



Level



Pressure



Flow



Temperature



Liquid
Analysis



Registration



Systems
Components



Services



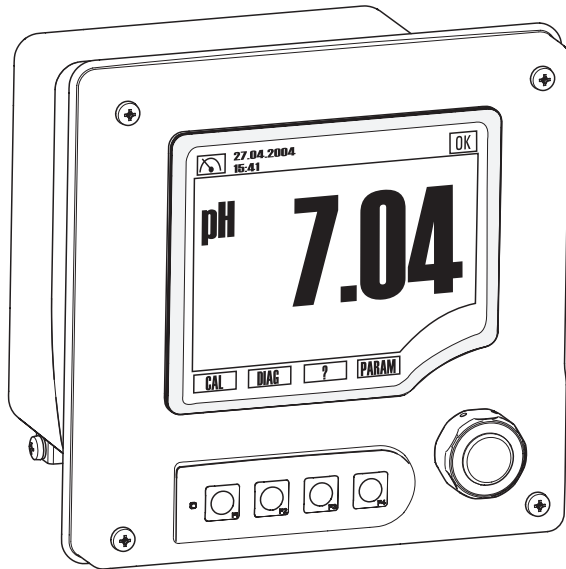
Solutions

Operating Instructions

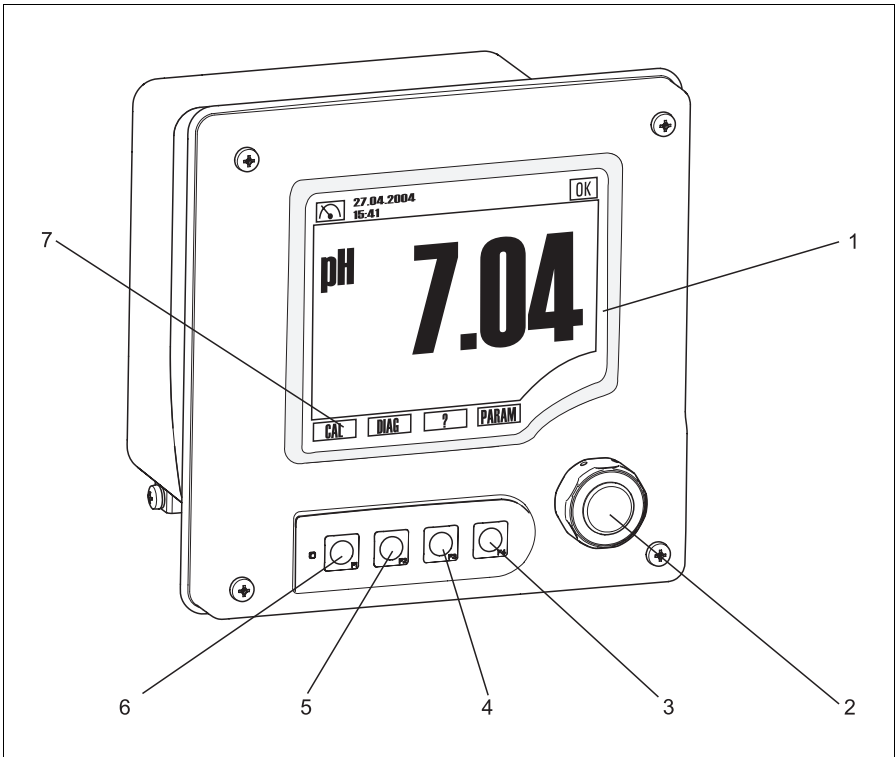
Liquiline M CM42

Two-wire transmitter for pH/redox measurement

Part 2: Operation



Overview of operation



a0001300

Fig. 1: Display and operation

- 1 Display
- 2 Navigator: turn = move cursor, press = select
- 3-6 Function keys: variable assignment depending on the menu in question
- 7 Assignment of the function keys in the menu in question

