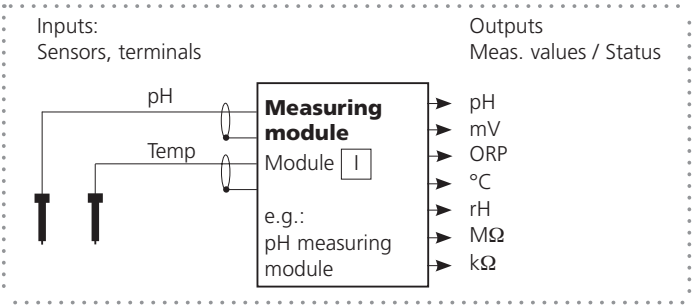
Measurement Display

All new process variables can be displayed as primary or as secondary value.

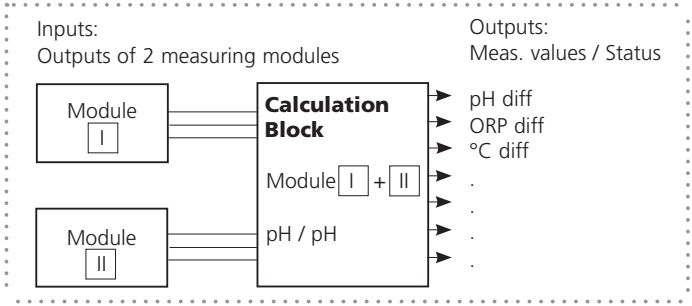
Controller

Controller functions are not supported.

Functionality of Measuring Module



Functionality of Calculation Block



Activating Calculation Blocks

Select menu: Parameter setting/System control/Calculation Blocks
Combining measuring modules to Calculation Blocks

Combining Measuring Modules

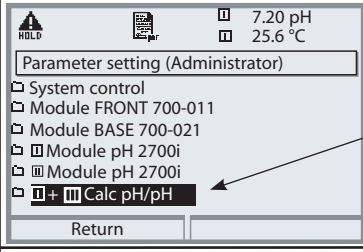
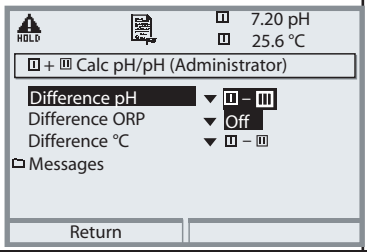
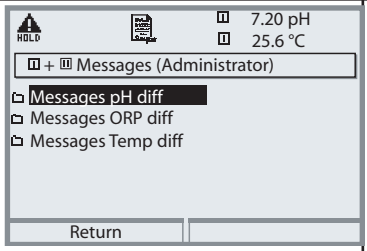
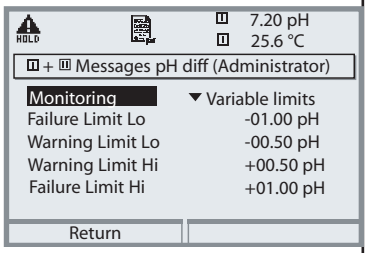
With three measuring modules the following Calculation Block combinations are possible: [I] + [II] , [I] + [III] , [II] + [III]

Two Calculation Blocks can be activated.

Menu	Display	Activating Calculation Blocks
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	**Calculation Blocks** • Call up parameter setting • System control • Select "Calculation Blocks"
	HOLD 7.10 pH 25.6 °C Calculation Blocks (Administrator) Block 1 Off Block 2 Calc pH/pH Return	• Depending on the modules installed, the possible combinations for Calculation Blocks are offered.
	HOLD 7.20 pH 25.6 °C Parameter setting (Administrator) System control Module FRONT 700-011 Module BASE 700-021 Module pH 2700i Module pH 2700i I + II Calc pH/pH Return	During parameter setting the Calculation Blocks are displayed like modules.

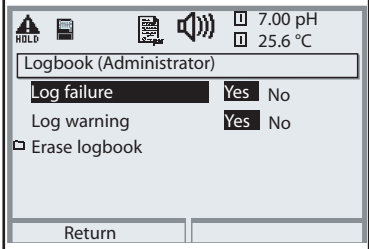
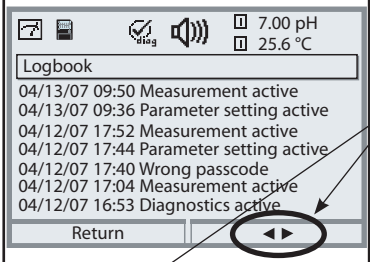
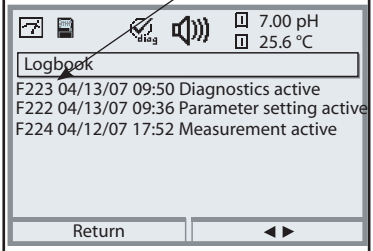
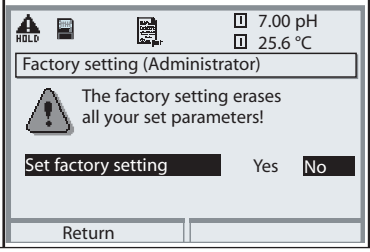
Configuring a Calculation Block

Select menu: Parameter setting/System control/Calculation Blocks
Setting the process variable to be calculated

Menu	Display	Configuring a Calculation Block
par		**Select Calculation Block** • Call up parameter setting • System control • Select module
		• Depending on the modules installed, the possible combinations for Calculation Blocks are offered.
		**Messages** You can activate messages for the selected variables. Variables which have been set as "Off" cannot be processed further.
		The measured values which shall release a message are set using the arrow keys (left/right: select position, up/down: edit number) and confirmed with **enter**.

