

Bedienungsanleitung
Instruction Manual
Notice d'utilisation

Transmitter pH 2100 PA



69956

METTLER TOLEDO



Mettler-Toledo GmbH
Process Analytics
Im Hackacker 15, P.O. Box
CH-8902 Urdorf
Switzerland
Phone: +41-1-736 22 11
Fax: +41-1-736 26 36
www.mtpro.com

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Gewährleistung

Innerhalb von 1 Jahr ab Lieferung auftretende Mängel werden bei freier Anlieferung im Werk kostenlos behoben.

Softwareversion: 2.x

Stand Bedienungsanleitung: 24.06.2005

Warranty

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

Software release: 2.x

Date of issue: June 24, 2005

Garantie

Tout défaut constaté dans les 1 an à dater de la livraison sera réparé gratuitement dans notre usine à réception franco de l'appareil.

Version logiciel : 2.x

Version du mode d'emploi : 24.06.2005



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1 Information on this instruction manual

1.1 Markings



The warning symbol means that the instructions given must always be followed for your own safety.

Failure to follow these instructions may result in injuries



Notes provide important information that should be strictly followed when using the device.



When a key is shown, its function is explained.



When a display is shown, the corresponding information or operating instructions are provided.

Operating instructions

- Each operating instruction is preceded by a dot.

Enumerations

- Each enumeration is preceded by a dash.

Model designation

For practical purposes, the Transmitter pH 2100 PA is simply referred to as Transmitter in this instruction manual.

Trademarks

The following names are registered trademarks. For practical reasons they are shown without trademark symbol in this manual.

- Registered trademarks
 - InPro[®]
 - Sensocheck[®]
 - Sensoface[®]
 - Calimatic[®]
 - GainCheck[®]

2 Safety information

2.1 Be sure to read and observe the following instructions!

The Transmitter has been designed in accordance with the state of the art and complying with the applicable safety regulations.

When operating the device, certain conditions may nevertheless be dangerous for the operator or cause damage to the device.



Whenever it is likely that protection has been impaired, the device shall be made inoperative and secured against unintended operation.

The protection is likely to be impaired if, for example:

- the device shows visible damage
- the device fails to perform the intended measurements
- after prolonged storage at temperatures above 70 °C
- after severe transport stress

Before recommissioning the device, a professional routine test in accordance with EN 61010-1 must be performed. This test should be carried out by the manufacturer.



The Transmitter pH 2100 PA is approved for installation in ATEX, FM Zone 1 with measurement in Zone 0, and FM Class I Div 1.

Before commissioning it must be proved that the intrinsic safety is maintained when connecting the device to other equipment, such as segment coupler and cable.



For hazardous-area applications, the Transmitter pH 2100 PA may only be connected to explosion-proof segment couplers, power supplies

The Transmitter pH 2100 PA may be operated in accordance with the FISCO model.



The stipulations of EN 60079-10:1996 and the following must be observed for the installation.



To protect against electrostatic discharge, the Transmitter may only be cleaned with a damp cloth in hazardous locations.

3 PROFIBUS technology

3.1 General

PROFIBUS is a digital communication system that connects different field devices over a common cable and integrates them into a control system. In the long term, PROFIBUS will replace the 4-20 mA technology, which only supplies pure measured values.

Advantages of the PROFIBUS technology are:

- easy and cost-saving cabling
- convenient operation over a central control station
- transmission, evaluation and control of high amounts of data from field device to control station.

3.2 Variants and basic characteristics

PROFIBUS determines the technical and functional characteristics of a serial bus system.

There are three PROFIBUS variants:

- PROFIBUS-FMS (FMS protocol)
 - is particularly suited for exchanging large amounts of data between control devices. It operates according to the RS 485 standard with transmission rates up to 12 Mbits/sec.
- PROFIBUS-DP (decentralized peripherals)
 - is tailored for communication of automation systems and distributed peripherals. It operates according to the RS 485 standard with transmission rates up to 12 Mbits/sec.
- PROFIBUS-PA (process automation)
 - is dedicated to the process industry. It permits connection of

3.3 Definitions for PROFIBUS-PA

The bus protocol defines type and speed of the data exchange between master and slave devices and determines the transmission pro-

- devices installed in hazardous locations are configured and maintained from the control station

PROFIBUS is the leading open fieldbus system in Europe. Its application range covers manufacturing, process and building automation. As open fieldbus standard to EN 50170, PROFIBUS ensures communication of different devices over one bus.

The PROFIBUS User Organization (PNO) provides for further development and maintenance of the PROFIBUS technology. It combines the interests of users and manufacturers.

sensors and actuators to a common bus even in hazardous locations. PROFIBUS-PA has a transmission rate of 31.25 kbits/sec.

PROFIBUS distinguishes between two types of devices:

- Masters
 - control the data traffic on the bus. They send messages without external request.
- Slaves
 - are peripheral devices such as valves, drives, transmitters and analyzers. They can react acyclically to servicing, configuration and diagnostic tasks of the master. The central controller cyclically reads the measurement data with status.

ocol of the respective PROFIBUS system.

PROFIBUS-PA permits cyclic and acyclic services.

- Cyclic services are used for transmission of measurement data and actuating commands with status information.
- Acyclic services are used for device configuration, maintenance and diagnostics during operation.

The device profile defines the device class and typical functionalities with parameters, ranges and limit values.

The FISCO model developed by the German PTB for hazardous locations permits connection of several devices to one common bus and defines permissible limits for device and cable parameters.

3.4 PROFIBUS-PA with the Transmitter pH 2100 PA

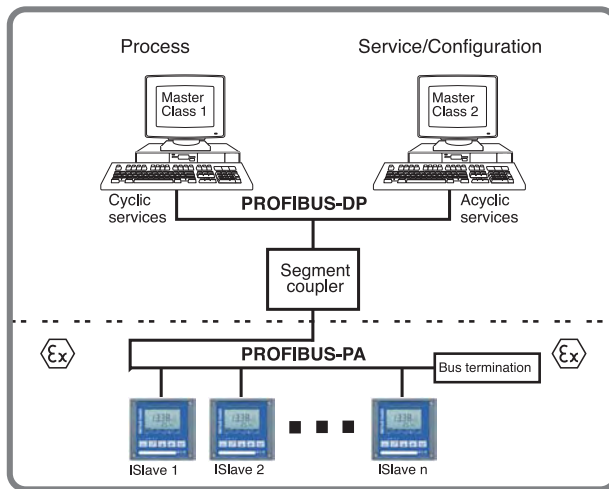


Fig. 3.1 Typical configuration of a PROFIBUS system with the Transmitter pH 2100 PA

4 Description

4.1 Proper use

The Transmitter pH 2100 PA is a PROFIBUS-PA analyzer. The Transmitter is used for pH/mV, ORP and temperature measurement in industry, environment, food processing and sewage treatment.

The rugged molded enclosure can be wall mounted or fixed into a control panel. It can also be mounted at a post or pipe.

The protective hood provides additional protection against direct

weather exposure and mechanical damage.

The Transmitter can be easily replaced since the terminals are of a plug-in design.

The Transmitter accepts commercially available electrodes with a nominal zero point at pH 7.

4.2 Technical features

Communication between measuring point and control room is via PROFIBUS-PA. The data exchange (cyclic and acyclic) is performed

in accordance with the PROFIBUS-DP/V1 protocol.

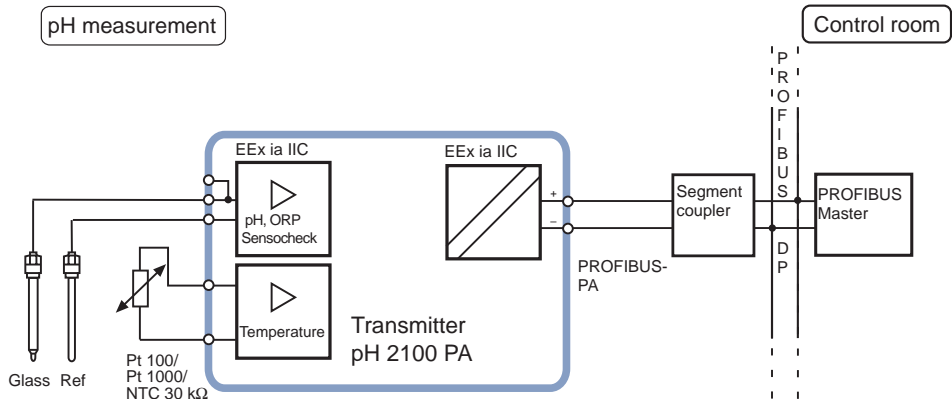


Fig. 4.1 System functions (hardware)

4.3 Communication model

The device performance is described by function blocks according to the PNO profile for Process Control Devices. The respective blocks contain different parameters and functions.

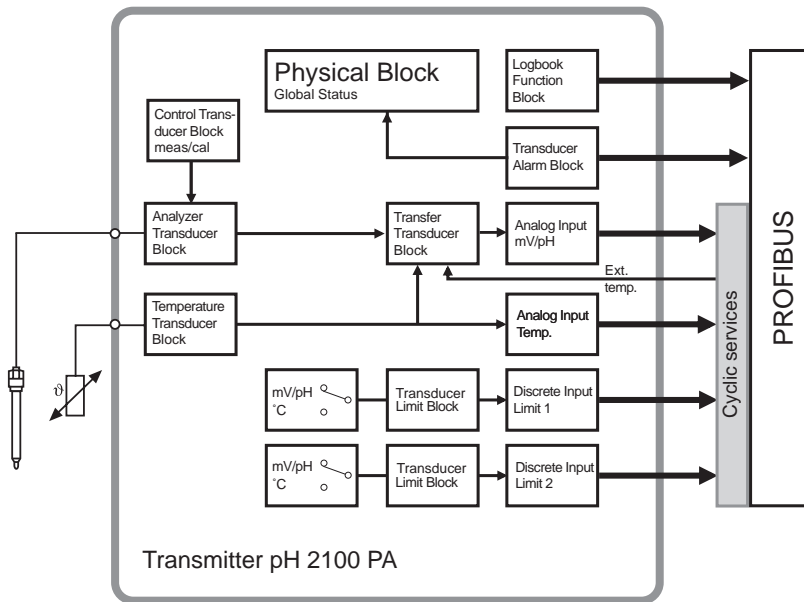


Fig. 4.2 Communication model Transmitter pH 2100 PA according to the "Profile for Process Control Devices" (PNO).

