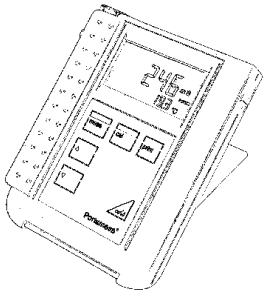
Instruction Manual

Portamess® 911 Cond



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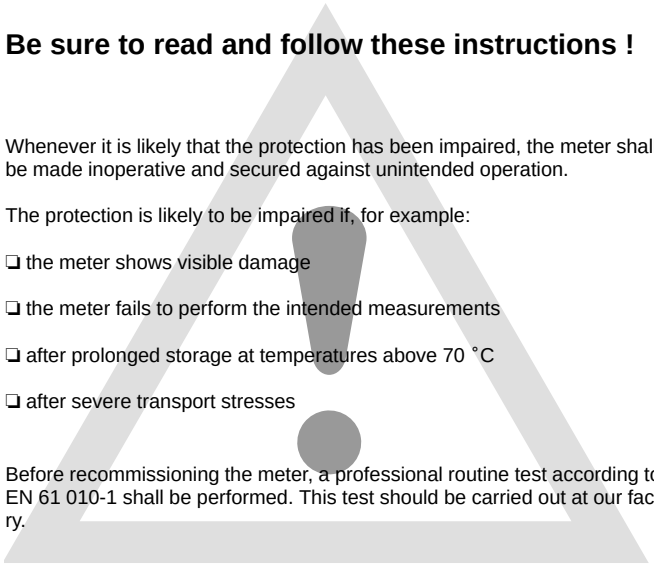
TA–193.202–PME01 130701

Software version: 1.x

Safety Precautions

Be sure to read and follow these instructions !



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

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

❏ the meter shows visible damage

❏ the meter fails to perform the intended measurements

❏ after prolonged storage at temperatures above 70 ˚C

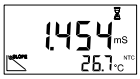
❏ after severe transport stresses

Before recommissioning the meter, a professional routine test according to EN 61 010-1 shall be performed. This test should be carried out at our factory.

Information on this Instruction Manual

ITALICS are used for texts which appear in the Portamess® 911 Cond display.

Bold print is used to represent the texts of keys, e.g. **cal**.



Display examples

or

keys whose functions are explained are frequently shown in the left-hand column.

Note

Notes provide important information which should always be observed when using the meter.

Warning

Warning means that the instructions given must always be followed for your own safety. Failure to follow these instructions may result in injuries.

Contents

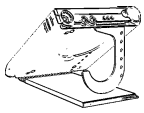
1 The Model 911 Cond

Package contents

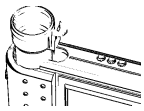
Please check the completeness of the shipment after unpacking.
The package should include:

- ❏ Portamess® 911 Cond incl. batteries and sensor container
- ❏ LF 204 conductivity cell
- ❏ Carrying strap
- ❏ Instruction manual
- ❏ Short instructions in German, English and French
- ❏ Field case

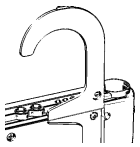
Short description of meter



- ❏ The Portamess® 911 Cond measures conductivity, salinity, TDS and temperature in industry, the environment, food processing and waste-water treatment.
- ❏ The meter meets the EMC requirements of 89-336-EEC and the recommendations as per NAMUR NE 21.



- ❏ The meter is IP 66 protected to EN 60 529 (jet water from all directions).
- ❏ Temperature compensation is automatic with an NTC 30 kΩ or a Pt 1000 temperature probe (automatic recognition during power-on). When using sensors without a temperature probe, the temperature can be manually specified.



