EN

HCO304

Handheld conductivity measuring device

Operating manual

European catalogue number:

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1 Legal address of the manufacturer

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CE

2 About this documentation

2.1 Foreword

Read this document carefully and familiarise yourself with the operation of the product before you use it. Keep this document ready to hand and in the immediate vicinity of the product so that it is available to the personnel/user for reference at all times in case of doubt.

The product was developed according to the state of the art and fulfils the requirements of the applicable European and national Directives. All corresponding documents are available from the manufacturer.

Only technically qualified persons are permitted to carry out commissioning, operation, maintenance and decommissioning. The qualified personnel must have carefully read and understood the operating manual before beginning any work.

2.2 Purpose of the document

- This document describes the operation and maintenance of the product.
- Provides important information for working safely and efficiently with the product.
- In addition to the quick reference guide with all relevant legal and safety content in hard copy, this document is a detailed reference option for the product.

2.3 Warranty

VWR guarantees that this product will remain free from material and production defects for a period of two (2) years from the time of delivery. If there is a defect, VWR shall decide on its own discretion whether to repair or replace the product free of charge or to provide the customer with a refund of the purchase price of the product, insofar as it is sent back during the warranty period. This warranty shall be voided if the product was damaged accidentally or intentionally due to improper use or normal wear. Insofar as the necessary maintenance tasks and inspections are not carried out in accordance with the operating manual and the local requirements, the warranty shall be voided, unless this omission is not causal for the defects of the product.

The customer must insure returned articles against damage and loss. This warranty is limited to the aforementioned rights. IT IS EXPRESSLY AGREED THAT THIS WARRANTY APPLIES INSTEAD OF ANY WARRANTY OF FITNESS AND INSTEAD OF WARRANTY OF GENERAL MERCHANTABILITY.

2.4 Compliance with local laws and other legal regulations

The customer is responsible for obtaining the necessary official approvals and other authorisations that are necessary for operation and use of the purchased product in its place of use. VWR can only be held liable if the customer fails to carry out the necessary activities for this purpose or authorisations are not issued unless a corresponding rejection is based on a defect of the product.

2.5 Correctness of content

The contents of this document were checked for corrected and are subject to a continuous correction and updating process. This does not rule out potential errors. In the event that errors are discovered or in case of suggestions for improvement, please inform us immediately via the indicated contact information in order to help us make this document even more user-friendly.

2.6 Layout of this document

Description

Each chapter is explained at the beginning in the description.

Prerequisite

All mandatory prerequisites are then listed for each step.

Instruction

Tasks to be carried out by the personnel / user are represented as numbered instructions. Adhere to the sequence of the specified instructions.

Representation

Shows an illustrative instruction or a configuration of the product.

Formula

Some instructions include a formula for a general understanding of a configuration, programming or a setting of the product.

Outcome of an action

Result, consequence or effect of an instruction.

Emphases

In order to simplify legibility and provide a clearer overview, various sections / information are emphasised.

- 1234 Display elements
- *Mechanical controls*
- ***Product functions***
- *Product labels*
- Cross-reference [▶ p. 6]
- *Foot notes*

2.7 Further information

Software version of the product:

- V1.3 or later

For the exact product name, refer to the type plate on the rear side of the product.

NOTE

For information about the software version, press and hold the ON button to switch on the product for longer than 5 seconds. The series is shown in the main display and the software version of the product is shown in the secondary display.

3 Safety

3.1 Explanation of safety symbols

DANGER

This symbol warns of imminent danger which can result in death, severe bodily injury, or severe property damage in case of non-observance.

CAUTION

This symbol warns of potential dangers or harmful situations which can cause damage to the device or to the environment in case of non-observance.

NOTE

This symbol indicates processes which can have a direct influence on operation or can trigger an unforeseen reaction in case of non-observance.

3.2 Foreseeable misuse

The fault-free function and operational safety of the product can only be guaranteed if generally applicable safety precautions and the device-specific safety instructions for this document are observed.

If these notices are disregarded, personal injury or death, as well as property damage can occur.

