GHMGROUP
Specialists by Competence.

ANALYSIS
PRODUCT CATALOG

Analysis.

Product catalog 2019.

Editorial. Specialists by Competence.

„Clean water is one of the most important basic prerequisites for healthy life in our civilization. Furthermore the purity for water must also be ensured for industry. With mobile and stationary analysis devices, at GHM GROUP we monitor water quality directly from the source as well as in tanks and pipes."

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GHMGROUP
Specialists by Competence.

For informations look at our website:
www.ghm-group.de/branchen

Dear readers,

Growing population and growing industries – both are increasing dramatically the need of water in good quality. Transport is expensive and so it is needed at the place, where humans and animals want to drink, where fish want to survive in a healthy water quality or where the machines of a producing company need to be cooled, cleaned or fed.

Therefore, the importance of cleaning waste water, re-processing of industry water or desalination and purifying of drinking water is increasing.
These important processes require reliable analysis measurement and testing equipment, which is suitable for different ranges from ultrapure water to sea water, for different outdoor ambient and also stable enough for a rough handling.

Handling plays a special role for analysis measurement, because – different to the measurement of temperatures, pressures or flow rates – these instruments have to be regularly re-calibrated to deliver reliable values. This should be possible with a few steps, easy and quick.

GHM GROUP is offering a wide range of process instruments for pH, conductivity and oxygen measurement that meets these requirements. Our customers will find a complete offer of sensors, amplifiers, various fittings and cables to adapt to the special application – equipment ready to use!

Additionally to the process instruments, GHM GROUP is also offering a range of hand-held testing equipment for laboratory and calibration purpose. Choose from several lines from a simple testing device with long-life battery and waterproofed housing to the comfortable measuring sets with data logger and computer interface.

And last but not least, ask our specialists for their advice. We are here to support you!

Overview Analysis

Analysis

www.ghm-group.de

ph / ORB

GHMGROUP
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Product information

Analysis pH / ORP

Characteristics

System
- Transmitter
- Digital displays
- Combined electrodes
- Inline fittings

Process connection
- Combined electrodes with PG13.5 process thread
  pH-value -1..+15 pH
- ORP-value ±1500 mV

Pressure range
- Max. 10 bar

Media temperature
- -30..+135 °C

Applications

- **Food industry**
- **Chemical and Pharmaceutical industry**
- **Water and Sewage treatment**

Function
The measuring devices and the transducers operate with the standard pH and ORP measurement chains. The measuring devices are fitted with comprehensive monitoring functions of the measurement chains. For measuring tasks that are to be carried out over a great-er distance of 5 m to 100 m, the impedance converter pH40 is implemented.

Advantage
- Compact version
- Automatic and manual calibration
- Impedance monitoring of glass and reference electrode of the combined electrode
- Monitoring the calibration interval
- Can be used for many standard combined electrodes
- Long cable length possible by impedance transmitter
- Temperature compensation by RTD PT100/Pt1000 sensor

