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GREISINGER

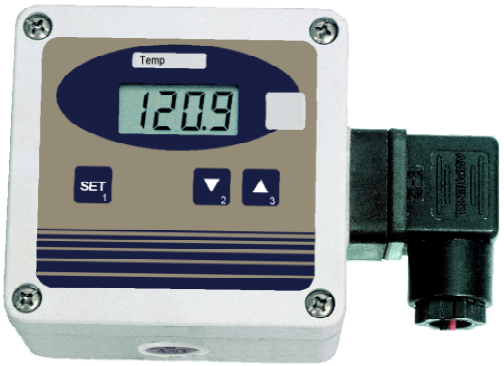
EN

Conductivity-Transmitter
(without measuring cell)

as of version 3.0

Operating Manual

GLMU 400 MP -UNI



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Inhalt

1 General Advice

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

Mounting, start-up, operating, maintenance and removing from operation must be done by qualified, specially trained staff that have carefully read and understood this manual before starting any work.

The manufacturer will assume no liability or warranty in case of usage for other purpose than the intended one, ignoring this manual, operating by unqualified staff as well as unauthorized modifications to the device. The manufacturer is not liable for any costs or damages incurred at the user or third parties because of the usage or application of this device, in particular in case of improper use of the device, misuse or malfunction of the connection or of the device.

The manufacturer is not liable for misprints.

2 Intended use

The GLMU 400 MP-UNI is a universal transmitter for measuring conductivity or other units based on conductivity measuring in liquids.

The measurement is performed by means of alternating current flow between the poles of the measuring cell, being in direct contact with the liquid.

The measurement is displayed via analogue standard signal output and a liquid crystal display.

The 4-20 mA model is supplied by the current loop, the 0-1 or 0-10 V model requires separate power supply.

The configuration of the various parameters has to be checked prior to use.

The measuring cell is included in the scope of supply and prior to measuring a suitable cell has to connected and configured.

2.1 Safety signs and symbols

Warning notices are marked in this manual as shown below:

 DANGER	Warning! Symbol warns of impending danger, death, serious bodily injury or serious property damage if ignored.
	Attention! Symbol warns of potential hazards or hazardous situations that can cause damage on the equipment or the environment if ignored.
	Note! Symbol indicates incidents that have an indirect impact on the operation or can trigger an unforeseen reaction if ignored.

2.2 Safety Instructions

This device has been designed and tested in accordance to 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 it.

1. Trouble-free operation and reliability of the device can only be guaranteed if it is not subjected to any other climatic conditions than those stated under “Specification”.
   Transporting the device from a cold to a warm environment condensation may result 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.
2. General instructions and safety regulations for electric, light and heavy current plants, including domestic safety regulations (e.g. VDE), have to be observed.
3. 
   DANGER
   Whenever there may be 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

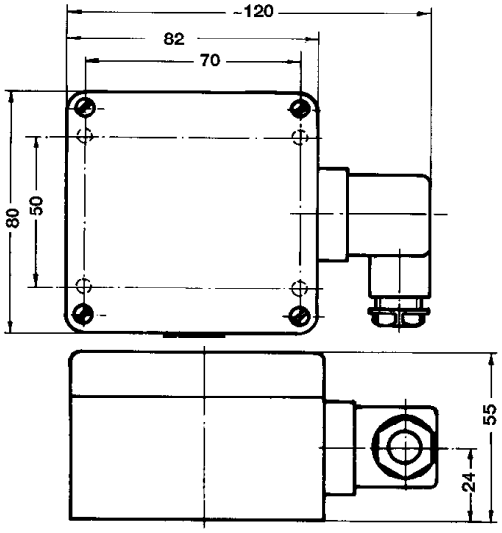
   In case of doubt, please return device to manufacturer for repair or maintenance.

4. DANGER

Do not use this product as safety or emergency stop device 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.

