Communication Module M 700® PID 700(X)

PID Controller Module with
2 Current Outputs and 4 Relay Outputs

52121217

METTLER TOLEDO

71957

Warranty

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

Return of Products Under Warranty

Please contact our Service Team before returning a defective device. Ship the cleaned device to the address you have been given. If the device has been in contact with process fluids, it must be decontaminated/disinfected before shipment. In that case, please attach a corresponding certificate, for the health and safety of our service personnel.

Disposal

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

Trademarks

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Konformitätserklärung
Déclaration de conformité

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Description Beschreibung/Description	PID 700
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Low-voltage directve/Niederspannungs-Richtlinie/ Directive basse tension	73/23/EWG

Norm/Standard/Standard	EN 60529 / 10.91	/ VDE 0470 Teil 1:	1992-11
	EN 61010 Teil 1 / 03.93	/ VDE 0411 Teil 1:	1994-03
	EN 61010-1 / A2 / 07.95	/ VDE 0411 Teil 1 / A1:	1996-05

EMC Directive/EMV-Richtlinie Directive concernantl a CEM	89/336/EWG

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Place and Date of issue Ausstellungsort / - Datum Lieu et date d'émission	Urdorf, August 28, 2003

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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

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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**

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Intended Use

The module is a general-purpose PID controller module. Analog control valves are actuated via 2 passive current outputs. Digital straightway valves are actuated via 2 relay contacts. In addition, two relay contacts are provided for limit monitoring or pre-control.

The PID 700X 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

Application in Hazardous Locations

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

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

Be sure to observe during installation:
- Switch off power supply before replacing or inserting a module.
- Before commissioning it must be proved that the device may be connected with other equipment.

Application in Hazardous Locations:
PID 700X Module
When using the PID 700X 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

PID 700(X) Module

Device Software M 700(X)

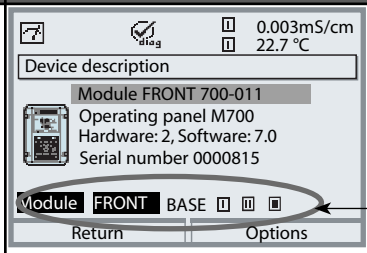
The PID 700 module is supported by software version 1.0 or higher.
The PID 700X module is supported by software version 4.0 or higher.

Module Software PID 700(X)

Software version 1.1

Query Actual Device/Module Software

When the analyzer is in measuring mode:
Press **menu** key, open Diagnostics menu.

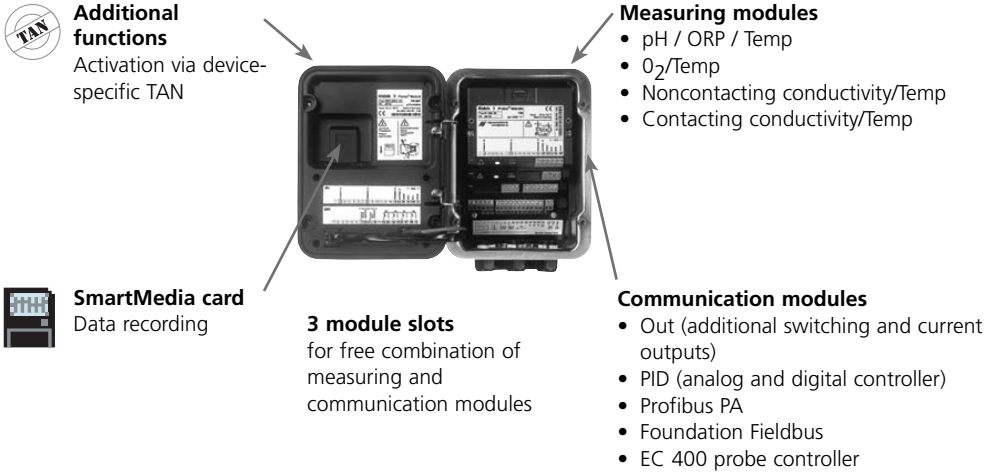
Menu	Display	Device description
diag		Provides information about all modules installed: Module type and function, serial number, hardware and software version and device options. Select the different modules (FRONT, BASE, slots 1 - 3) using the arrow keys.

Modular Concept

Basic Unit, Measuring Module, Additional Functions

The M 700(X) is an expandable modular process analysis system.
The basic unit (FRONT and BASE modules) provides three slots which can be equipped by the user with any combination of measuring or communication modules. The software capabilities can be expanded by additional functions (options). Additional functions must be ordered separately. They are supplied with a device-specific TAN for function release.

M 700(X) Modular Process Analysis System



Documentation

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

Short Description

Short Description: FRONT Module

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

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

Measurement display

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

Secondary displays

2 softkeys
with context-sensitive functions.

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

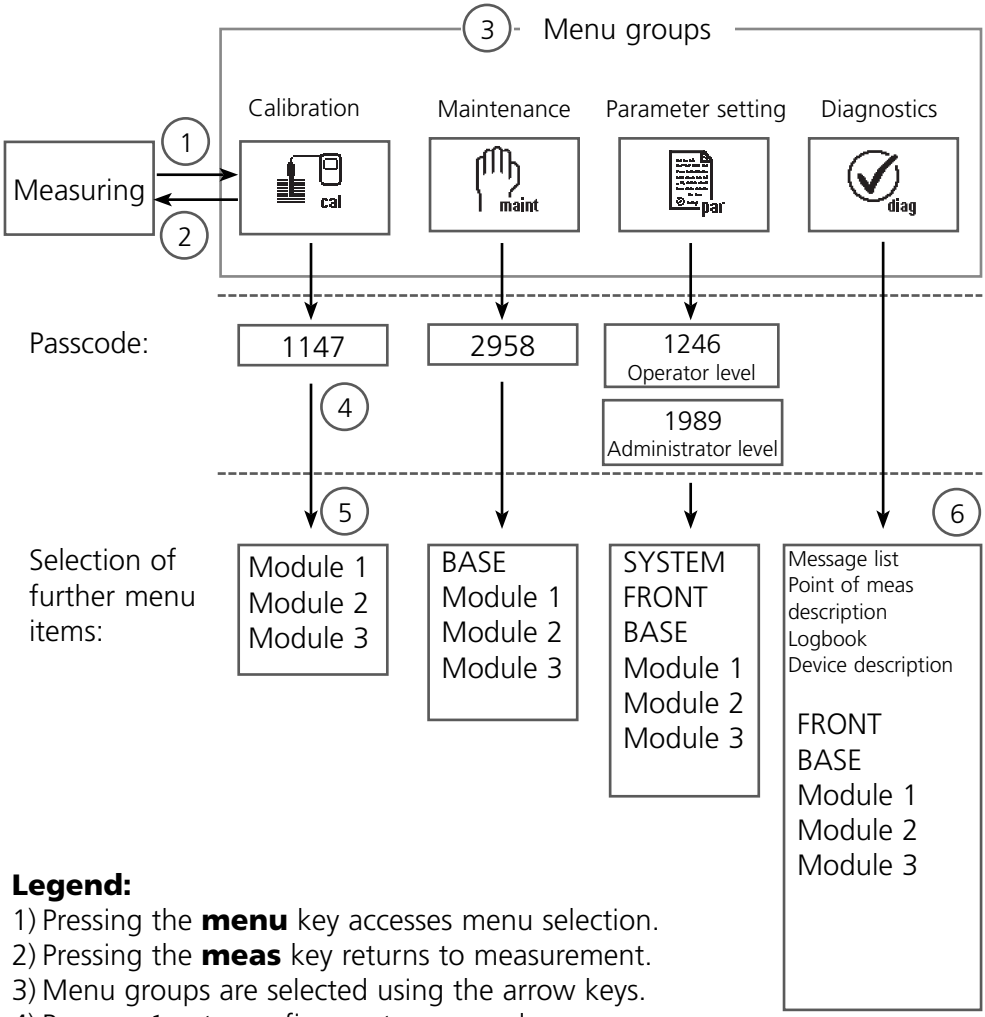
Green LED
Voltage supply okay

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

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

Short Description: Menu Structure

Basic Functions: Calibration, Maintenance, Parameter Setting, Diagnostics



Legend:

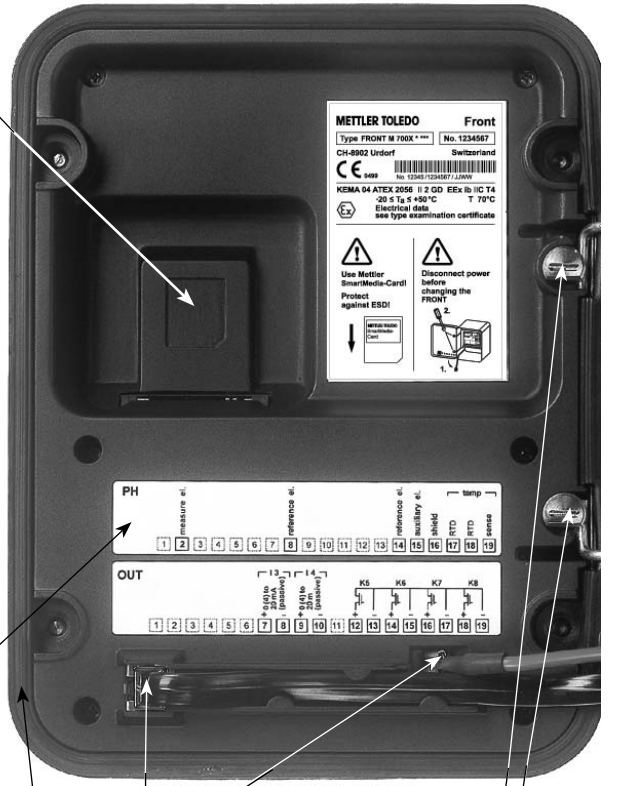
1) Pressing the **menu** key accesses menu selection.
2) Pressing the **meas** key returns to measurement.
3) Menu groups are selected using the arrow keys.
4) Press **enter** to confirm, enter passcode.
5) Further menu items are displayed.
6) Selected functions of the Diagnostics menu can be recalled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

Short Description: FRONT Module

View into the open device (FRONT module)

Slot for SmartMedia card

- Data recording
  The SmartMedia card expands the measurement recorder capacity to > 50000 records.
- Exchange of parameter sets
  5 parameter sets can be stored on the SmartMedia card. The 2 internal parameter sets can be switched by remote control.
  Configurations can be transmitted from one analyzer to the other.
- Function expansions
  are possible with additional software modules, which are released using transaction numbers (TAN)
- Software updates



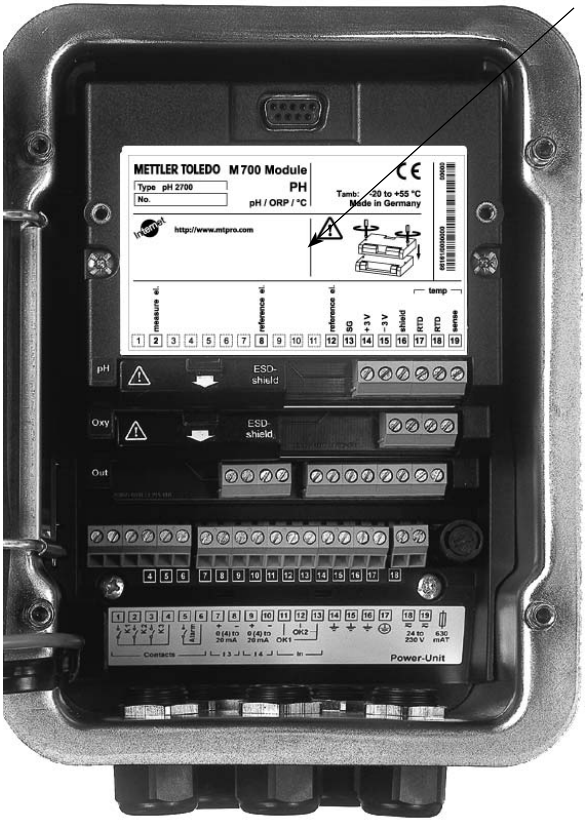
Terminal plates of "hidden" modules
Each module comes with an adhesive label containing the contact assignments. This label should be sticked to the inner side of the front (as shown). Then, the terminal assignments remain visible even if further modules are inserted.

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

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

Short Description: BASE Module

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



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

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

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

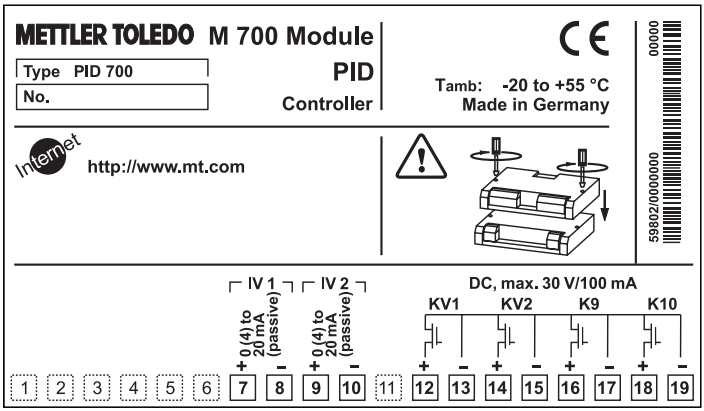
Warning!
Do not touch the terminal compartment, there may be dangerous contact voltages!

Important Notice Concerning SmartMedia Card

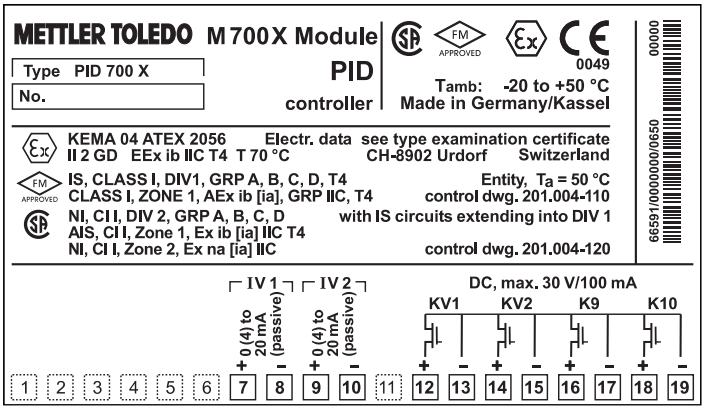
The SmartMedia card may be inserted or replaced with the power supply switched on. Before a memory card is removed, it must be "closed" in the maintenance menu. When closing the device, make sure that the sealing is properly seated and clean.

Terminal Plate PID 700(X) Module

Terminal Plate PID 700 Module



Terminal Plate PID 700X Module

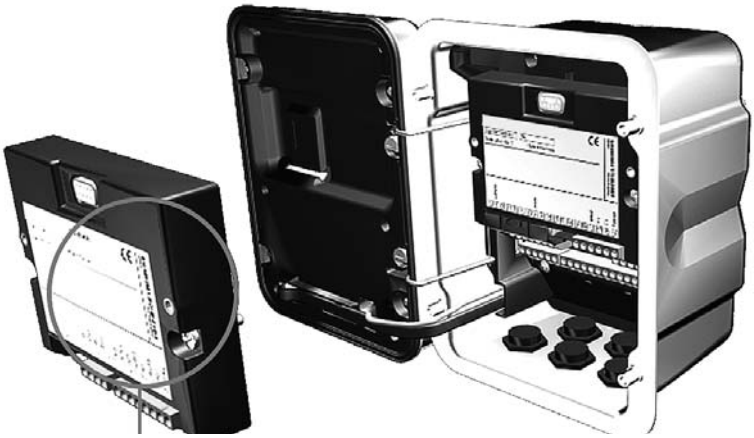


Attaching the Terminal Plates

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

Inserting the Module

Note: Be sure to connect the shielding properly!