Device overview

Device	Input	Measuring range	Output	Process connection	Operating temperature	Process pressure	Page
Displays							
pH9648	PH, ORP, Pt100/1000	1..+15 pH, ±1500 mV -40..+160 °C	0/4..20 mA 0/2..10 V DC max. 4 alarm outputs	Terminals	-10..+55 °C	-	12
UNICON-pH	PH, ORP, Pt100/1000	-1..+15 pH, ±1500 mV -40..+160 °C	4..20 mA 2 alarm outputs	Terminals	-10..+55 °C	-	15
Transmitter							
pH40	pH	-1..+15 pH	-1..+15 pH oder 4..20 mA	8 pol. round connector	-10..+60 °C	-	17
GPHU	pH	0..14 pH	4..20 mA oder 0..10 V DC	BNC- or Cinch connector	0..50 °C	-	18
GRMU	ORP	± 2000 mV	4..20 mA oder 0..10 V DC	BNC- or Cinch connector	0..50 °C	-	19
Combined Electrodes pH							
AL70pH-00	-	2..13 pH	-	PG13,5	-5..+80 °C	3 bar	20
EGA142-VP	-	0..14 pH	-	PG13,5	-5..+80 °C	6 bar	20
EGAT173-VP	-	0..14 pH	-	PG13,5	-5..+80 °C	6 bar	20
SL81-120pHT-VP	-	0..14 pH	-	PG13,5	0..135 °C	10 bar	20
APS-X1Q2K1A-00	-	1..12 pH	-	PG13,5	-15..+80 °C	6 bar	20
L9080	-	0..12 pH	-	PG13,5	-30..+80°C	6 bar	20
Combined electrodes ORP							
AL79Pt-00	-	2..13 pH	-	PG13,5	-5..+80 °C	3 bar	20
Pt8281HD-00	-	2..13 pH	-	PG13,5	-5..+100 °C	10 bar	20
Fittingsn							
EA1200 / EA2200	-	-	-	PVC-U Systems	0..60 °C	16 bar / 22 °C	22
EA1630 / EA2630	-	-	-	G ¾, G 1	-10..+120 °C	16 bar	23
EA1730 / EA2730	-	-	-	Milk pipe DIN 11887	-10..+120°C	16 bar	24
EA2650	-	-	-	G ½, G ¾, G 1	Depending to the sensor	16 bar	25
DFG	-	-	-	PG13,5, G ¼, G1	140 °C	16 bar	26
Accessories							27

Mistakes reserved, technical specifications subject to change without notice.

pH and ORP Panelmeter pH9648

- **LED-Display 14,2 mm red**
- **Measuring range programmable -1..+15 pH / ±1500 mV**
- **Temperature compensation via P100/Pt1000 sensor**
- **Analog output 0/4..20 mA or 0/2..10 V for pH/ORP**
- **Max. 4 alarm outputs relay or transistor**

Characteristics

The pH and ORP Panelmeter pH9648 is suitable for pH and ORP measurement in food technology, chemistry within pharmaceutical and sewage-water technology. The pH9648 operates with all common pH- and ORP electrodes. It is recommended to connect the Impedance-Converter pH40 for cable length > 5 m.

Technical data

Power supply

Supply voltage	: 230 V AC ±10 %; 115 V AC ±10 %; 24 V AC ±10 % or 24 V DC ±15 %
Power consumption	: max. 3.5 VA, with analog output 5 VA
Operating temperature	: -10..+55 °C
CE-conformity	: EN 61326-1:2013 EN 60664-1:2007

Input
pH/ORP

Measuring range	: -1.00..+15.00 pH or -1500..+1500 mV
R_i	: > 10^{12} Ω
Input current	: < 10^{-12} A
Accuracy	: 0.2 % measuring value, ±2 Digit
pH setup	: electrode zero point 4.00..10.00 pH slope 40.0..70.0 mV/pH
ORP setup	: ± 200 mV
Calibration mode	: - **1- or 2-point-calibration** Buffer selection possible: -Schott -WTW -Ingold (Mettler Toledo) -Puffer acc. to DIN 19266 -or manual buffer input - **Data** entering for zero point and slope - **ORP** offset

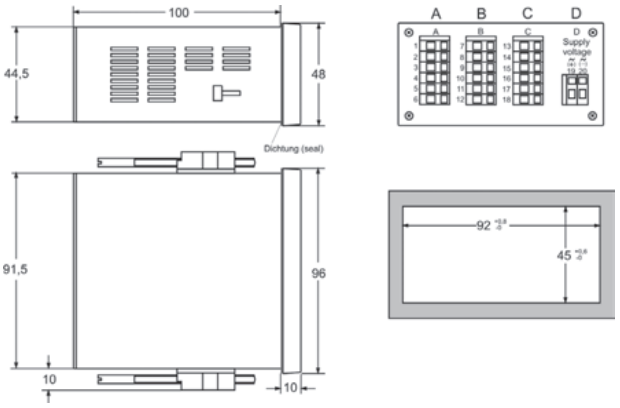
Temperature

Sensor	: RTD, Pt100 or Pt1000, (2- or 3-wire connection)
Unit	: programmable °C, °F
Measuring range	: -40.0..+160.0 °C (-40.0..+320.0 °F)
Accuracy	: ± 0.1 %, ±1Digit
Transmitter supply	: 24 V DC, R_i approx. 150 Ω, max. 50 mA (25 mA with 4 relay outputs)
Display	: LED red, 14.2 mm
Parameter display	: LED 2-digit red, 7 mm (Parameter - and output indicator)

