Measuring Module
M 700® Cond 7700(X)

For Conductivity Measurement with
2- or 4-Electrode Sensors

52121223

METTLER TOLEDO

71932

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.
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Return of Products Under Warranty

Please contact our Service Team before returning a defective device. Ship the <u>cleaned</u> 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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Process Analytics

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Internet	www.mt.com
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

Cond 7700

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) normatif(s).

EMC Directive/EMV-Richtlinie
Directive concernant la CEM

89/336/EWG

Norm/Standard/Standard

EN 61326	/ VDE 0843 Teil 20:	1998-01
EN 61326 / A1	/ VDE 0843 Teil 20 / A1:	1999-05

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

Urdorf, August 28, 2003
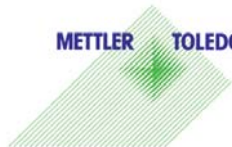
Mettler-Toledo GmbH, Process Analytics

Waldemar Rauch
General Manager PO Urdorf

Christian Zwicky
Head of Marketing

METTLER TOLEDO

Artikel Nr.: 52960332KE   52960332KE-Cond7700-i nternetdoc

Sitz der Gesellschaft   Mettler-Toledo GmbH, Im Langacher, CH-8606 Greifensee

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Declaration of conformity
Konformitätserklärung
Déclaration de conformité

CE 0344

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Description
Beschreibung/Description

Cond 7700X

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auquel se réfère cette déclaration est conforme à la (aux) norme(s) ou au(x)
document(s) normatif(s).

Explosion protection
Explosionsschutzrichtlinie
Prot. contre les explosions

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

Low-voltage directive
Niederspannungs-Richtlinie
Directive basse tension

73/23/EWG

EMC Directive
EMV-Richtlinie
Directive concernant la CEM

89/336/EWG

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

Urdorf, July 16, 2004

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METTLER TOLEDO

Norm/Standard/Standard	94/9/EG:	EN 50014	
		EN 50020	
		EN 50281-1-1	
		EN 50284	
	73/23/EWG:	DIN EN 61010-1 / VDE 0411 Teil 1:	2002-08
	89/336/EWG:	DIN EN 61326 / VDE 0843 Teil 20:	2002-03

METTLER TOLEDO

Contents

M700 Cond 7700(X)

Contents

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M700 Cond 7700(X)

Intended Use

The module is an input module for conductivity measurement with commercially available 2- or 4-electrode sensors.

The Cond 7700X 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 M 700(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

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.

Application in Hazardous Locations:
Cond 7700X Module
When using the Cond 7700X 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

Cond 7700(X) Module

Device Software M 700(X)
The Cond 7700 module is supported by software version 4.0 or higher.
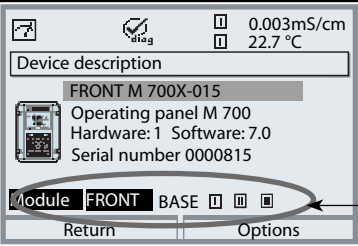
Module Software Cond 7700(X)
Software version 2.0

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

Menu	Display	Device description
		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.

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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.
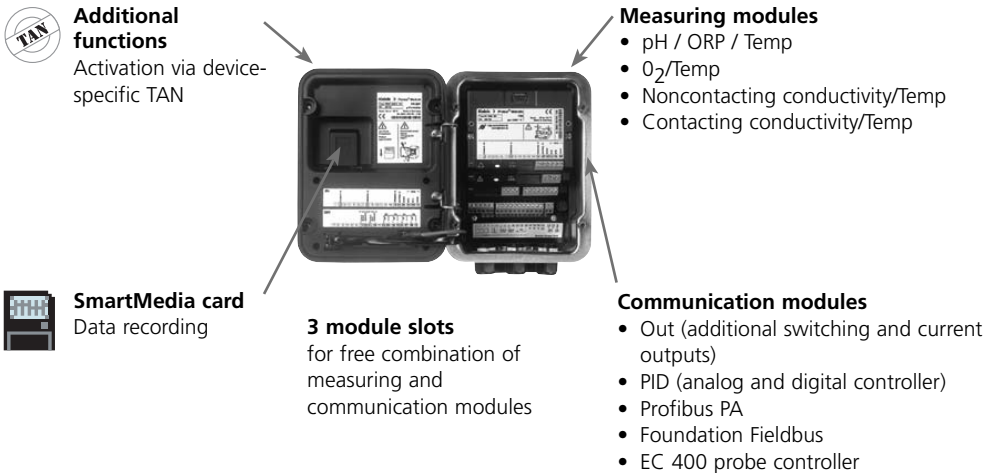
M 700(X) Modular Process Analysis System

Additional functions
Activation via device-specific TAN

Measuring modules
• pH / ORP / Temp
• O_2/Temp
• Noncontacting conductivity/Temp
• Contacting conductivity/Temp

SmartMedia card
Data recording

3 module slots
for free combination of measuring and communication modules

Communication modules
• Out (additional switching and current outputs)
• PID (analog and digital controller)
• Profibus PA
• Foundation Fieldbus
• EC 400 probe controller

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

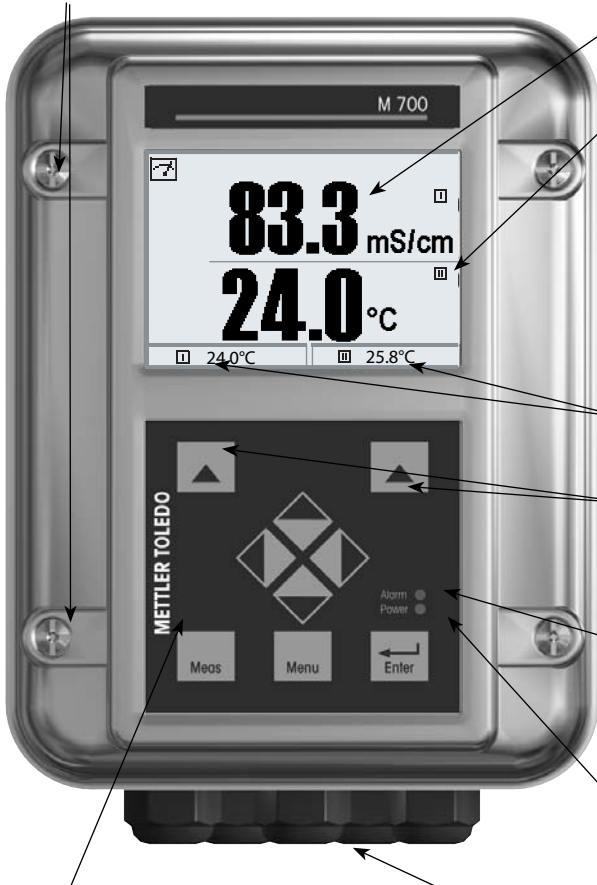Short Description: FRONT Module

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
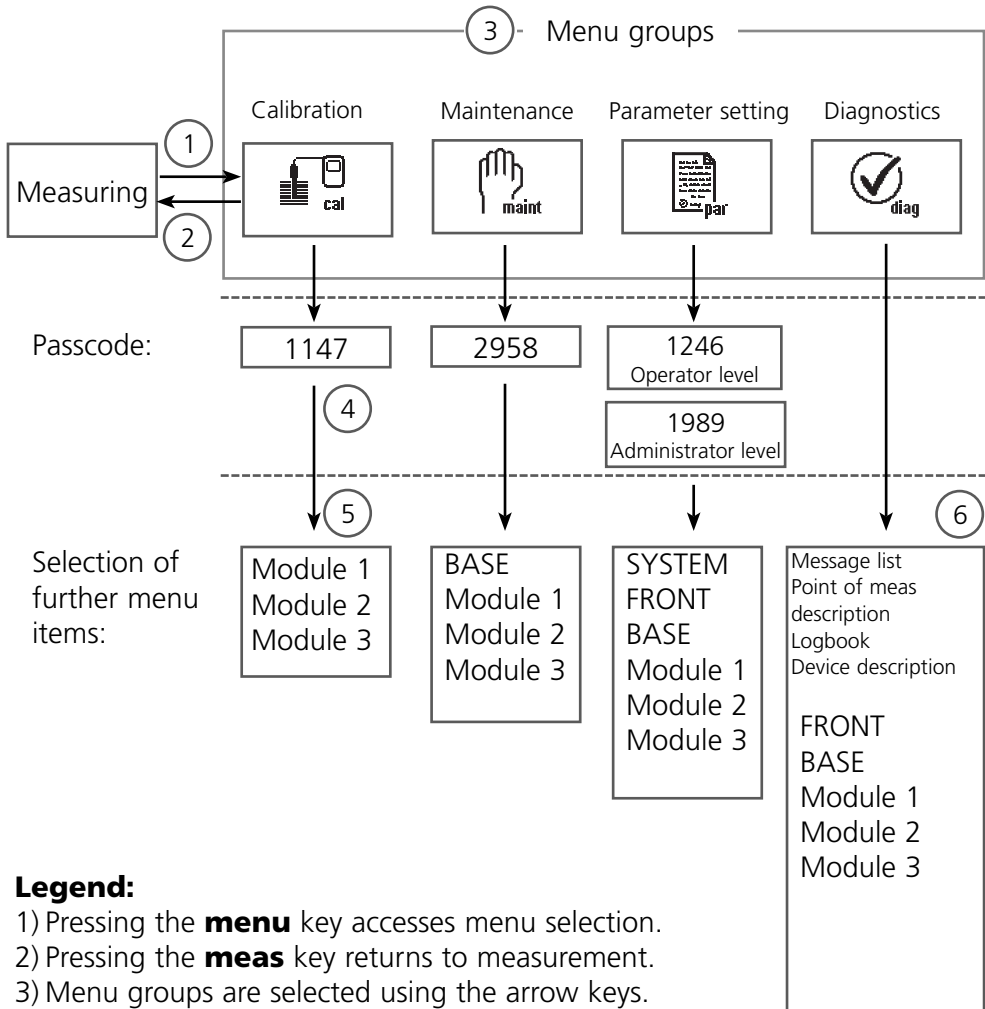and data entries

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

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Short Description: Menu Structure

Basic Functions: Calibration, Maintenance, Parameter Setting, Diagnostics

③ Menu groups

| Calibration | Maintenance | Parameter setting | Diagnostics |

Measuring ① ②

cal   maint   par   diag

Passcode:

| 1147 | 2958 | 1246 Operator level |
| | | 1989 Administrator level |

④

Selection of further menu items:

⑤

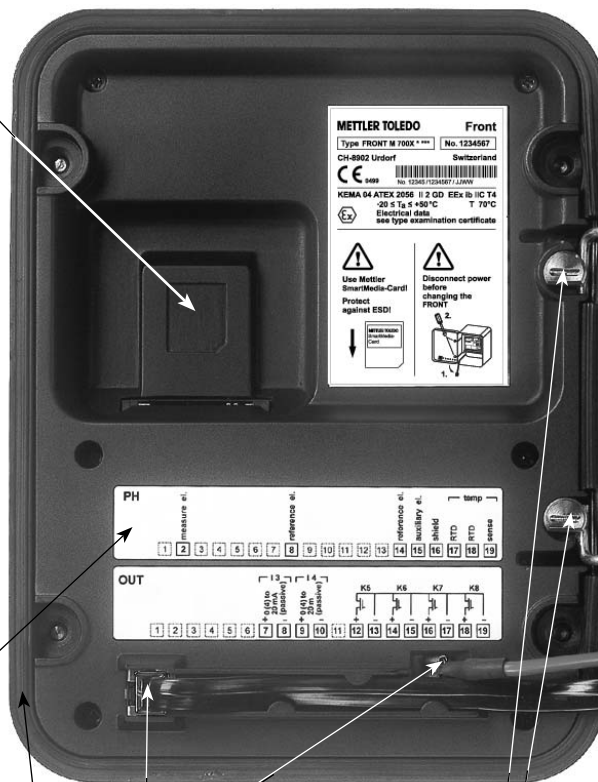| Module 1 Module 2 Module 3 | BASE Module 1 Module 2 Module 3 | SYSTEM FRONT BASE Module 1 Module 2 Module 3 | Message list Point of meas description Logbook Device description |

⑥

FRONT
BASE
Module 1
Module 2
Module 3

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

METTLER TOLEDO Front
Type FRONT M 700X * *** No. 1234567
CH-8902 Urdorf Switzerland
CE 0499 No 12345 /1234567 / JJWW
KEMA 04 ATEX 2056 II 2 GD EEx ib IIC T4
-20 ≤ Ta ≤ +50°C T 70°C
Electrical data
see type examination certificate

Use Mettler SmartMedia-Card! Protect against ESD!

Disconnect power before changing the FRONT

PH

OUT

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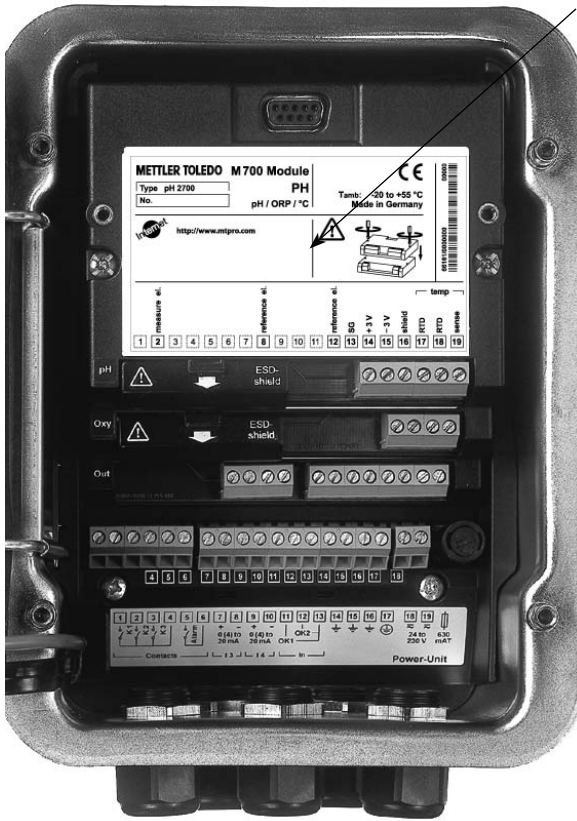
The circumferential sealing
guarantees IP 65 protection and allows spray cleaning / disinfection.
Caution! Keep clean!

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:
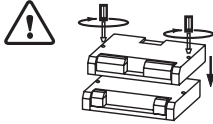100 ... 230 V AC or
24 V AC/DC

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.

Terminal Plates Cond 7700(X) Module

Terminal Plate Cond 7700 Module:

METTLER TOLEDO M 700 Module

Type Cond 7700
No.

COND
Conductivity / °C

CE

Tamb: -20 to +55 °C
Made in Germany

00000
59802/0000000

Internet http://www.mt.com

gnd

temp

shield RTD RTD sense

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 |

Terminal Plate Cond 7700X Module:

METTLER TOLEDO M 700 X Module

Type Cond 7700 X
No.

COND
Conductivity / °C

SP FM APPROVED Ex CE
0049

Tamb: -20 to +50 °C
Made in Germany/Kassel

00000
6586/0000000/0650

KEMA 04 ATEX 2056   Electr. data see type examination certificate
II 2 (1) GD EEx ib [ia] IIC T4 T 70 °C CH-8902 Urdorf   Switzerland
IS, CLASS I, DIV1, GRP A, B, C, D, T4   Entity, T$_A$ = 50 °C
CLASS I, ZONE 1, AEx ib [ia], GRP IIC, T4   control dwg. 201.004-110
NI, CI I, DIV 2, GRP A, B, C, D   with IS circuits extending into DIV 1
AIS, CI I, Zone 1, Ex ib [ia] IIC T4
NI, CI I, Zone 2, Ex na [ia] IIC   control dwg. 201.004-120

gnd

temp

shield RTD RTD sense

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 |

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

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Inserting the Module

Note: Be sure to connect the shielding properly!

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. Connect sensor cable
6. Close device, tighten screws at the front
7. Switch on power supply
8. Set parameters

Caution!
Be sure to select the sensor type you are using in the parameter setting menu!

Wiring Examples

Note: Be sure to connect the shielding properly!

See EC-Type-Examination Certificate (www.mt.com/pro) for Ex ratings.

