Operating Instructions
Liquiline To Go CYM290

Endress+Hauser
People for Process Automation

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".

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

- Memosens®
- Liquiline®
- Sensocheck®
- Sensoface®

Table of Contents

6 Package Contents

Check the shipment for transport damage and completeness.
The package of the Liquiline To Go CYM290 includes:

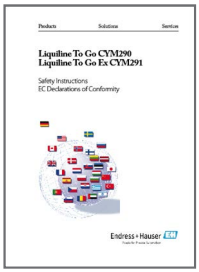
	Liquiline To Go CYM290
Meter incl. 4 batteries (AA) and premounted quiver	✓
Carrying strap	✓
Data carrier with detailed user manuals	✓
USB cable, 1.5 m	✓
Safety instructions	✓
Quickstart instructions in various languages	✓

Specific Test Report

CD-ROM

Complete documentation:

- User manuals in different languages
- Safety instructions
- Certificates
- Quickstart guides

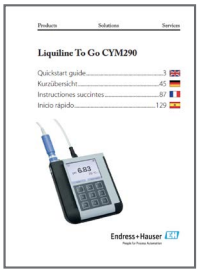


Safety Instructions

In official EU languages and others.

- EU Declarations of Conformity

CAUTION!
These safety instructions are part of the product documentation and must be observed.



Quickstart Guides

Installation and first steps:

- Operation
- Menu structure
- Calibration
- Error messages and recommended actions

Various languages on CD-ROM:

- German
- English
- French
- Italian
- Spanish
- Portuguese (Brazil)

8 Overview

The **Liquiline To Go CYM290** is a portable multiparameter meter for use with analog or digital sensors. The meter automatically recognizes a connected Memosens sensor and accordingly selects the corresponding process variable. By simply replacing the Memosens sensor, the meter can be used for measuring **conductivity**, **pH/ORP** or **oxygen**.
Operation is simple and intuitive, supported by detailed information and help texts.

The meter stands out by the following features:

- Use of digital Memosens sensors
- A detachable quiver protects the sensor and prevents it from drying out. Furthermore, it can be used for calibration.
- The rugged housing is made of a high-performance polymer. It provides high impact resistance and dimensional stability even when exposed to extreme moisture.
- Scratch-proof clear glass display, perfectly readable even after years
- Long operating time with one set of batteries (4 x AA) or use of a Li-ion battery for reliable operation even at high or very low operating temperatures
- Data logger with 10,000 values
- Micro USB port
- Sensoface icons provide single-glance information on the sensor condition
- Real-time clock and indication of battery charging level
- Automatic compensation of ambient pressure for oxygen measurement
- At measuring temperatures from -20 to +100 °C the temperature detector can be automatically identified.

Value-Added Features

Memosens

The Liquiline To Go CYM290 can communicate with Memosens sensors. These digital sensors are automatically identified and the meter switches to the appropriate measurement method.
When a Memosens sensor is connected to the meter, it is indicated by the logo shown on the right. Furthermore, Memosens allows the storage of calibration data, which will be available and can still be used when the sensor is connected to another Memosens-capable device.

Sensoface

Sensoface provides quick information on the sensor condition. The three "smiley" faces as shown on the right represent the sensor condition during measurement and after a calibration. When the condition deteriorates, a status message gives a hint to the cause.

Programmed buffers

"Programmed buffers" is a very convenient method for pH calibration with automatic buffer recognition. You only have to select the buffer set with the buffers used. The buffers can then be used in any order.

Protective Cover

The front of the meter is protected by a cover, which can be completely flipped over and secured to the back for operation.

Hook

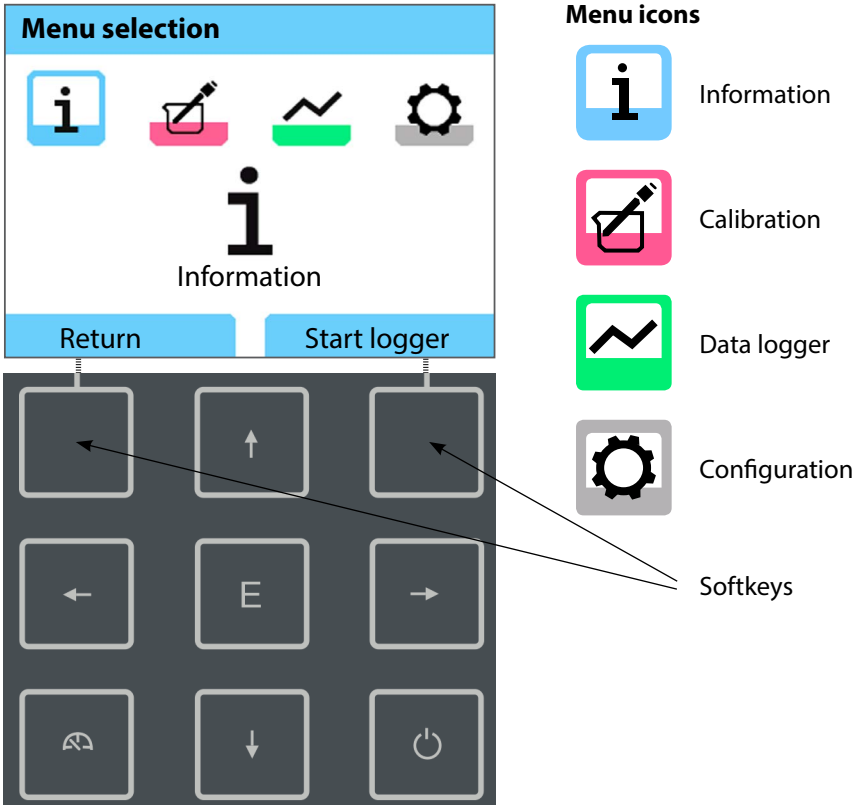
A fold-out hook on the back allows suspending the meter. This leaves your hands free for the actual measurement. The **rating plate** is located beneath the hook.

Protective Cover and Hook Combined

Cover and hook can be joined together to form a benchtop stand allowing comfortable and fatigue-free working at a lab bench or desk.

Display and Keypad

Display and keypad correspond directly via softkeys.



Softkeys	Function is shown in the display above the key
Arrow keys	Selecting / Adjusting entries
E	Confirming an adjustment
⏻	Switching on / off
	Switching on / Immediate access of meas. mode / Toggling the display / Displaying time and date

Check the shipment for transport damage and completeness (see Package Contents).

NOTICE!

Do not operate the device when one of the following conditions applies:

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

In this case, a professional routine test must be performed.
This test should be carried out at our factory.

Inserting the Batteries

With four AA batteries, the CYM290 has an operating time of up to 500 h when operated in logger mode (see page 42).
Open the battery compartment on the rear of the device. Be sure to observe the correct polarity when inserting the batteries (see markings in the battery chamber).
Close the battery compartment cover and screw it handtight.

Note: You can use rechargeable NiMH (AA) batteries instead of the AA cells.
The battery indicator is designed to be compatible with alkaline batteries.
When NiMH batteries are used, it shows a lower capacity.

NOTICE!

Recharging the batteries via the USB port can damage the device.
Charge the NiMH batteries using an external charger.

A battery icon in the display indicates the battery power level:

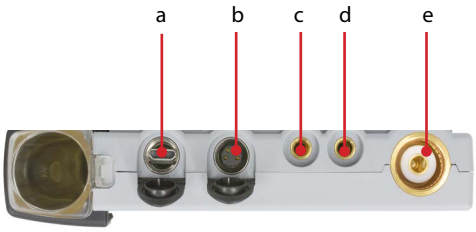
	Icon fully filled	Batteries at full capacity
	Icon partially filled	Battery capacity is sufficient
	Icon empty	Battery capacity not sufficient; calibration is possible, no logging
	Icon blinks	Only a few operating hours remaining, measurement is still possible. **NOTICE!** It is absolutely necessary to replace the batteries.

Connecting a Sensor

The Liquiline To Go CYM290 provides a pH socket acc. to DIN 19262 for analog pH sensors. Alternatively, you can connect a Memosens sensor for pH/ORP, conductivity or oxygen measurement. The meter automatically recognizes a connected Memosens sensor and accordingly selects the corresponding process variable.
Memosens is signaled in the display.
Note that only **one** sensor may be connected to the meter at a time.

Separate temperature probe

After power-on, a separate temperature probe is automatically recognized.
When you want to replace the temperature probe, you must switch off the meter and then switch it on again.



Connections

a - Micro USB port
b - M8, 4 pins, for Memosens lab cable
c - Temperature probe GND
d - Temperature probe
e - pH socket acc. to DIN 19262 for analog sensors

Memosens sensors have a **cable coupling**, which allows convenient replacement of sensors while the cable remains connected to the meter. The connecting cable is connected to socket **b** (Memosens lab cable) or **e**.