4.4 Profile for process control devices (extract)

Type of block	Block contents (general)	Block contents (detailed)
Physical Block (PB)	Description of device	Measurement procedure, device configuration Serial number, manufacturer name Operating state (run, maintenance, ...) Global status, diagnostics information
Transducer Block (TB)	Measurement procedure with interpretation	Process variable (plain text and unit) Number of measurement ranges (MR), start and end value of MR, active MR Autorange function On/Off Sampling rate of measured values Uncorrected measured value with time stamp and status
Control Transducer Block	Control of device functions	Status of function execution of respective Transducer Blocks Number of buffer sets available Slope of sensor characteristic
Transfer Transducer Block	Pre-processing of a measured value	Measured value pre-processing Temperature compensation Selection of pre-processing function
Transducer Limit Block	Limit monitoring	Block (TB) for limit setting Threshold, effective direction, hysteresis On-delay, off-delay Reset behavior, reset confirmation Limit status (active, not active)

Type of block	Block contents (general)	Block contents (detailed)
Analog Input (AI) Function Block	Measured value	Currently measured value with status and range Rise time, hysteresis of AI limits Upper/lower alarm limit Upper/lower warning limit Switchover manual/automatic operation, measured value simulation Fail-safe behavior
Discrete Input (DI) Function Block	Digital input	Switchover manual/automatic operation Limit value message/status Signal inversion Fail-safe behavior
Transducer Alarm Block	Signaling of states and events	Required maintenance, function check, errors, limits incl. cumulative message
Logbook Function Block	Registration of states and events	Power on, power off, reset State of execution Navigation through entries

Tab. 4.1: Profile for Process Control Devices (function contents)

5 Assembly

5.1 Package contents and unpacking

Unpack the Transmitter carefully. Check the shipment for transport damage and completeness.

The package should contain:

- Front unit of Transmitter
- Lower case

- This instruction manual
- Short instruction sheet
- Floppy disk with GSD file METT7533.GSD
- Bag containing small parts:

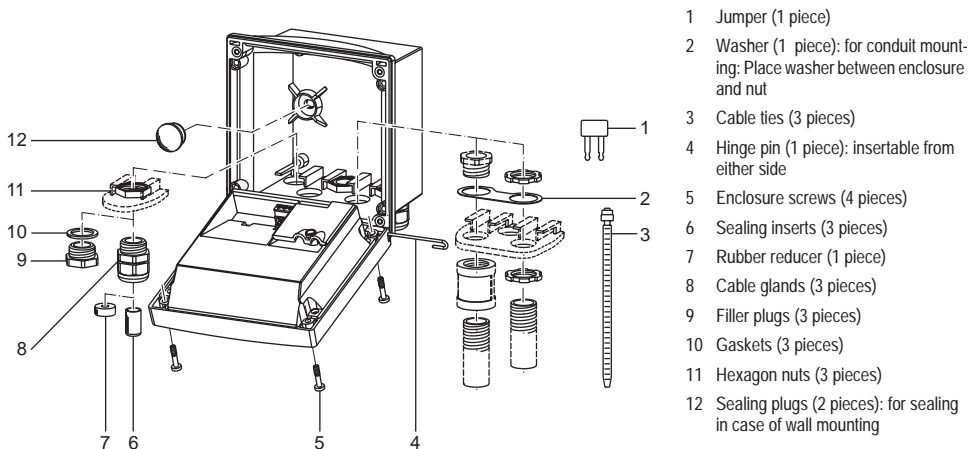


Fig. 5.1 Assembling the enclosure

5.2 Mounting plan

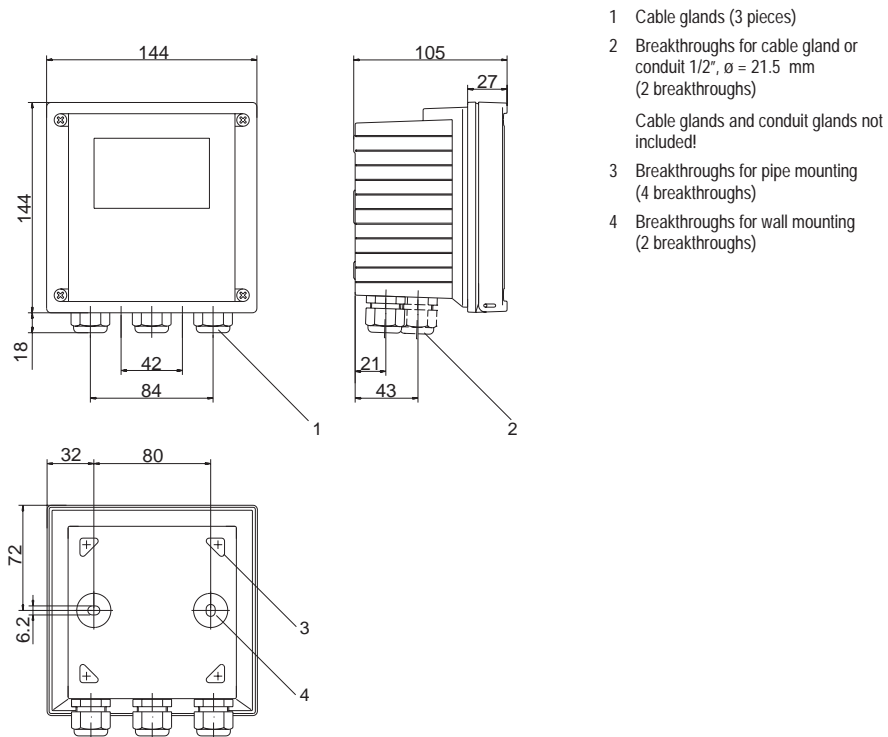
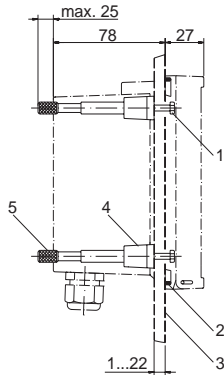
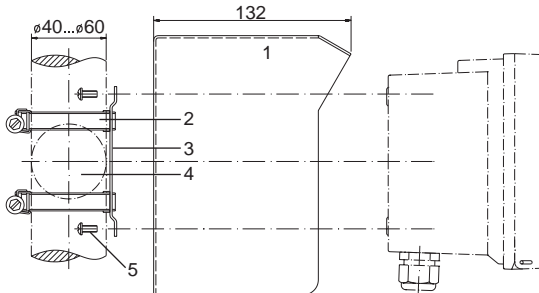


Fig. 5.2 Mounting plan



- 1 Screws (4 pieces)
- 2 Gasket (1 piece)
- 3 Panel
- 4 Span pieces (4 pieces)
- 5 Threaded sleeves (4 pieces)

Fig. 5.3 ZU 0275 panel-mount kit, panel cutout 138 x 138 mm (DIN 43700)



- 1 ZU 0276 protective hood (if required)
- 2 Hose clamps with worm gear drive to DIN 3017 (2 pieces)
- 3 Pipe-mount plate (1 piece)
- 4 For vertical or horizontal posts or pipes
- 5 Self-tapping screws (4 pieces)

Fig. 5.4 ZU 0274 pipe-mount kit

1 Protective hood

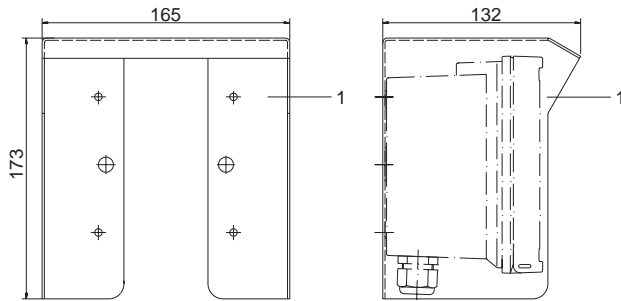


Fig. 5.5 ZU 0276 protective hood for wall and pipe mounting

6 Installation and connection

6.1 Information on installation



Installation may only be carried out by trained experts in accordance with this instruction manual and as per applicable local and national codes.



Be sure to observe the technical specifications and input ratings.



According to the PTB FISCO model, the limits of the permissible parameter range must be observed for connection in a hazardous location.

See PROFIBUS Technical Guidelines PNO Order No.: 2.091



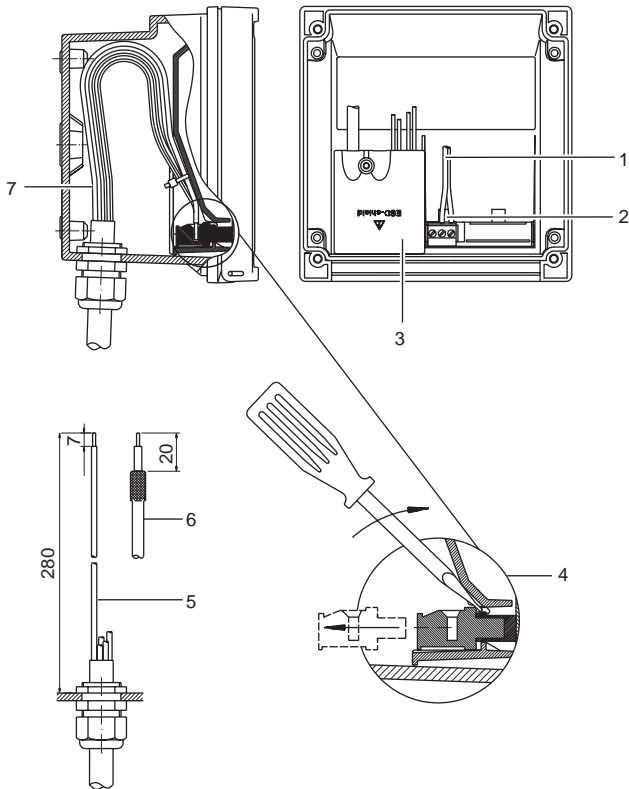
Be sure not to notch the conductor when stripping the insulation.

For easier installation, the terminal strips are of a plug-in design. The terminals are suitable for single wires and flexible leads up to 2.5 mm² (AWG 14).

A special twisted and shielded two-wire cable (e.g. Siemens) is used as bus cable.

Division 2 wiring

The connections to the Transmitter must be installed in accordance with the National Electric Code (ANSI-NFPA 70) Division 2 hazardous (classified) location non-incendive wiring techniques.