Wiring Example 1

Conductivity measurement with InPro 7000 Series
2-electrode sensor via VP plug

Cond 7700
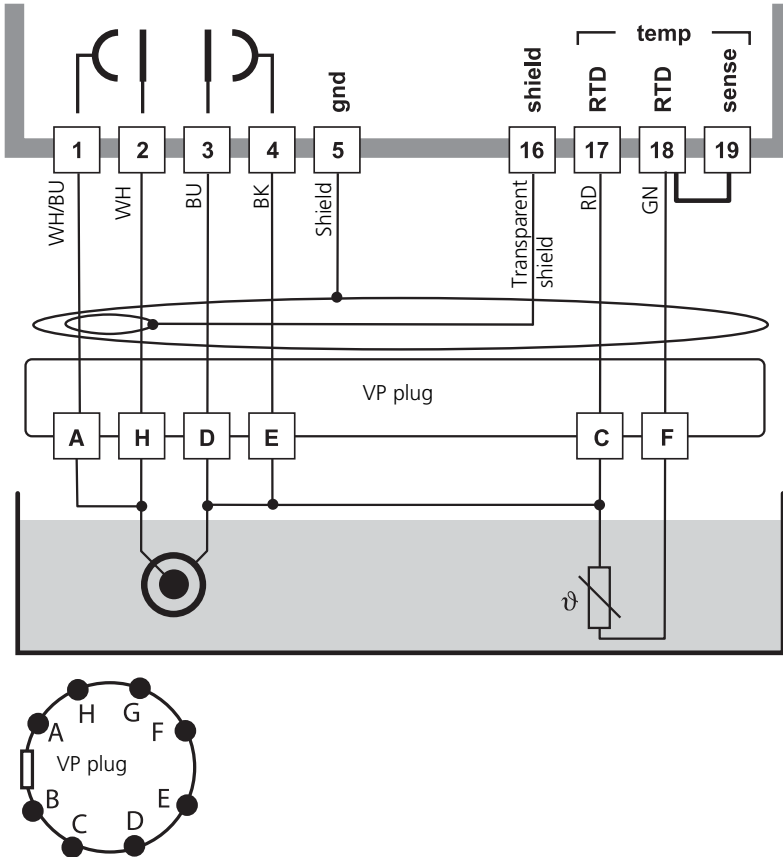
Wiring Example 2

Conductivity measurement with InPro 7100 Series
4-electrode sensor via VP plug

Cond 7700
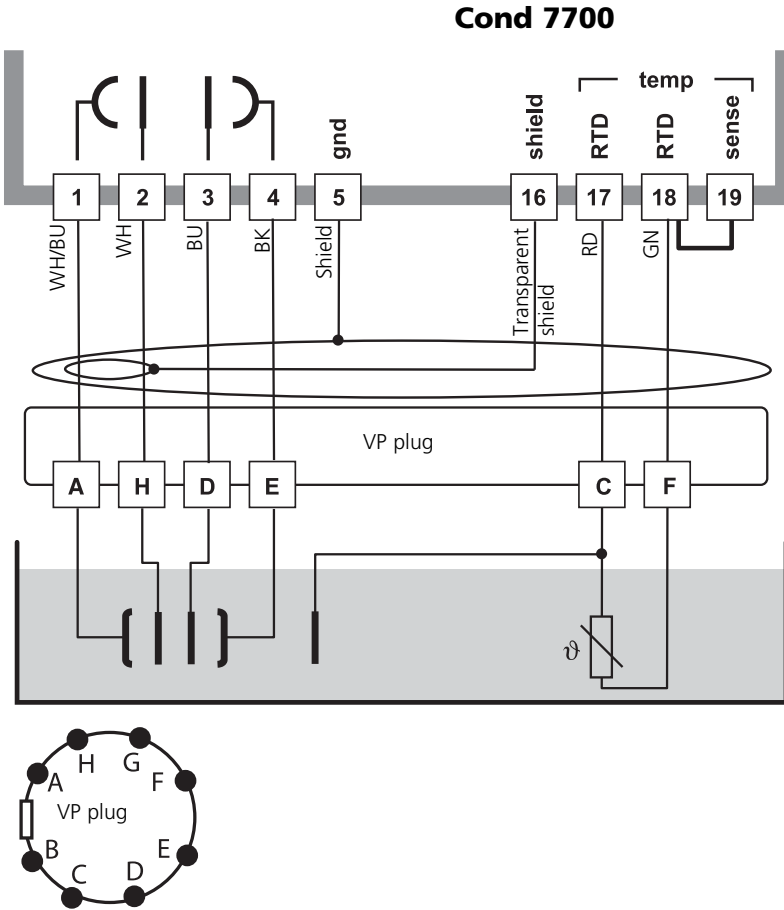
Wiring Example 3

Conductivity measurement with 4-electrode sensor

Cond 7700
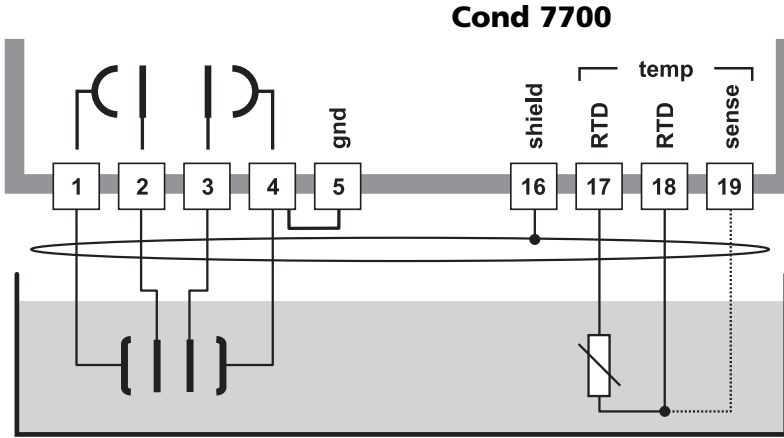
Wiring Example 4

Conductivity measurement with 2-electrode coax sensor

Cond 7700

22
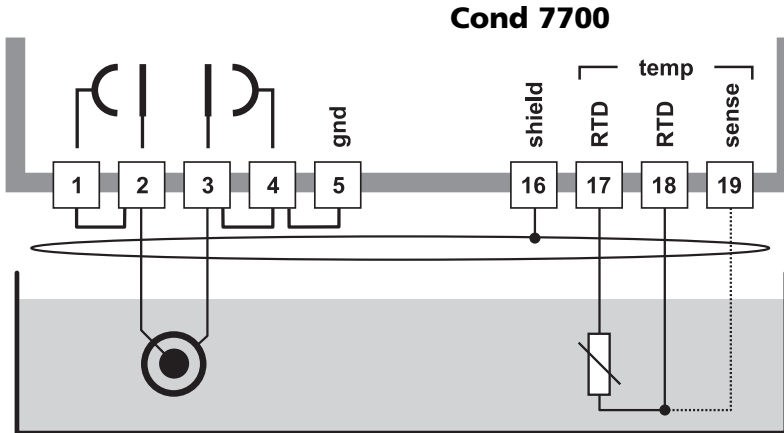
Menu Selection

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

3 Menu groups (Select using arrow keys)

	Calibration	Maintenance	Parameter setting	Diagnostics

| | cal | maint | par | diag |

| Passcode (as delivered) | 1147 | 2958 | 1246 Operator level | |
| | | | 1989 Admin. level | |

Selection of further menu items:
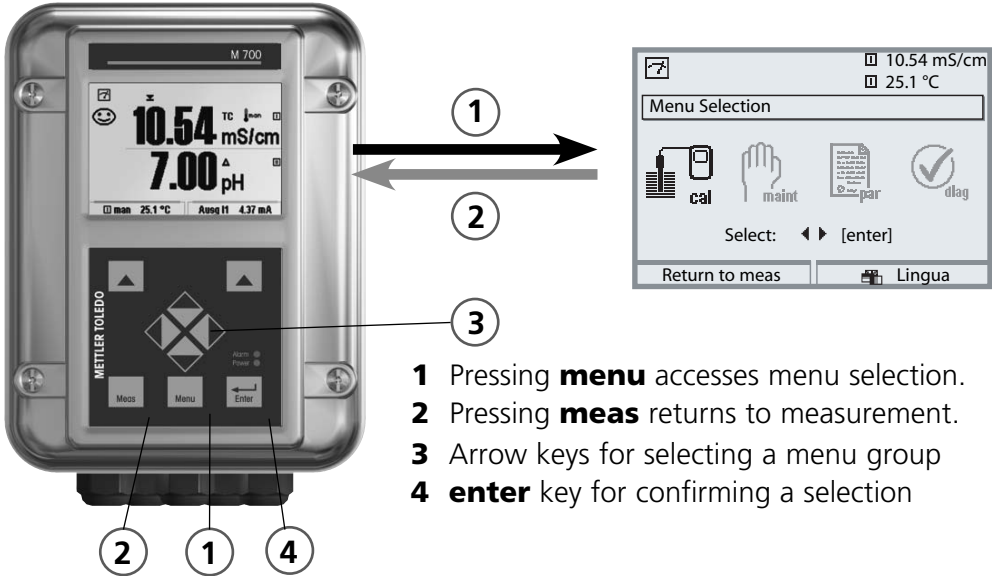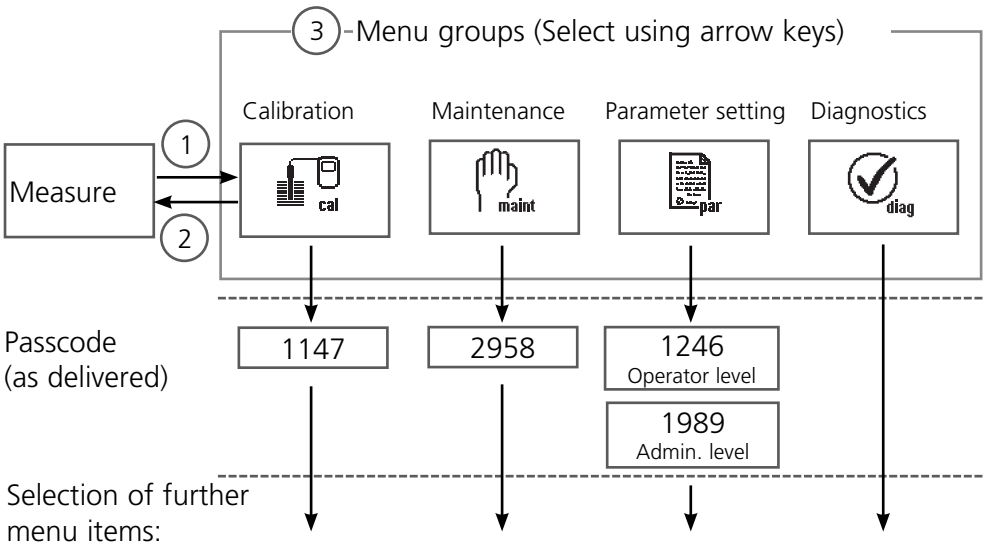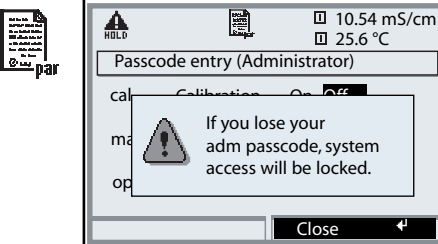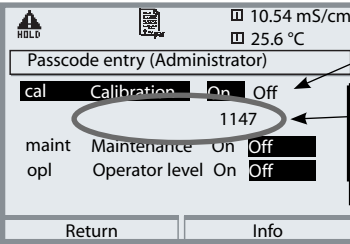
Passcode Entry

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**.

Display content (first figure):
⚠ HOLD ☷ 10.54 mS/cm ☷ 25.6 °C
Passcode entry (Administrator)
cal   Calibration   On Off
⚠ If you lose your adm passcode, system access will be locked.
Close

Display content (second figure):
⚠ HOLD ☷ 10.54 mS/cm ☷ 25.6 °C
Passcode entry (Administrator)
cal   Calibration   On Off
1147
maint Maintenance On Off
opl   Operator level On Off
Return   Info

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.
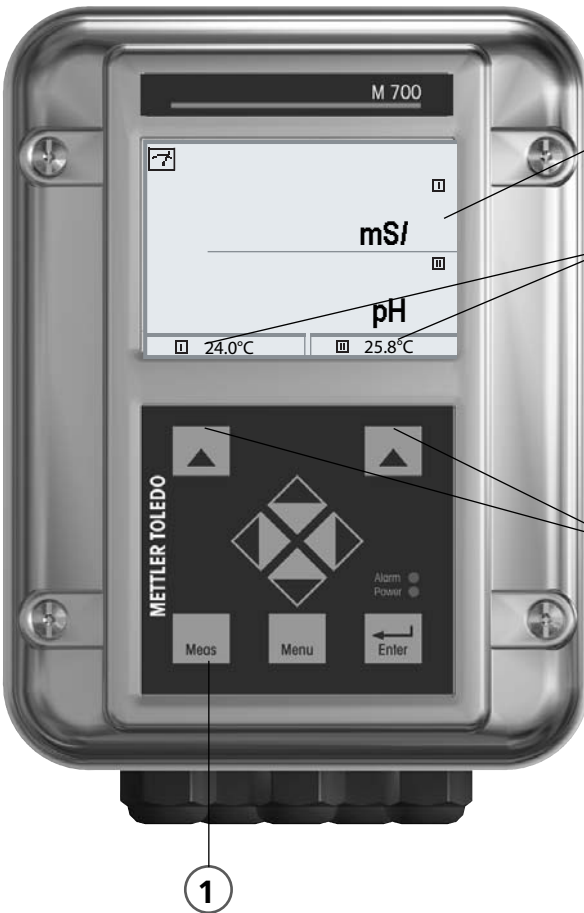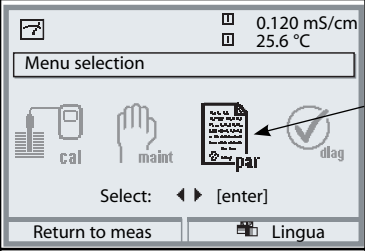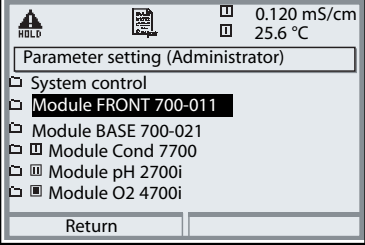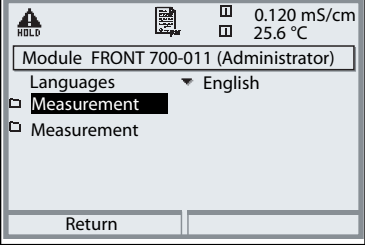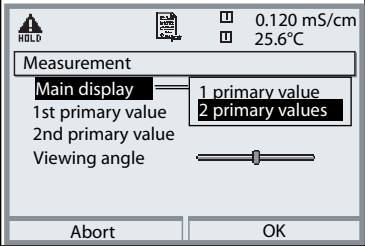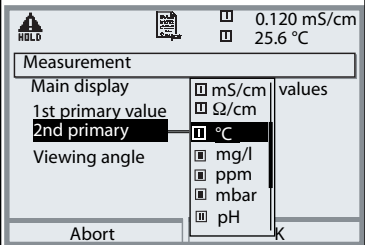
Measurement display
Typical display for 2 points of measurement: conductivity, pH.

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
	⊡ 0.120 mS/cm 25.6 °C Menu selection cal maint ⚙par diag Select: ◀ ▶ [enter] Return to meas 🏳 Lingua	**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	⚠ HOLD ⊡ 0.120 mS/cm 25.6 °C Parameter setting (Administrator) ▫ System control ▫ Module FRONT 700-011 ▫ Module BASE 700-021 ▫ ⊡ Module Cond 7700 ▫ ▥ Module pH 2700i ▫ ▪ Module O2 4700i Return	Parameter setting: Select "Module FRONT"
	⚠ HOLD ⊡ 0.120 mS/cm 25.6 °C Module FRONT 700-011 (Administrator) Languages ▼ English ▫ Measurement ▫ Measurement Return	Front module: Select "Measurement display"
	⚠ HOLD ⊡ 0.120 mS/cm 25.6°C Measurement Main display ── 1 primary value 1st primary value 2 primary values 2nd primary value Viewing angle ══╪══ Abort OK	Measurement display: Set the number of primary values (large display) to be displayed
	⚠ HOLD ⊡ 0.120 mS/cm 25.6 °C Measurement Main display ⊡ mS/cm values 1st primary value ⊡ Ω/cm 2nd primary ⊡ °C Viewing angle ▪ mg/l ▪ ppm ▪ mbar ▥ pH Abort K	Select process variable(s) to be displayed and confirm with **enter**. Pressing the **meas** key returns to measurement.

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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 conductivity meter delivers an imprecise or wrong
output value! Every conductivity sensor has its individual cell constant.
To determine the correct conductivity value, the conductivity meter must
be adjusted to the sensor. From the sensor signal and the cell constant, the
meter calculates the conductivity value to be displayed.

Procedure
Every conductivity sensor has its individual cell constant.
Depending on the sensor design, the cell constant may vary over a wide
range. As the conductivity is calculated from the measured conductance and
the cell constant, this must be known to the measuring system. For calibra-
tion or sensor standardization, either the known (stamped on) cell constant
of the conductivity sensor used is entered in the measuring system or it is
determined automatically by measuring a calibration solution with a known
conductivity. The data are stored in a calibration record. By "Adjustment"
the determined calibration data can be used for correction (see following
page).

- Use fresh calibration solutions only!
- The calibration solution used must have been selected during parameter
  setting.
- Calibration accuracy decisively depends on the exact detection of the cali-
  bration solution's temperature. Using the measured or entered tempera-
  ture, the M 700 determines the nominal value for the calibration solution
  from a stored table.
- Observe response time of temperature probe!
- For exact determination of the cell constant, wait until the temperature
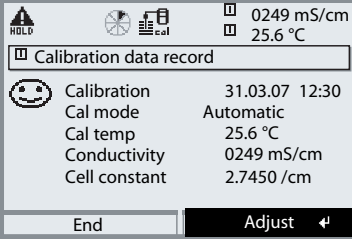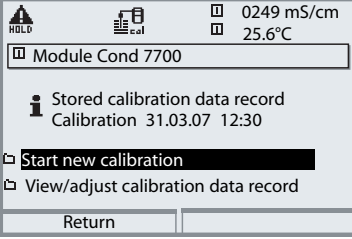 probe and calibration solution have the same temperature.

Adjustment

Adjustment

means that the cell constant determined by a calibration is taken over.
It is entered in the calibration record. (Cal record can be called up in the
Diagnostics menu for the Cond 347700(X) module.) The value is only effec-
tive 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 autho-
rized 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 "Audit Trail" (continuous data recording and backup
according to FDA 21 CFR Part 11).

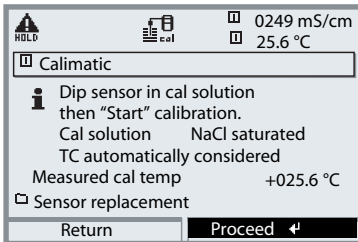| Menu	Display	Adjustment after calibration
	☀ 🜂 🗎 0249 mS/cm **HOLD** 25.6 °C Calibration data record ☺ Calibration 31.03.07 12:30 Cal mode Automatic Cal temp 25.6 °C Conductivity 0249 mS/cm Cell constant 2.7450 /cm End Adjust ↵	**Administrator** With the corresponding access rights, the device can immediately be adjusted after calibration. The calibration values are taken over for calculating the measured variables.
	🗎 0249 mS/cm **HOLD** 25.6°C Module Cond 7700 ℹ Stored calibration data record Calibration 31.03.07 12:30 ▫ Start new calibration ▫ View/adjust calibration data record Return	**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

Temperature Compensation

Temperature Compensation During Calibration

The conductivity value of the calibration solution is temperature-dependent. For calibration, the calibration solution temperature must therefore be known in order to choose the actual value from the conductivity table. During parameter setting you define whether cal temperature is measured automatically or must be entered manually.