Thanks to the staggered arrangement of connectors and fastening screws the terminal strips of all modules are easy to access.

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 signal lines.
6. Close device, tighten screws at the front
7. Switch on power supply
8. Set parameters

Wiring Examples

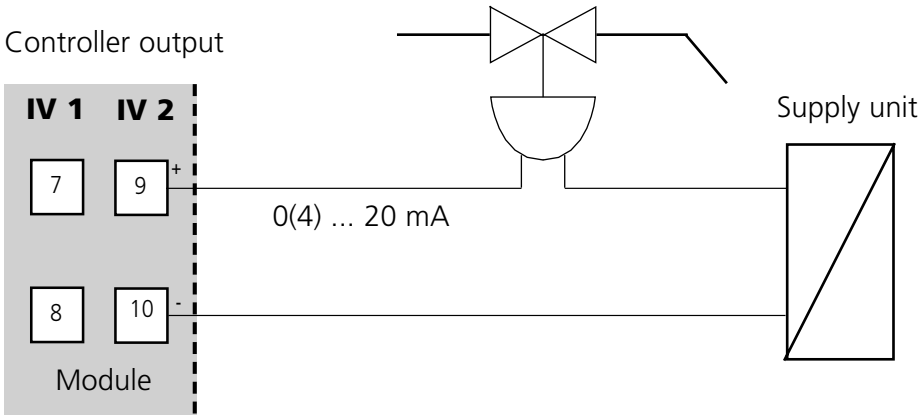
Analog and Digital Controller Outputs

Caution!
The PID 700X module is intended for operation in locations subject to explosion hazards which require equipment of Group II, device category 2(1), gas/dust.
Before commissioning it must be proved that the device may be connected with other equipment.

For corresponding specifications, refer to EC-Type-Examination Certificate.

Wiring Example 1

Analog controller outputs IV 1, IV 2 (passive, supply unit required)



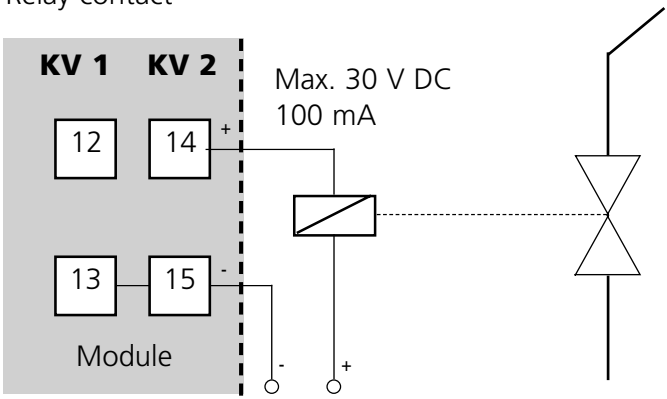
Wiring Examples

Relay Contacts

Wiring Example 2

Digital controller outputs KV 1, KV 2 (electronic relay contacts)

Relay contact

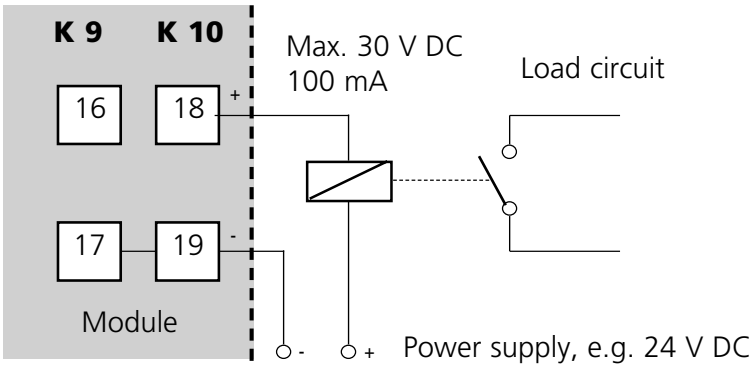


Power supply, e.g. 24 V DC

Wiring Example 3

Electronic relay contacts K 9, K 10

Limit contact



PID Controller

Short Introduction

PID control requires a closed loop. The control loop is made up of individual components which must be in permanent operation. The process variable to be controlled (controlled variable) is continuously measured and compared with the desired value (setpoint). The aim is to keep the controlled variable at the setpoint.

The controlled variables (e.g. pressure, temperature, pH value, concentration, ...) are measured using suitable sensors which provide the continuously measured values for comparison with the setpoint. The comparison intervals can be selected as desired. Deviations trigger a control procedure with the aim to adjust the controlled variable to the setpoint within a preset time.

This comparison procedure and the calculation of the required change of the controlled variable is performed by the controller.

Controllers are classified according to their characteristic, dynamic response, and mode of operation.

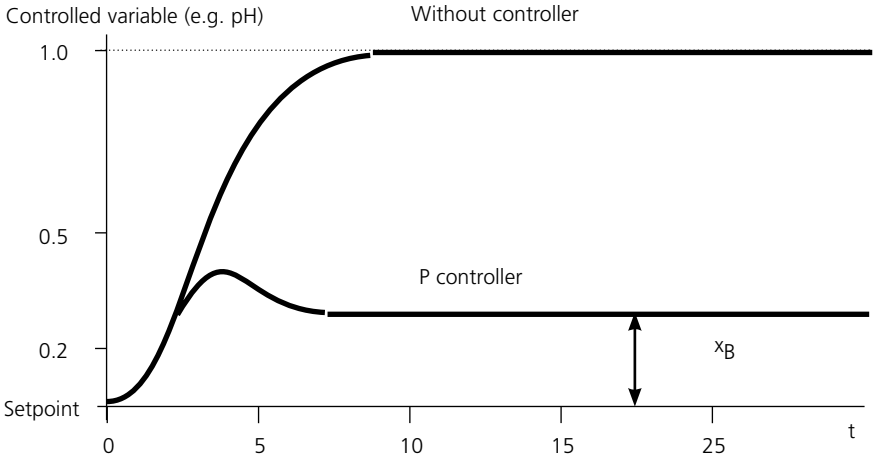
- Curve
  A distinction is made between continuous (linear) and discontinuous controllers.

- Dynamic response:
  A change in the error variable at the controller input influences the manipulated variable at the controller output.

There is a great variety of classification criteria for linear controllers. Particular importance must be placed on their dynamic response, however. The following text describes the components of dynamic action and their typical combinations.

P Controller (Parameter: Controller Gain)

The proportional-action component of a P controller transforms the control deviation (error variable) to a proportional controller output (manipulated variable). The range of the manipulated variable is limited. Therefore, also the usable range of the controller input signal (control range) is limited.



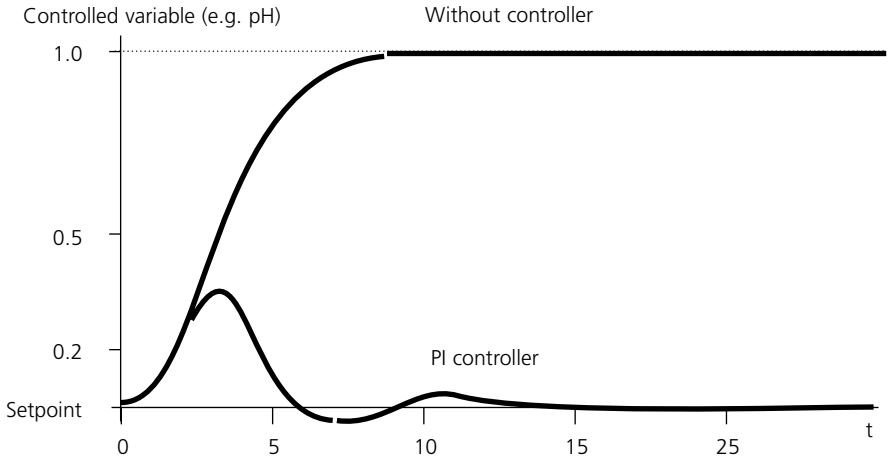
Schematic Diagram of P Controller
Time response of control as reaction to a disturbance:
After a short settling time a deviation x_B remains.
The desired value is not reached.