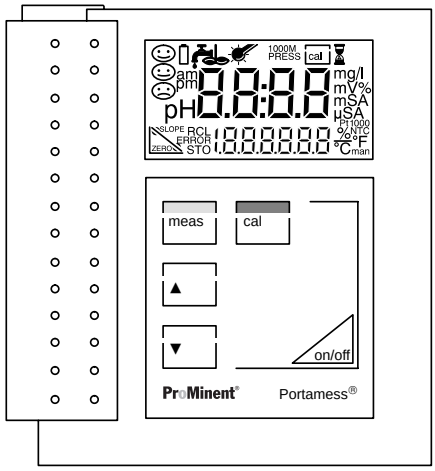
- Calibration can be carried out by directly entering the cell constants, by calibrating with calibration solutions KCl 0.01 mol/l or 0.1 mol/l or with any other buffer solutions.

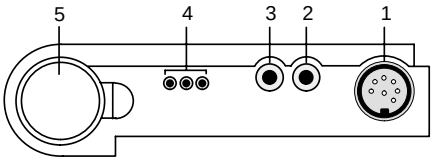
- To minimize battery consumption, the meter switches off after 12 hours when it is not operated.

- Only three alkaline AA batteries are required for uninterrupted operation for approx. 1,000 hours.

2 Operation

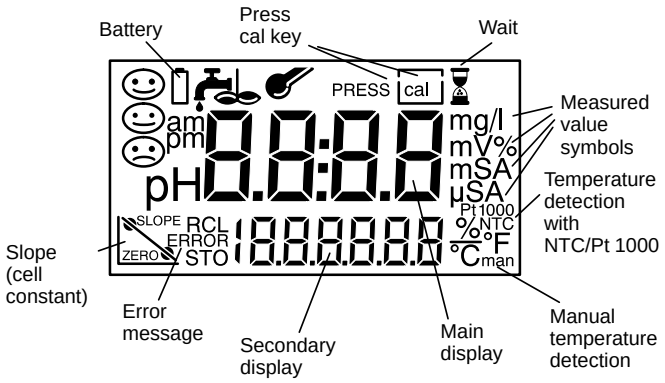
Meter design





1	Sensor connection
2, 3	Separate temperature probe connection
4	Unused
5	Sensor container, removable

Display



Keypad

on/off

Pressing **on**/**off** switches the meter on or off, resp. After switching on, the meter automatically carries out a self-test and adjusts itself to the connected temperature probe.

meas

Pressing **meas** returns the meter to the measuring mode from any function. Pressing **meas** in the measuring mode displays the following parameters:
Cond measuring mode: temperature compensation
tdS measuring mode: TDS factor

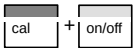
Note

The meter can also be switched on with **meas**. However, in this case only a short test is conducted without determination of the temperature probe. The meter assumes that the last temperature probe determined is used.

cal

Pressing **cal** starts calibration.

With ▲ and ▼ you can select and change parameters and select a mode.



Pressing **cal** and **on**/**off** simultaneously when the meter is switched off, activates the configuration menu.

Note

When pressing two keys simultaneously, make sure that the key shown at the left is pressed first.

Connection and start-up

Connecting sensor

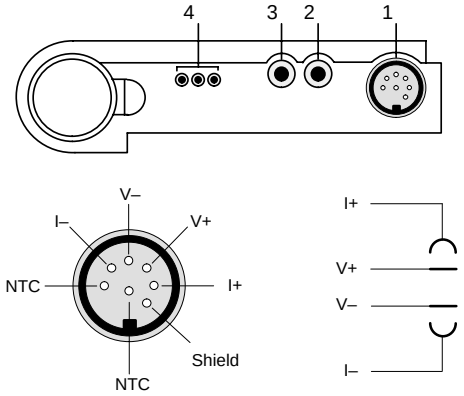
The following sensor from the line of accessories can be connected to the meter.

LF 204	4-electrode sensor with integrated NTC 30 kΩ temperature probe

Connection assignment

Connection ..... Socket

Sensor 1
Separate temperature probe 2, 3
Unused 4



If no temperature probe is used for measurement, the meter operates with the manually set temperature and *man* appears in the display.

Note

When using a sensor with temperature probe, do not connect an external temperature probe.