DANGER

Incorrect area of application!

In order to prevent erratic behaviour of the product, personal injury or property damage, the product must be used exclusively as described in the chapter Description [▷ p. 10] in the operating manual.

- Do not use in safety / Emergency Stop devices!
- The product is not suitable for use in explosion-prone areas!
- The product must not be used for diagnostic or other medical purposes on patients!
- The product is not intended to come into direct contact with food. For measurement in foods, samples must be taken and discarded after the measurement!

3.3 Safety instructions

This product has been designed and tested according to the safety requirements for electronic measuring devices.

CAUTION

Erratic behaviour!

On suspicion that the product can no longer be operated without danger, it must be decommissioned and prevented from recommissioning with appropriate labelling. The safety of the user can be impaired by the device if, for example, if it shows visible damage, it no longer works as specified or if it was stored for an extended period of time under unsuitable conditions.

– Visual inspection!

– In case of doubt, send the product to the manufacturer for repair or maintenance!

NOTE

If the product is stored at a temperature above 50 °C, or is not used for an extended period of time, the batteries must be removed. Leaks from the batteries are avoided as a result.

NOTE

This product does not belong in children's hands!

For this purpose, also refer to

Technical data [▸ 26]

3.4 Intended use

The product is designed for measuring the conductivity in liquids. The measuring cell is connected permanently.

See Technical data [▸ p. 26].

3.5 Qualified personnel

For commissioning, operation and maintenance, the relevant personnel must have adequate knowledge of the measuring process and use of the measurements, for which purpose this document makes a valuable contribution. The instructions in this document must be understood, observed and followed.

In order to ensure that no risks arise from the interpretation of the measurements in the concrete application, the user must have additional technical knowledge, because the user is liable in case of damage/danger due to misinterpretation as a result of inadequate technical knowledge.

4 Description

4.1 Scope of delivery

Please check to ensure the completeness of the product after opening the package. You should find the following components:

- Quick reference guide
- Handheld measuring device, ready for operation, including batteries
- Permanently connected conductivity measuring cell

4.2 Job description

The product offers precision, speed and reliability in a compact, ergonomic housing. Additional impressive features include the dust-proof and waterproof design in accordance with IP 65/67 and the 3-line illuminated display, which offers overhead display at the push of a button. The product can be switched on, switched off and configured and the measurements and parameters can be adjusted and held with the operating elements. The product is equipped with a universal 2-pole graphite conductivity measuring cell for measurement in the range of 0 µS/cm to 100.0 mS/cm. In addition to conductivity, salinity and TDS can be determined.

5 The product at a glance

5.1 The HCO304

LCD Display

HCO304

HCO304

5.2 Display elements

Display

Battery indicator	Evaluation of the battery status
Unit display	Display of units, if applicable, with unstable symbol or type of mode, min/max/hold
Main display	Measurement of the current conductivity value or value for min/max/hold
Auxiliary display	Corresponding temperature value for the value shown in the main display. If applicable, alternating with the temperature compensation.

NOTE

The unit display shows a rotating circle segment in the first position as long as the measurement is unstable, if the position is unoccupied by the unit display.

5.3 Operating elements

On / Off button

Press briefly	Switch on the product Activate / deactivate lighting
Long press	Switch off the product Reject changes in a menu

Up / Down button

Press briefly	Display of the min/max value Change value of the selected parameter
Long press	Reset the min/max value of the current measurement
Both simultaneously	Rotate display, overhead display

Function key

Press briefly	Freeze measurement
	Return to measurement display
	Call up next parameter
Long press, 2s	Open menu, frozen measurement is displayed
	Close menu, changes are saved

6 Bases for measurement

6.1 Conductivity principles

Conductivity γ

Conductivity describes the capability of a material to conduct electrical current. It is also the inverse of specific resistance. The conductance is the inverse of the measured resistance R.

Formula

γ = l / (R*A)

l = length of the material

A = cross section

R = measured resistance

Unit [γ] = Siemens / metre = S / m

Normally, the values for liquids are specified in µS / cm or in mS / cm.

