

User Manual

# Portavo® 904X MULTI

Portable Meter



Read before installation.  
Keep for future use.





## Repair

The meter cannot be repaired by users. For inquiries regarding repairs, please contact Knick Elektronische Messgeräte GmbH & Co. KG at [www.knick.de](http://www.knick.de).

## Returns

Clean and securely package the product before returning it to Knick Elektronische Messgeräte GmbH & Co. KG.

If there has been contact with hazardous substances, the product must be decontaminated or disinfected prior to shipment. The consignment must always be accompanied by a corresponding return form to prevent service employees being exposed to potential hazards.

Further information can be found at [www.knick.de](http://www.knick.de).



## Disposal

The local codes and regulations must be observed when disposing of the product.

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Check the shipment for transport damage and completeness.

The Portavo 904X MULTI package includes:

- Meter, incl. premounted quiver
- 4 batteries (AA)
- Carrying strap
- USB cable, 1.5 m
- Quickstart overview for attaching to the inside of the protective cover (German, English, French)
- Safety guide
- Quickstart guide in various languages
- Test report 2.2 according to EN 10204
- EU Declaration of Conformity
- Control drawing no. 209.009-110 (ATEX, IECEx, cFMus)

User manuals, certificates, the Paraly SW 112 PC software, and other product information can be downloaded from [www.knick.de](http://www.knick.de).



## Intended Use

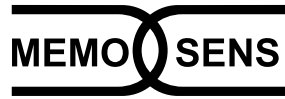
The Portavo 904X MULTI is a portable multiparameter meter for measuring pH, ORP, conductivity, and oxygen. With a plain text line on a high-contrast LCD, operation is largely intuitive. The meter stands out by the following features:

- Application in hazardous locations up to Zone 0
  - 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
  - Very long operating time with one set of batteries (4x AA) for reliable operation even at high or very low operating temperatures
  - Data logger with 5000 values
  - Micro USB port for communication with Paraly SW 112 PC software for data evaluation of digital sensors (Memosens)
  - Sensoface icons provide single-glance information on the sensor condition (page 54)
  - Real-time clock and indication of battery charging level

## Value-Added Features

### Memosens

The Portavo 904X MULTI 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, an "INFO ..." message provides additional information on the cause.



### Automatic Calibration with Calimatic (pH)

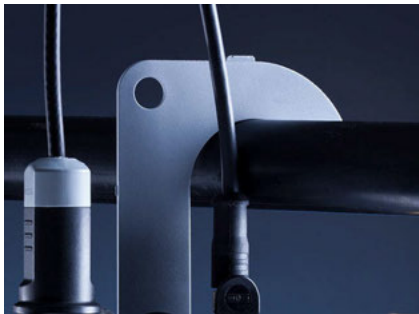
Calimatic is a very convenient method for pH calibration with automatic buffer recognition. You only have to select the buffer set with the buffers used. The buffers can then be used in any order. As delivered, this calibration method is preset. It can be adjusted or disabled in the configuration menu.





## 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. A label on the inner side of the cover explains the control functions and device messages.



## Hook

A fold-out hook on the back allows the meter to be suspended. This leaves your hands free for the actual measurement. The nameplate is located beneath the hook.



## Protective Cover and Hook Combined

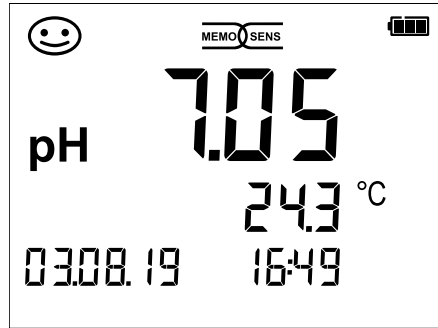
The two parts can be combined to form a benchtop stand, enabling convenient and fatigue-free work with the device at a laboratory table or desk.

## Display

The meter has a three-line display for showing alphanumeric information such as measurement and calibration data, temperatures, and date/time.

Additional information is provided by means of icons (Sensoface, battery icon, etc.).

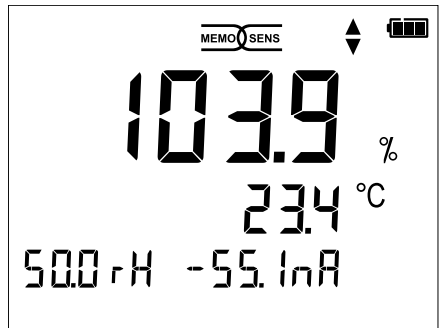
Some typical displays are shown here.



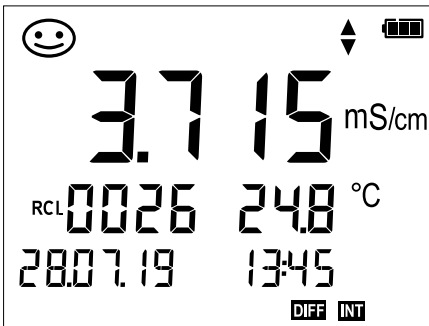
pH measurement  
(display of measured value, temperature, date and time)



Oxygen calibration – step 1  
(calibration in air)



Oxygen calibration – step 2  
(adjusting the relative humidity)



Logger data for conductivity  
(display of measured value, memory location, temperature, date and time)



Clock  
(display of hours and minutes, seconds and date)



## Keypad

The keys of the membrane keypad have a noticeable pressure point.

They have the following functions:

- on/off** Switches the meter on and displays the device and calibration data (see Start-up)
- meas** Switches the meter on / Activates measuring mode / Data logger, stopping
- cal** Start calibration
- set** Activates configuration / Confirms entries
- clock** Displays time and date, allows setting the clock using **set**
- RCL** View stored values
- STO** Holds and saves a measured value, allows setting and starting of the logger by pressing **set** (page 39)
- ▲**  
**▼** When this icon is displayed, you can use the arrow keys for navigation.

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

**⚠ CAUTION!**

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

- the device shows visible damage
- failure to perform the intended function
- prolonged storage at temperatures above 70 °C / 158 °F
- after severe transport stresses

In this case, a professional routine test must be performed.

This test should be carried out at our factory.

**Note on Use in Hazardous Locations**

**⚠ WARNING! Impairment of explosion protection.**

- Only open the battery compartment of the Portavo 904X outside the hazardous location.
- The device cannot be repaired by users. For inquiries regarding repairs, please contact Knick Elektronische Messgeräte GmbH & Co. KG at [www.knick.de](http://www.knick.de).
- Never use the USB port within the hazardous location.





## Inserting the Batteries



With four AA batteries, the Portavo has an operating time of over 1000 h.

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 fasten it finger tight.

## 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	Max. 10 operating hours remaining, measurement is still possible <b>NOTICE!</b> It is absolutely necessary to replace the batteries.

### **⚠ WARNING! Impairment of explosion protection.**

When using the Portavo 904X MULTI in a hazardous location, only the battery types listed below may be used. The batteries must be from the same manufacturer and of identical type and capacity. Never use new and used batteries together (see also Control Drawing 209.009-110).

## Batteries for Application in Hazardous Locations

Batteries (4x each)	Temp. class	Ambient temperature range
Duracell MN1500 <sup>1)</sup>	T4	-10 °C ≤ Ta ≤ +40 °C
Energizer E91	T3	-10 °C ≤ Ta ≤ +50 °C
Power One 4106	T3	-10 °C ≤ Ta ≤ +50 °C
Panasonic Pro Power LR6	T3	-10 °C ≤ Ta ≤ +50 °C

1) The Duracell Plus Power 4ct (EAN: 5000394017641) is an MN1500 battery.

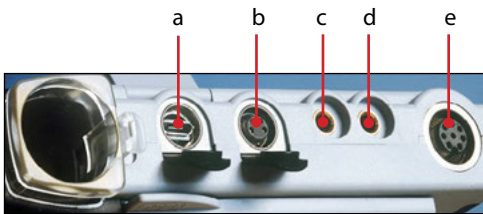
## Connecting a Sensor

The Portavo 904X MULTI provides several connections so that many types of sensors can be used for measurement (see illustration below). Note that only **one** sensor may be connected to the meter at a time. The meter recognizes the connected Memosens sensor and displays the Memosens logo.

### Separate Temperature Probe

**Note:** Temperature measurement using a separate temperature probe is only possible when no Memosens sensor is connected.

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



### Connections

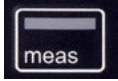
- a - Micro USB port
- b - M8, 4 pins, for Memosens cable
- c - Temperature probe GND
- d - Temperature detector
- e - M12, 8 pins, for Memosens cable

Memosens sensors have a cable coupling, which allows convenient replacement of sensors while the cable remains connected to the meter. Depending on the version, the Memosens cables are connected to socket **b** (M8, 4 pins) or **e** (M12, 8 pins).

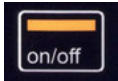
### **⚠ WARNING! Impairment of explosion protection.**

Never use digital Memosens sensors or Memosens cables without Ex approval in a hazardous location. For these applications, you must use Memosens sensors with Ex approval. These sensors and the Memosens Ex cable are marked by an orange-red ring.

## Switching On the Meter



The meter can be switched on by pressing the **meas** or **on/off** key. If you press **meas**, the meter immediately switches to measuring mode.

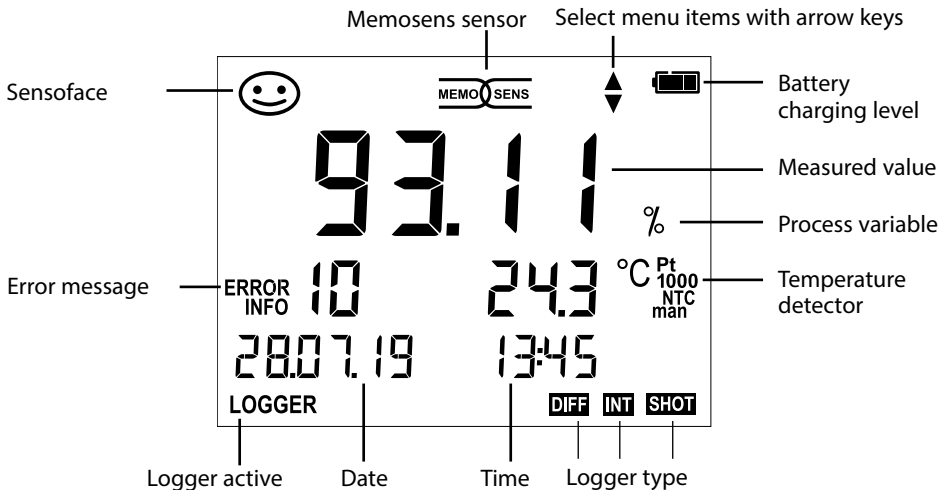


After pressing the **on/off** key, the meter displays selected sensor information, incl. adjustment data, before it switches to measuring mode.

Depending on the connected sensor and the specific measuring task, several steps for configuration and calibration must be performed as described on the following pages.

## Icons

Important information about the state of the device:



pH



## pH Configuration

Configuration is required to match the connected sensor and the desired measurement performance. Furthermore, you can select the suitable calibration method. The following table gives you an overview. Factory settings are shown in **bold print**.