I Controller (Parameter: Reset Time)

The integral-action component takes account of the rate of change of the manipulated variable, i.e. it forms the time integral of the error variable. Each value of the controlled variable is assigned to a particular rate of change of the manipulated variable.

PI Controller

These controllers combine proportional and integral action. Compared to P controllers, which only provide a proportional relationship between controlled variable and manipulated variable, here an integration over time is also performed.
First, the value of the manipulated variable is calculated in proportion to the error variable, and then the integral-action component is added.



Schematic Diagram of PI Controller
Time response of control as reaction to a disturbance.
The desired value is reached after several oscillations.

D Control (Parameter: Derivative)

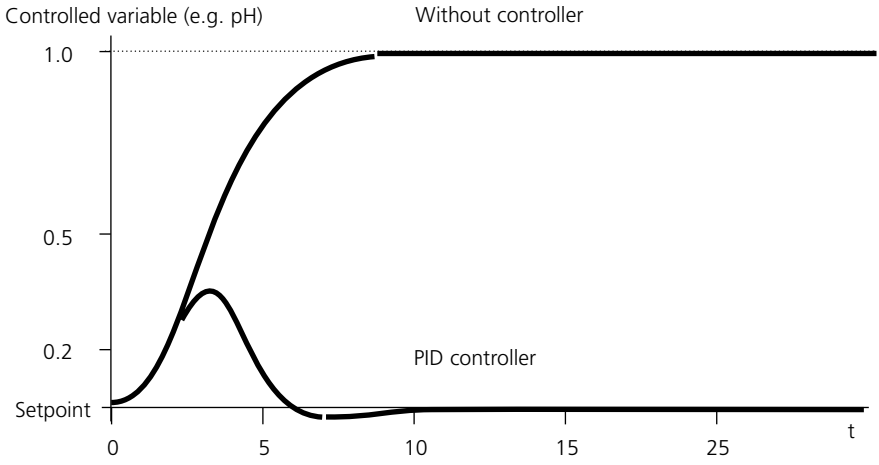
A derivative control alone is completely unsuitable since it only reacts to changes of the error variable, that is, constant errors remain unnoticed.

PD Controller

This controller adds the proportional change of the input signal and the rate of change of the controlled variable to the resulting manipulated variable.

PID Controller

This controller comprises the P, I, and D components of linear controllers. The manipulated variable of a PID control system is the sum of the output variables of a P, an I, and a D control system.



Schematic Diagram of PID Controller

Time response of control as reaction to a disturbance.
The desired value is reached after a short overshoot.

The maximum overshoot of the PID controller is even smaller than that of the PD controller. Due to its I-action component there is no remaining offset. However, the components (P, I, D) of a PID controller implement a universally applicable, classical controller thanks to the fast reaction of the P component, the regulating capacity of the I component, and the attenuating effect of the D component.

Typical Applications

P Controller

Application for integrating control systems (e.g. closed tank, batch processes).

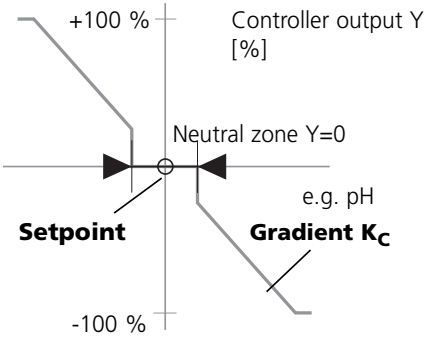
PI Controller

Application for non-integrating control systems (e.g. drains).

PID Controller

The additional derivative action compensates for measurement peaks.

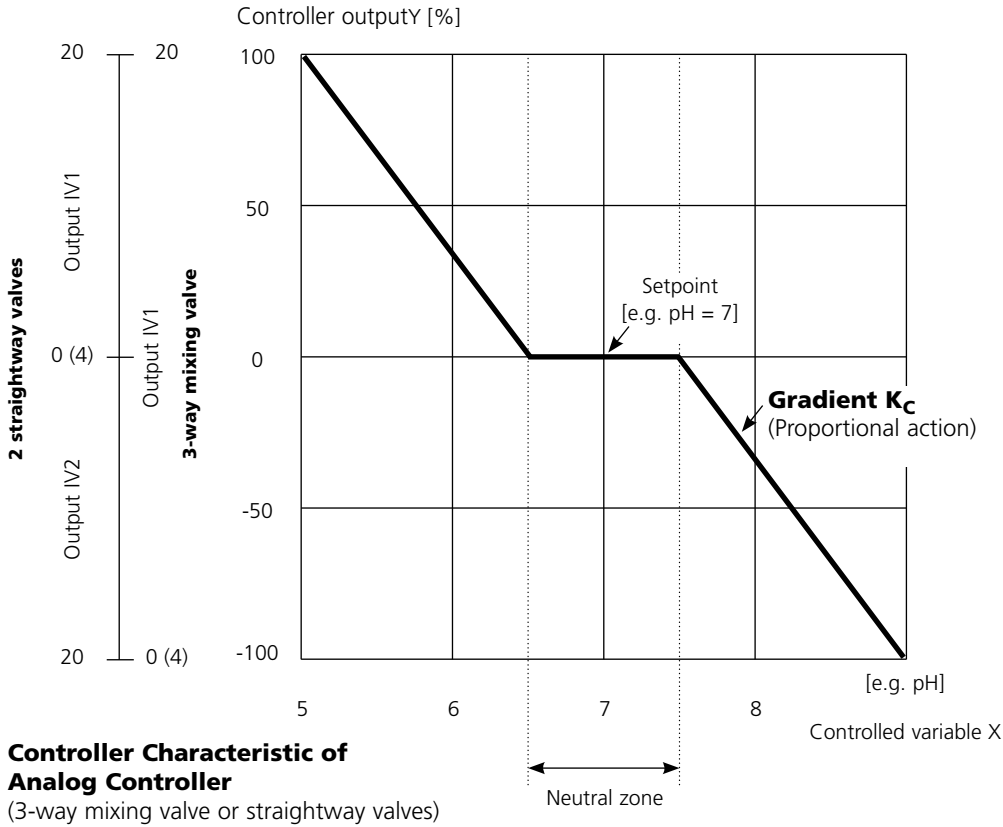
Controller Characteristic



Analog Controller IV1/IV2

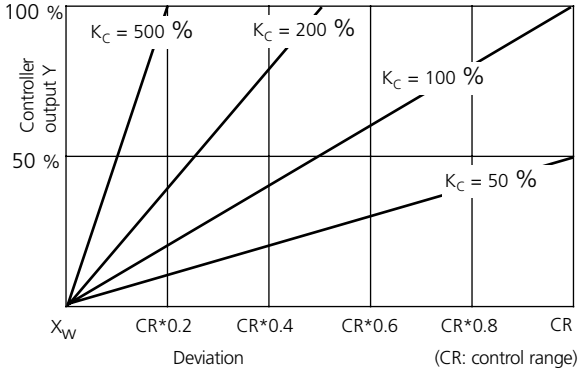
The following controller characteristics can be defined:

- Values are adjusted toward the setpoint.
- In the neutral zone (symmetrical to setpoint) no control takes place.
- Controller parameters: Controller gain, reset, and derivative.
- Feed time alarm: determines how long the controller output may be at maximum until an alarm is released. This allows recognition of a defective valve or an error in the process.
- Behavior during HOLD: User-defined Constant controller output ("last usable value")
  Controller output = 0 (controller switched off)



Controller Characteristic of Analog Controller
(3-way mixing valve or straightway valves)

Proportional Action (Gradient K_C [%])

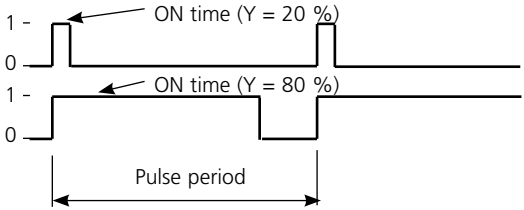


Variable	Control Range CR
pH	5
ORP	500 mV
$\%O_2$	50 %
%Air	50 %
mg/l	5 mg/l
S/cm	5 mS/cm
°C	50 K
%vol	50 %
ppm	5000 (oxygen in gases)

Pulse Length Controller

The pulse length controller is used to operate a valve as an actuator.
It switches the contact on for a time that depends on the controller output (Y). The period is constant. A minimum ON time of 0.5 sec is maintained even if the controller output takes corresponding values.