6.2 Conductivity measurement

The conductivity measurement is a comparatively uncomplicated measurement. The standard electrodes are stable for correct use for a long time and can be calibrated over the gradient correction.

Range	1	2	3
	0 to 2000 µS/cm	0.00 to 20.00 mS/cm	0 to 200 mS/cm

With the automatic range selection, the range with the best resolution is selected automatically.

6.3 Total dissolved solids / TDS measurement

The total dissolved solids measurement - TDS measurement - determines the total dissolved solids, which also called evaporation residue, based on the conductivity and a conversion factor CtdS of the total dissolved solids. Well-suited to conduct simple concentration measurements of salt solutions. The display shows mg/l

Range	1
	0 to 2000 mg/l

Display value TDS = conductivity [in µs/cm, nLF temperature compensation at 25°C] * CtdS menu entry

With selection of TDS, the necessary temperature compensation is selected automatically. Menu settings for temperature compensation are ignored.

The following approximations apply:

CtdS	
0.50	Monovalent salts with 2 ion types = NaCl, KCl or similar
0.50	Natural water of surface water, drinking water
0.65 to 0.70	Salt concentration of aqueous fertiliser solutions

NOTE

These are guideline values for estimates, but are not suitable for precise measurements. The conversion factor for the respective type of solution and the examined concentration range must be determined for precise measurements. This can take

place with calibration to known comparison solutions or with actual evaporation of a certain amount of liquid with measured conductivity and subsequent weight of the total dissolved solids.

6.4 Salt content / salinity measurement

In SAL measuring mode, the salinity, which is the salt content of sea water, is determined. The basis for this is the International Oceanographic Tables, IOT. Standard salt water has a salinity of 35 ‰, 35 g of salt per 1 kg of sea water. The display in % [g/kg] normally does not show units. The designation PSU, Practical Salinity Unit, is also commonly used; the display value is identical. The salinity measurement has temperature compensation, which means the temperature is considered for the display and has a major influence on the display value; any menu settings regarding temperature compensation are ignored.

NOTE

The salt composition of different seas is not identical. Depending on the location, weather, seasons, etc., there are considerable deviations from the 35 ‰ according to the IOT. The salt composition can also influence the relationship of the salinity display and the actual amount of salt present.

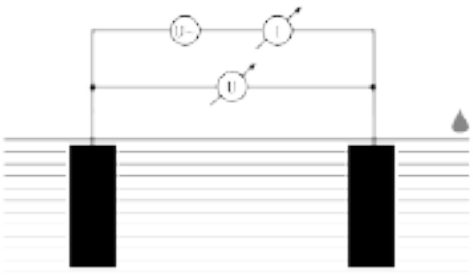
Corresponding tables are available for many salts in salt water aquarium applications. Salt weight to salinity according to the IOT or conductivity. In consideration of these tables, very precise salinity measurements can be conducted.

6.5 Electrodes / measuring cell

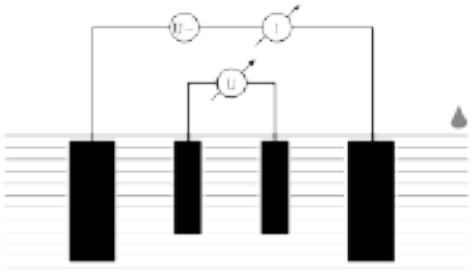
6.5.1 Design and selection

There are basically two different types of measuring cells: 2-pole and 4-pole measuring cells. Control and/or evaluation take place in a similar manner; the 4-pole measuring cells can compensate well for polarisation effects and contamination to a certain degree with the more elaborate measuring processes.

The product is equipped with a permanently connected 2-pole measuring cell.



2-pole measuring cell



4-pole measuring cell

Universal 2-pole graphite measuring cell with wide range of applications, such as fish husbandry, measurement of surface water and drinking water.