Measurement

↓ **set**

"SETUP" view

	DISPLAY 1	<b>pH x.xx</b>   pH x.xxx   mV																															
	DISPLAY 2	<b>OFF</b>   Date + Time   Date   Time																															
	CAL Timer	<b>OFF</b>   1 ... 99 days																															
	CAL	<b>CALIMATIC</b>   MANUAL   DATA INPUT   ISFET-Zero   CAL SOP (Option 001)   ORP OFFSET (for ORP or pH/ORP combo sensors)   TEMP. OFFSET (Option 001)   FREE CAL																															
	CAL POINTS	1   <b>2</b>   3   1-2-3 (for CALIMATIC, Manual, FREE CAL)																															
		BUFFER SET (CALIMATIC, FREE CAL)	<table border="1"> <tr> <td>-01-</td> <td>Mettler-Toledo</td> <td>2.00 4.01 7.00 9.21</td> </tr> <tr> <td><b>-02-</b></td> <td>Knick CaliMat</td> <td>2.00 4.00 7.00 9.00 12.00</td> </tr> <tr> <td>-03-</td> <td>Ciba (94)</td> <td>2.06 4.00 7.00 10.00</td> </tr> <tr> <td>-04-</td> <td>NIST Technical</td> <td>1.68 4.00 7.00 10.01 12.46</td> </tr> <tr> <td>-05-</td> <td>NIST Standard</td> <td>1.679 4.006 6.865 9.180</td> </tr> <tr> <td>-06-</td> <td>HACH</td> <td>4.01 7.00 10.01 12.00</td> </tr> <tr> <td>-07-</td> <td>WTW techn. buffers</td> <td>2.00 4.01 7.00 10.00</td> </tr> <tr> <td>-08-</td> <td>Hamilton</td> <td>2.00 4.01 7.00 10.01 12.00</td> </tr> <tr> <td>-09-</td> <td>Reagecon</td> <td>2.00 4.00 7.00 9.00 12.00</td> </tr> <tr> <td>-10-</td> <td>DIN 19267</td> <td>1.09 4.65 6.79 9.23 12.75</td> </tr> </table>	-01-	Mettler-Toledo	2.00 4.01 7.00 9.21	<b>-02-</b>	Knick CaliMat	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	1.679 4.006 6.865 9.180	-06-	HACH	4.01 7.00 10.01 12.00	-07-	WTW techn. buffers	2.00 4.01 7.00 10.00	-08-	Hamilton	2.00 4.01 7.00 10.01 12.00	-09-	Reagecon	2.00 4.00 7.00 9.00 12.00	-10-	DIN 19267	1.09 4.65 6.79 9.23 12.75
		-01-	Mettler-Toledo	2.00 4.01 7.00 9.21																													
		<b>-02-</b>	Knick CaliMat	2.00 4.00 7.00 9.00 12.00																													
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		-04-	NIST Technical	1.68 4.00 7.00 10.01 12.46																													
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		-06-	HACH	4.01 7.00 10.01 12.00																													
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-09-		Reagecon	2.00 4.00 7.00 9.00 12.00																														
-10-	DIN 19267	1.09 4.65 6.79 9.23 12.75																															
AUTO OFF	<b>OFF</b>   12h   6h   1h   0.1h																																
TEMP UNIT	°C   °F																																
TIME FORMAT	<b>24h</b>   12h																																
DATE FORMAT	<b>DD.MM.YY</b>   MM.DD.YY																																
TAN TEMP CAL	Enter TAN to enable option (see page 50)																																
TAN SOP	<b>OFF (0000)</b>   0001 ... 9999 (with option 001 SOP only, see page 48)																																
SETUP CODE	<b>NO</b>   YES (reset to factory settings)																																
CAL CODE	<b>Note:</b> All data logger entries will be deleted.																																
LOGGER CODE																																	
DEFAULT																																	

Select using arrow keys, confirm by pressing **set**.



This icon prompts you to select a menu item using the arrow keys – the selection is confirmed by pressing **set**.





## Conductivity Configuration

Prior to measurement, a configuration should be performed to match the connected sensor and the desired measurement performance. Furthermore, you can select the suitable calibration method. The following table gives you an overview. Factory settings are shown in **bold print**.

Measurement

↓ **set**

“SETUP” view

	DISPLAY 1	<b>Cond</b>   Conc %   SAL g/kg   TDS mg/l   °C
	DISPLAY 2	<b>OFF</b>   Date + Time   Date   Time
	MOHM cm	<b>OFF</b>   On
	COND UNIT	<b>mS/cm</b>   S/m
	TDS FACTOR	0.0 ... <b>1.0</b> (if display = TDS)
	TC <sup>*)</sup>	<b>OFF</b>   LINEAR   NAOH   NH3   HCL   NACL   NLF (if display = Cond)
	TC LINEAR	0.0 ... 20.0 %/K   <b>2.1 %/K</b> (if TC = LINEAR)
	REF TEMP	0 ... 100 °C   <b>25.0 °C</b> ( 32 ... 212 °F   <b>77 °F</b> ) (if TC = LINEAR)
	CONC TABLE	-01- ... -10- (if display = Conc %) For concentration determination, see page 65
	<b>set</b>	
	↔	
	▲ CAL	<b>CELL CONST.</b>   COND   0.01 MOL KCL   0.1 MOL KCL   INST. FACTOR <sup>**</sup> )   ZERO POINT <sup>***</sup> )   TEMP. OFFSET (Opt.)   FREE CAL
	▼ AUTO OFF	<b>OFF</b>   12h   6h   1h   0.1h
	TEMP UNIT	°C   °F
	TIME FORMAT	<b>24h</b>   12h
	DATE FORMAT	<b>DD.MM.YY</b>   MM.DD.YY
	TAN TEMP CAL	Enter TAN to enable option (see page 50)
	TAN SOP	
	SETUP CODE	<b>OFF (0000)</b>   0001 ... 9999 (with option 001 SOP only, see page 48)
CAL CODE		
LOGGER CODE		
DEFAULT	<b>NO</b>   YES (reset to factory settings) <b>Note:</b> All data logger entries will be deleted.	

<sup>\*)</sup> Temperature compensation   <sup>\*\*)</sup> With selected sensors

<sup>\*\*\*)</sup> For inductive conductivity measurements only



This icon prompts you to select a menu item using the arrow keys – the selection is confirmed by pressing **set**.

## Oxy



## Oxygen Configuration

Configuration is required to match the connected sensor and the desired measurement performance. Furthermore, you can select the suitable calibration method. The following table gives you an overview. Factory settings are shown in **bold print**.

Measurement

↓ **set**

“SETUP” view

MEAS MEDIUM	<b>LIQU</b>   GAS
DISPLAY 1	<b>Sat. %Air</b>   Concentration in mg/l (if MEAS MEDIUM = LIQU)
DISPLAY 2	<b>OFF</b>   Date + Time   Date   Time
HUMIDITY	0.0 ... <b>100.0</b> % (if MEAS MEDIUM = GAS)
ALTITUDE	<b>0</b> ... 4000 m
SALT CORRECT	<b>0.0</b> ... 45.0 g/kg
CAL	<b>AIR CAL</b>   ZERO CAL   DATA INPUT   FREE CAL
CAL TIMER	<b>OFF</b>   1 ... 99 days
AUTO OFF	<b>OFF</b>   12h   6h   1h   0.1h
TEMP UNIT	°C   °F
TIME FORMAT	<b>24h</b>   12h
DATE FORMAT	<b>DD.MM.YY</b>   MM.DD.YY
TAN TEMP CAL	Enter TAN to enable option (see page 50)
TAN SOP	<b>OFF (0000)</b>   0001 ... 9999 (with option 001 SOP only, see page 48)
SETUP CODE	<b>NO</b>   YES (reset to factory settings)
CAL CODE	<b>Note:</b> All data logger entries will be deleted.
LOGGER CODE	
DEFAULT	

Select using arrow keys, confirm by pressing **set**.



**set**



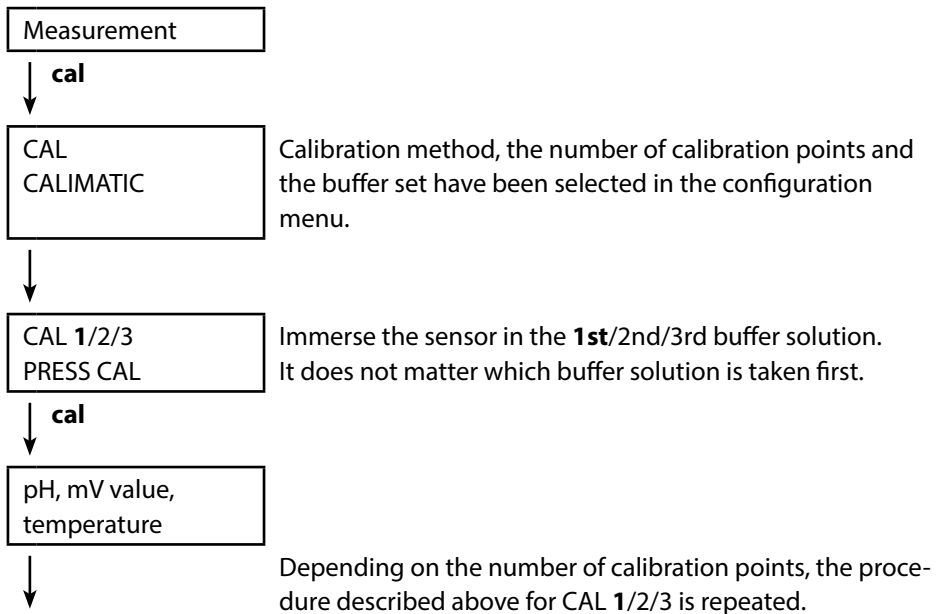
This icon prompts you to select a menu item using the arrow keys – the selection is confirmed by pressing **set**.



## CALIMATIC Calibration

(Calibration with automatic buffer recognition)

The calibration method is selected in the configuration menu. Calibration is required to adjust the sensor to the meter. It is indispensable for achieving comparable and reproducible measurement results.

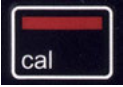


mV value blinks until calibration is completed, then successive display of:

- CAL DATA
- 1/2/3 CAL POINTS
- ZERO POINT
- SLOPE

The meter then automatically returns to measuring mode.

**Note:** To abort calibration, you can press **meas** at any time. This will be confirmed by the “CAL ABORTED” display message. Exception: When you have selected “CAL POINTS 1-2-3” and the first calibration step has been completed, the calibration process cannot be stopped any more.



## MANUAL Calibration

(Manual calibration)

The calibration method is selected in the configuration menu.

Measurement

↓ **cal**

CAL  
MANUAL

The number of calibration points has been selected in the configuration menu.

↓

CAL 1/2/3  
PRESS CAL

↓ **cal**

pH display blinks  
PRESS CAL

Take the temperature-corrected pH value from the buffer description and enter it using ▲▼ .

↓ **cal**

mV display blinks

↓

Depending on the number of calibration points, the procedure described above for CAL 1/2/3 is repeated.

mV value blinks until calibration is completed, then successive display of:

CAL DATA

1/2/3 CAL POINTS

ZERO POINT

SLOPE

The meter then automatically returns to measuring mode.