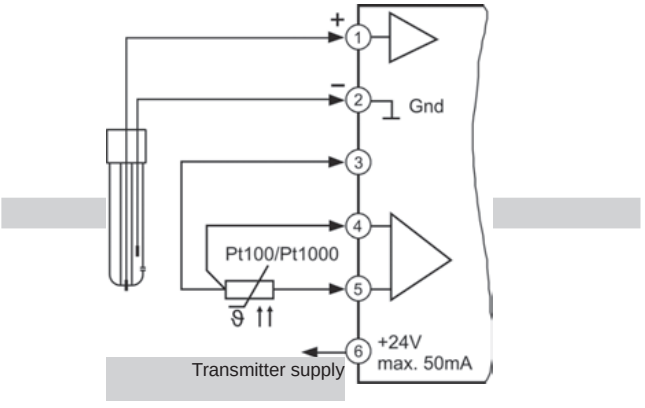
Output

Relay SPDT	: < 250 V AC < 250 VA < 2 A, < 300 V DC <50 W < 2 A
Transistor	: < 35 V AC/DC, max.100 mA, short-circuit-proof
Analog output *active*	: 0/4..20 mA burden ≤500 Ω; 0/2..10 V burden > 500 Ω, isolated automatic output changing (burden dependent)
Analog output *passive*	: 4..20 mA, ext. burden = RA[Ω]≤ (U_B-5 V) ÷ 0,02 A ; supply voltage 5..30 V DC
Accuracy	: 0.1 %
Panel case	: DIN 96x48 mm, material PA6-GF; UL94V-0
Dimensions	: Front 96x48 mm, mounting depth 100 mm,
Weight	: max. 390 g
Connection	: clamp terminals, 2.5 mm² single wire, 1.5 mm² flex wire, AWG14
Protection class	: Front IP65, terminals IP20, finger save acc. to BGV A3

Dimensions



Connection diagram input

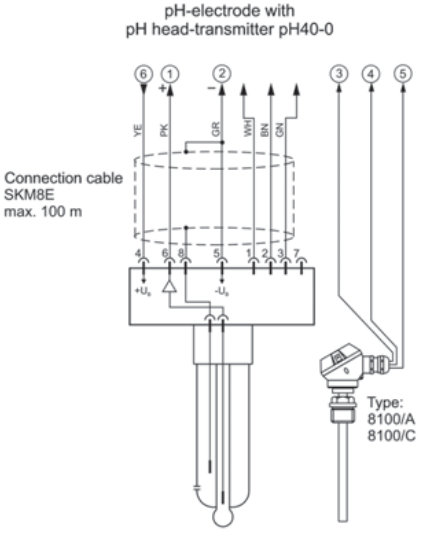


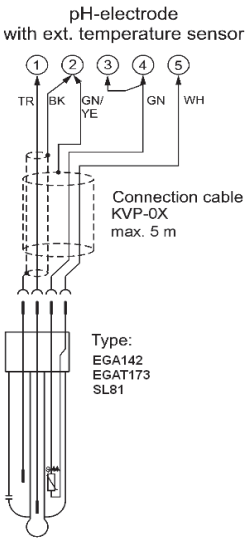
Ordering code

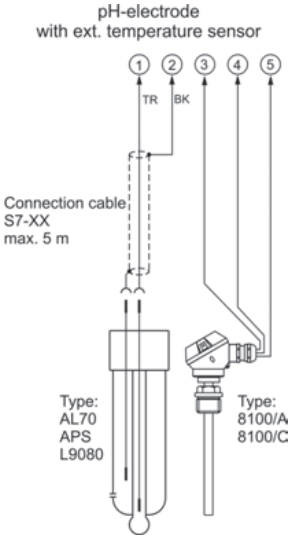
pH9648 - 1. [ ] - 2. [ ] - 3. [ ] - 4. [ ] - 5. [ ] - 6. [ ] - 7. [ ]