- 1 Connection leads PROFIBUS-PA
- 2 Area for placing the screwdriver to pull out the terminals
- 3 Cover for electrode and temperature probe terminals
- 4 Pulling out the terminal blocks using a screwdriver
- 5 Recommended stripping lengths for multi-core cables
- 6 Recommended stripping lengths for coaxial cables
- 7 Cable laying in the Transmitter

Fig. 6.1 Information on installation

6.2 Terminal assignments

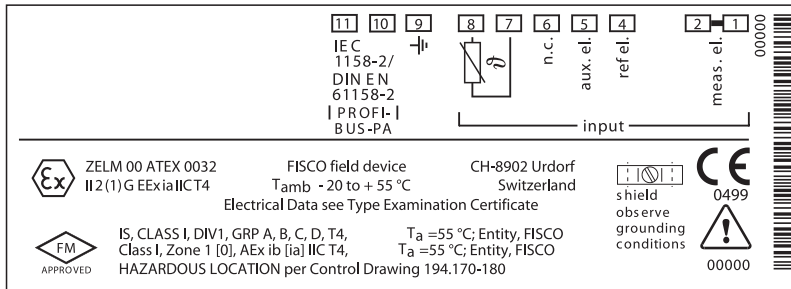
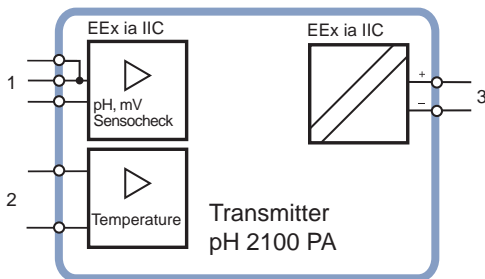


Fig. 6.2 Terminal assignments of the Transmitter

6.3 Overview of the Transmitter pH 2100 PA



- 1 Inputs for glass and reference electrode
- 2 Input for temperature probe
- 3 PROFIBUS-PA

Fig. 6.3 Inputs and outputs

6.4 pH measurement

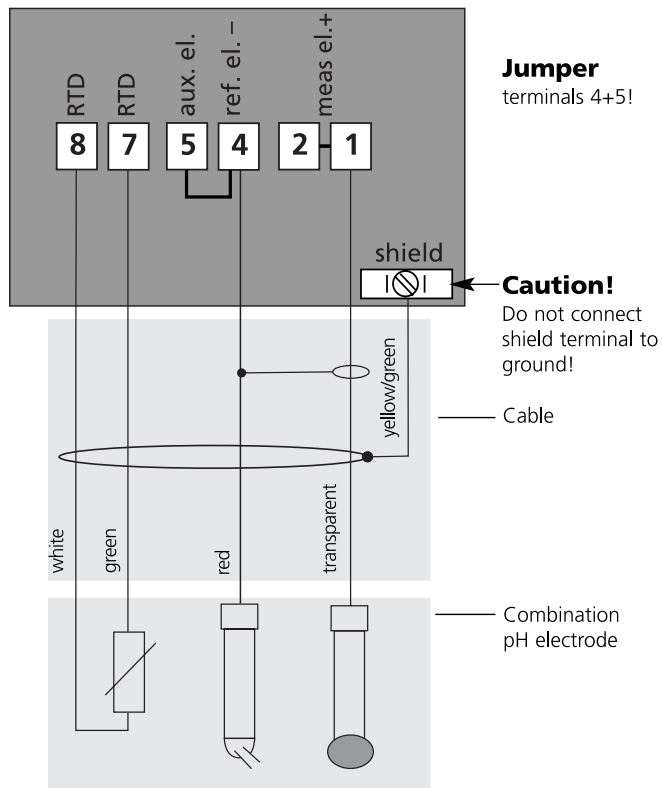


Fig. 6.4 pH measurement with monitoring of glass, VP connection

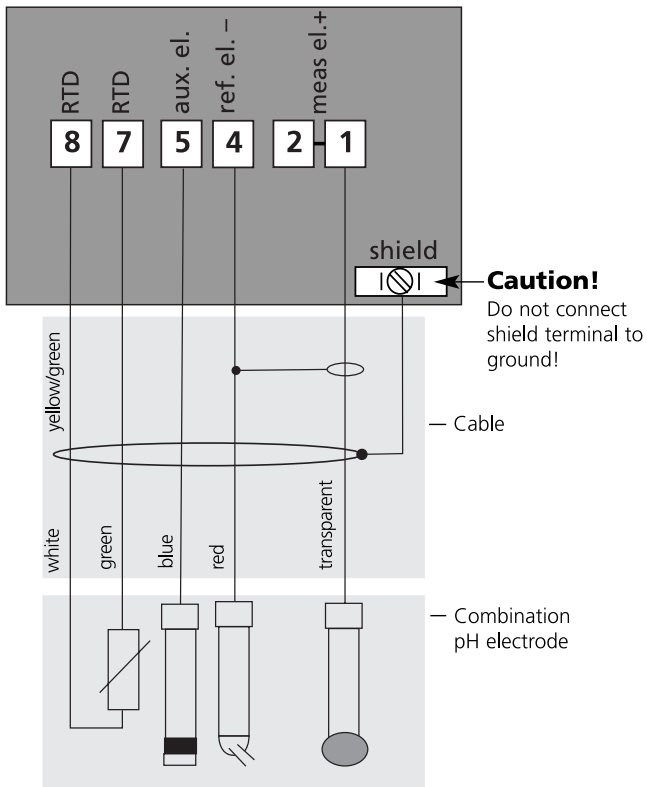


Fig. 6.5 pH measurement with monitoring glass and reference electrode, VP connection

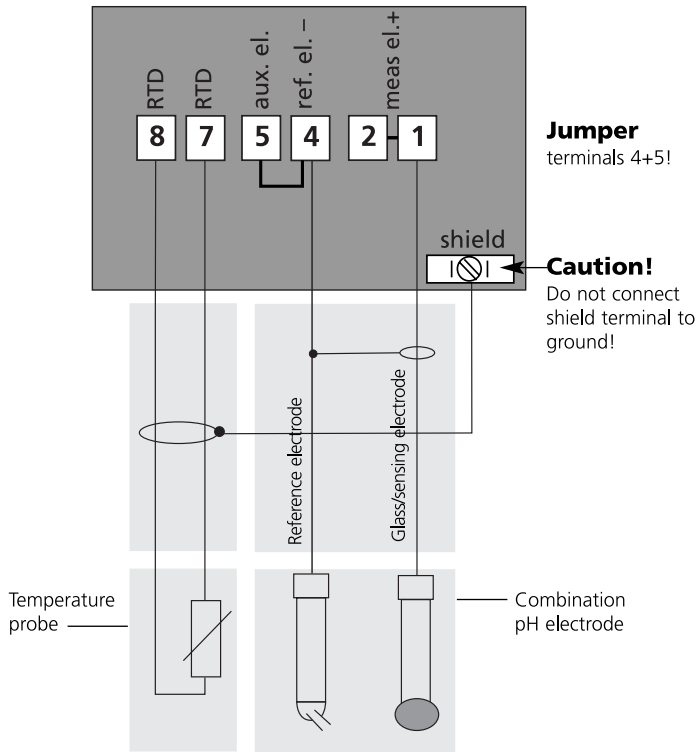


Fig. 6.6 pH measurement with monitoring of glass electrode

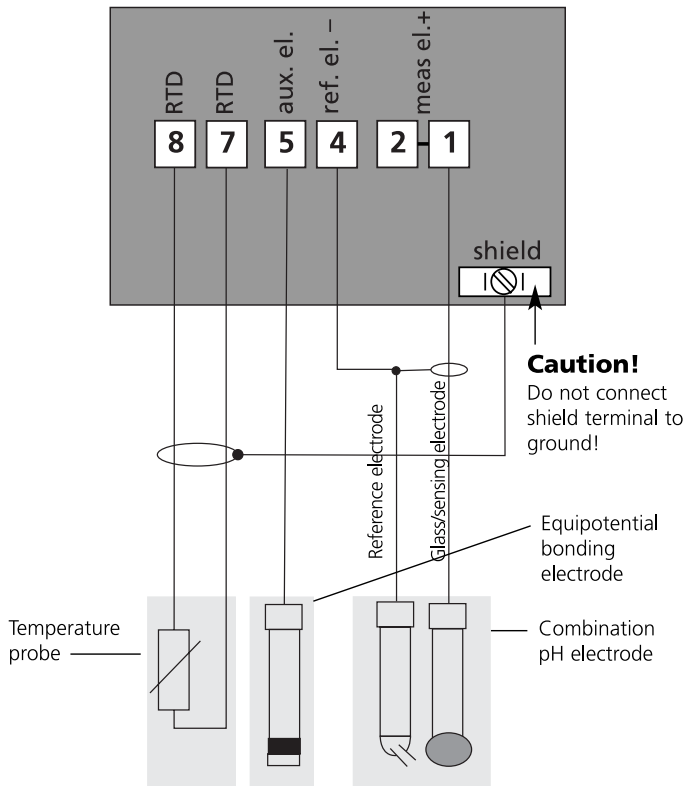


Fig. 6.7 pH measurement with monitoring of glass and reference electrode

6.5 ORP measurement

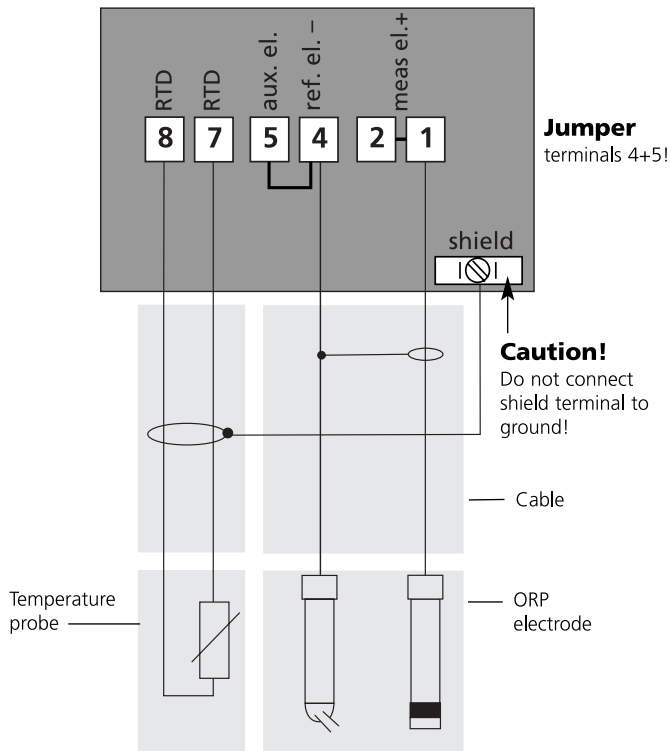


Fig. 6.8 ORP measurement without monitoring of reference electrode

7 Commissioning

7.1 Checklist



Commissioning may only be carried out by trained experts.



