

Stratos® FF 2231 X pH

Instruction manual



Knick >

Warranty

Defects occurring within 3 years from delivery date shall be remedied free of charge at our plant (carriage and insurance paid by sender).

Sensors, fittings, and accessories: 1 year

Subject to change without notice.

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".

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Be sure to read and observe the following instructions!

The device has been manufactured using state of the art technology and it complies with applicable safety regulations. When operating the device, certain conditions may nevertheless lead to danger for the operator or damage to the device.

Caution!

Commissioning may only be carried out by trained experts. 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 stresses

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.

Caution!

Before commissioning it must be proved that the device may be connected with other equipment, such as coupling elements and cables.

Safety precautions for installation

- The stipulations of EN 60079-10 / EN 60079-14 must be observed during commissioning.
- The **Stratos FF 2231 X pH** is approved for installation in ATEX, FM Zone 1 with measurement in Zone 0, and FM Class I Div 1.

Connection to supply and coupling elements

- The **Stratos FF 2231 X pH** may only be connected to explosion-proof power supply and coupling elements (for input ratings refer to annex of Type Examination Certificate).

Before commissioning it must be proved that the intrinsic safety is maintained when connecting the device to other equipment, such as supply elements and cables.

Terminals:

suitable for single wires / flexible leads up to 2.5 mm² (AWG 14)

Cleaning in a hazardous location

In hazardous locations the device may only be cleaned with a damp cloth to prevent electrostatic discharge.

Intended use / Short description

The Stratos FF 2231 X pH is an analyzing device with digital communication via Foundation Fieldbus (FF). It is used for simultaneous pH/mV, ORP, and temperature measurement in biotechnology, chemical and pharmaceutical industry, as well as in the field of industry, environment, food processing and waste-water treatment.

3 measured values can be cyclically transmitted at the same time (pH, ORP, temperature, glass impedance, reference impedance, slope, asymmetry).

The bus address is automatically assigned by the control system, but can also be adjusted on the device. The rugged molded enclosure can be fixed into a control panel or mounted on a wall or at a post.

The protective hood provides additional protection against direct weather exposure and mechanical damage.

The device can be easily replaced and it accepts commercially available electrodes with a nominal zero point at pH 7 and ISFET electrodes.

- The **Stratos FF 2231 X pH** is an intrinsically safe equipment for operation in in the following locations:
ATEX, FM Zone 1 with measurement in Zone 0, and FM Class I Div 1.
Power is supplied (intrinsically safe) via the fieldbus.

Trademarks

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

Stratos®

GainCheck®

Sensoface®

Sensocheck®

Calimatic®

Durafet® is a registered trademark of Honeywell.

InPro® is a registered trademark of Mettler-Toledo.

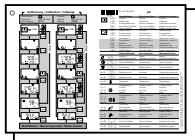
Provided documentation:



- **Instruction manual**



- **Safety instructions /
EC Declarations of Conformity**



- **Short instructions**

Devices only:



- **EC-Type Examination Certificate**

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 99 ATEX 0016

- (4) Equipment: **Transmitter Stratos PROFIBUS 2221X pH****
- (5) Manufacturer: **Knick Elektronische Meßgeräte GmbH & Co.**
- (6) Address: **Beuckestraße 22, D-14163 Berlin**
- (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 0069914024.
- (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, February 21, 2000

Dipl.-Ing. Harald Zelm



Sheet 1/4

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SCHEDULE

(13)

(14) **EC-TYPE-EXAMINATION CERTIFICATE ZELM 99 ATEX 0016**

(15) Description of equipment

The Transmitter Stratos *PROFIBUS* 2221X pH/** with Profibus – PA – communication interface is preferably used for the recognition and processing of electrochemical quantities and is equipped with an input for pH-measurements and a temperature measuring input.

The maximum permissible ambient temperature is 55 °C.

Electrical data

BUS- / Supply loop
(terminals 11/14 and 10/15)

type of protection Intrinsic Safety resp. EEx ia IIC/IIB
EEx ib IIC/IIB

only for the connection to a certified intrinsically safe circuit (for example FISCO – supply unit) with the following maximum values:

| | FISCO-supply unit | | linear barrier | |
|-------------------|-------------------|----|----------------|----|
| U _{omax} | 17,5 | V | 24 | V |
| I _{omax} | 280 | mA | 200 | mA |
| P _{omax} | 4,9 | W | 1,2 | W |

effective internal capacitance: Ci ≤ 1 nF

effective internal inductance: Li ≤ 10 μH

ph-measuring loop
(terminals 1/2, 4 and 5)

type of protection Intrinsic Safety resp. EEx ia IIC/IIB
EEx ib IIC/IIB

maximum values: U_o = 11,8 V
I_o = 12 mA
P_o = 18 mW
(linear characteristic)

| | IIC | bzw. | IIB | |
|---------------------------------------|------|------|-----|----|
| max. permissible external inductance | 240 | mH | 850 | 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)

Sheet 2/4

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SCHEDULE TO EC-TYPE-EXAMINATION CERTIFICATE ZELM 99 ATEX 0016

| | IIC | bzw. | IIB | |
|---------------------------------------|-----|------|------|----|
| max. permissible external inductance | 3 | mH | 10 | mH |
| max. permissible external capacitance | 452 | 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.

| | | |
|---|--|--|
| 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 | µF | 1000 | µF |

(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 | µF |

(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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SCHEDULE TO EC-TYPE-EXAMINATION CERTIFICATE ZELM 99 ATEX 0016

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

(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 | 2,8 | mH | 9 |
| max. permissible external capacitance | 424 | nF | 1,47 |

(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 electrostatical leakage.

The BUS- / Supply loop is safely electrically isolated from the other loops up to a voltage of 60 V.


The operation manual has to be considered.

- (16) Report No. ZELM Ex 0069914024
- (17) Special conditions for safe use
not applicable
- (18) Essential Health and Safety Requirements
met by standards

Zertifizierungsstelle ZELM Ex



Braunschweig, February 21, 2000


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EC-Type-Examination Certificate

1st supplement



Prüf- und Zertifizierungsstelle
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1. Supplement

(Supplement according to EC-Directive 94/9 Annex III letter 6)

to **EC-type-examination Certificate**

ZELM 99 ATEX 0016

Equipment: **Transmitter Stratos FF 2231 X pH**
Manufacturer: **Knick Elektronische Messgeräte GmbH & Co. KG**
Address: **D - 14163 Berlin, Beuckestraße 22**

Description of supplement

The Transmitter model Stratos PROFIBUS 2221 X pH was extended by the model Stratos FF 2231 X pH with Foundation Fieldbus communication interface.

The Transmitter Stratos FF 2231 X pH model differs from the previous model in some, not safety relevant parts added, changed or removed to the Transmitter. The protection concept of the equipment is not affected by these changes.

The type of protection, the electrical and all further data of the device remain unchanged.

The Foundation Fieldbus version of the Transmitter may be manufactured in future in consideration of this supplement.

References:

The Operating Instructions has to be considered.

Report No.: ZELM Ex 0350417282

Special conditions for safe use

not applicable

Essential Health and Safety Requirements


met by adherence to the standards

EN 50 014: 1997+A1+A2 EN 50 020: 1994

Zertifizierungsstelle **ZELM Ex**



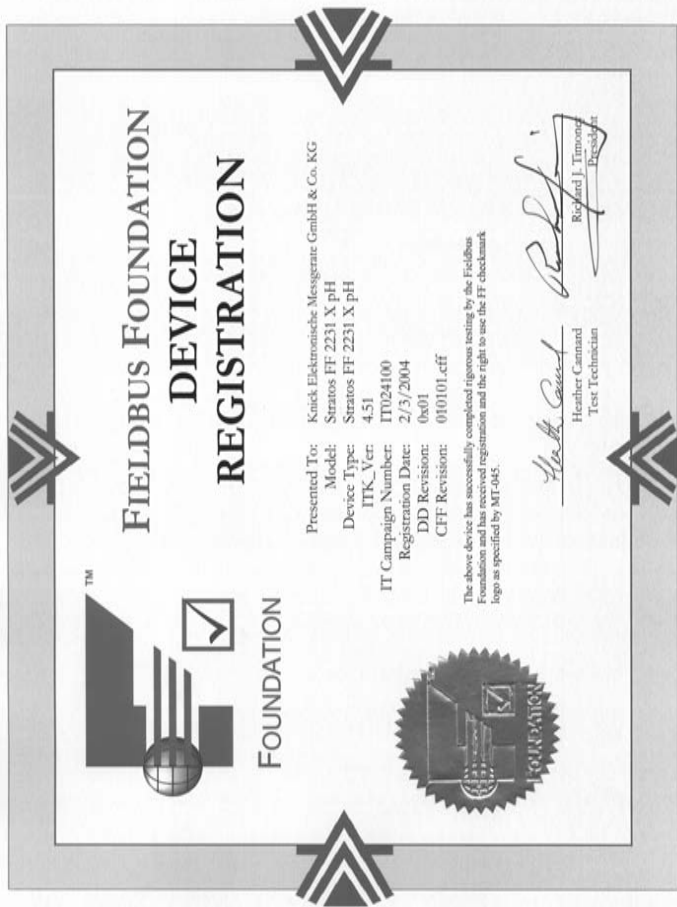
Braunschweig, August 09, 2004


Dipl.-Ing. Harald Zelm

Sheet 1 / 1

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Foundation Fieldbus (FF) technology

General

Foundation Fieldbus (FF) is a digital communication system that connects different field devices over a common cable and integrates them into a control system.

Its application range covers manufacturing, process, and building automation.

As fieldbus standard according to EN 61158-2 (IEC 1158-2) the Foundation Fieldbus ensures the communication of different devices over one bus line.

Basic properties

The “Data Link Layer” of the Fieldbus Foundation protocol defines 3 device types:

The **Active Link Master** plans all activities as “Link Active Scheduler” (LAS). It controls the complete data traffic on the bus. Several Link Masters on one bus increase safety, but only one is active at a time.

Basic devices are peripheral devices such as valves, drives, transmitters, or analyzers. They can react acyclically to servicing, configuration and diagnostic tasks of the master.

The Link Master cyclically reads the measurement data with status.

Bridges can connect a network from different bus systems.

Bus communication

Foundation Fieldbus (FF) permits cyclic and acyclic services:

Cyclic Services – Scheduled Communication:

are used to transmit measurement data with status information.

The Link Active Scheduler maintains a list of transmission times for all data in all devices that need to be cyclically transmitted. When it is time to transmit data, the LAS issues a "Compel Data (CD)" start signal to the respective device. Upon receipt of the "Compel Data" signal, the device broadcasts the data to all devices on the fieldbus.

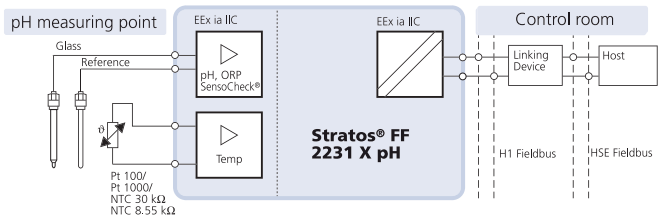
Acyclic Services – Unscheduled Communication:

are used for device configuration, remote maintenance, and diagnostics during operation.

All devices are given the chance to send acyclic (unscheduled) messages between transmissions of cyclic (scheduled) data. The LAS grants permission to a device to broadcast acyclic messages by issuing a "Pass Token (PT)" message. Upon receipt of the "Pass Token", the device starts data transmission.

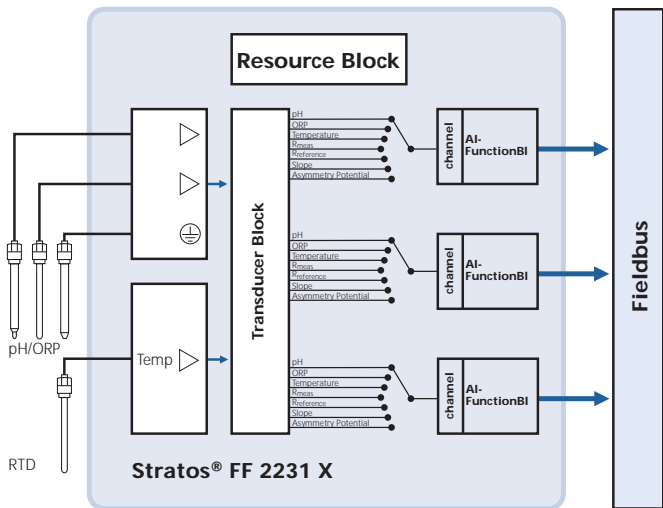
Technical features of the Stratos FF 2231X pH

Communication between the field devices and control room is effected by Foundation Fieldbus (FF). Data exchange is cyclic and acyclic.



Communication model

The device performance is described by function blocks according to the "Fieldbus Specification" for process control devices.



* R_{meas} = glass impedance

** $R_{\text{reference}}$ = reference impedance

Function blocks

All variables and parameters of the transmitter are assigned to blocks. The Stratos FF 2231 X pH is equipped with the following blocks:

Standard Resource Block (RB) describes the transmitter characteristics (manufacturer, device name, operating status, global status).

Standard Analog Input Block (AI)

Three Analog Input Function Blocks provide for cyclic transmission of measured values (currently measured value with status, alarm limits, freely selectable process variable).

Transducer Block (TB) with calibration possibility

provides for acyclic data transmission.

Calibration, configuration, and maintenance commands coming from the control station are processed in the Transducer Block.

The sensor signal is first preprocessed in the Transducer Block. From here, the measured value is sent to the Analog Input Blocks where it can be further processed (limit values, scaling).

Commissioning and configuration via Foundation Fieldbus

Commissioning on the Foundation Fieldbus

Only when the Stratos FF 2231 X pH is competently configured, can the Foundation Fieldbus communication function properly. Different configuration tools from different manufacturers are available (e.g. NI-FBUS Configurator / National Instruments). They can be used to configure the device and the Foundation Bus.

Note:

Be sure to observe the operating instructions and the menu guidance of the control system or the configuration tool during installation and configuration via the control system.

Installing the DD (Device Description):

During initial installation the device description (*.sym, *.ffo) must be installed in the control system (e.g. Delta V from Emerson Process). For network projecting, you require the CFF file (Common File Format).

These files can be obtained from:

- the included CD
- the www.knick.de website
- Foundation Fieldbus: www.fieldbus.org.

Identifying the transmitter

There are several possibilities to identify a FF transmitter in the network. The most important one is the “Device Identifier” or DEV_ID. It consists of the manufacturer ID, device type, and serial number XXXXXXXX.

The DEVICE_ID is: 00010208B7 V2_01__XXXXXXXX00

Manufacturer ID Knick MANUFAC_ID = 0x000102

Device type Stratos FF 2231 X pH:
 DEV_TYPE = 2231

Initial commissioning

1. Supply the device with power (see “Installation and wiring”, Pg 32).
2. Open the configuration program of the control system.
3. Load DD and CFF file.

After the first connection establishment, the device answers as follows:

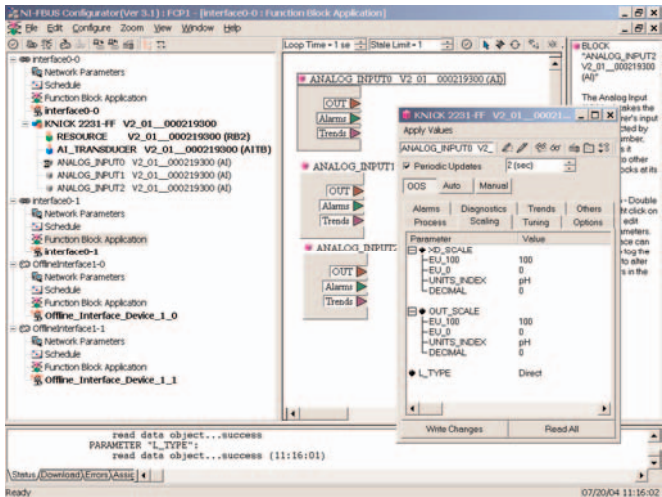
Knick 2231 FF V2_01__XXXXXXXX00- ID= 00010208B7 V2_01__XXXXXXXX00

4. Assign the desired name to the field device.
(PD_TAG)

Setting the Resource Block (RB) parameters

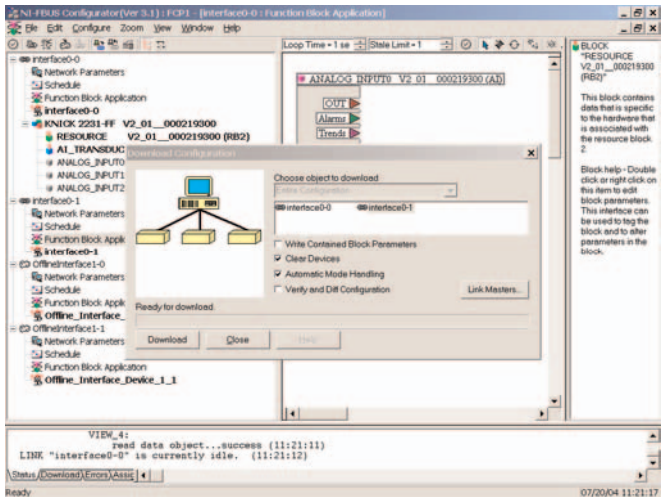
5. Make sure that the WRITE_LOCK parameter is set to “NOT LOCKED”.
6. Set the MODE_BLK. TARGET to Auto.

Setting the Analog Input Block (AI) parameters



7. Set MODE_BLK. TARGET to OOS (Out Of Service).
8. Select the desired process variable from the CHANNEL parameter. See table on Page 108.
9. Select the unit belonging to the process variable from the XD_SCALE parameter.
10. Select the unit belonging to the process variable from the OUT_SCALE parameter.
11. Set the LIN_TYPE linearization type to Direct
12. If these steps are not properly executed, the "Block Configuration Error" is generated when the block is set to "Auto".

System configuration

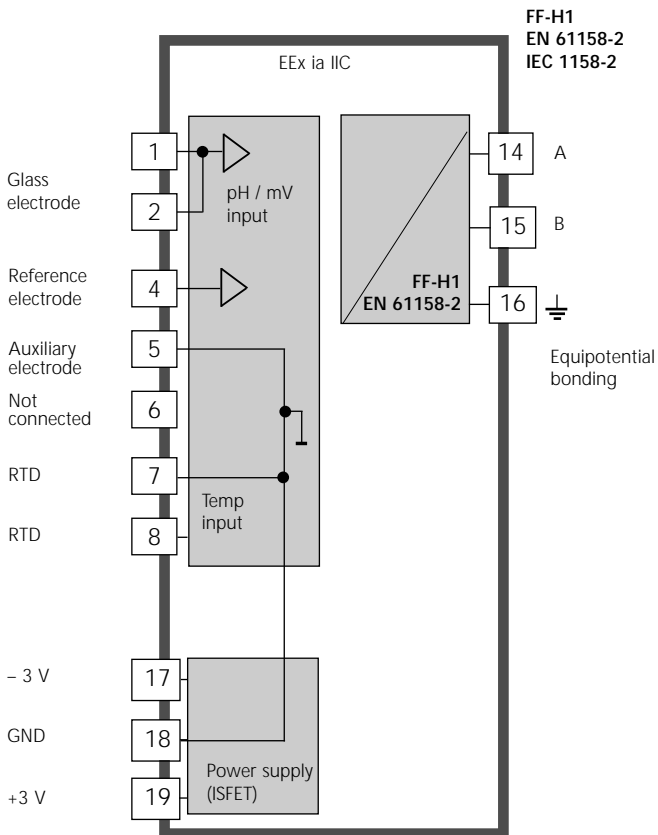


This step is mandatory since otherwise the target mode of the Analog Input Block cannot be set to "Auto".

