

Measuring device for conductivity temperature

as of version V2.1

Operating Manual

GMH 3430



WEEE-Reg.-Nr. DE93889386



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1 Designated Use

The device is designed for conductivity measurements. Additionally resistivity, TDS (Filtrate dry residue) and salinity measurements can be done.

A cable permanently connects the electrode to the device.

Field of application:

- Soft and salt water aquaristics
 - Fish farming
 - Checking of drinking water
- etc...

2 General Note

Read this document carefully and get used to the operation of the device before you use it. Keep this document within reach for consulting in case of doubt.

3 Operating and Maintenance Advice

a) When to replace battery:

If Δ and 'bAt' are shown in the lower display the battery has been used up and needs to be replaced. The device will, however, operate correctly for a certain time.

If 'bAt' is shown in the upper display the voltage is too low to operate the device; the battery has been completely used up.

Please note: The battery has to be taken out, when storing device above 50°C.

We recommend to take out battery if device is not used for a longer period of time.

b) Treat device and sensor carefully. Use only in accordance with above specification. (do not throw, hit against etc.). Protect plug and socket from soiling.

c) When connecting the temperature probe the connector may not lock to the jack correctly. In such a case hold the connector not at the case but at the buckling protection of the cable during the plug in. Don't connect electrode canted! If plug is entered correctly, it will slide in smoothly.

To disconnect temperature probe do not pull at the cable but at the plug.

If plug is entered incorrectly the connecting pins of the plug can be damaged. => Plug can no longer be used and connecting cable needs to be replaced.

d) Mains operation:

When using a power supply device please note that operating voltage has to be 10.5 to 12 V DC.

Do not apply overvoltage!! Cheap 12V-power supply devices often have excessive no-load voltage. We, therefore, recommend using regulated voltage power supply devices. Trouble-free operation is guaranteed by our power supply devices. Trouble-free operation is guaranteed by our power supply, GNG10/3000.

Prior to connecting the plug power supply device with the mains supply make sure that the operating voltage stated at the power supply device is identical to the mains voltage.

4 Safety Requirements

This device has been designed and tested in accordance with the safety regulations for electronic devices.

However, its trouble-free operation and reliability cannot be guaranteed unless the standard safety measures and special safety advises given in this manual will be adhered to when using the device.

1. Trouble-free operation and reliability of the device can only be guaranteed if the device is not subjected to any other climatic conditions than those stated under "Specification".
2. If the device is transported from a cold to a warm environment condensation may cause in a failure of the function. In such a case make sure the device temperature has adjusted to the ambient temperature before trying a new start-up.
3. If device is to be connected to other devices (e.g. via serial interface) the circuitry has to be designed most carefully. Internal connection in third party devices (e.g. connection GND and earth) may result in not-permissible voltages impairing or destroying the device or another device connected.

Warning: If device is operated with a defective mains power supply (short circuit from mains voltage to output voltage) this may result in hazardous voltages at the device (e.g. sensor socket, serial interface).

4. If there is a risk whatsoever involved in running it, the device has to be switched off immediately and to be marked accordingly to avoid re-starting.

Operator safety may be a risk if:

- there is visible damage to the device
- the device is not working as specified
- the device has been stored under unsuitable conditions for a longer time.

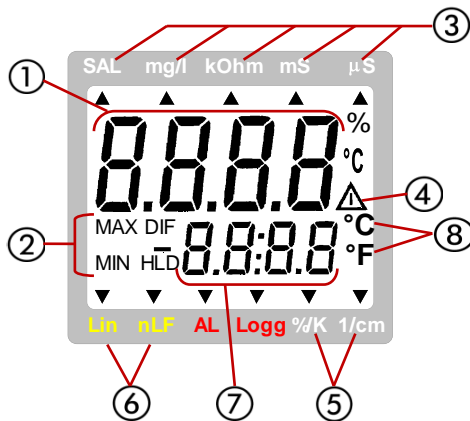
In case of doubt, please return device to manufacturer for repair or maintenance.

5. **Warning:** Do not use these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury or material damage.

Failure to comply with these instructions could result in death or serious injury and material damage.