Before commissioning the Transmitter pH 2100 PA, the following requirements must be met:

- The device must not show any damage.
- When recommissioning the device after a repair, a professional routine test in accordance with EN 61010-1 must be performed.
- It must be proved that the intrinsic safety is maintained when connecting the device to other equipment.
- It must be ensured that the device is configured in accordance with the connected peripherals.
- All connected voltage and current sources must correspond to the technical data of the device.
- The device must only be connected to explosion-proof segment couplers, power supplies, ...

8 Operation

8.1 Operation possibilities

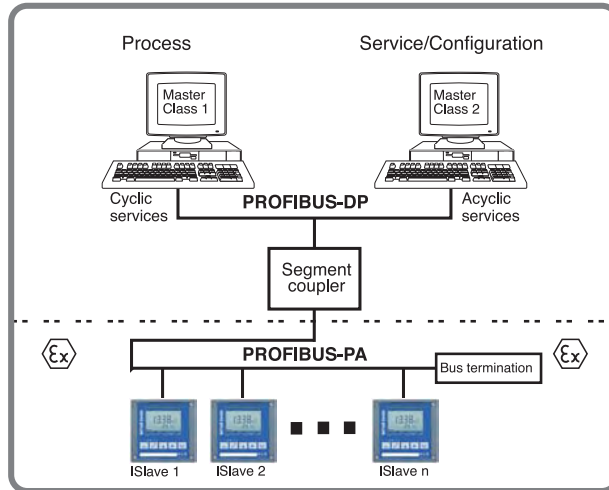
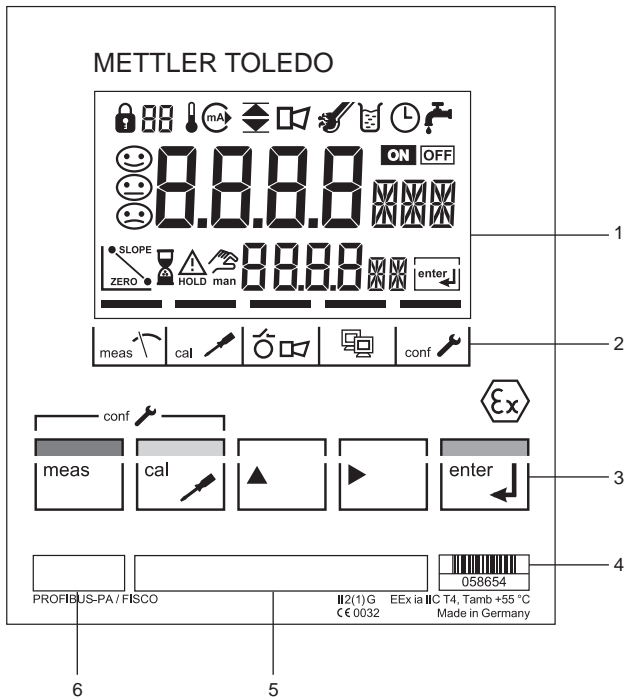


Fig. 8.1 System configuration

The Transmitter can be operated as follows:

- using the keypad on the Transmitter
- using an operating tool in the service station

8.2 Operation using keypad on the Transmitter



- 1 Display
- 2 Mode indicators (no keys)
 - Measuring mode
 - Calibration mode
 - Alarm
 - PROFIBUS-PA communication
 - Configuration mode
- 3 Keypad
- 4 Coding
- 5 Model designation
- 6 Rating plate

Fig. 8.2 Front view of the Transmitter pH 2100 PA

Display

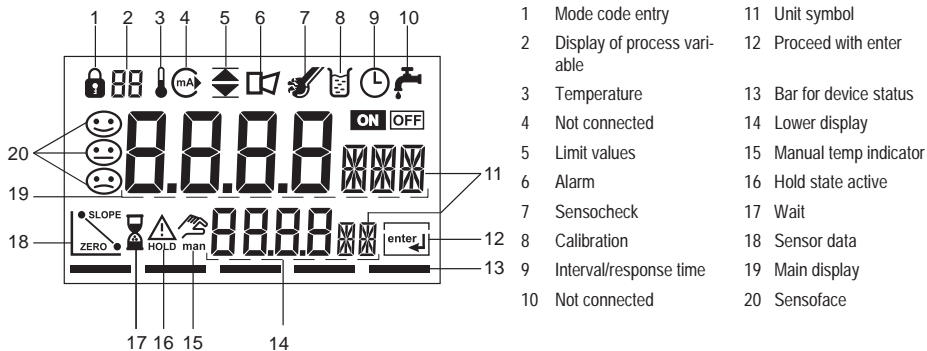


Fig. 8.3 Transmitter display

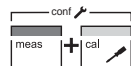
Keypad functions



Measurement



Calibration



Configuration



Select digit position
 Selected position flashes



Change digit



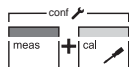
Prompt in display:
 Continue in program sequence
 Configuration: Confirm entries, next configuration step



Further key combinations are explained in the respective function descriptions.

8.3 Mode code

After pressing meas and/or cal you can enter one of the following mode codes to access the designated mode:



conf, 0000 Error Info
conf, 1200 Configuration mode



cal, 0000 Cal Info
cal, 1015 Adjusting temp probe
cal, 1100 Calibration mode
cal, 2222 Display of electrode potential

8.4 Safety functions

Sensocheck, Sensoface electrode monitoring

Sensocheck continuously monitors the glass and reference electrodes.



Sensoface provides information on the electrode condition.

The asymmetry potential (zero), slope and response time during calibration are evaluated.

The three Sensoface indicators provide the user with information about wear and required maintenance of the electrode.

GainCheck manual device self-test

A display test is carried out, the software version is displayed and the memory and measured value transfer are checked.



Start GainCheck
manual device self-test

Automatic device self-test

The automatic device self-test checks the memory and measured-value transfer. It runs automatically in the background at fixed intervals.

Hold state

The Hold state is a safety state that is activated in the case of interventions such as configuration and calibration. The Transmitter freezes the last valid measured value and sends a status message to the control system.



This symbol indicates that the Transmitter is in the "Hold" state.

The Hold state is activated by the following mode codes:

- Calibration
 - Mode code 1015 = Temp probe adjustment
 - Mode code 1100 = Calibration mode
 - Mode code 2222 = Display of electrode potential
- Configuration
 - Mode code 1200 = Configuration mode

The measured value and Hold are displayed alternately.



- Check whether the measured value is plausible
- End the Hold state

After 20 sec (for measured value stabilization) the Transmitter returns to measuring mode.

8.5 Mode indicators

Measuring mode



The Transmitter is in measuring mode.

Calibration mode



Calibration mode is active.

Alarm



During an error message the red alarm LED beneath the display flashes.

The alarm response time is permanently set to 10 sec.

PROFIBUS-PA communication



The Transmitter communicates via PROFIBUS-PA and can be configured from the service station. Measured values, messages and device identification can be downloaded at any time. This allows integration in fully automatic process cycles.

Configuration mode

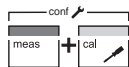


The Transmitter is in configuration mode.

8.6 Configuration

In the configuration mode the device parameters are set.

The following steps must be executed:



- Activate configuration



- Enter mode code "1200"



- Confirm



Welcome text 3 sec



During configuration the Transmitter remains in the Hold state for reasons of safety.



- Select or edit parameter



- Confirm entries

All configurable parameters are shown in the table "Configuration parameters" Pg. 30.



The configuration parameters are checked during the input.

Err

In the case of an incorrect input "Err" is displayed for approx. 3 sec. The incorrect parameters cannot be stored. Input must be repeated.



- End configuration

The measured value and Hold are displayed alternately.

















- End the Hold state / accept configuration or





- repeat configuration

Configuration parameters

Picto-graph	Display	Parameter	Selection/input	Comment	Factory setting
		Process variable	0.00...14.00 pH -1500...+1500 mV	The selected process variable is shown in the display. When it is changed, a complete configuration is required.	pH
		Temperature display/ Temperature detection	Auto °C Auto °F	Automatic detection during measurement and calibration (temp probe must be connected)	Auto °C
	 man		man °C man °F	Manual input during measurement and calibration	
	 man		°C Auto man °F Auto man	Automatic detection during measurement, manual input during calibration	
		Temperature probe	Pt 100 Pt 1000 NTC 30	Selection of temperature probe	PT 1000
			BUS EXT	External temp during measurement [°C] Manual input during calibration [°C]	
		Temperature probe	xxx.x °C xxx.x °F	Input of manual temperature	025.0 °C
 		Sensocheck	ON OFF	Sensor monitoring on/off	OFF

Picto-graph	Display	Parameter	Selection/input	Comment	Factory setting
	-01-BUF	Calibration mode:	Mettler-Toledo	Calibration mode: Automatic with Calimatic	BUF -01-
	-02-BUF	Buffer set selection	Merck Titrisols, Riedel Fixanals		
	-03-BUF		Ciba (94)		
	-04-BUF		NIST technical buffers		
	-05-BUF		NIST standard buffers		
	-06-BUF		HACH buffers		
	-07-BUF		Customer-specific buffer solutions		
	MAN			Calibration with manual buffer entry	
	DAT			Direct entry of zero and slope of premeasured electrodes	

Picto-graph	Display	Parameter	Selection/input	Comment	Factory setting
	0000 _h	Calibration timer	0000 to 9999 h	Entry of time interval within which the Transmitter is to be calibrated. With a time interval of 0000 hrs the calibration timer is not active.	0000 h
		PROFIBUS device address	0001 to 0126	Entry of PROFIBUS address of device. Be sure that the device is not communicating via PROFIBUS.	0126

Tab. 8.1: Configuration parameters

8.7 Calibration

Calibration procedures (configurable)

- Automatic calibration with Calimatic / temperature detection automatic or manual (See Page 33)
- Manual calibration / temperature detection automatic or manual (See Page 35)
- Data entry of premeasured electrodes (See Page 37)
- Adjustment of temperature probe (See Page 39)



Incorrectly set parameters may go unnoticed, but change the measuring properties.