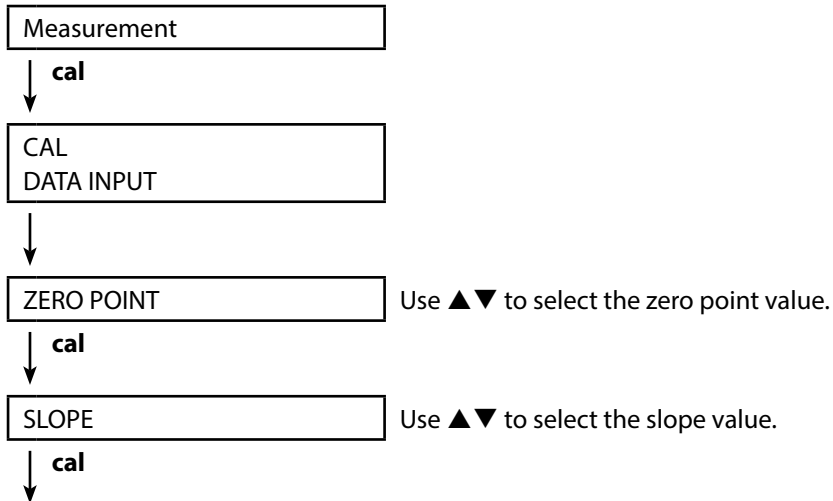
**Note:** To abort calibration, you can press **meas** at any time. This will be confirmed by the "CAL ABORTED" display message. Exception: When you have selected "CAL POINTS 1-2-3" and the first calibration step has been completed, the calibration process cannot be stopped any more.



## DATA INPUT Calibration

(Calibration by entering known sensor values)

The calibration method is selected in the configuration menu.



The calibration data will be displayed successively:

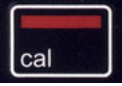
Date and time

ZERO POINT

SLOPE

The meter then automatically returns to measuring mode.

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

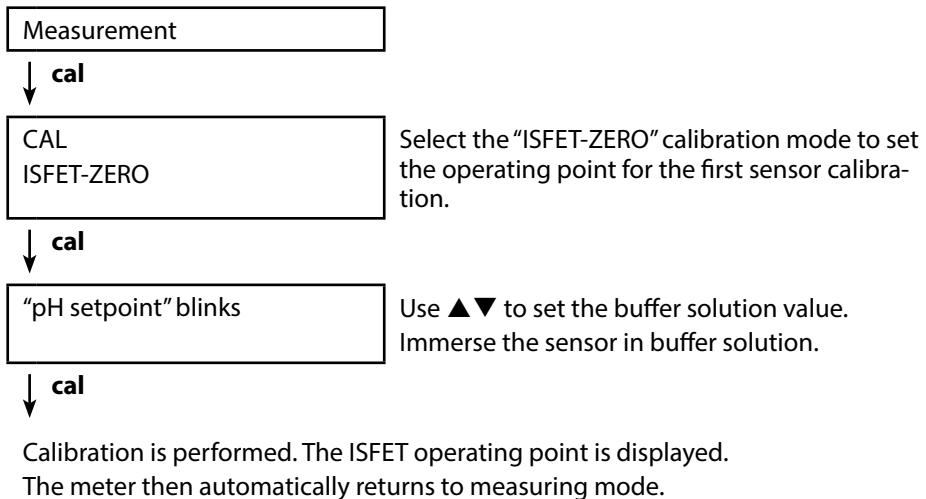


## ISFET Calibration

– available if an ISFET sensor is connected

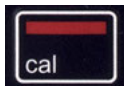
The calibration method is selected in the configuration menu.

When using ISFET sensors for pH measurement, the individual operating point of the sensor first needs to be determined, and should be in the pH 6.5...pH 7.5 range. The sensor is immersed in a buffer solution with a pH value of 7.00 for this purpose.



Keep the sensor connected to the Portavo while performing the next calibration step. The operating point will be taken into account for the following calibration.

**Note:** The operating point only needs to be determined once for each ISFET sensor. To abort calibration, you can press **meas** at any time.



## CAL SOP Calibration

(Option, must have been configured in Paraly SW 112 PC software)

In the Paraly SW 112 PC software, you specify which buffers are to be used in which sequence. You can combine buffer solutions from different buffer sets. Please note that the minimum distance allowed between two buffer solutions is  $\Delta 2$  pH.

SOP calibration allows you to:

- use up to 3 buffers for adjustment
- use a 4th point for verification (“verification buffer”) specify a maximum deviation from the verification buffer
- use buffers from different buffer sets, including a “user buffer”.

Measurement

↓ **cal**

CAL  
CAL SOP blinks

Use ▲▼ to set the required calibration method (CAL SOP).

↓ **cal**

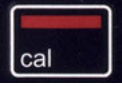
Perform the selected calibration

(see Paraly SW 112 PC software for description).

The meter then automatically returns to measuring mode.

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

pH



## ORP OFFSET Calibration

(available if an ORP or  
pH/ORP combo sensor is connected)

Selected in the configuration menu.

Measurement

↓ cal

CAL  
ORP OFFSET

You can specify an offset for the ORP value measured by the sensor.

After calibration has been activated, the following values are listed in the display:

- ORP setpoint (in mV)
- temperature measured by sensor
- measured ORP value (in mV)

↓ cal

"ORP setpoint" blinks

Use ▲▼ to set the ORP value.

↓ cal

Calibration is performed, the offset value is indicated.  
The meter then automatically returns to measuring mode.

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





## TEMP. OFFSET Calibration (option)

Temperature calibration (offset)

Selected in the configuration menu.

Measurement

↓ **cal**

CAL  
TEMP. OFFSET

You can specify an offset for the temperature measured by the sensor.

After calibration has been activated, the following values are listed in the display:

- temperature setpoint
- temperature measured by sensor
- offset (display in K)

↓ **cal**

Temperature setpoint value  
blinks.

Use ▲▼ to set the temperature setpoint value.

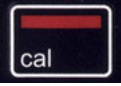
↓ **cal**

Calibration is performed, the offset value is indicated.

The meter then automatically returns to measuring mode.

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

pH

**FREE CAL Calibration****(Free selection of calibration method)**

FREE CAL calibration is selected in the configuration menu.

Measurement

↓ cal

CAL  
CALIMATIC blinks

↓ cal

Perform the selected calibration as described on the previous pages.  
The meter then automatically returns to measuring mode.

Use ▲▼ to select the required calibration method (CALIMATIC, MANUAL, DATA INPUT, ISFET-Zero, CAL SOP (Option 001), ORP OFFSET (for ORP or pH/ORP combo sensors), or TEMP. OFFSET (Option 001)).

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



## CELL CONST. Calibration

(Calibration by entry of cell constant)

The calibration method is selected in the configuration menu.

Measurement

↓ cal

CAL  
CELL CONST.

The conductivity will be shown in the display and can be compared with a reference solution (temperature-corrected).

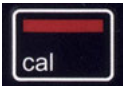
↓

Value blinks

Use ▲▼ to set the cell constant value.

↓ cal

Calibration is performed. Display: CELL CONSTANT.  
The meter then automatically returns to measuring mode.



## COND Calibration

(Calibration by entry of conductivity)

The calibration method is selected in the configuration menu.

Measurement

↓ cal

CAL  
COND

Immerse sensor in solution.

↓

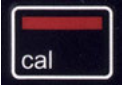
Value blinks

Use ▲▼ to set the temperature-corrected conductivity value. **Note:** Here, the meter does not perform a temperature compensation!

↓ cal

Calibration is performed. Display: CELL CONSTANT.  
The meter then automatically returns to measuring mode.

Cond



### 0.1/0.01 MOL KCL Calibration

(Automatic calibration with KCl solution)

The calibration method is selected in the configuration menu.

#### Important notes:

- 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.

Measurement

↓ cal

CAL  
0.1/0.01 MOL KCL  
PRESS CAL

Dip sensor in KCl solution.  
The meter automatically compensates for the temperature deviation!

↓ cal

Measured value  
Temperature  
Conductivity KCl  
Hourglass blinks

Calibration is performed.

↓

Display: CELL CONSTANT.

The meter then automatically returns to measuring mode.

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



## INST. FACTOR calibration

(For inductive conductivity measurement only or with Memosens 4-electrode sensor with specification of installation factor)

Selected in the configuration menu.

Measurement

↓ cal

CAL  
INST. FACTOR

In narrow installation conditions, the conductivity measurement is influenced by the sensor's distance to the wall and the wall material. This effect can be compensated for by the installation factor. The meter corrects the cell constant by multiplying it with the installation factor. The value of the installation factor depends on the diameter and the conductivity of the pipe as well as on the sensor's distance from the wall. If the distance from the wall is sufficient ( $> 15 \text{ mm}$  ( $0.59''$ ), DN 80 or larger), it is not necessary to consider the installation factor (1.00). If the distance from the wall is smaller, the installation factor increases ( $> 1$ ) when the pipe is electrically insulating and decreases ( $< 1$ ) when the pipe is electrically conductive. See the instructions in the sensor manufacturer's documentation.

↓ cal

Value blinks

Use ▲▼ to set the installation factor.

↓ cal

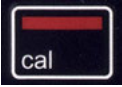
Calibration is performed.

Display: CELL CONSTANT, INST. FACTOR.

The meter then automatically returns to measuring mode.

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

Cond

**ZERO POINT Calibration**

(For inductive conductivity measurement only:  
calibrating the sensor zero point)

Calibration method is selected in the configuration menu.

Measurement

↓ cal

CAL  
ZERO POINT

Remove the sensor for calibration and place it in  
air – then start calibration.

↓ cal

The “hourglass” icon blinks  
until the zero point has been  
calculated:



Calibration is performed.

↓

Calibration is performed.

Display: CELL CONSTANT, ZERO POINT, INST. FACTOR.

The meter then automatically returns to measuring mode.

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



## TEMP. OFFSET Calibration (option)

Temperature calibration (offset)

Selected in the configuration menu.

Measurement

↓ **cal**

CAL  
TEMP. OFFSET

You can specify an offset for the temperature measured by the sensor.

After calibration has been activated, the following values are listed in the display:

- temperature setpoint
- temperature measured by sensor
- offset (display in K)

↓ **cal**

Temperature setpoint value  
blinks.

Use ▲▼ to set the temperature setpoint value.

↓ **cal**

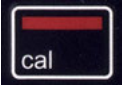
Calibration is performed.

Display: TEMP. OFFSET.

The meter then automatically returns to measuring mode.

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

Cond

**FREE CAL Calibration****(Free selection of calibration method)**

FREE CAL calibration is selected in the configuration menu.

Measurement

↓ cal

CAL  
CELL CONST. blinks

↓ cal

Use ▲▼ to select a calibration method (depending on the connected sensor: CELL CONST., COND, 0.01 MOL KCL, 0.1 MOL KCL, INST. FACTOR, ZERO POINT, TEMP. OFFSET).

Perform the selected calibration as described on the previous pages.  
The meter then automatically returns to measuring mode.