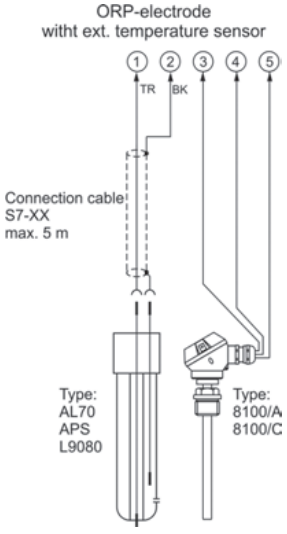
1.	**Terminal strip A**		
	13	input pH / ORP electrode, temperature compensation via Pt100 / Pt1000	
2.	**Terminal strip B**		
	00	not installed	
	2R	2 relay outputs	
	2T	2 electronic outputs	
3.	**Terminal strip C**		
	00	not installed	
	2R	2 relay outputs	
	2T	2 electronic outputs	
	AO	analog output 0/4..20 mA, 0/2..10 V DC	
	2A	2 analog outputs 4..20 mA passive	
4.	**Terminal strip B supply voltage**		
	0	230 V AC	±10 % 50-60Hz
	1	115 V AC	±10 % 50-60Hz
	4	24 V AC	±10 % 50-60Hz
	5	24 V DC	±15 %
5.	**Options**		
	00	without option	
6.	**Unit** appears in the unit field		
7.	**Additional text** above the display (3x90 mm HxW)		