The calibration is directly conducted on the Transmitter.
Calibration via PROFIBUS-PA is not provided.



The response times of the electrode and temperature probe are considerably reduced if the electrode is first moved about in the buffer solution and then held still.

Information on calibration

You can conduct either a one or a two-point calibration.

The calibration can be carried out with the Calimatic automatic buffer recognition, with manual buffer input or by entering premeasured electrode data.



All calibration procedures must be performed by trained personnel.



The Transmitter can only operate properly when the buffer solutions used correspond to the configured set.

Other buffer solutions, even those with the same nominal values, may demonstrate a different temperature behavior. This leads to measurement errors.

Automatic calibration with Calimatic (BUF -XX-) / temperature detection automatic or manual



The automatic calibration mode and the type of temperature detection must be preset in the configuration mode. See table 8.6 "Configuration" Pg. 29

The following steps must be executed:



- Activate calibration



- Enter mode code "1100"



- Confirm



Welcome text 3 sec



During calibration the Transmitter remains in the Hold state for reasons of safety.



- Remove the electrode and temperature probe, clean them and immerse them in the first buffer solution

It does not matter which buffer solution is taken first.



During calibration the Transmitter remains in the Hold state for reasons of safety.

Err

In the case of an incorrect input "Err" is displayed for approx. 3 sec. The incorrect parameters cannot be stored. Input must be repeated.



For keypad functions refer to Pg. 26.



- Enter calibration temperature



This step is omitted when automatic cal temp detection has been selected.



- Start calibration



While the hour glass flashes, the electrode and temperature probe remain in the first buffer solution.



Buffer recognition



The nominal buffer value is displayed.



Stability check:
The measured mV value is displayed.



- Abort stability check if desired



When the stability check is aborted, calibration accuracy will be compromised.



Calibration with the first buffer solution is completed.



For a one-point calibration, the procedure is ended at this point.



- End procedure for one-point calibration



For one-point calibration: The Transmitter now shows the old slope in the main display and the newly determined asymmetry potential of the electrode related to 25 °C in the lower display.



For a two-point calibration, you must proceed with the following steps.

- Remove the electrode and temp probe from the first buffer solution and rinse them thoroughly



- Immerse electrode and temperature probe in the second buffer solution



- Start calibration
The calibration process runs again as for the first buffer.



Calibration with the second buffer solution is completed.

The Transmitter shows the newly determined slope and the asymmetry potential of the electrode related to 25 °C.



After calibration (one- or two-point) is ended, the following steps must be executed:

- Remove the electrode and temperature probe from the buffer solution, rinse them thoroughly and reinstall them
- Check whether the measured value is plausible
- Repeat calibration if required
- End the Hold state



After 20 sec (for measured value stabilization) the Transmitter returns to measuring mode.

Manual calibration /
temperature detection automatic or manual

For calibration with manual buffer specification, you must enter the pH value of the buffer solution used in the Transmitter for the proper temperature.

This presetting enables calibration with any desired buffer solution.



The MAN calibration mode and the type of temperature detection must be preset in the configuration mode. See table 8.6 "Configuration" Pg. 29

The following steps must be executed:



- Activate calibration



- Enter mode code "1100"



- Confirm



Welcome text 3 sec



During calibration the Transmitter remains in the Hold state for reasons of safety.



- Enter calibration temperature and confirm



This step is omitted when automatic cal temp detection has been selected.



- Enter the pH value of your buffer solution for the proper temperature and confirm



- Start calibration



While the hour glass flashes, the electrode and temperature probe remain in the first buffer solution.



Stability check:
The measured mV value is displayed.



- Abort stability check if desired



When the stability check is aborted, calibration accuracy will be compromised.



Calibration with the first buffer solution is completed.



For a one-point calibration, the procedure is ended at this point.



- End procedure for one-point calibration



For one-point calibration: The Transmitter now shows the old slope in the main display and the newly determined asymmetry potential of the electrode related to 25 °C in the lower display.



For a two-point calibration, you must proceed with the following steps.

- Remove the electrode and temp probe from the first buffer solution and rinse them thoroughly.



- Immerse electrode and temperature probe in the second buffer solution



- Start calibration
The calibration process runs again as for the first buffer.



Calibration with the second buffer solution is completed.



The Transmitter shows the newly determined slope and the asymmetry potential of the electrode related to 25 °C.



After calibration (one- or two-point) is ended, the following steps must be executed:

- Remove the electrode and temperature probe from the buffer solution, rinse them thoroughly and reinstall them
- Check whether the measured value is plausible



- Repeat calibration if required



- End the Hold state

After 20 sec (for measured value stabilization) the Transmitter returns to measuring mode.

Data entry of premeasured electrodes

You can directly enter the values for slope and asymmetry potential (zero point) of an electrode.

The values must be known, e.g. determined beforehand in the laboratory.



The DAT calibration mode must be preset in the configuration mode. See table 8.6 "Configuration" Pg. 29

The following steps must be executed:



- Activate calibration



- Enter mode code "1100"



- Confirm



Welcome text 3 sec



- Enter asymmetry potential and confirm



- Enter slope and confirm



The Transmitter shows the new slope and the asymmetry potential of the electrode related to 25 °C.

- Check whether the measured value is plausible and repeat adjustment if required



- Repeat calibration if required



- End the Hold state

After 20 sec (for measured value stabilization) the Transmitter returns to measuring mode.

Convert slope [%] to slope [mV/pH] at 25 °C:

%	78	80	82	84	86	88	90	92	94	96	98	100	102
mV/pH	46.2	47.4	48.5	49.7	50.9	52.1	53.3	54.5	55.6	56.8	58.0	59.2	60.4

Tab. 8.2: Slope conversion table at 25 °C

Convert asymmetry potential to electrode zero point:



PROFIBUS-PA transmits the slope in mV/pH and the electrode zero point as pH value.

$$\text{ZERO} = 7 - \frac{V_{AS} \text{ [mV]}}{S \text{ [mV / pH]}}$$

ZERO	Electrode zero point
V _{AS}	Asymmetry potential
S	Slope

Fig. 8.4 Conversion formula for electrode zero point

Adjustment of temperature probe



Especially for Pt 100 temperature probes, it is advisable to perform an adjustment.

The following steps must be executed:



- Activate calibration



- Enter mode code "1015"



- Confirm



Welcome text 3 sec



- Measure the temperature of the process medium using an external thermometer
- Enter the determined temperature value in the main display



If you take over the temperature value shown in the lower display, the correction is without effect.



- Confirm the temperature value
- Check whether the measured value is plausible



- Repeat temperature adjustment if required



- End the Hold state

After 20 sec (for measured value stabilization) the Transmitter returns to measuring mode.

8.8 Operating tool

For parameter setting, commissioning and diagnostics of the Transmitter via PROFIBUS, we recommend operating tools such as SIMATIC-PDM Version 5 or higher.

The current device description is included.

8.9 Measurement

Measuring mode

In the measuring mode the main display shows the configured process variable and the lower display the temperature.



The Transmitter returns to measuring mode, also from configuration or calibration mode (after a relax time for measured-value stabilization, if required).

Cal Info

"Cal Info" shows the asymmetry potential and the slope.



- Select function



- Mode code



- Confirm

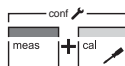
The current calibration data are displayed for approx. 20 sec.



- End "Cal Info"

Error Info

"Error Info" shows the most recent error message.



- Select function



- Mode code



- Confirm

The error message is displayed for approx. 20 sec. Afterwards, the message will be deleted.



- End "Error Info"

Manual temperature specification



This symbol indicates that the temperature is manually specified.

The measuring temperature is set in the configuration, the calibration temperature in the calibration.

9 Diagnostics

9.1 Sensoscheck, Sensoface

Sensoscheck continuously monitors the glass and reference electrodes.

Sensoscheck can be switched off.



Sensoface provides information on the electrode condition.



The asymmetry potential (zero), slope and response time during calibration are evaluated.



The three Sensoface indicators provide the user with information about wear and required maintenance of the electrode.



A friendly Smiley can only be displayed when Sensoscheck has been activated.



The basis for accurate Sensoface indication is proper calibration.



The worsening of a Sensoface criterion leads to the devaluation of the Sensoface indicator (average/poor).











An improvement of the Sensoface indicator can only take place after calibration or removal of an electrode defect.



The Sensoface status does not influence the measured value display.

Sensoface displays

Display	Problem	Status	
	Electrode response time		The electrode adjusts slowly to the measured value. <ul style="list-style-type: none"> • Clean the electrode • Soak it in buffer for several hours • Replace electrode if there is no improvement
			The electrode adjusts very slowly to the measured value. Correct measurement is no longer ensured. <ul style="list-style-type: none"> • Replace the electrode

Display	Problem	Status	
	Asymmetry potential (zero) and slope		Asymmetry potential (zero) and slope of the electrode are still okay, however cleaning is recommended.
			Asymmetry potential (zero) and/or slope of the electrode have reached values which no longer ensure proper calibration. <ul style="list-style-type: none"> Replace the electrode
	Calibration timer		Over 80 % of the calibration interval have already past.
			The calibration interval has been exceeded.
	Electrode defect		<ul style="list-style-type: none"> Check the electrode and its connections

Tab. 9.1: Sensoface display

9.2 PROFIBUS-PA limit monitoring

The Transmitter pH 2100 PA is equipped with two limit blocks that can be separately configured for temperature and/or the process variable.



When this symbol is displayed, limit block 2 is active.

Configuration is only performed via the bus.

The limit conditions are transmitted cyclically.

Hysteresis, effective direction, on and off delay can be configured.



Limit value setting and output of limit messages is via the PROFIBUS-PA.



When this symbol is displayed, limit block 1 is active.

9.3 Error messages

When one of the following error messages is displayed, the Transmitter can no longer determine the measured value correctly.

The alarm response time is permanently set to 10 sec.




During an error message the red alarm LED beneath the display flashes.



The error messages are sorted according to their priority. A higher-priority message overlays a lower-priority message.