Note Prior to first use, the cell constant, temperature compensation and time and date must be checked and set, if required. The cell constant is printed on the sensor head and listed in the sensor specifications (also see Pg. 21).

Note The calibration and configuration data remain permanently stored both with the meter switched off and with the batteries removed (battery replacement).

Pressing **on**/**off** switches the meter into the measuring mode.
When switched on, the meter determines the connected temperature probe and conducts a self-test:

- ❏ Simultaneous appearance of all display segments
- ❏ Display of the model number
- ❏ Display of the software version

Note For recognition of the temperature probe, the conductivity sensor must be connected to the meter before power-on. The temperature probe is only recognized during the power-on procedure after pressing **on**/**off.**

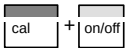
Note The meter can also be switched on with **meas**. However, in this case only a short test is conducted and no determination of the temperature probe is carried out. The meter assumes that the last temperature probe determined is used.

Note The LF 204 sensor has an integrated NTC temperature probe.

Configuration

The following basic settings can be changed in the configuration:

- ❏ Function *Cond* (conductivity), *SAL* (salinity) or *tdS* (Total Dissolved Solids or evaporation residue)
- ❏ Calibration by entering the cell constant (AutCal Off) or calibration with calibration solution (AutCal On)
- ❏ Temperature display
  °C or °F



To activate the configuration, hold down **cal** with the meter switched off and then press **on**/**off**.

The menu items of the configuration menu are worked through in sequence. Use ▲ and ▼ to change the setting of the respective menu item. Pressing **cal** saves the parameters and switches to the next menu item.

Pressing **meas** exits the configuration menu at any time. The value last displayed and possibly changed will then not be saved.

Function

Select the measuring function *Cond* (conductivity), *SAL* (salinity) or *tdS* (Total Dissolved Solids or evaporation residue).

Automatic or manual calibration

Select whether you wish to adapt the sensor by directly entering the cell constants or by calibrating with a calibration solution and automatic drift check.
(Default setting: Direct entry of the cell constant (*AutCAL OFF*))

Direct entry of the cell constants (*AutCal OFF*) from 0.010 cm^{-1} to 199.9 cm^{-1}.
(Default setting 0.475 cm^{-1})

Automatic calibration (*AutCAL On*) with 0.1 molar KCl solution, 0.01 molar KCl solution or entry of the temperature-compensated conductivity of another known calibration solution.

Temperature display

The temperature can be displayed either in °C or °F.

(Default setting: °C)

Calibration

With calibration the Portamess® 911 Cond is adjusted to the cell constant of the sensor.
It is generally sufficient to enter the cell constant specified by the sensor manufacturer in the meter.

General information on calibration

Calibration solutions
Solutions for calibration of conductivity measuring devices are unbuffered systems. Care should be taken to use fresh conductivity standards and to avoid contamination of the conductivity standard by water droplets adhering to the conductivity sensor.

Clean sensors
Before calibration, make sure that the conductivity sensor is clean. Residues should be rinsed off with distilled water. Afterwards, the sensor should be wiped dry and rinsed with the calibration solution to be used.

Cell constant
The cell constant is determined by the size and geometric arrangement of the measuring electrodes. It is the characteristic parameter of conductivity sensors. The cell constant changes very little over time. The prerequisite is clean electrode surfaces without insulating deposits. Regular calibration is therefore generally not necessary.

4-electrode sensors
With 4-electrode sensors the principle of separate current/voltage electrodes results in virtually no measuring errors even in the case of partial soiling of the measuring electrodes. However, electrodes completely soiled with insulating coatings cause the measurement to fail.

LF 204 sensor
For the LF 204 conductivity sensor, the cell constant is specified with a tolerance of 1.5 %. This cell constant is entered and stored in the Portamess® 911 Cond in the calibration mode (*AutCAL OFF*). An additional calibration with calibration solutions is not necessary.