3 Installation

3.1 Dimensions

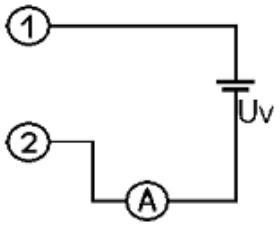


General elbow-type plug installation instructions

To mount the connection cable (2-, or 3-wire depending on type of device) the elbow-type plug screw has to be loosened and the coupling insert has to be removed by means of a screw driver at the position indicated (arrow).
Pull out connection cable through glanding and connect to the loose coupling insert as described in the wiring diagram.
Replace loose coupling insert onto the pins at the transmitter housing and turn cover cap with cable outlet in the direction desired untill it snaps on (4 different starting positions at 90° intervals).
Re-tighten the screw at the angle plug.

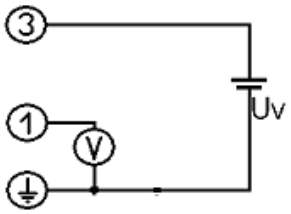
3.2 Assignment of elbow-type plug

4-20 mA (2-wire-connection)



1 = supply +
2 = GND / signal

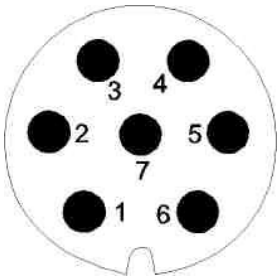
voltage (3-wire connection)



1 = signal +
3 = supply +Uv
⏚ (4) = supply -Uv

The type current or voltage output is set by works and cannot be changed

3.3 Terminal assignment of meas. cell socket



contact no.	2 pole-cell	4 pole-cell
1	temperature +	temperature +
2	temperature GND	temperature GND
3	supply 1 (electrode 1)	supply 1 (outer electrode 1)
4	signal 1 (electrode 1)	signal 1 (outer electrode 1)
5	signal 2 (electrode 2)	signal 2 (inner electrode 2)
6	supply 2 (electrode 2)	supply 2 (inner electrode 2)
7	not used	not used

3.4 Usage of Unit-Labels

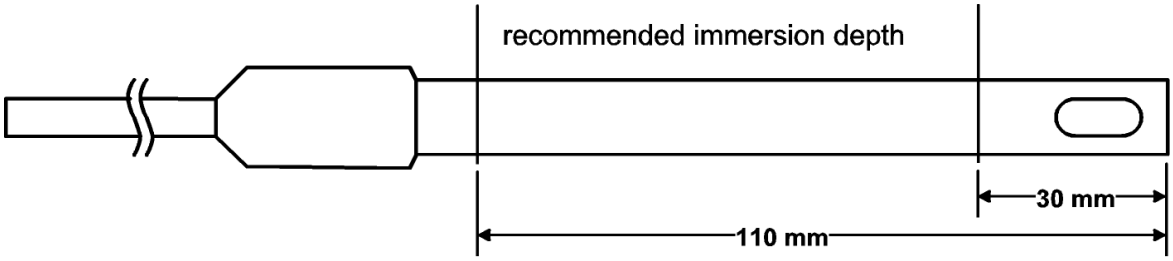
As the transmitter is a multiple purpose device, many different display units are possible, e.g. µS/cm, kOhm·cm.
Therefore unit-labels (within scope of supply) can be shoved between the case cover and the front foil behind the **transparent unit-window**.
To replace a label, unscrew the cover, pull out the old label (if present) and shove in the new one.
The unit depends on the settings of the Cell-constant, the function and the measuring range!
Please refer to table in chapter “Configuration of the device”

4 Operation

4.1 General information about the conductivity measuring

4.1.1 The measuring cell

During the measurement, the conductivity measuring cell must be dipped at least in so far, that at least the electrodes and the integrated temperature sensor is “under water”.
Example for measuring cell without thread: Practical immersion depth 30...110 mm.



The measuring cell can either be stored dry or in water. After dry storage a “wetting time” has to be considered until the final precision is achieved.

Attention: Measuring cells with graphite electrodes 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 measuring being soiled with non-conducting or conducting extraneous materials. The measuring cell has to be cleaned e.g. with a watery soap solution.
When measuring media at low conductivity the measuring cell has to get sufficient flow.
GLMU 200 MP: cost optimized 2 pole cell, suitable e.g. for pure water / drinking water / sweat water
GLMU 400 MP: 4 pole cell, especially suitable for applications above 2000 µS/cm e.g. sewage water, sea water etc.