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

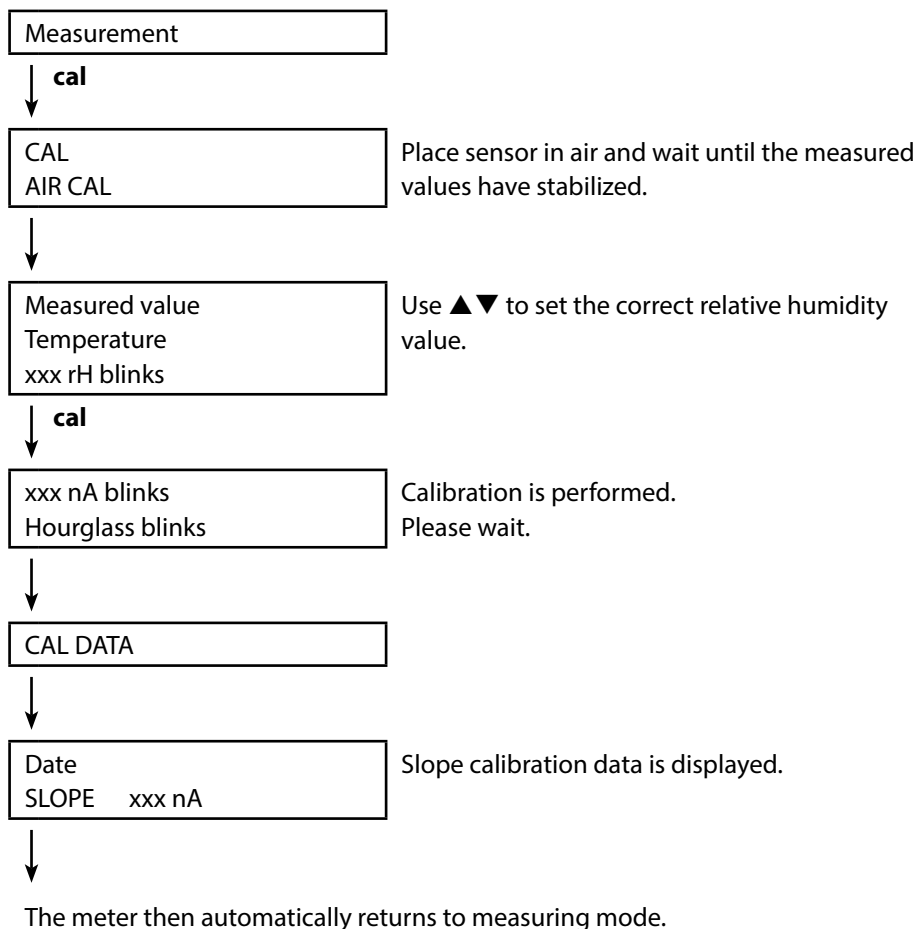




## AIR CAL Calibration

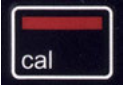
(Calibrating the slope in air)

The calibration method is selected in the configuration menu.



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

## Oxy

**ZERO CAL Calibration****(Zero calibration with oxygen-free medium)**

The calibration method is selected in the configuration menu.

Measurement

↓ **cal**CAL  
ZERO CAL

↓

xxx  
nA  
PRESS CAL blinks

Place sensor in oxygen-free medium (e.g., nitrogen 5.0) and wait until the measured values have stabilized.

↓ **cal**

CAL DATA

Calibration is performed.  
Please wait.

↓

Date  
ZERO P. xxx nA

Zero calibration data is displayed.

↓

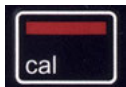
Date  
SLOPE xxx nA

Slope calibration data is displayed.

↓

The meter then automatically returns to measuring mode.

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



## DATA INPUT Calibration

(Calibration by entering known sensor values)

The calibration method is selected in the configuration menu.

Measurement

↓ **cal**

CAL  
DATA INPUT

↓

xx blinks  
nA  
ZERO POINT

Use ▲▼ to set the known value for the sensor zero point.

↓ **cal**

xxx blinks  
nA  
SLOPE

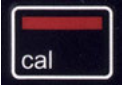
Use ▲▼ to set the known value for the sensor slope.

↓ **cal**

Calibration is performed. The meter then automatically returns to measuring mode.

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

Oxy

**TEMP. OFFSET Calibration (option)****Temperature calibration (offset)**

Selected in the configuration menu.

Measurement

↓ **cal**CAL  
TEMP. OFFSET

You can specify an offset for the temperature measured by the sensor.

After calibration has been activated, the following values are listed in the display:

- temperature setpoint
- temperature measured by sensor
- offset (display in K)

↓ **cal**Temperature setpoint value  
blinks.

Use ▲▼ to set the temperature setpoint value.

↓ **cal**

Calibration is performed, the offset value is indicated.  
The meter then automatically returns to measuring mode.

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



## FREE CAL Calibration

(Free selection of calibration method)

FREE CAL calibration is selected in the configuration menu.

Measurement

↓ **cal**

CAL  
AIR CAL blinks

Use ▲▼ to set the required calibration method (AIR CAL, ZERO CAL, DATA INPUT).

↓ **cal**

Perform the selected calibration as described on the previous pages.

The meter then automatically returns to measuring mode.

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

pH

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. Information on this can be found in the sensor's user manual.
- 2) Switch the meter on using the **on/off** or **meas** 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.
- 5) By pressing the **STO** key, you can hold and save a measured value (see data logger, page 39).

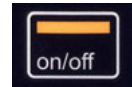
Measurement can also be controlled using the Paraly SW 112 PC software.

## Toggling the Measurement Display

During measurement, you can toggle the measurement display by pressing **meas**:

- pH: between pH and ORP values in mV (also with pH/ORP combo sensor)
- Cond: between compensated and uncompensated measured value (when temperature compensation, SAL or TDS are activated)
- Oxy: not applicable

### Keys for measurement





## 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:

- DIFF (signal-controlled logging of measured variable and temperature)
- INT (time-controlled logging at a fixed interval)
- DIFF+INT (combined time- and signal-controlled logging)
- SHOT (manual logging by pressing the **STO** key)

The data logger records up to 5000 entries and saves them in a circular buffer.

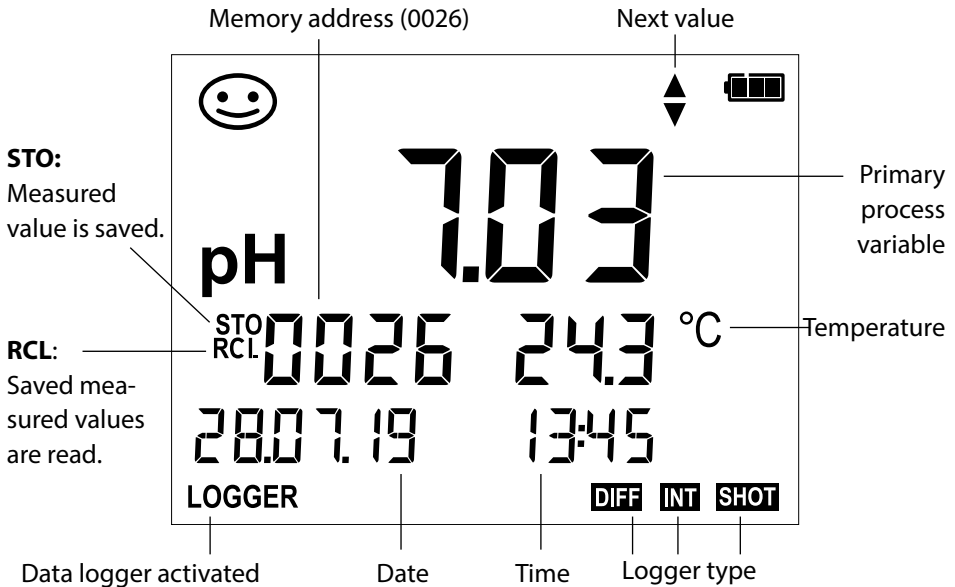
Already existing entries will be overwritten.

The following data are recorded: primary value, temperature, time stamp and device status.

Option 001 SOP can be used to set up an access lock for the data logger, which in the absence of an access code allows only logger data to be displayed (see page 48).

The Paraly SW 112 PC software allows convenient management of the data logger. It is always the currently selected process variable which is recorded. The "STO" icon and the memory address is displayed briefly to indicate that an entry is being saved.

### Display: Icons Related to the Data Logger



pH

Oxy

Cond

## Operating Modes of the Data Logger (Logger Type)

### Manual Logging when Logger is Activated (SHOT)

In this mode, a measured value is recorded each time the **STO** key is pressed.

Measurement  
Logger **activated**

↓ **STO**

The measured value is saved to the address of the last recorded value + 1

### Manual Logging when Logger is Deactivated

Measurement  
Logger **deactivated**

↓ **STO**

Measured value is maintained  
Proposed address blinks  
(address of the last recorded  
value + 1)

If desired: Select a start address using ▲▼.

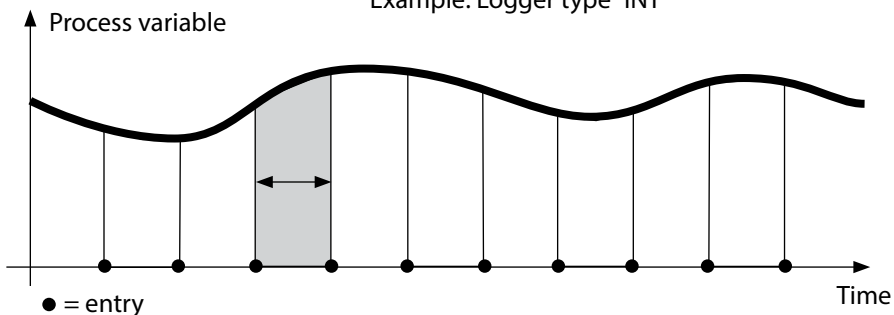
↓ **STO**

Measured value is saved to the desired address (e.g., for overwriting an incorrect measurement).

### Interval (INT)

In this mode, the measured values are cyclically recorded.