Connection examples pH9648







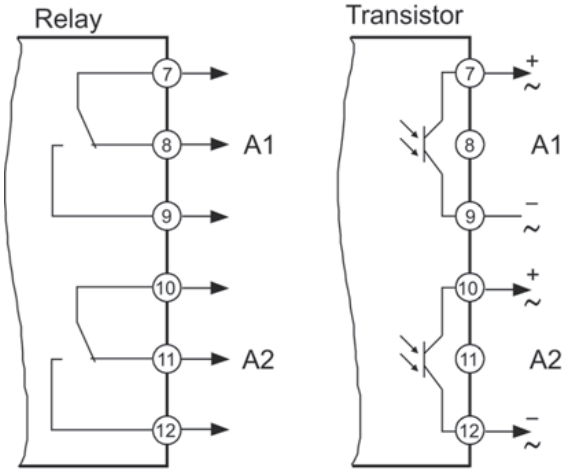


Connection Diagrams X9648, Terminals B-D

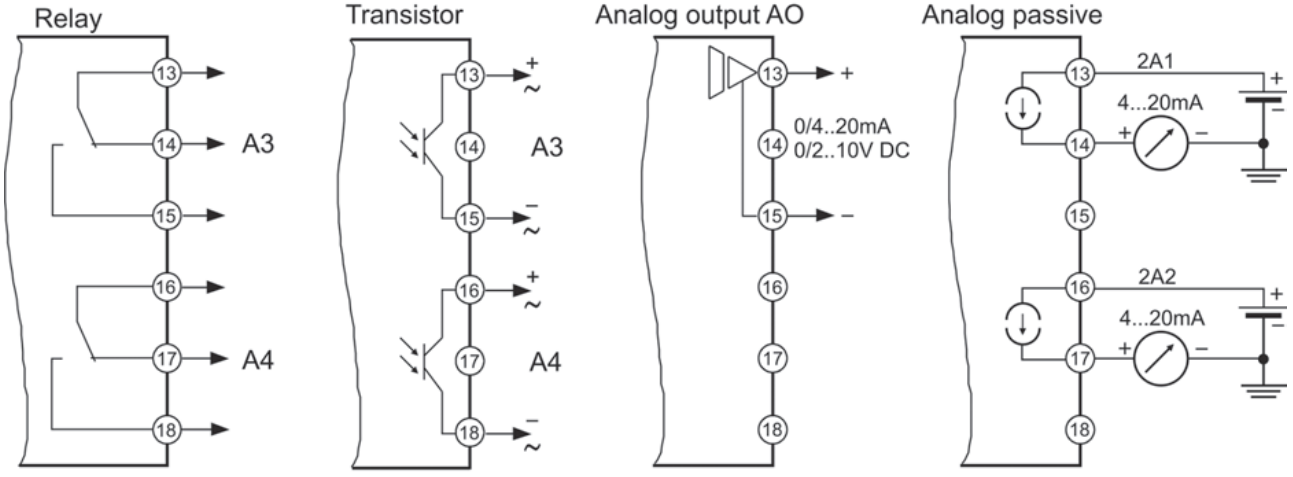
Terminal strips B, C, D

Terminal strip A belongs to each article.

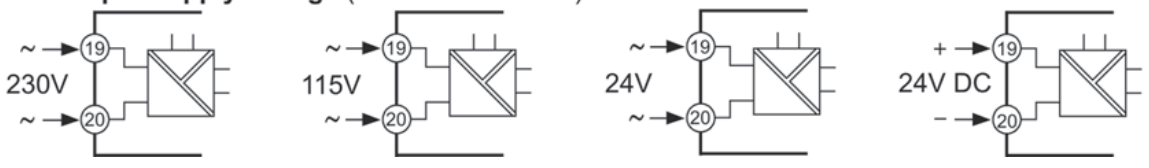
Ternminal strip B (varies with versions)
2 alarm outputs



Terminal strip C (varies with versions)
2 alarm outputs



Terminal strip D supply voltage (varies with version)



pH and ORP Converter UNICON®-pH

- **Field or head mounting**
- **Measuring range programmable -1..+15 pH / ±1500 mV**
- **Temperature compensation via P100/Pt1000 sensor**
- **Analog output 4..20 mA for pH/ORP and temperature**
- **2 alarm outputs, transistor**

Characteristics

The pH and ORP converter UNICON-pH is suitable for pH and ORP measurement in food technology, chemistry within pharmaceutical and sewage-water technology. The converter works with all common pH- and ORP electrodes.

Technical data

Power supply

Supply voltage	:	14..30 V DC, 2-wire
Operating temperature	:	0..55 °C
CE- conformity	:	EN 61326-1:2013

Input pH/ORP

Output signal	:	4..20 mA
Burden	:	RA[Ω]≤ (U_B-14 V) ÷ 0,02 A
Measuring range	:	-1.00..+15.00 pH or -1500..+1500 mV
R_i	:	>10^{12} Ω
Input current	:	<10^{-12} A
Accuracy	:	0.2 % measuring value, ±2 Digit
Electrode zero point	:	7.00 pH
Slope	:	30..80 mV/pH
ORP setup	:	± 200 mV
Calibration mode	:	- **1- or 2-point-calibration** buffer selection possible : -Schott - WTW -Ingold (Mettler Toledo) -Buffer acc. to DIN 19266 - or manual buffer input - **Data** entering for zero point and slope - **ORP** setup

Temperature

Output signal	:	4..20 mA
Burden	:	RA[Ω]≤ (U_B-14 V) ÷ 0,02 A
Temperature sensor	:	Pt100 or Pt1000, (2-wire)
Unit	:	programmable °C, °F
Measuring range	:	-40.0..+160.0 °C (-40.0..+320.0 °F)
Accuracy	:	± 0.1 %, ±1Digit
Glass impedance	:	0..1 GΩ (temperature compensated)
Detection range	:	0.001..2 GΩ (non compensated)
Accuracy	:	± 20 %
Reference imped.	:	0..100 kΩ (non compensated)
Monitoring of the calibration interval	:	1..1000 days
Display	:	LCD-dot matrix, 3.8 mm characters 2 lines 16 characters each