4.1.2 Measuring hints

Conductivity measuring is comparably easy to perform, the precision of the instrument is very constant if it is used as intended. Depending on the necessary accuracy the instruments can be used up to several years without re-calibration of the cell constant.
If the accuracy should be controlled or improved, this is done by means of suitable reference solutions and the adjusting of the cell factor.
Attention! Wrong handling of reference solution can make them useless very fast.

4.1.3 Temperature compensation

The conductivity of aqueous solution is temperature dependent. The dependency itself is strongly dependent on the kind of solution. For the most applications e.g. in fish farming etc., the non linear temperature compensation of natural waters is precise (“nLF” according to EN 27888). The most common reference temperature is 25 °C.

4.1.4 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 ‰ (35 g salt per 1 kg seawater).
The values are displayed in ‰ or g/kg, an additional commonly used unit for this value is “PSU“ (Practical Salinity Unit).

4.1.5 TDS measuring

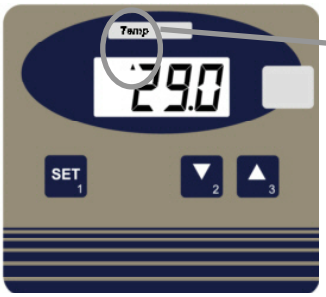
At the TDS measuring the dry residues or **t**otal **d**issolved **s**olids value is calculated by means of the conductivity and a calculation factor (C.tdS). This factor has to be evaluated for the referring type of solution.
The values are displayed in mg/l.

5 Display functions

5.1 Currently measured values

During normal operation **the conductivity display value** is displayed.
By short press of key 'SET' (1) the **temperature** in **[°C]** will displayed for 10 seconds.

display of conductivity value



display temperature

Arrow to Temp indicates temperature display

5.1.1 Min/Max Value Memory

watch Min values (Lo):	press 'down'(2) shortly once	display changes between 'Lo' and Min values
watch Max values (Hi):	press 'up'(3) shortly once	display changes between 'Hi' and Max values
restore current values:	press 'down'(2) or 'up'(3) once again	current values are displayed
clear Min-values:	press 'down'(2) for 2 seconds	Min values are cleared. The display shows shortly 'CLr'.
clear Max-values:	press 'up'(3) for 2 seconds	Max values are cleared. The display shows shortly 'CLr'.

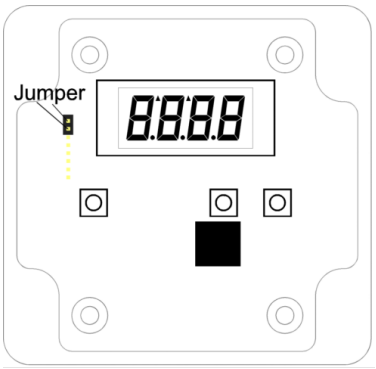
After 10 seconds the currently measured values will be displayed again.

6 Error and system messages

Display	Description	Possible fault cause	Remedy
Err.1	measuring range exceeded	Wrong signal	Temperature above 140°C not allowed. Choose right measuring range for conductivity
Err.2	Measuring value below measuring range	Wrong signal	Temperature below -5°C not allowed. Choose right measuring range for conductivity
Err.7	System fault	Error in device	Disconnect from supply and reconnect. If error remains: return to manufacturer
Err.9	Sensor error	Sensor or cable defective	Check sensor, cable and connections
Er.11	Calculation not possible	Calculation variable missing or invalid	Check temperature
Er.12	Measuring Cell fault	Cell cannot be driven	Clean/Restart or return to manufacturer
Er.13	Measuring Cell fault	Cell cannot be driven	Clean/Restart or return to manufacturer
8.8.8.8	Segment test	The transducer performs a display test for 2 seconds after power up. After that it will change to the display of the measuring.	