Calibration by direct entry of the cell constant (*AutCAL OFF*)

LF 204 sensor: c = 0.475 cm^{-1}

Press **cal** to activate calibration. The cell constant determined or set during the last calibration is displayed. Pressing **meas** exits calibration again.

Set the cell constant of the sensor used with ▲ and ▼ and confirm with **cal**. Then the meter switches back into the measuring mode.

Calibration with 0.1 or 0.01 molar KCl solution (*AutCAL On*)

Note

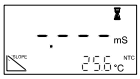
Impurities must always be prevented from getting into the calibration solutions.

Pressing **cal** activates calibration.
Calibration can be exited again with **meas**. Then the cell constant of the last calibration is displayed briefly.

Select the calibration solution used (*CALSoL*). A 0.1 and a 0.01 molar KCl solution are available to choose from. Confirm the corresponding solution with **cal**.

Immerse the clean and dry sensor in the calibration solution (also see “Clean sensors“, Pg. 10).

Press **cal** to start calibration. If calibration is not desired, cancel the process with **meas**.



During calibration the lower line indicates the temperature. The automatic drift check checks the stability of conductivity and temperature. The hour glass flashes.

When the measured values are stable, the temperature-compensated table value of the KCl solution is displayed. The measured conductivity value flashes.

Confirm with **cal**.

The determined cell constant is displayed for a few seconds. Then the meter switches back into the measuring mode.

Calibration with any calibration solution (*AutCAL ON*)

Note

Impurities must always be prevented from getting into the calibration solutions.

Pressing **cal** activates calibration.
Calibration can be exited again with **meas**. Then the cell constant of the last calibration is displayed briefly.

First confirm any of the 0.1 or 0.01 mol/l KCl solutions (*CALSoL*) with **cal**.

Immerse the clean and dry sensor in the calibration solution (also see “Clean sensors“, Pg. 10).

Press **cal** to start calibration. If calibration is not desired, cancel the process with **meas**.

During calibration the lower line indicates the temperature. The automatic drift check checks the stability of conductivity and temperature. The hour glass flashes.

When the measured values are stable, the temperature-compensated table value of the KCl solution is displayed. The measured conductivity value flashes.

See the table of your calibration solution for the conductivity value which belongs to the displayed measuring temperature.
Set the temperature-compensated conductivity in the meter with ▲ and ▼, then confirm it with **cal**.

The determined cell constant is displayed for a few seconds. Then the meter switches back into the measuring mode.

Measurement

Measuring mode

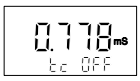
With **meas** the measuring mode can be reached from all functions. In the measuring mode the main display indicates the measured variable and the secondary display the temperature.

Measuring the conductivity (Cond)

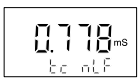
The main display indicates the measured conductivity, the secondary display the temperature.

Temperature compensation

The meter offers various temperature compensation methods. With **meas** and ▲ or ▼ the temperature compensation method can be selected and set:



(*tc OFF*) No temperature compensation



(*tc nLF*) Temperature compensation with non-linear characteristic to EN 27088 or DIN 38404.8 for natural water and ultrapure water (reference temperature 25 °C). In the secondary display *tc* also appears.

(*tc 0.01 – 9.99 %/°C*) Temperature compensation with linear characteristic and definable temperature coefficients (reference temperature 25 °C). In the secondary display *tc* also appears.

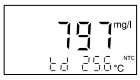
Note

When you have selected temperature compensation with linear characteristic, you can only exit this function or select the nonlinear function when the temperature coefficient has been set to 0.00.

Measuring the salinity (SAL)

The main display indicates the measured salinity in ‰ (g/kg), the secondary display the temperature.

TDS determination (TDS)



The main display indicates the concentration of the dissolved solids contributing to the solution conductivity (TDS, comparable to the evaporation residue) in mg/l, the secondary display the temperature.

TDS factor

Pressing **meas** and then ▲ or ▼ sets the TDS factor within the range 0.40 – 1.00.