Error No.	Display (flashing)	Problem	Possible causes
Err 01		pH electrode	<ul style="list-style-type: none"> - Electrode defective - Too little electrolyte in electrode - Electrode not connected - Break in electrode cable - Incorrect electrode connected - Measured pH value < 0 - Measured pH value > +14
Err 02		Redox electrode	<ul style="list-style-type: none"> - Electrode defective - Electrode not connected - Break in electrode cable - Incorrect electrode connected - Measured electrode voltage < -1500 V - Measured electrode voltage > +1500 V
Err 03		Temperature probe	<ul style="list-style-type: none"> - Wrong temperature probe connected - Wrong temperature probe configured - Open circuit in temperature probe - Short circuit in temperature probe - Measured temperature < -20 °C - Measured temperature > +150 °C (NTC 30 kΩ : +130 °C)
Err 33		Glass electrode	<ul style="list-style-type: none"> - Glass electrode defective - Connection cable or electrode cap defective - Connection terminals or electrode cap dirty




Error No.	Display (flashing)	Problem	Possible causes
Err 34		Reference electrode	<ul style="list-style-type: none"> - Reference electrode defective - Connection cable or electrode cap defective - Connection terminals or electrode cap dirty - Jumper between terminal 4 and 5 missing
Err 98	CONF	System error	<ul style="list-style-type: none"> - Memory error in device program (PROM defective) - Measured value transmission defective - Configuration or calibration data defective • Completely reconfigure and calibrate the Transmitter
Err 99	FAIL	Factory settings	<ul style="list-style-type: none"> - EEPROM or RAM defective - Error in factory settings <p>This error message normally should not occur as the data are protected from loss by multiple safety functions.</p> <ul style="list-style-type: none"> • Should it nevertheless occur, send in the Transmitter for repair


Tab. 9.2: Error messages

Calibration error messages











Calibration error messages only occur during calibration.












Display (flashing)	Problem	Possible causes
	Asymmetry potential (zero) out of range (± 60 mV)	<ul style="list-style-type: none"> - Electrode "worn out" - Buffer solution contaminated - Buffer does not belong to configured buffer set - Temperature probe not immersed in buffer solution (for automatic temperature compensation) - Wrong buffer temperature set (for manual temperature specification) - Electrode with nominal zero point \neq pH 7
	Electrode slope out of range (80-103 %)	<ul style="list-style-type: none"> - Electrode "worn out" - Buffer solution contaminated - Buffer does not belong to configured buffer set - Temperature probe not immersed in buffer solution (for automatic temperature compensation) - Wrong buffer temperature set (for manual temperature specification) - Electrode used has different nominal slope
	Problems during recognition of the buffer solution	<ul style="list-style-type: none"> - Same or similar buffer solution was used for both calibration steps - Buffer solution used does not belong to buffer set currently configured in the Transmitter - During manual calibration the buffer solutions were not used in the specified order - Buffer solutions contaminated - Wrong buffer temperature set (for manual temperature specification) - Electrode defective - Electrode not connected - Electrode cable defective

Display (flashing)	Problem	Possible causes
 The display shows the text "CAL ERR" in a large, blocky font. Above the text is a small warning symbol consisting of a circle with a diagonal slash through it.	Calibration was canceled after approx. 2 minutes, because the electrode drift was too large.	<ul style="list-style-type: none">- Electrode defective- Electrode dirty- No electrolyte in the electrode- Electrode cable insufficiently shielded or defective- Strong electric fields influence the measurement- Major temperature fluctuation of the buffer solution- No buffer solution or extremely diluted

Tab. 9.3: Calibration error messages

9.4 Display messages and PROFIBUS communication

User interface / display of device				Cause	Communication via PROFIBUS				
Display pictograph	Display message	Sensoface	LED	For comments see Pg. 44 through Pg. 47	No. of binary message (logbook)	Analog input status	Physical Block (PB) Global status	Text of binary message (factory setting)	Logbook entry (factory setting)
	Err 99		X	Error in factory settings	1	0001 11xx	Failure	ERR SYSTEM	X
	Err 98		X	Error in configuration data, Gaincheck	2	0001 11xx	Failure	ERR PARAMETERS	X
	Err 98		X	Memory error (RAM, ROM, EPROM)	3	0001 11xx	Failure	ERR MEMORY	X
	Err 01		X	pH range violation (pH electrode)	4	0100 0111	Failure	ERR PH VALUE	X
	Err 02		X	mV range violation (redox electrode)	5	0100 0111	Failure	ERR MV VALUE	X
	Err 03		X	Temp range violation	6	0100 0111	Failure	ERR TEMP VALUE	X
	Err 33		X	Sensocheck Glass electrode	7	0100 0111	Failure	CHK GLASS EL.	X

User interface / display of device				Cause	Communication via PROFIBUS					
Display pictograph	Display message	Sensoface	LED	For comments see Pg. 44 through Pg. 47	No. of binary message (logbook)	Analog Input status	Physical Block (PB) Global status	Text of binary message (factory setting)	Logbook entry (factory setting)	
	Err 34		X	Sensoscheck Reference electrode	8	0100 0111	Failure	CHK REF. EL.	X	
				Zero point/ slope	9	0101 00xx	Maintenance required	CHK ZERO/SLOPE.	X	
				Response time of electrode	10	0101 00xx	Maintenance required	CHK EL. RESPONSE.	X	
				Calibration timer Cal prompt	11	0101 00xx	Maintenance required	CAL REQUIRED	X	
				Calibration	12	0100 0111	Function check	CAL RUNNING	X	
				Configuration	13	0100 0111	Function check	CONF RUNNING	X	
				HOLD	14	0100 0111	Function check	HOLD	X	
				HI_HI_LIM FB analysis mV/mV	15	1000 1110	Limit 1 Bit 1	HI_HI_LIMIT PH		

User interface / display of device				Cause	Communication via PROFIBUS				
Display pictograph	Display message	Sensoface	LED	For comments see Pg. 44 through Pg. 47	No. of binary message (logbook)	Analog Input status	Physical Block (PB) Global status	Text of binary message (factory setting)	Logbook entry (factory setting)
				HI_LIM FB analysis mV/mV	16	1000 1010	Limit 1 Bit 2	HI_LIMIT PH	
				LO_LIM FB analysis mV/mV	17	1000 1001	Limit 1 Bit 3	LO_LIMIT PH	
				LO_LO_LIM FB analysis mV/mV	18	1000 1101	Limit 1 Bit 4	LO_LO_LIMIT PH	
				HI_HI_LIM FB temperature	19	1000 1110	Limit 2 Bit 1	HI_HI_LIMIT TEMP	
				HI_LIM FB temperature	20	1000 1010	Limit 2 Bit 2	HI_LIMIT TEMP	
				LO_LIM FB temperature	21	1000 1001	Limit 2 Bit 3	LO_LIMIT TEMP	
				LO_LO_LIM FB temperature	22	1000 1101	Limit 2 Bit 4	LO_LO_LIMIT TEMP	
				Logbook empty	23		Function Check	LOGBOOK EMPTY	

Tab. 9.4: Display messages and PROFIBUS communication

9.5 Diagnostics functions

Cal Info

"Cal Info" shows the asymmetry potential and the slope.



- Select function



- Mode code



- Confirm

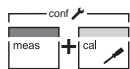
The current calibration data are displayed for approx. 20 sec.



- End "Cal Info"

Error Info

"Error Info" shows the most recent error message.



- Select function



- Mode code



- Confirm

The error message is displayed for approx. 20 sec.
Afterwards, the message will be deleted.



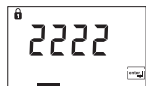
- End "Error Info"

Display of electrode potential

During electrode maintenance it is useful to directly indicate the electrode potential. This allows, for example, to check electrode response after cleaning.



- Select function



- Enter mode code "2222"



- Confirm

The electrode potential is displayed.



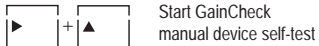
- End display mode



During electrode potential display the Transmitter is in the Hold state.

GainCheck manual device self-test

A display test is carried out, the software version is displayed and the memory and measured value transfer are checked.



Automatic device self-test

The automatic device self-test checks the memory and measured-value transfer. It runs automatically in the background at fixed intervals.

10 Maintenance and cleaning

10.1 Maintenance

The Transmitter contains no user repairable components.

10.2 Cleaning

To remove dust, dirt and spots, the external surfaces of the Transmitter may be wiped with a soft cloth moistened with water.

A mild household cleaner may also be used if necessary.

11 Appendix

11.1 Product line

Devices

Model designation	Ref. No.
Transmitter pH 2100 PA for applications in hazardous and safe areas	52 121 042

Mounting accessories

Accessories	Ref. No.
ZU 0274 pipe-mount kit	52 120 741
ZU 0275 panel-mount kit	52 120 740
ZU 0276 protective hood	52 120 739

11.2 Specifications

General specifications

Manufacturer / ID	Mettler-Toledo GmbH / METT
Model designation / ID	Transmitter pH 2100 PA / 7533

Applications

pH/mV, ORP and temperature measurement
--

input

Process variable	pH or mV (ORP)	Ranges	pH value	0.00 to +14.00
			mV value	-1500 mV to +1500 mV
		Glass electrode input	Input resistance	$>0.5 \times 10^{12} \Omega$
			Input current (20°C) ^b	$<2 \times 10^{-12} \text{ A}$
		Reference electrode input	Input resistance	$>1 \times 10^{10} \Omega$
			Input current (20°C) ^b	$<1 \times 10^{-10} \text{ A}$
	Max. cable length	Glass electrode	20 m	
	Temperature	Temperature sensor ^a	Pt100 / Pt1000 / NTC 30 kΩ	
		Ranges	Pt100 / Pt1000	-20.0 to +150.0 °C / -4 to +302 °F
			NTC 30 kΩ	-20.0 to +130.0 °C / -4 to +266 °F
		Resolution	0.1 °C / 1 °F	
		Temperature compensation ^a	Automatic	Pt100 / Pt1000 / NTC 30 kΩ
	Manual input			

a) Configurable

b) Doubles every 10 K

Accuracy (± 1 count)

pH value	< 0.02	TC: $<0.002 \text{ pH/K}$
mV value	$< 1 \text{ mV}$	TC: $<0.1 \text{ mV/K}$
Temperature	0.5 K (with Pt100 $< 1 \text{ K}$, with NTC $> 100 \text{ °C} < 1 \text{ K}$)	

Monitoring function

Electrode	Sensocheck (can be disabled)	Monitoring of glass and reference electrode
mV value		Determination of alarm limits during calibration