7 Configuration

In the configuration the devices parameters can be changed.
The jumper has to be set, p.r.t. figure right hand side. To set or remove jumper, the housing cover has to be removed. Ex works the jumper is set.
To change parameters press “SET” (key 1) two seconds, then the parameter selection is started with the first parameter (display shows “C.rnG”).
By pressing “SET” the desired parameter is selected, the editing of the parameter values happens via keys ▲ (key 3) or ▼ (key 2).
Pressing “SET” again (after editing the parameter values) returns to the parameter selection
Pressing “SET” again after the last parameter finishes the configuration, stores the changes and restarts the device.



If the jumper is removed from the shown contacts, the configuration is inaccessible, values are protected.

7.1 'C.rnG': Setting of Cell Constant: Cell constant range

0.01	Purewater, cells with K = 0.003…0.012
0.1	Purewater, cells with K =0.03…0.12
1	**Standard cells with K = 0.3 … 1.2**
10	Cells with K =3…12

7.2 'CELL': Setting of the cell-constant of the connected measuring cell

Possible inputs: 0.300...1.200
Cell constant K = C.rnG * CELL (Unit is 1/cm)
Example : Cell with K = 0.412: 'C.rnG' = 1, CELL = 0.412
Cell with K = 0.120: 'C.rnG' = 0.1, CELL = 1.200
Cell with K = 0.22: not supported

7.3 'Func': Setting of the measuring function

Possible inputs:
cond conductivity
reSi: resistivity
tdS: TDS (total dissolved solids
SAL: Salinity = salt content of sea water

7.4 'rAnG': Setting of the measuring range (not at “Func SAL”)

The measuring range is depending on the function set above. Possible inputs:

C.rnG = 0.01

	Range (rAnG) r 4	Bereich (rAnG) r 3	Range (rAnG) r 2	Range (rAnG) r 1	Range (rAnG) r 0
Conductivity (cond)	0 - 5000 µS/cm	0 - 2000 µS/cm	0.0 - 200.0 µS/cm	0.00 – 20.00 µS/cm	0.000 – 2.000 µS/cm
Resistivity (rESi)	1 - 5000 Ohm·cm	0.00 -20.00 kOhm·cm	0 - 200 kOhm·cm	0 - 2000 kOhm·cm	
TDS (tdS)	0.00 – 20.00 g/l	0 - 2000 mg/l	0.0 - 200.0 mg/l	0.00 – 20.00 mg/l	0.000 – 2.000 mg/l

C.rnG = 0.1

	Range (rAnG) r 4	Range (rAnG) r 3	Range (rAnG) r 2	Range (rAnG) r 1	Range (rAnG) r 0
Conductivity (cond)	0.00 - 50.00 mS/cm	0.00 - 20.00 mS/cm	0 - 2000 µS/cm	0.0 - 200.0 µS/cm	0.00 – 20.00 µS/cm
Resistivity (rESi)	1.0 - 500.0 Ohm·cm	1 - 5000 Ohm·cm	0.00-20.00 kOhm·cm	0 - 200 kOhm·cm	0 - 2000 kOhm·cm
TDS (tdS)	0.0 – 200.0 g/l	0.00 - 20.00 g/l	0 - 2000 mg/l	0.0 - 200.0 mg/l	0.00 – 20.00 mg/l

C.rnG = 1

	Range (rAnG) r 4	Range (rAnG) r 3	Range (rAnG) r 2	Range (rAnG) r 1	Range (rAnG) r 0
Conductivity (cond)	0 - 500 mS/cm	0.0 - 200.0 mS/cm	0.00 - 20.00 mS/cm	0 - 2000 µS/cm	0.0 - 200.0 µS/cm
Resistivity (rESi)	1.00 - 50.00 Ohm·cm	1.0 - 500.0 Ohm·cm	1 - 5000 Ohm·cm	0.00 - 20.00 kOhm·cm	0 - 200 kOhm·cm
TDS (tdS)	0 - 1000 g/l	0.0 - 200.0 g/l	0.00 - 20.00 g/l	0 - 2000 mg/l	0.0 - 200.0 mg/l
Salinity (SAL)	0.0 - 70.0				