6.5.2 Calibration / adjustment of the measuring cell

In harsh applications and due to ageing processes, the cell constant of measuring cells changes. Depending on the application and precision requirement, the overall precision of the display device and measuring cell measuring chain should be checked

regularly. Special testing and calibration solutions, such as GKL 100, 101 and 102 are available for this purpose. In normal application conditions, semi-annual testing is recommended; Adjustment of the measuring input [▶ p. 20]. A system test by the manufacturer is recommended in case of doubt; Calibration and adjustment service.

For this purpose, also refer to

- Adjustment of the measuring input [▶ 20]

6.6 Temperature compensation

The conductivity of aqueous solutions is temperature-dependent. The temperature dependency varies greatly according to the type of solution. With temperature compensation, the solution is calculated back to a uniform temperature in order to compare it independently of the temperature. The normal operating temperature for this is 25 °C.

6.6.1 NLF temperature compensation according to EN 27888

For most applications, such as fish husbandry applications and measurement of surface water and drinking water, non-linear temperature compensation for natural water nLF is sufficiently accurate in accordance with EN 27888. The normal operating temperature is 25 °C. The recommended application range of nLF compensation is between 60 µS/cm and 1000 µS/cm.

7 Maintenance

7.1 Operating and maintenance notices

NOTE

The product and conductivity measuring cell must be handled with care and used in accordance with the technical data. Do not throw or strike.

NOTE

If the product is stored at a temperature above 50 °C, or is not used for an extended period of time, the batteries must be removed. Leaks from the batteries are avoided as a result.

NOTE

If the product is stored at a temperature above 50 °C, or is not used for an extended period of time, the batteries must be removed. Leaks from the batteries are avoided as a result.

The device is calibrated at the factory with the permanently connected conductivity measuring cell. The highest system precision can be achieved in this manner. If desired, a gradient correction can be carried out for the product in order to further optimise the accuracy in a narrow range. This is only necessary for normal use. See Adjustment of the measuring input [▷ p. 20].

7.2 Battery

7.2.1 Battery indicator

If the empty frame in the battery display blinks, the batteries are depleted and must be replaced. However, the device will still operate for a certain length of time.

If the bAt display text appears in the main display, the battery voltage is no longer adequate for operation of the product. Now the battery is fully depleted.

7.2.2 Changing battery

DANGER

Danger of explosion!

Using damaged or unsuitable batteries can generate heat, which can cause the batteries to crack and possibly explode!

– Only use high-quality and suitable alkaline batteries!

CAUTION

Damage!

If the batteries have different charge levels, leaks and thus damage to the product can occur.

– Use new, high-quality batteries!
– Do not use different types of batteries!
– Remove depleted batteries and dispose of them at a suitable collection point!

NOTE

Unnecessary screwing places the water-tightness of the product, among other things, at risk and should be avoided.

NOTE

Read the following handling instructions before replacing batteries and follow them step by step. If disregarded, the product could be damaged or the protection from moisture could be diminished.

Description

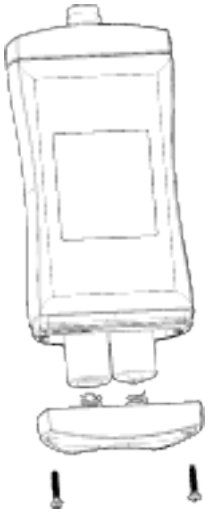
Proceed as follows to replace the batteries.

Prerequisites

– The product is switched off.

Instruction

1. Unscrews the Phillips screws and remove the cover.
2. Carefully replace the two Mignon AA batteries. Ensure that the polarity is correct! It must be possible to insert the batteries in the correct position without using force.
3. The O-ring must be undamaged, clean and positioned at the intended depth. In order to facilitate assembly and avoid damage, a suitable grease can be applied.
4. Fit the cover on evenly. The O-ring must remain at the intended depth!
5. Tighten the Phillips screws.



Outcome of an action

The product is now ready for use again.

8 Operation

8.1 Commissioning

8.1.1 Explanation

Description

The product is switched on with the *On/Off button*. It may be necessary to configure the product after switching on. See Configuration [▶ p. 18].