Automatic Temperature Compensation

```
⚠       ⌷⌷       □ 0249 mS/cm
HOLD    ⌷cal     □ 25.6 °C
□ Calimatic
ℹ  Dip sensor in cal solution
   then "Start" calibration.
   Cal solution      NaCl saturated
   TC automatically considered
 Measured cal temp        +025.6 °C
▭ Sensor replacement
     Return         Proceed  ↵
```

For automatic cal temp detection, the M 700 measures the temperature of the calibration solution with a temperature probe (Pt 100 / Pt 1000 / NTC 30 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 calibration 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

```
⚠       ⌷⌷       □ 0249 mS/cm
HOLD    ⌷cal     □ 25.6 °C
□ Calimatic
ℹ  Dip sensor in cal solution
   then "Start" calibration.
   Cal solution      NaCl saturated
   TC automatically considered
 Enter cal temp          +025.6 °C
▭ Sensor replacement
     Return         Proceed  ↵
```
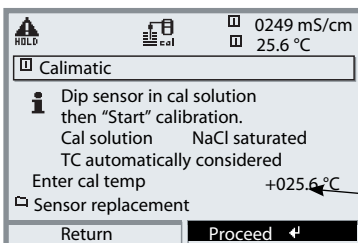
The temperature of the calibration solution must be entered manually in the Calibration menu. When "Cal temp automatic" is set, "Measured cal temp" appears in the menu. When "Cal temp manual" is set, "Enter cal temp" appears in the menu.

Calibration / Adjustment

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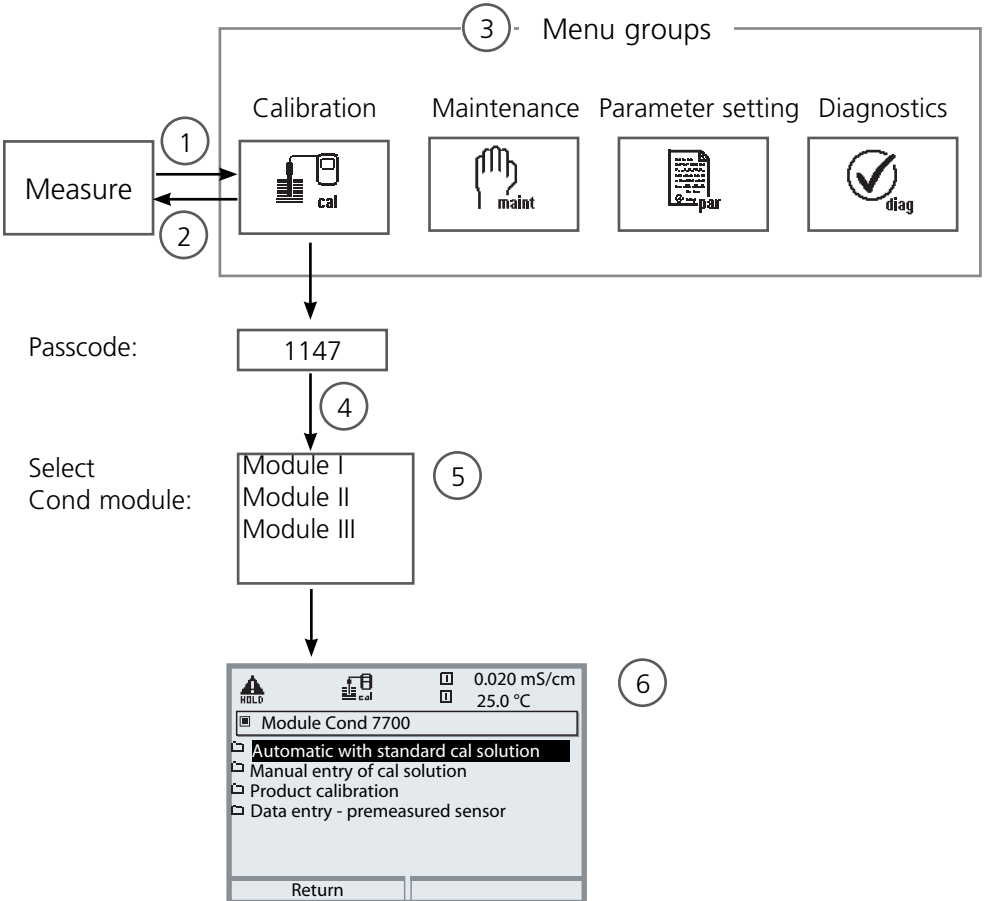
To calibrate a Cond module: Select a calibration method
(1) Press **menu** key to access menu selection
(2) Pressing the **meas** key returns to measurement
(3) Select Calibration menu group using the arrow keys
(4) Press **enter** to confirm, enter passcode
(5) Select Cond module, confirm with **enter**.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

Menu	Display	Select a calibration method

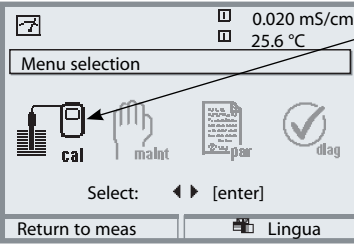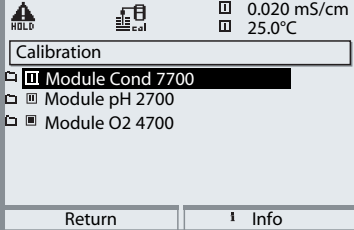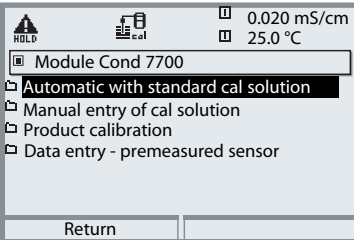| | **0.020 mS/cm** **25.6 °C** — Menu selection — cal maint par diag — Select: ◀ ▶ [enter] — Return to meas Lingua | **Call up calibration** Press **menu** key to select menu. Select calibration using arrow keys, confirm with **enter**, passcode 1147 (The passcode can be edited by the administrator.) 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 | HOLD cal **0.020 mS/cm** **25.0 °C** — Calibration — Module Cond 7700 — Module pH 2700 — Module O2 4700 — Return Info | Calibration: Select "Module Cond" |

| | HOLD cal **0.020 mS/cm** **25.0 °C** — Module Cond 7700 — Automatic with standard cal solution — Manual entry of cal solution — Product calibration — Data entry - premeasured sensor — Return | Select calibration method: • Automatic with standard cal solution • Manual entry of cal solution • Product calibration • Data entry - premeasured sensor When you call up calibration, the analyzer automatically proposes the previous calibration method. If you do not want to calibrate, "Return" with the left softkey. |

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Calibration / Adjustment

Automatic with Standard Calibration Solution

For automatic calibration, the conductivity sensor is immersed in a standard calibration solution (NaCl or KCl, selected during parameter setting). From the measured conductance and temperature, the M 700 automatically calculates the cell constant. The temperature dependence of the calibration solution is taken into account.

During calibration the module is in HOLD mode.

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

Caution!

- Use fresh calibration solutions only! The calibration solution used must have been selected during parameter setting.
- Calibration accuracy decisively depends on the exact detection of the calibration solution's temperature. Using the measured or entered temperature, the M 700 determines the nominal value for the calibration solution from a stored table.
- Observe response time of temperature probe!
- For exact determination of the cell constant, wait until the temperature probe and calibration solution have the same temperature.

Be sure to observe during calibration:

- If the measured conductance or the measured temperature fluctuate greatly, the calibration procedure is aborted after 2 min.
- If an error message appears, you have to repeat calibration.

Adjustment: Taking over the values determined by calibration

- When the values determined by calibration are correct, they must be taken over to adjust the analyzer.

Menu	Display	Automatic calibration
🔋 cal	⚠ HOLD　　　🔋cal　　□ 0250 mS/cm　□ 25.0 °C ▣ Module Cond 7700 ▭ **Automatic with standard cal solution** ▭ Manual entry of cal solution ▭ Product calibration ▭ Data entry - premeasured sensor Return	Select calibration menu Select "Module Cond" Select calibration method: "Automatic with standard cal solution", confirm with **enter**.
	⚠ HOLD　　　🔋cal　　□ 0250 mS/cm　□ 25.0 °C ▣ Automatic ℹ Dip sensor in cal solution then "Start" calibration. 　Cal solution　　　NaCl saturated 　TC automatically considered 　Enter cal temp　　　+025.0 °C ▭ Sensor replacement Return　　　　Start　↵	Display of selected calibration solution. Enter process temperature, if manual temperature adjustment has been selected. Dip sensor in calibration solution. Start calibration with softkey or **enter**.
	⚠ HOLD　　✳ 🔋cal　　□ 0250 mS/cm　□ 25.6 °C ▣ Automatic ℹ Calibration running 　Correction of cell constant 　Calibration temp　　+025.0 °C 　Solution table value　0.020 mS/cm 　Response time　　　0003s End　　　　Repeat　↵	Calibration is running. The display shows: • Calibration temperature • Solution table value (conductivity in dependence on cal temperature) • Response time
	⚠ HOLD　　✳ 🔋cal　　□ 0250 mS/cm　□ 25.6 °C ▣ Calibration data record ℹ Calibration　　31.03.07　11:37 　Cal mode　　　Automatic 　Cal temp　　　+025.6°C 　Conductivity　0249 mS/cm 　Cell constant　2.7450 /cm End　　　　Adjust　↵	**Adjustment** Press "Adjust" to take over the values determined during calibration for calculating the measured variables.

Calibration / Adjustment

Manual Entry of Calibration Solution

For calibration with manual entry of the calibration solution's conductivity, the sensor is immersed in a calibration solution. M 700 determines a conductivity/calibration temperature value pair. Then, the temperature-corrected conductivity value of the solution must be entered. To do this, read off the conductivity for the temperature displayed from the TC table of the calibration solution. Intermediate conductivity values must be interpolated. M 700 automatically calculates the cell constant.

During calibration the module is in HOLD mode.

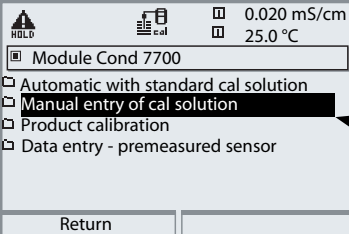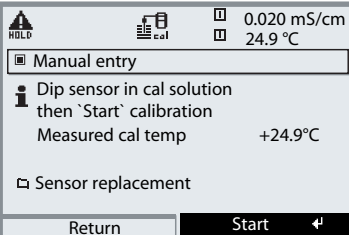Current outputs and relay contacts of the module behave as configured (Module BASE).
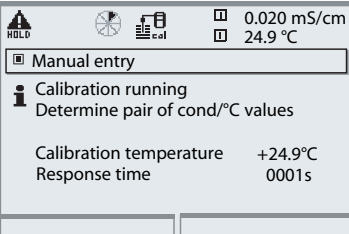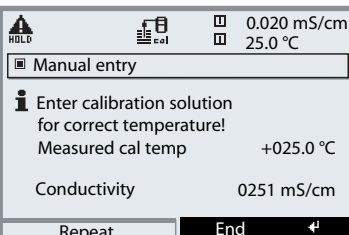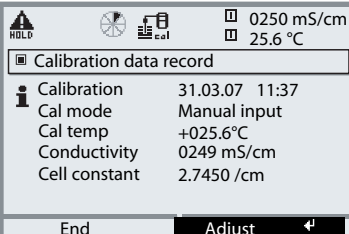
Caution!
• Use fresh calibration solutions only!
• Calibration accuracy decisively depends on the exact detection of the calibration solution's temperature.
• Observe response time of temperature probe!
• For exact determination of the cell constant, wait until the temperature probe and calibration solution have the same temperature.

Be sure to observe during calibration:
• If the measured conductance or the measured temperature fluctuate greatly, the calibration procedure is aborted after 2 min.
• If an error message appears, you have to repeat calibration.

Adjustment: Taking over the values determined by calibration
• When the values determined by calibration are correct, they must be taken over to adjust the analyzer.

Menu	Display	Manual entry of cal solution
▒▒ 🔲 cal	⚠ HOLD 📟📟 🔲 0.020 mS/cm 25.0 °C ▪ Module Cond 7700 ▫ Automatic with standard cal solution ▫ **Manual entry of cal solution** ▫ Product calibration ▫ Data entry - premeasured sensor Return	Select calibration menu Select "Module Cond" Select calibration method: "Manual entry of cal solution", confirm with **enter**.
	⚠ HOLD 📟📟 🔲 0.020 mS/cm 🔲 24.9 °C ▪ Manual entry ℹ Dip sensor in cal solution then `Start` calibration Measured cal temp +24.9°C ▫ Sensor replacement Return **Start** ↵	Enter process temperature, if manual temperature adjustment has been selected. Immerse sensor in cal solution. Start calibration with softkey or **enter**.
	⚠ HOLD ✳ 📟📟 🔲 0.020 mS/cm 🔲 24.9 °C ▪ Manual entry ℹ Calibration running Determine pair of cond/°C values Calibration temperature +24.9°C Response time 0001s	Calibration is running. The display shows: • Calibration temperature • Response time
	⚠ HOLD 📟📟 🔲 0.020 mS/cm 🔲 25.0 °C ▪ Manual entry ℹ Enter calibration solution for correct temperature! Measured cal temp +025.0 °C Conductivity 0251 mS/cm Repeat **End** ↵	Enter conductivity. End calibration with softkey ("End").
	⚠ HOLD ✳ 📟📟 🔲 0250 mS/cm 🔲 25.6 °C ▪ Calibration data record ℹ Calibration 31.03.07 11:37 Cal mode Manual input Cal temp +025.6°C Conductivity 0249 mS/cm Cell constant 2.7450 /cm End **Adjust** ↵	**Adjustment** Press "Adjust" to take over the val- ues determined during calibration for calculating the measured variables.

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Calibration / Adjustment

Product Calibration

When the sensor cannot be removed, e.g. for sterility reasons (for biotechnical processes), its cell constant 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 sample value should be measured at process conditions (same temperature!). The determined value is entered in the measuring system. From the difference between process value and sample value, the M 700 calculates the cell constant of the conductivity sensor.

During calibration the module is in HOLD mode.

Current outputs and relay contacts of the module behave as configured (Module BASE).
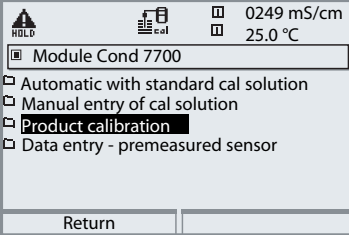
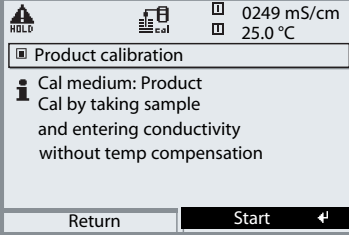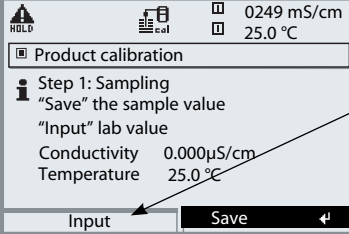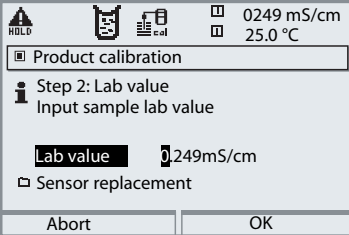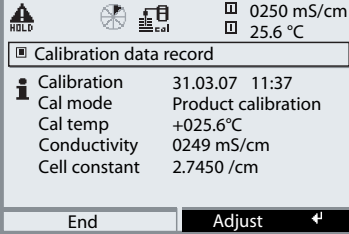## • Product calibration without TC correction

Take a sample from the process. Measure its value at the temperature at which the sample has been taken ("Sample temp", see display). To do so, it may be necessary to thermostat the sample correspondingly in the lab. Temperature compensation must be turned off at the comparison meters (TC = 0 %/K).

• Product calibration with TC correction T_{ref} = 25 °C

Take a sample from the process. When measuring in the lab (TC linear), be sure that the same values are set for reference temperature and temperature coefficient in the comparison meter and in the M 700. Furthermore, the measuring temperature should correspond to the sample temperature (see display). Transport the sample in an insulated container (Dewar).

Caution!

Product calibration can only be performed if the process medium is stable. That means, for example, that there are no chemical reactions which have an effect on the process conductivity. At higher temperatures, the sample values can also be invalidated due to evaporation.

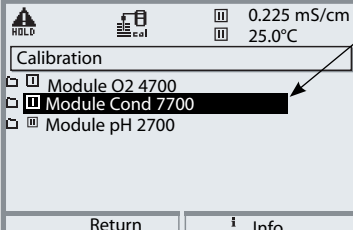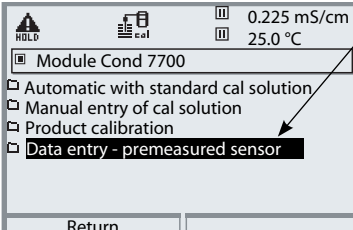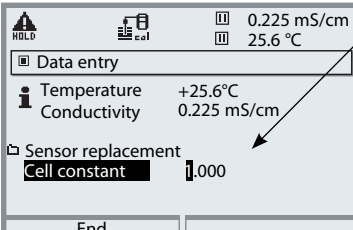| Menu	Display	Product calibration
	HOLD 0249 mS/cm 25.0 °C ■ Module Cond 7700 ▢ Automatic with standard cal solution ▢ Manual entry of cal solution ▢ Product calibration ▢ Data entry - premeasured sensor Return	Select calibration menu Select "Module Cond" Calibration method: "Product calibration", confirm with **enter**.