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 up from the diagnostics menu (Fig.). Pressing the right softkey displays the message identifier.
		Additional function SW 700-104: 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.).

Parameter Setting

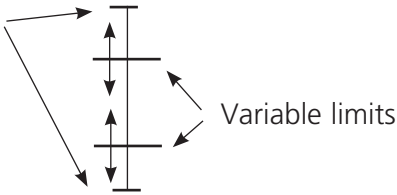
Messages: Default settings and selection range
Note: HOLD mode active

Parameter	Default	Selection / Range
Messages		
• pH value	Limits max	Off, device limits max., variable limits*
• ORP value	Off	Off, device limits max., variable limits*
• rH value	Off	Off, device limits max., variable limits*
• Temperature	Limits max	Off, device limits max., variable limits*
• mV value	Off	Off, device limits max., variable limits*
		* With "Variable limits" selected, the following parameters can be edited: • Failure Limit Lo • Warning Limit Lo • Warning Limit Hi • Failure Limit Hi

Device Limits

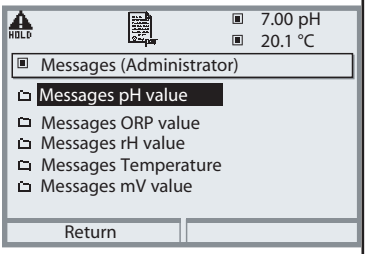
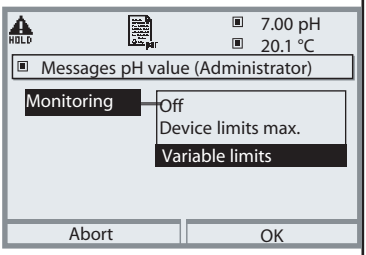
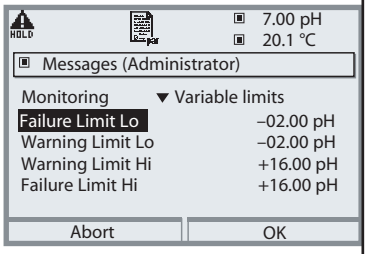
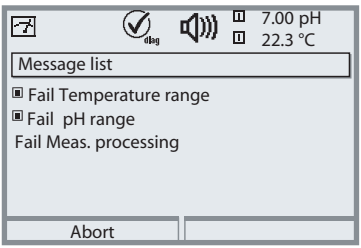
- Device limits max. Maximum measurement range of device
- Variable limits: Range limits specified

Device limits max.



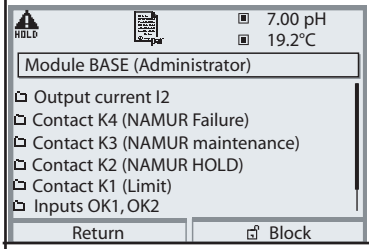
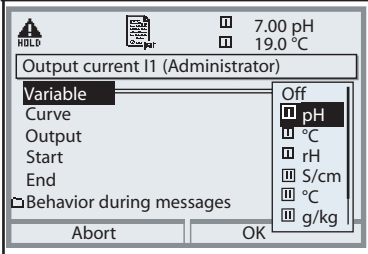
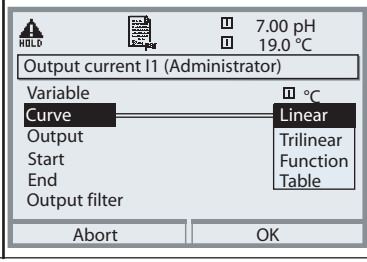
Setting the Message Parameters

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)
		
		
diag		**Diagnostics menu** When the "Maintenance" or "Failure" icons are flashing in the display, you should call up the Diagnostics menu. The messages are displayed in the "Message list".

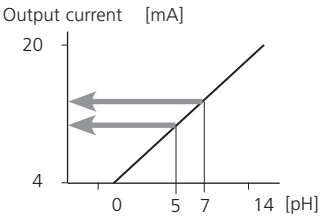
Current Outputs, Contacts, OK Inputs

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

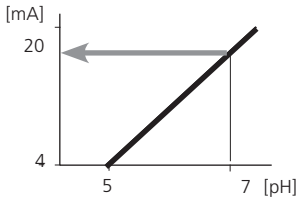
Menu	Display	Parameter setting BASE module
par		To configure current output • Call up parameter setting • Enter passcode • Select "Module BASE" • Select "Output current ..."
		• Select measured variable
		• Select Curve, e.g. "linear": The measured variable is represented by a linear output current curve. 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

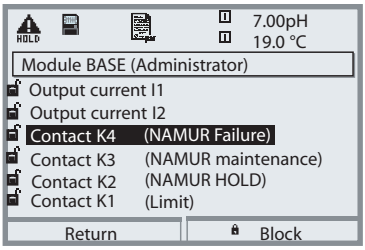


NAMUR Signals: Relay Contacts

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)
Maint. 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).