Example: Logger type "INT"

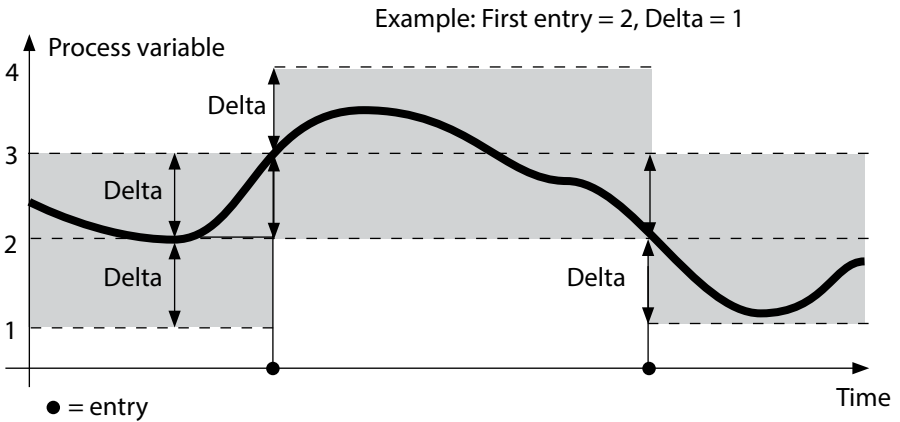




pH	Oxy	Cond
----	-----	------

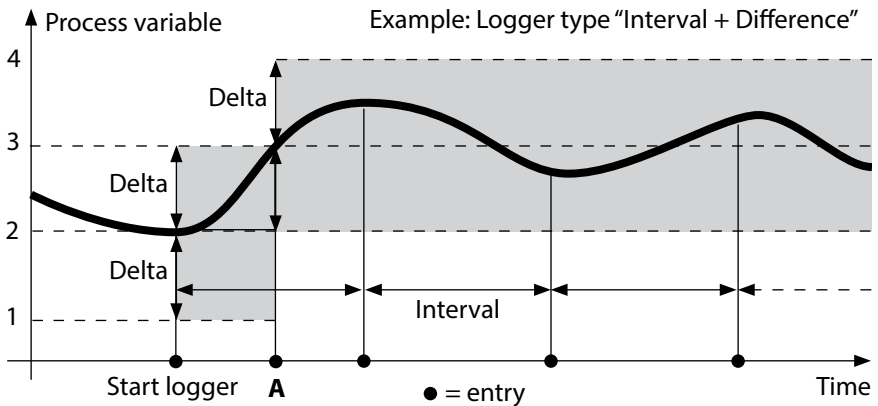
### Difference (DIFF)

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.



### Difference + Interval Combined (DIFF+INT)

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.



pH

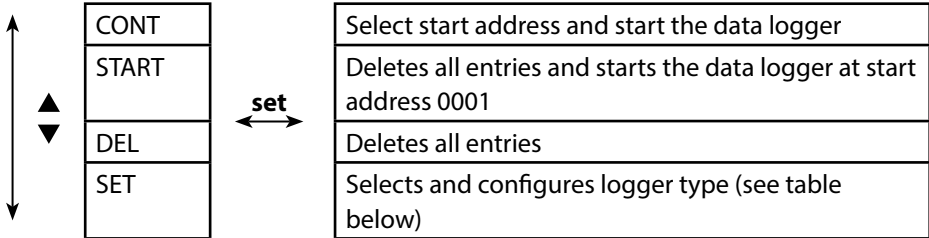
Oxy

Cond

## Data Logger Menu

Logger view

Select using arrow keys, confirm by pressing **set**.



## Configuring the Data Logger

Prerequisite: The data logger is stopped (press **meas**).

Measurement

↓ **STO**

Measured value is maintained

↓ **set**

Logger: CONT blinks

↓ ▼

Logger: START blinks

↓ ▼

Logger: DEL blinks

↓ ▼

Logger: SET blinks

↓ **set**

Logger: Current logger type blinks

↓ **set**

Select desired logger type using ▲▼: DIFF, INT, DIFF+INT or SHOT.

Select the appropriate parameters using ▲▼ and confirm each selection by pressing **set**. When configuration is finished, CONT blinks. You can start the data logger by selecting START or CONT (see page 44).

pH

Oxy

Cond

## Configuring the Logger Type

Logger type	Select (default in bold print)		
Logger type	DIFF <sup>1)</sup>	LIQU: Delta % air	OFF   0.1 ... 100.0 % air   <b>1.0 % air</b>
		Delta mg/l	OFF   0.01 ... 20.00 mg/l   <b>1.00 mg/l</b>
		GAS: Delta %	OFF   0.001 ... 9.999 %   <b>1.000 %</b>
		Delta pH / mV	OFF   pH 0.01...14.00   <b>pH 1.00</b> OFF   1... 1000 mV   <b>1 mV</b>
		Delta cond	OFF   <b>1</b> ... 1000 mS/cm OFF   0.1 ... 100.0 S/m   <b>1.0 S/m</b>
		Delta Conc %	OFF   0 ... 10 %   <b>1 %</b>
		Delta SAL	OFF   <b>0.1</b> ... 45.0 g/kg
		Delta TDS	OFF   <b>1</b> ... 5000 mg/l
		Delta °C / °F	OFF   0.1 ... 50.0 °C   <b>1.0 °C</b> OFF   0.1 ... 100.0 °F   <b>1.0 °F</b>
	INT	Interval	h:mm:ss 0:00:01 ... 9:59:59   <b>0:02:00</b>
DIFF+INT	DIFF	See logger type DIFF	
	INT	See logger type INT	
SHOT	Currently selected process variable is saved.		

1) Process variables dependent on connected sensor and configuration, see page 16

pH

Oxy

Cond

## Starting the Data Logger using CONT

Prerequisite: Data logger is configured. Every time the meter has been switched off, the data logger must be restarted (exception: SHOT).

Measurement

↓ **STO**

Measured value is maintained

↓ **set**

Logger: CONT blinks

↓ **set**

Address of the last recorded  
value + 1 blinks  
(proposed start address)

If desired: Select a start address using ▲▼.

↓ **set**

The measured value is saved to the selected start address (exception: SHOT).

"... FREE MEMORY" is displayed.

"LOGGER" and "active logger type" icons are displayed.

## Starting the Data Logger using START

Prerequisite: Data logger is configured. All existing entries are deleted. The start address for saving the values is 0001. Every time the meter has been switched off, the data logger must be restarted (exception: SHOT).

Measurement

↓ **STO**

Measured value is maintained

↓ **set**

Logger: CONT blinks

↓ ▼

Logger: START blinks

↓ **set**

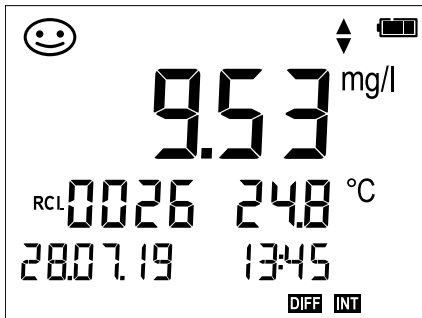
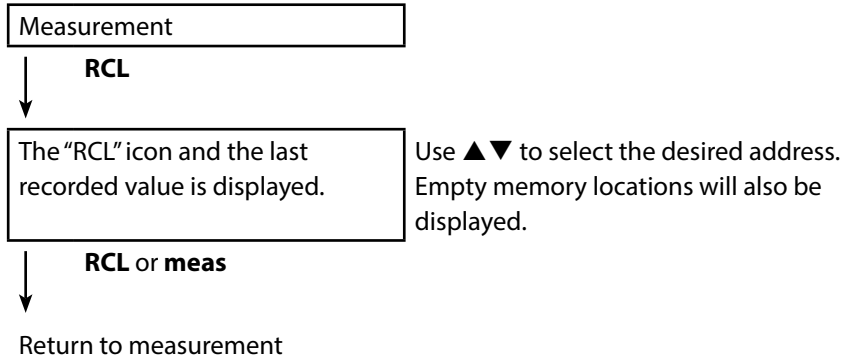
All entries will be deleted. "5000 FREE MEMORY" is displayed.

"LOGGER" and "active logger type" icons are displayed.

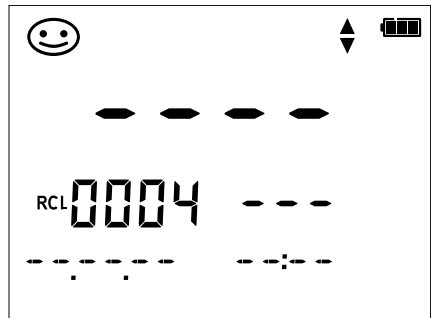


## Displaying the Logger Data

Pressing the **RCL** key displays all stored values. The Paraly SW 112 PC software allows convenient management of the data logger.



Example:  
Measured value stored at location 0026



Example:  
Empty memory location 0004

pH

Oxy

Cond

## Stopping the Data Logger

You can stop the data logger at any time by pressing the **meas** key.

Measurement, logger **activated**



**meas**

Data logger is stopped. "LOGGER" and "active logger type" icons are no longer displayed. It is still possible to hold a measured value by pressing **STO** and send it to any desired address.

## Clearing the Data Logger

Selecting "DEL" deletes all data records.

Measurement



**STO**

Measured value is maintained



**set**

Logger: CONT blinks



Logger: START blinks



Logger: DEL blinks  
PRESS SET



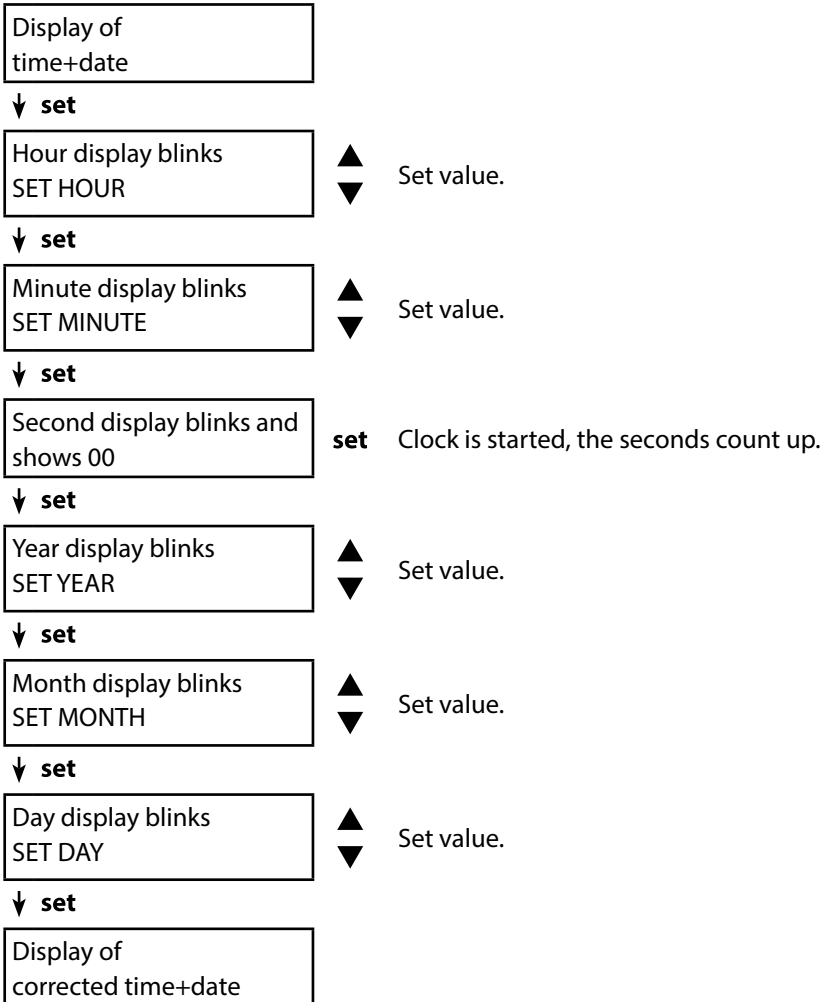
**set**

All stored data are deleted.  
"0000 DELETED" is displayed.



Press the **clock** key to access the clock mode. Date and time will be displayed in the format as set in the configuration menu.