	HOLD 0249 mS/cm 25.0 °C
	■ Product calibration
	ℹ Cal medium: Product
	  Cal by taking sample
	  and entering conductivity
	  without temp compensation
	
	Return Start ↵
		Step 1
		Take sample.
		Store measured value and tempera-ture at the moment of sampling
		("Save" softkey or **enter**)
		The analyzer automatically returns to calibration mode selection.
		Press **meas** to return to measure-ment.

	HOLD 0249 mS/cm 25.0 °C
	■ Product calibration
	ℹ Step 1: Sampling
	  "Save" the sample value
	  "Input" lab value
	  Conductivity 0.000µS/cm
	  Temperature 25.0 °C
	
	Input Save ↵
		Exception:
		Sample value can be measured on the site and be entered immediately. To do so, press "Input" softkey.

	HOLD 0249 mS/cm 25.0 °C ■ Product calibration ℹ Step 2: Lab value Input sample lab value Lab value 0.249mS/cm ▢ Sensor replacement Abort OK	**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.

	HOLD 0250 mS/cm 25.6 °C
	■ Calibration data record
	ℹ Calibration 31.03.07 11:37
	  Cal mode Product calibration
	  Cal temp +025.6°C
	  Conductivity 0249 mS/cm
	  Cell constant 2.7450 /cm
	
	End Adjust ↵
		Adjustment
		Press "Adjust" to take over the values determined during calibra-tion for calculating the measured variables.

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Calibration / Adjustment

Data Entry of Premeasured Sensors

Data Entry of Premeasured Sensors
Entry of cell constant and zero point of a sensor, related to 25°C,
1013 mbars.

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

Menu	Display	Data entry premeasured sensors
cal	⚠ HOLD · 0.225 mS/cm · 25.0°C Calibration ▢ Module O2 4700 ▣ Module Cond 7700 ▢ Module pH 2700 Return · i Info	**Select module: Cond** During calibration, the output currents (1 and 2), limit contacts, and controller output are in HOLD mode. Confirm with **enter**
	⚠ HOLD · 0.225 mS/cm · 25.0 °C ▣ Module Cond 7700 ▢ Automatic with standard cal solution ▢ Manual entry of cal solution ▢ Product calibration ▢ Data entry - premeasured sensor Return	Select calibration method "Data entry" Confirm with **enter**
	⚠ HOLD · 0.225 mS/cm · 25.6 °C ▣ Data entry i Temperature +25.6°C Conductivity 0.225 mS/cm ▢ Sensor replacement Cell constant 1.000 End	Enter cell constant of premeasured sensor Confirm with "OK" or repeat calibration.

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Calibration

Calibrating the Sensors

Sensor Calibration

Since the cell constant is subject to production-related variances, the dis-mounted sensor should be calibrated with a calibration solution (e.g. NaCl saturated).
The cell constant of the sensor – particularly of a fringe-field sensor – depends on the type of installation:

• When the sensor is mounted in a free space (minimum distances exceeded), the cell constant can be entered directly as given in the specifications. Calibration method: "Data entry"

• When mounted in restricted space (minimum distances not kept), the sensor must be calibrated when mounted since the resulting cell constant has changed. Calibration method: "Product calibration".
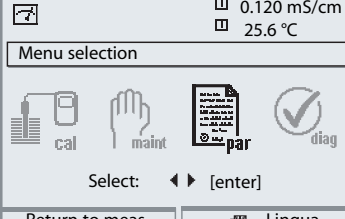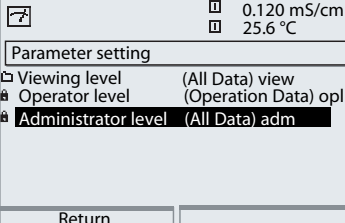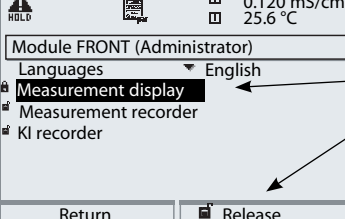
InPro 7000-VP Series

2-electrode sensors with cell constant 0.1 cm^{-1} (nominal).
The sensor must be calibrated with direct input of the cell constant since calibration solutions in the µS/cm range are not stable..

InPro 7100-VP Series

4-electrode sensors with cell constant 0.25 cm^{-1} (nominal).
The sensors can be calibrated automatically or manually. A suitable calibration solution is 0.1 mol/l NaCl, for example. When mounted in restricted space (minimum distances not kept), the sensor must be calibrated when mounted since the resulting cell constant has changed.
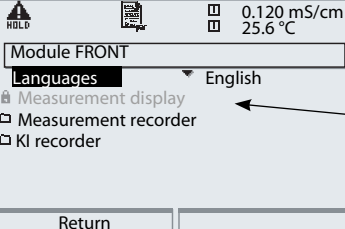Calibration method: "Product calibration".

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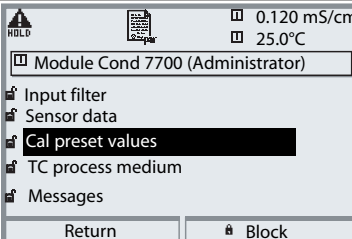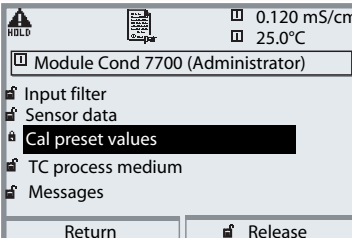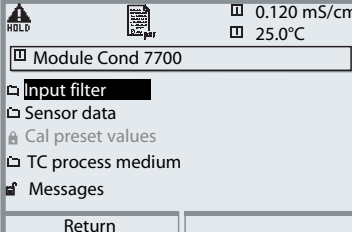
Viewing level, Operator level, Administrator level
Note: HOLD mode (Setting: BASE module)

Menu	Display	Viewing level, Operator level, Administrator level
par	0.120 mS/cm 25.6 °C Menu selection cal maint par diag Select: ◀ ▶ [enter] Return to meas Lingua	**Call up parameter setting** From the measuring mode: Press **menu** key to select menu. Select parameter setting using arrow keys, confirm with **enter**.
	0.120 mS/cm 25.6 °C Parameter setting ▢ Viewing level (All Data) view 🔒 Operator level (Operation Data) opl 🔒 Administrator level (All Data) adm Return	**Administrator level** Access to all functions, also passcode setting. Releasing or blocking a function for access from the Operator level.
	HOLD 📋 0.120 mS/cm 25.6 °C Module FRONT (Administrator) Languages ▼ English 🔒 Measurement display ▫ Measurement recorder ▫ KI recorder Return 🔒 Release	Functions which can be blocked for the Operator level are marked with the "lock" symbol. The functions are released or blocked using the softkey.
	HOLD 📋 0.120 mS/cm 25.6 °C Module FRONT Languages ▼ English 🔒 Measurement display ▫ Measurement recorder ▫ KI recorder Return	**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!

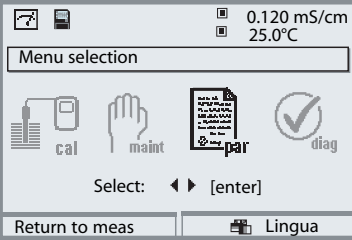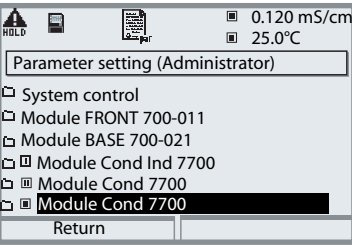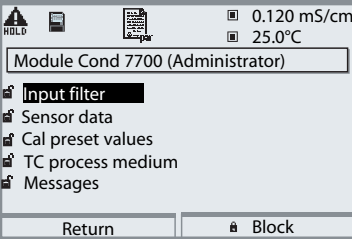# Parameter Setting: Lock Functions

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

Menu	Display	Administrator level: Enable / lock functions
par	⚠️ HOLD 📄 ⬜ 0.120 mS/cm ⬜ 25.0°C **Parameter setting (Administrator)** 📁 System control 📁 Module FRONT 700-011 📁 Module BASE 700-021 📁 **Ⅱ Module Cond 7700** 📁 Ⅲ Module Cond 7700 📁 Ⅲ Module Cond Ind 7700 Return	**Example:** Blocking access to the calibration adjustments from the Operator level **Call up parameter setting** Select Administrator level. Enter passcode (1989). Select "Module Cond" (for example) using arrow keys, confirm with **enter**.
	⚠️ HOLD 📄 ⬜ 0.120 mS/cm ⬜ 25.0°C **Ⅱ Module Cond 7700 (Administrator)** 🔓 Input filter 🔓 Sensor data 🔓 **Cal preset values** 🔓 TC process medium 🔓 Messages Return 🔒 Block	Select "Cal preset values" using arrow keys, "Block" with softkey.
	⚠️ HOLD 📄 ⬜ 0.120 mS/cm ⬜ 25.0°C **Ⅱ Module Cond 7700 (Administrator)** 🔓 Input filter 🔓 Sensor data 🔒 **Cal preset values** 🔓 TC process medium 🔓 Messages Return 🔓 Release	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	⚠️ HOLD 📄 ⬜ 0.120 mS/cm ⬜ 25.0°C **Ⅱ Module Cond 7700** 📁 **Input filter** 📁 Sensor data 🔒 Cal preset values 📁 TC process medium 🔓 Messages Return	**Call up parameter setting** Select <u>Operator level</u>, passcode (1246). Select "Module Cond" (e.g.). Now, the locked function is displayed in gray and marked with the "lock" icon.

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Activating Parameter Setting

Call up parameter setting

Menu	Display	Setting
	 0.120 mS/cm 25.0°C Menu selection cal maint par diag Select: ◀ ▶ [enter] Return to meas Lingua	**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
	⚠ HOLD 0.120 mS/cm 25.0°C Parameter setting (Administrator) ▢ System control ▢ Module FRONT 700-011 ▢ Module BASE 700-021 ▢ Module Cond Ind 7700 ▢ Module Cond 7700 ▢ Module Cond 7700 Return	Select module, confirm with **enter**. (In the Figure, the Module "Cond" is selected, for example.)
	⚠ HOLD 0.120 mS/cm 25.0°C Module Cond 7700 (Administrator) 🔓 Input filter 🔓 Sensor data 🔓 Cal preset values 🔓 TC process medium 🔓 Messages Return 🔒 Block	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).

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Documenting Parameter Setting

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

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

Documenting Parameter Setting

◇	A	B	C	D	E	F
1						
2	1.	**Meßstelle:**				Zugriff über Menüpunkt:
3		**M 700**				
4	1.1.	parametriert am / von:				
5						
6						
7	2.	Gerätebeschreibung	Hardware	Software	Seriennummer	Diagnose / Gerätebeschreibung
8	2.1.	Bedienfront 700-011 :				Diagnose / Gerätebeschreibung / Front
9	2.2.	M 700 Base 700-021:				Diagnose / Gerätebeschreibung / Base
10	2.3.	Modul Steckplatz [I] :				Diagnose / Gerätebeschreibung / I
11	2.4.	Modul Steckplatz [II] :				Diagnose / Gerätebeschreibung / II
12	2.5.	Modul Steckplatz [III] :				Diagnose / Gerätebeschreibung / III
13						
14						
15		**M 700 Front**				
16	3.	M 700 Front Einstellungen	Werkseinstellung	Parametersatz A	Parametersatz B	
17	3.1.	Sprache:	Deutsch			Parametrierung (Spezialist) / Modul Front ...
18						
19	3.1.1	Meßwertanzeige:				
20		Hauptanzeige	2 Hauptmeßwerte			Parametrierung (Spezialist) / Modul Front ... / Meß
21		1. Hauptmeßwert (Modul/Wert):	modulabhängig			
22		2. Hauptmeßwert (Modul/Wert):	modulabhängig			
23		Anzeigeformat (pH)	xx.xx pH			
24		Blickwinkel	Mitte			
25						
26	3.3.	Nebenanzeige				Einstellung erfolgt über Softkeys, wenn in Matrixfu
27		Anzeigewert, links	-			
28		Anzeigewert, rechts	-			
29						
30	3.4	Meßwertrecorder:	Option SW700-103			Parametrierung (Spezialist) / Modul Front ... / Meß
31		Zeitbasis (t / Pixel)	1 min			
32		Zeitlupe (10x)	Aus			
33		Min / Max anzeigen	Ein			
34	3.4.1	Kanal 1: Meßgröße	modulabhängig			
35		Anfang	0.00			
36		Ende	14.00			
37	3.4.2	Kanal 2: Meßgröße	modulabhängig			
38		Anfang	-50.0			
39		Ende	150.0			

M 700 | M 700 Optionen | M 700 Tabellen | pH 2700 | Cond 7700 | Cond Ind 7700 | O2 4700

Bereit · · · Summe=0 · ROLL · GROSS · N

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

Caution!

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

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Parameter Setting
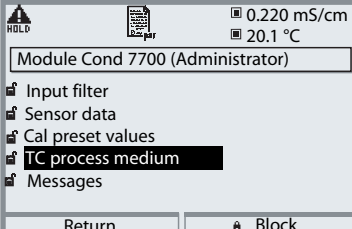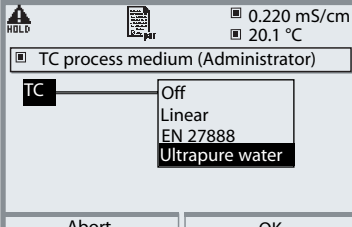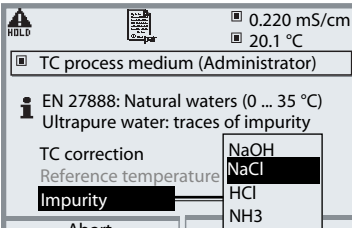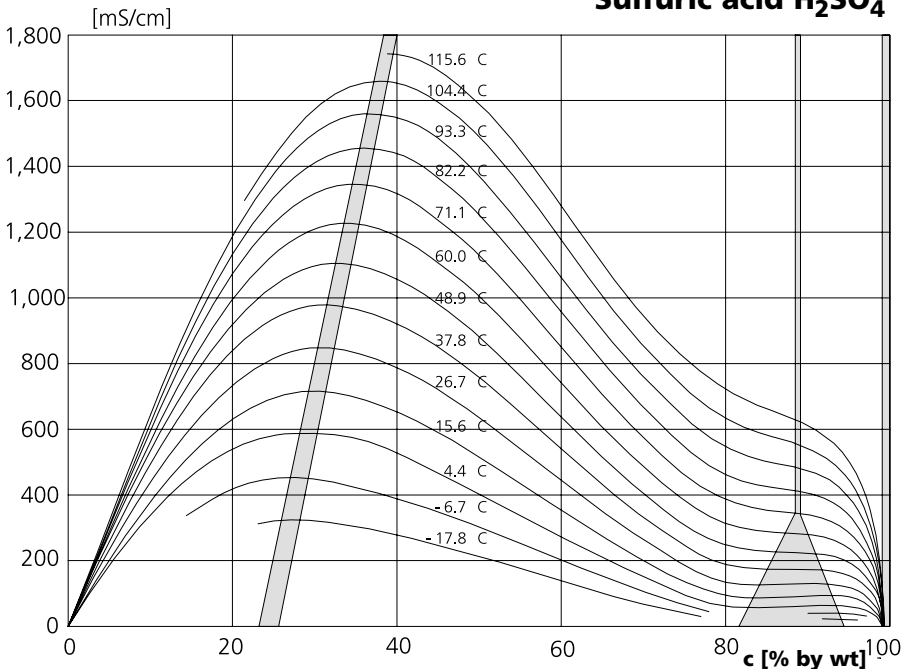
Default Settings and Selection Range
Note: HOLD mode active
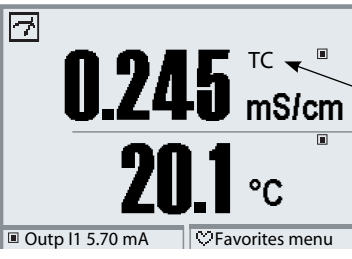
Parameter	Default	Selection / Range
Input filter • Pulse suppression	Off	Off, On

Sensor data
• Sensor type
 	
• Nominal cell constant
• Temperature detection
 	
    Measuring temp
    Calibration temp
• Sensocheck
	Other 2-EL sensor
	
	1.0000 cm*
	Pt 1000
	
	Auto
	Auto
	Off
		Other 2-El sensor, Other 4-El sensor
		InPro7000-VP Series
		InPro7100-VP Series
		X.XXXX (entry) depending on selected sensor
		Pt100, Pt1000, NTC30kohm, Ni100
		(sensor selection)
		Auto, manual: Default +25.0 °C (entry)
		Auto, manual: Default +25.0 °C (entry)
		Off, Failure, Maint. request

Cal preset values • Calibration solution • Product calibration	NaCl sat without TC	NaCl 0.01 mol/l NaCl 0.1 mol/l NaCl saturated KCl 0.01 mol/l KCl 0.1 mol/l KCl 1 mol/l without TC, with TC
TC process medium • TC correction • Reference temp • Impurity	Off	Off, linear, EN 27888, ultrapure water (Linear: Enter reference temp +025.0 °C) (Ultrapure water: NaOH, NaCl, HCl, NH_3) (Adjustment range depending on parameter)

Parameter Setting

TC Process Medium
Note: HOLD mode active

Menu	Display	TC process medium
	0.220 mS/cm / 20.1 °C Module Cond 7700 (Administrator) □ Input filter □ Sensor data □ Cal preset values □ TC process medium □ Messages Return — Block 0.220 mS/cm / 20.1 °C TC process medium (Administrator) TC — Off / Linear / EN 27888 / Ultrapure water Abort — OK 0.220 mS/cm / 20.1 °C TC process medium (Administrator) ℹ EN 27888: Natural waters (0 … 35 °C) Ultrapure water: traces of impurity TC correction Reference temperature Impurity — NaOH / NaCl / HCl / NH3 Abort — OK **0.245** TC mS/cm **20.1** °C Outp I1 5.70 mA — ♡Favorites menu	**TC process medium** You can choose from: • Linear (input of TC coefficient) • EN 27888 • Ultrapure water (add. function SW 700-008) When you have selected "Ultrapure water", you must specify the type of impurity: **NaOH** Alkaline ultrapure water **NaCl** Neutral ultrapure water, for conductivity measurement in water processing behind gravel bed filter **HCl** Acidic ultrapure water, for conductivity measurement behind cation filter **NH$_3$** Ammoniacal ultrapure water When the TC correction for process medium is switched on, "TC" appears in the display in measuring mode.