Electrode standardization

Operating modes ^a	Calimatic automatic calibration with buffer sets	-01- Mettler-Toledo	2.00 / 4.01 / 7.00 / 9.21
		-02- Merck-Titrisols, Riedel Fixanals	2.00 / 4.00 / 7.00 / 9.00 / 12.00
		-03- Ciba (94)	2.06 / 4.00 / 7.00 / 10.00
		-04- NIST technical buffers	1.68 / 4.00 / 7.00 / 10.01 / 12.46
		-05- NIST standard buffers	4.006 / 6.865 / 9.180
		-06- HACH buffers	4.00 / 7.00 / 10.18
		-07- Customer-specific buffers	2.00 / 4.01 / 7.00 / 10.00
			MAN calibration with manual buffer entry
	DAT data entry of premeasured electrodes		
Calibration timer ^a	Adjustment range	0 to 9999 h	
Calibration ranges	Asymmetry potential	±60 mV	
	Slope	80 to 103 %	
	Out-of-range conditions	Sensoface display message	

a) Configurable

Conditions for use

Temperature	Operation	-20 to +55 °C	
Electromagnetic compatibility	RFI suppression	EN 50 081-2	
	Immunity to interference	EN 50 082-1, EN 50 082-2	
Ingress protection	Enclosure	IP65	
Explosion protection	ATEX	II 2(1) G EEx ia IIC T4, FISCO	
	FM	IS, Class I Div1, Group A, B, C, D T4 FISCO I / 1[0] / AEx ib [ia] / IIC / T4 FISCO NI, Class I Div2, Group A, B, C, D T4 NIFW	
Data retention	Parameters and calibration data	> 10 years	EEPROM

Construction

Dimensions	Height	144 mm	
	Width	144 mm	
	Depth	105 mm	
Weight	Approx. 1 kg		
Material	PBT (polybutylene terephthalate)		
Color	Bluish gray	RAL 7031	
Assembly	Wall mounting		
	Post/pipe mounting	on pipe with 40 to 60 mm diameter, on square post with 30 to 45 mm edge length	
	Panel mounting	Cutout to DIN 43 700 Sealed against panel	
Electrical connection	Cable glands	3 breakthroughs	for included cable glands
		2 breakthroughs	for NPT 1/2" or Rigid Metallic Conduit or cable glands

Display and user interface

Display	LC display, 7-segment	Measured value display	pH / mV value, temperature
		3 Sensoface states	Good / average / poor
		5 mode indicators	meas / cal / alarm / online / conf
	Alarm LED	Error message	
Operation	5 keys	meas / cal / up / right / enter	
Operating tool	Device description implemented in SIMATIC PDM		

Remote interface

PROFIBUS-PA communication	Digital communication by current modulation of supply current Reading of device identification, measured values, status and message Reading and writing of parameter and configuration data	
	Protocol	PROFIBUS-PA (DPV 1)
	Connection	via segment coupler or link to SPC, PC, PCS
	Profile	PNO directive: PROFIBUS-PA, Profile for Process Control Devices, Version 3.0
	Physical interface	to IEC 1158-2
	Address range	1 to 126, factory setting: 126
	Supply voltage	FISCO bus supply: 9 to 17.5 V Linear barrier: (9 to 24 V)
	Current consumption	< 12.7 mA
	Max. current in case of fault (FDE)	< 21.4 mA

11.3 ATEX EC-Type-Examination Certificate



Prüf- und Zertifizierungsstelle

ZELM Ex



(1) **EC-TYPE-EXAMINATION CERTIFICATE**
(Translation)

- (2) Equipment and Protective Systems intended for Use in Potentially Explosive Atmospheres - Directive 94/9/EC
(3) EC-TYPE-EXAMINATION CERTIFICATE Number:

ZELM 00 ATEX 0032

- (4) Equipment: **pH Transmitter Type pH 2100 PA**
(5) Manufacturer: **Mettler Toledo GmbH**
(6) Address: **CH - 8902 Urdorf**
(7) This equipment and any acceptable variation thereto are specified in the schedule to this certificate and the documents therein referred to.
(8) The Prüf- und Zertifizierungsstelle ZELM Ex, notified body No. 0820 in accordance with Article 9 of the Council Directive 94/9/EC of 23 March 1994, certifies that this equipment has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres, given in Annex II to the Directive.
The examination and test results are recorded in the confidential report ZELM Ex 0110019039.
(9) Compliance with the Essential Health and Safety Requirements has been assured by compliance with:
EN 50 014: 1997 EN 50 020: 1994
(10) If the sign "X" is placed after the certificate number, it indicates that the equipment is subject to special conditions for safe use specified in the schedule to this certificate.
(11) This EC-type-examination Certificate relates only to the design and construction of the specified equipment in accordance with Directive 94/9/EC. Further requirements of this Directive apply to the manufacture and supply of this equipment.
(12) The marking of the equipment shall include the following:



II 2 (1) G EEx ia IIC T4

Zertifizierungsstelle ZELM Ex

Braunschweig, June 28, 2000

Dipl.-Ing. Harald Zelm



Sheet 1/4

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Prüf- und Zertifizierungsstelle

ZELM Ex



Schedule to EC-TYPE-EXAMINATION CERTIFICATE ZELM 00 ATEX 0032

	IIC	bzw.	IIB
max. permissible external inductance	3 mH	10	mH
max. permissible external capacitance	452 nF	1,47	μ F

(also valid if external inductance and external capacitance exist in concentrated form at the same time)

effective internal capacitance: $C_i \leq 30$ nF
The effective internal inductance is negligibly small.

Temperature measuring loop (terminals 7 and 8)	type of protection Intrinsic Safety resp.	EEx ia IIC/IIB EEx ib IIC/IIB
	maximum values:	$U_o = 5,9$ V $I_o = 3,1$ mA $P_o = 4,6$ mW (linear characteristic)

	IIC	bzw.	IIB
max. permissible external inductance	1000 mH	1000	mH
max. permissible external capacitance	43 μ F	1000	μ F

(only valid if external inductance and external capacitance do not exist in concentrated form at the same time)

	IIC	bzw.	IIB
max. permissible external inductance	5 mH	10	mH
max. permissible external capacitance	550 nF	1,75	μ F

(also valid if external inductance and external capacitance exist in concentrated form at the same time)

effective internal capacitance: $C_i \leq 250$ nF
The effective internal inductance is negligibly small.

DF-output (terminals 17, 18 and 19)	type of protection Intrinsic Safety resp.	EEx ia IIC/IIB EEx ib IIC/IIB
	maximum values:	$U_o = 11,8$ V $I_o = 32,8$ mA $P_o = 48,4$ mW (linear characteristic)

Sheet 3/4

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Prüf- und Zertifizierungsstelle

ZELM Ex



Schedule to EC-TYPE-EXAMINATION CERTIFICATE ZELM 00 ATEX 0032

	IC	bzw.	IIB
max. permissible external inductance	34 mH		130 mH
max. permissible external capacitance	1,47 µF		9,9 µF

(only valid if external inductance and external capacitance do not exist in concentrated form at the same time)

	IC	bzw.	IIB
max. permissible external inductance	2,8 mH		9 mH
max. permissible external capacitance	424 nF		1,47 µF

(also valid if external inductance and external capacitance exist in concentrated form at the same time)

effective internal capacitance: $C_i \leq 30$ nF
The effective internal inductance is negligibly small.

EP for the connection to the equipotential bonding system
(terminal 9 or terminal 16)

References:

Connecting the equipotential bonding is absolutely required to guarantee electrostatic leakage.

The BUS- / Supply loop is safely electrically isolated from the other loops up to a voltage of 80 V.

The operation manual has to be considered.

(16) Report No.

ZELM Ex 0110019039


(17) Special conditions for safe use

not applicable

(18) Essential Health and Safety Requirements

met by standards

Zertifizierungsstelle ZELM Ex


Dipl.-Ing. Harald Zelm








Braunschweig, June 28, 2000

Sheet 4/4

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11.4 Declaration of Conformity

		
		<small> Im Hockacker 15, Industrielle Nord, CH-8902 Urdorf, Schweiz Adresse: Im Hockacker 15, Industrielle Nord, CH-8902 Urdorf Briefadresse: Postfach, CH-8902 Urdorf Telefon: 01 736 22 11 Telefax: 01 735 26 26 www.mt.com Bank: Credit Suisse First Bank, Zürich (Kto. 0835-310001-21-92) </small>
		
We/Nir/Nous	Mettler-Toledo GmbH, Process Analytics	
	Im Hockacker 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	pH 2100 PA	
Beschreibung/Description	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 dem/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).	
Explosionsschutzrichtlinie	94/9/EG	
Explosion Protection / Protection contre les explosions	Prüf- und Zertifizierungsstelle ZELM ZELM 00 ATEX 0032 D-38124 Braunschweig, ZELM 0820	
EMC Directive/EMV-Richtlinie	89/336/EWG	
Directive concernant la CEM	SR 734.5, VEMV	
Low-voltage directive/Niederspannungs-Richtlinie/ Directive basse tension	73/23/EWG SR 734.26, NEV	
Norm/Standard/Standard	EN 50 014: 1997 EN 50 020: 1994 DIN EN 50 081-1 / VDE 0836 Teil 81-1: 1993-03 DIN EN 50 082-2 / VDE 0839 Teil 82-1: 1996-02 DIN EN 61326 / VDE 0843 Teil 20: 1998-01 DIN EN 61326 / A1 / VDE 0843 Teil 20 / A1: 1999-05 EN 60528 / 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	
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<small>Site de l'utilisateur: Mettler Toledo GmbH, en Langgasse, CH-8906 Grellingen</small>		

11.6 Buffer tables

°C	pH			
	2.03	4.01	7.12	9.52
0	2.03	4.01	7.12	9.52
5	2.02	4.01	7.09	9.45
10	2.01	4.00	7.06	9.38
15	2.00	4.00	7.04	9.32
20	2.00	4.00	7.02	9.26
25	2.00	4.01	7.00	9.21
30	1.99	4.01	6.99	9.16
35	1.99	4.02	6.98	9.11
40	1.98	4.03	6.97	9.06
45	1.98	4.04	6.97	9.03
50	1.98	4.06	6.97	8.99
55	1.98	4.08	6.98	8.96
60	1.98	4.10	6.98	8.93
65	1.99	4.13	6.99	8.90
70	1.99	4.16	7.00	8.88
75	2.00	4.19	7.02	8.85
80	2.00	4.22	7.04	8.83
85	2.00	4.26	7.06	8.81
90	2.00	4.30	7.09	8.79
95	2.00	4.35	7.12	8.77