Prerequisite

– Sufficiently full batteries are inserted in the product.

Instruction

– Press *On/Off button*.

Outcome of an action

Information about the configuration of the product appears in the display.

PoFF	Automatic shut-off	Automatic shut-off activated. The product is switched off if no buttons have been pressed after the adjusted time
t.oF	Zero point correction	If a zero point correction of the temperature sensor was made
t.SL	Gradient correction	If a gradient correction of the temperature sensor was made
SCL	Gradient correction	If a gradient correction of the conductivity measuring cell was made

The product is now ready for measurement.

NOTE

The device is calibrated at the factory and ready for measurement. The offset and gradient correction of the temperature measurement and gradient correction of the conductivity measurement can be carried out when exact references are available. This is only necessary in exceptional cases.

8.2 Configuration

8.2.1 Explanation

The following steps describe how to adapt the product for your purposes.

NOTE

There are various configuration parameters available depending on the product version and configuration. They can differ depending on the product version and configuration.

8.2.2 Opening the configuration menu

Description

In order to configure the product, you must first open the ***Configuration*** menu. The menu is opened as shown in the illustration.

Prerequisite

Instruction

1. Press the *Function key* for 2 seconds to open the ***Configuration*** menu.
2. ConF appears in the display. Release the function key.

3. By briefly pressing the *Function key*, you can scroll through the parameters. Select the parameter you would like to configure.
4. When you have selected the desired parameter, change the parameter to the desired value with the *Up button* and the *Down button*.
5. The changes are saved after running through the entire ***Configuration*** menu. Stor appears in the display. The ***Configuration*** menu can be exited from any arbitrary parameter by pressing and holding the *Function key* for 2 seconds. The changes made up that point are saved.

Representation

Call up menu	Next parameter	Change value	Save changes	Discard changes
2s		Press: Single step Hold: Rapid change	2s	2s

Outcome of an action

The ***Configuration*** menu is closed after the last parameter.

NOTE

If the product is switched off without saving the configuration, the last save value is reproduced on the next start-up of the product.

8.2.3 Configuring parameters of the configuration menu

Description

The following representation shows the available parameters and various configuration options.

Prerequisite

– The ***Configuration*** menu is open. See Opening the configuration menu [▷ p. 18].

Instruction

1. Select the desired parameter you would like to configure.
2. Adjust the desired configuration in the selected parameter with the *Up button* and *Down button*.
3. The available configuration options are listed for each parameter in the following representation.

Representation

Parameter	Values	Meaning
Input		
InP		
	Cond	Measured variable - conductivity
	SAL	Measured variable - salt content / salinity
	tdS	Measured variable - total dissolved solids
Factor for TDS		
ctdS		
	0.40 .. 1.00	Conversion factor for TDS measurement
Temperature compensation		

tcor

oFF	Do not compensate conductivity measurement
nLF	Non-linear function for natural water in accordance with EN 27888 (ISO 7888) Ground water, surface water or drinking water

Reference temperature for temperature compensation

trEF

25 °C	Reference temperature 25 °C or 77 °F
20 °C	Reference temperature 20 °C or 68 °F

Shut-off time

PoFF

oFF	No automatic shut-off
15 30 60 120 240	Automatic shut-off after a selected time in minutes, during which no buttons have been pressed

Backlighting

Li tE

oFF	Backlighting deactivated
15 30 60 120 240	Automatic shut-off of the backlighting after a selected time in seconds, during which no buttons have been pressed
on	No automatic shut-off of the backlighting

Temperature unit

Unit

°C	Temperature display in °C
°F	Temperature display in °F

Factory settings

Init

no	Use current configuration
YES	Reset product to factory settings. Init donE appears in the display

Outcome of an action

The changed value is saved and the ***Configuration*** menu is closed. Stor appears in the display. If necessary, the product is restarted automatically in order to adopt the changed values.

NOTE

The configuration is closed if no button is pressed for 2 minutes. Any changes made up to that point are not saved. c.End appears in the display.