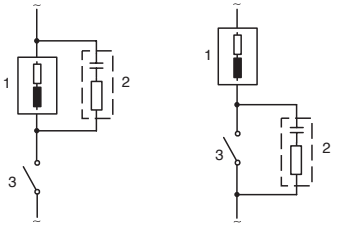
Maintenance request is active
when a value has exceeded (or fallen below, resp.) a preset "Warning Limit Hi" or "Warning Limit Lo", or when other warning messages have been activated. That means that the equipment is still operating properly but should be serviced, or that process parameters have reached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

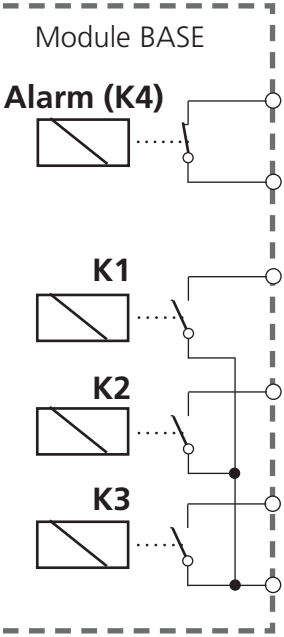
Information Concerning Relay Contacts

As delivered, the relay contacts are suitable for low signal currents (down to approx. 1mA). 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
par	HOLD 7.00pH 19.2°C Contact K1 (Administrator) Usage: NAMUR maintenance Variable: NAMUR HOLD Limit value: Limit value Hysteresis: Rinse contact Effective direction: Parameter set B active Contact type: USP output Return	**Relay contacts, usage** • Call up 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:

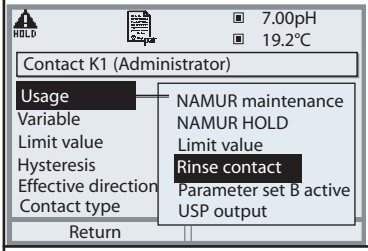
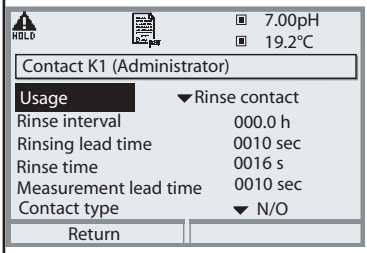
K3: NAMUR maintenance request
K2: NAMUR HOLD (function check)
K1: Limit

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
- Controller alarm

Rinse Contact

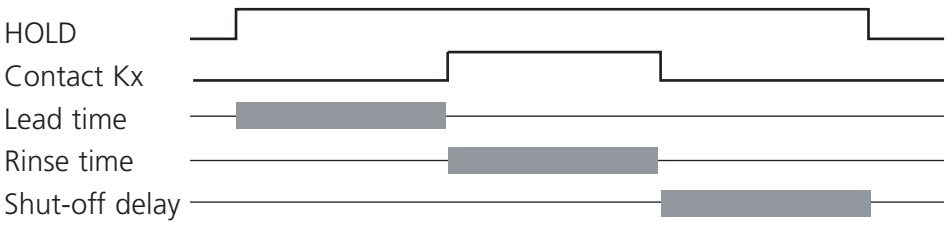
Parameter setting/Module BASE/Relay contacts/Usage/Rinse contact

Menu	Display	Configuring the rinse contact
par		**Relay contacts, usage** • Call up parameter setting • Enter passcode • Select "Module BASE" • Select contact e.g. K1) • "Rinse contact" (Fig.)
		**Configuring the rinse contact** • 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



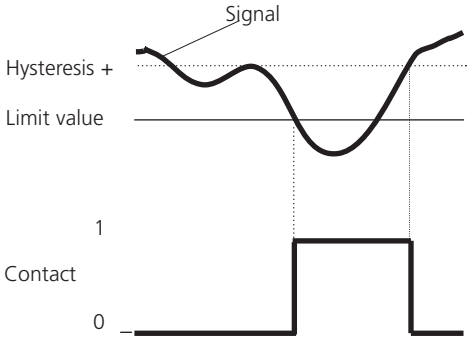
Limit Value, Hysteresis, Contact Type

Parameter setting/Module BASE/Relay contacts/Usage

Menu	Display	Usage as limit value
par	HOLD 7.00pH 19.2°C Contact K1 (Administrator) Usage Variable Limit value Hysteresis Effective direction Contact type NAMUR maintenance NAMUR HOLD Limit value Rinse contact Parameter set B active USP output Return	**Relay output: Limit** • Call up parameter setting • Enter passcode • Select "Module BASE" • Select "Contact ..." • "Usage: Limit" (Fig.)

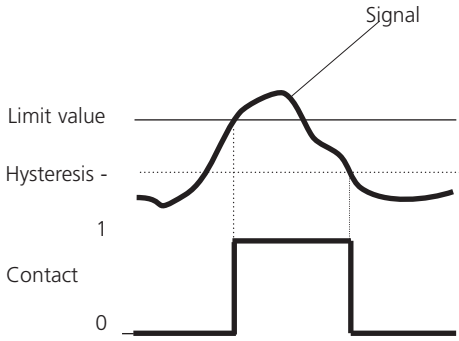
Limit value ▼

Effective direction min



Limit value ▲

Effective direction max



Icons in the Measurement Display:

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

Hysteresis

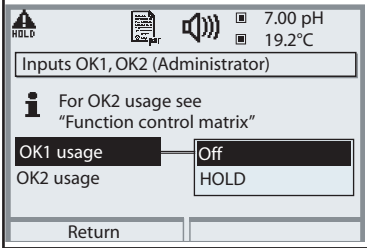
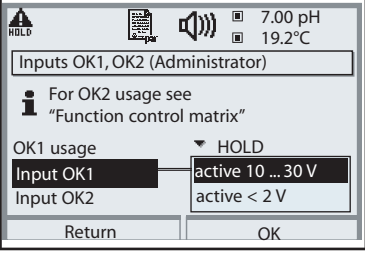
Tolerance band around the limit value, within which the contact is not actuated. Serves to obtain appropriate switching behavior at the output and suppress slight fluctuations of the measured variable (Fig.)