Using the NI-FBUS Configurator from National Instruments, for example, you can graphically connect the function blocks and then load the system configuration in the device.

13. Download all data and parameters to the field device.
14. Set the target modes of all Analog Input Blocks to "Auto".

Overview of Stratos FF 2231X pH

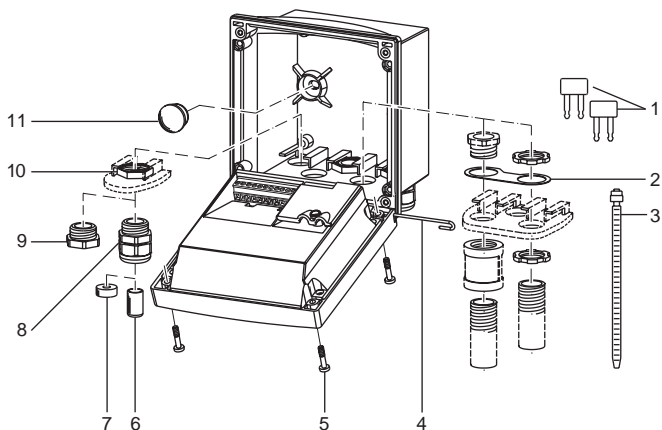


Assembly

Packing list

Check the shipment for transport damage and completeness.
The package should contain:

- Front unit of Stratos
- Lower case
- Bag containing small parts
- Description
- Instruction manual
- Specific test report
- CD with Device
 - * .sym, * .ffo
- Common File Format CFF-File



- | | | | |
|---|--|----|--|
| 1 | Jumper (2 piece) | 6 | Sealing inserts (1 piece) |
| 2 | Washer (1 piece), for conduit mounting: place washer between enclosure and nut | 7 | Rubber reducer (1 piece) |
| 3 | Cable ties (3 pieces) | 8 | Cable glands (3 pieces) |
| 4 | Hinge pin (1 piece), insertable from either side | 9 | Filler plugs (3 pieces) |
| 5 | Enclosure screws (4 pieces) | 10 | Hexagon nuts (5 pieces) |
| | | 11 | Sealing plugs (2 pieces): for sealing in case of wall mounting |

Fig.: Assembling the enclosure

Mounting plan

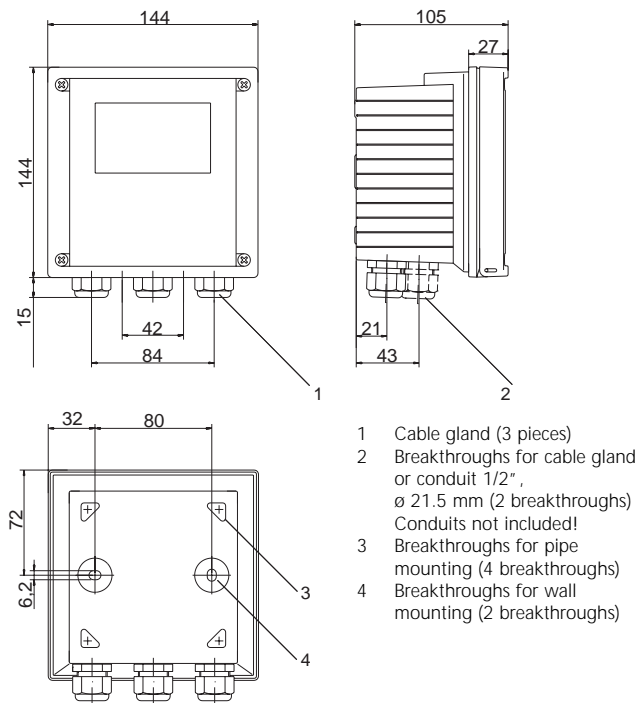
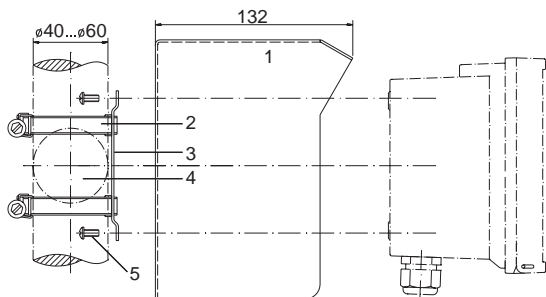


Fig.: Mounting plan

Pipe mounting, panel mounting



- 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.: ZU 0274 pipe-mount kit

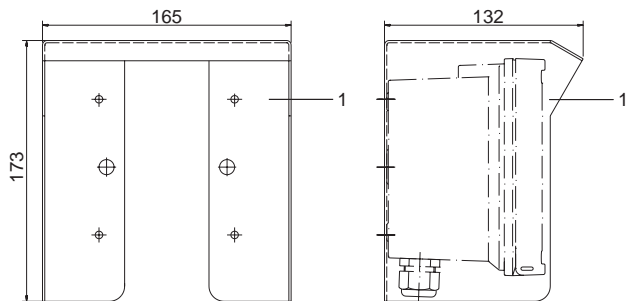
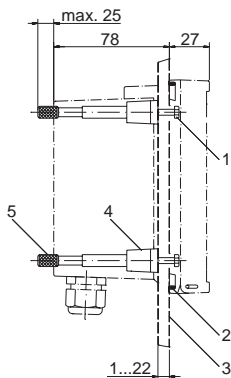


Fig.: ZU 0276 protective hood for wall and pipe mounting



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

Panel cutout 138 x 138 mm
(DIN 43700)

Fig.: ZU 0275 panel-mount kit

Installation and connection

- The **Stratos FF 2231 X pH** may only be connected to explosion-proof power supply and coupling elements (for input ratings refer to annex of Type Examination Certificate). Before commissioning it must be proved that the device may be connected to other equipment, such as supply elements and cables.
- 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 during installation.
- Be sure to observe the IEC 60079-27 "Fieldbus Intrinsically Safe Concept (FISCO)" and the "Fieldbus Non-Incendive Concept (FNICO)".
- Be sure not to notch the conductor when stripping the insulation.
- When commissioning, a complete configuration must be carried out by the system administrator.

For easy installation, the terminal strips are of a plug-in design.

Terminals: suitable for single wires / 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.



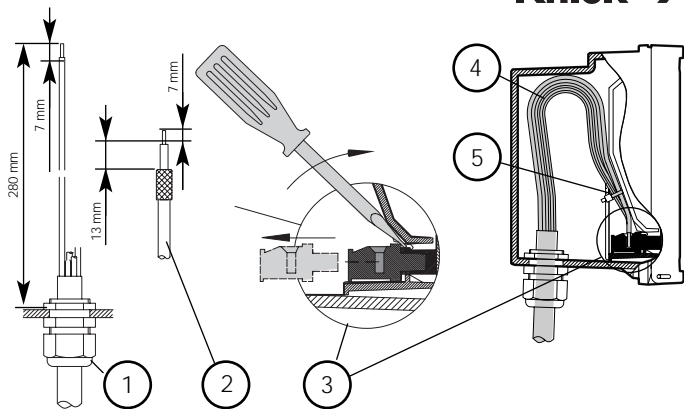
Division 2 wiring: Refer to page 128.

Control Drawing: Refer to page 138.

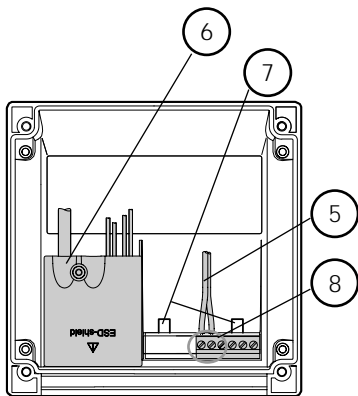
Terminal assignments

| | | | | | | | | | | | | | |
|-------------------|--|-------------|--|-----------|-----------------------------------|----------|------------------------------------|-----------|---------|---------------|----------------|---|-------|
| 19 + 3 V | 18 0 | 17 - 3 V | 16 IEC 1158-2 DIN EN 61158-2 | 15 | 14 | 8 RTD | 7 RTD | 6 n.c. | 5 SG | 4 ref. el. | 2 meas. el. | 1 | 00000 |
| L supply/ ISFET J | | | | L FF-H1 J | | input | | | | | | | |
| | ZELM 99 ATEX 0016 II 2 (1) G EEx ia IIC T4 | | FISCO field device Tamb - 20 to + 55 °C | | D-14163 Berlin Made in Germany | | | | shield | | | | 00000 |
| | IS, CLASS I, DIV1, GRP A, B, C, D, T4, Ta = 55 °C; Entity, FISCO Class I, Zone 1 [0], AEx ib [ia] IIC T4, Ta = 55 °C; Entity, FISCO | | HAZARDOUS LOCATION per Control Drawing 194.170-170 | | | | observe grounding conditions | | | | 00000 | | |

Fig.: Terminal assignments Stratos FF 2231 X pH



- 1** Recommended stripping lengths for multi-core cables
- 2** Recommended stripping length for coaxial cable
- 3** Pulling out the terminals using a screwdriver (also see **7**)

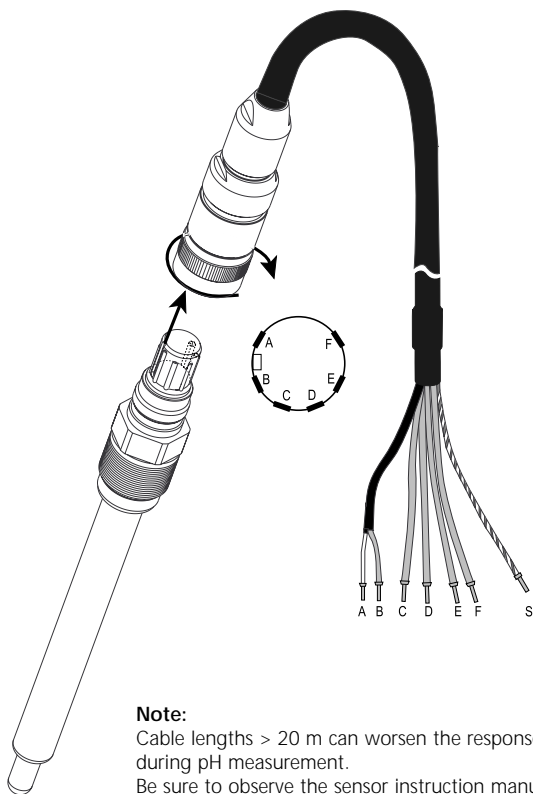


- 4** Cable laying in the device
- 5** Connecting lines for Fieldbus
- 6** Cover for electrode and temperature probe terminals
- 7** Area for placing the screwdriver to pull out the terminals
- 8** Connecting terminals for Fieldbus

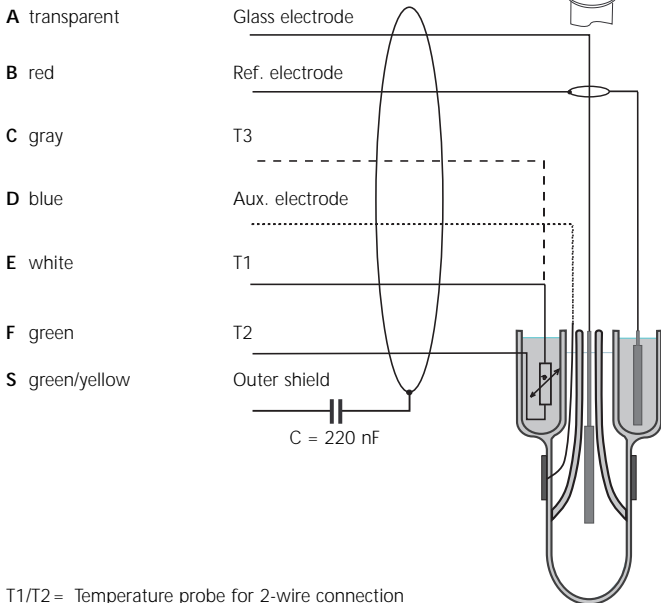
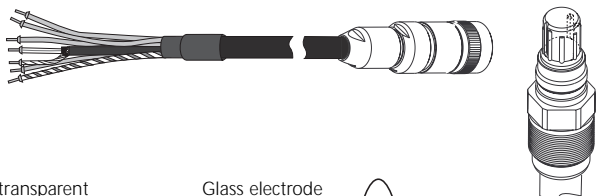
Fig.: Information on installation, rear side of device

Connecting the VP cable

Connecting the sensor to the VP cable



VP cable assignment

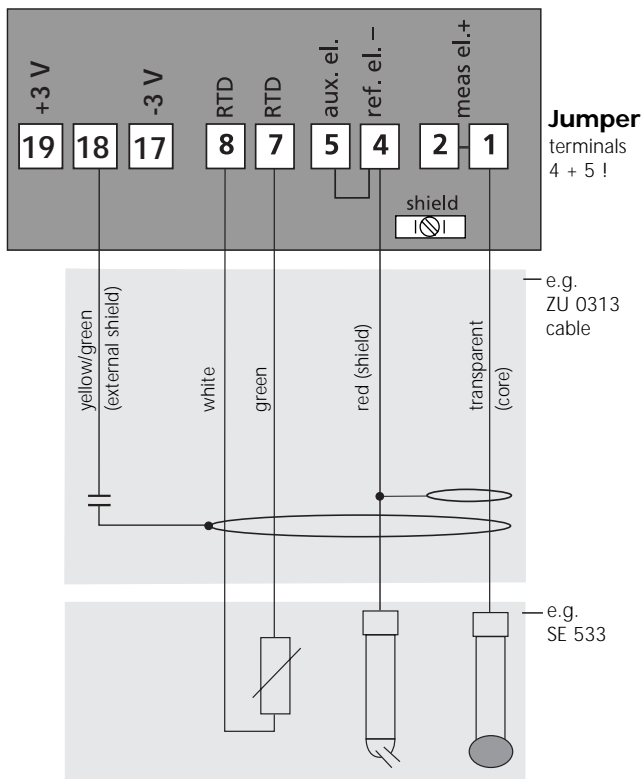


T1/T2 = Temperature probe for 2-wire connection
 T1 = Additional connection for temperature probe
 (3-wire connection)

pH wiring examples

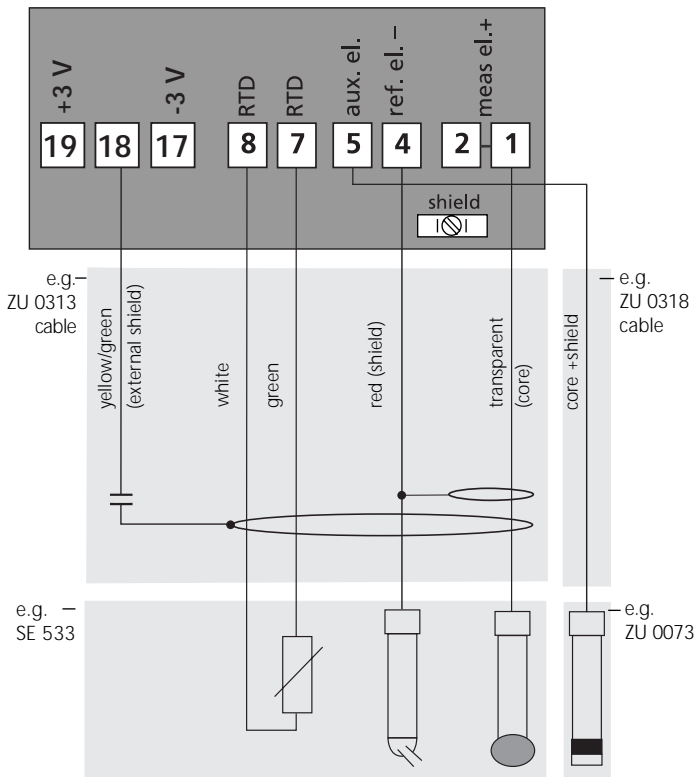
Example 1:

- pH measurement with monitoring of glass electrode (connection: VP)



Example 2:

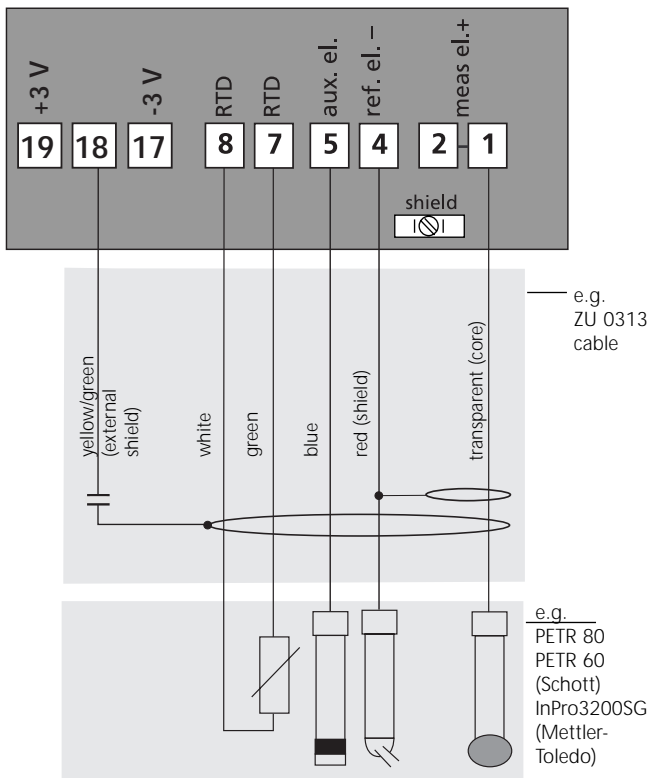
- pH measurement with monitoring of glass and reference electrode/
simultaneous ORP measurement (connection: VP)
- pH/ORP values can be simultaneously transmitted over the Fieldbus.



pH wiring examples

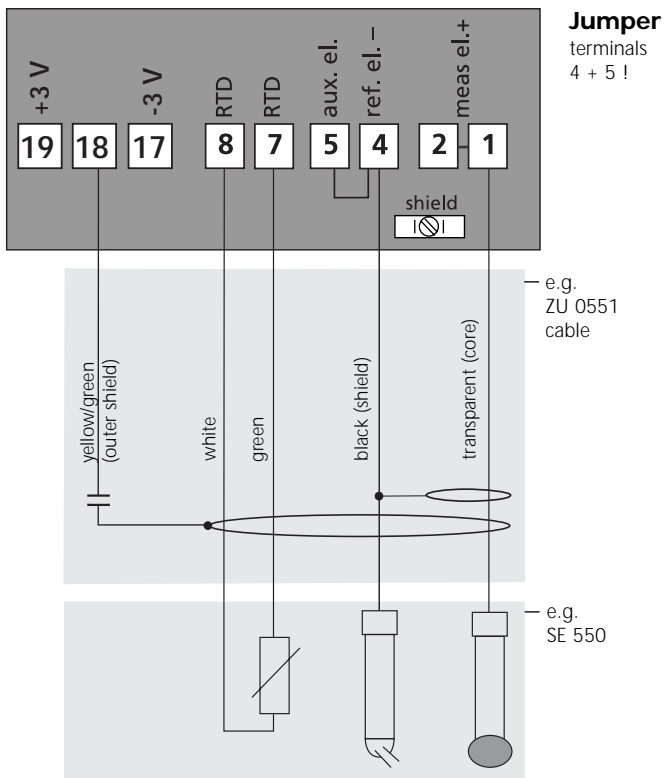
Example 3:

- pH measurement with monitoring of glass and reference electrode / simultaneous ORP measurement (connection: VP)
- pH/ORP values can be simultaneously transmitted over the Fieldbus.