5 Display and control elements

5.1 Display elements



- ① **Main display:** conductivity, resistivity, filtrate dry residue (TDS), salinity or user prompt

- ② **MAX/MIN/HLD:** display elements to show minimum/maximum/memorized measuring value

- ③ Display of **measuring units** for main display

- ④ **Warning signal:** indicates low battery

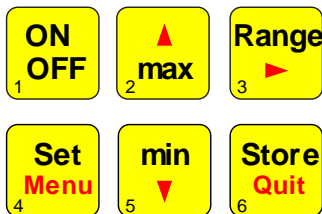
- ⑤ **Units** for configuration settings

- ⑥ **Lin/nLF-arrow:** indicates set temperature compensation

- ⑦ **Secondary Display:** measuring value temperature or configuration settings

- ⑧ **Measuring value units** for temperature

5.2 Pushbuttons



- ON/OFF** 1: On/off key

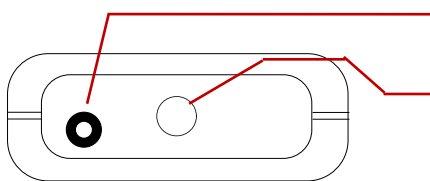
- min/max when taking measurements:**
 - max** 2 (with up arrow): press shortly: indication of min. or max. value measured so far as well as corresponding temperature
 - min** 5 (with down arrow): press for 2 sec.: the corresponding value is deleted

- Configuration:**
 - Range:** (for conductivity measuring only)
 - press for 2 sec.: change between automatic and manual measuring range selection
 - Range** 3 (with right arrow): press shortly (at manual measuring range selection): change next higher measuring range or change from highest to smallest measuring range

- Set/Menu:**
 - Set/Menu** 4: press shortly (Set): change-over between measuring units: conductivity, resistivity of fluid, filtrate dry residue (TDS) and salinity
 - press for 2 sec. (Menu): configuration will be activated

- Store/Quit:**
 - Store/Quit** 6: measurement: holding of current meas. value ('HLD' in display)
 - Set/Menu: acknowledge setting, return to measuring

5.3 Connections




- Interface:** Connection for electrically isolated interface adaptor (accessories: GRS 3100, GRS3105 or USB3100)

- Electrode:** cable gland for fixed conductivity electrode

The mains socket is located at the left side of the instrument.


6 Selection of Measuring Unit

The device allows a choice between the various measuring units, i.e. conductivity, resistivity of fluid, filtrate dry residue ('Total Dissolved Solids') and salinity. To do so press -key for a short time. The measuring value of the current measuring unit will be shown in the upper line of the display, the corresponding device will be indicated by an arrow at the top corner of the display. Simultaneously, the temperature is shown in the lower line of the display with all measuring units.



7 Change Between Measuring Range Resolutions

For measuring conductivity you have a choice between four different measuring range resolutions:

0.0	...	200.0	μS/cm
0	...	2000	μS/cm
0.00	...	20.00	mS/cm
0.0	...	200.0	mS/cm

If Auto-Range is switched on the GMH3430 will automatically choose the optimum resolution. If Auto-Range is switched off you can change to the next measuring range resolution by pressing the -key for a short time. In case you have already been working in the highest resolution range, pressing of the key will bring you down to the lowest measuring range resolution. The corresponding measuring unit is shown by an arrow in the top right-hand corner of the display.



To activate/deactivate Auto-Range press -key press for 2 seconds. The Auto-Range function set will be shown in the display as long as the -key is being pressed.

8 Salinity measuring:

The salinity (salt content) of seawater can be determined in the measuring mode „SAL“ (basis: International Oceanographic Tables; IOT)
The salinity of standard-seawater is 35 ‰ (35g salt per 1kg seawater).
The values are displayed in ‰ (g/kg).

9 Display at reboot

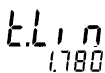
After the device is switched on it will display some information about the current configuration. There are the following displays:



segment test

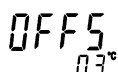


set scale correction of measuring cell



set compensation coefficient

(only displayed if t.Cor = lin)



set temperature offset


(not displayed if OFFS = off)




setting for Autorange


Then 0 is displayed until the first valid measuring value is available.

10 Configuration

For configuration of the device press -key for 2 seconds.