C.rnG = 10

	Range (rAnG) r 4	Range (rAnG) r 3	Range (rAnG) r 2	Range (rAnG) r 1	Range (rAnG) r 0
Conductivity (cond)	0 - 5000 mS/cm	0 - 2000 mS/cm	0.0 - 200.0 mS/cm	0.00 - 20.00 mS/cm	0 - 2000 µS/cm
Resistivity (rESi)	0.10 - 5.000 Ohm·cm	1.00-50.00 Ohm·cm	1.0 - 500.0 Ohm·cm	1 - 5000 Ohm·cm	0.00-20.00 kOhm·cm
TDS (tdS)		0 - 2000 g/l	0.0 - 200.0 g/l	0.00 - 20.00 g/l	0 - 2000 mg/l

7.5 't.Cor': Setting of temperature compensation method (not at "Func SAL")

Possible inputs: off: no temperature compensation
nLF:non linear compensation for natural water according to EN 27888 (DIN 38404).
For measurings of ground and surface water, drinking water or pure water.
Attention: restricted temperature range: -5..105 °C
Lin: linear temp. compensation (for other aqueous solutions, factor has to be entered)

7.6 't.Lin': Setting of temperature coefficient (only for t.Cor = Lin)

Possible input: 0.300 .. 5.000 [%]
If it is only measured in a narrow conductivity range, the temperature compensation factor of this range can be determined.

$$LF\ reference\ temperature = \frac{LF\ current\ temperature}{1 + \frac{\text{"t.Lin"}}{100} * (current\ temperature - reference\ temperature)}$$

7.7 't.rEF': Setting of reference temperature (only for t.Cor = nLF or Lin)

Possible input: 20 °C or 25 °C

7.8 'C.tdS': Setting of TDS-factor

Calculation factor for TDS (Total Dissolved Solids)-measurements, possible input: 0.40 .. 1.00.
The calculation factor depends on the composition of the medium and has to be determined for each type.

7.9 't.InP' t-Input: Temperatureinput

ntc: NTC 10k / Pt: Pt1000

7.10 'dA.Lo': Display at zero output (output scaling)

Enter the display value at which the output should have 4 mA (or 0 V).
The value range is depending on the selected measuring function (Func) and range (rAnG).

7.11 'dA.Hi': Display at maximum output (output scaling)

Enter the value at which the output should have 20 mA (or 1 / 10 V).
The value range is depending on the selected measuring function (Func) and range (rAnG).

7.12 'Unit' with Temp-arrow: Temperature unit

Temperature unit: All referring settings and displays are done in this unit.
Choice between °C and °F (ex works: °C)

7.13 'OFFS' with Temp-arrow: Offset of temperature measuring

The offset of the measuring will be shifted by this value, the input is in °C. Calculation: see below.
Max. input range: -5.0...5.0 °C or 'oFF' (= 0.0°) (factory setting = off)

7.14 'SCAL' with Temp-arrow: Scale correction of temperature measuring

The scale of the measuring is changed by this value. Calculation: see below.
Max. input range: -5.00...5.00 or 'oFF' (= 0.00) (factory setting = off)
The adjusting of the temperature by means of offset and scale is intended to be used to compensate deviations of the measuring. It is recommended to keep the scale correction deactivated ("oFF"). The display value is given by following formula:

Temperature display = measured value - offset

With a scale correction (just for calibration laboratories, etc) the formula changes:

Temperature display = (meas. value - offset) * (1 + scale correction/100)

After pressing key 1 again, the instrument will restart (display 8888).

8 Disposal instructions

This device must not be disposed as 'residual waste'.
To dispose this device, please send it directly to us (adequately stamped).
We will dispose it appropriately and environmentally friendly.

9 Calibration Services

Factory calibration certificate - DKD certificate - official certifications:
If the measuring instrument is supposed to receive a factory calibration certificate, it has to be sent to the manufacturer. Just the manufacturer can check the factory settings and correct them if necessary.