Example 4:

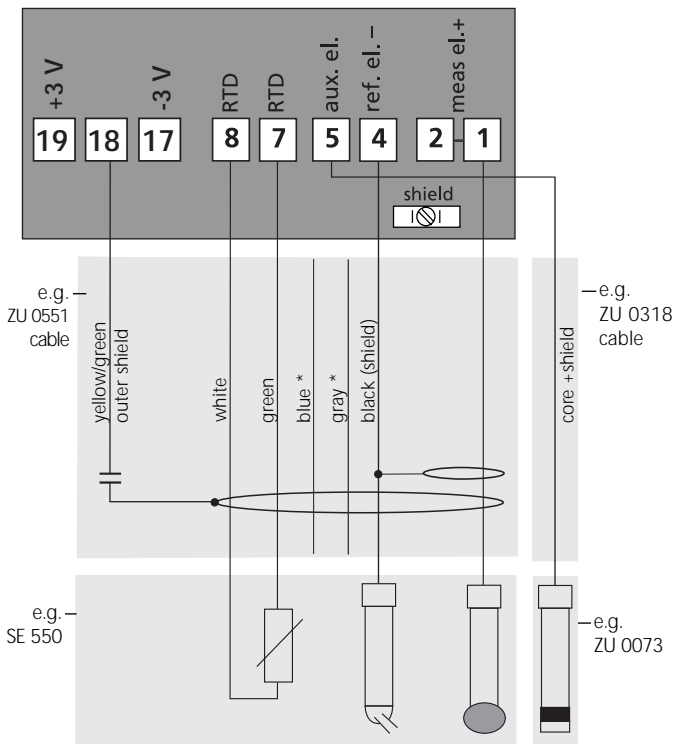
- pH measurement with monitoring of glass electrode
Connection: SixPlug (formerly SMEK)



pH wiring examples

Example 5:

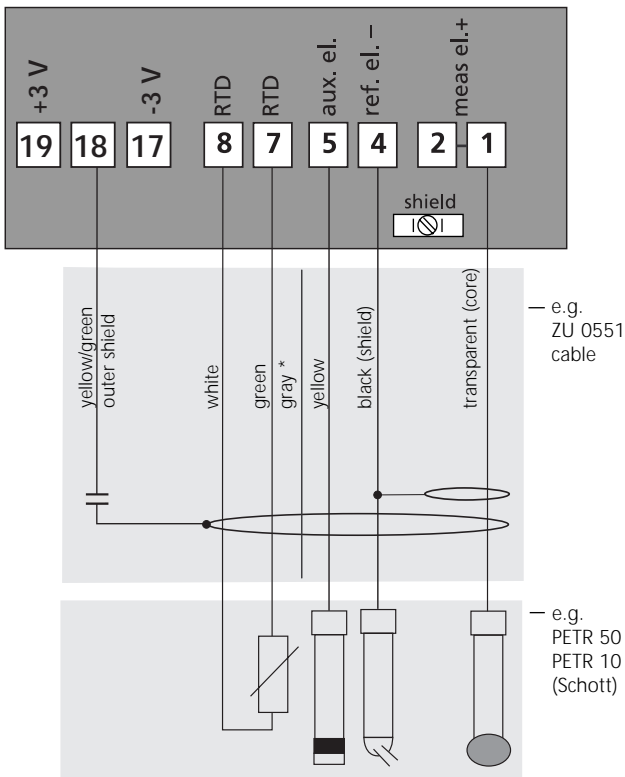
- pH measurement with monitoring of glass and reference electrode/
simultaneous ORP measurement (Connection: SixPlug, formerly SMEK)
- pH/ORP values can be simultaneously transmitted over the Fieldbus.



*) blue, gray: Do not connect!

Example 6:

- pH measurement with monitoring of glass and reference electrode/
simultaneous ORP measurement (connection: SixPlug, formerly SMEK)
- pH/ORP values can be simultaneously transmitted over the Fieldbus.



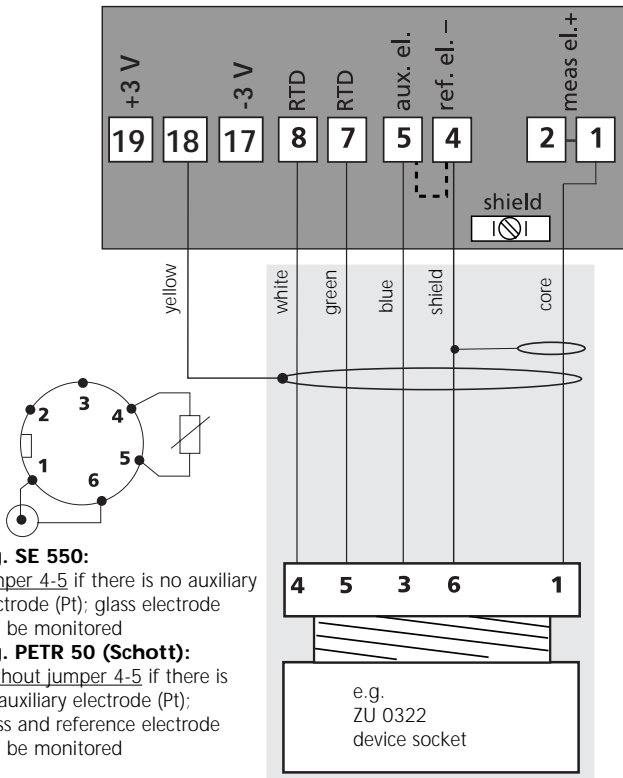
*) gray: Do not connect!

pH wiring examples

Example 7:

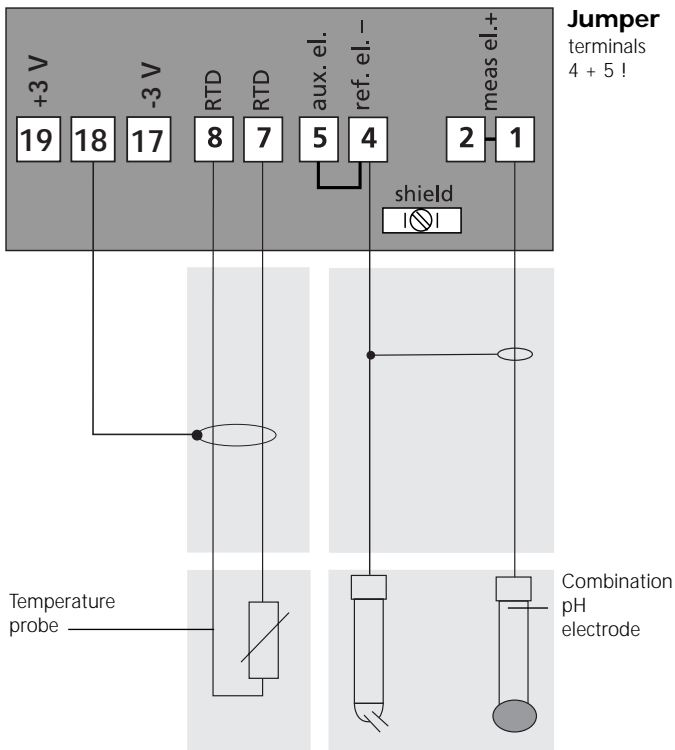
- pH measurement with monitoring of glass and reference electrode / simultaneous ORP measurement (connection: SixPlug, formerly SMEK, on device)

Note: pH/ORP values can only be simultaneously transmitted over the fieldbus when the jumper across terminals 4 + 5 has been removed.



Example 8:

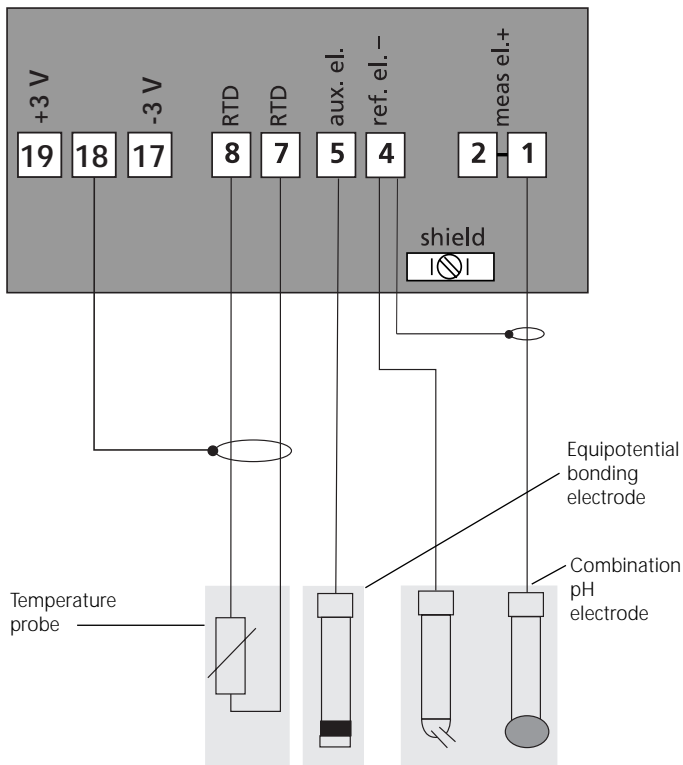
- pH measurement with monitoring of glass electrode



pH wiring examples

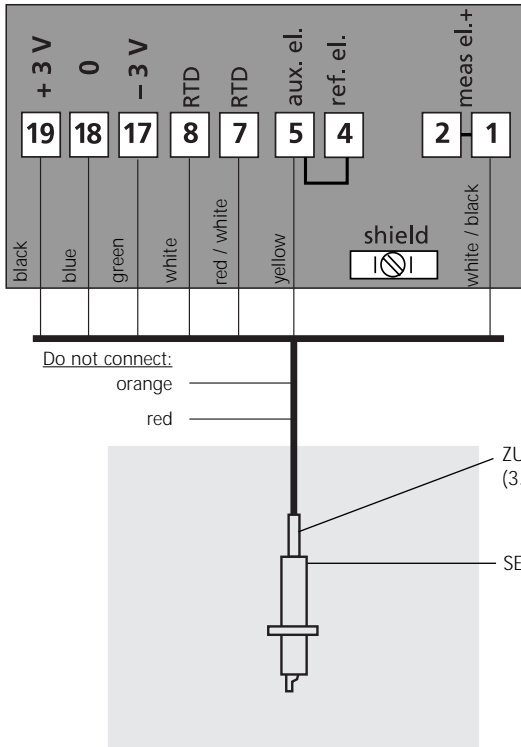
Example 9:

- pH measurement with monitoring of glass and reference electrode/simultaneous ORP measurement
- pH/ORP values can be simultaneously transmitted over the Fieldbus.



Example 10:

- pH measurement with Durafet electrode
- Be sure that "ISFET" is set in the configuration, see Pg 59.

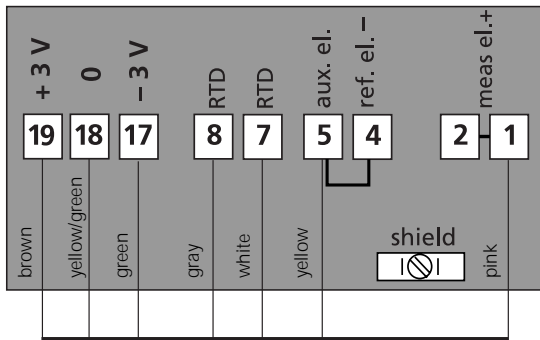


Jumper
 terminals
 4 + 5 !

pH wiring examples

Example 11:

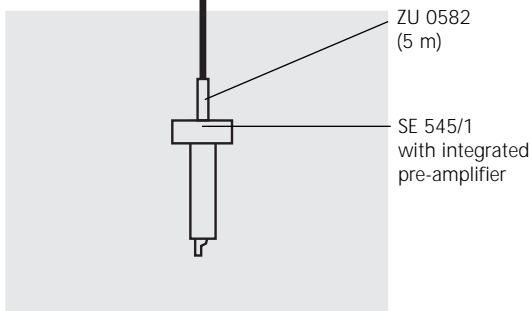
- pH measurement with SE 545/1 ISFET sensor
- Be sure that "ISFET" is set in the configuration, see Pg 59.



Jumper

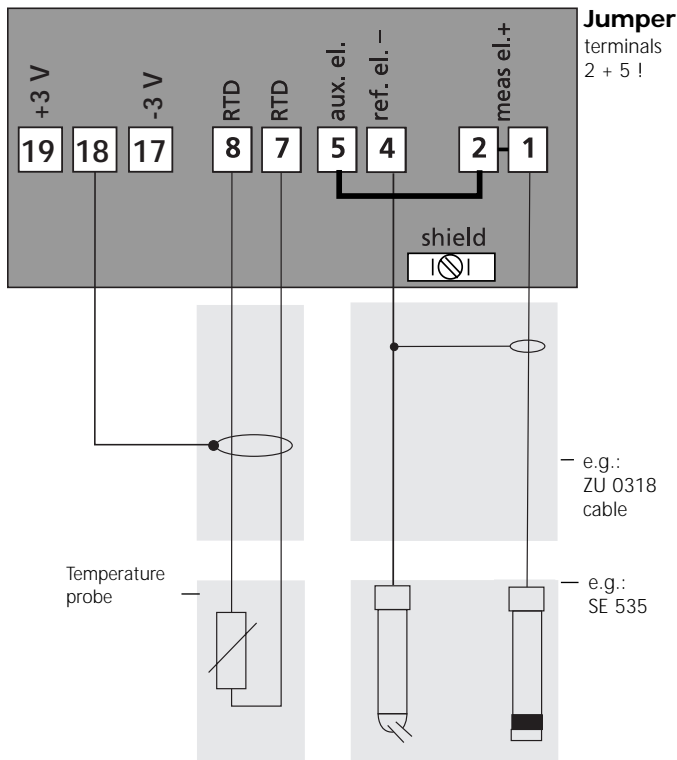
terminals

4 + 5 !



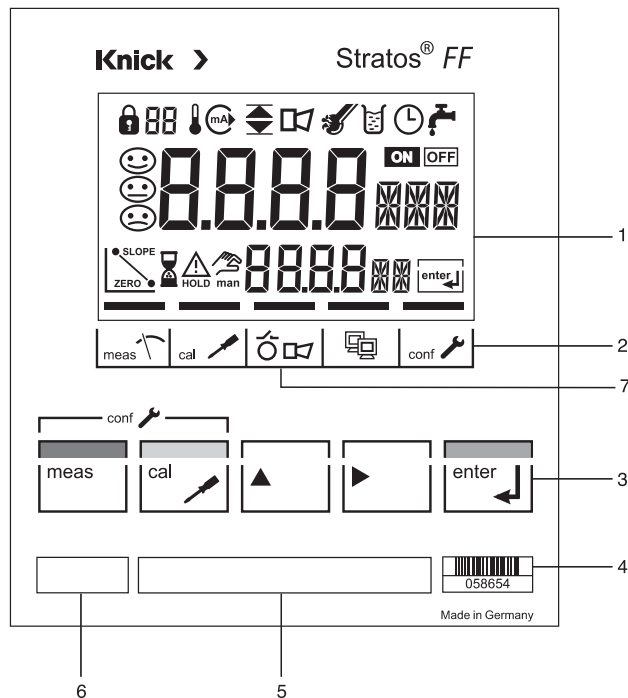
Example 12:

- ORP measurement with Sensoscheck for reference electrode



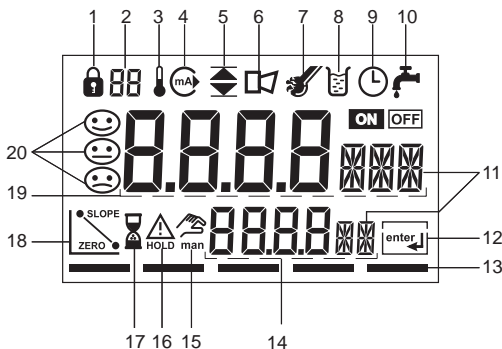
User interface and display

User interface


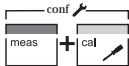









- | | | | |
|---|---|---|-------------------|
| 1 | Display | 3 | Keypad |
| 2 | Mode indicators (no keys), from left to right: | 4 | Coding |
| | - Measuring mode | 5 | Rating plate |
| | - Calibration mode | 6 | Model designation |
| | - Alarm | 7 | Alarm LED |
| | - Foundation Fieldbus communication | | |
| | - Configuration mode | | |

Display




- | | | | |
|----|--|----|---------------------------|
| 1 | Mode code entry | 14 | Lower display |
| 2 | Display of measured variable* | 15 | Manual temp specification |
| 3 | Temperature | 16 | Hold mode active |
| 4 | Not connected | 17 | Waiting time running |
| 5 | Limit values | 18 | Electrode data |
| 6 | Alarm | 19 | Main display |
| 7 | Sensocheck | 20 | Sensoface |
| 8 | Calibration | | |
| 9 | Interval/response time | | * Not in use |
| 10 | Not connected | | |
| 11 | Measurement symbols | | |
| 12 | Proceed with enter | | |
| 13 | Bar for identifying the device status, above mode indicators from left to right: | | |
| | - Measuring mode | | |
| | - Calibration mode | | |
| | - Alarm | | |
| | - Foundation Fieldbus communication | | |
| | - Configuration mode | | |

| | |
|---|---|
|  | <p>Start, end calibration</p> |
|  | <p>Start configuration</p> |
|  | <p>Abort configuration, calibration, then Hold mode is activated.</p> |
|  | <p>Select digit position (selected position flashes)</p> |
|  | <p>Edit digit</p> |
|  | <ul style="list-style-type: none"> • Calibration: Continue in program sequence • Configuration: Confirm entries, next configuration step • End the Hold mode |
|  | <p>Cal Info, display of asymmetry potential and slope</p> |
|  | <p>Error Info: Display of last error message</p> |
|  | <p>Start GainCheck device self-test</p> |

Safety functions

Hold mode

Display: 

The Hold mode is a safety state during configuration and calibration. In Hold mode the last valid value (last usable value) is transmitted.

Measured value status = uncertain : Last_usable_value

If the calibration or configuration mode is exited, the Stratos remains in the Hold mode for safety reasons. This prevents undesirable reactions of the connected peripherals due to incorrect configuration or calibration. The measured value and "HOLD" are displayed alternately. The Stratos only returns to measuring mode after **enter** is pressed and 20 seconds have passed.

Configuration mode is also exited automatically 20 minutes after the last keystroke (timeout). The Stratos returns to measuring mode.

Timeout is not active during calibration.

Alarm

During an error message the alarm LED flashes.

The alarm response time is permanently set to 10 sec.

The alarm LED on the front panel can be configured as follows:

HOLD off: Alarm: LED flashing

HOLD on: Alarm: LED on. HOLD: LED flashing.

(see Pg 67)

For alarm handling via Foundation Fieldbus, see Pg 109

Safety functions

Sensocheck, Sensoface sensor monitoring


Sensocheck continuously monitors the sensor and lines. Sensocheck can be switched off (Configuration, Pg 67).



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 device self test

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

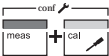


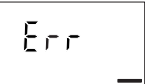


Start GainCheck device self-test:  + 

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.

Configuration on the device

Configuration on the device is mainly used for setting display parameters.