Switching On the Meter

You can use or to switch the meter on:

Analog sensors:

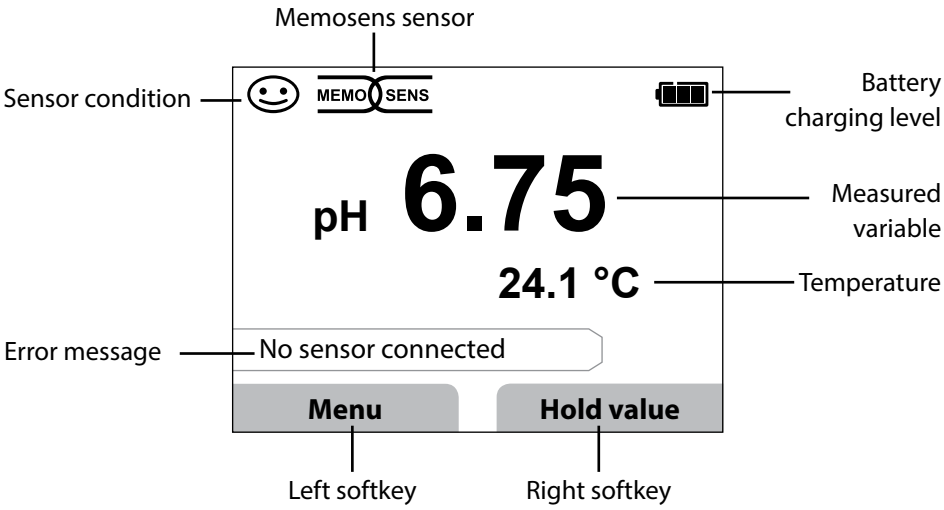
- When you press or , the meter immediately switches to measuring mode.

Memosens sensors:

- When you press or , the meter displays selected sensor data before it switches to measuring mode.

Icons

Important information about the state of the device:



16 Information

pH | ORP | Oxy | Cond

1) In measuring mode, press the **Menu** softkey.
2) Select "Information" and confirm by pressing **E**.
3) Select the desired submenu and confirm by pressing **E**.
   The different submenus are described below.

Calibration Record

Shows the data of the last calibration performed on the currently connected sensor.

Sensor Information (Digital Sensors only)

Shows the data of the currently connected digital sensor. You can save sensor data (MemoLog) in the device by pressing the "Save" softkey. The following table shows the sensor information depending on the respective sensor type:

	pH/ pH/ORP**	**Cond**	**Oxy**	**ISFET**	**ORP**
Manufacturer	✓	✓	✓	✓	✓
Ref. No.	✓	✓	✓	✓	✓
Sensor serial no.	✓	✓	✓	✓	✓
TAG	✓	✓	✓	✓	✓
SW version	✓	✓	✓	✓	✓
HW version	✓	✓	✓	✓	✓
Calibration*	✓	✓	✓	✓	✓
Zero point	✓		✓		
Slope	✓		✓	✓	
ORP calibration**	✓				
Correction					✓
Nom. cell constant		✓			
Temp. offset	✓	✓	✓		✓
Sensor operating time	✓	✓	✓	✓	✓
Wear	✓		✓	✓	
SIP	✓	✓	✓	✓	✓
CIP	✓**)	✓			
Autoclaving	✓**)				
Cell constant		✓			
Operating point				✓	

* latest calibration ** for pH/ORP combo sensor only

Sensor Network Diagram (pH and Oxy only)

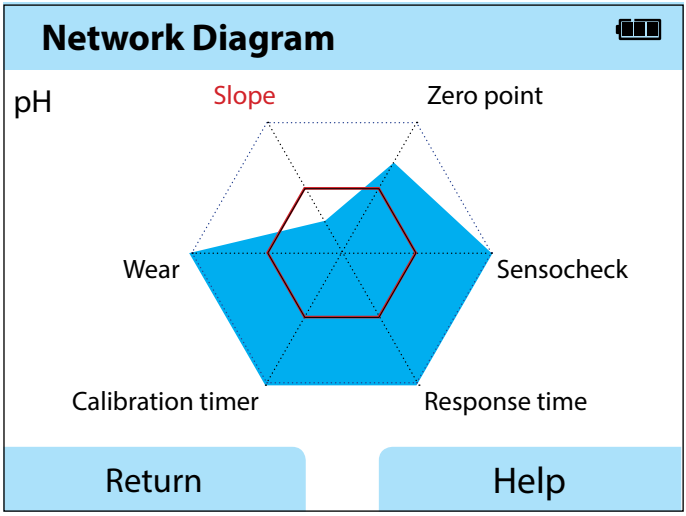
Provide single-glance information on the following parameters of the connected sensor:

- Slope
- Zero point (operating point for Memosens ISFET)
- Sensocheck (pH) or leakage current (ISFET and Oxy)
- Response time
- Calibration timer
- Wear (Memosens)

Parameters which cannot be checked are shown as inactive (gray) and are set to 100% (e.g., Sensocheck for analog sensors).

The parameter values should lie between the outer (100%) and inner (50%) hexagon. When a value enters the inner hexagon (<50%), the corresponding caption text flashes red (see example).

Example: Network diagram of a digital pH sensor (Memosens)



pH | ORP | Oxy | Cond

Sensor Monitor

Shows the raw values available fom the connected sensor:

pH, analog	mV, temperature, temperature detector, temperature resistance
pH, digital, glass	mV, temperature, glass impedance
pH, digital, ISFET	mV, leakage current, temperature
pH, ORP	mV, temperature
Cond, digital	Resistance, conductance, temperature
Oxy, digital	Sensor current, leakage current, polarization voltage, partial pressure, air pressure, temperature

Messages

Shows all active error and status messages as well as supplementary help texts.

MemoLog (Memosens only)

Displays the individual calibration records. You have the possibility to delete individual entries or all entries. The following parameters are displayed:

- Sensor type
- Serial no.
- Tag number (TAG)
- Calibration date
- Zero point
- Slope
- Cell constant (Cond sensor)
- Operating point (ISFET sensor)

Background: The device provides a calibration data logger, which must be activated in the configuration menu. With "MemoLog" activated, up to 100 calibration records can be directly saved to the device. Then, the complete Memosens index structure will be recorded after every calibration.

Device Info

Shows the following device information:

- Device name
- Serial number
- Software version
- Hardware version
- Air pressure
- Battery

Device Test

A device self-test is automatically run in the background at regular intervals.
It checks the memory modules listed below.
A green checkmark shows that the test was successful.

- FLASH program memory
- FLASH data memory
- FLASH parameter memory
- RAM (working memory)

Display test

1) Select "Display test" and press **E**.
2) The display lights up red, green, blue and then white.
3) Press any key to stop the test.

Keypad test

1) Select "Keypad test" and press **E**.
2) Press all nine keys one after the other.
   A green checkmark shows that a key functions properly.
3) Press any key to stop the test.

pH Configuration

1) In measuring mode, press the **Menu** softkey.
2) Select "Configuration" and confirm by pressing **E**.
3) Make the desired adjustments.

The following table gives you an overview.
Factory settings are shown in **bold print**.

"Configuration" menu selection – part 1

Language	**Deutsch** | English | Español | Italiano | Français | Português | 中文
Auto-off	**Off** | 5 min | 10 min | 30 min | 60 min
Temperature	**°C** | °F
+ pH sensor*	
Wear	**On** | Off
+ Calibration*	
Cal timer	**Off** | On
Interval	On: 00 … 99 days
Cal mode	**Programmed buffer** | Manual | Data entry
Calibration points	**Auto** | 1-point | 2-point | 3-point
Buffer set	**Endress+Hauser** 2.00/4.01/6.98/9.95/11.87 Mettler-Toledo 2.00/4.01/7.00/9.21 Knick CaliMat 2.00/4.00/7.00/9.00/12.00 Ciba 2.06/4.00/7.00/10.00 NIST technical 1.68/4.00/7.00/10.01/12.46 NIST standard 1.679/4.006/6.865/9.180 Hach 4.01/7.00/10.01/12.00 WTW 2.00/4.01/7.00/10.00 Hamilton 2.00/4.01/7.00/10.01/12.00 Reagecon 2.00/4.00/7.00/9.00/12.00 DIN 19267 1.09/4.65/6.79/9.23/12.75 Metrohm 4.00/7.00/9.00
MemoLog	**Off** | On
TAG	**Off** | On

* "+" indicates that submenus can be opened by pressing **E** .

pH

"Configuration" menu selection – part 2

+ Time/Date*				
	Time format			**24 h** | 12 h
	Date format			**dd.mm.yyyy** | yyyy-mm-dd | dd/mm/yyyy | mm/dd/yyyy
	Time			hh:mm:ss
	Date			Date format as configured
+ Display*				
	Appearance			**Modern** | Retro
	Lighting			**Permanent** | 60 min | 30 min | 10 min | 5 min | 1 min | 30 sec
	Brightness			**Bright** | Standard | Dim
+ Data logger*				
	Meas.point			**Without**
	Note			**Without**
	Right softkey			Logger Start/Stop | **Hold value**
	Recording			**Non-circular** | Circular
	Logger type			Shot
				Interval 00.00.01…12:59:59 | **00:02:00**
		Difference	1st difference	**On** | Off
			Delta pH	pH 0.0…16.0 | **pH 1.0**
			Delta mV	0 … 2000 mV | **1 mV**
			2nd diff.	On | **Off**
			Delta °C	0…99.9 °C | **1.0 °C**
			Delta °F	0…450 °F | **1.0 °F**
		Intv+Diff	Interval	as logger type: interval
			Difference	as logger type: difference
		Limit value	Interval	Basis/Event 00.00.01…12:59:59 **00:01:00/00:00:01**
			Limit values	Min/Max corresponding to permissible range (see Specifications)
Factory setting				Yes | **No**

* "+" indicates that submenus can be opened by pressing **E** .