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1 Operating concept

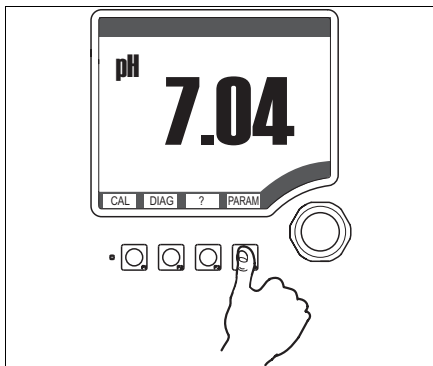


Fig. 2: Press soft key: select menu directly

a0003273

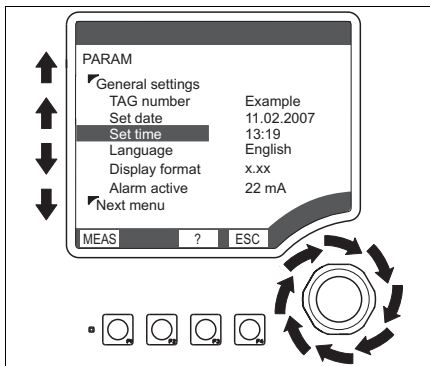


Fig. 3: Turn navigator: move cursor in the menu

a0003259

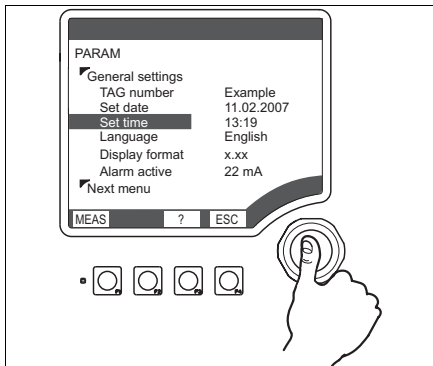


Fig. 4: Press navigator: select a function

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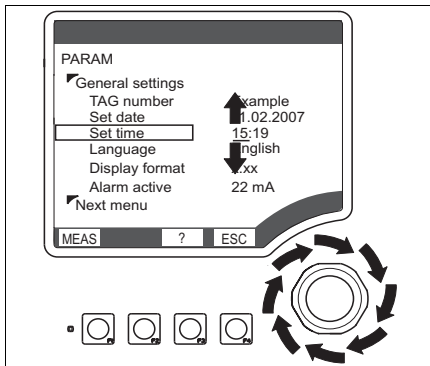


Fig. 5: Turn navigator: change value

a0003260

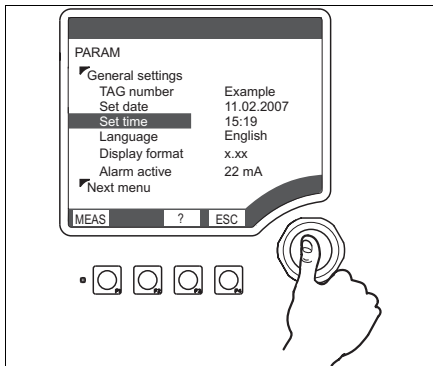


Fig. 6: Press navigator: select new value

a0003277

Operating concept

1. You select a menu directly by pressing the soft key in question.
2. You move the cursor in the menu by turning the navigator.
3. Press the navigator and select the desired function.
4. Change the value by turning the navigator.
5. Press the navigator to accept the new value.

2 Display

2.1 Overview

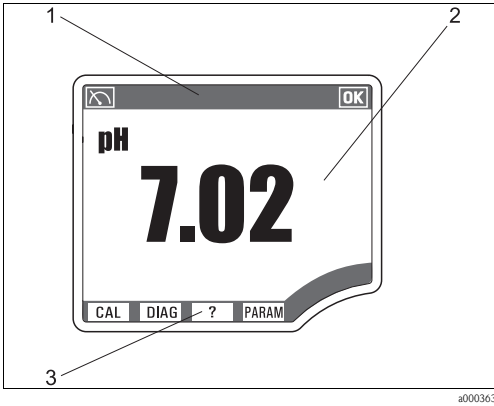


Fig. 7: Local display (measuring mode)

a0003631

- 1 Status line
- 2 Display and configuration field
- 3 Assignment of the soft keys

2.2 Status messages

	Symbol for the measuring menu (MEAS)
	Device status is o.k.. No alarms or warnings are present.
	Service warning. Maintenance is recommended. The device is operational; the reliability of the measured value may be restricted.
	Alarm that points to an error. The device is no longer operational or the measured value is no longer reliable.
17.03.2009 16:59	Date and time display in measuring menu
I 3.68 pH 25 °C	Measured value display in the status line if a menu other than MEAS is launched. The main measured value and the secondary measured value are displayed.
	Hold is set to "ON", the measured value is "frozen".
	Symbol for the simulation mode

3 Measure (MEAS)









Note!

In the measuring menu, you can switch between three different displays. To do so, simply press the enter button of the navigator.

