

Operating Manual

Conductivity Measuring Instrument

GMH 3430

as of version 2.0



How to Operate and Maintain Device:

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) 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 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.



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 a failure of the instrument. 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).

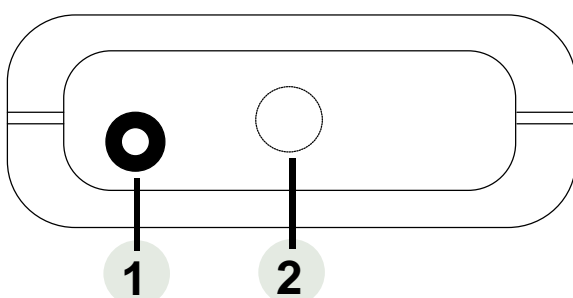
4. If there is a risk whatsoever involved in running it, the device has to be switched off immediately and to be marked accordingly to avoid re-starting.

Operator safety may be risk if:

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

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

Connections

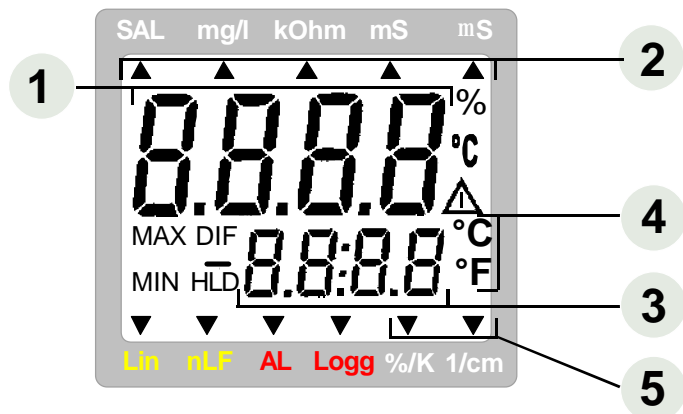


1 Interface: Connection for electrically isolated interface adaptor (accessories: GRS 3100)

2 Electrode: cable gland for fixed conductivity electrode

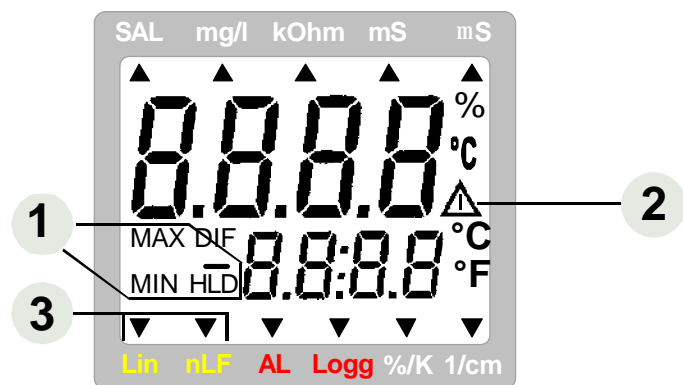
The mains socket is located at the left side of the instrument.

Displays:



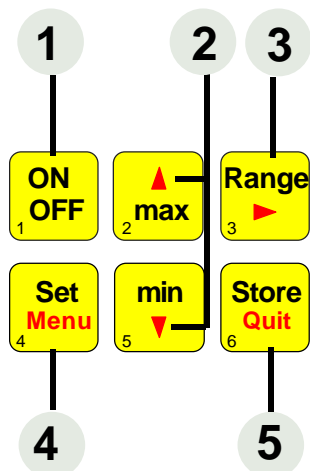
- 1 **Main display:** conductivity, resistivity, filtrate dry residue (TDS), salinity or user prompt
- 2 Display of **measuring value units** for main display
- 3 **Secondary display:** temperature or configuration settings
- 4 **Measuring value units** for temperature
- 5 **Units** for configuration settings

Special Display Elements:




- 1 **MAX/MIN/HLD:** indicates if min., max. or HOLD values are displayed in the main or secondary display.
- 2 **Warning triangle:** indicates low battery
- 3 **Lin/nLF:** indicates temperature compensation set.

Pushbuttons



- 1 **On/off key**
- 2 **min/max for measurements:**
 press shortly: indication of min. or max. value measured so far as well as corresponding temperature
 press for 2 sec.: delete min./max. values
Configuration: to enter values or change settings
- 3 **Range:** for conductivity measuring only
 press for 2 sec.: change between automatic and manual measuring range selection
 press shortly for manual measuring range selection: change to widest measuring range or change from highest to smallest measuring range
- 4 **Set/Menu:**
 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
- 5 **Store/Quit:**
 measurement: holding of current meas. value ('HLD' in display)
 Set/Menu: acknowledge setting, return to measuring


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

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.

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).


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 - or -keys have been pressed for a short time. The lower display line will simultaneously show the temperature at which the max./min. values for conductivity or resistivity, filtrate dry residue, salinity have occurred. To switch over between the max./min. values of the measuring units press  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 -key or -key for approx. 2 seconds.

Device 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



To measure the TDS value always use non-linear temperature compensation for natural water (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.



For any aqueous solution to be measured the relevant factor has to be established beforehand.

'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.

'CELL': Setting of Cell Correction



0.800 .. 1.200: cell correction



The cell correction 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 GMH3430 by changing the cell correction accordingly.

Factory setting of the cell correction is 1.000.

'Unit t': Selection of Temperature Unit



°C: All temperature values in degrees Celsius



°F: All temperature values in degrees Fahrenheit

'OFFS': Selection of Temperature Offset



-2.0 .. 2.0°C: The zero point of the temperature measurement will be displaced by this value (temperature displayed = temperature measured - offset).



-3.6 .. 3.6°F The offset is used to compensate for deviations.

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

'P.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.