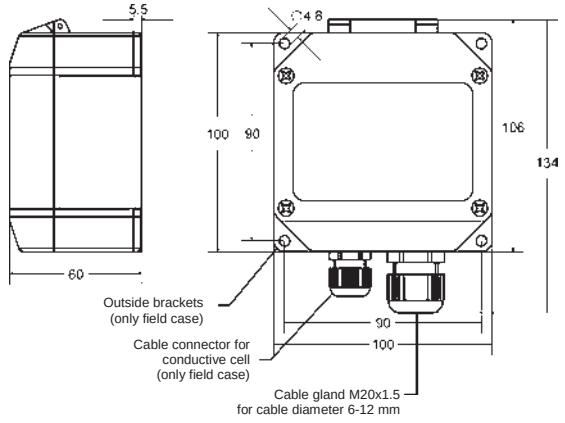
Alarm outputs

Transistor	:	14..30 V DC<, max.60 mA, with short-circuit-proof
Voltage drop	:	< 2 V

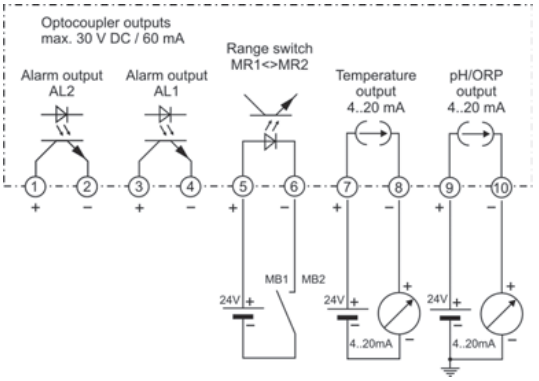
Range switch

Ri	:	>10 kΩ
MB1 active	:	U = 0..3 V DC
MB2 active	:	U = 12..30 V DC
Case	:	Head-field case
Material	:	Polyamide fiber glass PA6-GF/GK 15/15, front foil polyester
Dimensions	:	100 x 100 x 60 mm (WxHxD)
Weight	:	max. 360 g
Connection	:	screw terminals pressure plate, 2.5 mm² flexible, 4 mm² single wire connection cable
Protection class	:	IP65, terminals IP20 acc. to BGV A3

Dimensions



Connection diagram



For supplying the converter use terminals 9 and 10 as shown. If the converter is used form monitoring only, terminals 9 and 10 must be connected directly to the supply voltage.

Continue next page

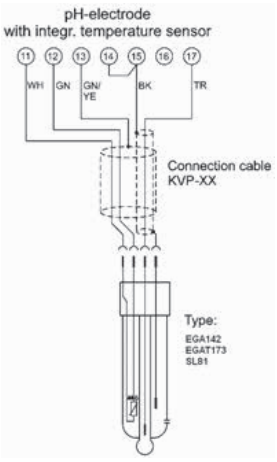
Ordering code

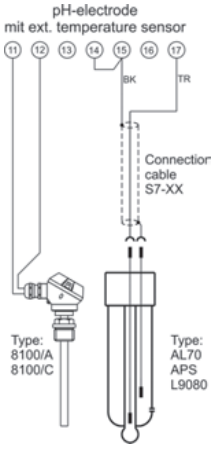
UNICON-pH - 1. [ ] - 2. [ ] - 3. [ ] - 4. [ ] - 5. [ ]

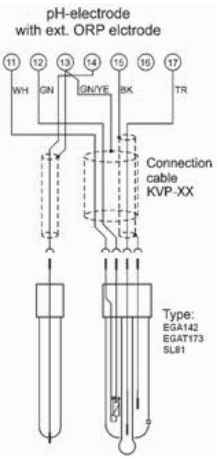
1.	**Model**	
	1	output 4..20 mA for pH/ORP, 2 electronic alarm outputs
	2	as 1, but 2nd measuring range for pH/ORP, output 4..20 mA for temperature, monitoring of the glass impedance, reference electrode and the calibration interval
2.	**Mounting**	
	01	head mounting, on the electrode
	02	field mounting, separate connection cable see page Fehler: Referenz nicht gefunden
3.	**Reference system**	
	3	all systems with electrode zero point pH7.00 e.g. silver/silver chloride
4.	**Temperature compensation**	
	13	Pt100/Pt1000 sensor via software selectable
5.	**Options**	
	00	without option

