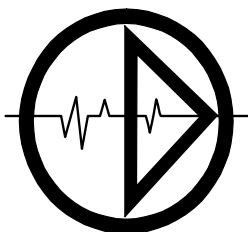


# Operating Manual

## Conductivity Measuring Instrument

# LF 6



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INSTRUMENTATION FOR WATER AND WASTE WATER

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## How to Operate and Maintain Unit:

### a) When to replace battery:

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

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

Please note: We recommend to take out battery if unit is not used for a longer period of time.

### b) Treat unit 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 unit please note that operating voltage has to be 10.5 to 12 V DC.

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

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



## Safety Requirements:

This unit has been designed and tested in accordance with the safety regulations for electronic instruments.

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 unit.

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

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

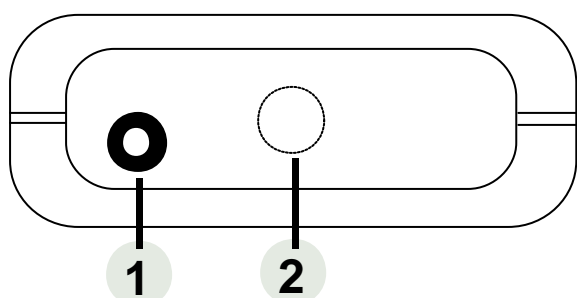
4. If there is a risk whatsoever involved in running it, the unit has to be switched off immediately and to be marked accordingly to avoid re-starting.

Operator safety may be risk if:

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

In case of doubt, please return unit to manufacturer for repair and/or maintenance.

## Connections

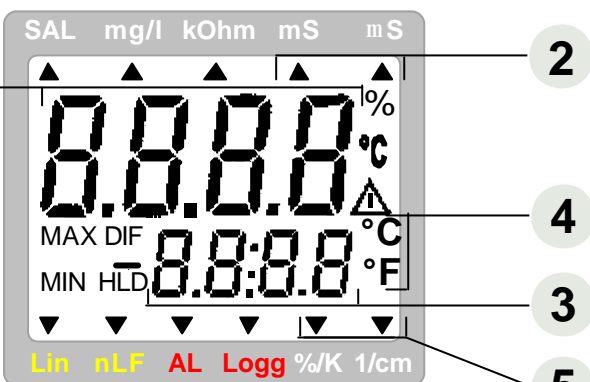


**1 Interface:** connection for electrically isolated interface adaptor (accessories: GRS 3100)

**2 Electrode:** cable gland for fixed conductivity electrode

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

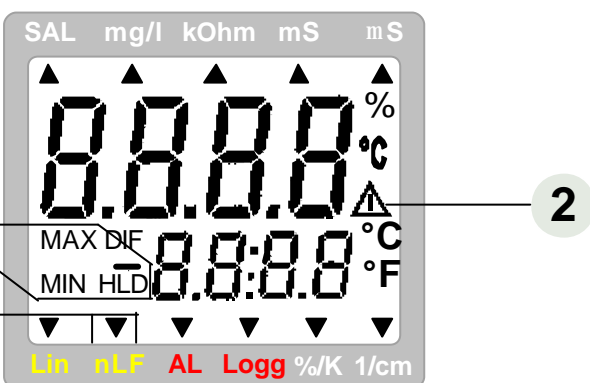
## Displays:



The diagram shows a digital display with the following elements:

- 1** Main display: Conductivity 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

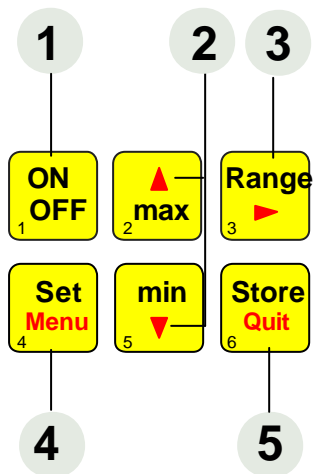
## Special Display Elements:



The diagram shows the main display with special elements:

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

## Pushbuttons




The diagram shows the following pushbuttons:

- 1** On/off key
- 2** min/max when taking measurements:
  - press shortly: display of min. or max. meas. value measured so far as well as relevant temperature.
  - press for 2 sec.: min./max. values will be deleted
  - Set/Menu-level:** to enter values or change settings
- 3** Range:
  - press for 2 sec.: change between automatic and manual measuring range selection
  - press shortly for manual measuring range selection: change to higher measuring range (next one) or change from highest to lowest measuring range
- 4** Set/Menu:
  - press for 2 sec. (Menu): configuration will be activated
- 5** Store/Quit:
  - measuring: holds current meas. value ('HLD' in display)
  - Set/Menu: acknowledge setting, return to measuring.