- Meas
 - Main value
 - pH or ORP mV
 - Main value and secondary value
 - pH or ORP mV and temperature
 - All measured values
 - Main value
 - Raw value
 - TAG number
 - Temperature
 - Current output 1
 - Reference impedance
 - Glass impedance





























4 Specifying the parameters (PARAM)

4.1 Menu structure, level 1

-  PARAM
 -  Sensor
 -  Current output
 -  General Settings
 -  Display
 -  Quick Setup


4.2 Sensor

4.2.1 Menu structure

-  PARAM
 -  Sensor
 -  Measurand
 -  Potential equalisation
 -  Sensor type pH
 -  Damping main value
 -  Temperature sensor
 -  CAL settings *(there is no menu or submenus if measurand = ORP mV)*
 -  Type of calibration
 -  Buffer recognition *(only pH)*
 -  Buffer manufacturer *(only pH and if buffer recognition = "Automatic" or "Fixed")*
 -  Temperature adjustment *(there is no menu or submenus if measurand = ORP %)*
 -  Temp. adjustment mode
 -  Current temperature
 -  Temperature offset
 -  Temp. compensation *(only pH)*
 -  Temperature entry *(only if temp. compensation = manual)*
 -  Sensor diagnosis
 -  Diag. functions
 -  Diagnosis list
 -  Diagnosis limits
 -  Reference impedance *(only pH)*
 -  Glass 1 impedance *(only pH)*
 -  Glass 2 impedance *(only pH)*
 -  Slope pH 1 *(only pH)*
 -  Zero point pH 1 *(only pH)*
 -  Slope pH 2 *(only pH)*
 -  Zero point pH 2 *(only pH)*

-  Stable criteria
-  Offset variation (*only ORP*)

4.2.2 Configuration options







Function	Options	Info
Measurand	Options <ul style="list-style-type: none"> ■ pH ■ ORP mV 	Some of the subsequent menus and their options depend on the option selected here.
Potential equalisation	Options <ul style="list-style-type: none"> ■ With PM ■ Without PM 	Indicate whether you want to measure symmetrically (= with PM) or asymmetrically (= without PM).  Note! More information on symmetrical and asymmetrical measurement on the CD-ROM.
Sensor type pH (1)	Options <ul style="list-style-type: none"> ■ Glass 7.0 ■ Glass (internal buffer entry) ■ ISFET 	
Internal buffer entry	-2.0 ... 16.0 pH	Only available if you have selected " Sensor type " = " Glass (internal buffer entry) ".
Damping main value	0.0 ... 60.0 s	
Temperature sensor	Options <ul style="list-style-type: none"> ■ None ■ Pt100 / Pt1000 ■ NTC 30K ■ NTC 3K 	If " Pt100/Pt1000 " is selected, the system automatically detects whether a Pt100 or Pt1000 is connected.
Cal settings		Menu and submenus are not available if you have selected " Measurand " = " ORP mV ".
Type of calibration	Options <ul style="list-style-type: none"> ■ Offset ■ Two point ■ Numeric input 	
Buffer recognition	Options <ul style="list-style-type: none"> ■ Automatic ■ Fixed buffer ■ Manual entry 	If you chose " Manual entry ," you can specify any two buffers of your choice. These must differ in terms of their pH value.
Buffer manufacturer	Options <ul style="list-style-type: none"> ■ E+H (NIST) ■ Ingold/Mettler ■ DIN 19267 ■ DIN 19266 ■ Merck ■ Riedel 	The menu is not available unless the " Buffer recognition " is set to " Automatic " or " Fixed ".
Temperature adjustment		Menu and submenus are not available if you have selected " Measurand " = " ORP mV ".

Function	Options	Info
Temp. adjustment mode	Options <ul style="list-style-type: none"> ■ Single point ■ Two point table 	
Current temperature	-40 ... +250 °C	Only available if you have selected " Temperature adjustment mode " = " Single point ".
Temperature offset	-5 ... +5 °C	
Temperature compensation	Options <ul style="list-style-type: none"> ■ Automat. comp. (ATC) ■ Manual comp. (MTC) ■ Off 	Menu not available if you have selected " Measurand " = " ORP mV ".
Temperature entry	-20 ... +150 °C	Only available if you have selected " Temperature compensation " = " Manual comp. ".
Sensor diagnosis		
Diag. functions	Options <ul style="list-style-type: none"> ■ On ■ Off 	
Diagnosis list	Cannot be edited	See Section "Trouble-shooting"/"Diagnosis messages"
Diagnosis limits		
Reference impedance	Selection and subsequent entry <ul style="list-style-type: none"> ■ Upper alarm value 0.0 ... 1000 kΩ ■ Upper warning value 0.0 ... 1000 kΩ ■ Lower warning value 0.0 ... 1000 kΩ ■ Lower alarm value 0.0 ... 1000 kΩ 	
Glass (1) impedance	Selection and subsequent entry <ul style="list-style-type: none"> ■ Upper alarm value 0.0 ... 10000 kΩ ■ Upper warning value 0.0 ... 10000 kΩ ■ Lower warning value 0.0 ... 10000 kΩ ■ Lower alarm value 0.0 ... 10000 kΩ 	Menu not available if you have selected " Measurand " = " ORP mV ".