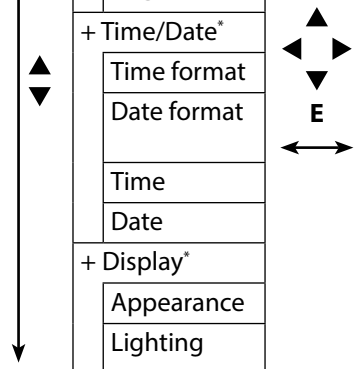
ORP Configuration

1) In measuring mode, press the **Menu** softkey.
2) Select "Configuration" and confirm by pressing **E**.
3) Make the desired adjustments.

The following table gives you an overview.
Factory settings are shown in **bold print**.

"ORP Configuration" menu selection – part 1

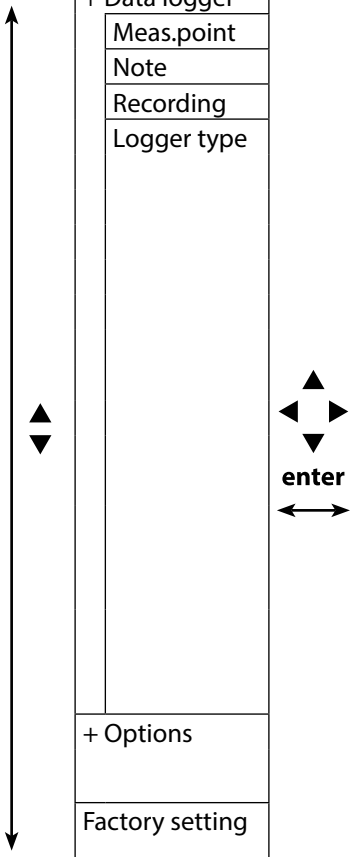
Language	**Deutsch** | English | Español | Italiano | Français | Português | 中文
Auto-off	**Off** | 5 min | 10 min | 30 min | 60 min
Temperature	**°C** | °F
Right softkey	Logger Start/Stop | **Hold value**
+ Calibration*	
MemoLog	**Off** | On
TAG	**Off** | On
+ Time/Date*	
Time format	**24 h** | 12 h
Date format	**dd.mm.yyyy** | yyyy-mm-dd | dd/mm/yyyy | mm/dd/yyyy
Time	hh:mm:ss
Date	Date format as configured
+ Display*	
Appearance	**Modern** | Retro
Lighting	**Permanent** | 60 min | 30 min | 10 min | 5 min | 1 min | 30 sec
Brightness	**Bright** | Standard | Dim



* "+" indicates that submenus can be opened by pressing **E** .

ORP

"ORP Configuration" menu selection – part 2



+ Data logger*			
Meas.point		- -	
Note		- -	
Recording		**Non-circular** | Circular	
Logger type		Shot	
		Interval	00.00.01…12:59:59 | **00:02:00**
	Difference	1st difference	**On** | Off
		Delta pH	pH 0.0…16.0 | **pH 1.0**
		Delta mV	0 … 2000 mV | 1 mV
		2nd diff.	On | **Off**
		Delta °C	0…99.9 °C | **1.0 °C**
		Delta °F	0…450 °F | **1.0 °F**
	Intv+Diff	Interval	See logger type: Interval
		Difference	See logger type: Difference
	Limit value	Interval	Basis/Event 00.00.01…12:59:59 **00:01:00/00:00:01**
		Limit values	Min/Max, corresponding to permissible range (see Specifications)
+ Options		001 SOP 002 Temp.cal	Add-on function, enabled via TAN
Factory setting		Yes | **No** **Note:** Reset to factory settings will also erase all logger data!	

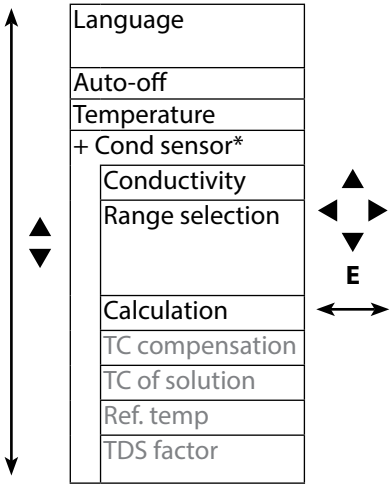
* "+" indicates that submenus can be opened by pressing **E** .

Conductivity Configuration

1) In measuring mode, press the **Menu** softkey.
2) Select "Configuration" and confirm by pressing **E**.
3) Make the desired adjustments.

The following table gives you an overview. Factory settings are shown in **bold print**.

"Configuration" menu selection – part 1

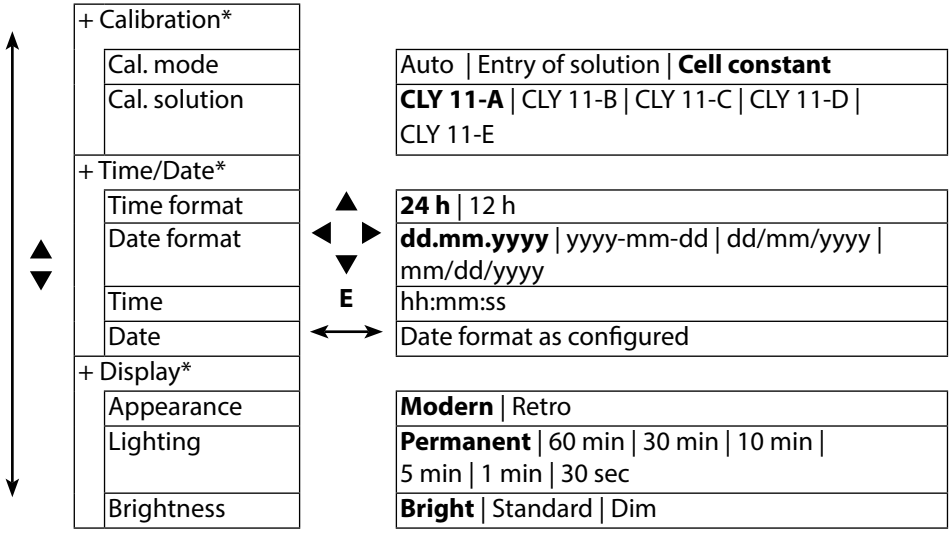


Language		**Deutsch** | English | Español | Italiano | Français | Português | 中文
Auto-off		**Off** | 5 min | 10 min | 30 min | 60 min
Temperature		**°C** | °F
+ Cond sensor*		
	Conductivity	**S/cm** | S/m
	Range selection	**Auto** | o.ooo µS/cm | oo.oo µS/cm | ooo.o µS/cm | oooo µS/cm | oo.oo mS/cm | ooo.o mS/cm | oooo mS/cm
	Calculation	**Off** | MΩ cm | TC | SAL | TDS
	TC compensation	TC: **Linear** | NLF | NaCl | HCl | NH3 | NaOH
	TC of solution	TC: 0 … 20.0 %/K | **2.1 %/K**
	Ref. temp	TC: 0 … 100.0 °C | **25 °C** 32 … 212 °F | **77 °F**
	TDS factor	TDS: 0 …9.99 | **1.00**

* "+" indicates that submenus can be opened by pressing **E** .

Cond

"Configuration" menu selection – part 2



* "+" indicates that submenus can be opened by pressing **E** .

"Configuration" menu selection – part 3

+ Data logger*			
Meas.point	**Without**		
Note	**Without**		
Right softkey	Logger Start/Stop | **Hold value**		
Recording	**Non-circular** | Circular		
Logger type	Shot		
	Interval	1…12:59:59 | **00:02:00**	
	Difference	1st difference	**On** | Off
		Delta cond	0 … 2000 mS/cm | **1.0 µS/cm**
		Delta MΩcm	0 … 9.999 MΩcm | **1 MΩcm**
		Delta salinity	0 … 45.0 g/kg | **1.0 g/kg**
		Delta TDS	0 … 2000.0 mg/l | **1 mg/l**
		2nd diff.	On | **Off**
		Delta °C	0…99.9 °C | **1.0 °C**
		Delta °F	0…450 °F | **1.0 °F**
	Intv+Diff	Interval	as logger type: interval
		Difference	as logger type: difference
	Limit value	Interval	Basis/Event 00.00.01…12:59:59 **00:01:00/00:00:01**
		Limit values	Min/Max corresponding to permissible range (see Specifications)
Factory setting	Yes | **No** **Note:** Reset to factory settings will also erase all logger data!		