Note

The TDS factor is dependent on the composition of the water to be tested and must be determined for each water type.

Manual temperature specification

The display *man* signals that no temperature probe is connected. The meter operates with the manually specified temperature. The specified temperature can be edited with the ▲ and ▼ keys in the *Cond* measuring mode.

3 Troubleshooting and Maintenance

Error messages

Range limits exceeded

If a measured value lies outside the ranges accepted by the meter, an error message appears and the measured-value display flashes.

ERROR 1

The measurement range was exceeded.

Possible causes:

- ❏ Sensor defective
- ❏ Break in sensor cable
- ❏ Wrong sensor connected
- ❏ Wrong cell constant entered

ERROR 3

The measured temperature is outside the ranges:

Conductivity	–20 °C to +120 °C
nLF:	0 °C to 120 °C
Salinity:	0 °C to 30 °C
TDS:	10 °C to 40 °C

Possible causes:

- ❏ Temperature probe in sensor defective
- ❏ Short circuit in temperature probe
- ❏ Wrong temperature probe connected

Note

When changing the conductivity sensor, note that the temperature probe type (Pt 1000/NTC 30 kΩ) is only recognized when the meter is switched on with **on**/**off**.

Calibration error messages

If errors occur during calibration, or if the determined sensor data are outside the valid range, an error message appears (ERROR 6, ERROR 11).

ERROR 6 The cell constant lies outside the permissible range < 0.01 cm^{-1} or > 199.9 cm^{-1}.

Possible causes:

- ❏ No sensor connected during calibration
- ❏ Wrong calibration solution
- ❏ Sensor not immersed far enough in calibration solution

ERROR 11 The calibration was cancelled after approx. 2 minutes, because the drift was too large.
This message only appears briefly during calibration.

Possible causes:

- ❏ Sensor defective or dirty
- ❏ Sensor cable insufficiently shielded or defective
- ❏ Strong electric fields influence the measurement
- ❏ Major temperature fluctuation of the calibration solution
- ❏ Calibration solution unstable

ERROR 18 If the meter determines an error during the self-test, an error message appears.

Possible causes:

- ❏ Configuration or calibration data are defective. Completely reconfigure and recalibrate the meter.

ERROR 19

FAIL

Error in the factory settings or system memory.
“FAIL” appears in the display.

Possible causes:

- ❏ EPROM or RAM defective
- ❏ Error in meter factory settings

Note

This error message should normally not occur, as the data are protected from loss with multiple safety functions. Should this error message nevertheless appear, no remedy is available. The meter must be repaired and recalibrated at the factory.

Maintenance

Changing batteries

When the battery symbol appears in the display, the batteries need replacement. However, the meter can still be used for a few days. If the battery voltage continues to drop, the meter will switch itself off.

To replace the batteries, you need 3 alkaline AA cells and a screwdriver (either straight-blade or Phillips).

- ❏ Close the protective cover and remove the sensor container.
- ❏ Lift the hook, unscrew the four screws on the back of the meter and remove the lid.
- ❏ Remove the old batteries from the battery holder.
- ❏ Insert the new batteries in the specified direction.
- ❏ Make sure the protective cover is in the notches provided and the rubber seal is correctly seated, especially near the sensor socket.
- ❏ Remount the lid and secure it with the screws. Be sure to tighten the screws thoroughly.
- ❏ Remount the sensor container.

Note

When changing the batteries all calibration and configuration data are retained.

Warning

If the meter is to be stored for a longer time, the batteries must always be removed beforehand. Leaky batteries may damage the meter.

Cleaning the meter

To remove dust and dirt, the external surfaces of the meter may be cleaned with water, and also with a mild household cleaner if necessary.