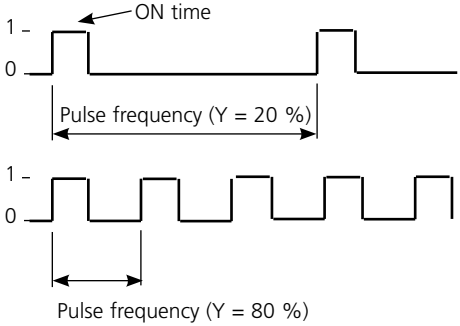
Output signal (switching contact) of pulse length controller



Pulse Frequency Controller

The pulse frequency controller is used to operate a frequency-controlled actuator (metering pump). It varies the frequency with which the contacts are switched on. The maximum pulse frequency [pulses/min] can be defined. It depends on the actuator. The Contact ON time is constant.
It is automatically calculated from the user-defined maximum pulse frequency:

Output signal (switching contact) of pulse frequency controller



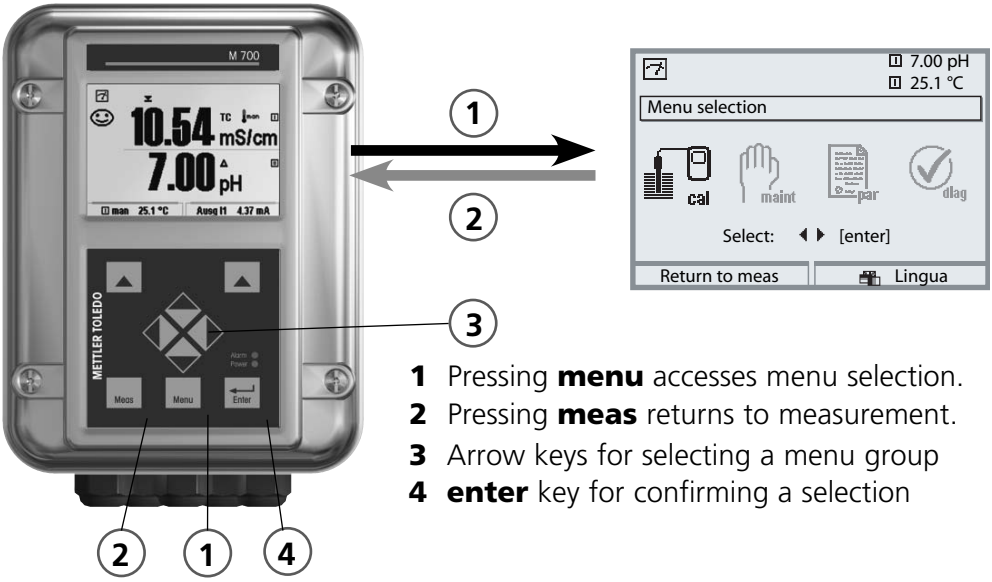
PID Controller and Limit Contacts

User-Defined Variables

Measuring module (measured variable)	Controller	Limit value
pH	pH, ORP, °C	pH, ORP, °C, rH
Cond	S/cm, °C	S/cm, % by wt, °C, g/kg, Ω*cm
Cond Ind	S/cm, °C	S/cm, % by wt, °C, g/kg, Ω*cm
O_2	%Air, %O_2, °C, mg/l Vol%	%Air, %O_2, mbar, nA, °C, mg/l Partial pressure (mbar) Vol% (O_2 measurement in gases) ppm (gas)
Calculation Blocks		Process variables as configured

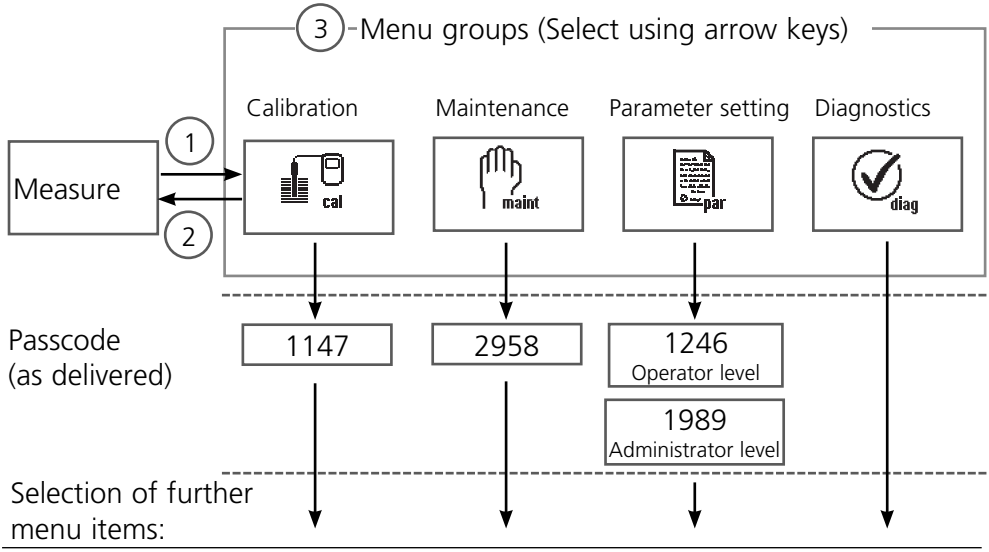
Menu Selection

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



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

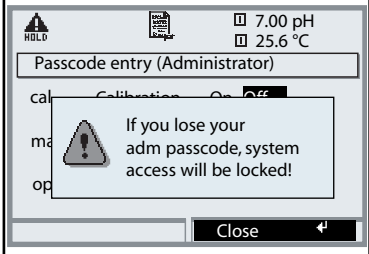
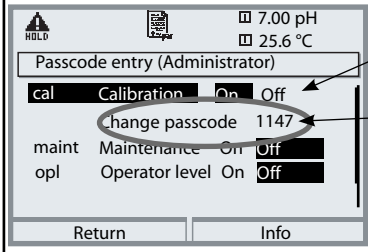
Menu Structure



Passcode Entry

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

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

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

Configuring the Measurement Display

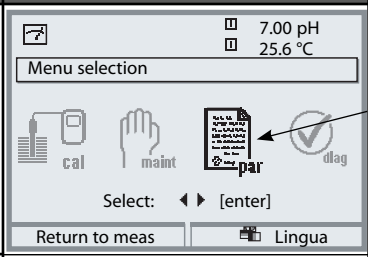
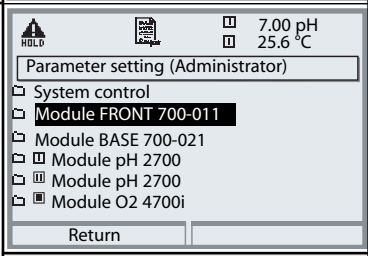
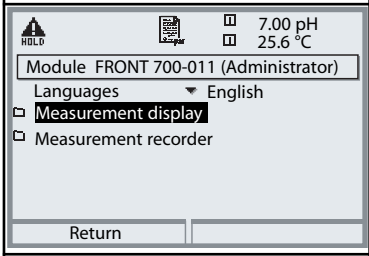
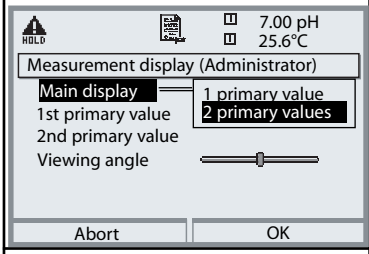
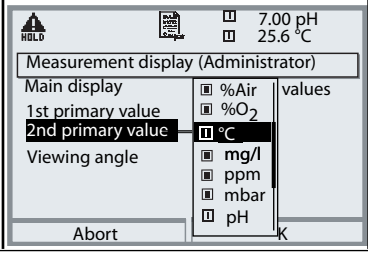
Select menu: Parameter setting/Module FRONT/Measurement display

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

Measurement display
Typical display for
2 pH measurement points.