* "+" indicates that submenus can be opened by pressing **E** .

Oxy

Oxygen Configuration

1) In measuring mode, press the **Menu** softkey.
2) Select "Configuration" and confirm by pressing **E**.
3) Make the desired adjustments.

The following table gives you an overview.
Factory settings are shown in **bold print**.

"Configuration" menu selection – part 1

Language	**Deutsch** | English | Español | Italiano | Français | Português | 中文
Auto-off	**Off** | 5 min | 10 min | 30 min | 60 min
Temperature	**°C** | °F
+ Oxy sensor*	
Display	**Saturation** | Concentration | Partial pressure
Salinity	**0** … 45.0 g/kg
Pressure correction**	**Air pressure**| Manual
Pressure	Manual: 0 … 9999 mbar | **1013 mbar**
Wear	**On** | Off
+ Calibration*	
Cal. mode	**In air** | Zero point | Data entry
Calibration timer	**Off** | On
Interval	On: 0 … 99 days
MemoLog	**Off** | On
TAG	**Off** | On
+ Time/Date*	
Time format	**24 h** | 12 h
Date format	**dd.mm.yyyy** | yyyy-mm-dd | dd/mm/yyyy | mm/dd/yyyy
Time	hh:mm:ss
Date	Date format as configured

E

* "+" indicates that submenus can be opened by pressing **E** .
** The device provides an internal barometer.

"Configuration" menu selection – part 2

E

+ Display*			
	Appearance		**Modern** | Retro
	Lighting		**Permanent** | 60 min | 30 min | 10 min | 5 min | 1 min | 30 sec
	Brightness		**Bright** | Standard | Dim
+ Data logger*			
	Meas.point		**Without**
	Note		**Without**
	Right softkey		Logger Start/Stop | **Hold value**
	Recording		**Non-circular** | Circular
	Logger type		Shot
		Interval	00.00.01…12:59:59 | **00:02:00**
		Difference	1st difference: **On** | Off
			Delta saturation: 0 … 200 %Air | **1% Air**
			Delta conc: 0 … 20 mg/l | **1 mg/l**
			Delta mbar: 0 … 999.99 mbar | **1 mbar**
			2nd diff.: On | **Off**
			Delta °C: 0…99.9 °C | **1.0 °C**
			Delta °F: 0…450 °F | **1.0 °F**
		Intv+Diff	Interval: see logger type: interval
			Difference: see logger type: difference
		Limit value	Interval: Basis/Event 00.00.01…12:59:59 **00:01:00/00:00:01**
			Limit values: Min/Max corresponding to permissible range (see Specifications)
Factory setting			Yes | **No**

* "+" indicates that submenus can be opened by pressing **E** .

pH

pH Calibration

1) In measuring mode, press the **Menu** softkey.
2) Select "Configuration" and confirm by pressing **E**.
3) Select the desired "Calibration mode".
4) Perform the selected calibration as described on the following pages. Follow the instructions on the display.

Calibration

(Automatic calibration with specification of the buffer solution used)

1) Select the number of calibration points and the buffer set as shown in the table below and press the **Start** softkey.

Calibration points	**Auto** | 1-point | 2-point | 3-point	
Buffer set	**Endress+Hauser**	2.00/4.01/6.98/9.95/11.87
	Mettler-Toledo	2.00/4.01/7.00/9.21
	Knick CaliMat	2.00/4.00/7.00/9.00/12.00
	Ciba	2.06/4.00/7.00/10.00
	NIST technical	1.68/4.00/7.00/10.01/12.46
	NIST standard	1.679/4.006/6.865/9.180
	Hach	4.01/7.00/10.01/12.00
	WTW	2.00/4.01/7.00/10.00
	Hamilton	2.00/4.01/7.00/10.01/12.00
	Reagecon	2.00/4.00/7.00/9.00/12.00
	DIN 19267	1.09/4.65/6.79/9.23/12.75
	Metrohm	4.00/7.00/9.00

2) Immerse the sensor in the **1st**/2nd/3rd buffer solution and press **Continue** (repeat this step for each calibration point).
3) Finally, the calibration data will be displayed. You can **Apply** or **Discard** these values.

Note: To abort calibration, you can press ↩ at any time.

pH

Manual Calibration

(Calibration with manual specification of the number of calibration points and the buffer solution)

1) Select the number of calibration points and press the **Start** softkey.
2) Adjust the temperature-corrected value (see buffer table) for the **1st**/2nd/3rd buffer solution and press **Continue** (repeat this step for each calibration point).
   Note: When using sensors without temperature detector, you should adjust the temperature manually before starting calibration (see page 38).
3) Finally, the calibration data will be displayed. You can **Apply** or **Discard** these values.

Data Entry Calibration

(Calibration by entering known sensor values)

1) Press the **Start** softkey.
2) Enter the known sensor values for zero and slope.
3) Finally, you can **Apply** these values or **Cancel** the calibration.

pH ORP

Calibrating a pH/ORP Combo Sensor

The pH/ORP combo sensor can be calibrated as a pH sensor and/or as an ORP sensor.

pH Calibration
Follow the instructions given for pH calibration, page 30.

ORP Calibration
Follow the instructions given for ORP calibration, page 33.

Note: To abort calibration, you can press ⮌ at any time.

ORP

ORP Calibration

1) In measuring mode, press the **Menu** softkey.
2) Select "Calibration" and confirm by pressing **enter**.
3) Select the desired "Calibration mode" and confirm by pressing **enter**.
4) The "TAG" menu allows the sensor TAG to be edited.
   To do so, set "TAG" to **On** in the configuration menu (default setting: **Off**).
5) Enter the temperature-corrected setpoint of the calibration solution.
6) Immerse the sensor in the calibration solution and wait until the measured value is stable.
7) **Apply** or **Discard** the ORP setpoint.

Note: To abort calibration, you can press ⮌ at any time.

ISFET Calibration

1) In measuring mode, press the **Menu** softkey.
2) Select "Calibration" and confirm by pressing **enter**.
3) Select the desired "Calibration mode" and confirm by pressing **enter**.
4) The "TAG" menu allows the sensor TAG to be edited.
   To do so, set "TAG" to **On** in the configuration menu (default setting: **Off**).
5) Perform the selected calibration as described on the following pages.
   Follow the instructions on the display.

Calibrating the ISFET Zero (Operating Point)

1) Select the "ISFET zero" calibration mode for setting the operating point for the first sensor calibration.

Calibration mode	**Calimatic**
	Manual
	Data entry
	ISFET zero (operating point)

2) Press the **Start** softkey.
3) Adjust the buffer value if required: default pH 7.00
4) Press the **Start** softkey.
5) Finally, you can **Apply** or **Discard** the calibration value for the operating point.
   When you apply the calibration value, the operating point will be stored in the device, but not in the sensor!
   Keep the sensor connected to the meter while performing the next calibration step. The operating point will be taken into account for the following calibration.

Calimatic/Manual/Data Entry Calibration

Follow the instructions given for pH calibration, page 30.
If you disconnect the sensor before performing the calibration (e.g., Calimatic), you must set the operating point again as described above.

Note: To abort calibration, you can press at any time.

Cond

Conductivity Calibration

1) In measuring mode, press the **Menu** softkey.
2) Select "Configuration" and confirm by pressing **E**.
3) Select the desired "Calibration mode".
4) Perform the selected calibration as described on the following pages.
   Follow the instructions on the display.

Auto Calibration

(Automatic calibration with specification of the calibration solution used)

5) Select the calibration solution:

	5 °C	10°C	15 °C	20 °C	**25 °C**	30 °C	35 °C	40 °C	50 °C	
CLY 11-A	46.4	52.9	59.7	66.7	**74.0**	81.4	88.8	96.5	112.2	µS/ cm
CLY 11-B	93.9	107.1	120.8	135.2	**149.6**	164.5	179.7	195.1	226.8	
CLY 11-C	0.8	1.010	1.136	1.270	**1.406**	1.542	1.683	1.824	2.114	mS/ cm
CLY 11-D	8.07	9.16	10.29	11.45	**12.64**	13.86	15.11	16.37	18.97	
CLY 11-E	70.58	79.34	88.20	97.56	**107.00**	116.52	126.10	135.98	155.82	

6) Press the **Start** softkey.
7) Immerse the sensor in the solution and press **Continue**.
8) Finally, the calibration data record will be displayed.
   You can **Apply** or **Discard** these values.

NOTICE!