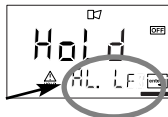
| | | |
|--|--|---|
| Activate |  | Activate with meas + cal |
| Hold |  | Enter mode code "1200" Edit parameter with ▶ and ▲ , confirm/continue with enter . (End with meas , then enter .) |
| During configuration the Stratos remains in the Hold mode. |  HOLD icon | The last valid value (last usable value) is transmitted. Measured value status = uncertain : Last_usable_value. Sensoface is off, "Configuration" mode indicator is on. Red LED flashes when "HOLD ON" has been set. |
| Input errors |  | The configuration parameters are checked during the input. 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 |  | End with meas . The measured value and Hold are displayed alternately "enter" flashes. (HOLD symbol is on, "hourglass" flashes, Sensoface is active). |
| |  | Press enter to end the Hold mode. The measured value is displayed. Hold remains on for 20 sec (measured value status = uncertain: Last_usable_value). |

Menu structure of configuration

The configuration steps are optically organized in menu groups:

- Process variable /
electrode type selection (code: In.)
- Temperature compensation (code: tc.)
- Calibration mode (code: CA.)
- Alarm settings (code: AL.)
- Input of bus address (code: FF.)

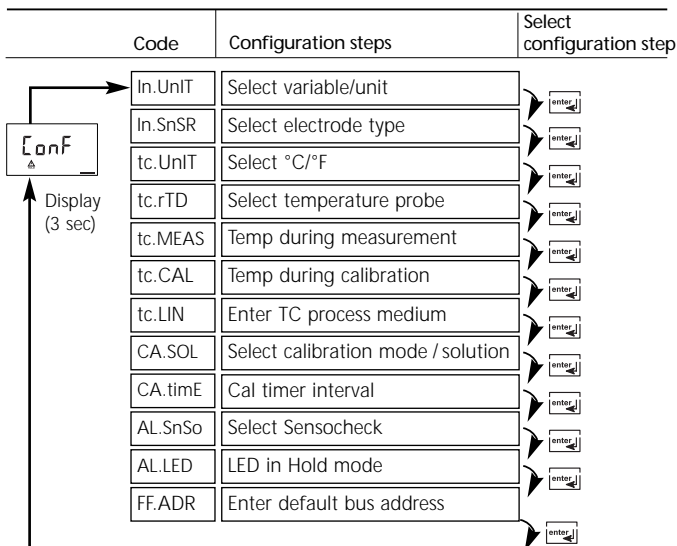
Code: AL.LED



Pressing the **enter** key accesses the next configuration step. The values are edited using the arrow keys. Pressing **enter** confirms/stores the settings and opens the next configuration step.

After the last configuration step the menu starts once more with the welcome text and the first step is opened again.

Return to measurement: Press **meas**.



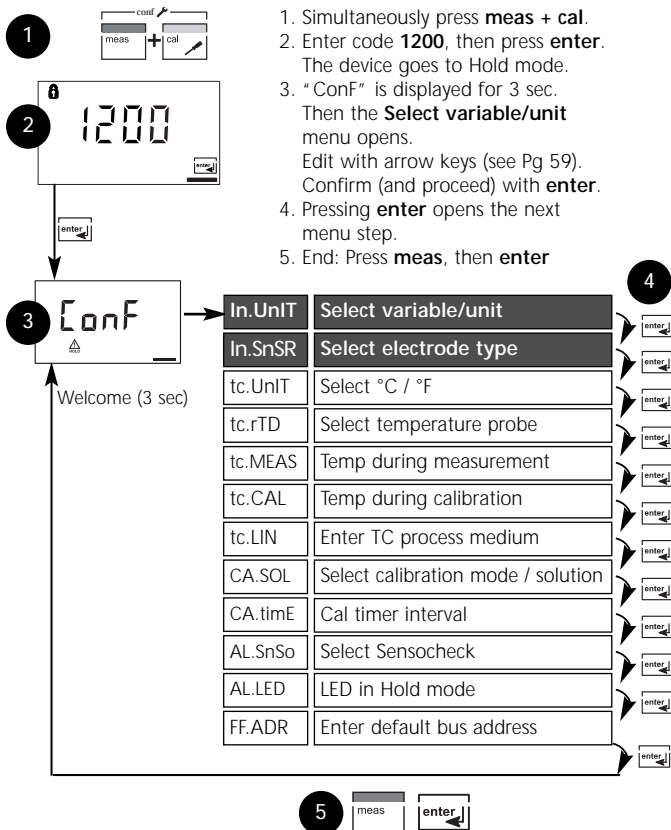
Overview of configuration steps







| Code | Menu | Selection / Default | BUS access |
|------------|---------------------------------------|--|------------|
| In | Select measurement procedure / sensor | (Factory setting bold print) | |
| In.UnIT | Select variable/unit | pH /ORP pH: -2.00 ... 16.00 pH ORP: -1500 mV to +1000 mV | X |
| In.SnSR | Select electrode type | GLAS EL / FET EL | X |
| tc | Temp compensation | | |
| tc.UnIT | Select temperature unit | °C / °F | X |
| tc.rTD | Selection of temperature probe | Pt100/ Pt1000 /NTC30/NTC8.55 | X |
| tc.MEAS | Temp detection for meas | Auto /man (man: -20.0 200 °C) (025.0 °C) (man: -004 ... 0392 °F) (0078 °F) | X |
| tc.CAL | Temp detection for cal | Auto /man (man: -20.0 200 °C) (025.0 °C) (man: -004 ... 0392 °F) (0078 °F) | X |
| tc.LIN | Enter TC process medium | -19.99 ... 19.99 %/K (00.00 %/K) | X |
| CAL | Calibration mode | | |
| CA.SOL | Select calibration mode | BUF / MAN / DAT (-01-BUF) | X |
| CA.tIME | Enter cal timer interval | 0000 ... 9999 h (0000 h) | X |
| AL | Alarm settings | | |
| AL.SnSO | Select Sensocheck | ON / OFF (OFF) | X |
| AL.LED | LED in HOLD mode | ON / OFF (OFF) | X |
| FF | Bus address | | |
| FF.ADR | Adjust bus address | (0017 ... 0031) (0026) | X |

| Code | Parameter | Setting | |
|---------|----------------------|---------|-------|
| In.UniT | pH/ORP unit | _____ | _____ |
| In.SnSR | Electrode type | _____ | _____ |
| tc.UniT | Unit °C / °F | _____ | _____ |
| tc.rTD | Temp probe | _____ | _____ |
| tc.MEAS | Measuring temp | _____ | _____ |
| tc.CAL | Calibration temp | _____ | _____ |
| tc.LIN | TC process medium | _____ | _____ |
| CA.SOL | Calibration solution | _____ | _____ |
| CA.tiME | Calibration interval | _____ | _____ |
| AL.SnSO | Sensocheck | _____ | _____ |
| AL.LED | LED Hold | _____ | _____ |
| FF.ADR | Bus address | _____ | _____ |

Configuration on the device

Select variable/unit. Select electrode type

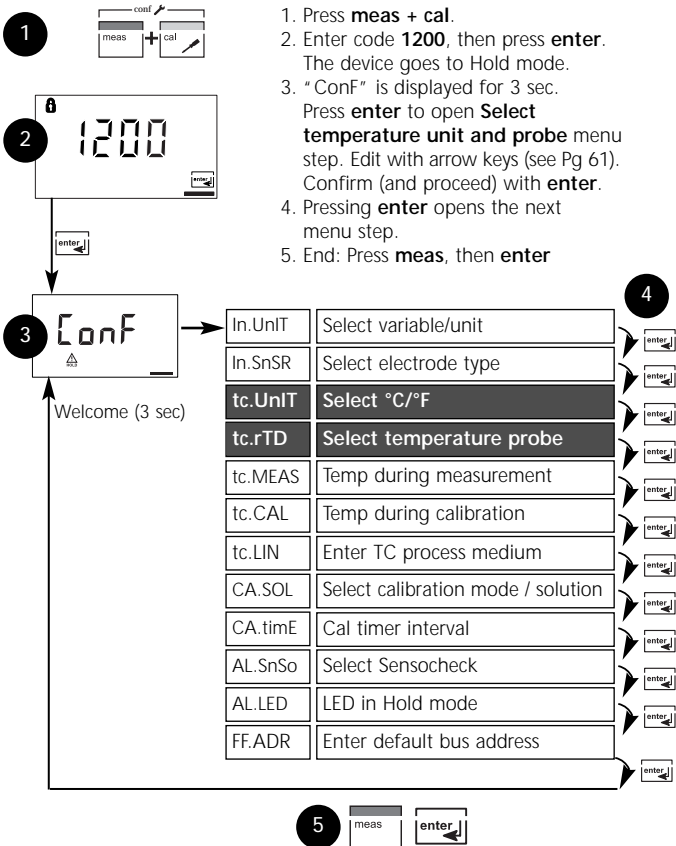


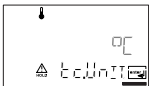




| Code | Display | Action | Choices |
|------|---|---|--|
| In. | | Select configuration (Press meas + cal.) | |
| |  <p>After correct input a welcome text (CONF) is displayed for approx. 3 sec</p> | Enter mode code "1200" (Select position using arrow key ▶ and edit number using ▲ key. When the display reads "1200", press enter to confirm.) | |
| |  | The device is in HOLD mode (HOLD icon is active, red LED flashes when "HOLD ON" has been set.). | |
| |   | Select variable/unit to be displayed pH / ORP Select with arrow key ▶ Proceed with enter | pH/ORP (pH: -2.00 ... +16.00 / ORP: -1500 ... +1000mV) |
| |   | Select electrode type: <ul style="list-style-type: none"> • Glass electrode • ISFET electrode Select with ▶ arrow key Proceed with enter | Glass (Fet EL) |

Note: Characters represented in gray are flashing and can be edited.

Configuration on the device

Select temperature unit and probe.

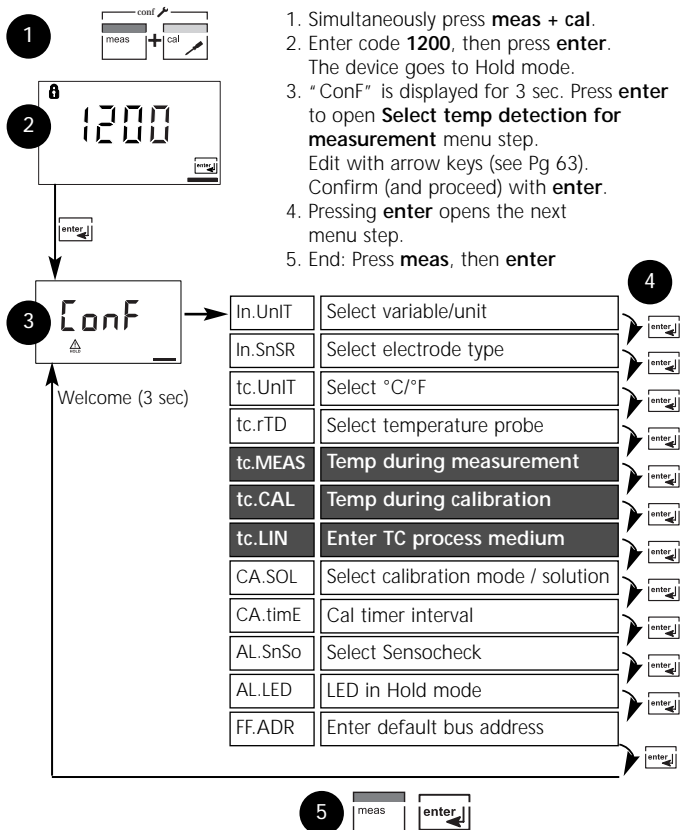







| Code | Display | Action | Choices |
|------|---|---|--|
| tc. |  | Specify temperature unit Select with ▶ arrow key. Proceed with enter | °C (°F) |
| |  | Select temperature probe Select with ▶ arrow key. Proceed with enter | Pt1000 (Pt100, NTC30, NTC8.55) |
| |  | | |
| |  | | |
| |  | | |

Configuration on the device

Temperature compensation

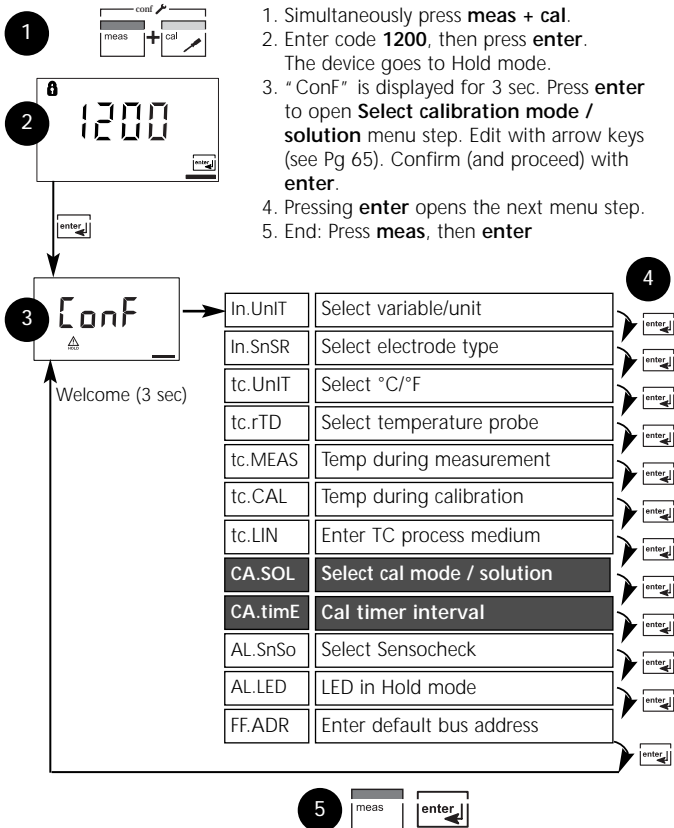
Temp detection for meas/cal, TC process medium







| Code | Display | Action | Choices |
|------|--|--|---|
| tc. |  | Select temp detection during measurement (Auto/MAN) AUTO: Temp detection with temperature probe MAN: Manual temperature input Select with ▶ key, proceed with enter | AUT (MAN) |
| |  | Only with manual temp detection selected (MAN) Enter temperature. Select position with ▶ arrow key and edit number with ▲ key. Proceed with enter | 25 °C (xxx.x °X) |
| |  | Select temp detection during calibration (Auto/MAN) Select with ▶ key, proceed with enter | AUT (MAN) |
| |  | Only with manual temp detection selected (MAN) Enter temperature. Select position with ▶ arrow key and edit number with ▲ key. Proceed with enter | 25 °C (xxx.x °X) |
| |  | Enter temperature compensation of process medium Select position with ▶ arrow key and edit number with ▲ key. Proceed with enter $pH_{(25)} = pH_M + TC/100\% (25^\circ C - T_M)$ $pH_{(25)} = \text{pH value compensated for } 25^\circ C$ $pH_M = \text{measured pH value (temperature-corrected)}$ $TC = \text{temperature factor } [\%/K]$ $T_M = \text{measured temperature } [^\circ C]$ | 00.00 %/K (-19.99 ... 19.99 %/K) |

Configuration on the device

Select calibration mode and solution

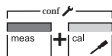


| Code | Display | Action | Choices |
|------|---|---|--|
| CA. |  | <p>Select calibration mode BUF: Calibration with Calimatic automatic buffer selection. To do so, you must select your buffer set:</p> <ul style="list-style-type: none"> -01- BUF: Mettler-Toledo -02- BUF: Merck Titrisols, Riedel Fixanals -03- BUF: Ciba (94) -04- BUF: NIST technical buffers -05- BUF: NIST standard buffers -06- BUF: HACH buffers -07- BUF: WTW technical buffers | <p>-01-BUF (-02-BUF/ -03-BUF/ -04-BUF/ -05-BUF/ -06-BUF/ -07-BUF/ MAN/ DAT)</p> |
| |  | <p>MAN: Calibration with manual buffer entry</p> | |
| |  | <p>DAT: Entry of asymmetry potential and slope of premeasured electrodes Select with ► key, proceed with enter</p> | |
| |  | <p>Enter calibration interval: Entry of time interval within which the device is to be calibrated. With a time interval of 0000 hrs the calibration timer is not active. Select with ► key, edit number with ▲ key, proceed with enter</p> | <p>0000 h (0000 ... 9999 h)</p> |

Configuration on the device

Alarm settings

1





1. Simultaneously press **meas + cal**.
2. Enter code **1200**, then press **enter**.
The device goes to Hold mode.
3. "ConF" is displayed for 3 sec. Press **enter** to open **Alarm settings** menu step.
Edit with arrow keys (see Pg 67).
Confirm (and proceed) with **enter**.
4. Pressing **enter** opens the next menu step.
5. End: Press **meas**, then **enter**



4

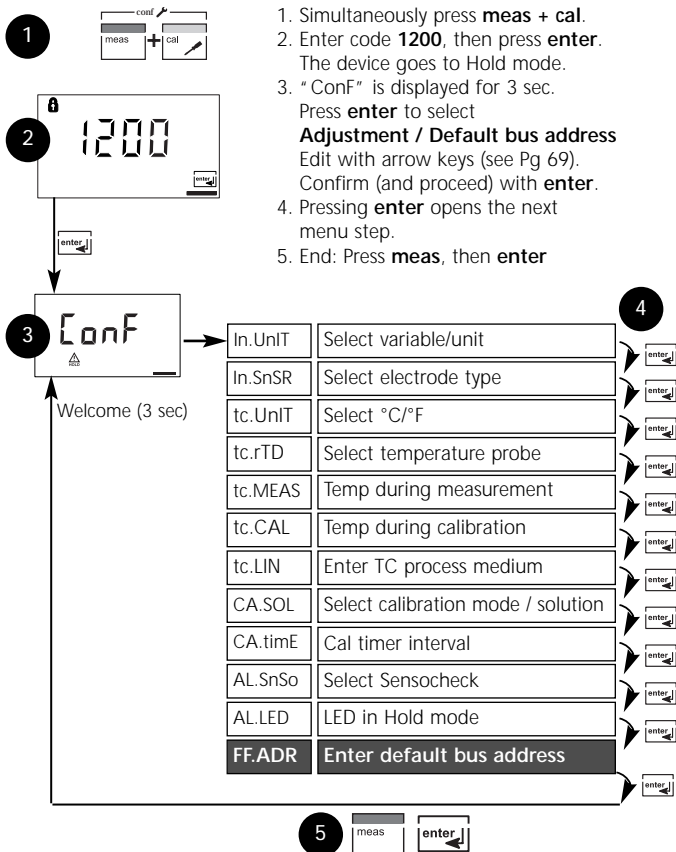
| | | |
|---------|------------------------------------|-------|
| In.UnIT | Select variable/unit | enter |
| In.SnSR | Select electrode type | enter |
| tc.UnIT | Select °C/°F | enter |
| tc.rTD | Select temperature probe | enter |
| tc.MEAS | Temp during measurement | enter |
| tc.CAL | Temp during calibration | enter |
| tc.LIN | Enter TC process medium | enter |
| CA.SOL | Select calibration mode / solution | enter |
| CA.timE | Cal timer interval | enter |
| AL.SnSo | Select Sensocheck | enter |
| AL.LED | LED in Hold mode | enter |
| FF.ADR | Enter default bus address | enter |




| Code | Display | Action | Choices | | | | | | | | |
|-------------------|---|--|-------------------|-------|------|----|----|---------|-----|---------|-----|
| AL. |  | Select Sensocheck (continuous monitoring of glass and reference electrode) Select with ▶ key, proceed with enter | ON / OFF | | | | | | | | |
| |  | LED in Hold mode Select with ▶ key, proceed with enter LED state: <table border="1" data-bbox="397 654 806 773"> <thead> <tr> <th>Parameter setting</th> <th>Alarm</th> <th>HOLD</th> </tr> </thead> <tbody> <tr> <td>ON</td> <td>on</td> <td>flashes</td> </tr> <tr> <td>OFF</td> <td>flashes</td> <td>off</td> </tr> </tbody> </table> | Parameter setting | Alarm | HOLD | ON | on | flashes | OFF | flashes | off |
| Parameter setting | Alarm | HOLD | | | | | | | | | |
| ON | on | flashes | | | | | | | | | |
| OFF | flashes | off | | | | | | | | | |

Configuration on the device

Adjustment / Default bus address



| Code | Display | Action | Choices |
|------|---|---|---|
| FF. |  | <p>Only when there is <u>no</u> bus connection:</p> <p>The bus address can be manually adjusted from 0017 ... 0036.</p> <p>Select with ▶ key, edit number with ▲ key, proceed with enter.</p> <p>When the bus address has been changed, the device automatically restarts to re-initialize the bus parameters.</p> | <p>0026 (0017 ...0036)</p> |

Adjusting a new default bus address

The Fieldbus Foundation automatically assigns an address. Therefore it is not required to manually adjust the bus address.