Choose between the individual values that can be set by pressing the -key again.

The individual values are changed by pressing the keys  or .

Use  to leave configuration and to store settings.

't.Cor': Selection of Temperature Compensation



off: no temperature compensation selected

nLF: non-linear temperature compensation for natural water acc. to EN27888 (DIN 38404).
to measure ground water, surface water, drinking water and purest water

Lin: linear temperature compensation
for other aqueous solutions



For TDS value measurements, non-linear temperature compensation for natural water is used (reference temperature = 25°C).

To measure salinity the instrument automatically switches over to the non-linear temperature compensation acc. to IOT (reference temperature = 15°C).

't.Lin': Setting of Temperature Coefficient (only when t.Cor = Lin)



0.300 ... 3.000: Temperature compensation coefficient in %/K.

't.rEF': Selection of Reference Temperature (only when t.Cor = nLF or Lin)



20°C / 68°F: reference temperature 20°C (68°F)

25°C / 77°F: reference temperature 25°C (77°F)

'C.tdS': Setting of TDS-factor



0.40 ... 1.00: calculation factor for TDS-measurements

The calculation factor depends on the composition of the medium and has to be determined for each type of water.

'SCL': Setting of Scale Correction of Measuring Cell

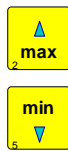


0.800 ... 1.200: scale correction of measuring cell

The cell constant may change due to natural ageing or depositions at the fixed measuring cell. In case you have an accurate reference liquid, you may adjust the device by changing the scale correction accordingly.

Factory setting of the scale correction is 1.000.

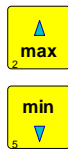
'Unit': Selection of Temperature Unit °C /°F



°C All temperature values in degrees Celsius

°F: All temperature values in degrees Fahrenheit

'Offset': Selection of Temperature Offset



-2.0°C ... 2.0°C

or

-3.6°F ... 3.6°F

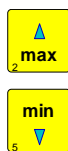
The zero point of the temperature measurement will be displaced by this value:

temperature displayed = temperature measured - offset

The offset is used to compensate for deviations.

off: Zero displacement has been deactivated (=0.0°)

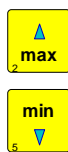
'Power.off': Selection of Power-off Delay



1...120: Power-off delay in minutes. The instrument will be automatically switched off as soon as this time has elapsed if no key is pressed/no interface communication takes place.

off: automatic power-off function deactivated (continuous operation, e.g. in case of mains operation)

' Address': Selection of Base Address



01, 11, 21, ..., 91:

Base address for interface communication.

Channel 1 will be addressed by the base address set, channels 2 and 3 will have the following addresses.

(Example: base address 21 - channel 1 = 21, channel 2 = 22, channel 3 = 23)

Using the interface converter GRS3105 it is possible to connect several devices to a single interface. As a precondition the base addresses of all devices must not be identical. In case several devices will be connected via one interface make sure to configure the base addresses accordingly.

11 Minimum and Maximum Values



The min. or max. value of the current measuring unit will be shown in the upper line of the display after the **max** - or **min** -keys have been pressed for a short time.

The lower display line will simultaneously show the temperature at which the max./min. value for conductivity or resistivity, filtrate dry residue, salinity has occurred.

To switch over between the max./min. values of the measuring units press **Set Menu** for a short time.

Max./min. values for conductivity, filtrate dry residue and salinity will be recorded even though the measuring unit is not shown in the display at the moment.

To delete max./min. values press **max** -key or **min** -key for approx. 2 seconds.

12 The Conductivity Measuring Cell

During the measurement, the conductivity measuring cell must be dipped into so far, that at least 30mm beginning from the top of the measuring cell, is located in the medium.

The maximum immersion depth for continuous operation should be 110mm.



The measuring cell can either be stored dry or in water. After dry storage wetting time will be prolonged slightly. If changing over from one liquid to another with conductivities varying widely make sure to properly rinse and shake dry measuring cell.



Measuring cell must never come into contact with water-repellent materials such as oil or silicone.

If conductivity measured is much higher or lower than expected this may be due to the electrode being soiled with nonconducting or conducting foreign materials. Measuring cell has to be cleaned with a watery soap solution.