To set the clock, proceed as follows:



## Option 001 SOP (Standard Operating Procedure)

### Scope:

#### Cal SOP Calibration Method

The calibration method must be configured using the Paraly SW 112 PC software. Here, you specify which buffers are to be used in which sequence. You can combine buffer solutions from different buffer sets. Please note that the minimum distance allowed between two buffer solutions is  $\Delta 2$  pH units.

SOP calibration allows you to:

- select up to three calibration points and three buffer sets.
- add a verification buffer.
- specify a maximum deviation (0 ... 0.5 pH units) for the verification buffer as delta pH.

#### Sensor Verification

The Paraly SW 112 PC software allows a sensor to be assigned to the device. See the Paraly SW 112 PC software user manual.

#### Setup / Cal / Logger Code

Access codes can be set on the meter or using the Paraly SW 112 PC software; see page 50.

Configuration: SETUP CODE

Calibration: CAL CODE

Data logger: LOGGER CODE

Without entry of an access code, the data logger will only display logger data (RCL).

#### Temperature Calibration

(also separately available as Option 002 TEMP.CAL)

## Option 002 TEMP.CAL (Temperature Calibration)

For Memosens sensors, you can perform a 1-point calibration of the internal temperature detector. See the Calibration chapter for a description.



## Enabling Options / TAN Input



When you have bought an option, you receive a document with a code (TAN) for enabling this option on your device.

Press the **set** key to access the configuration mode.

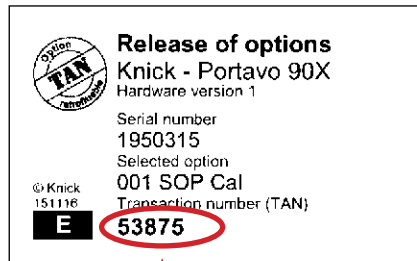
Use the arrow keys to select the "TAN TEMP CAL" function, for example, where you can enter the TAN for enabling the option.

↓ **set**

TAN TEMP CAL

**set** Press the **set** key.

↓ **set**



Enter the TAN code:

First digit blinks.



Set value.

↓ **set**

Next digit blinks.



Set value.

↓ **set**

...



Set value, press **set** to save the TAN.

After correct input of the TAN, the device signals "PASS" – the option is now available

## Access Codes for CONF, CAL, and Data Logger

(with Option 001 SOP only)



Press the **set** key to access the configuration mode.

Use the arrow keys to select the "SETUP CODE" function and set an access code for configuration, "CAL CODE" to set an access code for calibration, and/or "LOGGER CODE" to set an access code for the data logger.

### Important Note:

If you lose the SETUP access code, system access is locked.

See the next page for more information.

↓ **set**

SETUP CODE

**set** Press the **set** key.

↓ **set**

First digit blinks.



Set value.

↓ **set**

Next digit blinks.



Set value.

↓ **set**

...



Set value, press **set** to save the configuration access code.

When accessing the configuration menu, you will be prompted to enter an access code.

If you want to set a code for access to calibration or the data logger, select "CAL CODE" or "LOGGER CODE" and proceed as described above.

**Note:** Functions are accessible to anyone with access code "0000".

## Inputting the Rescue TAN

If you lose the SETUP access code, system access is locked.

The manufacturer can generate a rescue TAN (TAN RESCUE).

For this purpose, please have the serial number of the corresponding device to hand.

If you have any questions, please contact Knick Elektronische Messgeräte GmbH & Co. KG using the contact details provided on the last page of this document.

The menu for input of the rescue TAN appears if the SETUP access code is incorrectly entered three times:



The Paraly SW 112 PC software supplements the Portavo series. It allows convenient management of the data that have been acquired by the meters as well as simple and clear configuration of the meters. Paraly SW 112 starts automatically when the Portavo USB port is connected to the computer.

The Paraly SW 112 PC software stands out by the following features:

- Intuitive Windows user interface
- Easy configuration and management of several meters
- Display of device and sensor information
- Configuration of individual buffer sets
- Convenient management and evaluation of the data logger
- Export function for Microsoft Excel
- Print function
- Upgrade/downgrade of device firmware

**Note:** Prior to upgrading/downgrading the device firmware, Portavo is reset to its factory settings.

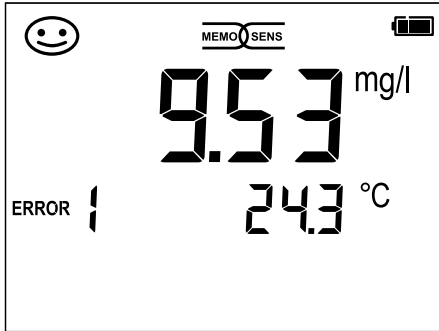
Make the following backups prior to upgrading or downgrading:

- Read out Portavo data logger.
- Save the Portavo device configuration in Paraly.

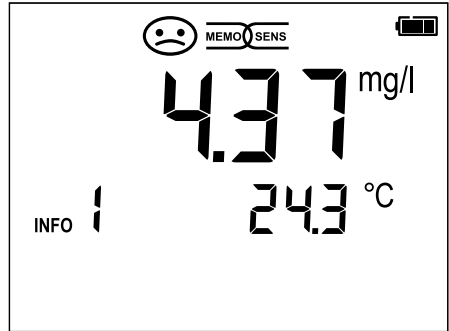
The Paraly SW 112 PC software, incl. a detailed user manual, can be downloaded from [www.knick.de](http://www.knick.de).



Error messages are indicated as “ERROR ...” on the display. Information on the sensor condition is indicated by the “Sensoface” icon (friendly, neutral, sad) possibly accompanied by an info message (“INFO ...”).



Example of an error message:  
ERROR 1 (value out of range)



Example of a “Sensoface” message:  
INFO 1 (cal timer expired)

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.

The most important error messages and “Sensoface” info messages are shown on the inside of the protective cover. A complete list of messages and their meanings is provided in the following tables.



pH

Oxy

Cond

**“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

The “neutral” and “sad” Sensoface icons are accompanied by an “INFO ...” message to give a hint to the cause of deterioration.

Sensoface	Message	Cause
	INFO 1	Calibration timer
	INFO 3	Sensocheck
	INFO 5	Zero/Slope
	INFO 6	Response time
 	INFO 7	Operating point (asymmetry potential)
	INFO 8	Leakage current
	INFO 9	ORP offset
	INFO 10	Polarization


pH

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## Error Messages

The following error messages can be shown in the display.

Message	Cause	Remedy
 blinks	Battery empty	Replace batteries
ERROR 1	Value out of range	Check whether the measurement conditions correspond to the adjusted measuring range.
ERROR 2	ORP value out of range	
ERROR 3	Temperature value out of range	
ERROR 4	Zero point too high/low	Thoroughly rinse the sensor and recalibrate. If this does not help, replace the sensor.
ERROR 5	Slope too high/low	
ERROR 6	Cell constant too high/low	Enter nominal cell constant or calibrate the sensor using a known solution.
ERROR 8	Calibration error: Identical buffers	Use a buffer solution with a different nominal value before starting the next calibration step.
ERROR 9	Calibration error: Buffer unknown	Make sure that you use the same buffer set as configured.
ERROR 10	Cal. media interchanged	Repeat calibration.
ERROR 11	Measured value unstable Stability criterion not met	Leave the sensor in the liquid until the temperature is stable. If this does not help, replace the sensor.
ERROR 14	Time and date invalid	Set time and date
ERROR 18	Configuration invalid	Restart, reset to factory settings, configure and calibrate. If this does not help, send in the device for repair.
ERROR 19	Factory settings error	Device defective, send it in.
ERROR 21	Sensor error (Memosens) or Sensor verification message	Connect an operational Memosens sensor. With sensor verification activated in Paraly SW 112, this error message indicates that an unassigned sensor was connected.
ERROR 22	Sensor conflict	Connect only <b>one</b> sensor.
ERROR 25	Buffer distance	Re-enter the buffer table.

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## Accessories/Options

Accessories	Order No.
Robust field case (for meter, sensor, various small parts and user manual)	ZU0934
Replacement quiver (5 units)	ZU0929
Base stand for accepting up to 3 sensors with base plate made of stainless steel	ZU6953
Measuring cable with M8 connector for sensors with Memosens connector	
Length 1.5 m / 4.92 ft	CA/MS-001XFA-L
Length 2.9 m / 9.51 ft	CA/MS-003XFA-L

Temperature Detectors	Order No.
Pt1000 temperature detector	ZU6959
Pt1000 temperature detector with angled connector	ZU0156

**Note:** When a Memosens sensor is connected, the temperature detector of the Memosens sensor is used. When a Memosens sensor is not connected, the Portavo can be used as a temperature meter.

TAN Options	Order No.
Cal SOP calibration method: user management, sensor verification, temperature detector adjustment in the Memosens sensor (offset correction)	SW-P001
Temperature detector adjustment in the Memosens sensor (offset correction)	SW-P002

Paraly SW112 PC software for configuration and firmware updates:  
Free download from [www.knick.de](http://www.knick.de)



## Digital pH Sensors (Memosens)

Please visit our website for more information on our product range: [www.knick.de](http://www.knick.de).

## Knick CaliMat (pH) Buffer Solutions

Ready-to-Use Quality pH Buffer Solutions

<b>pH Value (20 °C/68 °F)</b>	<b>Quantity</b>	<b>Order No.</b>
2.00	250 ml	CS-P0200/250
4.00	250 ml	CS-P0400/250
	1000 ml	CS-P0400/1000
	3000 ml	CS-P0400/3000
7.00	250 ml	CS-P0700/250
	1000 ml	CS-P0700/1000
	3000 ml	CS-P0700/3000
9.00	250 ml	CS-P0900/250
	1000 ml	CS-P0900/1000
	3000 ml	CS-P0900/3000
12.00	250 ml	CS-P1200/250

### Buffer Solution Sets (20 °C/68 °F)

Set 4.00	3x 250 ml	CS-PSET4
Set 7.00	3x 250 ml	CS-PSET7
Set 9.00	3x 250 ml	CS-PSET9
Set 4.00, 7.00, 9.00	250 ml each	CS-PSET479
KCl solution, 3 molar	250 ml	ZU0062

## Accessories for pH

<b>Item</b>	<b>Order No.</b>
Adapter for process sensors with Ø 12 mm and PG 13.5 thread for use with quiver	ZU0939
Sensor protection for process sensors with Ø 12 mm and PG 13.5 thread	ZU1054
Sensor protection for process sensors with Ø 12 mm and PG 13.5 thread made of PVDF	ZU1121

Cond

## Digital Conductivity Sensors (Memosens)

Please visit our website for more information on our product range: [www.knick.de](http://www.knick.de).