10 Specification

Measuring range 1 (one of the following can be configured):

C.rnG = 0.01	Range (rAnG) r 4	Bereich (rAnG) r 3	Range (rAnG) r 2	Range (rAnG) r 1	Range (rAnG) r 0
Conductivity (cond)	0 - 5000 µS/cm	0 - 2000 µS/cm	0.0 - 200.0 µS/cm	0.00 – 20.00 µS/cm	0.000 – 2.000 µS/cm
Resistivity (rESi)	1 - 5000 Ohm·cm	0.00 -20.00 kOhm·cm	0 - 200 kOhm·cm	0 - 2000 kOhm·cm	
TDS (tdS)	0.00 – 20.00 g/l	0 - 2000 mg/l	0.0 - 200.0 mg/l	0.00 – 20.00 mg/l	0.000 – 2.000 mg/l

C.rnG = 0.1	Range (rAnG) r 4	Range (rAnG) r 3	Range (rAnG) r 2	Range (rAnG) r 1	Range (rAnG) r 0
Conductivity (cond)	0.00 - 50.00 mS/cm	0.00 - 20.00 mS/cm	0 - 2000 µS/cm	0.0 - 200.0 µS/cm	0.00 – 20.00 µS/cm
Resistivity (rESi)	1.0 - 500.0 Ohm·cm	1 - 5000 Ohm·cm	0.00-20.00 kOhm·cm	0 - 200 kOhm·cm	0 - 2000 kOhm·cm
TDS (tdS)	0.0 – 200.0 g/l	0.00 - 20.00 g/l	0 - 2000 mg/l	0.0 - 200.0 mg/l	0.00 – 20.00 mg/l

C.rnG = 1	Range (rAnG) r 4	Range (rAnG) r 3	Range (rAnG) r 2	Range (rAnG) r 1	Range (rAnG) r 0
Conductivity (cond)	0 - 500 mS/cm	0.0 - 200.0 mS/cm	0.00 - 20.00 mS/cm	0 - 2000 µS/cm	0.0 - 200.0 µS/cm
Resistivity (rESi)	1.00 - 50.00 Ohm·cm	1.0 - 500.0 Ohm·cm	1 - 5000 Ohm·cm	0.00 - 20.00 kOhm·cm	0 - 200 kOhm·cm
TDS (tdS)	0 - 1000 g/l	0.0 - 200.0 g/l	0.00 - 20.00 g/l	0 - 2000 mg/l	0.0 - 200.0 mg/l
Salinity (SAL)	0.0 - 70.0				

C.rnG = 10	Range (rAnG) r 4	Range (rAnG) r 3	Range (rAnG) r 2	Range (rAnG) r 1	Range (rAnG) r 0
Conductivity (cond)	0 - 5000 mS/cm	0 - 2000 mS/cm	0.0 - 200.0 mS/cm	0.00 - 20.00 mS/cm	0 - 2000 µS/cm
Resistivity (rESi)	0.10 - 5.000 Ohm·cm	1.00-50.00 Ohm·cm	1.0 - 500.0 Ohm·cm	1 - 5000 Ohm·cm	0.00-20.00 kOhm·cm
TDS (tdS)		0 - 2000 g/l	0.0 - 200.0 g/l	0.00 - 20.00 g/l	0 - 2000 mg/l

Meas. range 2 Temperature (only display) -5.0...140.0 °C (resolution 0.1°C or 0.1°F, NTC10k or Pt1000)
Attention: Consider application range of measuring cell

Accuracy: (at nominal temperature = 25°C)

Measuring: conductivity: ±0,5% of measured value ±0,3 FS (-RW: ±1% of m. value ±0,3 FS
Depending on measuring cell eventually worse
temperature: ±0.1°C of measured value ±1 Digit

Add. output signal: ±0.2 % FS

Temp. compensation: non linear function, linear function (coefficient configurable) or none

Min-/Max-Value Memory: Min and max measured values are stored

Output signal: refer to type plate, freely scaleable

Scaling: By entering display values for 4mA (or 0V) and 20mA (or 1V/10V) output

Connection: 4 - 20 mA type: 2-wire – output signal electrically isolated
options AV01 (0-1 V), AV10 (0-10 V): 3-wire – output signal electrically isolated

Auxiliary energy (supply voltage)**:** Uv = 12 - 30 V DC (4-20 mA)
Uv = 12 - 30 V DC, max. 10mA (0-1V)
Uv = 18 - 30 V DC, max. 10 mA (0-10 V)
or refer to type plate

Rev. voltage protection: 50 V permanent

Perm. impedance (at 4-20mA): RA(Ohm) < ((Uv – 12 V) / 0.02 A)
Example: for Uv = 18V: RA < (18 V – 12 V) / 0.02 A => RA < 300 Ohm

Permissible load (at 0-...V): RL(Ohm) > 3000 Ohm

Adjusting: via keys. Conductivity by editing cell constant K (CELL)
Temperature by offset and scale.