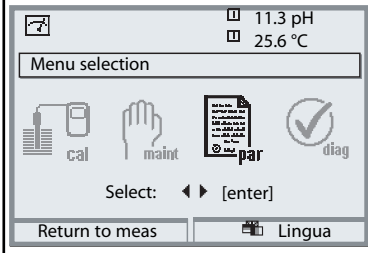
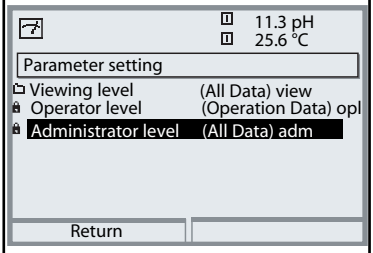
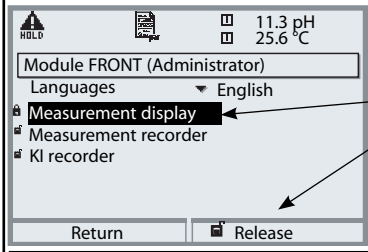
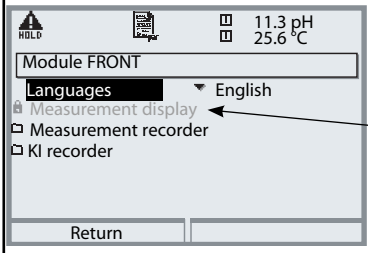
Secondary displays
Additional values, also date and time, can be displayed depending on the modules installed.

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

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

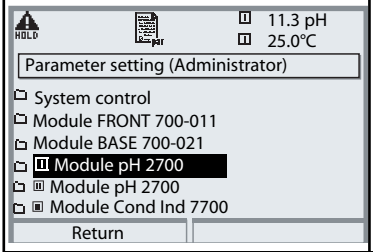
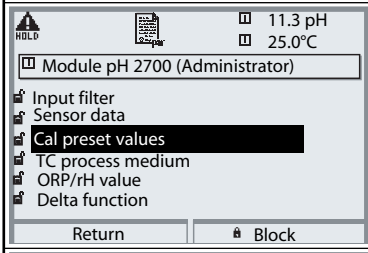
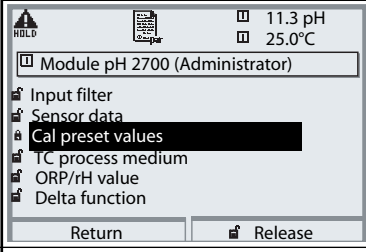
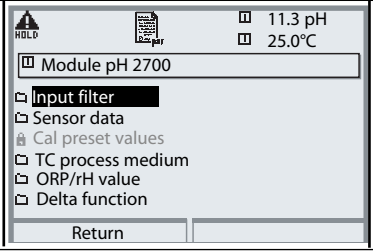
Parameter Setting: Operating Levels

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

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

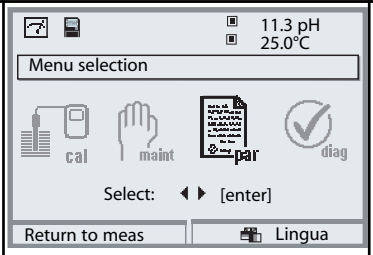
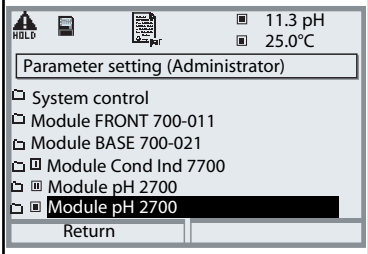
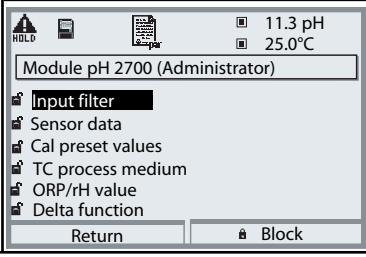
Parameter Setting: Lock Functions

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

Menu	Display	Administrator level: Enable / lock functions
par		**Example:** Blocking access to the calibration adjustments from the Operator level **Call up parameter setting** Select Administrator level. Enter passcode (1989). Select "Module pH" (e.g.) using arrow keys, confirm with **enter**.
		
		Select "Cal preset values" using arrow keys. "Block" with softkey.
		Now, the "Cal preset values" line is marked with the "lock" icon. This function cannot be accessed from the Operator level any more. The softkey function changes to "Release".
par		**Call up parameter setting** Select Operator level, passcode (1246). Select "Module pH" (e.g.). Now, the locked function is displayed in gray and marked with the "lock" icon.

Activating Parameter Setting

Call up parameter setting

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

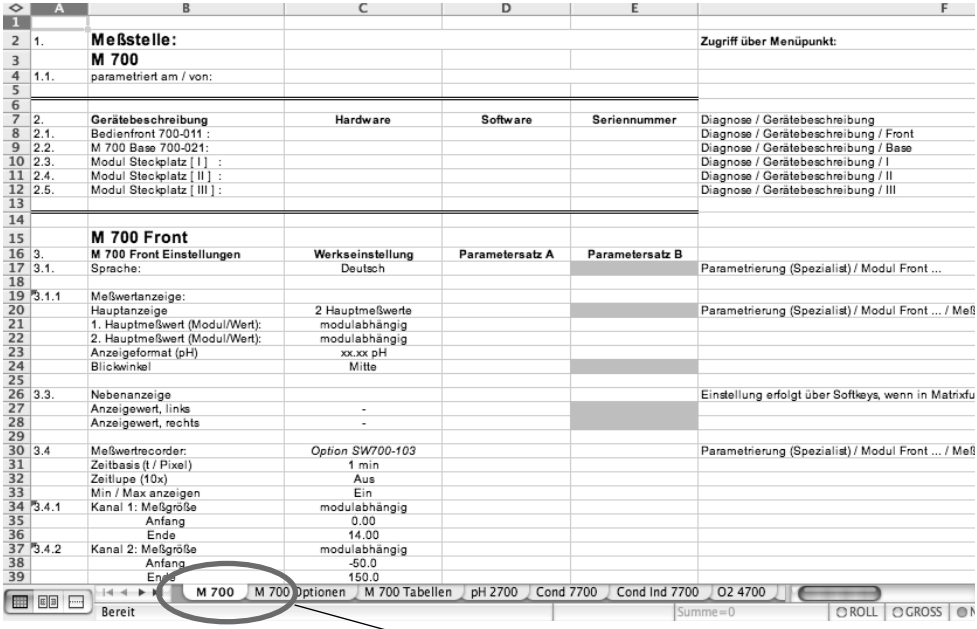
During parameter setting the analyzer is in HOLD mode:
Current outputs and relay contacts behave as configured (BASE module).

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			

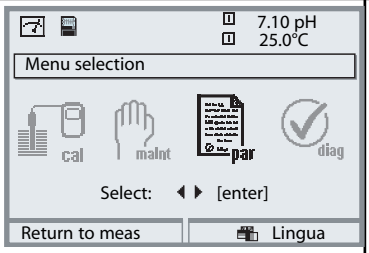
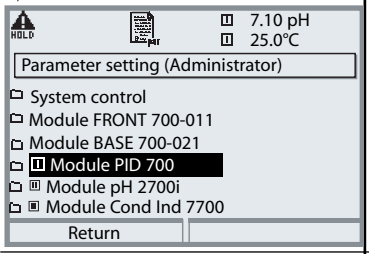
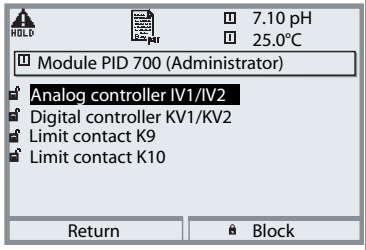
From the application window of the Excel file, select the worksheet for the module the parameter settings of which you want to document.
Set the parameters of the respective module and enter the selected values in the corresponding cells of the module worksheet.