### Conductivity Standards for determining a cell constant

Ready-to-Use Solutions	Quantity	Order No.
1.3 $\mu\text{S/cm}$ , KCl	300 ml	ZU0701
15 $\mu\text{S/cm}$ , KCl	500 ml	CS-C15K/500
147 $\mu\text{S/cm}$ , (0.001 mol/l KCl)	500 ml	CS-C147K/500
1413 $\mu\text{S/cm}$ , (0.01 mol/l KCl)	500 ml	CS-C1413K/500
12.88 mS/cm, (0.1 mol/l KCl)	500 ml	CS-C12880K/500

### Solutions for Preparation

For preparation of 1000 ml 0.1 mol/l NaCl solution (12.88 mS/cm)	1 ampoule	ZU 6945
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### Accessories for Conductivity

Item	Order No.
Adapter for process sensors with $\varnothing$ 12 mm and PG 13.5 thread for use with quiver	ZU0939
Replacement KPG® tube for ZU6985 4-electrode sensor, incl. O-ring	ZU0180
Replacement flow cell for SE 202 2-electrode sensor	ZU0284
Adapter for connecting a conductivity sensor with 2 banana plugs	ZU0289
Adapter for connecting the ZU6985 4-electrode sensor	ZU0290
Measuring cable for digital toroidal conductivity sensors with Memosens Protocol, 4-pin M12 socket, 4-pin M8 plug, length 1.5 m / 4.92 ft	CA/M12-001M8-L
Measuring cable for connecting 2-/4-electrode sensors with VP connector	ZU1120

## Digital Oxygen Sensors (Memosens)

Please visit our website for more information on our product range: [www.knick.de](http://www.knick.de).

## Accessories for Oxygen

<b>Item</b>	<b>Order No.</b>
Sensor protection for process sensors with Ø 12 mm and PG 13.5 thread made of PVDF	ZU1121
Maintenance kit for SE715/1-MS (electrolyte, 3 membrane caps)	ZU0879
Flow-through cell for SE715/1-MS oxygen sensor	ZU1014
O <sub>2</sub> electrolyte	ZU0565
Measuring cable with M12 connector for sensors with Memosens connector	
Length 1.5 m / 4.92 ft	CA/MS-001XDA-L
Length 2.9 m / 9.51 ft	CA/MS-003XDA-L

pH

Oxy

Cond

<b>Connections</b>	1 x M8 socket, 4 pins, for Memosens sensors 1 x M12 socket, 8 pins, for Memosens sensors 2 x 4-mm socket for separate temperature detector 1 x micro USB-B for data transmission to PC <b>Be sure to observe the safety instructions when using the USB port.</b>
<b>Display</b>	LCD STN 7-segment display with 3 lines and icons
Sensoface	Status display (friendly, neutral, sad)
Status indicators	For battery condition, logger
Notices	Hourglass
Keypad	[on/off], [cal], [meas], [set], [▲], [▼], [STO], [RCL], [clock]
<b>Data logger</b>	With up to 5000 memory locations
Recording	Manual, interval- or event-controlled
<b>Communication</b>	USB 2.0
Profile	HID, driverless installation
Usage	Data exchange and configuration via Paraly SW 112 PC software
<b>Diagnostic functions</b>	
Sensor data	Manufacturer, sensor type, serial number, operating time
Calibration data	Calibration date; zero and slope, or cell constant, resp.
Device self-test	Automatic memory test (FLASH, EEPROM, RAM)
Device data	Device type, software version, hardware version
<b>Data retention</b>	Parameter, calibration data > 10 years
<b>EMC</b>	EN 61326-1 (General requirements)
Emitted interference	Class B (residential)
Immunity to interference	Industrial applications EN 61326-2-3 (Particular Requirements for Transmitters)
<b>Explosion protection</b>	See control drawing for entity parameters.

pH

Oxy

Cond

<b>RoHS conformity</b>	According to directive 2011/65/EU
<b>Power supply</b>	4x AA batteries For battery types, see Control Drawing No. 209,009-110
<b>Operating time</b>	Approx. 500 h (alkaline)
<b>Rated operating conditions</b>	
<b>Ambient temperature</b>	-10 °C ≤ Ta ≤ +40 °C T4 Duracell MN1500 -10 °C ≤ Ta ≤ +50 °C T3 Energizer E91 -10 °C ≤ Ta ≤ +50 °C T3 Power One 4106 -10 °C ≤ Ta ≤ +50 °C T3 Panasonic Pro Power LR6
<b>Transport/ Storage temperature</b>	-25 ... +70 °C / -13 ... +158 °F
<b>Relative humidity</b>	0 ... 95 %, short-term condensing allowed
<b>Housing</b>	
<b>Material</b>	PA12 GF30 (silver gray RAL 7001) + TPE (black)
<b>Protection</b>	IP66/67 with pressure compensation
<b>Dimensions</b>	Approx. 132 x 156 x 30 mm
<b>Weight</b>	Approx. 500 g

## pH

<b>Memosens pH input (also ISFET)</b>	M8 socket, 4-pin or M12 socket, 8-pin	
Display ranges <sup>1)</sup>	pH	-2.00 ... 16.00
	mV	-1999 ... 1999 mV
	Temperature	-50 ... 250 °C / -58 ... 482 °F
<b>Memosens input ORP</b>	M8 socket, 4-pin or M12 socket, 8-pin	
Display ranges <sup>1)</sup>	mV	-1999 ... 1999 mV
	Temperature	-50 ... 250 °C / -58 ... 482 °F
Sensor standardization *	ORP calibration (zero offset)	
Permissible calibration range	ΔmV (offset)	-700 ... 700 mV
<b>Sensor standardization *</b>	pH calibration	
Operating modes *	CALIMATIC	Calibration with automatic buffer recognition
	MANUAL	Manual calibration with entry of individual buffer values
	DATA INPUT	Data entry of zero and slope
	ISFET calibration	Setting the ISFET operating point
	Cal-SOP (TAN option)	Software option SW-P001: Defining the pH buffers and the sequence of the calibration steps; defining the delta deviation for the verification buffer
	ORP calibration	Zero offset for ORP or pH/ORP combo sensors
	Temperature Calibration (TAN option)	Software option SW-P002 for temperature probe adjustment in the Memosens sensor (offset correction)
	FREE CAL	Free selection of calibration method
Calimatic buffer sets *	-01- Mettler-Toledo	2.00/4.01/7.00/9.21
	-02- Knick CaliMat	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	1.679/4.006/6.865/9.180
	-06- HACH	4.01/7.00/10.01/12.00
	-07- WTW techn. buffers	2.00/4.01/7.00/10.00
	-08- Hamilton	2.00/4.01/7.00/10.01/12.00
	-09- Reagecon	2.00/4.00/7.00/9.00/12.00
	-10- DIN 19267	1.09/4.65/6.79/9.23/12.75
	-U1- (User)	loadable via Paraly SW 112

\*) User-defined

1) Ranges dependent on Memosens sensor

Permissible calibration ranges	Zero point	6 ... 8 pH
	For ORP sensor: $\Delta mV$ (offset)	-700 ... 700 mV
	With ISFET:	-750 ... 750 mV
	Operating point (asymmetry)	
	Slope	Approx. 74 ... 104 % (possibly restricting notes from Sensoface)

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**Calibration timer** \* Interval 1 ... 99 days, can be switched off

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**Sensoface** Provides information on the condition of the sensor

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Evaluation of Zero point/slope, response time, calibration interval

<b>Cond</b>
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<b>Conductivity input, Memosens</b>	M8 socket, 4-pin or M12 socket, 8-pin	
Measuring range	SE 615/1-MS sensor:	10 $\mu\text{S/cm}$ ... 20 $\text{mS/cm}$
	For other sensors, see the sensor documentation.	
Measuring cycle	Approx. 1 s	
Display resolution <sup>1)</sup> (autoranging)	Conductivity	0.001 $\mu\text{S/cm}$ ( $c < 0.05 \text{ cm}^{-1}$ ) 0.01 $\mu\text{S/cm}$ ( $c = 0.05 \dots 0.2 \text{ cm}^{-1}$ ) 0.1 $\mu\text{S/cm}$ ( $c > 0.2 \text{ cm}^{-1}$ )
	Resistivity	00.00 ... 99.99 $\text{M}\Omega \text{ cm}$
	Salinity	0.0 ... 45.0 $\text{g/kg}$ (0 ... 30 $^{\circ}\text{C}$ / 32 ... 86 $^{\circ}\text{F}$ )
	TDS	0 ... 5000 $\text{mg/l}$ (10 ... 40 $^{\circ}\text{C}$ / 50 ... 104 $^{\circ}\text{F}$ )
	Temperature	-50 ... 250 $^{\circ}\text{C}$ / -58 ... 482 $^{\circ}\text{F}$
Temperature compensation	OFF Linear 0 ... 20 $\%/K$ , reference temperature adjustable nLF: 0 ... 120 $^{\circ}\text{C}$ / 32 ... 248 $^{\circ}\text{F}$ NaCl HCl (ultrapure water with traces) NH <sub>3</sub> (ultrapure water with traces) NaOH (ultrapure water with traces)	
<b>Sensor adjustment</b>		
Operating modes *	CELL CONST	Input of cell constant with simultaneous display of conductivity value and temperature
	COND	Input of calibration solution conductivity with simultaneous display of cell constant and temperature
	0.1 / 0.01 MOL KCL	Automatic determination of cell constant with KCl solution
	INST. FACTOR <sup>5)</sup>	Entry of installation factor
	ZERO POINT <sup>5)</sup>	Zero calibration
	TEMP. OFFSET (TAN option)	Software option SW-P002 for temperature probe adjustment in the Memosens sensor (offset correction)
	FREE CAL	Free selection of calibration method

\*) User-defined

1) Ranges dependent on Memosens sensor

2) For inductive conductivity measurement



## Concentration determination

-01- NaCl	0 – 26 wt% (0 °C / 32 °F) ... 0 – 28 wt% (100 °C /+212 °F)
-02- HCl	0 – 18 wt% (-20 °C / -4 °F) ... 0 – 18 wt% (50 °C /122 °F)
-03- NaOH	0 – 13 wt% (0 °C / 32 °F) ... 0 – 24 wt% (100 °C /+212 °F)
-04- H <sub>2</sub> SO <sub>4</sub>	0 – 26 wt% (-17 °C /-1.4 °F) ... 0 – 37 wt% (110 °C /230 °F)
-05- HNO <sub>3</sub>	0 – 30 wt% (-20 °C / -4 °F) ... 0 – 30 wt% (50 °C /122 °F)
-06- H <sub>2</sub> SO <sub>4</sub>	94 – 99 wt% (-17 °C /-1.4 °F) ... 89 – 99 wt% (115 °C /239 °F)
-07- HCl	22 – 39 wt% (-20 °C / -4 °F) ... 22 – 39 wt% (50 °C /122 °F)
-08- HNO <sub>3</sub>	35 – 96 wt% (-20 °C / -4 °F) ... 35 – 96 wt% (50 °C /122 °F)
-09- H <sub>2</sub> SO <sub>4</sub>	28 – 88 wt% (-17 °C /-1.4 °F) ... 39 – 88 wt% (115 °C /239 °F)
-10- NaOH	15 – 50 wt% (0 °C / 32 °F) ... 35 – 50 wt% (100 °C /+212 °F)

## Oxy

<b>Memosens input, oxygen</b>	M8 socket, 4-pin or M12 socket, 8-pin	
Display ranges <sup>1)</sup>	Saturation	0.000 ... 200.0 %
	Concentration	000 µg/l ... 20.00 mg/l
	Gas	0.000 ... 100.0 %
Temperature meas. range <sup>1)</sup>	-20 ... 150 °C / -4 ... 302 °F	
<b>Sensor adjustment</b>		
Operating modes *	AIR CAL	Automatic calibration in air (100 % RH)
	ZERO CAL	Zero calibration
	DATA INPUT	Data entry of zero and slope
	FREE CAL	Free selection of calibration method

\*) User-defined

1) Ranges dependent on Memosens sensor

**-01- Mettler-Toledo**

Nominal values in bold.