## How to Switch Over 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 LF 6 will automatically choose the optimum resolution. If Auto-Range is switched off you can change-over 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 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.

## 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 have occurred.

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

## The Conductivity Measuring Cell


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.

## Unit Configuration:

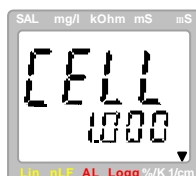
For configuration of the unit press -key for 2 seconds.

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.

### '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 LF 6 unit 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).

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

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

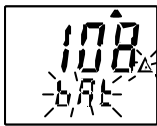
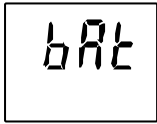
### 'P.off': Selection of Power-off Delay



**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)

# Error and System Messages

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

## The Serial Interface

All measuring and setting data of the unit 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) and the temperature (channel 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 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		
Channel 1	Channel 2	DLL-Code	Name/Function
x	x	0	Read nominal value
x	x	3	Read system state
x		6	Read min. value
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	176	Read min. measuring range
x	x	177	Read max. measuring range
x	x	178	Read unit for measuring range
x	x	179	Read decimal point for measuring range
x	x	180	Read measuring type
x		194	Set display unit
x		195	Set decimal point of display
x	x	199	Read measuring type of display
x	x	200	Read min. display range
x	x	201	Read max. display range
x	x	202	Read unit of display
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

## Specifications :

<b>Measured variables</b>	<b>Measuring ranges:</b>	<b>Resolution:</b>
<b>Conductivity</b>	0.0 .. 200.0 $\mu$ S/cm	0.1 $\mu$ S/cm
	0 .. 2000 $\mu$ S/cm	1 $\mu$ S/cm
	0.00 .. 20.00 mS/cm	0.01 mS/cm
	0.0 .. 200.0 mS/cm	0.1 mS/cm
<b>Temperature</b>	-5.0 .. +100.0°C	0.1°C or 0.1°F
<b>Accuracy:</b> (at nominal temperature)		
<b>Conductivity</b> ( $\pm$ 3digit)	$\pm$ 0.5% of m.v. $\pm$ 0.5% FS	
<b>Temperature</b>	$\pm$ 0.3K	
<b>Cell correction:</b>	can be set from 0.8 .. 1.2	
<b>Temperature compensation</b>	non-linear temperature compensation acc. to EN 27888 (DIN 38404), ref. temp. 25°C	
<b>Nominal temperature</b>	25°C	
<b>Working temperature:</b> unit:	0 to +50°C	
	meas. cell: -5 to 80°C (peaks up to 100°C)	
<b>Relative humidity</b>	0 to +95%r.h. (non condensing)	
<b>Interface</b>	serial interface (3.5mm jack), serial interface can be connected to RS232 interface of a PC via electrically isolated interface adapter GRS3100 (see accessories).	
<b>Min-/max-value memory</b>	maximum and minimum value will be memorized for the conductivity together with the temperature at which the min./max. value was recorded.	
<b>Power supply</b>	9V-battery, type IEC6F22 (included) as well as additional d.c.connector (dia. of internal pin 1.9 mm) for external 10-12V direct voltage supply. (suitable power supply: GNG10/3000)	
<b>Power consumption</b>	approx. 3.5 mA	
<b>Display</b>	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	
<b>Pushbuttons</b>	6 membrane keys for on/off switch, selection of measuring range resolution, min. and max. value memory, HOLD-function etc.	
<b>Automatic-power-off-function</b>	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.	
<b>Housing dimensions</b>	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.	
<b>Weight</b>	ca. 225 g (incl. battery and measuring cell)	
<b>Storage temperature</b>	-20 to +70°C	
<b>Measuring cell</b>	Two-electrode-conductivity-measuring cell with integrated temperature sensor. Electrode material: special graphite Collar material: Polysulfon Dimensions: dia. 12mm, length 120mm	
<b>EMC</b>	The LF 6 unit 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 (89/336/EWG). Additional fault: <1%.	