Contact Type

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

OK1, OK2 Inputs: Specify Level

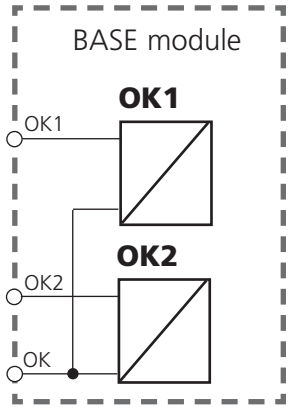
Parameter setting/Module BASE/Inputs OK1, OK2
Note: HOLD mode (Setting: BASE module)

Menu	Display	Setting the OK inputs
par		**OK1 usage** • Call up parameter setting • Enter passcode • Select "Module BASE" • Select "Inputs OK1/OK2" • Select "OK1 usage"
		**OK1/OK2 switching level** • Call up 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" (Function check),
- OK2: Select: System control / Function control matrix ("Off", "Parameter set A/B", "Start KI recorder")

The switching level for the control signal must be specified:
(active 10...30 V or active < 2 V).

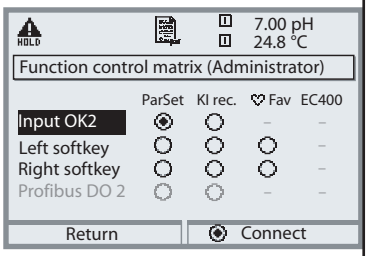
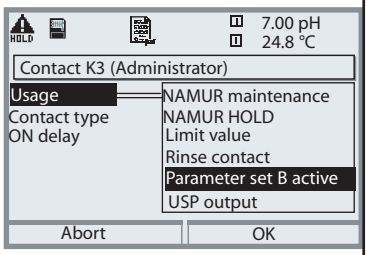


Switching Parameter Sets via OK2

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

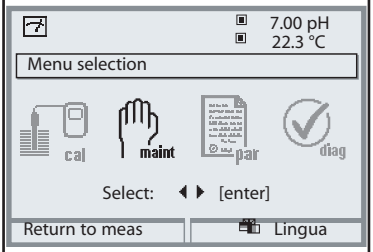
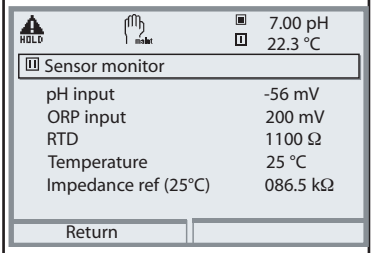
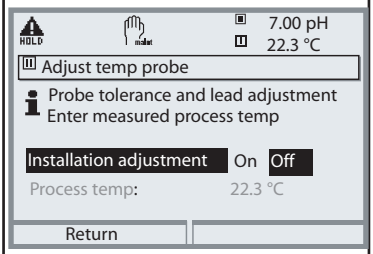
Menu	Display	Parameter sets
par		**Select parameter set (A, B) via OK2 input** • Call up parameter setting • System control • Function control matrix • Select "OK2" • Connect "Parameter set A/B"
		**Signaling active parameter set via relay contact** • Call up parameter setting • BASE module • Select contact • Usage: "Parameter set ...".

Notice

The selection has no effect when working on SmartMedia card with SW 700-102.

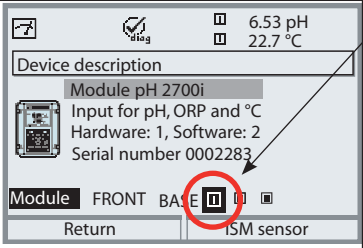
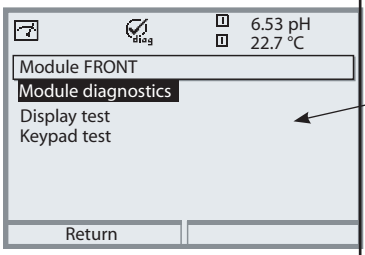
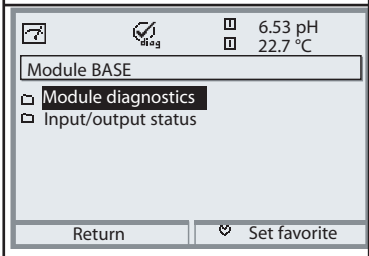
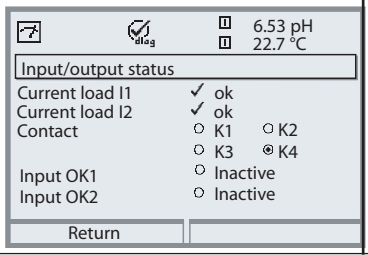
Maintenance

Sensor monitor, Temp probe adjustment
Note: HOLD mode active

Menu	Display	Maintenance
maint		**Call up Maintenance** From the measuring mode: Press **menu** key to select menu. Select maintenance using arrow keys, confirm with **enter**. Passcode as delivered: 2958 Then select "Module pH".
		**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!