Function	Options	Info
Slope pH (1)	Selection and subsequent entry <ul style="list-style-type: none"> ■ Lower warning value ■ Lower alarm value 0.00 ... 99.99 mV/pH	Menu not available if you have selected " Measurand " = " ORP mV ".
Zero point pH (1)	Selection and subsequent entry <ul style="list-style-type: none"> ■ Upper alarm limit ■ Upper warning value ■ Lower warning value ■ Lower alarm value -2 ... 16.00 pH (glass) -1000 ... 1000 mV (ISFET)	
Stable criteria	Selection and subsequent entry <ul style="list-style-type: none"> ■ Bandwidth 0.5 ... 10.0 mV ■ Timeframe 5 ... 60 s 	

4.3 Current output

4.3.1 Menu structure
















-  PARAM
 -  Current output
 -  Current output 1
 -  Output value
 -  Span start 4 mA
 -  Span end 20 mA

4.3.2 Configuration options

Function	Options	Info
Current output 1		
Output value	Options <ul style="list-style-type: none"> ■ pH (1) ■ Temperature 	
Span start 4 mA	-2 ... 11.5 pH	The smallest possible spread between 4 mA and 20 mA value is: 1 for pH, 1 mV for ORP mV
Span end 20 mA	-1.5 ... 16 pH	

4.4 General Settings

4.4.1 Menu structure







-  PARAM
 -  Gen. settings
 -  TAG number
 -  Hold settings
 -  CAL menu
 -  PARAM/Service menu
 -  DIAG menu
 -  Hold delay
 -  Device diagnosis
 -  Device diagnosis
 -  Diagnosis list
 -  Diagnosis limits
 -  User administration
 -  Password protection
 -  Enter code

4.4.2 Configuration options

| Function | Options | Info |
|---------------------|--|--|
| TAG number | Can be edited at random | Max. 32 characters |
| Hold settings | | |
| CAL menu | Options <ul style="list-style-type: none"> ■ Off ■ Last ■ Fixed | If you select " Fixed ", you can enter a value between 4.0 and 20.0 mA. |
| PARAM/Service menu | | |
| DIAG menu | | |
| Hold delay | 0 ... 60 s | |
| Device diagnosis | | |
| Device diagnosis | Options <ul style="list-style-type: none"> ■ Off ■ On | |
| Diagnosis list | | |
| User administration | | |
| Password protection | Options <ul style="list-style-type: none"> ■ None ■ Enter code | |

4.5 Display

4.5.1 Menu structure

-  PARAM
 -  Display
 -  Language
 -  Main value format
 -  Temperature unit
 -  Temperature display format

4.5.2 Configuration options

| Function | Options | Info |
|----------------------------|---|---|
| Language | Options <ul style="list-style-type: none"> ■ English ■ German | If you select a different language, all the other settings remain intact. |
| Main value format | Options <ul style="list-style-type: none"> ■ xx.xx ■ x.xxx | |
| Temperature unit | Options <ul style="list-style-type: none"> ■ °C ■ °F | |
| Temperature display format | Options <ul style="list-style-type: none"> ■ xxx ■ xxx.x | |


4.6 Quick Setup

4.6.1 Menu structure

- PARAM
 - Quick Setup
 - Language
 - TAG number
 - Measurand
 - Potential equalisation
 - Sensor type (only pH)
 - Damping
 - Temperature sensor
 - Temperature unit
 - Buffer manufacturer
 - Temperature compensation
 - Current output 1
 - Span start (4 mA)
 - Span end (20 mA)

4.6.2 Configuration options

| Function | Options | Info |
|------------------------|---|---|
| Language | Options <ul style="list-style-type: none"> ■ English ■ German | If you select a different language, all the other settings remain intact. |
| TAG number | Enter any text | |
| Measurand | Options <ul style="list-style-type: none"> ■ pH ■ ORP mV | |
| Potential equalisation | Options <ul style="list-style-type: none"> ■ With PM ■ Without PM | Indicate whether you want to measure symmetrically (= with PM) or asymmetrically (= without PM).