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Parameter Setting: Concentration Curves

Default Settings and Selection Range
Note: HOLD mode active

Parameter	Default	Selection / Range
Concentration • Medium ("Yes" selected)	Off H_2SO_4 (0-30%)	On, Off H_2SO_4 (0-30 %), H_2SO_4 (32-84 %), H_2SO_4 (92-99 %), HNO_3 (0-30 %), HNO_3 (35-96 %), HCl (0-18 %), HCl (22-39 %) NaOH (0-14 %), NaOH (18-50 %), NaCl (0-26 %), Table (additional function SW 700-009)
USP function • Reduced limit • Monitoring	Off 100 % Off	On, Off 10 % ... 100% Off, Failure, Maint. request

Sulfuric acid H_2SO_4

[mS/cm]

115.6 C
104.4 C
93.3 C
82.2 C
71.1 C
60.0 C
48.9 C
37.8 C
26.7 C
15.6 C
4.4 C
- 6.7 C
- 17.8 C

c [% by wt]

Nitric acid HNO$_3$

[mS/cm]

1,200
1,000
800
600
400
200
0

50 C
40 C
30 C
25 C
20 C
10 C
0 C
- 10 C
- 20 C

0   20   40   60   80   100
c [% by wt]

Hydrochloric acid HCl

[mS/cm]

1,200
1,000
800
600
400
200
0

50 C
40 C
30 C
25 C
20 C
10 C
0 C
- 10 C
- 20 C

0   10   20   30   40
c [% by wt]

50

Sodium hydroxide solution NaOH

[mS/cm]

1,600
1,400
1,200
1,000
800
600
400
200
0

100 C
90 C
80 C
70 C
60 C
50 C
40 C
30 C
25 C
20 C
10 C
0 C

0   10   20   30   40   50

c [% by wt]
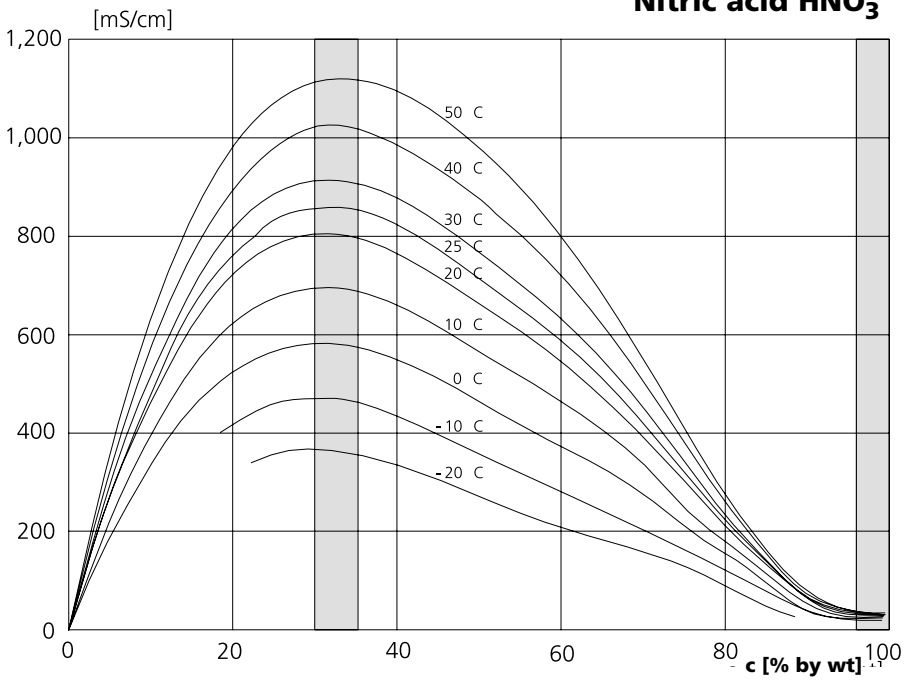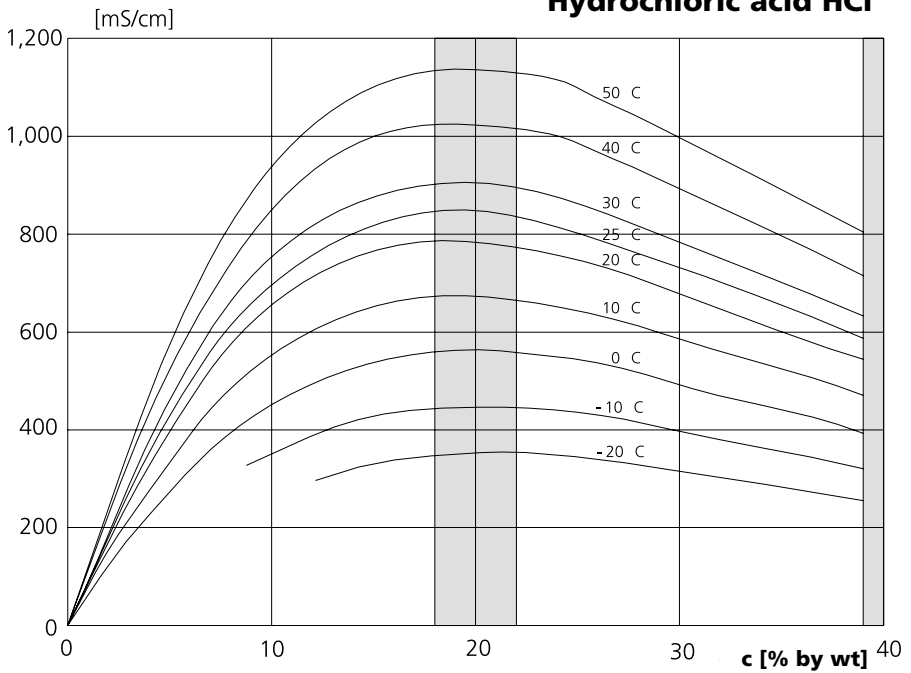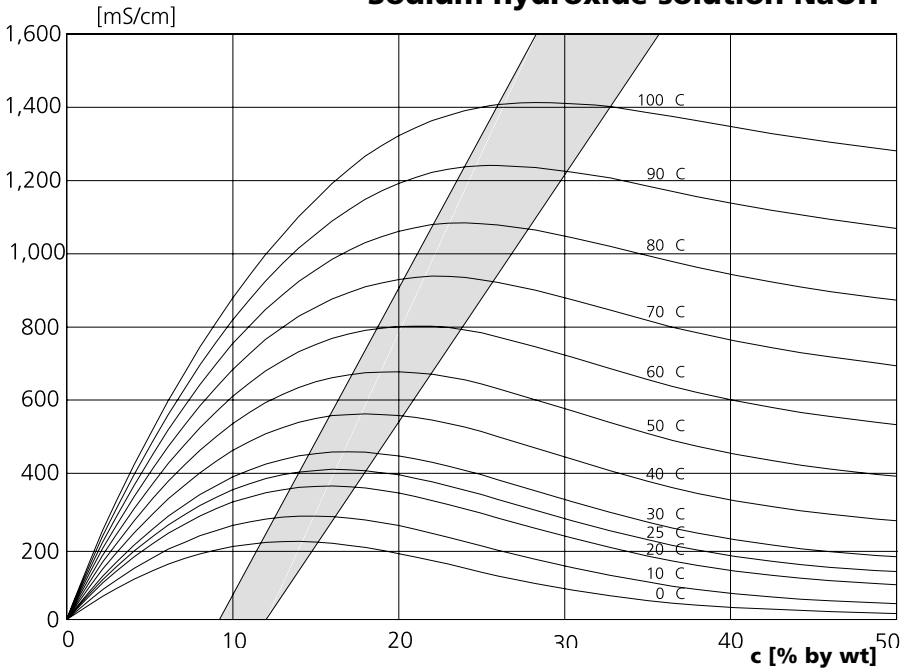
Table salt solution NaCl

[mS/cm]

450
400
350
300
250
200
150
100
50
0

60 C
46 C
35 C
20 C
10 C
0 C

0   5   10   15   20   25   30

c [% by wt]

51
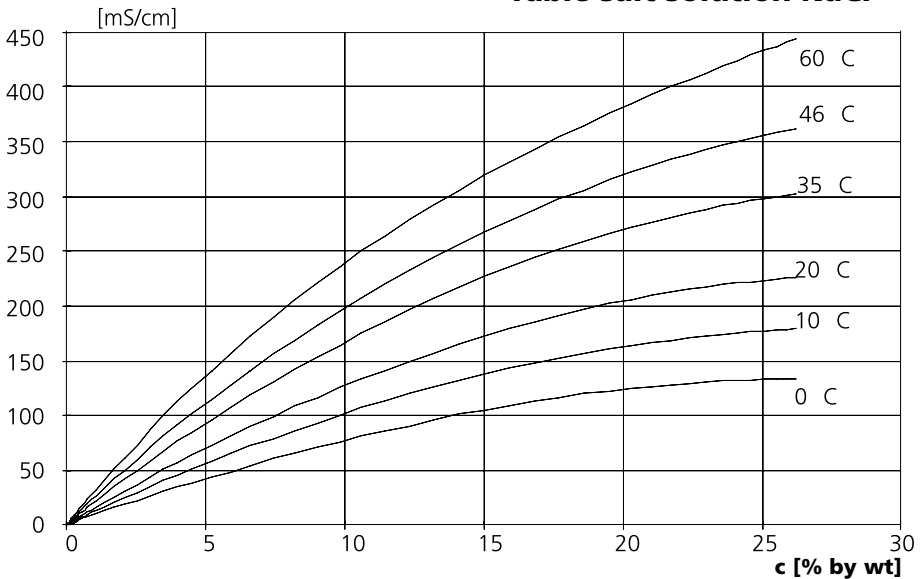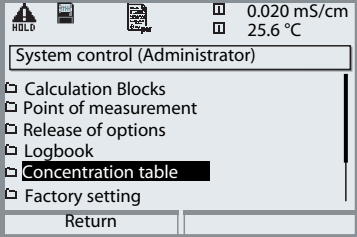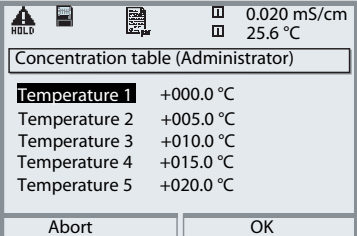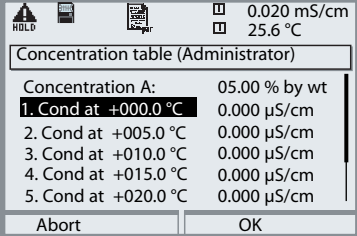
Concentration Table (Add. Function)

Select menu: Parameter setting/System control/Concentration table
Specifying a concentration solution for conductivity measurement

Concentration Table (Additional Function SW 700-009)

To specify the customer-specific solution, 5 concentration values A-E are
entered in a matrix together with 5 temperature values 1-5. To do so, first
enter the 5 temperature values, then enter the respective conductivity values
for each concentration A-E.
These solutions will then be available in addition to the permanently stored
standard solutions (select "Table").

Menu	Display	Enter concentration table
	⚠ HOLD ▤ 📄par 0.020 mS/cm 25.6 °C System control (Administrator) ▭ Calculation Blocks ▭ Point of measurement ▭ Release of options ▭ Logbook ▭ **Concentration table** ▭ Factory setting Return	**Enter values** • Call up parameter setting • System control • Select "Concentration table"
	⚠ HOLD ▤ 📄par 0.020 mS/cm 25.6 °C Concentration table (Administrator) **Temperature 1** +000.0 °C Temperature 2 +005.0 °C Temperature 3 +010.0 °C Temperature 4 +015.0 °C Temperature 5 +020.0 °C Abort OK	Enter 5 temperature values (right/left arrow keys to select position, up/down arrow keys to edit number, confirm with **enter**.)
	⚠ HOLD ▤ 📄par 0.020 mS/cm 25.6 °C Concentration table (Administrator) Concentration A: 05.00 % by wt **1. Cond at +000.0 °C** 0.000 µS/cm 2. Cond at +005.0 °C 0.000 µS/cm 3. Cond at +010.0 °C 0.000 µS/cm 4. Cond at +015.0 °C 0.000 µS/cm 5. Cond at +020.0 °C 0.000 µS/cm Abort OK	Enter values for concentrations A-E for the respective temperatures. The table values must be continuous. Maxima/minima are not permitted. Incorrect entries are marked with x.

The concentration table is selected as follows:
Parameter setting / Module Cond / Concentration = ON / Medium = Table.

pH Value Calculation

Note: 2 conductivity modules required

pH Value Calculation by Means of Dual Conductivity Measurement

When monitoring boiler feed water in power plants, the pH value can be calculated by means of a dual conductivity measurement. For that purpose, the boiler feed water conductance is measured before and after the ion exchanger. This commonly used method of indirect pH value measurement does not require much maintenance and has the following advantage: Normal pH measurement in ultrapure water is very critical. Boiler feed water does not contain many ions. This requires the use of a special electrode, which must be calibrated constantly and the service life of which is generally rather short.

Function

The conductivity before and after the ion exchanger is measured using two Cond 7700 modules. From the two calculated conductivity values, a "Calculation Block" determines the concentration of sodium hydroxide solution and the pH value according to the calculation formulas shown below:
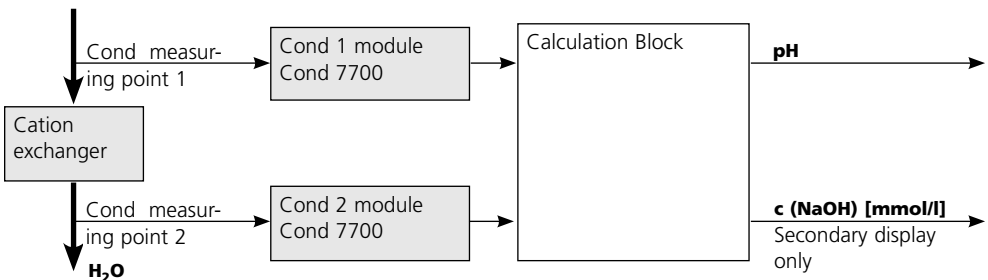
Calculating the Concentration of Sodium Hydroxide Solution / pH Value:

$$c(NaOH) = \frac{Cond\ 1 - 1/3\ Cond\ 2}{243}$$

$$pH = 11 + log[c(NaOH)]$$

Recommended pH Ranges:

10 ± 0.2   for < 136 bars operating overpressure or
9.5 ± 0.2   for > 136 bars operating overpressure

Conductivity measured after cation exchanger (Cond 2)
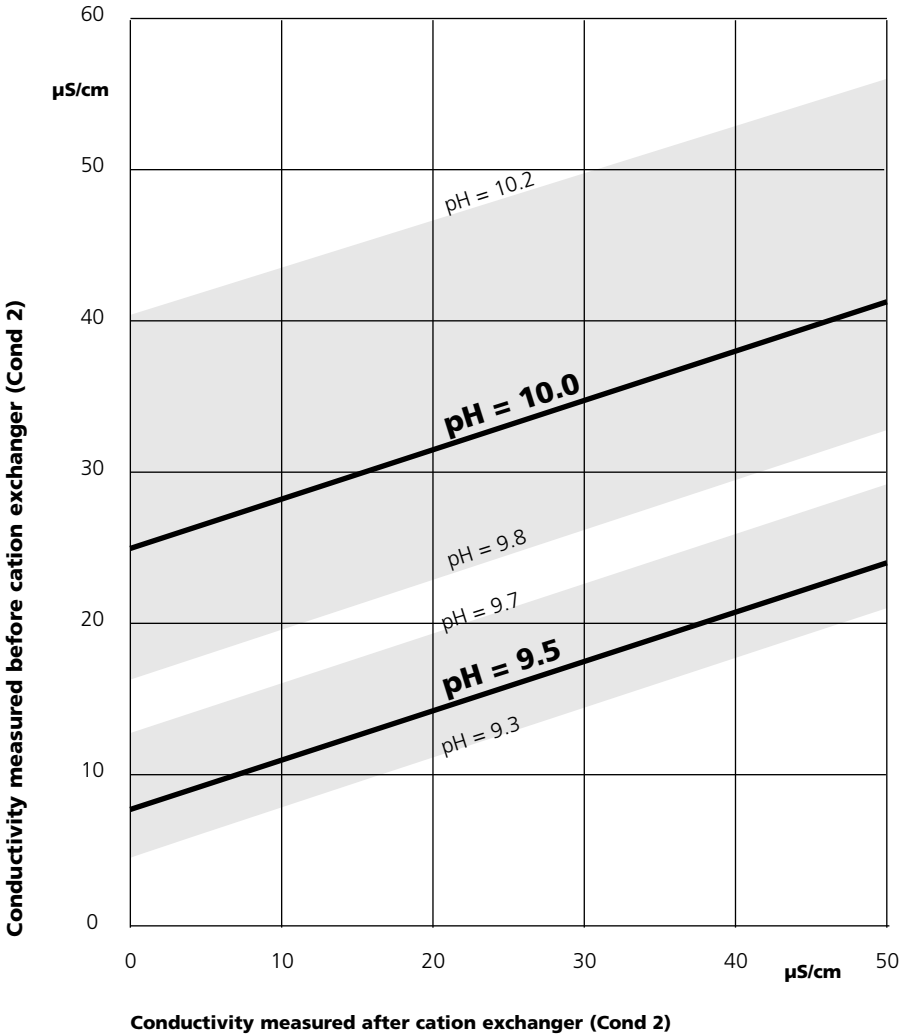
Figure:
Conditioning the feed water of natural circulation boilers with sodium hydroxide. Relationship between the pH value and the conductivity measured before and after the cation exchanger.
Source: Appendix to VGB guideline for boiler feed water, boiler water, and steam of steam generators above 68 bars permissible operating overpressure (VGB-R 450 L, edition 1988)