If the bus address has been changed, the bus configuration is reset to the default values during device restart. All bus parameters are set to their default values.

Note:

When the bus address has been changed, the bus configuration is automatically reset. All bus parameters are set to their default values. All individual settings have to be entered once more. The configuration must be reloaded into the device.

Calibration on the device

Calibration adjusts the device to the electrode.

Activate



Activate with **cal**



Enter mode code:

- 1001 zero adjustment (ISFET)
- 1100 for pH
- 1109 for ORP
- 1105 product calibration (pH/ORP)
- 1015 temp probe adjustment

Select with **▶** key, edit number with **▲** key, proceed with **enter** key
(End with **cal** and **enter**.)

Hold



The last valid value (last usable value) is transmitted. Measured value status = uncertain : Last_usable_value.

During calibration the device remains in the Hold mode.

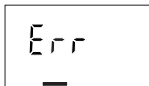


Sensoface is off, "Calibration" mode indicator is on.

Red LED flashes when "HOLD ON" has been set.

HOLD icon

Input errors



The calibration parameters are checked during the input. 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



End with **cal**.



The measured value and Hold are displayed alternately, "enter" flashes. Press **enter** to end the Hold mode. The measured value is displayed. Hold remains on for 20 sec (measured value status = uncertain: Last_usable_value. (HOLD icon is on, "hourglass" flashes).

pH calibration

Calibration is used to adapt the device to the individual electrode characteristics, namely asymmetry potential and slope. Calibration can be performed with Calimatic automatic buffer recognition, with manual buffer input, by entering premeasured electrode data, or by sampling the product.

When using ISFET electrodes, you must adjust the zero point first. Then you can conduct either a one or a two-point calibration.


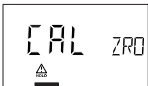


Caution



- All calibration procedures must be performed by trained personnel. Incorrectly set parameters may go unnoticed, but change the measuring properties.
- The response time of the electrode and temperature probe is considerably reduced if the electrode is first moved about in the buffer solution and then held still.
- The device 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.

When using ISFET electrodes or electrodes with a zero point other than pH 7 the nominal zero point must be adjusted each time a new electrode is connected. This is important if you want to obtain reliable Sensoface messages. The Sensoface messages issued during all further calibrations are based on this basic calibration.

Zero adjustment (ISFET)

Allows use of pH electrodes with differing nominal zero, e.g. ISFET sensors.

| Display | Action | Remark |
|---|--|--|
|  | Press cal key, enter mode code 1001 Select with ▶ key, edit number with ▲ key, proceed with enter | If an invalid code is entered, the device returns to measuring mode. Stratos is in the Hold mode. |
|  | Ready for calibration | Display (3 sec) |
|  | Immerse electrode in a pH 7.00 buffer. Enter the temperature-corrected pH value in the range 6.50 to 7.50 using the arrow keys (see buffer table). Confirm with enter . | If the zero offset of the electrode is too large ($> \pm 200$ mV), the CAL ERR error message is generated. In that case the electrode cannot be calibrated. |
|  | Stability check: The measured mV value is displayed. The "hourglass" as well as "zero" and "beaker" icons are flashing. | Note: Stability check can be stopped (by pressing cal). However, this reduces calibration accuracy. |

| Display | Action | Remark |
|---|---|--|
|  | <p>At the end of the adjustment procedure the zero offset [mV] (based on 25 °C) of the electrode is displayed. "Enter" flashes. Confirm with enter.</p> | <p>This is not the final calibration value of the electrode! Zero and slope must be determined with a complete 2-point calibration (cal 1100) (see following pages).</p> |
|  | <p>Security prompt. Display of pH value (alternately with Hold) and temperature, "enter" flashes, Sensoface is active.</p> <p>Place electrode in process.</p> <p>Press enter to end the zero point calibration.</p> | <p>After end of calibration, the outputs remain in Hold mode for approx. 20 sec.</p> |

Information on zero adjustment






After having adjusted the zero offset, be sure to calibrate the electrode following one of the procedures as described on the next pages:






- Automatic calibration with Calimatic
- Manual calibration
- Data entry of premeasured electrodes
- If the configuration is changed from "Glass" to "ISFET" or vice versa, the zero offset is reset to 0.

Automatic calibration with Calimatic (BUF -xx-) Temperature detection automatic or manual

Calibration mode must be set to "-xx- BUF".

The Stratos 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.





| Display | Action | Remark |
|--|--|---|
|  | Press cal key, enter mode code 1100 Select with ▶ key, edit number with ▲ key, proceed with enter | If an invalid code is entered, the device returns to measuring mode. |
|  | Welcome (3 sec) | Device in Hold mode, measured-value status = uncertain Sensoface inactive. |
|  | Remove the electrode and temperature probe, clean them and immerse them in the first buffer solution (in any order). Start with enter . | |
|  | Buffer recognition While the "hourglass" icon flashes, the electrode and tem- perature probe remain in the first buffer solution. | The response time of the electrode and temperature probe is considerably reduced if the electrode is first moved about in the buffer solution and then held still. |
|  | Buffer recognition terminated, the nominal buffer value is displayed. | |






| Display | Action | Remark |
|---|---|--|
|  | Stability check: The measured mV value is displayed. | To abort stability check: Press cal . (accuracy reduced) |
|  | Calibration with the first buffer is terminated. Remove the electrode and temp probe from the first buffer solution and rinse them thoroughly. | |
| | <ul style="list-style-type: none"> One-point calibration: End with cal. Slope [%] and asymmetry potential [mV] of the electrode are displayed. Proceed with enter. | For one-point calibration only:  |
| | <ul style="list-style-type: none"> Two-point calibration: Immerse electrode and temperature probe in the second buffer solution. Start with enter. | The calibration process runs again as for the first buffer. |
|  | Retract electrode and temp probe out of second buffer, rinse off, re-install. Repeat calibration: cal , End calibration: enter . | Slope and asymmetry potential of electrode (related to 25 °C) are displayed. |
|  | pH value and Hold are displayed alternately. Sensoface is active. Proceed with enter . Hold is deactivated after 20 s. | Security prompt. |

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 device for the proper temperature. This presetting enables calibration with any desired buffer solution. The MAN calibration mode and the type of temperature detection are selected in the configuration mode.







| Display | Action | Remark |
|--|--|--|
|  | Press cal key, enter mode code 1100 Select with ▶ key, edit number with ▲ key, proceed with enter . | If an invalid code is entered, the device returns to measuring mode. |
|  | Welcome | (Display approx. 3 sec) Device in Hold mode, measured-value status = uncertain Sensoface inactive. |
|  | Remove the electrode and temperature probe, clean them and immerse them in the first buffer solution (in any order). Start with enter . | |
|  | Enter the pH value of your buffer solution for the proper temperature. While the “hour-glass” icon flashes, the electrode and temperature probe remain in the first buffer solution. | The response time of the electrode and temperature probe is considerably reduced if the electrode is first moved about in the buffer solution and then held still. |

| Display | Action | Remark |
|---|--|--|
|  | Stability check: The measured mV value is displayed. | To abort stability check: Press cal (accuracy reduced). |
|  | Calibration with the first buffer is terminated. Remove the electrode and temp probe from the first buffer solution and rinse them thoroughly. | |
| | <ul style="list-style-type: none"> One-point calibration: End with cal. Slope [%] and asymmetry potential [mV] of the electrode are displayed. Proceed with enter. | For one-point calibration only:  |
| | <ul style="list-style-type: none"> Two-point calibration: Immerse electrode and temperature probe in the second buffer solution. Enter the pH value of the second buffer solution. Start with enter. | The calibration process runs again as for the first buffer. |
|  | Retract electrode and temp probe out of second buffer, rinse off, re-install. Repeat calibration: cal , End calibration: enter . | Slope and asymmetry potential of electrode (related to 25 °C) are displayed. |
|  | pH value and "Hold" are displayed alternately. Sensoface is active. Proceed with enter . Hold is deactivated after 20 s. | Security prompt. |

Data entry of premeasured electrodes

You can directly enter the values for slope and asymmetry potential 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.

| Display | Action | Remark |
|--|---|---|
|  | Press cal key, enter mode code 1100 Select with ▶ key, edit number with ▲ key, proceed with enter . | If an invalid code is entered, the device returns to measuring mode. |
|  | Ready for calibration | (Display approx. 3 sec) Device in Hold mode, measured-value status = uncertain Sensoface inactive. |
|  | Enter asymmetry potential [mV]. Select with ▶ key, edit number with ▲ key, proceed with enter . | |
|  | Enter slope [%]. Select with ▶ key, edit number with ▲ key, proceed with enter . | |
|  | The device displays the new slope and asymmetry potential (at 25 °C). Proceed with enter . | |
|  | pH value and "Hold" are displayed alternately. Sensoface active. Proceed with enter . Hold is deactivated after 20 sec. | Security prompt. |

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

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

**Converting
asymmetry potential in electrode zero point:**

| | | |
|---|-----------------------|--|
| $\text{ZERO} = 7 - \frac{V_{AS}[\text{mV}]}{S [\text{mV} / \text{pH}]}$ | ZERO V_{AS} S | Electrode zero point Asymmetry potential Slope |
|---|-----------------------|--|

Product calibration (calibration with sampling)



1. Depending on the display configuration, a pH or an ORP product calibration is performed.
2. For product calibration via Foundation Fieldbus, see Pg 94. During product calibration the electrode remains in the process. The measurement process is only interrupted briefly.







Procedure: During sampling the currently measured value is stored in the Stratos. The device immediately returns to measuring mode.

The calibration mode indicator flashes and reminds you that calibration has not been terminated.

The sample is measured in the lab or directly on the site using a portable meter. To ensure an exact calibration, the sample temperature should correspond to the measured process temperature. The measured sample value is then entered in the Stratos. From the difference between the stored measured value and entered sample value, the Stratos calculates the new asymmetry potential (one-point calibration).

If the sample is invalid, you can take over the value stored during sampling. In that case the old calibration values are stored. Afterwards, you can start a new product calibration.

| Display | Action | Remark |
|--|--|--|
|  | Press cal , Enter mode code 1105 (Press ▶ key to select position, enter number using ▲ key, confirm with enter) | If an invalid code is entered, the device returns to measuring mode. |
|  | <u>Product calibration step 1:</u> | (Display approx. 3 sec) |

| Display | Action | Remark |
|---|--|--|
|  | Take sample and store value. Proceed with enter | Now the sample can be measured in the lab. |
|  | Measuring mode: From the flashing CAL mode indicator you see that product calibration has not been terminated. | Until the sample value is determined and can be entered, the device is in measuring mode. |
|  | <u>Product calibration step 2:</u> When the sample value has been determined, call up the product calibration once more (cal , mode code 1105). | Display (approx. 3 sec) Device in Hold mode, measured-value status = uncertain, Sensoface inactive. |
|  | Enter lab value. The new asymmetry potential is calculated. | |
|  | Display of slope and new asymmetry potential (related to 25°C). End calibration with enter . | New calibration: Press cal . |
|  | The measured value is shown in the main display alternately with "Hold"; "enter" flashes. End with enter . | After end of calibration, the outputs remain in Hold mode for approx. 20 sec. |

ORP calibration

The potential of a redox electrode is calibrated using a redox (ORP) buffer solution. In the course of that, the difference between the measured potential and the potential of the calibration solution is determined according to the following equation. During measurement the Stratos adds this difference to the measured potential.






| | |
|--|--|
| $mV_{\text{ORP}} = mV_{\text{meas}} + \Delta mV$ | mV_{ORP} = displayed ORP mV_{meas} = direct electrode potential ΔmV = delta value, determined during calibration |
|--|--|

The electrode potential can also be related to another reference system – e.g. the standard hydrogen electrode. In that case the temperature-corrected potential (see table) of the reference electrode used must be entered during calibration. During measurement, this value is then added to the ORP measured.




Please make sure that measurement and calibration temperature are the same since the temperature behavior of the reference electrode is not automatically taken into account.




Temperature dependence of commonly used reference systems

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



| Display | Action | Remark |
|--|---|--|
|  | Activate calibration (Press cal). Enter mode code 1109 Select with ▶ key, edit number with ▲ key, proceed with enter . | If an invalid code is entered, the device returns to measuring mode. |
|  | Remove the electrode and tem- perature probe, clean them and immerse them in the redox buffer. | Display (approx. 3 sec) Device is in Hold mode. |
|  | Enter desired value for redox buffer (Secondary display: Electrode potential displayed for approx. 6 sec) Select with ▶ key, edit number with ▲ key, proceed with enter . | After approx. 6 sec the secondary display shows the measured tempera- ture. |
|  | Display of electrode data (delta value) Proceed with enter . Rinse electrode and temperature probe and reinstall them. | "Zero" and "enter" icons are flashing, Sensiface is active. |
|  | The measured ORP value [mV] is shown in the main display alter- nately with "Hold", Sensiface is active, "enter" flashes. End with enter . | Safety prompt After end of calibra- tion, the outputs remain in Hold mode for approx. 20 sec. |

Temp probe adjustment


| Display | Action | Remark |
|--|---|--|
|  | Activate calibration (Press cal , enter mode code 1015) Select with ▶ key, edit number with ▲ key, proceed with enter . | Wrong settings change the measure- ment properties! If an invalid code is entered, the device returns to measuring mode. |
|  | Measure the temperature of the process medium using an exter- nal thermometer | Stratos is in the Hold mode. |
|  | Enter measured temperature value. Select with ▶ key, edit number with ▲ key, proceed with enter . End adjustment with enter . HOLD will be deactivated after 20 sec. | Default: Current value of secondary display. |




| Symbol flashes: | Problem Possible causes |
|---|--|
|  | <p>Asymmetry potential out of range (± 60 mV)</p> <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 selected (for manual temperature specification) • Nominal electrode zero point \neq pH 7 |
|  | <p>Electrode slope out of range (80-103 %)</p> <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 |
|  | <p>Problems during recognition of the buffer solution</p> <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 device |

Calibration error messages

| Symbol flashes: | Problem / Possible cause |
|---|--|
|  | <p>Problems during recognition of the buffer solution (continued)</p> <ul style="list-style-type: none"> • 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 |
|  | <p>Calibration was canceled after approx. 2 min because the electrode drift was too large.</p> <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 |

Measurement

| Display | Remark |
|---|--|
|  <p>Smiley only with Sensocheck activated</p> | <p>In the measuring mode the main display shows the configured process variable (pH or ORP [mV]) and the lower display the temperature. During calibration you can return to measuring mode by pressing the cal, then the enter key, during configuration by pressing meas, then enter (waiting time for measured value stabilization approx. 20 sec).</p> |

| Display | Remark |
|--|--|
|  | <p>Cal info: Display of calibration data</p> <p>Press cal while in measuring mode and enter mode code "0000". The slope is shown in the main display, the asymmetry potential in the secondary display. After 20 sec the device returns to measuring mode (immediate return at pressing enter).</p> |
|  | <p>Sensor monitor: Display of uncorrected electrode potential</p> <p>Press meas + cal while in measuring mode and enter mode code "2222". The (uncompensated) electrode potential is shown in the main display, the measuring temperature in the secondary display. At pressing enter or ▲ the display switches to ORP indication. Press meas to end sensor monitor and return to measuring mode.</p> |
|  <p>Smiley only with Sensocheck activated</p> | <p>Error info: Display of last error message</p> <p>Press meas + cal while in measuring mode and enter mode code "0000". The last error message is displayed for approx. 20 sec. After that the message will be deleted. (immediate return to measurement at pressing enter).</p> |

Sensoface

(Sensocheck must have been activated during configuration.)

The smiley in the display (Sensoface) alerts to electrode problems (defective sensor, defective cable, maintenance required). The permitted calibration ranges and the conditions for a friendly, neutral, or sad Sensoface are summarized in the following chart. Additional icons refer to the error cause.

Sensocheck

Continuously monitors the electrodes and wires for short circuits or open circuits. Critical values make the Sensoface “sad” and the corresponding icon flashes:






Sensocheck messages are also output as error messages Err 33 and Err 34. The red LED lights.

Sensocheck can be switched off during configuration (then Sensoface is also disabled). Exception: After a calibration a smiley is always displayed for confirmation.

Note

The worsening of a Sensoface criterion leads to the devaluation of the Sensoface indicator (Smiley becomes “sad”). An improvement of the Sensoface indicator can only take place after calibration or removal of an electrode defect.

| Display | Problem | Status |
|---|-------------------------------|--|
|  | Asymmetry potential and slope | <p>☹️ Asymmetry potential (zero) and slope of the electrode are still okay, However, the electrode should be replaced soon.</p> <p>☹️ Asymmetry potential (zero point) and/or slope of the electrode have reached values which no longer ensure proper calibration. Replace the electrode.</p> |
|  | Cal timer | <p>☹️ Over 80 % of the calibration interval has already past.</p> <p>☹️ The calibration interval has been exceeded.</p> |
|  | Electrode defective | <p>☹️ Check the electrode and its connections (also see error messages Err 33 and Err 34, see Pg 120).</p> |

Cleaning

To remove dust, dirt and spots, the external surfaces of the device may be wiped with a damp, lint-free cloth. A mild household cleaner may also be used if necessary.

Communication Fieldbus / Device

Resource block (RB)

Block status:

The RS_STATE parameter indicates the operating status of the resource block:

- Standby The resource block is in OOS mode.
The other blocks cannot be executed.
- Online The resource block is in Auto mode, that is
normal state.

Write protection:

With the WRITE_LOCK parameter, you can set a write protection for the device.

- UNLOCKED Device can be written to (default)
- LOCKED Device is locked.

Key lock:

With the DEVICE_LOCK parameter, you can set a key lock.

- UNLOCKED Device can be operated via keypad.
- LOCKED Key lock is active.

Alarm

The BLOCK_ALM parameter sends the status of the process alarms to the control system. This parameter specifies whether an alarm must be acknowledged via the control system.

For bus parameters of resource block, see Pg 92.