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

Configuring the Module

Activating Parameter Setting
Note: HOLD mode active

Menu	Display	Parameter setting
par		**Call up parameter setting** From the measuring mode: Press **menu** key to select menu. Select parameter setting using arrow keys, confirm with **enter**. Passcode 1989 (To change passcode: Parameter setting/System control/ Passcode entry).
		**HOLD** During parameter setting the analyzer is in "HOLD" mode. Current outputs and relay contacts behave as configured.
		Select "Module PID". Confirm with **enter**
		Select parameter using arrow keys, confirm with **enter.**

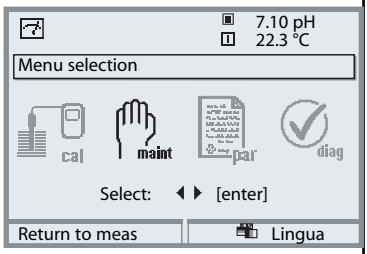
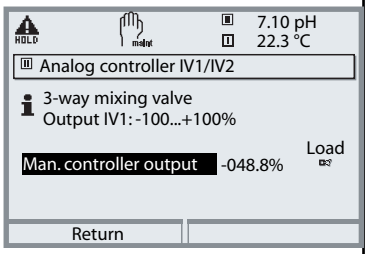
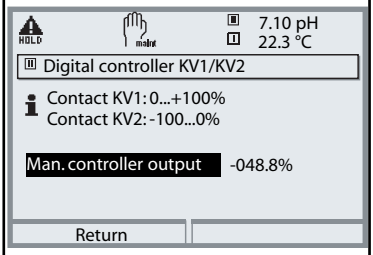
Parameter Setting

Default Settings and Selection Range
Note: HOLD mode active

Parameter	Default	Selection / Range
ANALOG CONTROLLER IV1/IV2		
• Controller type	Off	Off, 3-way mixing valve, straightway valve
• Controlled variable	(Module)	Depending on modules installed, e.g.: S/cm, °C, %Air, %O_2, mg/l, pH, ORP
• Setpoint	7.0	Default setting: pH control
• Neutral zone	0.0	Default setting: pH control
• (P) Controller gain	100%	
• (I) Reset time	0000 sec	0000 = Off
• (D) Rate time	0000 sec	0000 = Off
• Feed time alarm after	0000 sec	0000 = Off
• Behavior during HOLD	Y=const	Y=0%, Y=const
• Output IV1/IV2	4 ... 20 mA	0 ... 20 mA, 4 ... 20 mA
DIGITAL CONTROLLER KV1/KV2		
• Controller type	Off	Off, 3-way mixing valve, straightway valve
• Controlled variable	(Module)	Depending on modules installed, e.g.: S/cm, °C, %Air, %O_2, mg/l, pH, ORP, ...
• Setpoint	7.0	Default setting: pH control
• Neutral zone	0.0	Default setting: pH control
• (P) Controller gain	100%	
• (I) Reset time	0000 sec	0000 = Off
• (D) Rate time	0000 sec	0000 = Off
• Feed time alarm after	0000 sec	0000 = Off
• Behavior during HOLD	Y=const	Y=0%, Y=const
• Pulse period	0010 sec	Entry
• Max. pulse frequency	120 pulses/min	1 ... 180 pulses/min
Limit contacts K9/K10		The limit contacts can be configured separately
• Variable	(Module)	Depending on modules installed, e.g.: S/cm, °C, g/kg, Ωcm, pH, ORP, rH, ..
• Limit value	0.0	Entry
• Hysteresis	0.1	Entry
• Effective direction	Min	Min, Max
• Contact type	N/O	Normally open N/O, normally closed N/C
• ON delay	0000 sec	Entry
• OFF delay	0000 sec	Entry

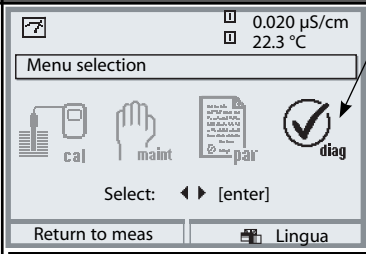
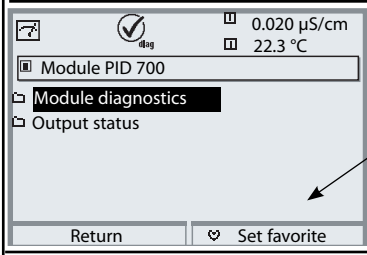
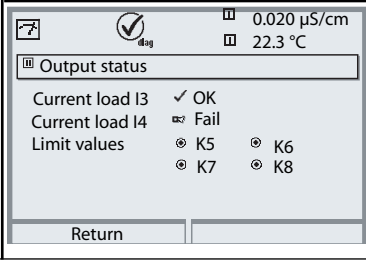
Maintenance

Analog Controller, Digital Controller
Note: HOLD mode active

Menu	Display	Maintenance
maint		**Call up Maintenance** From the measuring mode: Press **menu** key to select menu. Select maintenance using arrow keys, confirm with **enter**. Then select Module PID.
		**Analog controller IV1/IV2** The analog controller is configured during parameter setting. The default setting is shown on the display. For testing purposes, the controller output can be entered manually.
		**Digital controller KV1/KV2** The relay contacts (KV1/KV2) are configured during parameter setting. For testing purposes, the controller output can be entered manually.

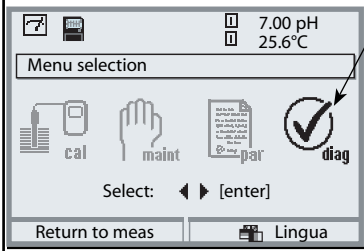
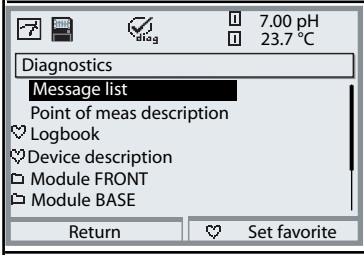
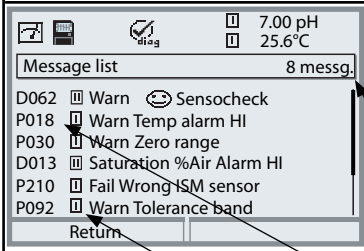
Diagnostics Functions

Select menu: Diagnostics

Menu	Display	Function
diag		**Call up diagnostics** From the measuring mode: Press **menu** key to select menu. Select diagnostics using arrow keys, confirm with **enter**. Then select "Module PID".
		The Diagnostics menu gives an overview of all diagnostics functions available. Functions which have been set as "Favorite" can be directly accessed from the measuring mode (see manual for basic unit).
		Diagnostics functions available: • Module diagnostics • Function test of internal components. • Output status (Fig.) • Status of signal outputs

Diagnostics Functions

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

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

PID 700(X) Module

No.	PID messages	Message type
R008	Meas. processing (factory settings)	FAIL
R009	Module failure (Firmware Flash check sum)	FAIL
R014	Feed time A controller Alarm HI_HI	FAIL
R019	Feed time D controller Alarm HI_HI	FAIL
R073	Current IV1 Load error	FAIL
R078	Current IV2 Load error	FAIL
R200	Control parameters	WARN
R254	Module reset	Text

Specifications

Specifications M 700 PID 700(X)