- Make sure that the values of the calibration solutions used correspond exactly to those specified in this manual. If not, the resulting cell constant will be incorrect.
- When calibrating in a liquid, make sure that the sensor, the separate temperature probe (if present) and the calibration solution have the same temperature. Only this ensures that the cell constant is determined correctly.

Note: To abort calibration, you can press ⮌ at any time.

"Entry of Solution" Calibration

(Calibration by entering the conductivity with display of the cell constant)

1) Press the **Start** softkey.
2) Immerse the sensor in the solution.
3) Enter the temperature-corrected conductivity value and press **E**.
4) Finally, you can **Apply** these values or **Cancel** the calibration.

Cell Constant Calibration

(Calibration by entering the cell constant with display of the conductivity)

1) Press the **Start** softkey.
2) Immerse the sensor in the solution.
3) Modify the value of the cell constant until the temperature-corrected conductivity value is reached. Then press **E**.
4) Finally, you can **Apply** these values or **Cancel** the calibration.

Conductivity sensor	Cell constant
CLS16D	k=0.1 cm^{-1}
CLS21D	k=1.0 cm^{-1}
CLS82D	k = 0.57 cm^{-1}

Installation Factor Calibration

1) Make sure that the sensor is in normal mounting position in the medium.
2) Press the **Start** softkey.
3) Modify the installation factor until the correct conductivity value is displayed (reference measurement). Then press **enter**.
4) Finally, you can **Apply** these values or **Cancel** the calibration.

Zero Calibration

1) Make sure that the sensor is outside the medium (in air).
2) Press the **Start** softkey.
3) Finally, you can **Apply** these values or **Cancel** the calibration.

Note: To abort calibration, you can press at any time.

Oxy

Oxygen Calibration

1) In measuring mode, press the **Menu** softkey.
2) Select "Calibration" and confirm by pressing **E**.
3) Select desired "Calibration mode" and confirm by pressing **E**.
4) Select "Membrane module replacement" if you wish to save a change of membrane or electrolyte in the connected sensor. The digital oxygen sensor automatically recognizes when its sensor cap has been replaced.
5) Select "TAG" to enter a measuring point which is to be saved in the sensor together with the calibration data record.
6) Perform the selected calibration as described on the following pages. Follow the instructions on the display.

Calibration in Air

(Calibrating the slope in air)

1) Place sensor in air and wait for a stable measured value.
2) Press **Start** softkey.
3) Adjust the correct value for "Relative humidity". Then press **Continue**. Calibration will be performed.
4) Finally, you can **Apply** or **Discard** these values.

Note: To abort calibration, you can press ⮌ at any time.

Zero Calibration

(Zero calibration with oxygen-free medium, e.g., nitrogen 5.0)

1) Place sensor in oxygen-free medium and wait for a stable measured value.
2) Press **Start** softkey. Calibration will be performed.
3) Finally, you can **Apply** these values or **Cancel** the calibration.

Data Entry Calibration

(Calibration by entering known sensor values)

1) Press **Start** softkey.
2) Adjust the known sensor values for zero and slope.
3) Finally, you can **Apply** these values or **Cancel** the calibration.

Note: To abort calibration, you can press at any time.

pH | ORP | Oxy | Cond

Once you have completed all preparations, you can start with the actual measurement.

1) Connect the desired sensor to the meter. Some sensors require a special preparation. Please proceed according to the operating instructions for the sensor.
2) Switch the device on using the ⏻ or 🕒 key.
3) Depending on the measurement method and the sensor used, immerse the sensing part of the sensor in the medium to be measured.
4) Watch the display and wait for the reading to stabilize.

Toggling the Measured Value Display

During measurement, you can toggle between display of primary / secondary measured value and clock by pressing 🕒.

Adjusting the Temperature

When you connect a sensor without temperature detector, you can manually adjust the temperature for measurement or calibration:

1) Press 🕒 to access measuring mode. The adjusted temperature will be displayed.
2) Set the desired temperature value using the ▼ or ▲ arrow.
   Holding the key depressed changes the temperature value at high speed.

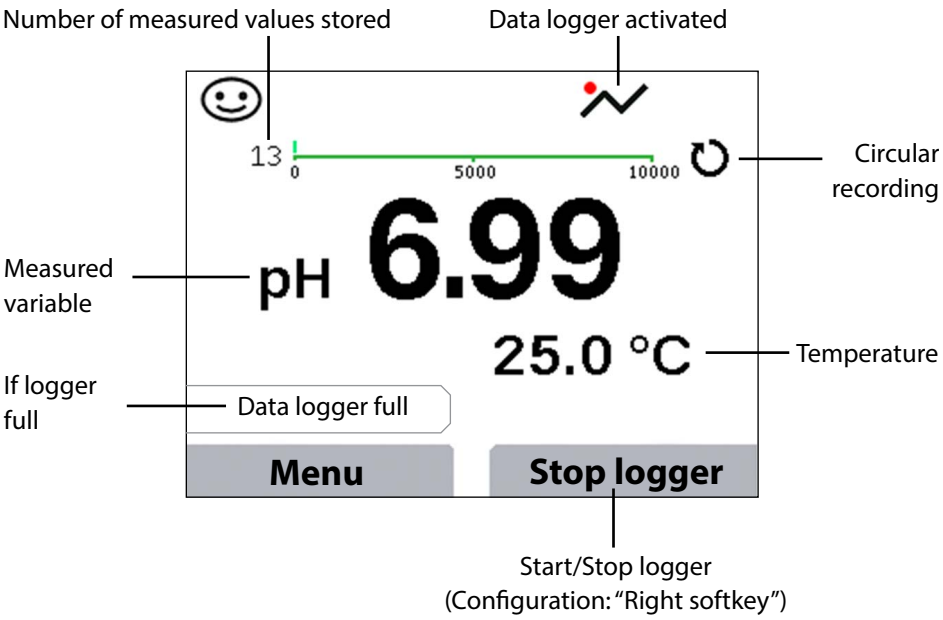
The Data Logger

The meter provides a data logger. **Prior to use**, it must be configured and then activated. You can choose from the following logger types:

- Shot (manual logging by pressing the **Save value** softkey)
- Interval (time-controlled logging at a fixed interval)
- Difference (signal-controlled logging of measured variable and temperature)
- Intv+Diff (combined time- and signal-controlled logging)
- Limit value (combined time- and threshold-controlled logging)

The data logger records up to 10 000 entries, which can be assigned to different points of measurement (TAGs) and notes. The following data will be recorded: meas. point, note, sensor ID, serial number of sensor (Memosens), primary value, temperature, time stamp, device status.
It is always the currently selected process variable which is recorded.

Display: Icons related to the data logger



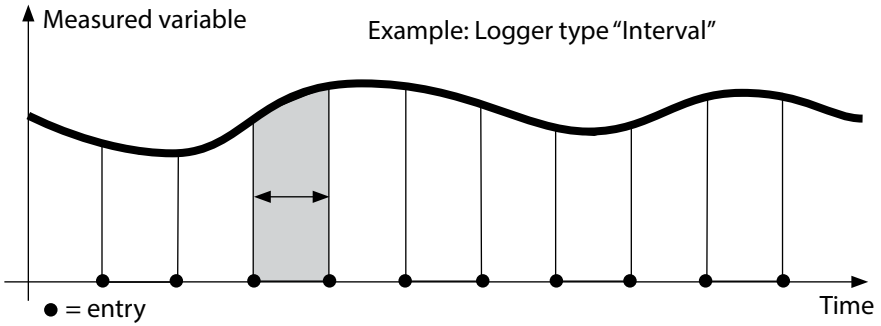
Operating Modes of the Data Logger (Logger Type)

Shot

In this mode, a measured value is recorded when the **Save value** softkey is pressed. In the measuring mode (), it is always possible to hold a value and then save it.

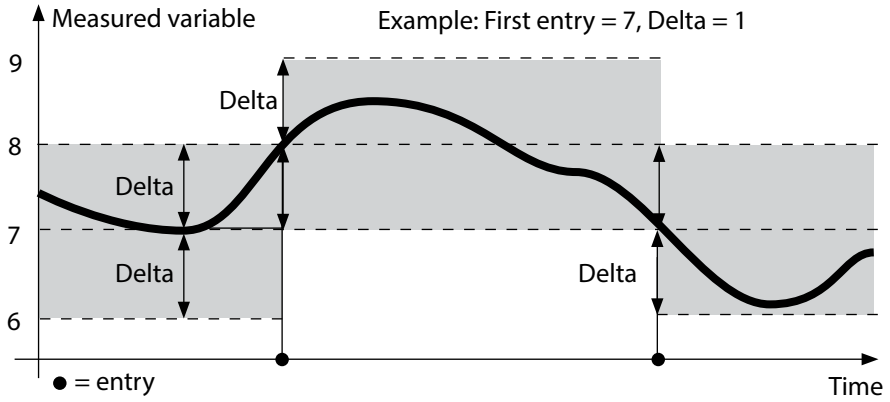
Interval (time-controlled)

In the "Interval" mode, the data are cyclically recorded.