 Note!
More information on symmetrical and asymmetrical measurement on the CD-ROM. |
| Sensor type pH | Options <ul style="list-style-type: none"> ■ Glass 7.0 ■ Glass (internal buffer entry) ■ ISFET | |
| Internal buffer entry | -2.0 ... 16.0 pH | Only available if you have selected " Sensor type " = " Glass (internal buffer entry) ". |
| Damping | 0.0 ... 60.0 s | Time constant
A value of 5.0 s means that the measured values are interpolated over the period of 5 seconds. |

| Function | Options | Info |
|--------------------------|---|--|
| Temperature sensor | Options <ul style="list-style-type: none"> ■ None ■ Pt100 / Pt1000 ■ NTC 30K ■ NTC 3K | If " Pt100/Pt1000 " is selected, the system automatically detects whether a Pt100 or Pt1000 is connected. |
| Temperature unit | Options <ul style="list-style-type: none"> ■ °C ■ °F | |
| Buffer manufacturer | Options <ul style="list-style-type: none"> ■ E+H (NIST) ■ Ingold/Mettler ■ DIN 19267 ■ DIN 19266 ■ Merck ■ Riedel | The menu is not available unless the buffer recognition is set to " Automatic " or " Fixed " in the PARAM/CAL-settings menu. The factory setting is set here during initial commissioning.

You can define special buffers in the PARAM/CAL-settings menu. |
| Temperature compensation | Options <ul style="list-style-type: none"> ■ Automat. comp. (ATC) ■ Manual comp. (MTC) ■ Off | |
| Temperature entry | -20 ... +150 °C | Only available if you have selected " Temperature compensation " = " Manual comp. ". |
| Current output 1 | | |
| Span start (4 mA) | -2 ... 11.5 pH | The smallest possible spread between 4 mA and 20 mA value is:
1 for pH, 1 mV for ORP mV |
| Span end (20 mA) | -1.5 ... 16 pH | |

5 Device diagnosis (DIAG)



Note!

You can find "Read only" functions in the DIAG function group. *(with the exception of "Service"/"Simulation")*

5.1 Errors/messages

- DIAG
 - Errors/messages

5.2 Sensor status

- DIAG
 - Sensor status

5.3 Output status

- DIAG
 - Output status
 - Current output 1

5.4 Sensor module information

- DIAG
 - Sensor module information
 - Name
 - Serial number
 - Part number
 - Hardware version
 - Software version

5.5 Device information

- 📁 DIAG
 - 📁 Device information
 - 📄 TAG number
 - 📄 Serial number
 - 📄 Order code
 - 📄 Planning
 - 📁 CPU
 - 📄 Name
 - 📄 Serial number
 - 📄 Part number
 - 📄 Hardware version
 - 📄 Software version

5.6 Service

- 📁 DIAG
 - 📁 Service
 - 📁 Simulation
 - 📁 Current output 1
 - 📄 Enter value
 - 📄 On/Off
 - 📁 Service interface
 - 📄 Activate communication
 - 📄 Reset
 - 📁 Device check
 - 📄 Test functions/test result
 - 📄 Start
 - 📁 DAT handling
 - 📄 View data in DAT module
 - 📄 Write data from DAT to device
 - 📄 Write data from device to DAT

6 Calibration (CAL)

Calibration is necessary:

- At initial commissioning
- After replacing a sensor
- After periods of standstill
- At sensible, process-dependent intervals¹).

6.1 Types of calibration

- Automatic buffer recognition (only pH):
 - "PARAM"/"Sensor"/"CAL-settings"/"Buffer manufacturer" or "PARAM"/"Quick Setup"/"Buffer manufacturer"
 - You select the buffer type (e.g. DIN 19266).
 - The device automatically recognises the buffer during calibration.
- Fixed buffer (only pH):
 - "PARAM"/"Sensor"/"CAL-settings"/"Buffer recognition"
 - You define two buffer solutions by entering the appropriate pH values.
- Manual:²)
 - You enter the buffer values during calibration.
- Numeric input:
 - "PARAM"/"Sensor"/"CAL-settings"/"Type of calibration"
 - You enter the slope, zero point and temperature (for pH).
 - You enter the mV value (for ORP).

6.2 Calibrate

Proceed as follows to calibrate the sensor:

1. Go through the menu "Param"/"Quick Setup" completely³).
2. Remove the sensor from the process.
3. Clean the sensor.
4. Press the soft key for "CAL".
5. Follow the instructions in the menu.
6. Finish calibrating by switching back to the measuring mode.

1) Depending on the process conditions, the intervals can range from several times daily to once quarterly.

2) Not available during initial commissioning if you are working with the factory settings.

3) Only for initial commissioning

7. Install the sensor back into the process.

Your measuring point is now ready for operation.