Communication Fieldbus / Device

Bus Parameters Resource Block (RB)

| Index | Parameter | Description | Default | R/W |
|-------|-------------|-------------------------|--------------------------------|-----|
| 1 | ST_REV | Static Revision | 0 | R |
| 2 | TAG_DESC | TAG Description | | R/W |
| 3 | STRATEGY | Strategy | 0 | R/W |
| 4 | ALERT_KEY | Alert key | 0 | R/W |
| 5 | MODE_BLK | Target | OOS | R/W |
| | | Actual | - | |
| | | Permitted | OOS, Auto | |
| | | Normal | Auto | |
| 6 | BLOCK_ERR | Block error | | R |
| 7 | RS_STATE | Resource state | 1 | R |
| 8 | TEST_RW | Test | | R/W |
| 9 | DD_RESOURCE | DD resource | | R |
| 10 | MANUFAC_ID | Manufacturer ID | 0x000102 for Knick | R |
| 11 | DEV_TYPE | Device type | 2231 | R |
| 12 | DEV_REV | Device revision | 1 | R |
| 13 | DD_REV | DD revision | 1 | R |
| 14 | GRANT_DENY | Grant | 0 | R/W |
| | | Deny | 0 | R/W |
| 15 | HARD_TYPES | Hardware type | 1 | R |
| 16 | RESTART | Restart | | R/W |
| 17 | FEATURES | Feature supported | Reports / Soft W Lock | R |
| 18 | FEATURES | Feature selected | Reports / Soft W Lock | R/W |
| 19 | CYCLE_TYPE | Cycle type | Scheduled / Block Execution | R |
| 20 | CYCLES_SEL | Cycle selected | Scheduled / Block Execution | R/W |
| 21 | MIN_CYCLE_T | Min cycle time | 1600 1/32 msec (50ms) | R |
| 22 | MEMORY_SIZE | Memory size | | R |
| 23 | NV_CYCLE_T | Non-volatile cycle time | | R |
| 24 | FREE_SPACE | Free space | | R |
| 25 | FREE_TIME | Free time | | R |
| 26 | SHED_RCAS | | | R/W |
| 27 | SHED_ROUT | | | R/W |
| 28 | FAULT_STATE | Fault state | | R |

| Index | Parameter | Description | Default | R/W |
|-------|--------------|------------------------------|---------------|-----|
| 29 | SET_FSTATE | Set fault state | 1 | R/W |
| 30 | CLR_FSTATE | Clear fault state | 1 | R/W |
| 31 | MAX_NOTIFY | Max notifications | 20 | R |
| 32 | LIM_NOTIFY | Limit of notification | 8 | R/W |
| 33 | CONFIRM_TIME | Confirmation time | 640000 1/32ms | R/W |
| 34 | WRITE_LOCK | Write locking | 1 (Unlocked) | R/W |
| 35 | UPDATE_EVT | Unacknowledged | 0 | R/W |
| | | Update state | 0 | R |
| | | Time stamp | 0 | R |
| | | Static revision | 0 | R |
| | | Relative index | 0 | R/W |
| 36 | BLOCK_ALM | Unacknowledged | | R/W |
| | | Alarm state | | R |
| | | Time stamp | | R |
| | | Sub-code | | R |
| | | Value | | R |
| 37 | ALARM_SUM | Current | | R |
| | | Unacknowledged | | R |
| | | Unreported | | R |
| | | Disabled | | R/W |
| 38 | ACK_OPTION | Automatic acknowledge option | 0 (Disabled) | R/W |
| 39 | WRITE_PRI | Write priority | 0 | R/W |
| 40 | WRITE_ALM | Unacknowledged | | R/W |
| | | Alarm state | | R |
| | | Time stamp | | R |
| | | Sub-code | | R |
| | | Value | | R |
| 41 | ITK_VER | ITK_version | 4 | R |
| 42 | DEVICE_LOCK | Keyboard lock | 0 (Unlocked) | R/W |

Communication Fieldbus / Device

Transducer Block (TB)

Configuration

In the Transducer Block you can configure the device via Fieldbus. The required parameters are listed in the table on Pg 96.

Calibration

With 3 parameters, product calibration for pH and ORP can be performed via Fieldbus.

pH product calibration via Fieldbus.

1. Set CAL_SAMPLE_PRD_PH parameter to sample.
The device stores the pH value of the sample.
After the writing, the parameter is automatically reset to NOP.
2. Read out CAL_SAMPLE_PRD_PH_STORED_VAL parameter.
It contains the stored value.
3. Write lab value of the sample in the CAL_PRODUCT_PH parameter.
The CAL_SAMPLE_PRD_PH_STORED_VAL parameter is reset to zero. Now the device is calibrated.

Note:

When step 1 has been performed directly on the site on the device, the operation on the Fieldbus as described in point 1 is omitted.

ORP product calibration via Fieldbus

Same as for pH - only that ORP parameters must be used.

The calibration values can also be entered directly in the CAL_SLOPE_PH, CAL_ZERO_PH, and CAL_ZERO_ORP parameters.

Error messages

The LAST_ERROR parameter always indicates the last error:

- 01 pH electrode
- 02 Redox electrode
- 03 Temperature probe
- 33 Glass electrode
- 34 Reference electrode
- 98 System error
- 99 Factory settings

If now a "BAD" status occurs for the OUT_Value in the Analog Input, the user can take this parameter to draw conclusions about the problem.

For bus parameters of transducer block, see Pg 96.

Communication Fieldbus / Device

Bus Parameters of Standard Transducer Block (TB)

| Index | Parameter | Description | |
|-------|----------------------|--|--|
| 1 | ST_REV | The revision of the static data associated with the function block. Used by the host to determine when to re-read the static data. | |
| 2 | TAG-DESC | The user description of the intended application of the block. | |
| 3 | STRATEGY | The strategy field can be used to identify a grouping of blocks. Can be used for any purpose by the user. | |
| 4 | ALERT_KEY | Identification number that may be used by the host system to sort alarms and other device information. | |
| 5 | MODE_BLK | Allows the user to set the Target, Permitted, and Normal device mode. Displays the actual mode. Target Actual Permitted Normal | |
| 6 | BLOCK_ERR | Reflects the error status associated with the hardware or software of the block. It is a bit string so multiple errors may be shown. | |
| 7 | UPDATE_EVENT | Unacknowledged Update State Time Stamp Static Rev Relative Index | |
| 8 | BLOCK_ALM | Unacknowledged Alarm State Time Stamp Sub-code Value | |
| 9 | TRANSDUCER_DIRECTORY | Directory that specifies the number and the starting indices of the transducers in the transducer block. | |

| | Default Value | R/W | Bytes | Data type | Range |
|--|--|------------------------|-----------------------|-----------|-------|
| | The revision value is incremented every time a static parameter in the block is changed. | R | 2 | | |
| | Text | R/W | 32 | | |
| | Default=0 | R/W | 2 | | |
| | Default=0 | R/W | 1 | | |
| | Available Modes: Automatic, Out Of Service (OOS), Manual | R/W R R/W R/W | 1 1 1 1 | | |
| | | R | 2 | | |
| | 0 0 0 0 0 | R | 1 1 8 2 2 | | |
| | 0 0 0 0 0 | R | 1 1 8 2 1 | | |
| | | R | 4 | | |

Communication Fieldbus / Device

Bus Parameters of Standard Transducer Block (TB)

| Index | Parameter | Description | |
|---|------------------------|---|-----------------|
| 10 | TRANSDUCER_TYPE | Identifies the transducer type. | |
| 11 | XD_ERROR | A transducer block sub-code. XD_ERROR contains the highest priority alarm that has been activated in the TB_DETAILED_STATUS parameter. | |
| 12 | COLLECTION_DIRECTORY | A directory that specifies the number, starting indices, and DD item of ID's of the data collection in each transducer within a transducer block. Used by the host for efficient transfer of information. | |
| Knick-Specific Parameters – Output | | | |
| 13 | PRIMARY_VALUE_TYPE | pH/ORP | |
| 14 | PRIMARY_VALUE | The pH value and status: | Value Status |
| 15 | PRIMARY_VALUE_RANGE | Shows the range of the pv High Range Low Range Unit Index Decimal Point | |
| 16 | SENSOR_TYPE_PH | e.g. Glass, ISFET | |
| 17 | SENSOR_MV | Sensor output in mV | |
| 18 | SECONDARY_VALUE_1 | Process ORP value and status | Value Status |
| 19 | SECONDARY_VALUE_UNIT_1 | | |
| 20 | ISO_POTENTIAL | Isopotential pH value | |
| 21 | SECONDARY_VALUE_2 | Process temperature value and status | Value Status |

| | Default Value | R/W | Bytes | Data type | Range |
|--|--------------------------------|------------------|------------------|-----------|------------------------|
| | 65535 = other | R | 2 | | |
| | 0 | R | 1 | | |
| | | R | 36 | | |
| | | | | | |
| | 0 = pH | R/W | 2 | uns 16 | 0 = pH 1 = ORP |
| | | R | 4 1 | DS-65 | |
| | 16pH -2pH 1422 (pH) 2 | R R R R | 4 4 2 1 | DS-68 | -2 ... +16 |
| | 0 = Glass | R/W | 2 | uns 16 | 0 = Glass 1 = ISFET |
| | | R | 2 | float | |
| | | R R | 4 1 | DS-68 | -1500...1000mV |
| | 1243 = mV | R | 2 | uns 16 | |
| | 7.00 pH | R | 4 | float | |
| | | R R | 4 1 | DS-65 | -20 ... +200 °C |

Communication Fieldbus / Device Bus Parameters of Standard Transducer Block (TB)

| Index | Parameter | Description |
|--|-----------------------------|---|
| Knick-Specific Parameters – Temperature | | |
| 22 | SECONDARY_VALUE_UNIT_2 | Degree C or degree F. Changes the unit of temperature being displayed and transmitted. |
| 23 | TEMP_SENSOR_COMP | Indicates manual or automatic temperature compensation. Turns automatic pH sensor temp. compensation on and off. |
| 24 | TEMP_SENSOR_MAN_VALUE | Temperature value used in manual temp. compensation mode. The constant temp. value used to calculate pH in the manual temp. compensation mode |
| 25 | TEMP_SENSOR_CALIB | Indicates manual or automatic mode of temperature measurement for calibration. |
| 26 | TEMP_SENSOR_CALIB_MAN_VALUE | Temperature value used in manual temp. compensation for calibration. |
| 27 | TEMP_SENSOR_TYPE | Type of temperature sensor. The value entered must correspond to the temp. element in the pH sensor being used. |
| 28 | TEMPERATURE_COEFF | Rate of change of solution pH with temp, used for solution pH temp. compensation. CAL_MAN_PH_POINT_1 Entering a value augments the temp. compensation to correct for changes in the actual solution pH with temp. This value should correspond to the known temperature characteristics of the process solution. |

| | Default Value | R/W | Bytes | Data type | Range |
|--|--|-----|-------|-----------|---|
| | 1001 = °C | R/W | 2 | uns16 | 1001 = °C 1002 = °F |
| | 0 = Automatic | R/W | 1 | uns8 | 0 = Automatic 1 = Manual |
| | | R/W | 4 | float | -20 ... +200 °C |
| | 0 = Automatic | R/W | 1 | uns8 | 0 = Automatic 1 = Manual |
| | | R/W | 4 | float | -20 ... +200 °C |
| | 128 = Pt1000 | R/W | 2 | uns16 | 128 = Pt1000 200 = Pt100 1000 = NTC30 1001 = NTC8.55 |
| | Typically 0.00, unless solution pH temperature compensation is being used. | R/W | 4 | float | -19.99...+19.99 |

Communication Fieldbus / Device

Bus Parameters of Standard Transducer Block (TB)

| Index | Parameter | Description |
|--|---------------------|--|
| Knick-Specific Parameters – Temperature | | |
| 29 | TEMP_WIRE_IMPEDANCE | Sets the wire impedance of the temp. sensor. Typically 0 unless the wire of the sensor gets too long. |
| 30 | TEMP_SENSOR_CAL | Desired temperature reading, used for temperature measurement calibration. The temp. value entered for a single point temp. standardization. |
| Knick-Specific Parameters – Impedance | | |
| 31 | GLASS_IMPEDANCE | Sensor glass electrode impedance Value Status |
| 32 | REFERENCE_IMPEDANCE | Sensor reference electrode impedance Value Status |
| Knick-Specific Parameters – Calibration | | |
| 33 | CAL_MAN_PH_POINT_1 | pH of buffer solution used in a manual buffer calibration. |
| 34 | CAL_MAN_PH_POINT_2 | pH of buffer solution used in a manual buffer calibration. |
| 35 | CAL_SLOPE_PH | The slope of the pH electrode in % |
| 36 | CAL_ZERO_PH | The zero offset resulting from a buffer calibration or a standardization |

| | Default Value | R/W | Bytes | Data type | Range |
|--|---|--------|--------|-----------|--------------|
| | 0 Ohm | R/W | 4 | float | 0...1000Ohm |
| | | R/W | 4 | float | -10...+10K |
| | | R R | 4 1 | DS-65 | 0...2000MOhm |
| | | R R | 4 1 | DS-65 | 0...200kOhm |
| | | R/W | 4 | float | -2 ... +16pH |
| | | R/W | 4 | float | -2 ... +16pH |
| | Theoretical value is 100% = 59.16mV/pH, but the actual value is determined by a 2 point buffer calibration. | R/W | 4 | float | 80 ... 103% |
| | Theoretical value is 0.00 mV, but actual value will depend upon the characteristics of the pH sensor field -60mV ... +60mV. | R/W | 4 | float | -60...+60mV |

Communication Fieldbus / Device

Bus Parameters of Standard Transducer Block

| Index | Parameter | Description | |
|--|-------------------------------|---|--|
| Knick-Specific Parameters – Calibration | | | |
| 37 | CAL_OFFSET_ISFET | Sets the offset of the ISFET. | |
| 38 | CAL_ZERO_ORP | The zero offset resulting from a buffer calibration. | |
| 39 | CALIBRATION_TIMER | Sets the calibration timer (time in which the device should be calibrated). | |
| 40 | CALIBRATION_MODE | Sets the calibration mode. | |
| 41 | CALIBRATION_MODE_BUFFER | Sets the buffer set for CALIBRATION_MODE. = BUF | |
| 42 | CAL_SAMPLE_PRD_PH | Starts the 1st part of pH-product calibration. | |
| 43 | CAL_SAMPLE_PRD_PH_STORED_VAL | Shows the stored value of the first step of pH-product calibration | |
| 44 | CAL_PRODUCT_PH | Sets the value for the 2nd part of pH-product calibration. | |
| 45 | CAL_SAMPLE_PRD_ORP | Starts the 1st part of ORP-product calibration. | |
| 46 | CAL_SAMPLE_PRD_ORP_STORED_VAL | Shows the stored value of the first step of ORP-product calibration | |
| 47 | CAL_PRODUCT_ORP | Sets the value for the 2nd part of ORP-product calibration. | |

| | Default Value | R/W | Bytes | Data type | Range |
|--|--|-----|-------|-----------|--|
| | | R/W | 4 | float | -200...+200mV |
| | The zero offset resulting from a buffer calibration. | R/W | 4 | float | -700...+700mV |
| | 0000 h = disable | R/W | 4 | float | 0 ... 9999h |
| | 0 = BUF | R/W | 1 | uns8 | 0 = BUF 1 = MAN 2 = DAT |
| | 1 = - 01 - BUF | R/W | 1 | uns8 | 1 = - 01 - BUF 2 = - 02 - BUF 3 = - 03 - BUF 4 = - 04 - BUF 5 = - 05 - BUF 6 = - 06 - BUF 7 = - 07 - BUF |
| | 0 = Nop | R/W | 1 | uns8 | 0 = Nop 1 = Sample |
| | 0 if step 1 of product calibration was not started | R | 4 | float | -2 ... +16pH |
| | pH | R/W | 4 | float | -2 ... +16pH |
| | 0 = Nop | R/W | 1 | uns8 | 0 = Nop 1 = Sample |
| | 0 if step 1 of product calibration was not started | R | 4 | float | -1500...+1000mV |
| | ORP | R/W | 4 | float | -1500...+1000mV |

Communication Fieldbus / Device

Bus Parameters of Standard Transducer Block (TB)

| Index | Parameter | Description | |
|---|------------------|--|--|
| Knick-Specific Parameters – Alert | | | |
| 48 | SENSOCHECK | Enables or disables Sensocheck. | |
| 49 | ALARM_LED_MODE | Sets the LED blink behavior to HOLD-Mode. | |
| 50 | LAST_ERROR | Shows the last Error. | |
| 51 | SENSOFACE_STATUS | Shows the current status of the Sensoface. | |
| Knick-Specific Parameters – Identification and Local Parameter Setting | | | |
| 52 | SW_REV_LEVEL | Software revision number | |
| 53 | HW_REV_LEVEL | Hardware revision number | |

| | Default Value | R/W | Bytes | Data type | Range |
|--|---------------|-----|-------|-----------|------------------------------------|
| | | | | | |
| | 0 = Off | R/W | 1 | uns8 | 0 = Off 1 = On |
| | 0 = Off | R/W | 1 | uns8 | 0 = Off 1 = On |
| | 0 = None | R | 2 | uns8 | 0...100 |
| | 0 = Good | R | 1 | uns8 | 0 = Good 1 = Neutral 2 = Bad |
| | | | | | |
| | | R | 2 | uns8 | |
| | | R | 1 | uns8 | |

Communication Fieldbus / Device

Analog Input Blocks (AI) of Stratos FF 2231 X pH

Setting the operating mode

The following operating modes can be set in the MODE_BLK parameter:

- OOS
- MAN
- Auto

When there is no write protection, the OOS mode allows unlimited access to all parameters.

Selecting the process variables and units

The Stratos FF 2231 X pH provides 3 Analog Input blocks. The respective process variable can be selected in the CHANNEL parameter.

The corresponding measurement unit is selected in the UNITS subparameter of the XD_SCALE parameter.

The following variables are available:

| | | |
|-----------|---------------------|---------|
| CHANNEL 1 | pH | pH |
| CHANNEL 2 | ORP | mV |
| CHANNEL 3 | Temperature | °C / °F |
| CHANNEL 4 | Glass impedance | MOhm |
| CHANNEL 5 | Ref. impedance | kOhm |
| CHANNEL 6 | Slope | % |
| CHANNEL 7 | Asymmetry potential | mV |

Linearization types

The input value can be linearized in the AI with the LIN_TYPE parameter:

• Direct

The measured value is directly led from the Transducer block to the Analog Input block, avoiding the linearization function.

Here, you must make sure that the units in the XD_SCALE and OUT_SCALE parameters are identical.

- **Indirect**

Here, the measured value of the TB is linearly scaled over the input scale (XD_SCALE) to the output scale (OUT_SCALE).

- **Indirect Square Root**

The input value is rescaled over the XD_SCALE parameter and recalculated using a root function. Then the value is further scaled to OUT_SCALE.

Diagnostics

The BLOCK_ERR parameter indicates the current block status.

Alarm handling

The process control system receives the alarm status via the BLOCK_ALM parameter. In the ACK_OPTION parameter you specify whether an alarm must be acknowledged via the control system.

Block alarms

An AI can generate the following block alarms via the BLOCK_ERR parameter:

- Simulate Active
- Block Configuration Error
- Input Failure
- Out Of Service

Limit alarms

If a measured value falls below or exceeds the defined limit in the AI block OUT parameter, the control system is alerted.

The following limit parameters are defined:

- HI_HI_LIM
- LO_LIM
- HI_LIM
- LO_LO_LIM

The behavior is defined by the respective priorities.