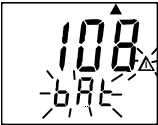

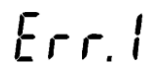
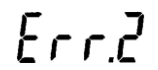

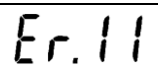
When measuring media with low conductivities the electrode has to be moved sufficiently.

13 Error And System Messages

Error or system messages:

Description / Reason:

Remedy:

	Low battery voltage device will only continue operation for a short time	replace battery
	Low battery voltage - If mains operation: wrong voltage	replace battery replace power supply, if fault continues to exist: device damaged
No display or mazy characters	- Battery voltage too low	replace battery
	- If mains op.: power supply defective or wrong voltage/polarity	check/replace mains supply
	- System error	disconnect battery or power supply, wait for a short time, re-connect
	- Device defective	return to manufacturer for repair
	Values exceeding measuring range	Check: are there any values exceeding the measuring range specified? -> meas. device not suitable
	Electrode/sensor/cable defective	-> replace electrode/probe
	Values below measuring range	check: are there any values below the measur- ing range specified? -> meas. device not suitable
	Electrode/sensor/cable defective	-> replace electrode/probe
	System fault	Disconnect battery, wait for 10 sec., switch on again: if fault continues to exist, device is dam- aged -> return to manufacturer for repair
	Value could not be calculated	A measuring variable device required for calcu- lation is faulty (overflow/underflow)

14 The serial interface

All measuring data and settings of the device can be read and changed by means of the serial interface and a suitable electrically isolated interface adapter (GRS3100, GRS3105 or USB3100).

In order to avoid faulty transmission, we have designed elaborate security measures for interface communication.

The following **standard software packages** are available for data transfer:

- **EBS9M** 9-channel software to display the measuring value (channel 1) and the temperature (ch. 2)
- **EASYCONTROL**: Universal multi-channel software (EASYBUS-, RS485-, or GMH3000- operation possible) for real-time recording and presentation of measuring data in the ACCESS®-data base format.

In case you want to develop your own software we offer a **GMH3000-development package** including:

- a universally applicable Windows functions library ('GMH3000.DLL') with documentation, can be used by all 'established' programming languages, suitable for:
Windows 95™, Windows 98™, Windows NT™, Windows 2000™, Windows XP™, Windows Vista™.
- Programming examples Visual Basic 4.0, Delphi 1.0, Testpoint



If you want to use the interface functions make sure to switch off the Auto-Range function.

14.1 The following interface functions will be supported

Operating mode	Conductivity	Temperature	Resistance	TDS	Salinity	DLL-Code	Name / function
Channel	1	2	3	4	5		
	x	x	x	x	x	0	Read nominal value
	x	x	x	x	x	3	Read system status
	x	*1	x	x	x	6	Read min. value
	x	*2	x	x	x	7	Read max. value
	x					12	Read ID no.
	x					174	Delete min. value
	x					175	Delete max. value
	x	x	x	x	x	176	Read min. measuring range
	x	x	x	x	x	177	Read max. measuring range
	x	x	x	x	x	178	Read unit for measuring range
	x	x	x	x	x	179	Read decimal pt. for measuring range
	x	x	x	x	x	180	Read measuring type
	x					194	Set display unit
	x					195	Set decimal point of display
	x	x	x	x	x	199	Read meas. type in display
	x	x	x	x	x	200	Read min. display range
	x	x	x	x	x	201	Read max. display range
	x	x	x	x	x	202	Read unit of display
	x	x	x	x	x	204	Read decimal point of display
	x					208	Read channel count
		x				216	Read offset correction
		x				217	Set offset correction
	x					222	Read power-off delay
	x					223	Set power-off delay
	x					240	Reset instrument
	x					254	Read program identification