8.2.4 Adjustment of the measuring input

Description

The temperature input can be adjusted with the zero point correction and the gradient correction. If an adjustment is made, you change the pre-adjusted factory settings. This is signalled with the t.oF, t.SL or SCL display text when the product is switched on.

The standard settings of the zero point value and the gradient value of the temperature input is 0.00. The standard setting of the gradient value of the conductivity value is 1.000. It signals that no correction is made.

In order to adjust the product, you must first open the ***Adjustment*** menu. The menu is opened as shown in the illustration.

Prerequisites

- Sufficiently full batteries are inserted in the product.
- The product is switched off.
- Ice water, regulated precision water baths or a water bath with a reference measurement are available as a reference.

Instruction

1. Press and hold the *Down button*.
2. Press the *On/Off button* to switch on the product and open the ***Configuration*** menu. Release the *Down button*. The display shows the first parameter.
3. By briefly pressing the *Function key*, you can scroll through the parameters. Select the parameter you would like to configure.
4. When you have selected the desired parameter, change the parameter to the desired value with the *Up button* and the *Down button*.
5. In order to save the new parameter value, press and hold the *Function key* for longer than 1 second.

Representation

Call up menu

Hold Release

Outcome of an action

The ***Configuration*** menu is closed after the last parameter.

NOTE

If the product is switched off without saving the configuration, the last save value is reproduced on the next start-up of the product.

8.2.5 Configuring parameters of the adjustment menu

Description

The following representation shows the available parameters and various configuration options.

Prerequisites

The ***Adjustment*** menu is open. See Adjustment of the measuring input [▶ p. 20].

Instruction

1. Select the desired parameter you would like to configure.
2. Adjust the desired configuration in the selected parameter with the *Up button* and *Down button*.
3. The available configuration options are listed for each parameter in the following representation.

Representation

Parameter	Values	Meaning
Zero point correction		
t.oF		
	0.00	No zero point correction
	-5.00 .. 5.00	Zero point correction in °C. and/or at °F -9.00 .. 9.00
Gradient correction of the temperature		

t.SL

0.00	No gradient correction
-5.00 .. 5.00	Gradient correction in %

Gradient correction for the conductivity value

t.SL

1.000	No gradient correction
0.800 .. 1.200	Multiplier for the gradient correction

Formula

Zero point correction:

Displayed value = measured value – t.oF

Gradient correction °C:

Display = (measured value – t.oF) * (1 + t.SL / 100)

Gradient correction °F:

Display = (measured value – 32 °F – t.oF) * (1 + t.SL / 100) + 32 °F

Gradient correction γ:

Display = measured value / t.SL

Example calculation

Temperature

- Zero point correction t.oF to 0.00
- Gradient correction t.SL to 0.00
- Display unit Unit to °C
- Display in ice water -0.2 °C
- Display in ice water setpoint t.oF = 0.0 °C
- Display in water bath 36.6 °C
- Display in water bath setpoint t.SL = 37.0 °C
- t.oF = display zero point correction – setpoint zero point
- t.oF = -0.2 °C – 0.0 °C = -0.2 °C
- t.SL = (setpoint gradient correction / (display gradient correction – t.oF) – 1) *100
- t.SL = (37.0 °C / (36.6 °C – (-0.2)) -1) *100 = 0.54

Conductivity

- Gradient correction SCL to 1.000
- Temperature compensation tcorr to oFF
- Control solution GKL 100 as reference
- Display in GKL 100 at 25 °C, setpoint = 1413 µS/cm
- Display = 1388 µS/cm
- SCL = setpoint / display value
- SCL = 1413 µS/cm / 1388 µS/cm = 1.018

NOTE

The most precise results can be achieved when the control solution temperature is adjusted to 25 °C. With different temperatures, the table value of the corresponding temperature must be used as a setpoint.

Outcome of an action

The changed value is saved and the ***Configuration*** menu is closed.

NOTE

If the product is switched off without saving the configuration, the last save value is reproduced on the next start-up of the product.