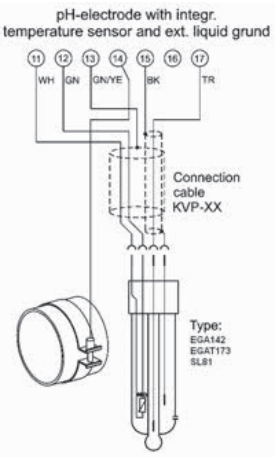
Accessories see page Fehler: Referenz nicht gefunden

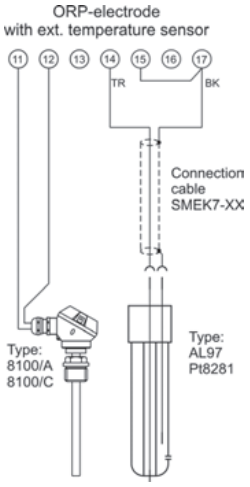
Connection diagram input UNICON-pH











pH Head-Transmitter pH40

pH40

pH-electrode

- **Measuring range -1..+15 pH**
- **2-wire transmitter 4..20 mA**
- **Error free measurement up to 100 m**

Characteristics

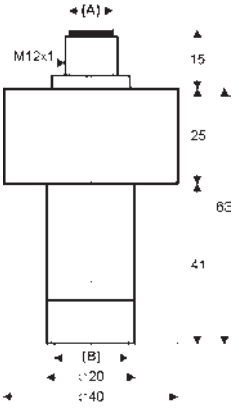
The head transmitter is designed for direct mounting on the pH-electrode with input lock nut connector B.
The output signal is located at output connector A.

Technical data

Power supply

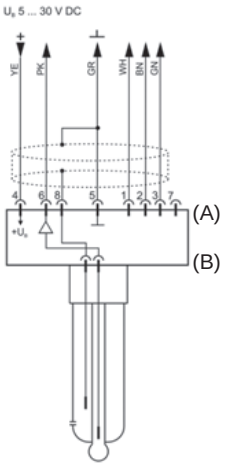
Supply voltage	: 5..30 V DC output 0
	: 10..30 V DC output 2
Operating temperature	: -10..+60 °C
Input pH/ORP	
Measuring range	: -1..+15 pH / ± 1500 mV
Input resistance	: >10^{12} Ω
Output	
Type 0	: 1:1 transfer of the pH-signal with low output impedance, error free measurement up to 100 m
Type 2	: 4..20 mA, 2-wire technology in the range -1..+15 pH depending at 25 °C, zero-point pH 7.0, slope 59.2 mV/pH, not compensated
Accuracy	: type 0 = 0.01 % type 2 = 0.2 %
Case	
Material	: PVC-U
Weight	: approx. 100 g
Process connection	: S7 or SMEK plug
Electrical connection	: 8 pole round socket, M12x1
Material	: brass plated
Protection class	: IP65

Dimensions

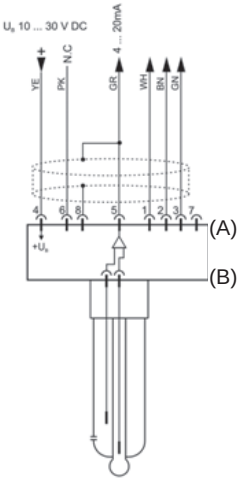


Connection diagram

Type 0



Type 2



Ordering code

pH40 - 1. - 2. - 3.