Tab. 11.1: BUF -01- Knick / Mettler Toledo

°C	pH				
	2.01	4.05	7.13	9.24	12.58
0	2.01	4.05	7.13	9.24	12.58
5	2.01	4.04	7.07	9.16	12.41
10	2.01	4.02	7.05	9.11	12.26
15	2.00	4.01	7.02	9.05	12.10
20	2.00	4.00	7.00	9.00	12.00
25	2.00	4.01	6.98	8.95	11.88
30	2.00	4.01	6.98	8.91	11.72
35	2.00	4.01	6.96	8.88	11.67
40	2.00	4.01	6.95	8.85	11.54
45	2.00	4.01	6.95	8.82	11.44
50	2.00	4.00	6.95	8.79	11.33
55	2.00	4.00	6.95	8.76	11.19
60	2.00	4.00	6.96	8.73	11.04
65	2.00	4.00	6.96	8.72	10.97
70	2.01	4.00	6.96	8.70	10.90
75	2.01	4.00	6.96	8.68	10.80
80	2.01	4.00	6.97	8.66	10.70
85	2.01	4.00	6.98	8.65	10.59
90	2.01	4.00	7.00	8.64	10.48
95	2.01	4.00	7.02	8.64	10.37

Tab. 11.2: BUF -02- Merck Titrisols, Riedel Fixanats

°C	pH			
	2.04	4.00	7.10	10.30
0	2.04	4.00	7.10	10.30
5	2.09	4.02	7.08	10.21
10	2.07	4.00	7.05	10.14
15	2.08	4.00	7.02	10.06
20	2.09	4.01	6.98	9.99
25	2.08	4.02	6.98	9.95
30	2.06	4.00	6.96	9.89
35	2.06	4.01	6.95	9.85
40	2.07	4.02	6.94	9.81
45	2.06	4.03	6.93	9.77
50	2.06	4.04	6.93	9.73
55	2.05	4.05	6.91	9.68
60	2.08	4.10	6.93	9.66
65	2.07 ^a	4.10 ^a	6.92 ^a	9.61 ^a
70	2.07	4.11	6.92	9.57
75	2.04 ^a	4.13 ^a	6.92 ^a	9.54 ^a
80	2.02	4.15	6.93	9.52
85	2.03 ^a	4.17 ^a	6.95 ^a	9.47 ^a
90	2.04	4.20	6.97	9.43
95	2.05 ^a	4.22 ^a	6.99 ^a	9.38 ^a

a) Interpolated

Tab. 11.3: BUF -03- Ciba (94) (Nominal values: 2.06; 4.00; 7.00; 10.00)

°C	pH				
	1.67	4.00	7.12	10.32	13.42
0	1.67	4.00	7.12	10.32	13.42
5	1.67	4.00	7.09	10.25	13.21
10	1.67	4.00	7.06	10.18	13.01
15	1.67	4.00	7.04	10.12	12.80
20	1.68	4.00	7.02	10.06	12.64
25	1.68	4.00	7.00	10.01	12.46
30	1.68	4.02	6.99	9.97	12.30
35	1.69	4.03	6.98	9.93	12.13
40	1.69	4.03	6.98	9.89	11.99
45	1.70	4.05	6.98	9.86	11.84
50	1.71	4.06	6.97	9.83	11.71
55	1.72	4.08	6.97	9.83	11.57
60	1.72	4.09	6.97	9.83	11.45
65	1.73	4.10	6.98	9.83	11.45
70	1.74	4.13	6.99	9.83	11.45
75	1.75	4.14	7.01	9.83	11.45
80	1.77	4.16	7.03	9.83	11.45
85	1.78	4.18	7.05	9.83	11.45
90	1.79	4.21	7.08	9.83	11.45
95	1.81	4.23	7.11	9.83	11.45

Tab. 11.4: BUF -04- NIST technical buffers

°C	pH		
0	4.010	6.984	9.464
5	4.004	6.951	9.395
10	4.000	6.923	9.332
15	3.999	6.900	9.276
20	4.001	6.881	9.225
25	4.006	6.865	9.180
30	4.012	6.853	9.139
35	4.021	6.844	9.102
40	4.031	6.838	9.068
45	4.043	6.834	9.038
50	4.057	6.833	9.011
55	4.071	6.834	8.985
60	4.087	6.836	8.962
65	4.109	6.841	8.942
70	4.126	6.845	8.921
75	4.145	6.852	8.903
80	4.164	6.859	8.885
85	4.185	6.868	8.868
90	4.205	6.877	8.850
95	4.227	6.886	8.833

Tab. 11.5: BUF -05- NIST standard buffers

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

a) Values complemented (buffer values up to 60 °C as specified by Bergmann & Bewing Process AB)

Tab. 11.6: BUF -06- HACH buffers (Nominal values: 4.00; 7.00; 10.18)

°C	ST 1	ST 2	ST 3	ST 5
0	2.03	4.01	7.12	10.65
5	2.02	4.01	7.09	10.52
10	2.01	4.00	7.06	10.39
15	2.00	4.00	7.04	10.26
20	2.00	4.00	7.02	10.13
25	2.00	4.01	7.00	10.00
30	1.99	4.01	6.99	9.87
35	1.99	4.02	6.98	9.74
40	1.98	4.03	6.97	9.61
45	1.98	4.04	6.97	9.48
50	1.98	4.06	6.97	9.35
55	1.98	4.08	6.98	
60	1.98	4.10	6.98	
65	1.99	4.13	6.99	
70	2.00	4.16	7.00	
75	2.00	4.19	7.02	
80	2.00	4.22	7.04	
85	2.00	4.26	7.06	
90	2.00	4.30	7.09	
95	2.00	4.35	7.12	

Tab. 11.7: BUF -07- Customer-specific buffer solutions

11.7 Glossary

Asymmetry potential

The voltage which a pH electrode provides at a pH of 7. The asymmetry potential is different for each electrode and changes with age and wear.

Buffer set

Contains selected buffer solutions which can be used for automatic calibration with the Calimatic. The buffer set must be selected prior to the first calibration.

Buffer solution

Solution with an exactly defined pH value for calibrating a pH meter.

Calibration

Adjustment of the pH meter to the current electrode characteristics. The asymmetry potential and slope are adjusted. Either a one- or two-point calibration can be carried out. With one-point calibration only the asymmetry potential (zero point) is adjusted.

Calibration buffer set

See buffer set

Calimatic

Automatic buffer recognition. Before the first calibration, the buffer set used must be activated once. The patented Calimatic then automatically recognizes the buffer solutions used during calibration.

Combination electrode

Combination of glass and reference electrode in one body.

Electrode

A pH electrode system consists of a glass and a reference electrode. If they are combined in one body, they are referred to as combination electrode.

Electrode slope

See slope

Electrode zero point

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

FISCO Model (Fieldbus Intrinsically Safe Concept)

Permits connection of several devices to a common bus line and defines limit values for device and cable parameters.

This model developed by the German PTB assumes that only one "active" device, i.e. the bus supply is connected to the field bus. All other devices are "passive" with regard to the power supply into the bus.

Within the defined limits, the line characteristics have no influence on the intrinsic safety.

GainCheck

Device self-test which runs automatically in the background at fixed intervals. The memory and measured-value transmission are checked. You can also start the GainCheck manually. Then a display test is also conducted and the software version displayed.

GSD file (device database file)

Contains the communication parameters of slave devices. During commissioning it is loaded and installed in the process control system.

Limit values

The Transmitter pH 2100 PA provides two limit blocks which can be assigned to the process variables pH/mV or °C. The limit conditions are cyclically transmitted via PROFIBUS. Hysteresis, effective direction, on and off delay can be configured via the PROFIBUS.

Link

A link collects the transmission data from the segment couplers and sends them in blocks to the control system.

Mode code

Preset four-digit number to select certain modes.

One-point calibration

Calibration with which only the asymmetry potential (zero point) is taken into account. The previous slope value is retained. Only one buffer solution is required for a one-point calibration.

PROFIBUS-DP (decentralized peripherals)

Standardized specification (EN 50 170) of an open fieldbus system for binary and analog signals of sensors and actuators. It has been designed for high-speed data exchange at the device level.

PROFIBUS-PA (process automation)

Open fieldbus standard for process automation. It makes use of the transmission technology to IEC 1158-2 approved for operation in hazardous locations, which at the same time allows the field devices to be powered over the bus.

Response time

Time from the start of calibration to the stabilization of the electrode potential.

Sensocheck

Sensocheck continuously monitors the glass and reference electrodes.

Sensoface

Provides information on the electrode condition.

SIMATIC-PDM

Tool developed by Siemens for projecting, configuring, commissioning and diagnostic of smart process analyzers. The device description for the Transmitter pH 2100 PA is implemented in the SIMATIC-PDM.

Slope

Is indicated in % of the theoretical slope (59.2 mV/pH at 25 °C). The electrode slope is different for each electrode and changes with age and wear.

Two-point calibration

Calibration with which the electrode asymmetry potential (zero point) and slope are determined. Two buffer solutions are required for two-point calibration.

Zero point

See electrode zero point

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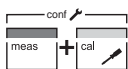
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Mode Codes



conf, 0000
conf, 1200

Error Info
Configuration mode



cal, 0000
cal, 1015
cal, 1100
cal, 2222

Cal Info
Temp probe adjustment
Calibration mode
Electrode potential

BR **Mettler-Toledo Ind. e Com. Ltda.,**
Alameda Araguaia, 451 - Alphaville
BR - 06455-000 Barueri / SP, Brazil
Phone +55 11 4166 74 00
Fax +55 11 4166 74 01

CH **Mettler-Toledo (Schweiz) AG,**
Im Langacher,
CH - 8606 Greifensee, Switzerland
Phone +41 44 944 45 45
Fax +41 44 944 45 10

D **Mettler-Toledo GmbH,** Prozeßanalytik,
Ockerweg 3,
D - 35396 Gießen, Germany
Phone +49 641 507-333
Fax +49 641 507-397

F **Mettler-Toledo Analyse Industrielle Sàrl,**
30 Bld. de Douaumont, BP 949,
F - 75829 Paris Cedex 17, France
Phone +33 1 47 37 06 00
Fax +33 1 47 37 46 26

USA **Mettler-Toledo Ingold, Inc.,**
36 Middlesex Turnpike,
USA - Bedford, MA 01730, USA
Phone +1 781 301-88 00
Fax +1 781 271-06 81



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Mettler-Toledo GmbH, Process Analytics
Industrie Nord, CH-8902 Urdorf, Switzerland
Phone + 41 44 736 22 11, Fax +41 44 736 26 36

www.mtpro.com