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
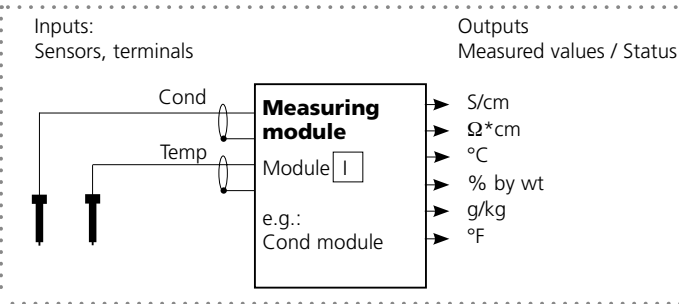
Functionality of Calculation Block
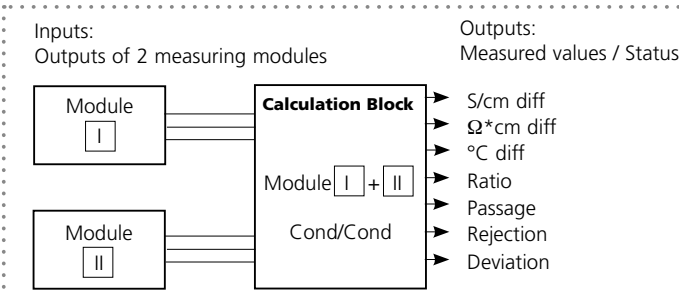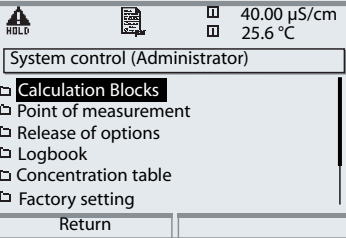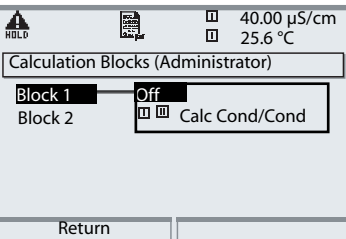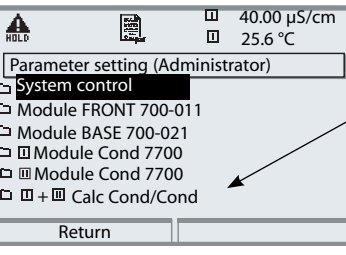
Activating Calculation Blocks

Select menu: Parameter setting/System control/Calculation Blocks
Combining 2 Cond measuring modules to Calculation Blocks

Combination of 2 Cond Measuring Modules
With three measuring modules the following Calculation Block combinations are possible: $\boxed{I}$ + $\boxed{II}$, $\boxed{I}$ + $\boxed{III}$, $\boxed{II}$ + $\boxed{III}$

Two Calculation Blocks can be activated.
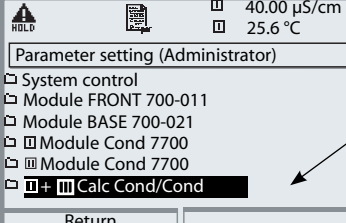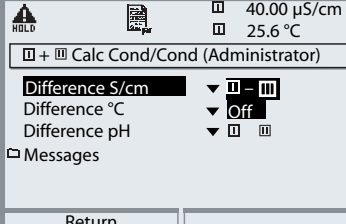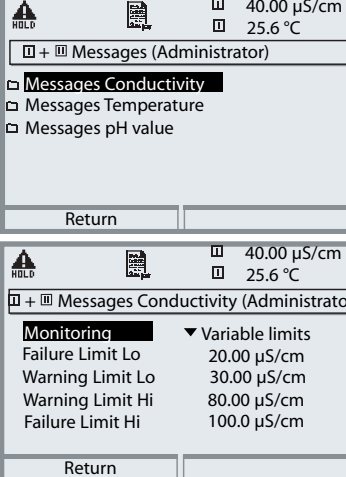
Menu	Display	Activating Calculation Blocks
	⚠ HOLD 📋 40.00 µS/cm 25.6 °C System control (Administrator) ▭ Calculation Blocks ▭ Point of measurement ▭ Release of options ▭ Logbook ▭ Concentration table ▭ Factory setting Return	**Calculation Blocks** • Call up parameter setting • System control • Select "Calculation Blocks"
	⚠ HOLD 📋 40.00 µS/cm 25.6 °C Calculation Blocks (Administrator) Block 1 Off Block 2 Calc Cond/Cond Return	• Depending on the modules installed, the possible combinations for Calculation Blocks are offered.
	⚠ HOLD 📋 40.00 µS/cm 25.6 °C Parameter setting (Administrator) ▭ System control ▭ Module FRONT 700-011 ▭ Module BASE 700-021 ▭ Ⅱ Module Cond 7700 ▭ Ⅲ Module Cond 7700 ▭ Ⅱ + Ⅲ Calc Cond/Cond Return	During parameter setting the Calculation Blocks are displayed like modules.

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Configuring a Calculation Block

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

Menu	Display	Calculation Block Configure
	HOLD ⚠ 📋 Ⅱ 40.00 µS/cm Ⅱ 25.6 °C Parameter setting (Administrator) ▢ System control ▢ Module FRONT 700-011 ▢ Module BASE 700-021 ▢ Ⅱ Module Cond 7700 ▢ Ⅲ Module Cond 7700 ▢ **Ⅱ + Ⅲ Calc Cond/Cond** Return	**Select Calculation Block** • Call up parameter setting • System control • Select module
	HOLD ⚠ 📋 Ⅱ 40.00 µS/cm Ⅱ 25.6 °C Ⅱ + Ⅲ Calc Cond/Cond (Administrator) Difference S/cm ▼ **Ⅱ – Ⅲ** Difference °C ▼ **Off** Difference pH ▼ Ⅱ Ⅲ ▢ Messages Return	Depending on the modules installed, the possible combinations for Calculation Blocks are offered.
	HOLD ⚠ 📋 Ⅱ 40.00 µS/cm Ⅱ 25.6 °C Ⅱ + Ⅲ Messages (Administrator) ▢ **Messages Conductivity** ▢ Messages Temperature ▢ Messages pH value Return --- **HOLD** ⚠ 📋 Ⅱ 40.00 µS/cm Ⅱ 25.6 °C Ⅱ + Ⅲ Messages Conductivity (Administrator) Monitoring ▼ Variable limits Failure Limit Lo 20.00 µS/cm Warning Limit Lo 30.00 µS/cm Warning Limit Hi 80.00 µS/cm Failure Limit Hi 100.0 µS/cm Return	**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). Confirm with **enter**.

USP Function

Monitoring of Ultrapure Water in the Pharmaceutical Industry
(To configure: Select Parameter setting Cond module)
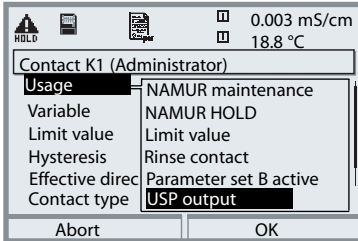
USP Function, Define Relay Output

When a Cond module is installed, one of the floating relay outputs of the BASE module (K1, K2 or K3) can be assigned to the USP function.
• Select parameter setting:
• Administrator level (HOLD active!)
• Module BASE: Define contact "Usage"
The USP can be selected as USP% process variable for output (display, current output, limit value, measurement recorder)

According to the "USP" directive (U.S.Pharmacopeia), Appendix 5, Section 645 "Water Conductivity" the conductivity of pharmaceutical waters can be monitored online.
To do so, the conductivity is measured without temperature compensation and compared with limit values. The water is usable without further test steps when the conductivity is below the USP limit.

Reduced Limit:

The USP limit can be reduced down to 10 % (Parameter setting).
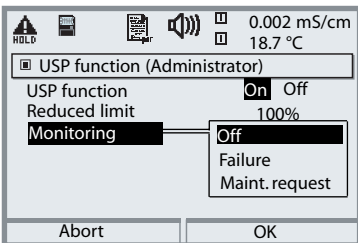
Select USP function

• Select parameter setting, then:
• Administrator level (HOLD active!)
• Module Cond: USP function
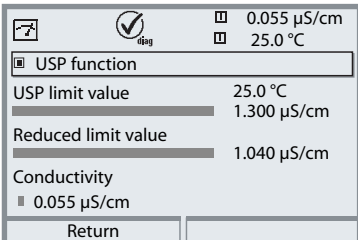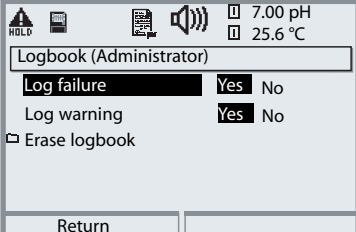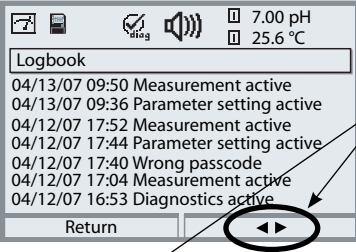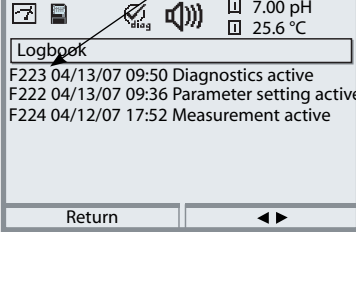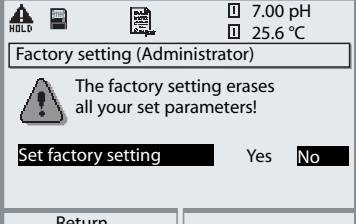
USP function: Diagnostics

• Select diagnostics:
• Module Cond
• USP function: Display of USP limit, reduced limit, conductivity

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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.).

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Parameter Setting

Messages: Default Settings and Selection Range
Note: HOLD mode active

Parameter	Default	Selection / Range

Messages
• Conductivity
• Resistivity
• Concentration
• Temperature
• Salinity
	Limits max
	Off
	Off
	Off
	Off
		Off, device limits max., variable limits*
		Off, device limits max., variable limits*
		Off, device limits max., variable limits*
		Off, device limits max., variable limits*
		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.

1999 mS/cm

Variable limits

0.000 µS/cm
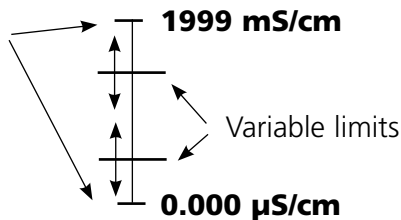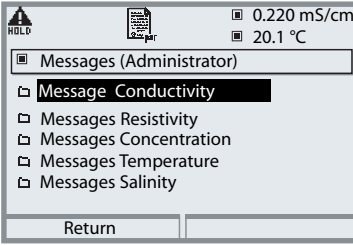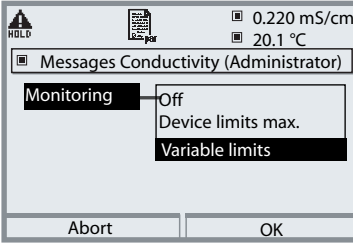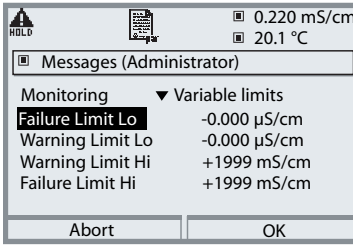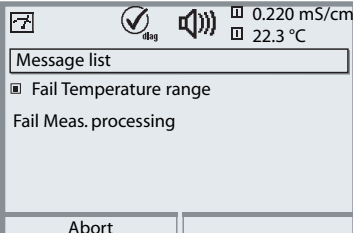
Setting the Message Parameters
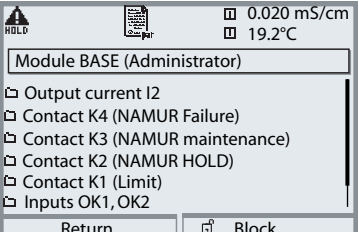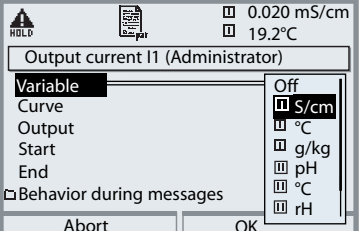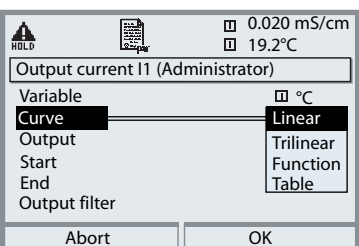
Messages
Note: HOLD mode active

Menu	Display	Messages
▣ par	⚠ HOLD · par · ▣ 0.220 mS/cm ▣ 20.1 °C ▣ Messages (Administrator) ▱ **Message Conductivity** ▱ Messages Resistivity ▱ Messages Concentration ▱ Messages Temperature ▱ Messages Salinity Return ⚠ HOLD · par · ▣ 0.220 mS/cm ▣ 20.1 °C ▣ Messages Conductivity (Administrator) Monitoring — Off / Device limits max. / **Variable limits** Abort · OK ⚠ HOLD · par · ▣ 0.220 mS/cm ▣ 20.1 °C ▣ Messages (Administrator) Monitoring ▾ Variable limits **Failure Limit Lo** −0.000 µS/cm Warning Limit Lo −0.000 µS/cm Warning Limit Hi +1999 mS/cm Failure Limit Hi +1999 mS/cm Abort · OK	**Messages** All parameters determined by the measuring module can generate messages. • **Device limits max:** Messages are generated when the process variable (e.g. conductivity) 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	🗎 · ✓ diag · 🔊 · ▣ 0.220 mS/cm ▣ 22.3 °C Message list ▣ Fail Temperature range Fail Meas. processing Abort	**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

Menu	Display	Parameter setting BASE module
par	⚠ HOLD ▤ par ▯ 0.020 mS/cm ▯ 19.2°C Module BASE (Administrator) ▭ Output current I2 ▭ Contact K4 (NAMUR Failure) ▭ Contact K3 (NAMUR maintenance) ▭ Contact K2 (NAMUR HOLD) ▭ Contact K1 (Limit) ▭ Inputs OK1, OK2 Return Block	**Configuring the Current Output** • Call up parameter setting • Enter passcode • Select "Module BASE" • Select "Output current ..."
	⚠ HOLD ▤ par ▯ 0.020 mS/cm ▯ 19.2°C Output current I1 (Administrator) Variable Off Curve ▯ S/cm Output ▯ °C Start ▯ g/kg End ▯ pH ▭ Behavior during messages ▯ °C ▯ rH Abort OK	• Select process variable
	⚠ HOLD ▤ ▯ 0.020 mS/cm ▯ 19.2°C Output current I1 (Administrator) Variable ▯ °C Curve Linear Output Trilinear Start Function End Table Output filter Abort OK	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". See also: "Minimum span"

Assignment of Measured Values: Start (4 mA) and End (20 mA)

Example 1:
Range 0 ... 1999 mS/cm

Example 2: Range 500 ... 700 mS/cm
Advantage: Higher resolution in range of interest
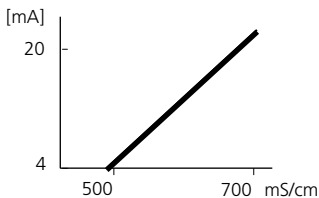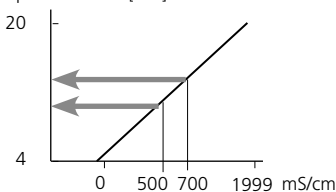
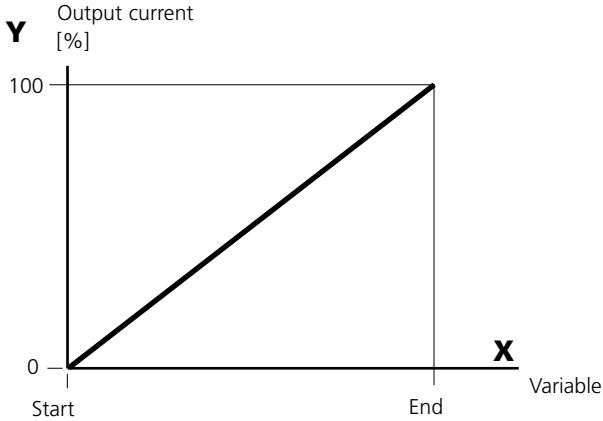# Current Outputs: Characteristics
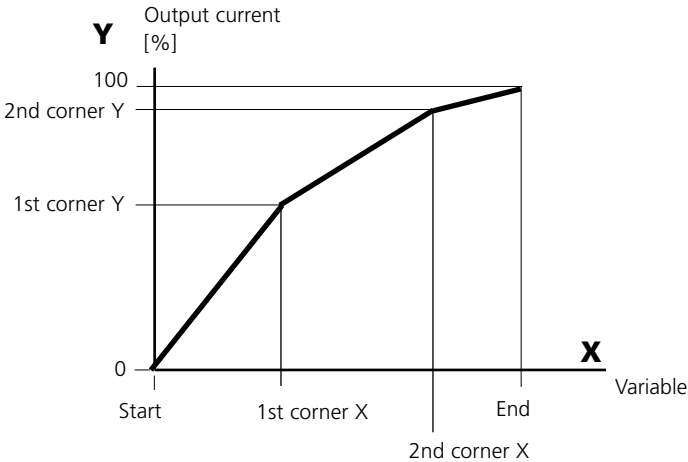
Select menu: Parameter setting/Module BASE

• Linear characteristic
The measured variable is represented by a linear output current curve.