9 Error and system messages

Display	Meaning	Possible causes	Remedy
----	Range switching or measured value unstable	Measuring cell defect	Wait for the transient effect of the controller
		Contamination or air bubbles	Measurement leaves the permissible range
	Measurement far outside of the measuring range		Send in for repair
No display, unclear characters or no response when buttons are pressed	Battery depleted	Battery depleted	Replace battery
	System error	Error in the product	Send in for repair
	Product is defective	Product is defective	
bAt	Battery depleted	Battery depleted	Replace battery
Err.1	Measuring range exceeded	Measurement too high	The measurement is above the permissible range
		Measuring cell defect	Check the measuring cell
			Send in for repair
Err.2	Measuring range is undercut	Measurement too low	The measurement is below the permissible range
		Measuring cell defect	Check the measuring cell
			Send in for repair
SYS Err	System error	Error in the product	Switch product on/off
			Replace batteries
			Send in for repair

10 Disposal

NOTE

This product bears the "recycle batteries" symbol. It means that this product must not be disposed of with household waste. Instead, it is your responsibility to dispose of the product correctly at the end of its service life by dropping it off at an authorised disposal facility which collects the product separately for recycling. It is also your responsibility to decontaminate the equipment in the event of biological, chemical and/or radioactive pollution in order to avoid putting any persons assigned with the disposal and recycling at risk. For further information about the location where you can drop off your product, contact your local dealer or the place where you originally purchased the product.

If you proceed as described above, you are contributing to the protection of natural resources and ensuring that your product is recycled so that no one's health is put at risk.

Thank you!

11 Technical data

Measuring range	Conductivity	0 .. 2000 S/cm 0.00 .. 20.00 mS/cm 0.0 .. 100.0 mS/cm
	Specific resistance	-
	Salinity	0.0 .. 50.0 g/kg
	TDS	0 .. 2000 mg/l
	Temperature	-5.0 .. +105.0 °C (23.0 .. +221.0 °F) – the conductivity measuring cells can be exposed temporarily to temperatures of up to 100 °C and permanently to temperatures of up to 80 °C.
Accuracy	Conductivity	± 0.5 % of measured value ± 0.5 % FS
	Temperature	± 0.3 °C
Measuring cycle		approx. 10 measurements per second Updating of the display approx. 2 times per second
Display		3-line segment LCD, additional symbols, illuminated (adjustable white, permanent illumination)
Additional functions		Min/Max/Hold
Compensation		Offset and gradient correction - temperature, Gradient correction - conductivity
Housing		Break-proof ABS housing
	Protection rating	IP65 / IP67
	Dimensions L*W*H [mm] and weight	108 * 54 * 28 mm without measuring cell or kink protection 180 g, incl. battery and measuring cell
Operating conditions		-20 to 50 °C; 0 to 95 % r.h. (temporarily 100 % r.h.)
Storage temperature		-20 to 70 °C
Power supply		2*AA battery (included in the scope of delivery)
	Current requirement/ battery life	approx. 2.2 mA, approx. 3.5 mA with lighting Service life > 1000 hours with alkaline batteries (without backlighting)
	Battery indicator	4-stage battery status indicator, Replacement indicator for depleted batteries: "BAT"
Auto-power-OFF function		The device switches off automatically if this is activated
Directives and standards		The devices conform to the following Directives of the Council for the harmonisation of legal regulations of the Member States: 2014/30/EU EMC Directive 2011/65/EU RoHS Applied harmonised standards: EN 61326-1:2013 Emission limits: Class B Immunity according to Table 2 Additional errors: < 1 % FS EN 50581:2012 The device is intended for mobile use and/or stationary operation in the scope of the specified operating conditions without further limitations.

12 Service

12.1 Online resources

The following information is provided on the VWR website at www.vwr.com:

- All contact information of the technical customer service
- VWR online catalogue and information about accessories and compatible products
- Additional product information and special offers

Contact If you require information or technical support, please contact your VWR sales centre or visit our website: www.vwr.com.

12.2 Sales partners

Your sales partner		
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