Examples of alarm handling in the Stratos FF 2231 X pH

Example 1: Device failure ERR 98

During pH measurement a device failure occurs. The measured value is given the BAD_DEVICE_FAILURE status. The BLOCK_ERROR parameter (Diagnostics parameter of AI) changes to INPUT_FAILURE. The Analog Input Block generates the "Input Failure" block alarm. When the LAST_ERROR parameter is read out in the Transducer Block, the Err 98 error is detected.
Measure: Replace device

Example 2: Calibration timer expired

(Prerequisite: The CALIBRATION_TIMER parameter has been set to a value > 0 or the cal timer interval has been preset on the device to a time > 0 s.) If the calibration timer has expired, the measured-value status changes to UNCERTAIN_SENSOR_CONVERSION_NOT_ACCURATE (see Pg. 120). To see how far the calibration timer has expired, the SENSOFACE_STATUS parameter can be read out in the TB (Good, Neutral = 80% expired, Bad = 100% expired).
Measure: Calibration

Example 3: Slope error

After a product calibration the measured value is given the UNCERTAIN_SENSOR_CONVERSION_NOT_ACCURATE status (zero and/or slope and/or response of the electrode are not okay) (see Pg. 120).
Measure: Replace electrode.

Alarm diagnostics / Bus parameters

In the case of an alarm the following bus parameters must be evaluated:

- AI block OUT parameter (currently measured value)
- TD LAST_ERROR parameter (error indication 1 ... 100)
- TD SENSOFACE_STATUS parameter
(0 = Good, 1 = Neutral, 2 = Bad)


Communication Fieldbus / Device Bus Parameters / Analog Input Blocks

| Index | Parameter | Description | Default | R/W |
|-------|-------------|--------------------------|-----------|-----|
| 1 | ST_REV | Static Revision | 0 | R |
| 2 | TAG_DESC | TAG Description | | R/W |
| 3 | STRATEGY | Strategy | 0 | R/W |
| 4 | ALERT_KEY | Alert Key | 0 | R/W |
| 5 | MODE_BLK | Target | OOS | R/W |
| | | Actual | - | |
| | | Permitted | OOS, Auto | |
| | | Normal | Auto | |
| 6 | BLOCK_ERR | Block Error | | R |
| 7 | PV | Process Value | | R |
| | | Status | | R |
| 8 | OUT | Measured Value | | R |
| | | Status | | R |
| 9 | SIMULATE | Simulate Status | | R/W |
| | | Simulate Value | | R/W |
| | | Transducer Status | | R |
| | | Transducer Value | | R |
| | | Simulate Enable/ Disable | | R/W |
| 10 | XD_SCALE | High Range | 100 | R/W |
| | | Low Range | 0 | R/W |
| | | Units Index | 0 | R/W |
| | | Decimal Point | 0 | R/W |
| 11 | OUT_SCALE | High Range | 100 | R/W |
| | | Low Range | 0 | R/W |
| | | Units Index | 0 | R/W |
| | | Decimal Point | 0 | R/W |
| 12 | GRANT_DENY | Grant | 0 | R/W |
| | | Deny | 0 | R/W |
| 13 | IO_OPTS | IO Block Options | 0 | R/W |
| 14 | STATUS_OPTS | Status Options | | |
| 15 | CHANNEL | Channel | 1 | R/W |
| 16 | L_TYPE | Linearization type | 0 | R/W |
| 17 | LOW_CUT | Low Cut Off | 0 | R/W |
| 18 | PV_TIME | Filter Time | 0 | R/W |
| 19 | FIELD_VAL | Percent Value | | R |
| | | Status | | R |
| 20 | UPDATE_EVT | Unacknowledged | 0 | R/W |
| | | Update State | 0 | R |
| | | Time Stamp | 0 | R |
| | | Static Revision | 0 | R |
| | | Relative Index | 0 | R |

| Index | Parameter | Description | Default | R/W |
|-------|------------|------------------------------|---------|-----|
| 21 | BLOCK_ALM | Unacknowledged | 0 | R/W |
| | | Alarm State | 0 | R |
| | | Time Stamp | 0 | R |
| | | Subcode | 0 | R |
| 22 | ALARM_SUM | Current | 0 | R |
| | | Unacknowledged | 0 | R |
| | | Unreported | 0 | R |
| | | Disabled | 0 | R/W |
| 23 | ACK_OPTION | Automatic Acknowledge Option | 0 | R/W |
| 24 | ALARM_HYS | Alarm Hysteresis | 0.50% | R/W |
| 25 | HI_HI_PRI | High High Priority | 0 | R/W |
| 26 | HI_HI_LIM | High High Limit | INF | R/W |
| 27 | HI_PRI | High Priority | 0 | R/W |
| 28 | HI_LIM | High Limit | INF | R/W |
| 29 | LO_PRI | Low Priority | 0 | R/W |
| 30 | LO_LIM | Low Limit | - INF | R/W |
| 31 | LO_LO_PRI | Low Low Priority | 0 | R/W |
| 32 | LO_LO_LIM | Low Low Limit | - INF | R/W |
| 33 | HI_HI_ALM | Unacknowledged | 0 | R/W |
| | | Alarm State | 0 | R |
| | | Time Stamp | 0 | R |
| | | Subcode | 0 | R |
| 34 | HI_ALM | Value | 0 | R |
| | | Unacknowledged | 0 | R/W |
| | | Alarm State | 0 | R |
| | | Time Stamp | 0 | R |
| 35 | LO_ALM | Subcode | 0 | R |
| | | Value | 0 | R |
| | | Unacknowledged | 0 | R/W |
| | | Alarm State | 0 | R |
| 36 | LO_LO_ALM | Time Stamp | 0 | R |
| | | Subcode | 0 | R |
| | | Value | 0 | R |
| | | Unacknowledged | 0 | R/W |
| | | Alarm State | 0 | R |
| | | Time Stamp | 0 | R |
| | | Subcode | 0 | R |
| | | Value | 0 | R |

Communication Fieldbus / Device

Cyclic measured value status

| Priority | Quality | Sub-status | Bin coding without limit bits | Hex coding |
|---|----------------|--------------------------------|-------------------------------------|---------------|
| Low  High | Good | Good non-specific | 10 00 00 00 | 0 x 80 |
| | | Good active advisory alarm | 10 00 10 xx | 0 x 88 |
| | | Good active critical alarm | 10 00 11 xx | 0 x 8C |
| | Uncertain | Uncertain non-specific | 01 00 00 xx | 0 x 40 |
| | | Last Usable Value (LUV) | 01 00 01 xx | 0 x 44 |
| | | Substitute set | 01 00 10 xx | 0 x 48 |
| | | Initial value | 01 00 11 xx | 0 x 4C |
| | | Sensor conversion not accurate | 01 01 00 xx | 0 x 50 |
| | | Engineering unit violation | 01 01 01 xx | 0 x 54 |
| | | Sub-normal | 01 01 10 xx | 0 x 58 |
| | | Bad | Non-specific | 00 00 00 xx |
| | Sensor failure | | 00 01 00 xx | 0 x 10 |
| | Device value | | 00 00 11 xx | 0 x 0C |
| | Out of service | | 00 01 11 xx | 0 x 1C |

The respective status bit is set when the condition occurs. It is reset as soon as the condition does not exist any more.

Limit bits

| Bin coding of limit bits | Meaning of limit bits |
|--------------------------|-----------------------|
| 00 | ok |
| 01 | Low limited |
| 10 | High limited |
| 11 | Constant |

When the measured-value status is "bad", the AI block BLOCK_ERR parameter indicates an "Input Failure".

Operating states / Measured value status

| Operating state (Activation) | Red LED | Time out | Status AI pH | |
|---|--------------------|----------|---------------------------------------|--|
| Measuring | live | - | good | |
| Cal Info (cal) 0000 | live | 20 s | good | |
| Error Info (meas + cal) 0000 | live | 20 s | good | |
| Configuration (meas + cal) 1200 | Hold ¹⁾ | 20 min | uncertain last usable value | |
| ISFET calibration (cal) 1001 | Hold ¹⁾ | - | uncertain last usable value | |
| pH calibration (cal) 1100 | Hold ¹⁾ | - | uncertain last usable value | |
| ORP calibration (cal) 1109 | Hold ¹⁾ | - | uncertain last usable value | |
| Temp probe adjust- ment (cal) 1015 | Hold ¹⁾ | - | uncertain last usable value | |
| Product calibration (pH +ORP) Step 1 (cal) 1105 | live | - | good | |
| Step 2 (cal) 1105 | Hold ¹⁾ | - | uncertain last usable value | |
| Sensor monitor (meas + cal) 2222 | live | 20 min | good | |

| | Status AI ORP | Status AI Temp | Status glass impedance AI R _{glass} | Status reference impedance AI R _{ref} |
|--|---------------------------------------|---------------------------------------|---|---|
| | good | good | good | good |
| | good | good | good | good |
| | good | good | good | good |
| | uncertain last usable value | uncertain last usable value | uncertain last usable value | uncertain last usable value |
| | uncertain last usable value | uncertain last usable value | uncertain last usable value | uncertain last usable value |
| | uncertain last usable value | uncertain last usable value | uncertain last usable value | uncertain last usable value |
| | uncertain last usable value | uncertain last usable value | uncertain last usable value | uncertain last usable value |
| | uncertain last usable value | uncertain last usable value | uncertain last usable value | uncertain last usable value |
| | good | good | good | good |
| | uncertain last usable value | uncertain last usable value | uncertain last usable value | uncertain last usable value |
| | good | good | good | good |

1) LED flashes when "HOLD ON" has been set (see Pg 67).








Error messages / Measured value status

| Error | Display | Problem Possible causes | Sensoface | Red LED | |
|---------------|------------------------|--|-----------|---------|--|
| ERR 99 | "FAIL" flashes | Factory settings EEPROM or RAM defective This error message only occurs in the case of a total defect. The device must be repaired and recalibrated at the factory. | | X | |
| ERR 98 | "Conf" flashing | System error Configuration or calibration data defective; completely reconfigure and recalibrate the device. Memory error in device program | | X | |
| ERR 01 | Measured value flashes | pH electrode Electrode defective <ul style="list-style-type: none"> • Too little electrolyte (electrode) • Electrode not connected • Break in electrode cable • Incorrect electrode connected • Value measured for: pH < -2 or > 16 | | X | |
| ERR 02 | Measured value flashes | Redox electrode <ul style="list-style-type: none"> • Electrode defective • Electrode not connected • Break in electrode cable • Incorrect electrode connected • Electrode potential < -1500 mV or > 1000 mV | | | |

| | Status AI pH | Status AI ORP | Status AI Temp | Status glass impedance AI R _{glass} | Status reference impedance AI R _{ref} |
|--|------------------------------|------------------------------|------------------------------|---|---|
| | bad device_failure | bad device_failure | bad device_failure | bad device_failure | bad device_failure |
| | bad device_failure | bad device_failure | bad device_failure | bad device_failure | bad device_failure |
| | bad sensor_failure | good | good | good | good |
| | good | bad sensor_failure | good | good | good |

Error messages / Measured value status

Also see Sensoscheck / Sensoface, Pg 88

| Error | Display flashes | Problem Possible causes | Sensoface | Red LED | |
|--------|--|---|-----------|---------|--|
| ERR 03 |  flashes | Temperature probe Open or short circuit Temperature range exceeded: < -10°C, -20°C / > 130°C, 150°C, 200°C | | X | |
| ERR 33 |  | Sensoscheck glass el (not for ISFET) | X | X | |
| ERR 34 |  | Sensoscheck ref el | X | X | |
| |  | Zero point • Zero error | X | | |
| |  | Slope • Slope error | X | | |
| |  | Response time • Response time exceeded | X | | |
| |  | Cal timer • Calibration timer expired | X | | |

| | Status AI pH | Status AI ORP | Status AI Temp | Status glass impedance AI R _{glass} | Status reference impedance AI R _{ref} |
|--|--|--|------------------------------|---|---|
| | bad ¹⁾ sensor_failure | good | bad sensor_failure | bad sensor_failure | bad sensor_failure |
| | bad ¹⁾ sensor_failure | good | good | bad sensor_failure | good |
| | bad ¹⁾ sensor_failure | bad ¹⁾ sensor_failure | good | good | bad sensor_failure |
| | uncertain ²⁾ sensor_ conversion_ not_accurate | good | good | good | good |
| | uncertain ²⁾ sensor_ conversion_ not_accurate | good | good | good | good |
| | uncertain ²⁾ sensor_ conversion_ not_accurate | good | good | good | good |
| | uncertain ³⁾ sensor_ conversion_ not_accurate | good | good | good | good |

1) For pH: when temperature has been set to "Auto".

2) When Sensocheck has been set to "ON"

3) With calibration timer off = 0000h

Product line and accessories

Devices

Stratos FF 2231X pH

Order no.

2231X pH

Mounting accessories

Pipe-mount kit

ZU 0274

Panel-mount kit

ZU 0275

Protective hood

ZU 0276

Further accessories

SixPlug input socket

ZU 0322

(for sensor cable with one coax line)

For more information concerning our sensors and fittings product line please refer to our website or request our "Sensors, Fittings, Accessories" catalog:

Phone: +49 (0)30 - 801 91 - 0

Fax: +49 (0)30 - 801 91 - 200

E-mail: knick@knick.de

The Device Description (DD file) and the Common File Format (CFF file) for network project are included in the shipment.

They can also be downloaded at:

<http://www.knick.de>

Specifications

| | | | |
|---|---|--|---|
| pH/mV input | Input | for glass electrode or ISFET | |
| | Input | Reference electrode | |
| | Input | Redox electrode (ORP) or solution GND for impedance measurement | |
| Measurement / Display range | pH value | -2.00 ... 16.00 | |
| | ORP | -1500 ... +1000 mV | |
| Glass electrode input ¹⁾ | | | |
| Input resistance | > 0.5 x 10 ¹² Ohms | | |
| Input current | < 2 x 10 ⁻¹² A ⁴⁾ | | |
| Reference electrode input ¹⁾ | | | |
| Input resistance | > 1 x 10 ¹⁰ Ohms | | |
| Input current | < 1 x 10 ⁻¹⁰ A ⁴⁾ | | |
| Meas. error ^{1,2,3)} | | | |
| pH value | < 0,02 | TC: 0.002 pH/K | |
| mV value | < 1 mV | TC: 0.1mV/K | |
| Sensor standardization pH¹⁾ | | | |
| Operating modes: | BUF: | pH calibration Calibration with automatic buffer recognition Calimatic: Buffer sets | |
| | | -01- | Mettler-Toledo 2.00/4.01/7.00/9.21 |
| | | -02- | Merck/Riedel de Haen 2.00/4.00/7.00/9.00/12.00 |
| | | -03- | Ciba (94) 2.06/4.00/7.00/10.00 |
| | | -04- | NIST technical 1.68/4.00/7.00/10.01/12.46 |
| | | -05- | NIST standard 1.680/4.008/6.865/9.184 |
| | | -06- | HACH 4.00/7.00/10.18 |
| | | -07- | WTW technical buffers 2.00/4.01/7.00/10.00 |
| | MAN | Calibration with manual entry of individual buffer values | |
| | DAT | Data entry of premeasured electrodes | |
| | PRD | Product calibration | |

Specifications

| | |
|-------------------------------------|--|
| FF communication | FF_H1 (Foundation Fieldbus) |
| Physical interface | To EN 61 158-2 (IEC 1158-2) |
| Address range | 017 ... 246, Factory setting: 026 |
| Mode of operation | Bus-powered device with constant current consumption |
| Supply voltage | FISCO ≤ 17.5 V (trapezoidal or rectangular characteristic) ≤ 24 V (linear characteristic) |
| Current consumption | < 12.7 mA |
| Max. current in case of fault (FDE) | < 21.4 mA |
| FF communication model | Certified to ITK 4.51, DD certified to ITK 4.6 |
| 1 resource block | |
| 1 transducer block | |
| 3 AI function blocks | Selectable: pH, ORP, temperature, R_{glass} , R_{ref} , asymmetry potential, slope |
| Execution time | 50 ms |
| Power output | for operating an ISFET adapter +3 V / 0.5 mA -3 V / 0.5 mA |
| Display | LC display, 7-segment with icons |
| Main display | Character height 17 mm, unit symbols 10 mm |
| Secondary display | Character height 10 mm, unit symbols 7 mm |
| Sensoface | 3 status indicators (friendly, neutral, sad smiley) |
| Mode indicators | 5 mode indicators " meas", " cal", " alarm", " FF communication", " config" |
| Alarm indication | 18 further icons for configuration and messages Red LED in case of alarm or HOLD, user defined |
| Keypad | 5 keys: [cal] [conf] [▶] [▲] [enter] |

Service functions

| | |
|------------------|---|
| Device self-test | Automatic memory test (RAM, ROM, EEPROM) |
| Display test | Display of all segments |
| Last error | Display of last error occurred |
| Sensor monitor | Display of direct, uncorrected sensor signal (resistance/temperature) |

Data retention

Parameters and calibration data > 10 years
(EEPROM)

EMC

| | |
|---------------------------|--|
| Emitted interference: | EN 61326 Class B (residential area) |
| Immunity to interference: | Industry |

USA: FCC: FCC rules part 15/B class A

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

Explosion protection

| | |
|-------|--|
| ATEX: | II 2(1)G EEx ia IIC T4 |
| USA: | 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 |

Nominal operating conditions

| | |
|------------------------|----------------|
| Ambient temperature | -20 ... +55 °C |
| Transport/Storage temp | -20 ... +70 °C |

Specifications

| | |
|--------------|--|
| Enclosure | Molded enclosure made of PBT (polybutylene terephthalate) |
| Color | Bluish gray RAL 7031 |
| Mounting | <ul style="list-style-type: none">• Wall mounting• Pipe mounting: Ø 40 ... 60 mm, □ 30 to 45 mm• Panel mounting, cutout to DIN 43 700 Sealed against panel |
| Dimensions | H 144 mm, W 144 mm, D 105 mm |
| Protection | IP 65/NEMA 4X (USA, Canada: indoor use only) |
| Cable glands | 3 breakthroughs for cable glands M20x1.5, 2 breakthroughs for NPT 1/2" or Rigid Metallic Conduit |
| Weight | Approx. 1 kg |

*) User-defined

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

2) ± 1 count

3) Plus sensor error

4) Doubles every 10 K

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.

| Patent/Application | Title |
|--|---|
| U.S. 6,424,872 | Block Oriented Control System |
| U.S. 6,594,530 | Block Oriented Control System, Cont'd. |
| U.S. App. 09/598,697 | Block Oriented Control System on High Speed Ethernet |
| European Patent App.* 941594.4 | Block Oriented Control System on High Speed Ethernet |
| China Patent App.* 00809263.X | Block Oriented Control System on High Speed Ethernet |
| Hong Kong Patent App.* 2107127.9 | Block Oriented Control System on High Speed Ethernet |
| U.S. App. 10/453596 | Flexible Function Blocks |
| U.S. App. 10/826,576 | System and Method for Implementing Safety Instrumented Systems in a Fieldbus Architecture |
| PCT App. US/04/11616 | System and Method for Implementing Safety Instrumented Systems in a Fieldbus Architecture |
| U.S. 5,909,368 | Process Control System Using a Process Control Strategy Distributed among Multiple Control Elements |
| U.S. 5,333,114 | Field Mounted Control Unit |
| U.S. 5,485,400 | Field Mounted Control Unit |
| U.S. 5,825,664 | Field Mounted Control Unit |
| Japan Patent # 3137643 | |
| Australian Patent # 638507 | |
| Canadian Patent # 2,066,743 | |
| European Patent # 0495001 | |
| Validated in: | |
| UK Patent # 0495001 | |
| France Patent # 0495001 | |
| Germany Patent # 69032954T | |
| Netherlands Patent # 0495001 | |
| U.S. 6,055,633 | Method of Reprogramming Memories in Field Devices Over a Multidrop Network |
| European Patent App.* Publication No. EP1029406A2 | |

Patents/ Intellectual Property Rights

U.S. 6,104,875

Method for Field Programming an Industrial
Process Transmitter

Australian Patent App.*

Publication No. AU9680998A1

The Foundation may acquire or hold patent rights in addition to those listed.