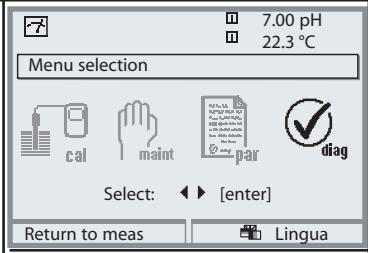
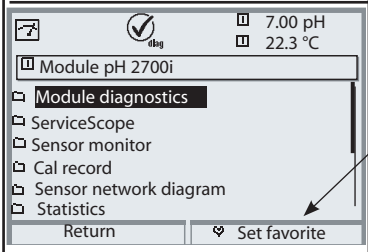
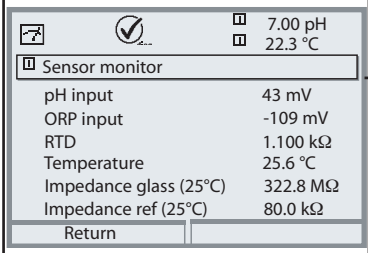
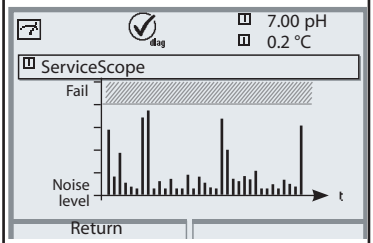
Diagnostics Functions

Device description, FRONT module, BASE module

Menu	Display	Diagnostics functions
diag		**Device description** Select module using arrow keys: Provides information about 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.

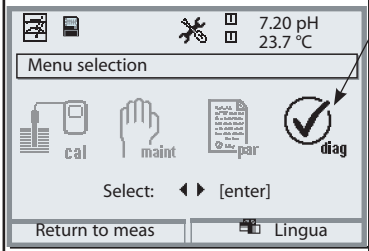
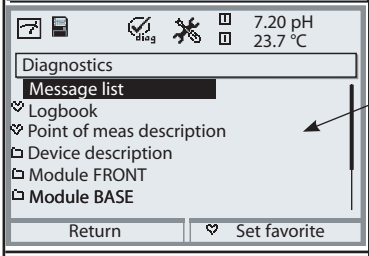
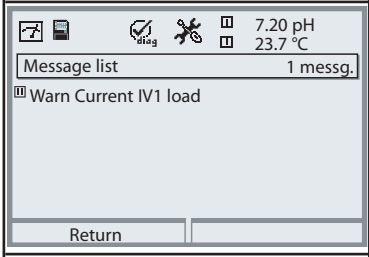
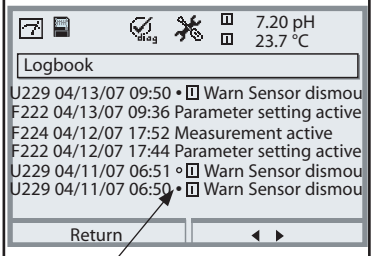
Module Diagnostics

Module diagnostics / Sensor monitor / ServiceScope

Menu	Display	Module diagnostics / Sensor monitor / ServiceScope
diag		**Call up diagnostics** From the measuring mode: Press menu key: select menu. Select diagnostics using arrow keys, confirm with **enter**. Then select "Module PH".
		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.
		**Module diagnostics** Internal function test (without Fig.). **Sensor monitor** Shows the values currently measured by the sensor. Important function for diagnostics and validation! (cf Maintenance)
		**ServiceScope** Monitors the pH input signal. Displays the noise levels over the time. An error message is generated if the noise level exceeds the failure limit.

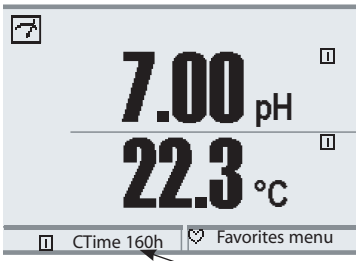
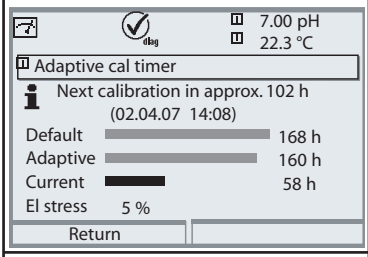
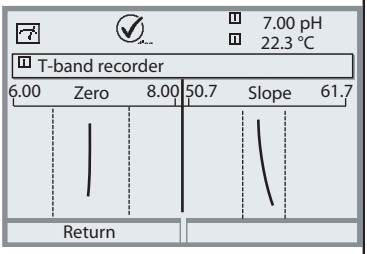
Module Diagnostics

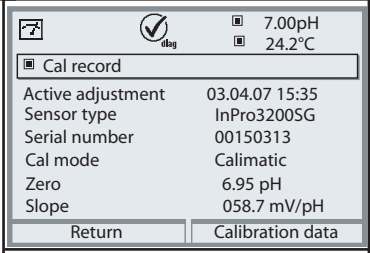
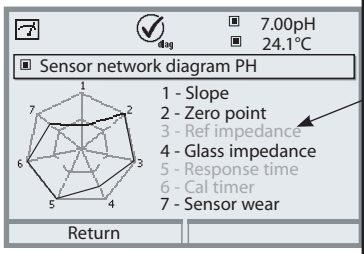
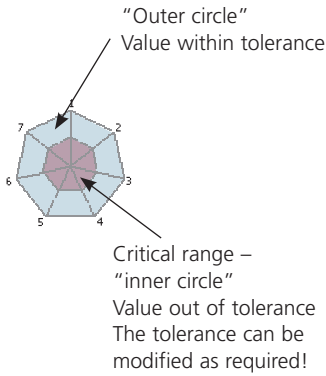
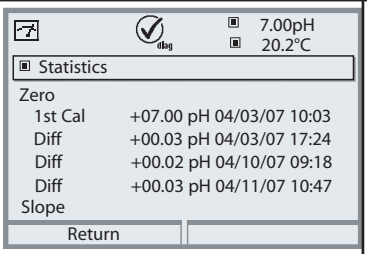
General status information of the measuring system
Select menu: Diagnostics