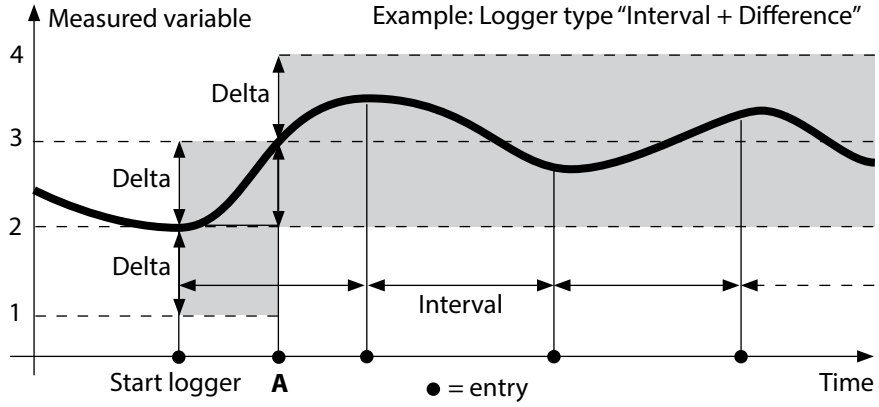
Difference

When the delta range (process variable and/or temperature) related to the last entry is exceeded, a new entry is created and the delta range is displaced upwards or downwards by the delta value. The first entry is automatically created when the data logger is started.



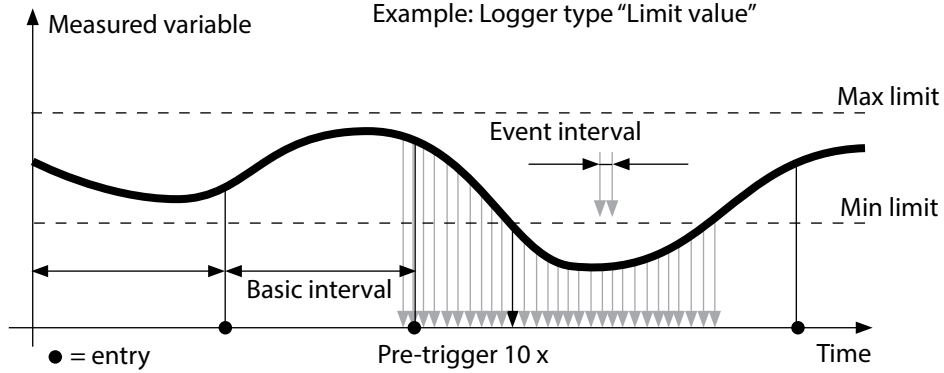
Interval and difference (combined)

When the delta range related to the last DIFF entry is exceeded, a new entry is created (example: entry **A**) and the delta range is displaced upwards or downwards by the delta value. As long as the measured value remains within the delta range, logging is performed at the preset interval. The first DIFF entry is automatically created when the data logger is started.



Limit value (combined)

When one of the two limit values (Min/Max) is exceeded, the data are logged as defined by the "event interval". Additionally, the last ten measured values before an event are recorded (pre-trigger). As long as the measured value remains within the limits, logging is performed at the preset "basic interval".



pH | ORP | Oxy | Cond

Configuring the Data Logger

Prerequisite: Data logger is stopped.

The "Data logger" menu shows the number of occupied entries as well as the number of free entries. Configuration can also be done in the "Configuration" menu under "Data logger".

1) Press **Menu** softkey.
2) Select "Data logger" and confirm by pressing **E**.
3) Select "Configure data logger" and confirm by pressing **E**.
4) Configure data logger as required (see table).
5) When you have completed the configuration, you can start the data logger!

Increasing the Battery Life

To increase the battery life for logger operation, the time for the display lighting selected in the configuration should be as short as possible.

Note: When the selected time has expired, display and backlighting switch off automatically. They can be switched on again by pressing any key.

Configuring the data logger (default in bold print)			
Meas.point	**Without**		
Note	**Without**		
Right softkey	Logger Start/Stop | **Hold value**		
Recording	**Non-circular**		
	Circular		
Logger type	Shot		
	Interval	Interval	00:00:01…12:59:59 | **00:02:00**
	Difference	1st difference	**On** Off
		Delta pH	pH 0.0…16.0 | **pH 1.0**
		Delta mV	0 … 2000 mV | **1 mV**
		Delta cond	0 … 2000 mS/cm | **1.0 µS/cm**
		Delta MΩcm	0 … 9.999 MΩcm | **1.0 MΩcm**
		Delta salinity	0.00 … 45.0 g/kg | **1.0 g/kg**
		Delta TDS	0.00 … 2000.0 mg/l | **1 mg/l**
		Delta saturation	0 … 200% Air | **1% Air**
		Delta conc	0 … 20.0 mg/l | **1 mg/l**
		Delta mbar	0 … 1000 mbar | **1 mbar**
		2nd difference	On **Off**
		Delta °C	0…99.9 °C | **1.0 °C**
		Delta °F	0…450 °F | **1.0 °F**
	Intv+Diff	Interval	see logger type: interval
		Difference	see logger type: difference
	Limit value	Interval	Basis 00.00.01…12:59:59 | **00:01:00**
			Event **00.00.01**…12:59:59
		Limit values	Min/Max corresponding to permissible range (see Specifications)

pH | ORP | Oxy | Cond

Starting/Stopping the Data Logger

With the data logger activated, automatic switch-off is disabled.
Every time the meter has been switched off, the data logger must be restarted.
Depending on the assignment of the right softkey (see "Configuring the data logger"), you can start/stop the data logger as follows:

Right softkey	
Start/Stop logger	1) Press right softkey **Start logger / Stop logger**.
Hold value	1) Press **Menu** softkey. 2) Select "Data logger" using the arrows and confirm by pressing **enter**. 3) Press **Start** or **Stop** softkey, resp.

Viewing the Logger Data

In the "Data logger" menu you can view the recorded entries either individually or as curve characteristic (see examples).

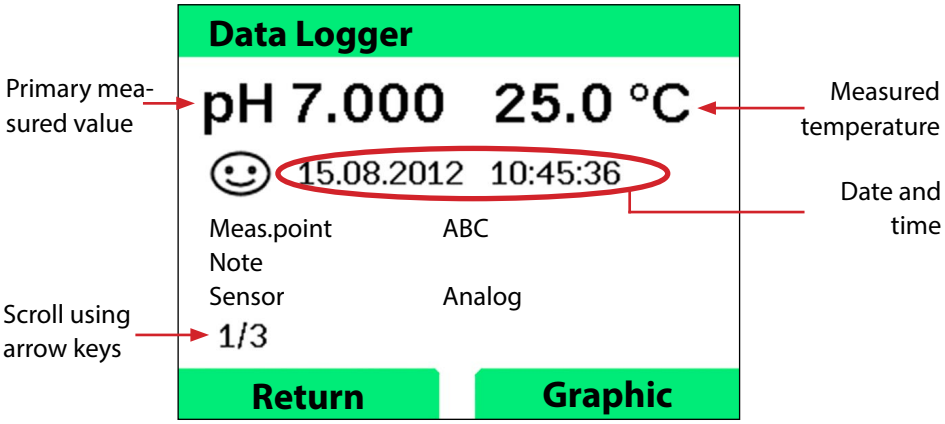
1) Press **Menu** softkey.
2) Select "Data logger" using the arrows and confirm by pressing **E**.
3) Select "View logger data" using the arrows and confirm by pressing **E**.
4) Select filter ("Meas.point" or "Time + Meas.point" or "All values").
5) Select the parameter corresponding to the sensor.
6) Press **Menu** softkey.
7) Select the desired entries using the arrow (see example 1).
8) For display as curve characteristic, press **Graphic** softkey.
   You can use the arrows to navigate between entries (see example 2).

Deleting the Logger Data

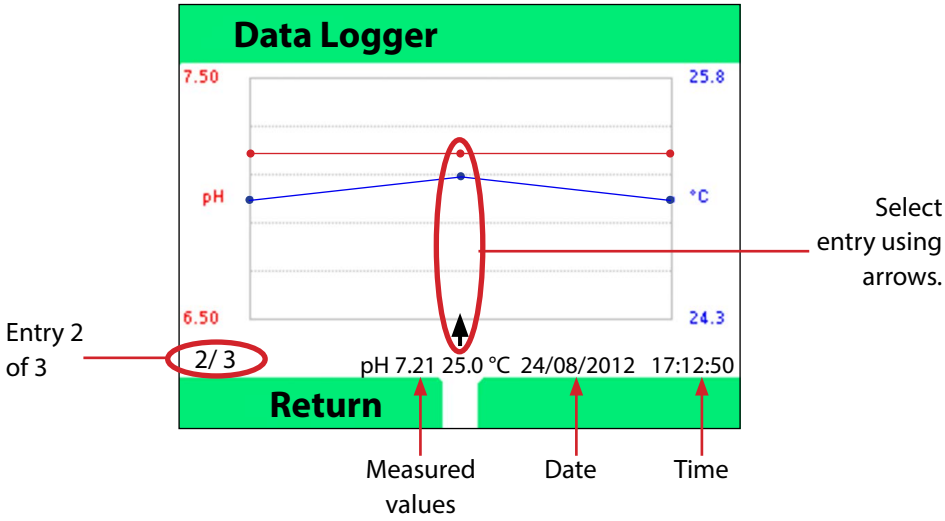
To delete the recorded entries, proceed as follows:

1) Press **Menu** softkey.
2) Select "Data logger" using the arrows and confirm by pressing **E**.
3) Select "Delete logger data" using the arrows and confirm by pressing **E**.
4) Select deletion mode: "Complete", "Data", "Meas.point" or "Filter"
   (you can filter for measuring point, parameter or time).
5) Press **Delete** softkey. The data are deleted according to the configuration.
6) Press **Back** softkey to return to menu selection.