FOUNDATION:

FIELDBUS FOUNDATION, a Minnesota
not-for-profit corporation

Buffer tables

-01- Mettler-Toledo technical buffers

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

Buffer tables

-02- Merck Titrisols, Riedel Fixanals

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

-03-

Ciba (94) buffers

Nominal values: 2.06, 4.00, 7.00, 10.00

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

* Extrapolated

Buffer tables

-04- Technical buffers to NIST

| °C | pH | | | | |
|-----------|-------------------|-------------------------|-------------------|--------------|--------------|
| 0 | 1.67 | 4.00 | 7.11 ₅ | 10.32 | 13.42 |
| 5 | 1.67 | 4.00 | 7.08 ₅ | 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 | 1.67 ₅ | 4.00 | 7.01 ₅ | 10.06 | 12.64 |
| 25 | 1.68 | 4.00₅ | 7.00 | 10.01 | 12.46 |
| 30 | 1.68 | 4.01 ₅ | 6.98 ₅ | 9.97 | 12.30 |
| 35 | 1.69 | 4.02 ₅ | 6.98 | 9.93 | 12.13 |
| 40 | 1.70 | 4.03 | 6.97 ₅ | 9.89 | 11.99 |
| 45 | 1.70 ₅ | 4.04 ₅ | 6.97 ₅ | 9.86 | 11.84 |
| 50 | 1.71 ₅ | 4.06 | 6.97 | 9.83 | 11.71 |
| 55 | 1.72 | 4.07 ₅ | 6.97 | 9.83 * | 11.57 |
| 60 | 1.73 | 4.08 ₅ | 6.97 | 9.83 * | 11.45 |
| 65 | 1.74 | 4.10 | 6.98 | 9.83 * | 11.45 * |
| 70 | 1.75 | 4.13 | 6.99 | 9.83 * | 11.45 * |
| 75 | 1.76 ₅ | 4.14 | 7.01 | 9.83 * | 11.45 * |
| 80 | 1.78 | 4.16 | 7.03 | 9.83 * | 11.45 * |
| 85 | 1.79 | 4.18 | 7.05 | 9.83 * | 11.45 * |
| 90 | 1.80 ₅ | 4.21 | 7.08 | 9.83 * | 11.45 * |
| 95 | | 4.23 | 7.11 | 9.83 * | 11.45 * |

* Extrapolated

-05- NIST standard buffers
 NIST standard (DIN 19266 : 2000-01)

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

Note:

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

Buffer tables

-06- HACH buffers
Nominal value: 4.00, 7.00, 10.18

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

* Values complemented

Buffer values up to 60 °C as specified by Bergmann & Beving
Process AB.

-07- WTW buffers

| °C | pH | | | |
|-----------|-------------|-------------|-------------|--------------|
| 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 | |

FM Control Drawing

Copying of this document and giving it to others and use or connection for the contents, therefore, are forbidden without express authority.

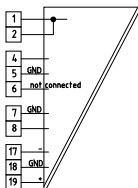
pH Transmitter
Stratos PROFIBUS PA 2221 X pH
Stratos FF 2231 X pH
IS/1/1/ABCD/T4, Ta=55°C; Entity; FISCO
I/1/AEx ib (ia)/IIC/T4, Ta=55°C; Entity; FISCO

Entity Parameters:

Terminals 1/2, 4, 5 and 6

$V_t = 11.8 \text{ V}$
 $I_t = 12 \text{ mA}$
 $P_{\max} = 18 \text{ mW}$

$C_a = 1.47 \mu\text{F}$
 $L_a = 240 \text{ mH}$



Terminals 7 and 8

$V_{oc} = 5.9 \text{ V}$
 $I_{sc} = 3.1 \text{ mA}$
 $P_{\max} = 4.6 \text{ mW}$

$C_a = 43 \mu\text{F}$
 $L_a = 1 \text{ H}$

Terminals 17, 18 and 19

$V_t = 11.8 \text{ V}$
 $I_t = 32.8 \text{ mA}$
 $P_{\max} = 48.4 \text{ mW}$

$C_a = 1.47 \mu\text{F}$
 $L_a = 34 \text{ mH}$

11/14 + Parameters
10/15 - see table 1
9/16 not connected

The intrinsically safe equipment connecting to 1, 2, 4, 5, 6 and 7, 8 must be FM Approved or be simple apparatus, a device which will neither generate nor store more than 1.5 V, 0.1 A, 25 mW.
The intrinsically safe equipment connecting to 17, 18 and 19 must be FM Approved.

pH sensor series InPro 2xxx
pH sensor series InPro 3xxx
pH sensor series InPro 4xxx

cable max 10 m

Metregels sowie Vermeidung flüssiger Überlagerungen, Verwertung und Wirtulung
des Inhalts sind gestattet, wenn nicht ausdrücklich angegeben.

table 1

| Concept | Groups | V _{max} (V) | I _{max} (mA) | P _{max} (W) | C _i (nF) | L _i (µH) |
|---------|----------|----------------------|-----------------------|----------------------|---------------------|---------------------|
| Entity | IIC/ABCD | 24 | 200 | 1.2 | 1.2 | 7 |
| FISCO | IIC/ABCD | 17.5 | 280 | 4.9 | | |

FISCO rules

The FISCO Concept allows the interconnection of intrinsically safe apparatus to associated apparatus not specifically examined in such combination. The criterion for such interconnection is that the voltage (V_{max}), the current (I_{max}) and the power (P) which intrinsically safe apparatus can receive and remain intrinsically safe, considering faults, must be equal or greater than the voltage (U_s, V_{oc}, V_i), the current (I_s, I_{sc}, I_i) and the power (P_s) which can be provided by the associated apparatus (supply unit). In addition, the maximum unprotected residual capacitance (C_i) and inductance (L_i) of each apparatus (other than the terminators) connected to the Fieldbus must be less than or equal to 5 nF and 10 µH respectively.

In each I.S. Fieldbus segment only one active source, normally the associated apparatus, is allowed to provide the necessary power for the Fieldbus system. The allowed voltage (U_s, V_{oc}, V_i) of the associated apparatus used to supply the bus must be limited to the range of 14 V d.c. to 24 V d.c. All other equipment connected to the bus cable has to be passive, meaning that the apparatus is not allowed to provide energy to the system, except to a leakage current of 50 µA for each connected device. Separately powered equipment needs a galvanic isolation to insure that the intrinsically safe Fieldbus circuit remains passive.

The cable used to interconnect the devices needs to comply with the following parameters:

Loop resistance R_L: 15 ... 150 Ω/km

Inductance per unit length L_i: 0.4 ... 1 mH/km

Capacitance per unit length C_i: 80 ... 200 nF/km

C = C' lineline + 0.5 C' linescreen, if both lines are floating

or C = C' lineline + C' linescreen, if the screen is connected to one line

Length of spur Cable: max. 30 m

Length of trunk cable: max. 1 km

Length of splice: max. 1 m

Terminators

At each end of the trunk cable an approved line terminator with the following parameters is suitable:

R = 80 ... 100 Ω

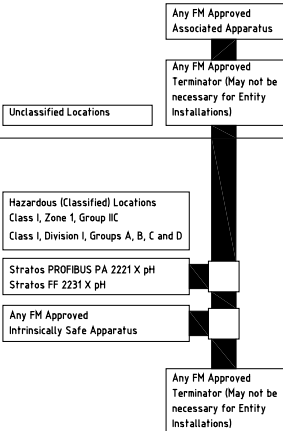
C = 0 ... 2.2 µF

System evaluation

The number of passive devices like transmitters, actuators, connected to a single bus segment is not limited due to I.S. reasons. Furthermore, if the above rules are respected, the inductance and capacitance of the cable need not to be considered and will not impair the intrinsic safety of the installation.

Installation Notes For FISCO and Entity Concepts

- The Intrinsic Safety Entity concept allows the interconnection of FM Approved intrinsically safe devices with entity parameters not specifically examined in combination as a systems when: U_s or V_{oc} or V_i ≤ V_{max}, I_s or I_{sc} or I_i ≤ I_{max}, P_s ≤ P_i, C_i or C_s ≤ C_i or C_s, L_i or L_s ≤ L_i or L_s.
- The Intrinsic Safety FISCO concept allows the interconnection of FM approved intrinsically safe devices with FISCO parameters not specifically examined in combination as a system when: U_s or V_{oc} or V_i ≤ V_{max}, I_s or I_{sc} or I_i ≤ I_{max}, P_s ≤ P_i.
- Dust-tight conduit seals must be used when installed in Class II and Class III environments.
- Control equipment connected to the Associated Apparatus must not use or generate more than 250 Vrms or Vac.
- Installation should be in accordance with ANSI/ISA RP12.06.01 (except chapter 5 for FISCO installations). "Installation of Intrinsically Safe Systems for Hazardous (Classified) Locations" and the National Electrical Code® (ANSI/NFPA 70) Sections 504 and 505.
- The configuration of associated Apparatus must be FM Approved under the associated concept.
- Associated Apparatus manufacturer's installation drawing must be followed when installing this equipment.
- The Stratos PA, Stratos FF Series are Approved for Class 1, Zone 0, applications, if connecting AEx (B) associated Apparatus or AEx Ib I.S. Apparatus to the Stratos PA, Stratos FF Series the I.S. circuit is only suitable for Class 1, Zone 1, or Class 1, Zone 2, and is not suitable for Class 1, Zone 0 or Class 1, Division 1, Hazardous (Classified) Locations.
- No revision to drawing without prior FM Approvals authorisation.
- Simple Apparatus is defined as a device that does not generate more than 15 V, 0.1 A or 25 mW.



| | | | | | | | |
|--|--|------------|--|--------|--|---------------------------------|--|
| Zul. Abweichungen für Maße ohne Toleranzangabe | | Oberfläche | | Maltab | | page 1/2 | |
| ISO 2768 - n | | Datum | | Name | | Benennung | |
| Beerb. | | 19.05.04 | | dam | | Control drawing | |
| Gep./KON) | | | | | | Stratos PROFIBUS PA 2221 (X) pH | |
| Freigabe(FGL) | | | | | | Stratos FF 2231(X) pH | |
| Schutzvermerk nach DIN 34 beachten | | | | | | Zeichnungsnummer | |
| 4. Texte geändert | | 30.11.04 | | gr | | 194.170-170 | |
| 3. Texte Haz. Loc. | | 18.10.04 | | dam | | | |
| 2. Texte | | 06.09.04 | | dam | | | |
| 1. page 2 | | 24.08.04 | | dam | | | |



pH Transmitter
 Stratos PROFIBUS PA 2221 pH
 Stratos FF 2231 pH
 NI/1/2/ABCD/T4, Ta=55°C; FNICO

Entity Parameters:

Terminals 1/2, 4, 5 and 6

$V_t = 11.8 \text{ V}$
 $I_t = 12 \text{ mA}$
 $P_{max} = 18 \text{ mW}$

$C_a = 1.47 \mu\text{F}$
 $L_a = 240 \text{ mH}$

Terminals 7 and 8

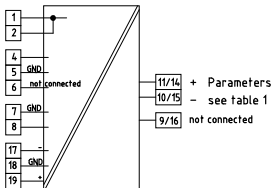
$V_{oc} = 5.9 \text{ V}$
 $I_{sc} = 3.1 \text{ mA}$
 $P_{max} = 4.6 \text{ mW}$

$C_a = 43 \mu\text{F}$
 $L_a = 1 \text{ H}$

Terminals 17, 18 and 19

$V_t = 11.8 \text{ V}$
 $I_t = 32.8 \text{ mA}$
 $P_{max} = 48.4 \text{ mW}$

$C_a = 1.47 \mu\text{F}$
 $L_a = 34 \text{ mH}$



The equipment connecting to 1, 2, 4, 5, 6 and 7, 8 must be FM Approved or be simple apparatus, a device which will neither generate nor store more than 1.5 V, 0.1A, 25 mW.
 The equipment connecting to 17, 18 and 19 must be FM Approved.

pH sensor series InPro 2xxx
 pH sensor series InPro 3xxx
 pH sensor series InPro 4xxx

cable max 10 m

Table 1

| Concept | Groups | V _{max} (V) | C _i (nF) | L _i (µH) |
|---------|--------|----------------------|---------------------|---------------------|
| FNICO | ABCD | 17.5 | 1.2 | 7 |
| Entity | ABCD | 24 | | |

FNICO rules

The FNICO Concept allows the interconnection of non-incendive apparatus to associated non-incendive apparatus not specifically examined in such combination. The criterion for such interconnection is that the voltage (V_{max}), which non-incendive apparatus can receive and remain non-incendive, must be equal or greater than the voltage (V_{oc}) which can be provided by the associated non-incendive apparatus (supply unit). In addition, the maximum unprotected residual capacitance (C_i) and inductance (L_i) of each apparatus (other than the terminators) connected to the Fieldbus must be less than or equal to 5 nF and 20 µH respectively.

In each NI Fieldbus segment only one active source, normally the associated non-incendive apparatus, is allowed to provide the necessary voltage for the Fieldbus system. The allowed voltage (V_{oc}) of the associated non-incendive apparatus used to supply the bus must be limited to the range of 14 V d.c. to 17.5 V d.c. All other equipment connected to the bus cable has to be passive, meaning that the apparatus is not allowed to provide energy to the system, except for a leakage current of 50 µA for each connected device. Separately powered equipment needs a galvanic isolation to insure that the non-incendive Fieldbus circuit remains passive.

The cable used to interconnect the devices needs to comply with the following parameters:

Loop resistance R: 15 - 150 Ω/km
Inductance per unit length L: 0.4 - 1 mH/km

Capacitance per unit length C: 80 - 200 nF/km

C = C' inline + 0.5 C' inline/screen, if both lines are floating

or

C = C' inline + C' inline/screen, if the screen is connected to one line

Length of spur Cable: max. 30 m

Length of trunk cable: max. 1 km

Length of splice: max. 1 m

Terminators

At each end of the trunk cable an approved line terminator with the following parameters is suitable:

R = 80 - 100 Ω

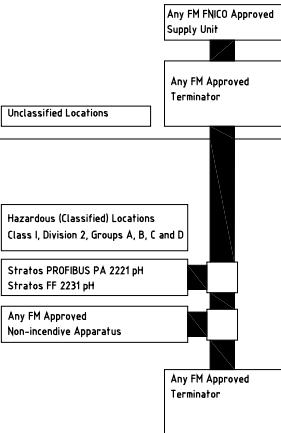
C = 0 - 2.2 µF

System evaluation

The number of passive devices like transmitters, actuators, connected to a single bus segment is not limited due to NI reasons. Furthermore, if the above rules are respected, the inductance and capacitance of the cable need not to be considered and will not impair the non-incendive safety of the installation.

Installation Notes for FNICO

- The Non-incendive concept allows the interconnection of FM Approved Non-incendive devices with parameters not specifically examined in combination as a systems when:
V_{oc} ≤ V_{max}, C_i ≤ C_i and L_i ≤ L_i.
For inductance see either L_i or L_o ≥ Σ(L_i or L_o) or L_o ≤ Σ(L_i or L_o) and L_o ≤ Σ(L_i or L_o)
- The Non-incendive FNICO concept allows the interconnection of FM approved Non-incendive devices with FNICO parameters not specifically examined in combination as a system when:
V_{oc} ≤ V_{max}
- Dust-tight conduit seals must be used when installed in Class II and Class III environments.
- Control equipment connected to the Associated Non-incendive Apparatus must not use or generate more than 250 V_{max} or V_{oc}.
- Installation should be in accordance with the National Electrical Code® (ANSI/NFPA 70) Section 501.
- The configuration of associated Non-incendive Apparatus must be FM Approved under the associated concept.
- Associated Non-incendive Apparatus manufacturer's installation drawing must be followed when installing this equipment.
- No revision to drawing without prior FM Approvals authorisation.



| Verteiler: FOL (2x) | Zd. Abweichungen für Maße ohne Toleranzangabe | Oberfläche | Material | page 2/2 |
|------------------------|---|------------------------------------|----------|---|
| | ISO 2768 - m | | Halbzeug | |
| | Beerb. 19.05.04 | Datum | Name dam | Besennung Control drawing |
| | Gegr./X/N/D Freigeber/FGL) | Schutzvermerk nach DIN 34 beachten | | Stratos PROFIBUS PA 2221 (X) pH Stratos FF 2231 (X) pH |
| 4. Texte geändert | 30.11.04 gr | | | Zeichnungsnummer |
| 3. Texte Haz. Loc. | 18.10.04 dam | | | 194.170-170 |
| 2. Texte | 06.09.04 dam | | | |
| 1. page 2 | 24.08.04 dam | | | |

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 Knick 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. You can conduct either a one or a two-point calibration. With one-point calibration only the asymmetry potential (zero point) is adjusted.

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.

| | |
|--|---|
| Durafet | Durafet combination pH/ORP electrodes consist of an ISFET measuring electrode, a reference electrode, and a temperature probe. |
| Electrode 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. |
| Electrode zero point | See asymmetry potential |
| FISCO model FNICO model | (Fieldbus Intrinsically Safe Concept) (Fieldbus Non Incendive 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. |
| 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. |

Glossary

| | |
|------------------------------|---|
| ISFET adapter | Adapter between Isfet sensor and transmitter. Here, the signal of the pH-sensitive FET is converted to voltage corresponding to the signal of a glass electrode. This voltage is led to the pH input of the Stratos and is processed further as usual. The adapter is directly supplied from the Stratos. |
| 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. |
| pH electrode system | 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. |
| Response time | Time from the start of a calibration step to the stabilization of the electrode potential. |
| Sensocheck | Sensocheck continuously monitors the glass and reference electrodes. The resulting information is indicated by the Sensoface smileys. Sensocheck can be switched off. |

| | |
|------------------------------|--|
| Sensoface | Provides information on the electrode condition. The zero point, slope, and response time are evaluated. In addition, the Sensocheck information is indicated. |
| Slope | See electrode slope |
| 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 adjustment | Basic adjustment of the ISFET electrode to ensure reliable Sensoface information. |
| Zero point | See asymmetry potential |

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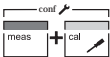
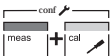
Mode codes

The mode codes allow fast access to the functions

Calibration

| Key + Code | Description | Page |
|---|--|------|
|  0000 | Cal Info Display of zero and slope | 87 |
|  1001 | Zero adjustment (ISFET) Adjusting the nominal zero (ISFET sensor only) | 72 |
|  1100 | pH calibration Adjusting the zero/slope (sensor) | 74 |
|  1009 | ORP calibration Adjusting the oxidation-reduction potential (zero) | 82 |
|  1105 | Product calibration Adjusting the asymmetry potential (zero) | 80 |
|  1015 | Temp probe adjustment | 84 |

Configuration

| Key + Code | Description | Page |
|---|---|------|
|  0000 | Error Info Display last error and erase | 87 |
|  1200 | Configuration | 59 |
|  2222 | Sensor monitor Display of uncorrected electrode potential | 87 |