Menu	Display	Diagnostics functions
diag		**Call up 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.
		**Message list** Shows the currently activated warning or failure messages in plain text.
		**Logbook** Shows the last 50 events with message identifier, date, time, module concerned, and plaintext of the message. This permits quality management documentation to ISO 9000 et seq. Extended logbook: SmartMedia card (SW 700-104)

Module Diagnostics

Cal timer, Adaptive cal timer, Tolerance adjustment

Menu	Display	Cal timer, Tolerance band recorder
		**Calibration timer** After expiration of a presettable interval (Parameter setting, Module pH, 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 temperature and pH value, i.e. old electrode = timer expires sooner.
		**Tolerance adjustment** Additional function SW 700-005 Records the tolerance ranges for zero and slope over the time. If the values determined by a calibration exceed the tolerance limits, the calibration is taken over as adjustment. Display can be graphical or as a listing. The tolerance band (zero, slope) is configured during parameter setting (Module pH, 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. See Parameter setting / Sensor data / Sensor monitoring details.
		
		**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. For ISM, the data are stored in the sensor)

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

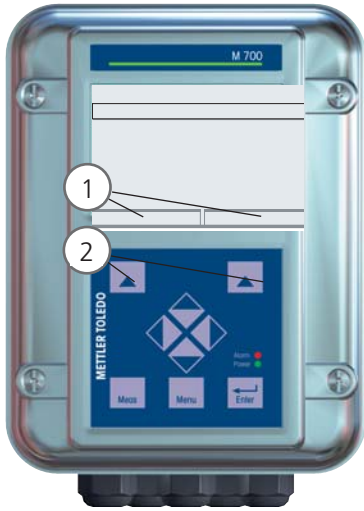
Parameter setting/System control/ Function control matrix

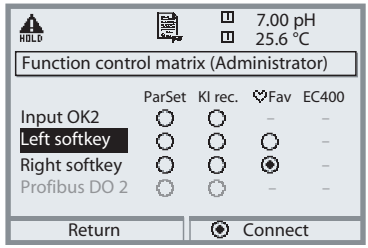
Function which can be controlled by softkeys:

- Parameter set selection
- KI recorder Start/Stop
- Favorites
- EC400 (fully automated probe controller)

Favorites

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

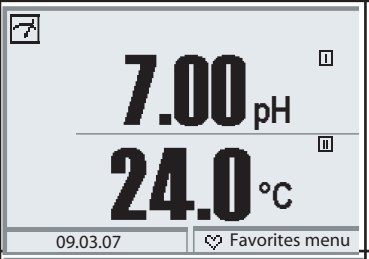
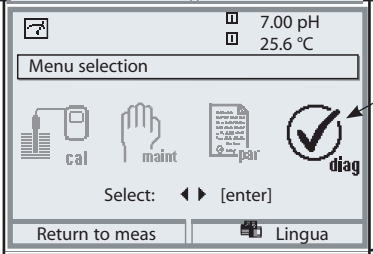
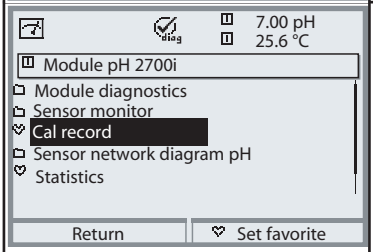
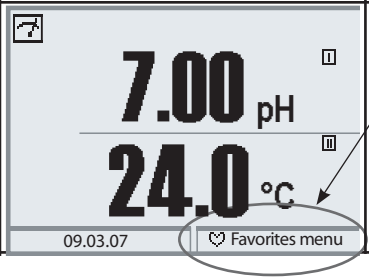




Example:
"Favorites" to be selected with "Right softkey"

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**.

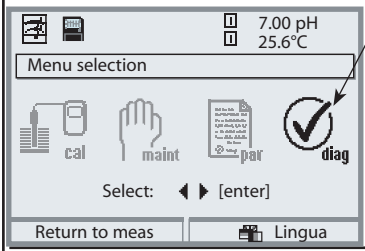
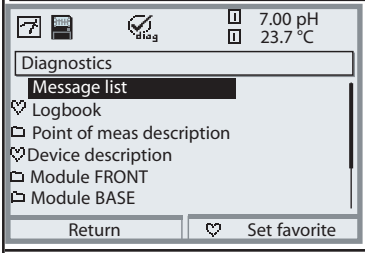
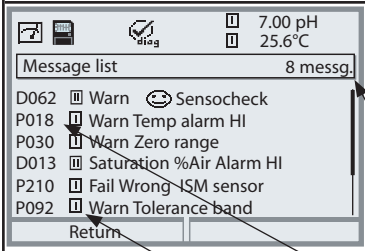
Menu	Display	Select favorites
		**Favorites menu** Diagnostics functions can be called up directly from the measuring mode using a softkey. The "Favorites" are selected in the Diagnostics menu.
diag		**Select favorites** Press **menu** key to Menu selection Select diagnostics using arrow keys, confirm 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 up from the measuring mode.