Appendix

Accessories

	Ref. No.
Sensor container, 5 pieces (for leak-proof storage of the sensors)	1008716
LF 204 4-electrode cell Material: epoxy/graphite Cell constant 0.475 cm^{-1} Range: 0.1 µS/cm – 500 mS/cm	1008723

Note

For calibrating the 4-electrode cell, you can use the conductivity standard by Merck, Merck Order No.: 1203, for example. (KCl solution 0.01 mol/l, retraceable to RSM by NIST)

Specifications Portamess® 911 Cond

Ranges	Conductivity:	0.1 µS/cm to 1,000 mS/cm ($c > 0.8$ cm^{-1}) 0.1 µS/cm to 500 mS/cm ($c = 0.2$ to 0.8 cm^{-1}) 0.01 µS/cm to 199.9 µS/cm ($c < 0.2$ cm^{-1})
	Temperature:	–20.0 to +120.0 °C / –4 to +248 °F nLF: 0 to +120 °C
	Salinity:	0.0 to 45.0 g/kg (0 to 30°C)
	TDS:	0 to 1,999 mg/l (10 to 40°C)
Display	LCD 35 x 67 mm, character height 15 mm	
Measurement cycle	Approx. 2 sec	
Measurement error (± 1 count)	Conductivity: Temperature:	< 0.5 % of measured value* < 0.3 K
Input 1 (Sensor)	Multi-contact for 2 and 4-electrode sensors with integrated temperature probe	
Input 2 (Temperature)	4 mm sockets for separate Pt 1000 / NTC (30 kΩ) temperature probe	
Permissible cell constant	0.010 to 199.9 cm^{-1} (adjustable)	
Sensor standardization	Direct entry of the cell constant, Automatic determination of the cell constant with KCl solution 0.01 mol/l or 0.1 mol/l, Sensor standardization with any known solutions	
Meter self-test	During switch-on routine, segment test, display of model number and software version	
Temperature measurement	Pt 1000 / NTC 30 kΩ (automatic recognition during switch-on) or manual temperature entry	
Temperature compensation	Linear characteristic: 0.01 to 9.99 %/°C nLF (non-linear characteristic for ultrapure water and natural water to EN 27088 (DIN 38404.8)	
Data retention	Configuration/calibration data and factory settings >10 years	
Automatic switch-off	After 12 hours	

* For conductivities > 500 mS/cm < 1% meas. value

EMC	Emitted interference: EN 61 326 Class B Immunity to interference: EN 61 326, EN 61 326/A1 and NAMUR NE 21
Ambient temperature	Operation: –10 to +55 °C Transport and storage: –20 to +70 °C
Power supply	3 AA (or LR 6) batteries, alkaline-manganese
Operating time	Approx. 1,000 h*
Enclosure	Material: PA, type of protection: IP 66, with integrated sensor container
Dimensions	133 x 160 x 30 mm (W x H x D)
Weight	Approx. 560 g with batteries

* Due to storage, the service life of the included battery may be shorter.

Glossary

Automatic switch-off (AutOFF)	To protect the batteries, the meter switches off automatically after twelve hours when it is not operated.
cal	Key for activating calibration.
Calibration	Adjustment of the conductivity meter to the cell constant of the sensor used.
Calibration solution	Solution with exactly defined conductivity for calibrating a conductivity meter.
Evaporation residue	See TDS.
GLP	Good Laboratory Practice: Rules for conducting and documenting measurements in the laboratory.
meas	Pressing this key returns to the measuring mode from all other levels. In the measuring mode *Cond* the set temperature compensation is displayed by pressing **meas**, in the TDS mode the TDS factor.
NAMUR	German committee for measurement and control standards in the chemical industry
nLF	Non-linear temperature compensation for ultrapure water with NaCl traces and for natural water to EN 27088 (DIN 38404.8), reference temperature = 25 °C.
Response time	Time from the start of a calibration step to the stabilization of the measured value.
Salinity	The salinity indicates the salt content, particularly of sea waters as a cumulative parameter. It is specified in g/kg (‰).
TDS	Total Dissolved Solids, corresponds to the concentration of the dissolved solids contributing to the conductivity – comparable to the evaporation residue.

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Addresses and delivery information from the manufacturer:

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