Example 1: Viewing the logger data



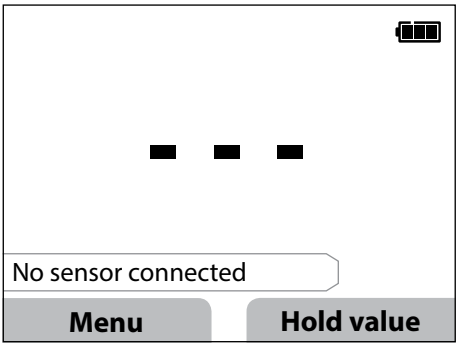
Example 2: Curve characteristic



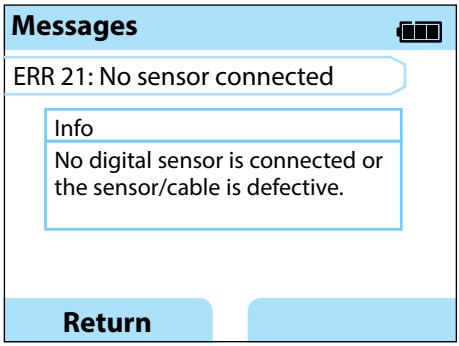
46 Error and Status Messages

pH | Oxy | Cond | ORP

Error and status messages appear as plain text on the display. By pressing **E** and **Help**, more detailed help texts can be displayed. Information on the sensor condition is indicated by the "Sensoface" icon (friendly, neutral, sad) possibly accompanied by an info text.



Example of an error message:
Press **E** and **Help** to access the help text.



Help text for error 21

Sensoface (the "smiley" icon) provides information on the sensor condition (maintenance request). Measurement can still be performed. After a calibration, the corresponding Sensoface icon (friendly, neutral, sad) is shown together with the calibration data. Otherwise, Sensoface is only visible in measuring mode.

"Sensoface" Messages

The "Sensoface" icon provides information on the sensor condition:

Sensoface	Meaning
	Sensor is okay
	Calibrate the sensor soon
	Calibrate or replace the sensor

Info and Help Texts

When an error or status message appears on the screen, proceed as follows to view the corresponding info or help text:

1) Press **E**.
2) Press the **Help** softkey.
3) The help text will be displayed. In most cases, you can remedy the cause of the error by yourself. Please refer to the following table for possible remedies.

Info	Message
Info 01	Cal timer expired
Info 02	Sensor wear
Info 03	Bad glass impedance
Info 05	Zero/Slope
Info 06	Response time too long
Info 07	Operating point (ISFET)
Info 08	Leakage current (ISFET)
Info 09	ORP offset
Info 10	Polarization

pH | Oxy | Cond | ORP

Error Messages

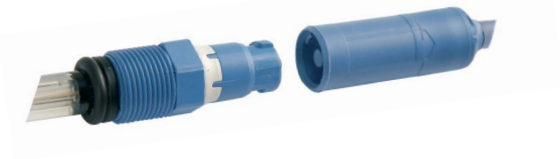
Error	Message	Remedy
🔋 blinks	Replace the batteries	Replace the batteries.
ERR 1	Primary variable range	Check whether the measurement conditions correspond to the adjusted measuring range.
ERR 2	ORP range	
ERR 3	Temperature range	
ERR 4	Zero point	Thoroughly rinse the sensor and recalibrate. If this does not help, replace the sensor.
ERR 5	Slope	
ERR 6	Cell constant too high/ low	Enter nominal cell constant or calibrate the sensor using a known solution.
ERR 7	Air pressure range	Check if the opening for the pressure sensor located on the back of the device is blocked.
ERR 8	Identical buffers!	Use a buffer solution with a different nominal value before starting the next calibration step.
ERR 10	Buffers interchanged!	Repeat calibration.
ERR 11	Unstable value (Drift too high)	Leave the sensor in the liquid until the measured value is stable. If this does not help, replace the sensor.
ERR 14	Time and date invalid	Set the date and time.
ERR 18	System error	Restart, reset to factory settings, configure and calibrate. If the error occurs again, contact the Service.
ERR 19	Factory settings error	Data error, measurement with analog sensors no longer possible. Contact the Service team.
ERR 21	No sensor connected	Connect operational Memosens sensor.
ERR 30	Data logger full	Clear the logger completely or partially.
ERR 31	MemoLog full	Clear the MemoLog completely or partially.

pH Sensors

Product Name (Link to Product Configurator)	Sensor type
Orbisint CPS11D	Digital pH sensor
Orbisint CPS12D	Digital ORP sensor
Memosens CPS16D	Combined digital pH/ORP sensor
Memosens CPS31D	Digital pH sensor
Ceraliquid CPS41D	Digital pH sensor
Ceraliquid CPS42D	Digital ORP sensor
Tophit CPS47D	Digital non-glass pH sensor
Orbipac CPS51	pH electrode
Orbipac CPS52	ORP combo electrode
Ceragel CPS71D	Digital pH sensor
Ceragel CPS72D	Digital ORP sensor
Memosens CPS76D	Combined digital pH/ORP sensor
Tophit CPS77D	Digital non-glass pH sensor
Orbipore CPS91D	Digital pH sensor
Orbipore CPS92D	Digital ORP sensor
Memosens CPS96D	Combined digital pH/ORP sensor
Tophit CPS97D	Digital non-glass pH sensor
Memosens CPS171D	Digital pH sensor
Ceramax CPS341D	Digital non-glass pH sensor
Tophit CPS441D	Digital non-glass pH sensor
Tophit CPS471D	Digital non-glass pH sensor
Tophit CPS491D	Digital non-glass pH sensor
Orbipac CPF81D	Digital pH sensor
Orbipac CPF82D	Digital ORP sensor

The Product Configurator can be accessed at: www.endress.com/<product name>

Memosens sensors have a **cable coupling**, which allows convenient replacement of sensors while the cable remains connected to the meter.



pH

Endress+Hauser Buffer Solutions (pH)

Ready-to-use quality pH buffer solutions

Quality buffers from Endress+Hauser - CPY20

Solutions which are traced by a DAkkS-accredited Endress+Hauser buffer laboratory (DkkS = German Accreditation Body) to a primary reference material of the PTB and to standard reference material of the National Institute of Standards and Technology (NIST) in accordance with DIN 19266 are used as secondary reference buffer solutions.

Buffer sets CPY20	**Quantity**
pH 2.00	5000 ml / 100 ml / 250 ml
pH 4.01	5000 ml / 100 ml / 250 ml / 18 ml
pH 6.98	5000 ml / 100 ml / 250 ml / 18 ml
pH 9.95	5000 ml / 100 ml / 250 ml
pH 11.87	5000 ml / 100 ml / 250 ml

Accessories for pH

Item

Memosens data cable CYK20

CPY7 electrolyte vessel, reservoir for KCl electrolyte, 150ml

The Product Configurator can be accessed at:
www.endress.com

Conductivity Sensors

Product Name (Link to Product Configurator)	Sensor type
Condumax CLS15D	Conductivity sensor
Condumax CLS16D	Conductivity sensor
Condumax CLS21D	Conductivity sensor
Memosens CLS82D	Conductivity sensor

The Product Configurator can be accessed at: www.endress.com/<product name>

Memosens sensors have a **cable coupling**, which allows convenient replacement of sensors while the cable remains connected to the meter.

Conductivity Calibration Solutions CLY11

CLY11-A, 74 µS/cm (reference temp. 25°C (77 °F)), 500ml (16,9 fl.oz)
CLY11-B, 149.6 µS/cm (reference temp. 25°C (77 °F)), 500ml (16,9 fl.oz)
CLY11-C, 1.406 mS/cm (reference temp. 25°C (77 °F)), 500ml (16.9 fl.oz)
CLY11-D, 12.64 mS/cm (reference temp. 25°C (77 °F)), 500ml (16.9 fl.oz)
CLY11-E, 107.00 mS/cm (reference temp. 25°C (77 °F)), 500ml (16.9 fl.oz)

Accessories for Conductivity

Item (Link to Product Configurator)

Memosens data cable CYK20

Calibration set Conducal CLY421

- Conductivity calibration set (case) for ultrapure water applications
- Complete, factory-calibrated measuring set with certificate, traceable to SRM of NIST and DKD, for comparative measurement in ultrapure water up to max. 20 µS/cm

Please visit our website for more information on our product range: **www.endress.com**.