Note!

- If calibration is aborted using ESC, or if the calibration is faulty, the system continues to use the original calibration data. A calibration error is shown as plain text on the display.
- During each calibration, the device automatically switches to Hold (factory setting).
- Any offset set is automatically deleted after accepting the calibration.

6.3 Current values



Note!

In this submenu, you can only read the current calibration data but not edit them.

 CAL

 Current values

7 Maintenance

Clean the front of the housing with usual commercial cleaning agents.

The front is resistant to the following in accordance with DIN 42 115:

- Alcohol (briefly)
- Diluted acids (max. 2% HCl)
- Diluted alkalis (max. 3% NaOH)
- Soap-based household cleaner



Caution!


Never use any of the following for cleaning purposes:

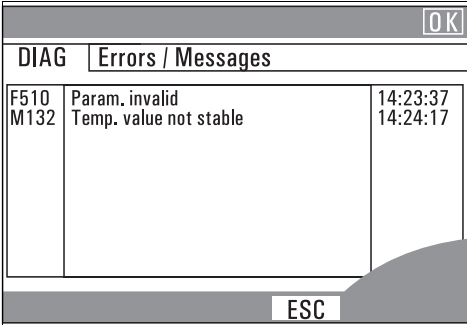
- Concentrated mineral acids or alkalis
- Benzyl alcohol
- Methylene chloride
- High-pressure steam

8 Trouble-shooting

8.1 Trouble-shooting instructions

The transmitter constantly monitors its functions itself.

The red alarm LED lights up if the device detects an error. You can read information on the error in the "DIAG/Error messages" menu →  8.



| DIAG | | Errors / Messages |
|------|------------------------|-------------------|
| F510 | Param. invalid | 14:23:37 |
| M132 | Temp. value not stable | 14:24:17 |

Fig. 8: Error messages (empty)

a0002140-en

Please refer to the "System error messages" section for the possible error numbers and remedial action.

8.2 Diagnosis messages

In the "DIAG/error messages" menu, you can find additional information on the errors currently pending (red alarm LED lights up¹⁾).

The error messages are characterised by:

- Error class (internal variable, not visible)
- Error status (letter in front of the error number)
 - F=Failure, general error message
 - M=Maintenance required
 - C=Device is in service (check)
 - U=Device status is uncertain, unidentifiable error
- Type of message
 - Alarm
 - Warning
 - Info

1) Red LED only lights up if the error current is ≥ 20 mA

The following tables are split by the type of error message.
The error messages are listed in order of priority (highest priority first).

8.2.1 Alarms

| No. | Display text | Tests and/or remedial action |
|------|-------------------------|---|
| F200 | Transmitter failure | |
| F100 | SCS glass breakage | <ul style="list-style-type: none"> - Check glass electrode for breakage and hairline cracks - Check fluid temperature - Check electrode plug-in head for moisture and dry if necessary |
| F101 | Reference blocked | <ul style="list-style-type: none"> - Check reference electrode for contamination and damage - Clean reference electrode |
| F102 | SCS glass alarm | |
| F103 | SCS reference alarm | |
| F003 | Temp. sensor defective | <ul style="list-style-type: none"> - Check wiring - Replace glass electrode |
| F218 | Current output defect | |
| F170 | Internal S. (xxxxxxxx) | |
| F212 | Internal E. (xxxxxxxx) | |
| F502 | Internal C. (xxxxxxxx) | |
| F513 | Internal CFW (xxxxxxxx) | |
| F800 | Internal P. (xxxxxxxx) | |
| F404 | Limit 4 mA | <ul style="list-style-type: none"> - Measured value outside the specified current range - Check plausibility - Adjust current output assignment if necessary |
| F405 | Limit 20 mA | |
| F500 | Planning | |
| F501 | Planning | |
| F510 | Param. invalid | |
| F520 | Initialisation error | |
| F810 | PV upper limit | |
| F811 | PV lower limit | |
| F812 | Temp upper limit | |
| F813 | Temp lower limit | |
| F134 | Zero point alarm (u) | |
| F137 | Zero point alarm (l) | |
| F138 | Slope alarm | |