• Trilinear characteristic
Two additional corner points must be entered:

• Note: Bilinear characteristic
For a bilinear characteristic, identical parameters are entered for the two corner points (1st corner, 2nd corner).

• Function characteristic

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

Required: Entering a value for 50 % output current.
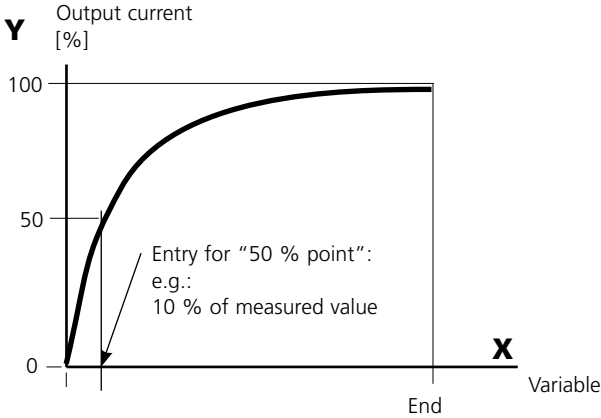
Equation

Output current (4 ... 20 mA) = $\dfrac{(1+K)x}{1+Kx}$ 16 mA + 4 mA

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

S: Start value at 4 mA
X50%:   50% value at 12 mA (output current range 4 to 20 mA)
E: End value at 20 mA
M: Measured value

Logarithmic output curve over one decade:
S: 10 % of maximum value
X50%:   31.6 % of maximum value
E: Maximum value

Logarithmic output curve over two decades:
S: 1 % of maximum value
X50%:   10 % of maximum value
E: Maximum value

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Output Filter

Time Constant

Time Constant of Output Filter

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

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

Notice:

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

Time constant 0 to 120 sec

NAMUR Signals: Current Outputs

Behavior During Messages
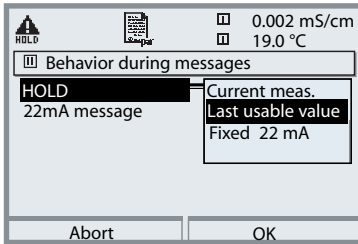
Depending on the parameter setting ("Messages") the current outputs switch to:
- Currently measured value
- Last measured value (HOLD function)
- Fixed value (22 mA)

In the case of a fault a 22 mA signal can be generated for the selected process variable (1st primary value).
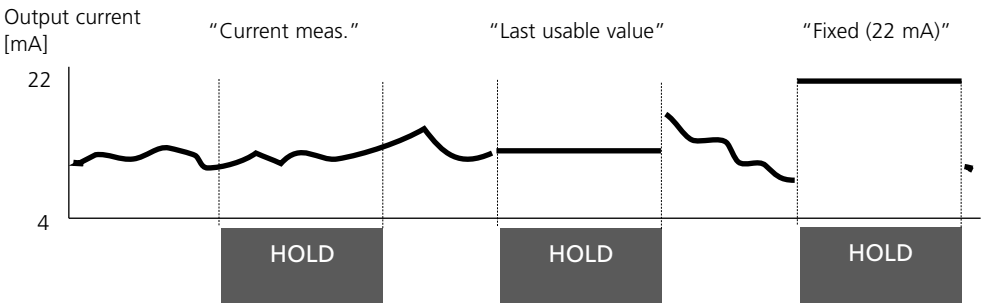
Message when the Current Range is Exceeded
As delivered, the "Maintenance request" (Warn) message is generated when the current range is exceeded (< 3.8 mA or > 20.5 mA).
This setting can be changed in the Parameter setting menu of the respective measuring module at "Messages".

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

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

NAMUR Signals: Relay Contacts

Failure, Maintenance Request, HOLD (Function Check)

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

Failure   Contact K4, normally closed
                     (signaling current failure)
Maint. request   Contact K3, normally open contact
HOLD   Contact K2, normally open contact
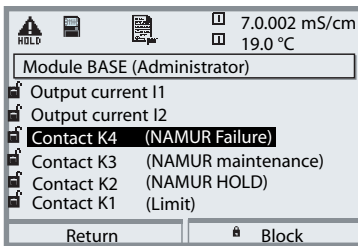
⚠ 📄 📄 ⊞ 7.0.002 mS/cm HOLD 📄 ⊞ 19.0 °C Module BASE (Administrator) 🔓 Output current I1 🔓 Output current I2 🔓 Contact K4　(NAMUR Failure) 🔓 Contact K3　(NAMUR maintenance) 🔓 Contact K2　(NAMUR HOLD) 🔓 Contact K1　(Limit) 　Return　｜　🔒 Block	**NAMUR signals:** Factory setting of contacts • Select parameter setting: • 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.
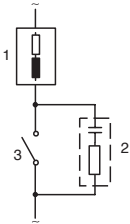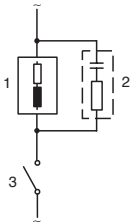
Typical AC applications with inductive load

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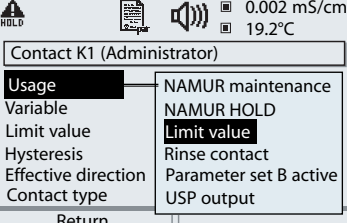
Make sure that the maximum ratings of the relay contacts are not exceeded even during switching!

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
	⚠ HOLD 📄 🔊)) ▣ 0.002 mS/cm ▣ 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
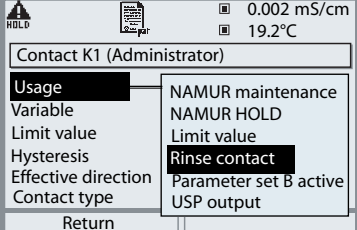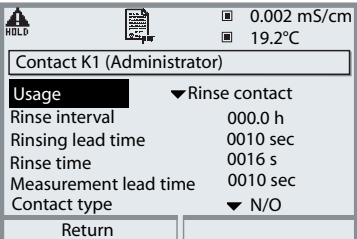
K1-K3 are user definable ("Usage"):
• NAMUR maintenance
• NAMUR HOLD
• Limit value
• Rinse contact
• Parameter set B active
• USP output (Cond module only)
• KI rec. active
• Sensoface
• Controller alarm

Rinse Contact

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

Menu	Display	Configuring the rinse contact
	⚠ HOLD / 📄 par ▣ 0.002 mS/cm ▣ 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 e.g. K1) • "Rinse contact" (Fig.)
	⚠ HOLD / 📄 ▣ 0.002 mS/cm ▣ 19.2°C Contact K1 (Administrator) **Usage** ▼Rinse contact Rinse interval 000.0 h Rinsing lead time 0010 sec Rinse time 0016 s Measurement lead time 0010 sec Contact type ▼ N/O Return	**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

HOLD	
Contact Kx	
Lead time	
Rinse time	
Shut-off delay	
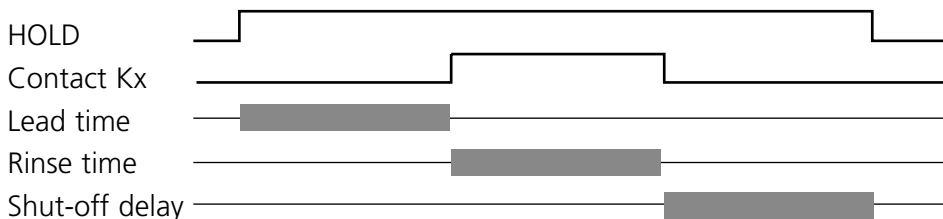
Limit Value, Hysteresis, Contact Type

Parameter setting/Module BASE/Relay contacts/Usage

Menu	Display	Usage as limit value
▦ par	⚠ HOLD 📄 🔊))) □ 0.002 mS/cm □ 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 output: Limit** • Call up parameter setting • Enter passcode • Select "Module BASE" • Select "Contact ..." • "Usage: Limit" (Fig.)

Limit value ▼

Effective direction min
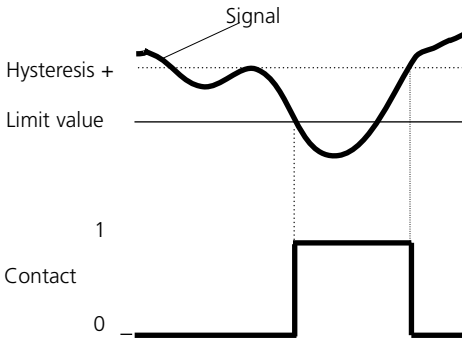
Limit value ▲

Effective direction max
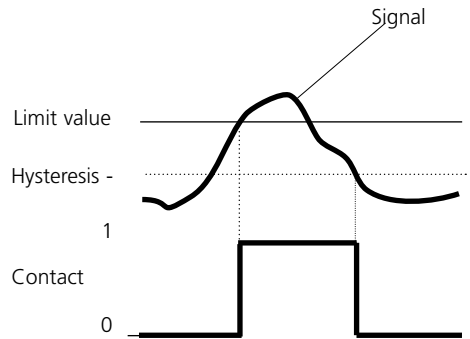
Icons in the Measurement Display:

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.)
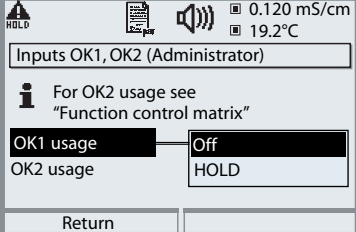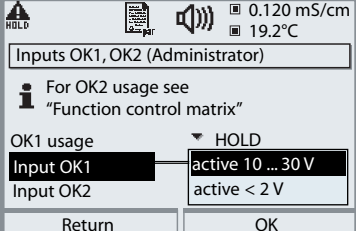
Contact Type

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
	 ⚠ HOLD 🔋 🔊))) ▣ 0.120 mS/cm ▣ 19.2°C Inputs OK1, OK2 (Administrator) ℹ For OK2 usage see "Function control matrix" OK1 usage — Off OK2 usage — HOLD Return	**OK1 usage** • Call up parameter setting • Enter passcode • Select "Module BASE" • Select "Inputs OK1/OK2" • Select "OK1 usage"
	⚠ HOLD 🔋 🔊))) ▣ 0.120 mS/cm ▣ 19.2°C Inputs OK1, OK2 (Administrator) ℹ For OK2 usage see "Function control matrix" OK1 usage ▼ HOLD Input OK1 active 10 ... 30 V Input OK2 active < 2 V Return OK	**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).

BASE module
OK1
OK1
OK2
OK2
OK
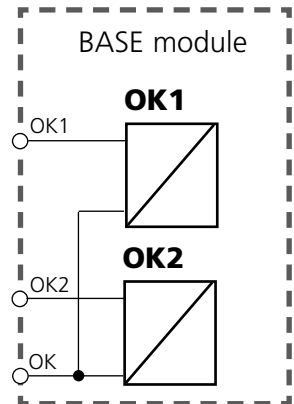
Switching Parameter Sets via OK2

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

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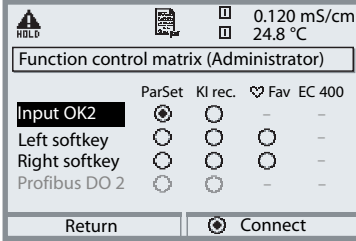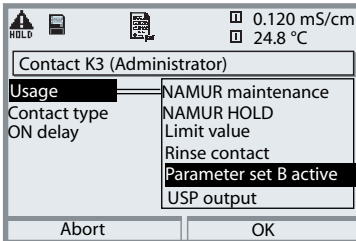
2 complete parameter sets (A, B) can be stored in the analyzer.
You can switch between the parameter sets using the OK2 input.
The currently activated set can be signaled by a relay contact.
An icon in the measurement display shows which parameter set is active:

📑A   or   📑B

Menu	Display	Parameter sets
📄par	⚠ HOLD 📑 0.120 mS/cm 24.8 °C Function control matrix (Administrator) ParSet KI rec. ♡ Fav EC 400 **Input OK2** ◉ ○ – – Left softkey ○ ○ ○ – Right softkey ○ ○ ○ – Profibus DO 2 ○ ○ – – Return ◉ Connect	**Select parameter set (A, B) via OK2 input** • Call up parameter setting • System control • Function control matrix • Select "OK2" • Connect "Parameter set A/B"
	⚠ 📄 📑 0.120 mS/cm 24.8 °C HOLD Contact K3 (Administrator) **Usage** NAMUR maintenance Contact type NAMUR HOLD ON delay Limit value Rinse contact **Parameter set B active** USP output Abort OK	**Signaling active parameter set via relay contact** • Call up parameter setting • BASE module • Select contact • Usage: "Parameter set …".
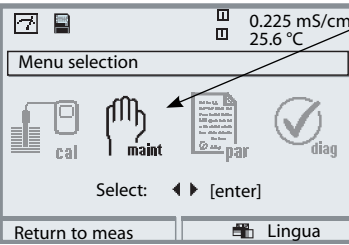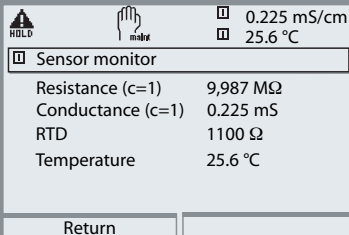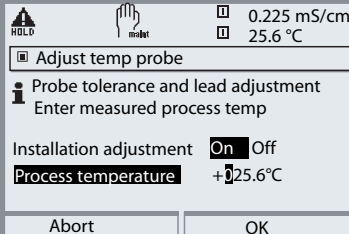
Notice

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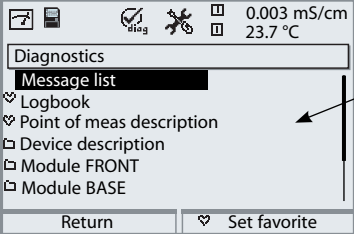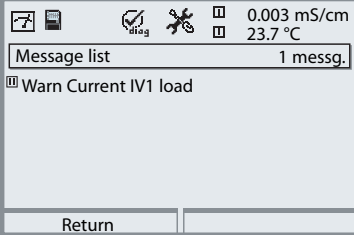SW 700-102.

Maintenance
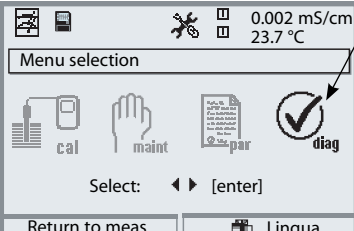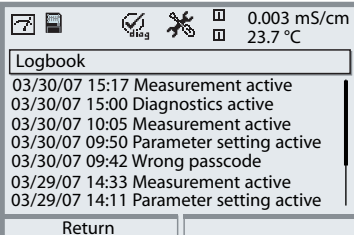
Sensor monitor, Temp probe adjustment
Note: HOLD mode active

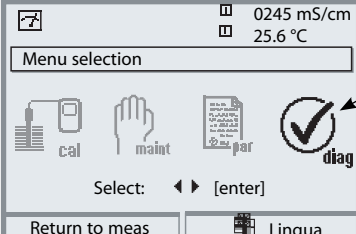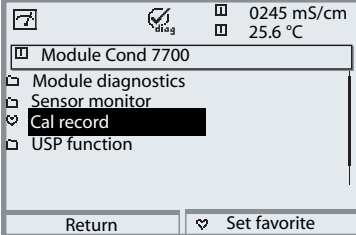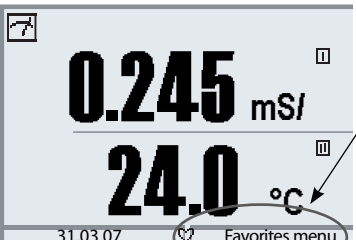| Menu	Display	Maintenance
maint	0.225 mS/cm 25.6 °C Menu selection cal maint par diag Select: ◀ ▶ [enter] Return to meas Lingua	**Call up Maintenance** From the measuring mode: Press **menu** key to select menu. Select maintenance using arrow keys, confirm with **enter**. Passcode 2958 (The passcode can be edited by the administrator.) Then select Module Cond.
	HOLD maint 0.225 mS/cm 25.6 °C Sensor monitor Resistance (c=1) 9,987 MΩ Conductance (c=1) 0.225 mS RTD 1100 Ω Temperature 25.6 °C Return	**Sensor monitor** During maintenance, the sensor monitor allows validation of the sensor by immersing it in a known solution, for example, and checking the values measured.
	HOLD maint 0.225 mS/cm 25.6 °C Adjust temp probe ℹ Probe tolerance and lead adjustment Enter measured process temp Installation adjustment On Off Process temperature +25.6°C Abort OK	**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 after the process temperature has been 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

General status information of the measuring system
Select menu: Diagnostics

Menu	Display	Diagnostics functions
(✓)diag	0.002 mS/cm 23.7 °C — Menu selection — cal maint par (✓)diag — Select: ◀▶ [enter] — Return to meas / Lingua	**Call up diagnostics** From the measuring mode: Press **menu** key to select menu. Select diagnostics using arrow keys, confirm with **enter**.
	0.003 mS/cm 23.7 °C — Diagnostics — Message list / Logbook / Point of meas description / Device description / Module FRONT / Module BASE — Return / Set favorite	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.
	0.003 mS/cm 23.7 °C — Message list 1 messg. — Warn Current IV1 load — Return	**Message list** Shows the currently activated warning or failure messages in plain text.
	0.003 mS/cm 23.7 °C — Logbook — 03/30/07 15:17 Measurement active / 03/30/07 15:00 Diagnostics active / 03/30/07 10:05 Measurement active / 03/30/07 09:50 Parameter setting active / 03/30/07 09:42 Wrong passcode / 03/29/07 14:33 Measurement active / 03/29/07 14:11 Parameter setting active — Return	**Logbook** Shows the last 50 events with date and time, e.g. calibrations, warning and failure messages, power failure etc. This permits quality management documentation to ISO 9000. Extended logbook: SmartMedia card (SW 700-104)

Setting Diagnostics Messages as Favorite

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

Menu	Display	Select favorites
	0.245 mS/ **24.0** °C 31.03.07　Favorites menu	**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	0245 mS/cm 25.6 °C Menu selection cal　maint　par　diag Select: ◀ ▶ [enter] Return to meas　Lingua	**Select favorites** Press **menu** key to select menu. Select diagnostics using arrow keys, confirm with **enter**. Then select module and confirm with **enter**.
	0245 mS/cm 25.6 °C Module Cond 7700 Module diagnostics Sensor monitor Cal record USP function Return　Set favorite	Set/delete favorite: "Set favorite" allows activation of the selected diagnostic function directly from the measuring mode via softkey. The respective function is marked with a heart icon. See softkey function "Function control matrix".
	0.245 mS/ **24.0** °C 31.03.07　Favorites menu	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").