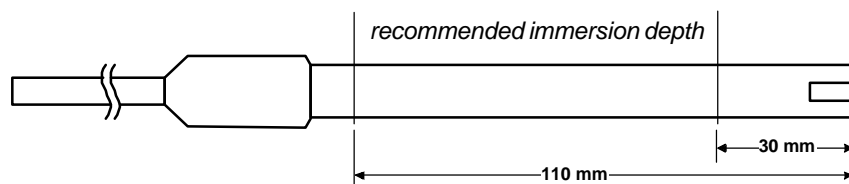
(Example: base address 21 - channel 1 = 21, channel 2 = 22, channel 3 = 23)

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.

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.


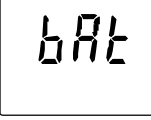


Measuring cell must never come into contact with water-repellent materials such as oil or silicone.

If conductivity measured is much higher or lower than expected this may be due to the electrode being soiled with non-conducting 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.

Error and System Messages

Display	Description	Remedy
	Low battery voltage, device will only continue operation for a short time	replace battery
	Low battery voltage If mains operation:	replace battery replace power supply, if fault continues to exist: device damaged
no display or confused characters	Battery voltage too low If mains operation: power supply defective or wrong voltage/polarity System error Device defective	replace battery check/replace power supply disconnect battery or power supply, wait for a short time, re-connect return to manufacturer for repair
Err.1	Values exceeding meas. range	Check: are there any values exceeding the specified meas. range? - measuring instrument not suitable! cable of measuring cell defective -> replace
Err.2	Values falling below meas. range	Check: are there any values falling below the specified meas. range? - measuring instrument not suitable! cable of measuring cell defective -> replace
Err.7	System fault	disconnect battery, wait for 10 sec. and re-connect battery, switch on device once again. If fault continues to exist device is defective -> return to manufacturer for repair.
Er.11	Value could not be calculated	A measuring variable device required for calculation is faulty (overflow/underflow)

The Serial Interface

All measuring and setting data of the device can be read and changed by means of the serial interface and a suitable electrically isolated interface adapter (GRS3100). In order to avoid transmission errors, there are several security checks implemented.

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

- EBS9M** 9-channel software to simultaneously display conductivity (channel 1), temperature (channel 2), resistivity (channel 3), TDS (channel 4) and/or salinity (channel 5).
- 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 32bit-Windows functions library ('GMH3000.DLL') with documentation that can be used by all 'serious' programming languages, suitable for:
Windows 95™, Windows 98™, Windows NT™
- 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.


The following interface functions will be supported:

Conductivity	Temperature	Resistance	TDS	Salinity		
Channel 1	Channel 2	Channel 3	Channel 4	Channel 5	DLL-Code	Name/Function
x	x	x	x	x	0	Read nominal value
x	x	x	x	x	3	Read system state
x	*1	x	x	x	6	Read min. value
x	*2	x	x	x	7	Read max. value
x					12	Read ID no.
x					13	Assign new address
					14	Read address
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 point 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 measuring type of 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 unit
x					254	Read program identification

*1 = temperature of the min conductivity value

*2 = temperature of the max conductivity value

Specification :

Measuring units	Display ranges:	Resolution:
Conductivity	0.0 .. 200.0 μ S/cm	0.1 μ S/cm
	0 .. 2000 μ S/cm	1 μ S/cm
	0.00 .. 20.00 mS/cm	0.01 mS/cm
	0.0 .. 200.0 mS/cm	0.1 mS/cm
Resistivity of Fluid	0.005 .. 100.0 kOhm/cm	0.001 kOhm/cm, 0.01 kOhm/cm, or 0.1 kOhm/cm,
Filtrate dry residue (TDS)	0 .. 1999 mg/l	1 mg/l
Salinity	0.0.. 70.0	0.1
Temperature	-5.0 .. +100.0°C	0.1°C or 0.1°F
Accuracy: (at nominal temperature, ± 1 digit)		
Conductivity	$\pm 0.5\%$ of m.v. $\pm 0.3\%$ FS or $\pm 2 \mu$ S/cm	
Resistivity of Fluid	$\pm 0.5\%$ of m.v. $\pm 0.3\%$ FS	
Filtrate dry residue (TDS)	$\pm 0.5\%$ of m.v. $\pm 0.3\%$ FS	
Salinity	$\pm 0.5\%$ of m.v. $\pm 0.3\%$ FS	
Temperature	± 0.3 K	
Cell correction	to be set from 0.8 .. 1.2	
Temperature compensation	select between <ul style="list-style-type: none"> - 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°C and 25°C or no temperature compensation 	
Nominal temperature	25°C	
Working temperature	device: 0 to +50°C meas. cell: -5 to 80°C (peaks up to 100°C)	
Relative humidity	0 to +95%r.h. (non-condensing)	
Interface	serial interface (3.5mm jack), serial interface can be connected to RS232 interface of a PC via electrically isolated interface adapter GRS3100 (see accessories)..	
Min-/max-value memory	max. and min. values will be memorized for the measuring ranges conductivity, resistivity, filtrate dry residue and salinity together with the temperature at which the min./max. value was recorded.	
Power supply	9V-battery, type IEC6F22 (included) as well as additional d.c.connector (dia of internal pin 1.9 mm) for external 10.5-12V direct voltage supply.  (suitable power supply: GNG10/3000)	
Power consumption	approx. 3.5 mA	
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 dimensions	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	ca. 225 g (incl. battery and measuring cell)	
Lagertemperatur	-20 to +70°C	
Measuring cell	Two-electrode-conductivity-measuring cell with integrated temperature sensor. Electrode material: special graphite Collar material: Polysulfon Dimensions: dia. 12mm, length 120mm	
EMC	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%.	

Disposal instruction:

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.