8.2.2 Warnings

| No. | Display text | Tests and/or remedial action |
|------|---------------------------|--|
| M142 | SCC alarm | |
| M111 | SCS glass warning | <ul style="list-style-type: none"> - Check glass electrode for breakage and hairline cracks - Check fluid temperature - Check electrode plug-in head for moisture and dry if necessary |
| M112 | SCS reference warning | Check reference electrode for contamination and damage Clean reference electrode |
| M171 | Internal S. (xxxxxxxx) | Contact the Service Team! |
| M213 | Internal E. (xxxxxxxx) | |
| M503 | Internal C. (xxxxxxxx) | |
| M514 | Internal CFW. (xxxxxxxx) | |
| M801 | Internal P. (xxxxxxxx) | |
| C2 | Scan sens./act. | |
| M131 | PV not stable | <ul style="list-style-type: none"> - PML missing - Sensor too old |
| M132 | Temperature not stable | <ul style="list-style-type: none"> - Sensor dry at times - Cable or connector defective |
| F136 | Zero point warn (l) | <ul style="list-style-type: none"> - Sensor old or defective - In the case of external reference: old or defective - Diaphragm blocked - Buffer solutions too old or contaminated - Potential matching missing (only for symmetrical measurement) |
| M135 | Zero point warn (u) | |
| M139 | Slope warn | |
| M141 | Buffer difference | Incorrect buffer used or incorrectly specified |
| M408 | Calib. aborted | Renew buffer, repeat calibration |
| M148 | SCC warning | |
| M840 | PV upper limit | |
| M841 | PV lower limit | |
| M842 | Temp upper limit | |
| M843 | Temp lower limit | |
| C215 | Current simulation active | |
| C217 | Initialisation | |

8.2.3 Info

| No. | Display text | Tests and/or remedial action |
|------|----------------------|------------------------------|
| C130 | Calibration active | |
| C216 | Hold active | |
| C406 | Configuration active | |
| C407 | Diagnosis active | |

8.3 Spare parts

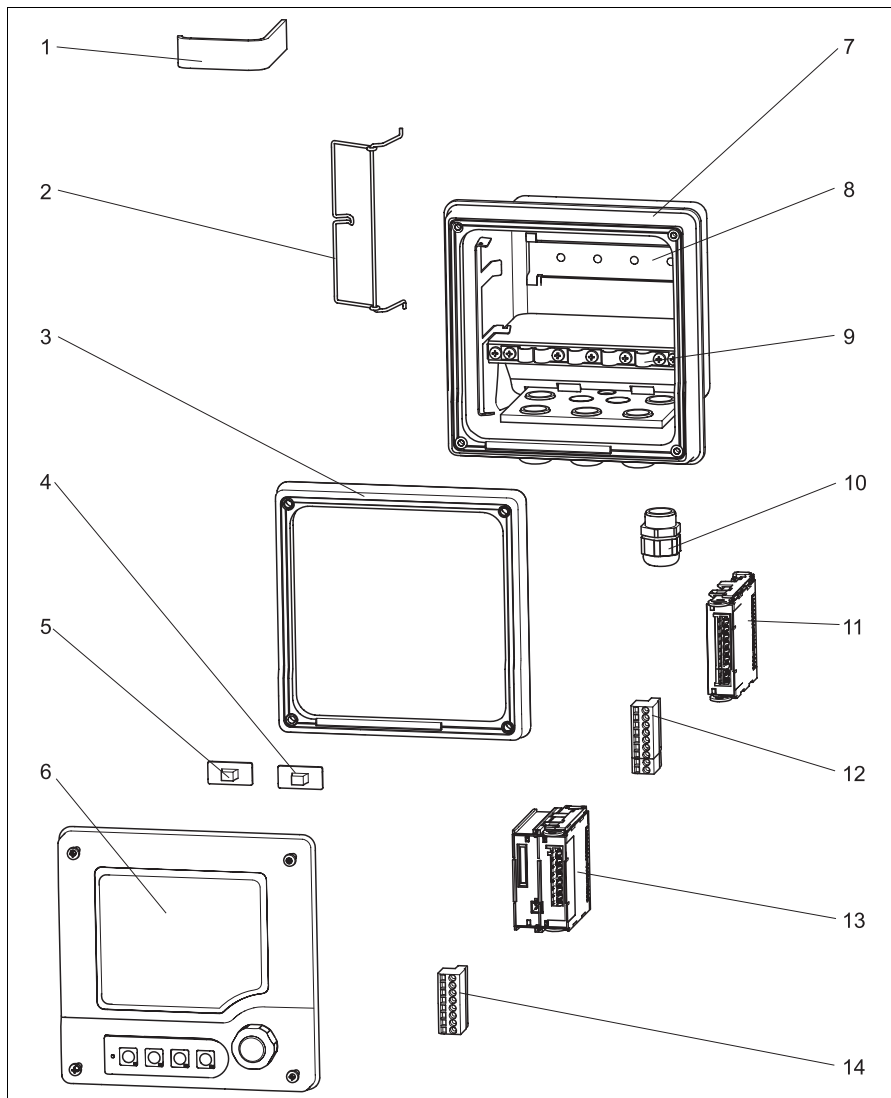


Fig. 9: Exploded view
Please refer to the following table for item names and order numbers for spare parts.