Analog controller outputs IV1, IV2	0/4... 20 mA, passive
Supply voltage	3 ... 30 V, I_{max} = 100 mA
Load monitoring	Error message if load is exceeded
Measurement error**	< 0,25 % current value + 0.05 mA
Usage	Actuation of analog control valves • IV1: active below setpoint (for straightway valves) • IV2: active above setpoint (for straightway valves)
Digital controller outputs KV1, KV2	Electronic relay outputs, polarized, floating, connected to each other and to K9, K10
Voltage drop	< 1.2 V
Loadability	DC: V_{max} = 30 V, I_{max} = 100 mA
Usage	Actuation of straightway valves, metering pumps • KV1: active below setpoint • KV2: active above setpoint
PID process controller	Continuous controller via the current outputs IV1, IV2 or / and quasi-continuous controller via the KV1, KV2 relay contacts
Controlled variable *	User-defined, depending on measuring modules installed (primary variables only: pH, ORP, °C, S/cm, % O_2, % Air)
Setpoint specification *)	As desired within range
Neutral zone *	As desired within range
P action *	Controller gain Kp: 0010 ... 9999 %
I action *	Reset time Tr: 0000 ... 9999 sec (0000 s = no integral action)
D action *	Rate time Td: 0000 ... 9999 sec (0000 s = no derivative action)
Pulse length controller *	0001 ... 0600 sec, min. ON time 0.5 sec
Pulse frequency controller *	0001 ... 0180 min^{-1}
Behavior during HOLD *	Controller output Y = const. or controller output Y = 0

Man. controller output	Manual specification for testing or starting up a process, bumpless switchover to automatic when I-action component ≠ 0000 s
Pulse period	0001 s (pulse length controller)

Switching output K9/K10	Electronic relay outputs, polarized, floating, connected to each other and to KV1, KV2
Voltage drop	< 1.2 V
Loadability	DC: V_{max} = 30 V, I_{max} = 100 mA
Usage	Limit monitoring or pre-control (3-point controller), process variable, threshold, hysteresis, contact type (N/C, N/O), switch on / switch off delay definable as desired

* User-defined

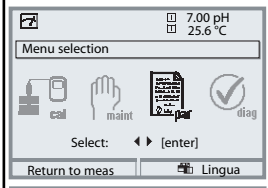
** To IEC 746 Part 1, at nominal operating conditions

Specifications

General Data

Explosion protection (IS module only)	ATEX: See rating plate: KEMA 03 ATEX 2056 II 2 (1) GD EEx ib [ia] IIC T4 T 70 °C FM: NI, Class I, Div 2, GP A, B, C, D T4 with IS circuits extending into Division 1 Class I, Zone 2, AEx nA, Group IIC, T4 Class I, Zone 1, AEx me ib [ia] IIC, T4 CSA: NI, Class I, Div 2, Group A, B, C, D with IS circuits extending into Division 1 AIS, Class I, Zone 1, Ex ib [ia] IIC, T4 NI, Class I, Zone 2, Ex nA [ia] IIC
EMC Emitted interference Immunity to interference	NAMUR NE 21 and EN 61326 VDE 0843 Part 20 /01.98 EN 61326/A1 VDE 0843 Part 20/A1 /05.99 Class B Industry
Lightning protection	EN 61000-4-5, Installation Class 2
Nominal operating conditions	Ambient temperature: –20 ... +55 °C (Ex: max. +50 °C) Rel. humidity: 10 ... 95 % not condensing
Transport/Storage temperature	–20 ... +70 °C
Screw clamp connector	Single wires and flexible leads up to 2.5 mm^2

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 memory card, not an update card. Commercially available SmartMedia cards must be formatted before they can be used as memory card.
Copy configuration	The complete configuration of an analyzer can be written on a SmartMedia card. This allows transferring all device settings to other devices with identical equipment (exception: options and passcodes).
Parameter sets • Load • Save	2 parameter sets (A,B) are available in the analyzer. The currently active parameter set is read on the display. Parameter sets contain all settings except: Sensor type, Options, System control settings Up to 5 parameter sets (1, 2, 3, 4, 5) are available when a SmartMedia card (Option) is used.
Function control matrix • Input OK2 • Left softkey • Right softkey	Selecting the control element for the following functions: - Parameter set selection - KI recorder (Start/Stop) - Favorites menu (selected diagnostics functions) - EC 400 (fully automated probe controller)
Time/date	Selecting the display format, entry
Point of meas description	Can be called up in the diagnostics menu.
Release of options	A TAN is required to release an Option.
Software update	Software update from SmartMedia card (update card)
Logbook	Selecting events to be recorded
Buffer table	Entering own buffer set for automatic calibration
Factory setting	Resetting all parameters to factory setting
Passcode entry	Editing the passcodes

Parameter Setting Menu

Display Settings: FRONT Module

Languages

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

Signal Outputs and Inputs, Contacts: BASE Module

Output current I1, I2 • Variable • Curve • Output (0/4 - 20 mA) • Output filter • Behavior during messages - HOLD --- Current meas. --- Last meas. value --- Fixed 22 mA - 22 mA message	2 current outputs, separately adjustable Behavior during messages Output current [mA] 22 4 "Current meas." "Last usable value" "Fixed (22 mA)" HOLD HOLD HOLD
Contact K4 • Contact type • ON delay • OFF delay	NAMUR Failure
Contacts K3, K2, K1 • Usage - Maintenance request - HOLD (function check) - Limit value (adjustable) - Rinse contact (adjustable) - Parameter set B active - USP output - KI recorder active - Sensoface • Conoller alarm (alarm output EC 400) • Contact type / ON/OFF delay	Factory setting: K3: Maintenance request, K2: HOLD, K1: Limit - Variable, limit value, hysteresis, effective direction, ... - Rinsing interval, lead times, rinse duration, logbook entry, ...
Inputs OK1, OK2 • OK1 usage - Signal level	Optocoupler - signal inputs Off, HOLD (function check) active level switchable from 10 to 30 V or < 2 V, resp. For OK2 see System control/Function control matrix

Parameter Setting of PID 700(X) Module

Parameter	Default	Selection / Range
ANALOG CONTROLLER IV1/IV2		
• Controller type	Off	Off, 3-way mixing valve, straightway valve
• Controlled variable	(Module)	Depending on modules installed, e.g.: S/cm, °C, %Air, $\%O_2$, mg/l, pH, ORP
• Setpoint	7.0	Default setting: pH control
• Neutral zone	0.0	Default setting: pH control
• (P) Controller gain	100%	
• (I) Reset time	0000 sec	0000 = Off
• (D) Rate time	0000 sec	0000 = Off
• Feed time alarm after	0000 sec	0000 = Off
• Behavior during HOLD	Y=const	Y=0%, Y=const
• Output IV1/IV2	4 ... 20 mA	0 ... 20 mA, 4 ... 20 mA
DIGITAL CONTROLLER KV1/KV2		
• Controller type	Off	Off, 3-way mixing valve, straightway valve
• Controlled variable	(Module)	Depending on modules installed, e.g.: S/cm, °C, %Air, $\%O_2$, mg/l, pH, ORP, ...
• Setpoint	7.0	Default setting: pH control
• Neutral zone	0.0	Default setting: pH control
• (P) Controller gain	100%	
• (I) Reset time	0000 sec	0000 = Off
• (D) Rate time	0000 sec	0000 = Off
• Feed time alarm after	0000 sec	0000 = Off
• Behavior during HOLD	Y=const	Y=0%, Y=const
• Pulse period	0010 sec	Entry
• Max. pulse frequency	120 pulses/min	1 ... 180 pulses/min
Limit contacts K9/K10		The limit contacts can be configured separately
• Variable	(Module)	Depending on modules installed, e.g.: S/cm, °C, g/kg, Ωcm, pH, ORP, rH, ...
• Limit value	0.0	Entry
• Hysteresis	0.1	Entry
• Effective direction	Min	Min, Max
• Contact type	N/O	Normally open N/O, normally closed N/C
• ON delay	0000 sec	Entry
• OFF delay	0000 sec	Entry

Maintenance Menu

BASE Module

Current source	Output current definable 0 ... 22 mA

PID 700(X) Module

Current source	Output current definable 0 ... 22 mA
Analog controller IV1/IV2	Controller output can be entered manually (function test)
Digital controller KV1/KV2	Controller output can be entered manually (function test)

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

PID 700(X) Module

Module diagnostics
Input/output status

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