Display: approx. 10 mm high, 4-digit LCD-display

Ambient conditions for electronics:

Nominal temperature: 25°C

Operating condition: -25 to 50°C, 0 to 95 %RH (non-condensing)

Storage temperature: -25 to 70°C

Housing: ABS (IP65)

Dimensions: 82 x 80 x 55 mm (without elbow-type plug and sensor connector)

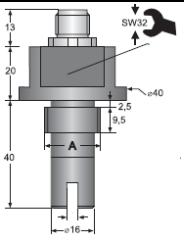
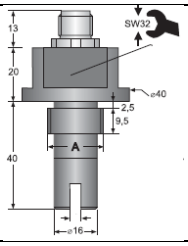
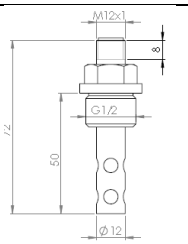
Mounting: With holes for wall mounting (in housing - accessible after cover has been removed).

Mounting distance: 50 x 70mm, max. shaft diameter of mounting screws is 4 mm.

Electrical connection: elbow-type plug conforming to DIN 43650 (IP65),
max. wire cross section: 1.5 mm², wire/cable diameter from 4.5 to 7 mm

EMC: In accordance with EN61326 +A1 +A2 (appendix A, class B), additional errors: < 1% FS.
When connecting long leads adequate measures against voltage surges have to be taken.
The electrode connections have to be protected sufficiently against ESD pulses, if the device is used in areas with risk of ESD.

11 Variants/ Measuring Cells and Accessories

Type/ Application	Best Value: Laboratory grade cells Standard cable length: 1 m	Option -PG (PG13.5 Thread), max. 6 bar @22°C Standard cable length: 1 m	Professional, Fieldmounting M12; G1/2A, max. 16 bar @22°C Standard cable length: 5 m
4 pole graphite cells, Especially for operation above 2000 µS/cm, “dirty applications”, Sea water, etc. 5 ranges 0.1µS/cm..500 mS/cm	 Ø12mm 4-pole cell **LFE-400** Graphite; C= 0.55, -5…+80 °C	 Ø12mm 4-pole cell **LFE-400-PG** Graphite; C= 0.55; -5…+80 °C	 Ø16mm 4-pole-cell **LFE-430** Graphite, C= 0.4; 0-60°C (wider on request)
2 pole graphite cells, Suitable for Sweat/ Drinking Water Recommended range up to 2000 µS/cm	 Ø12mm 2-pole cell **LFE-202** Graphite; C=1.0; -5 … +80	 Ø12mm 2-pole cell **LFE-202-PG** Graphite; C= 1.0; -5 … +80°C	 Ø16mm 2-pole cell **LFE-230** Graphite; C=0.9; 0-60°C (wider on request)
Purewater measuring cells Recommended range up to 200 µS/cm	 Ø12mm 2-pole cell **LFE-240-RW** Stainless steel/PEEK; C= 0.1 ; -5 … +80°C		 Ø12mm 2-pole cell **LFE-220** Stainless steel/PEEK; C= 0.1; -10…+100 °C
2pole glass/platinum cell, suitable for organic liquids (like alcohol, gasoline , diesel etc.) Recommended range up to 1000 µS/cm	 Ø12mm 2-pole cell **LFE-210** Glass/Platinum; C=1.0		-

Accessories			
	 **PG13.5** Plug on thread adapter for pressure less use ,for Ø12mm shafts	 **GWA1Z** G1A Thread adapter: from PG13,5 to G1”, plastic, max. 6bar	-
	GKL100: Conductivity control solution (100ml bottle, 1413 µS/cm) **GKL101**: Conductivity control solution (250ml bottle, 84 µS/cm) **GKL102**: Conductivity control solution (250ml bottle, 50 mS/cm)		