Diagnostics Functions

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

Menu	Display	Diagnostics functions
diag		**Call up 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.
		**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.

Messages pH 2700i(X) Module

No.	pH message	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

Messages

No.	pH message	Message type
P046	mV Alarm LO_LO	FAIL
P047	mV Alarm LO	WARN
P048	mV Alarm HI	WARN
P049	mV Alarm HI_HI	FAIL
P050	Man. temperature range	FAIL
P060	SAD SENSOFACE: Slope	User-defined
P061	SAD SENSOFACE: Zero	User-defined
P062	SAD SENSOFACE: Ref impedance (Sensocheck)	User-defined
P063	SAD SENSOFACE: Glass impedance (Sensocheck)	User-defined
P064	SAD SENSOFACE: Response time	User-defined
P065	SAD SENSOFACE: Calibration timer	WARN
P066	SAD SENSOFACE: Calcheck	User-defined
P069	SAD SENSOFACE: Calimatic (Zero/slope)	WARN
P070	SAD SENSOFACE: Sensor wear	User-defined
P071	SAD SENSOFACE: ISFET leakage current	User-defined
P090	Buffer offset (buffer table to be entered):	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

No.	pH message	Message type
P200	Noise level at pH input	FAIL
P201	Cal temp	WARN
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

Specifications

Specifications M700 pH 2700i(X)

pH/ORP input (EEx ia IIC)	With glass electrodes or ISFET InPro 3300, control of ISM sensors		
	Input for glass electrode		
	Input for reference electrode		
	Input for redox (ORP) electrode or auxiliary electrode		
Measurement 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 (cable length max. 20 m)		
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		
(EEx ia IIC)	3-wire connection, adjustable		
Measurement 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 media-related	Reference temp 25 °C		

Specifications

- 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
(EEx ia IIC)

for operating an ISFET adapter
+3 V (Vo = +2.9 ... +3.1 V / Ri = 360 Ω)
-3 V (Vo = -3.5 ... -3.0 V / Ri = 360 Ω)

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

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 pre-measured electrodes

Drift check *:

Fine / standard / coarse

Calimatic buffer sets: *

- Fixed buffer sets:

1 Mettler-Toledo	2.00 / 4.01 / 7.00 / 9.21
2 Merck/Riedel	2.00 / 4.00 / 7.00 / 9.00 / 12.00
3 DIN 19267	1.09 / 4.65 / 6.79 / 9.23 / 12.75
4 NIST Standard	4.006 / 6.865 / 9.180
5 Technical buffers to NIST	1.68 / 4.00 / 7.00 / 10.01 / 12.46
6 Hamilton buffer A	2.00 / 4.01 / 7.00 / 9.00 / 11.00
7 Hamilton buffer B	2.00 / 4.01 / 6.00 / 9.00 / 11.00
8 Kraft	2.00 / 4.00 / 7.00 / 9.00 / 11.00

- Manually enterable buffer set with max. three buffer tables (add. function SW700-002)

Specifications

Nom. zero *	pH 0 ... 14; calibration range ΔpH = ± 1
Nom. slope (25 °C) *	25 ... 61 mV/pH; calibration range 80 ... 103 %
Viso *	-1000 ... +1000 mV

Calibration record	Recording of: Zero point, slope, Viso, response time, calibration method with date and time
Statistics	Recording of: Zero, slope, Viso, 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 switched off
Sensoface	Provides information on the sensor condition: Zero/slope, response time, calibration interval, Sensocheck, CalCheck (can be disabled)
CalCheck (Pat DE 195 36 315 C2)	Monitoring of electrode calibration range during measurement
Sensor network diagram	Graphical representation of current sensor parameters in a network diagram on the display: Slope, zero, reference impedance, glass impedance, response time, cal 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 (add. function SW700-001)	Adaptive representation of process flow with monitoring and signaling of critical process parameters

Specifications

Adaptive cal timer*	Automatic adjustment of calibration interval (Sensoface signal), depending on measured values
ServiceScope* (add. function SW700-004)	Monitoring the inputs for overdrive Representation on display
Tolerance adjustment (add. function SW700-005)	Tolerant calibration/adjustment, tolerance limits adjustable, graphical recording of zero point and slope of the last 40 calibrations/adjustments

* 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 (IS module only)	ATEX: See rating plate: KEMA 03 ATEX 2056 II 2 (1) GD EEx ib [ia] IIC T4 T 70 °C FM: NI, Class I, Div 2, GP A, B, C, D T4 with IS circuits extending into Division 1 Class I, Zone 2, AEx nA, Group IIC, T4 Class I, Zone 1, AEx me ib [ia] IIC, T4 CSA: NI, Class I, Div 2, Group A, B, C, D with IS circuits extending into Division 1 AIS, Class I, Zone 1, Ex ib [ia] IIC, T4 NI, Class I, Zone 2, Ex nA [ia] IIC
EMC Emitted interference Immunity to interference	NAMUR NE 21 and EN 61326 VDE 0843 Part 20 /01.98 EN 61326/A1 VDE 0843 Part 20/A1 /05.99 Class B 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 pH 2700i(X) 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.