a0002216

| Item | Kit | Order number |
|---------|--|--------------|
| 1-3, 6 | Top housing section, stainless steel <ul style="list-style-type: none"> ■ Cover with display, navigator and cover plate (item 6) ■ Hinge (item 2) ■ Ribbon cable (item 1) ■ Moulded seal (item 3) | 51517461 |
| 1 | Ribbon cable for stainless steel housing | 51517502 |
| 2 | Hinge for stainless steel housing | 51517501 |
| 3 | Moulded seal for top housing section | 51517463 |
| 4 | DAT chip for internal Historom | 51517508 |
| 5 | DAT chip with software | 51517509 |
| 7-10 | Bottom housing section, stainless steel, M20 ¹⁾ <ul style="list-style-type: none"> ■ Bottom section (item 7) ■ DIN rail (item 8) ■ EMC barrier (angle plate) (item 9) ■ Threaded joints (item 10) | 51517455 |
| 11 | Sensor module pH/redox/temperature <ul style="list-style-type: none"> ■ FMPH1 module, complete ■ Terminal strip/power outlet strip | 51518004 |
| 12 | Terminal set, sensor module, pH/redox/temperature | 51517487 |
| 13 | CPU module <ul style="list-style-type: none"> ■ FMH1 module, complete ■ Terminal strip/power outlet strip | 51518002 |
| 14 | Terminal set, CPU module | 51517481 |
| No Fig. | Connection jack for external Historom/CDI | 51517507 |

- 1) When ordering, you must specify the serial number of the device for which you are ordering the spare part.

8.4 Return

If returning the transmitter, please send it *cleaned* to your sales centre. Use the original packaging when returning the device.

8.5 Disposal

This product contains electronic components. For this reason, it must be disposed of as electronic waste.

Please observe local regulations.

9 Technical data

9.1 Input

9.1.1 Measured variables

- pH
- Redox potential
- Temperature

9.1.2 Measuring range

| | |
|-------------|--------------------|
| pH | -2 ... 16 |
| Redox | -2000 ... +2000 mV |
| Temperature | -25 ... +150 °C |

9.1.3 Cable specification

| | |
|-------------|------------------------|
| Without SCS | Max. cable length 50 m |
| With SCS | Max. cable length 20 m |

9.2 Output

9.2.1 Output signal

4 ... 20 mA, potentially isolated against sensor circuit

0.8 ... 1.2 mA peak to peak¹⁾

9.2.2 Signal on alarm

≥21.5 mA

9.2.3 Load

Max. load with supply voltage of 24 V: 500 Ω

Max. load with supply voltage of 30 V: 750 Ω

1) Only for Hart®

9.2.4 Output distribution

| | |
|-------------|---|
| pH | Configurable, $\Delta\text{pH} > 0.5$ |
| Redox | Configurable, $\Delta U > 5 \text{ mV}$ |
| Temperature | Configurable, $DT > 2 \text{ }^\circ\text{C}$ |

9.3 Performance characteristics

9.3.1 Reference temperature

25 °C

9.3.2 Measured value resolution

| | | |
|-----------------------------|-----------------------------------|--------------------------------|
| pH | Glass electrodes
ISFET sensors | 0.01 pH
0.01 pH |
| Redox | | 1 mV |
| Temperature | NTC30k
Pt100 / Pt1000 | 0.1 °C
0.1 °C |
| SCS glass electrodes | Glass
Reference | 100 k Ω
100 Ω |
| Leak current, ISFET sensors | | 100 nA |

9.3.3 Maximum measured error

| | | |
|-----------------------------|-----------------------------------|--------------------|
| pH | Glass electrodes
ISFET sensors | 0.02 pH
0.02 pH |
| Redox | | 1 mV |
| Temperature | NTC30k
Pt100 / Pt1000 | 0.5 K
0.25 K |
| SCS glass electrodes | Glass
Reference | 200 MΩ
200 Ω |
| Leak current, ISFET sensors | | 100 nA |

9.3.4 Repeatability

| | |
|----|--------|
| pH | < 0.01 |
|----|--------|

9.4 Mechanical construction

9.4.1 Weight

2.1 kg

9.4.2 Material

| | |
|--------------------------|--|
| Housing
Housing seals | Stainless steel 1.4301 (AISI 304)
Foamed silicone, EPDM |
|--------------------------|--|

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