°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
<b>25</b>	<b>2.00</b>	<b>4.01</b>	<b>7.00</b>	<b>9.21</b>
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

pH

**-02- Knick CaliMat**

Nominal values in bold.

°C	pH				
0	2.01	4.05	7.09	9.24	12.58
5	2.01	4.04	7.07	9.16	12.39
10	2.01	4.02	7.04	9.11	12.26
15	2.00	4.01	7.02	9.05	12.13
<b>20</b>	<b>2.00</b>	<b>4.00</b>	<b>7.00</b>	<b>9.00</b>	<b>12.00</b>
25	2.00	4.01	6.99	8.95	11.87
30	2.00	4.01	6.98	8.91	11.75
35	2.00	4.01	6.96	8.88	11.64
40	2.00	4.01	6.96	8.85	11.53
50	2.00	4.01	6.96	8.79	11.31
60	2.00	4.00	6.96	8.73	11.09
70	2.00	4.00	6.96	8.70	10.88
80	2.00	4.00	6.98	8.66	10.68
90	2.00	4.00	7.00	8.64	10.48

## -03- Ciba (94)

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 <sup>1)</sup>	4.10 <sup>1)</sup>	6.92 <sup>1)</sup>	9.61 <sup>1)</sup>
70	2.07	4.11	6.92	9.57
75	2.04 <sup>1)</sup>	4.13 <sup>1)</sup>	6.92 <sup>1)</sup>	9.54 <sup>1)</sup>
80	2.02	4.15	6.93	9.52
85	2.03 <sup>1)</sup>	4.17 <sup>1)</sup>	6.95 <sup>1)</sup>	9.47 <sup>1)</sup>
90	2.04	4.20	6.97	9.43
95	2.05 <sup>1)</sup>	4.22 <sup>1)</sup>	6.99 <sup>1)</sup>	9.38 <sup>1)</sup>

1) extrapolated

**-04- Technical Buffers to NIST**

Nominal values in bold.

°C	pH				
0	1.67	4.00	7.115	10.32	13.42
5	1.67	4.00	7.085	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	1.675	4.00	7.015	10.06	12.64
<b>25</b>	<b>1.68</b>	<b>4.005</b>	<b>7.00</b>	<b>10.01</b>	<b>12.46</b>
30	1.68	4.015	6.985	9.97	12.30
35	1.69	4.025	6.98	9.93	12.13
40	1.69	4.03	6.975	9.89	11.99
45	1.70	4.045	6.975	9.86	11.84
50	1.705	4.06	6.97	9.83	11.71
55	1.715	4.075	6.97	9.83 <sup>1)</sup>	11.57
60	1.72	4.085	6.97	9.83 <sup>1)</sup>	11.45
65	1.73	4.10	6.98	9.83 <sup>1)</sup>	11.45 <sup>1)</sup>
70	1.74	4.13	6.99	9.83 <sup>1)</sup>	11.45 <sup>1)</sup>
75	1.75	4.14	7.01	9.83 <sup>1)</sup>	11.45 <sup>1)</sup>
80	1.765	4.16	7.03	9.83 <sup>1)</sup>	11.45 <sup>1)</sup>
85	1.78	4.18	7.05	9.83 <sup>1)</sup>	11.45 <sup>1)</sup>
90	1.79	4.21	7.08	9.83 <sup>1)</sup>	11.45 <sup>1)</sup>
95	1.805	4.23	7.11	9.83 <sup>1)</sup>	11.45 <sup>1)</sup>

1) values added

**-05- NIST Standard (DIN 19266: 2015-05)**

Nominal values in bold.

°C	pH				
0	1.666	4.000	6.984	9.464	
5	1.668	3.998	6.951	9.395	13.207
10	1.670	3.997	6.923	9.332	13.003
15	1.672	3.998	6.900	9.276	12.810
20	1.675	4.000	6.881	9.225	12.627
<b>25</b>	<b>1.679</b>	<b>4.005</b>	<b>6.865</b>	<b>9.180</b>	<b>12.454</b>
30	1.683	4.011	6.853	9.139	12.289
35	1.688	4.018	6.844	9.102	12.133
37		4.022	6.841	9.088	
38	1.691				12.043
40	1.694	4.027	6.838	9.068	11.984
45					11.841
50	1.707	4.050	6.833	9.011	11.705
55	1.715	4.075	6.834	8.985	11.574
60	1.723	4.091	6.836	8.962	11.449
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 actual pH(S) values of the individual batches of the reference materials are documented in a certificate of an accredited laboratory. This certificate is supplied with the respective buffers. 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(S) values for orientation.

pH

**-06- HACH**Nominal values: 4.01 7.00 10.01 ( $\pm 0.02$  at 25 °C)

°C	pH		
0	4.00	7.118	10.30
5	4.00	7.087	10.23
10	4.00	7.059	10.17
15	4.00	7.036	10.11
20	4.00	7.016	10.05
25	4.01	7.00	10.00
30	4.01	6.987	9.96
35	4.02	6.977	9.92
40	4.03	6.97	9.88
45	4.05	6.965	9.85
50	4.06	6.964	9.82
55	4.07	6.965	9.79
60	4.09	6.968	9.76
65	4.10	6.98	9.71
70	4.12	7.00	9.66
75	4.14	7.02	9.63
80	4.16	7.04	9.59
85	4.18	7.06	9.56
90	4.21	7.09	9.52
95	4.24	7.12	9.48



**-07- WTW Technical Buffers**

Nominal values in bold.

°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
<b>25</b>	<b>2.00</b>	<b>4.01</b>	<b>7.00</b>	<b>10.00</b>
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	

pH

**-08- Hamilton**

Nominal values in bold.

°C	pH				
0	1.99	4.01	7.12	10.19	12.46
5	1.99	4.01	7.09	10.19	12.46
10	2.00	4.00	7.06	10.15	12.34
15	2.00	4.00	7.04	10.11	12.23
20	2.00	4.00	7.02	10.06	12.11
<b>25</b>	<b>2.00</b>	<b>4.01</b>	<b>7.00</b>	<b>10.01</b>	<b>12.00</b>
30	1.99	4.01	6.99	9.97	11.90
35	1.98	4.02	6.98	9.92	11.80
40	1.98	4.03	6.97	9.86	11.70
45	1.97	4.04	6.97	9.83	11.60
50	1.97	4.06	6.97	9.79	11.51
55	1.97	4.08	6.98	9.77	11.51
60	1.97	4.10	6.98	9.75	11.51
65	1.97	4.13	6.99	9.74	11.51
70	1.97	4.16	7.00	9.73	11.51
75	1.97	4.19	7.02	9.73	11.51
80	1.97	4.22	7.04	9.73	11.51
85	1.97	4.26	7.06	9.74	11.51
90	1.97	4.30	7.09	9.75	11.51
95	1.97	4.35	7.09	9.75	11.51

**-09- Reagecon**

Nominal values in bold.

°C	pH				
0	2.01 <sup>1)</sup>	4.01 <sup>1)</sup>	7.07 <sup>1)</sup>	9.18 <sup>1)</sup>	12.54 <sup>1)</sup>
5	2.01 <sup>1)</sup>	4.01 <sup>1)</sup>	7.07 <sup>1)</sup>	9.18 <sup>1)</sup>	12.54 <sup>1)</sup>
10	2.01	4.00	7.07	9.18	12.54
15	2.01	4.00	7.04	9.12	12.36
20	2.01	4.00	7.02	9.06	12.17
<b>25</b>	<b>2.00</b>	<b>4.00</b>	<b>7.00</b>	<b>9.00</b>	<b>12.00</b>
30	1.99	4.01	6.99	8.95	11.81
35	2.00	4.02	6.98	8.90	11.63
40	2.01	4.03	6.97	8.86	11.47
45	2.01	4.04	6.97	8.83	11.39
50	2.00	4.05	6.96	8.79	11.30
55	2.00	4.07	6.96	8.77	11.13
60	2.00	4.08	6.96	8.74	10.95
65	2.00 <sup>1)</sup>	4.10 <sup>1)</sup>	6.99 <sup>1)</sup>	8.70 <sup>1)</sup>	10.95 <sup>1)</sup>
70	2.00 <sup>1)</sup>	4.12 <sup>1)</sup>	7.00 <sup>1)</sup>	8.67 <sup>1)</sup>	10.95 <sup>1)</sup>
75	2.00 <sup>1)</sup>	4.14 <sup>1)</sup>	7.02 <sup>1)</sup>	8.64 <sup>1)</sup>	10.95 <sup>1)</sup>
80	2.00 <sup>1)</sup>	4.16 <sup>1)</sup>	7.04 <sup>1)</sup>	8.62 <sup>1)</sup>	10.95 <sup>1)</sup>
85	2.00 <sup>1)</sup>	4.18 <sup>1)</sup>	7.06 <sup>1)</sup>	8.60 <sup>1)</sup>	10.95 <sup>1)</sup>
90	2.00 <sup>1)</sup>	4.21 <sup>1)</sup>	7.09 <sup>1)</sup>	8.58 <sup>1)</sup>	10.95 <sup>1)</sup>
95	2.00 <sup>1)</sup>	4.24 <sup>1)</sup>	7.12 <sup>1)</sup>	8.56 <sup>1)</sup>	10.95 <sup>1)</sup>

1) values added

**-10- DIN 19267**

Nominal values in bold.

°C	pH				
0	1.08	4.67	6.89	9.48	13.95 <sup>1)</sup>
5	1.08	4.67	6.87	9.43	13.63 <sup>1)</sup>
10	1.09	4.66	6.84	9.37	13.37
15	1.09	4.66	6.82	9.32	13.16
20	1.09	4.65	6.80	9.27	12.96
<b>25</b>	<b>1.09</b>	<b>4.65</b>	<b>6.79</b>	<b>9.23</b>	<b>12.75</b>
30	1.10	4.65	6.78	9.18	12.61
35	1.10	4.65	6.77	9.13	12.45
40	1.10	4.66	6.76	9.09	12.29
45	1.10	4.67	6.76	9.04	12.09
50	1.11	4.68	6.76	9.00	11.89
55	1.11	4.69	6.76	8.96	11.79
60	1.11	4.70	6.76	8.92	11.69
65	1.11	4.71	6.76	8.90	11.56
70	1.11	4.72	6.76	8.88	11.43
75	1.11	4.73	6.77	8.86	11.31
80	1.12	4.75	6.78	8.85	11.19
85	1.12	4.77	6.79	8.83	11.09
90	1.13	4.79	6.80	8.82	10.99
95	1.13 <sup>1)</sup>	4.82 <sup>1)</sup>	6.81 <sup>1)</sup>	8.81 <sup>1)</sup>	10.89 <sup>1)</sup>

1) extrapolated

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