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.

			0.120 mS/cm
HOLD			25.6 °C
Function control matrix (Administrator)			
	ParSet	KI rec.	♡Fav EC400
Input OK2	○	○	– –
Left softkey	○	○	○ –
Right softkey	○	○	◉ –
Profibus DO 2	○	○	– –
Return		◉ Connect	
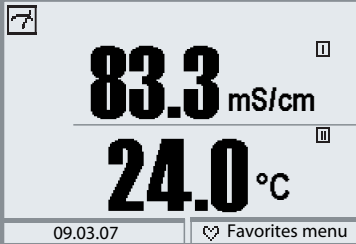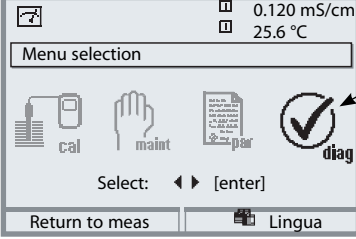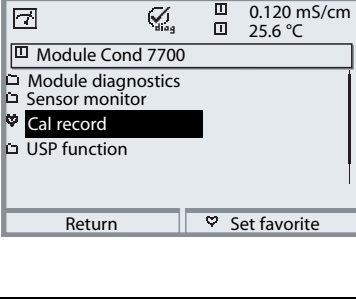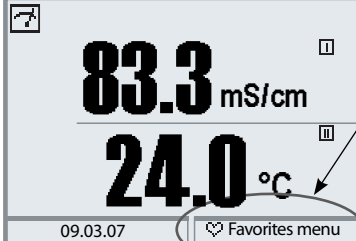
Example:
"Favorites" to be selected with
"Right softkey"

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

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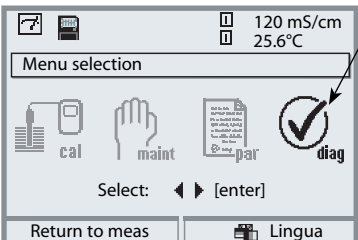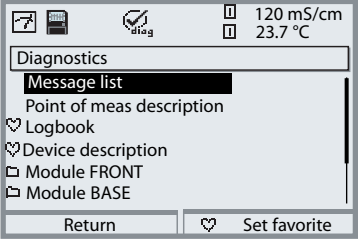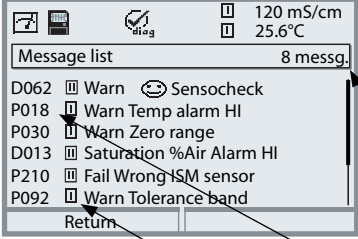Press "Disconnect" softkey,
confirm with **enter**.

Menu	Display	Select favorites
	83.3 mS/cm 24.0 °C 09.03.07 ♡ Favorites menu	**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	0.120 mS/cm 25.6 °C Menu selection cal maint par ✓ diag Select: ◀ ▶ [enter] Return to meas Lingua	**Select favorites** Press **menu** key to Menu selection Select diagnostics using arrow keys, confirm with **enter**. Then select module and confirm with **enter**.
	0.120 mS/cm 25.6 °C ▣ Module Cond 7700 ▫ Module diagnostics ▫ Sensor monitor ♡ Cal record ▫ USP function Return ♡ Set favorite	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.
	83.3 mS/cm 24.0 °C 09.03.07 ♡ Favorites menu	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
		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

Cond 7700(X) Module

No.	Cond messages	Message type
C008	Meas. processing (factory settings)	FAIL
C009	Module failure (Firmware Flash check sum)	FAIL
C010	Conductivity range	FAIL
C011	Conductivity Alarm LO_LO	FAIL
C012	Conductivity Alarm LO	WARN
C013	Conductivity Alarm HI	WARN
C014	Conductivity Alarm HI_HI	FAIL
C015	Temperature range	FAIL
C016	Temperature Alarm LO_LO	FAIL
C017	Temperature Alarm LO	WARN
C018	Temperature Alarm HI	WARN
C019	Temperature Alarm HI_HI	FAIL
C020	Resistivity range	FAIL
C021	Resistivity Alarm LO_LO	FAIL
C022	Resistivity Alarm LO	WARN
C023	Resistivity Alarm HI	WARN
C024	Resistivity Alarm HI_HI	FAIL
C025	Concentration range	FAIL
C026	Concentration Alarm LO_LO	FAIL
C027	Concentration Alarm LO	WARN
C028	Concentration Alarm HI	WARN
C029	Concentration Alarm HI_HI	FAIL
C035	Cell constant range	WARN
C040	Salinity range	FAIL
C041	Salinity Alarm LO_LO	FAIL
C042	Salinity Alarm LO	WARN
C043	Salinity Alarm HI	WARN

Messages

No.	Cond messages	Message type
C044	Salinity Alarm HI_HI	FAIL
C045	Conductance range	FAIL
C050	man. Temperature range	FAIL
C060	SAD SENSOFACE: Polarization	User-defined
C061	SAD SENSOFACE: Cable	User-defined
C090	USP limit value	User-defined
C120	Wrong ISM sensor	FAIL
C121	ISM sensor	FAIL
C122	ISM sensor memory	WARN
C123	New sensor, adjustment required	WARN
C130	SIP cycle counted	Text
C131	CIP cycle counted	Text
C200	Reference temperature	WARN
C201	TC correction	WARN
C202	TC range	WARN
C203	TC range	FAIL
C204	Cal: Sensor unstable	Text
C205	Cal: Sensor failure	Text
C254	Module reset	Text

No.	Calculation Block Cond/Cond messages	Message type
E010	Conductivity-Diff Range	FAIL
E011	Conductivity-Diff Alarm LO_LO	FAIL
E012	Conductivity-Diff Alarm LO	WARN
E013	Conductivity-Diff Alarm HI	WARN
E014	Conductivity-Diff Alarm HI_HI	FAIL
E015	Temperature-Diff Range	FAIL
E016	Temperature-Diff Alarm LO_LO	FAIL
E017	Temperature-Diff Alarm LO	WARN
E018	Temperature-Diff Alarm HI	WARN
E019	Temperature-Diff Alarm HI_HI	FAIL

Messages

No.	Calculation Block Cond/Cond messages	Message type
E020	Resistivity-Diff range	FAIL
E021	Resistivity-Diff Alarm LO_LO	FAIL
E022	Resistivity-Diff Alarm LO	WARN
E023	Resistivity-Diff Alarm HI	WARN
E024	Resistivity-Diff Alarm HI_HI	FAIL
E030	RATIO range	FAIL
E031	RATIO Alarm LO_LO	FAIL
E032	RATIO Alarm LO	WARN
E033	RATIO Alarm HI	WARN
E034	RATIO Alarm HI_HI	FAIL
E035	PASSAGE range	FAIL
E036	PASSAGE Alarm LO_LO	FAIL
E037	PASSAGE Alarm LO	WARN
E038	PASSAGE Alarm HI	WARN
E039	PASSAGE Alarm HI_HI	FAIL
E045	REJECTION range	FAIL
E046	REJECTION Alarm LO_LO	FAIL
E047	REJECTION Alarm LO	WARN
E048	REJECTION Alarm HI	WARN
E049	REJECTION Alarm HI_HI	FAIL
E050	DEVIATION range	FAIL
E051	DEVIATION Alarm LO_LO	FAIL
E052	DEVIATION Alarm LO	WARN
E053	DEVIATION Alarm HI	WARN
E054	DEVIATION Alarm HI_HI	FAIL
E055	c(NaOH) range	FAIL
E060	pH value range	FAIL
E061	pH value Alarm LO_LO	FAIL
E062	pH value Alarm LO	WARN
E063	pH value Alarm HI	WARN
E064	pH value Alarm HI_HI	FAIL

Specifications

Specifications M 700 Cond 7700(X)

Cond input (EEx ia IIC)	Operation with 2- or 4-electrode sensors

Conductivity	0 µS/cm to 1999 mS/cm
Resistivity	0.5 Ω cm ... 999 MΩ cm
Concentration	0.00 ... 100.0 % by wt
Salinity	0.0 ... 45.0 g/kg (0 ... 35 °C)
Meas. range	4EL sensors: 0.1 µS * c to 2000 mS * c **
	2EL sensors: 0.1 µS * c to 200 mS * c **
Display ranges	Resolution depending on cell constant

Cell constant	Resolution of cond.
< 0.1200 cm^{-1}	0 µS/cm
< 1.200 cm^{-1}	00.00 µS/cm
< 12.00 cm^{-1}	000.0 µS/cm
< 120.0 cm^{-1}	
≥ 120.0 cm^{-1}	00.00 mS/cm

Response time t_{90})	Approx. 1 s
Measurement error[***]	< 0.5 % meas. val. + 0.2 µS * c **

Temp compensation [*)]	- Without
	- Linear characteristic 00.00 ... 19.99 %/K
	(reference temp user-defined)
	- NLF natural waters to EN 27888
	- Ultrapure water with NaCl traces (0 ... 120 °C)*w
	- Ultrapure water with HCl traces (0 ... 120 °C)*w
	- Ultrapure water with NH_3 traces (0 ... 120 °C)*w
	- Ultrapure water with NaOH traces (0 ... 120 °C)*w *w
	for all waters: Reference temp 25 °C

Temperature input (EEx ia IIC)	

Specifications

Temperature probe *	Pt100 / Pt1000 / NTC 30 kΩ / Ni 100
	3-wire connection, adjustable
Measurement range (MR)	Pt100 / Pt1000: -50 ... +250 °C
	NTC 30 kΩ: -10 ... +150 °C
	Ni 100: -50 ... +180 °C
Resolution	0.1 °C
Measurement error***	0.2 % meas.val. + 0.5 K

Concentration determination *

For the substances:

HNO_3	0 ... 28	% by wt	–20 ... +50 °C
	35 ... 96	% by wt	–20 ... +50 °C
HCl	0 ... 18	% by wt	–20 ... +50 °C
	22 ... 39	% by wt	–20 ... +50 °C
H_2SO_4 ****	0 ... 30	% by wt	-17.8 ... +110 °C
	32 ... 84	% by wt	-17.8 ... +115,6 °C
	92 ... 99	% by wt	-17.8 ... +115,6 °C
NaOH *****	0 ... 14	% by wt	0 ... +100 °C
	18 ... 50	% by wt	0 ... +100 °C
NaCl	0 ... 26	% by wt	0 ... +60 °C

User-defined concentration table (5x5 values)

Sensor monitoring *

Sensocheck;
Polarization and cable capacitance

Sensoface

Provides information on the sensor condition

Sensor standardization *

Operating modes

- Automatic calibration with KCl or NaCl solution

- Manual: Entry of conductivity

- Product calibration / adjustment to vessel

- Entry of cell constant with simultaneous
  display of conductivity and temperature

Specifications

Adm. cell constant	0.0050 ... 199.99 cm^{-1}
Calibration record	Recording of: Cell constant, calibration method, with date and time

Output curves *

Linear

Trilinear

Function (logarithmic)

As desired via table

USP function

Water monitoring in the pharmaceutical industry (USP)
with possibility to enter a limit value (%)
Output via relay contact (K1 ... K3, BASE) possible
The USP value is available as USP% process variable (select-
able for display, current output, limit value, measurement
recorder).

* User-defined
** c = 0.0050 ... 199.99 cm^{-1}
*** To IEC Part 1, at nominal operating conditions, ± 1 count, plus sensor error
**** Range limits based on 27 °C
***** Range limits based on 25 °C

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	NAMUR NE 21 and EN 61326 VDE 0843 Part 20 /01.98 EN 61326/A1 VDE 0843 Part 20/A1 /05.99
Emitted interference	Class B
Immunity to interference	Industry

Lightning protection	EN 61000-4-5, Installation Class 2

Nominal operating conditions	Ambient temperature: –20 ... +55 °C (Ex: max. +50 °C) Rel. humidity: 10 ... 95 % not condensing

Transport/Storage temperature	–20 ... +70 °C

Screw clamp connector	Single wires and flexible leads up to 2.5 mm²

Appendix:

Minimum Spans for Current Outputs

The Cond 7700(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 module).
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.

Cond 7700(X) module

S/cm	20 %, min. 0.2 µS/cm
% by wt	1.00
°C	10.0
g/kg	1.00
Ohm*cm	20 %, min. 100.0 ohms*cm
°F	10.0

Calculation Block Cond/Cond

Diff S/cm	20 %, min. 0.2 µS/cm
Diff °C	10.0
Diff Ohm*cm	20 %, min. 100.0 ohms*cm
RATIO	0.10
PASSAGE	10.0
REJECTION	10.0
DEVIATION	10.0
pH	1.00

Overview of Parameter Setting
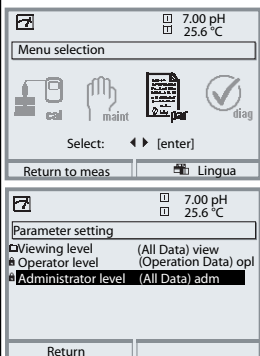
Parameter setting

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

Administrator level
Access to all functions, also passcode setting.
Releasing or blocking 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 <u>memory card</u>, not an <u>update</u> 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	Representation of measured values on the display:
• Main display	- Selecting the number of primary values displayed (one or two)
• Display format	- Decimal places
• Viewing angle	

Measurement recorder	Option: 2-channel, selection of process variable, start and end
• Time base	
• Zoom function	
• Min/Max display	

KI recorder	Option: See more detailed "Options" manual

Signal Outputs and Inputs, Contacts: BASE Module

Output current I1, I2 — 2 current outputs, separately adjustable
- Variable
- Curve — Behavior during messages
- Output (0/4 - 20 mA) — Output current [mA]
- Output filter
- Behavior during messages
  - HOLD
  - --- Current meas.
  - --- Last meas. value
  - --- Fixed 22 mA
  - 22 mA message

"Current meas." | "Last usable value" | "Fixed (22 mA)"

22 ... 4

HOLD   HOLD   HOLD

Contact K4	NAMUR Failure
• Contact type	
• ON delay	
• OFF delay	

Contacts K3, K2, K1	Factory setting:
• Usage	K3: Maintenance request, K2: HOLD, K1: Limit
- Maintenance request	
- HOLD (function check)	
- Limit value (adjustable)	- Variable, limit value, hysteresis, effective direction, ...
- Rinse contact (adjustable)	- Rinsing interval, lead times, rinse duration, logbook entry, ...
- Parameter set B active	
- USP output	
- KI recorder active	
- Sensoface	
• Conoller alarm (alarm output EC 400)	
• Contact type / ON/OFF delay	

Inputs OK1, OK2	Optocoupler - signal inputs
• OK1 usage	Off, HOLD (function check)
- Signal level	active level switchable from 10 to 30 V or < 2 V, resp.
	For OK2 see System control/Function control matrix

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Parameter Setting Menu

Cond 7700(X) Module

Input filter

Sensor data
- Sensor type
- Nom. cell constant
- Temperature detection
    - Temperature probe
    - Measuring temp
    - Calibration temp
- Sensocheck

Representation of measured values on the display:
- Select
- Selection for Measurement / Calibration

Cal preset values
- Cal solution
    - NaCl 0.01 mol/l
    - NaCl 0.1 mol/l
    - NaCl saturated
    - KCl 0.01 mol/l
    - KCl 0.1 mol/l
    - KCl 1 mol/l
- Sample calibration

TC process medium	Select: Off, linear, EN 27888, ultrapure water

Concentration

Messages
- Conductivity
- Resistivity
- Temperature
- Salinity

USP function

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Calibration Menu

Cond 7700(X) Module

Automatic
Calibration solution input
Product calibration
Data entry

Maintenance Menu

BASE Module

Current source   Output current definable 0 ... 22 mA

Cond 7700(X) Module

Sensor monitor   Resistance, conductance, RTD, temperature
Temp probe adjustment   Compensating for lead length

Diagnostics Menu

Message list   List of all warning and failure messages
Point of meas description
Logbook
Device description   Hardware version, Serial no., (Module) Firmware, Options

FRONT Module

Module diagnostics
Display test
Keypad test

BASE Module

Module diagnostics
Input/output status

Cond 7700(X) Module

Module diagnostics   Internal function test
Sensor monitor   Shows the values currently measured by the sensor
Cal record   Data of last adjustment / calibration

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Icon	Explanation of Icons Important for this Module
↗	The analyzer is in measuring mode.
🔲cal ⚠HOLD	The analyzer is in calibration mode. HOLD mode active for the currently calibrated module
✋maint ⚠HOLD	The analyzer is in maintenance mode. Operating status: HOLD.
📖par ⚠HOLD	The device is in parameter setting mode. Operating status: HOLD.
✓dia	The analyzer is in diagnostics mode.
NAMUR signals ⚠HOLD ◁)) ⚒	HOLD. 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
🌡 man	Temperature detection by manual input
✳	Calibration is performed
📟	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)
🗁	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.
📇B	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.)

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Menu Selection

Cond 7700(X) Module