*1 = temperature of the min conductivity value

*2 = temperature of the max conductivity value

15 Specification

Measuring units:	Display ranges:	Resolution:
Conductivity:	0.0 ... 200.0 $\mu\text{S/cm}$ 0 ... 2000 $\mu\text{S/cm}$ 0.00 ... 20.00 mS/cm 0.0 ... 200.0 mS/cm	0.1 $\mu\text{S/cm}$ 1 $\mu\text{S/cm}$ 0.01 mS/cm 0.1 mS/cm
Resistivity of Fluid:	0.005 ... 100.0 $\text{kOhm} \cdot \text{cm}$	0.001 $\text{kOhm} \cdot \text{cm}$, 0.01 $\text{kOhm} \cdot \text{cm}$ or 0.1 $\text{kOhm} \cdot \text{cm}$
Filtrate dry residue (TDS):	0 .. 1999 mg/l	1 mg/l
Salinity:	0.0.. 70.0	0.1
Temperature:	-5.0 ... +100.0 $^{\circ}\text{C}$	0.1 $^{\circ}\text{C}$ or 0.1 $^{\circ}\text{F}$
Accuracy: (at nominal temperature = 25 $^{\circ}\text{C}$, ± 1 digit)		
Conductivity:	± 0.5 % of m.v. ± 0.3 % FS or ± 2 mS/cm	
Resistivity of Fluid:	± 0.5 % of m.v. ± 0.3 % FS	
Filtrate dry residue (TDS):	± 0.5 % of m.v. ± 0.3 % FS	
Salinity:	± 0.5 % of m.v. ± 0.3 % FS	
Temperature:	± 0.2 % of m.v. ± 0.3 K	
Cell correction:	to be set from 0.8 .. 1.2	
Temperature compensation:	select between - linear temperature compensation with compensation factor from 0.3 to 3.0 %/K - non-linear temperature compensation according to EN 27888 (DIN 38404), reference temperatures 20 $^{\circ}\text{C}$ and 25 $^{\circ}\text{C}$ or no temperature compensation	
Working temperature:	device: 0 to +50 $^{\circ}\text{C}$ / 0 to +95 % RH (non condensing) meas. cell: -5 to +80 $^{\circ}\text{C}$ (peaks up to 100 $^{\circ}\text{C}$)	
Storage temperature:	-20 to +70 $^{\circ}\text{C}$	
Interface:	Serial interface (3.5mm jack), serial interface can be connected to RS232 or USB interface of a PC via electrically isolated interface adapter GRS3100, GRS3105 or USB3100 (accessories).	
Min-/max-value memory:	Max- and min- pair of values: highest and lowest value of each measuring type (conductivity, resistivity, TDS and salinity) is safed together with the corresponding temperature	
Power supply:	9V-battery, type IEC 6F22 (included) or additional d.c. connector (internal pin \varnothing 1.9 mm) for external 10.5-12V direct voltage supply $\ominus \oplus$ (suitable power supply: GNG10/3000)	
Power consumption:	approx. 3.5 mA	
Low battery warning:	\triangle and ' bAt '	
Display:	2 four-digit LCD-displays (12.4mm and 7mm high) for meas. values, min. and max. values HOLD-function etc. as well as additional pointing arrows	
Pushbuttons:	6 membrane keys for on/off switch, selection of measuring range resolution, min. and max. value memory, HOLD-function etc.	
Automatic-power-off-function:	The instrument will be automatically switched off if no key is pressed/no interface communication takes place for the time of the power-off delay. The power-off delay can be set to values between 1 and 120 min.; it can be completely deactivated.	
Housing:	142 x 71 x 26 mm (L x W x D), impact-resistant ABS plastic housing, membrane keyboard, transparent panel. Front side IP65, integrated pop-up clip for table top or suspended use.	
Weight:	approx. 225 g (incl. battery and measuring cell)	
Measuring cell:	Two-electrode-conductivity-measuring cell with integrated temperature sensor	
Electrode material:	special graphite	
Collar material:	polysulfon	
Dimensions:	dia. 12 mm, length 120 mm	
Warranty:	2 years for device electronics, 1 year for conductivity measuring cell	
EMV:	The device corresponds to the essential protection ratings established in the Regulations of the Council for the Approximation of Legislation for the member countries regarding electromagnetic compatibility (2004/108/EG). Additional fault: <1%	

16 Disposal instruction:

Batteries must not be disposed in the regular domestic waste but at the designated collecting points. The device must not be disposed in the unsorted municipal waste! Send the device directly to us (sufficiently stamped), if it should be disposed. We will dispose the device appropriate and environmentally sound.