pH 2700i(X) 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 Merck / Riedel

°C	pH				
0	2,01	4,05	7,13	9,24	12,58
5	2,01	4,04	7,07	9,16	12,41
10	2,01	4,02	7,05	9,11	12,26
15	2,00	4,01	7,02	9,05	12,10
20	**2,00**	**4,00**	**7,00**	**9,00**	**12,00**
25	2,00	4,01	6,98	8,95	11,88
30	2,00	4,01	6,98	8,91	11,72
35	2,00	4,01	6,96	8,88	11,67
40	2,00	4,01	6,95	8,85	11,54
45	2,00	4,01	6,95	8,82	11,44
50	2,00	4,00	6,95	8,79	11,33
55	2,00	4,00	6,95	8,76	11,19
60	2,00	4,00	6,96	8,73	11,04
65	2,00	4,00	6,96	8,72	10,97
70	2,01	4,00	6,96	8,70	10,90
75	2,01	4,00	6,96	8,68	10,80
80	2,01	4,00	6,97	8,66	10,70
85	2,01	4,00	6,98	8,65	10,59
90	2,01	4,00	7,00	8,64	10,48
95	2,01	4,00,	7,02	8,64	10,37

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 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

°C	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 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*

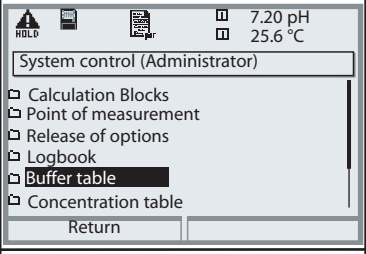
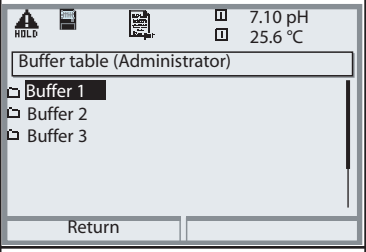
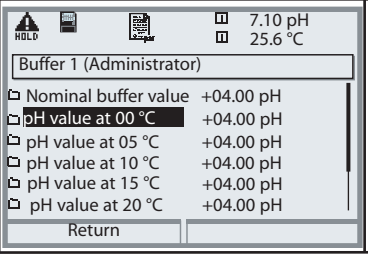
* Values complemented

Buffer Sets to be Entered: SW 700-002

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. To do so, you enter 3 complete buffer solutions in ascending order (e.g. pH 4, 7, 10) for the correct temperature (range 0 ... 95 °C, 5 °C steps).
Distance between buffers in the whole temperature range: min. 1 pH unit.
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
		**Enter buffer set** • Call up parameter setting • System control • Select "Buffer table"
		• Select buffer to be entered. 3 complete buffer solutions must be entered in ascending order (e.g. pH 4, 7, 10). Mininum distance: 1 pH unit
		• 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.

Parameter Setting Menu

pH 2700i(X) Module

Input filter	
Sensor data • Sensor type • Temperature detection • Sensoface • Sensor monitoring Details - Slope - Zero point - Sensocheck ref. el. - Sensocheck glass el. - Response time - Sensor wear - CIP counter - SIP counter - Autoclaving counter - Sensor operating time	Representation of measured values on the display: - Selection (automatic for ISM) - Selection (automatic for ISM) for meas / cal
Cal preset values • Calimatic buffer - Mettler-Toledo - Merck/Riedel - DIN 19267 - NIST standard - NIST technical - Hamilton A, B - Kraft - Table • Drift check • Calibration timer • Tolerance adjustment • 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	
Devaluate ISM sensor	

Calibration Menu

pH 2700i(X) Module

Calimatic
Entry of buffer values
Product calibration
Data entry
ORP calibration

Maintenance Menu

BASE Module

Current source	Output current definable 0 ... 22 mA

pH 2700i(X) Module

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

Diagnostics Menu

Diagnostics messages	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

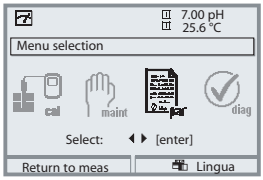
Module diagnostics
Input/output status

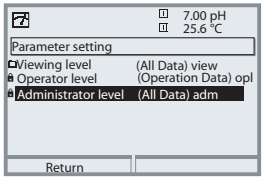
pH 2700i(X) Module

Module diagnostics	Internal function test
Servicescope	pH input signal: Displays the noise levels over the time
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
Sensor wear monitor	Current sensor wear, No. of CIP/SIP/autoclaving cycles
Statistics	Displays first calibration and deviations of last 3 calibrations

Overview of Parameter Setting

par





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 a function 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 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) - EC 400 (fully automated probe controller)
Time/date	Selecting the display format, entry
Point of meas description	Can be called up in 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 meas. value --- Fixed 22 mA - 22 mA message	2 current outputs, separately adjustable Behavior during messages Output current [mA] 22 4 "Current meas." "Last usable value" "Fixed (22 mA)" HOLD HOLD HOLD
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 • Conoller alarm (alarm output EC 400) • 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

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M700 pH 2700i(X)

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Icon	Explanation of icons important for this 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 	Function check. The NAMUR "function check" 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 up: Diagnostics menu/Message list
	Limit indication: Lower / upper range limit exceeded
	Temperature detection by manual input
	Calibration - Step 1 of product calibration has been executed. The analyzer is waiting for the sample values.
TC	Calibration: 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.)

Menu Selection pH 2700i(X) Module