Oxygen Sensor

Product Name
(Link to Product Configurator)
Oxymax COS22D digital oxygen sensor

The Product Configurator can be accessed at: www.endress.com/<product name>

Accessories for Oxygen

Item

COS22D maintenance kit

Sensor cable CYK20-AAB1C2 1.5 meters

Please visit our website for more information on our product range:
www.endress.com.

pH | ORP | Oxy | Cond

Connections	2x socket, 4 mm dia., for separate temp. detector 1x M8 socket, 4 pins, for Memosens lab cable 1x micro USB-B for operation without batteries 1x pH socket, to DIN 19262	
Air pressure measurement	700 … 1100 hPa	
User interface	Straightforward menu navigation with graphic icons and detailed operating instructions in plain text	
Languages	German, English, French, Spanish, Italian, Portuguese, Chinese	
Sensoface	Status indication (friendly, neutral, sad)	
Status indicators	For battery power level, logger	
Graphic display	QVGA TFT display with white backlighting	
Keypad	[⏻], [🕗], [**E**], [◄], [►], [▲], [▼], 2 context-sensitive softkeys	
Data logger	10 000 memory locations	
Recording	Manual, interval- or event-controlled, with management of tag numbers and notes	
Cal data logger MemoLog (Memosens only)	Up to 100 Memosens calibration records can be saved	
	Viewable on the display	Manufacturer, sensor type, serial no., zero, slope, calibration date
Temperature input	2 x 4 mm dia. for integrated or separate temperature detector	
Measuring ranges	NTC30 temp detector	-20 … +120 °C (-4 ... +248 °F)
	Pt1000 temp detector	-40 … +250 °C (-40 ... +482 °F)
Measuring cycle	Approx. 1 s	
Measurement error[1,2,3)]	< 0.2 K (Tamb = 23 °C); TC < 25 ppm/K	

1) according to EN 60746-1, at nominal operating conditions
2) ± 1 count
3) plus sensor error

pH ORP Oxy Cond

Communication	USB 2.0
Profile	HID, driverless installation
Usage	Data exchange
Diagnostics functions	
Sensor data (Memosens only)	Manufacturer, sensor type, serial number, wear, operating time
Calibration data	Calibration date; pH/Oxy: zero, slope; Cond: Cell constant
Device self-test	Automatic memory test (FLASH, EEPROM, RAM)
Device data	Device type, software version, hardware version
Data retention	Parameters, calibration data > 10 years
EMC	EN 61326-1 (General Requirements)
Emitted interference	Class B (residential area)
Immunity to interference	Industry
	EN 61326-2-3 (Particular Requirements for Transmitters)
RoHS conformity	According to directive 2011/65/EU
Power supply	4 x AA alkaline batteries or 4x rechargeable NiMH batteries 1x Li-ion battery, USB chargeable
Nominal operating conditions	
Ambient temperature	-10 … +55 °C (+14 ... +130 °F)
Transport/ Storage temperature	-25 … +70 °C (-13 ... +158 °F)
Relative humidity	0 … 95 %, short-term condensing allowed
Housing	
Material	PA12 GF30 (silver gray RAL 7001) + TPE (black)
Protection	IP66/67 with pressure compensation
Dimensions	Approx. (132 x 156 x 30) mm
Weight	Approx. 500 g

pH

Analog pH/mV input	pH socket, DIN 19 262 (13/4 mm)		
pH range	-2 … 16		
Decimal places *)	2 or 3		
	Input resistance	1 x 10^{12} Ω	(0 … 35 °C)
	Input current	1 x 10^{-12} A	(at RT, doubles every 10 K)
Measuring cycle	Approx. 1 s		
Measurement error[1,2,3)]	< 0.01 pH, TC < 0.001 pH/K		
mV range	-1300 … +1300 mV		
Measuring cycle	Approx. 1 s		
Measurement error[1,2,3)]	< 0.1 % meas. val. + 0.3 mV, TC < 0.03 mV/K		
Memosens pH input (also ISFET)	M8 socket, 4 pins, for Memosens lab cable or M12 socket for Memosens sensors		
Display ranges [4)]	pH	-2.00 … +16.00	
	mV	-1999 … +1999 mV	
	Temperature	-50 … +250 °C (-58 ... +482 °F)	

* User-defined
1) according to EN 60746-1, at nominal operating conditions
2) ± 1 count
3) plus sensor error
4) Ranges depending on Memosens sensor

Memosens input ORP	M8 socket, 4 pins, for Memosens lab cable or M12 socket for Memosens sensors	
Display ranges [4)]	mV	-1999 … +1999 mV
	Temperature	-50 … +250 °C / -58 … +482 °F
Sensor standardization *	ORP calibration (zero adjustment)	
Permissible calibration range	ΔmV (offset)	-700 … +700 mV

* user-defined
4) Ranges depending on Memosens sensor

pH

Sensor standardization *	pH calibration	
Operating modes *	Programmed buffers	Calibration with automatic buffer recognition
	Manual	Manual calibration with entry of individual buffer values
	Data entry	Data entry of zero and slope
Buffer sets *	Endress+Hauser	2.00/4.01/6.98/9.95/11.87
	Mettler-Toledo	2.00/4.01/7.00/9.21
	Knick CaliMat	2.00/4.00/7.00/9.00/12.00
	Ciba (94)	2.06/4.00/7.00/10.00
	NIST technical	1.68/4.00/7.00/10.01/12.46
	NIST standard	1.679/4.006/6.865/9.180
	HACH	4.01/7.00/10.01/12.00
	WTW techn. buffers	2.00/4.01/7.00/10.00
	Hamilton	2.00/4.01/7.00/10.01/12.00
	Reagecon	2.00/4.00/7.00/9.00/12.00
	DIN 19267	1.09/4.65/6.79/9.23/12.75
	Metrohm	4.00/7.00/9.00
Permissible calibration range	Zero point	6 ... 8 pH
	With ISFET: Operating point (asymmetry)	-750 … +750 mV
	Slope	Approx. 74 … 104 %
	(possibly restricting notes from Sensoface)	
Calibration timer *	Interval 1 … 99 days, can be switched off	
Sensoface	Provides information on the sensor condition	
Evaluation of	zero/slope, response, calibration interval	

* User-defined

Conductivity input	M8 socket, 4 pins, for Memosens lab cable	
Measuring Ranges	CLS15D	k = 0.01 : 0-20 µS/cm k = 0.1 : 0-200 µS/cm
	CLS16D	k = 0.1 : 0.04 µS/cm - 500 µS/cm
	CLS21D	k = 1 : 10.0 µS/cm - 20.0 mS/cm
	CLS82D	k = 0.57 : 1 µS/cm - 500 mS/cm
Permissible cell constant	0.005 … 200.0 cm^{-1} (adjustable)	
Measuring cycle	Approx. 1 s	
Temperature compensation	Linear 0 … 20 %/K, default 2.1%/K, reference temperature adjustable nLF: 0 … 120 °C NaCl HCl (ultrapure water with traces) NH3 (ultrapure water with traces) NaOH (ultrapure water with traces)	
Display resolution (autoranging)	Conductivity	0.001 µS/cm (c < 0.05 cm^{-1}) 0.01 µS/cm (c = 0.05 … 0.2 cm^{-1}) 0.1 µS/cm (c > 0.2 cm^{-1})
	Resistivity	00.00 … 99.99 MΩ cm
	Salinity	0.0 … 45.0 g/kg (0 … 30 °C)
	TDS	0 … 1999 mg/l (10 … 40 °C)
Sensor standardization	Cell constant	Input of cell constant with simultaneous display of conductivity value and temperature
	Input of solution	Input of conductivity of the calibration solution with simultaneous display of cell constant and temperature
	Auto	Automatic determination of the cell constant with calibration solution
Measurement error[1,2,3)]	< 0.5 % meas.val. + 0.4 µS * c [4)]	

1) according to EN 60746-1, at nominal operating conditions
2) ± 1 count
3) plus sensor error
4) c = cell constant

Oxy

Memosens input, oxygen	M8 socket, 4 pins, for Memosens lab cable	
Display ranges [4]	Saturation	0.000 … 200.0 %
	Concentration	000 µg/l … 20.00 mg/l
	Partial pressure	0.0 … 1000 mbar
Temperature meas. range [4]	-20 … 150 °C	
Sensor standardization	Automatic calibration in air (100 % RH)	
	Zero calibration	
Storage	in quiver with moistening sponge	

1) according to EN 60746-1, at nominal operating conditions
2) ± 1 count
3) plus sensor error
4) Ranges depending on Memosens sensor

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