1.	**Output**		
	0	-1..+15 pH = 1:1 signal transfer	
	2	4..20 mA = -1..+15 pH	
2.	**Input plug**	**B** process connection for pH-electrode	
	2	S7 socket	
3.	**Options**		
	00	without option	
	Accessories connection cable with 8 pole cable socket brass plated and pigtail, PU-cable		
	SKM8E-02	2 m	IP67
	SKM8E-05	5 m	IP67
	SKM8E-10	10 m	IP67
	SKM8E-25	25 m	IP67
		other length on request	
	8 pole cable socket for self assembling		

pH Measuring Transducer GPHU

- **With local display and galvanic isolation**
- **Automatic and manual temperature compensation**
- **2-point calibration**
- **4 to 20 mA version with 2 wires: Power supply via current loop (optionally with 0-10V 3-wire)**

Features

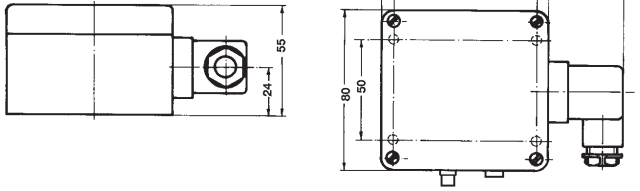
The GPHU is used in control, measurement and monitoring tasks, e.g. in environmental and medical technology.

Any standard pH electrode with a BNC or Cinch socket can be used for the GPHU. In addition, the GPHU has a Pt1000 temperature input for connection of electrodes with integrated temperature sensors or a separate Pt1000 sensor via two banana sockets. The temperature compensation can also be adjusted manually with buttons.

Technical data

Measuring range	:	0.00..14.00 pH
Accuracy	:	0.02 pH ±1 digit (at nominal temperature 25 °C)
Output signal	:	4..20 mA, (2-wire) 0..10 V (3-wire)
Galvanic Isolation	:	Galvanically isolated input
Auxiliary energy	:	12..30 V DC at 4..20 mA 18..30 V DC at 0..10 V
Permissible resistance	:	$R_A[\Omega] = (U_V [V] – 12V) / 0.02 A$
Permissible load	:	$R_L > 3000 \Omega$
Electrode	:	all standard pH electrodes are suitable No pH electrodes included
Input resistance	:	$10^{12} \Omega$
Electrode connection socket	:	BNC / Cinch
Temp. compensation	:	-30..+150 °C, manually adjustable with buttons or automatically by means of external Pt1000 sensor
Temperature input	:	2x banana socket Ø 4 mm, for Pt1000 sensor
Display	:	10 mm height, 4-digit display
Electrical connection	:	Angle connector according to EN 175301-803/A,
Working temperature	:	0..50 °C
Housing	:	ABS
Ingress protection	:	IP65 (excluding electrode and temperature connection sockets)

Dimension



Ordering code

GPHU14MP - 1. ☐ - 2. ☐ - 3. ☐

1.	**Electrode connection socket**	
	BNC	BNC socket
	CINCH	Cinch jack
2.	**Output signal**	
	A1	4..20 mA
	V2	0..10 V
3.	**Option**	
	00	No options
	MB	Limited measuring range (please specify range separately, e.g.: 2.00..10.00 pH)

Order example:
GPHU14MP-BNC-A1-00

Accessories

GTF 2000 WD-B

Waterproof Pt1000 temperature sensor with 2 banana plugs Ø 4 mm, measuring range: -20..+105 °C

Accessory electrodes

GE 126-BNC-L05	pH electrode, extremely low maintenance/calibration, adapter 1/2" NPT, Ø26.4 mm, 5 m cable
GE 108-BNC-L02	pH electrode, pressure-resistant to 6 bar, adapter PG13.5, low-maintenance, gel-filled, 2 m cable
GE 117-BNC-L02	pH electrode, pressure-resistant to 6 bar, adapter PG13.5, low-maintenance, gel-filled, with integrated Pt 1000 temperature sensor, 2 m cable
GE 173-BNC-L01	pH electrode, pressure-resistant to 6 bar, adapter PG13.5, alkaline-resistant, ground diaphragm, 1 m cable (optionally with S7 connection)
GE 171-S7	pH electrode, pressure-resistant to 6 bar, adapter PG13.5, S7 connection, sterilisation / autoclave-compatible
GE 117	pH electrode with integrated Pt1000 sensor 1x BNC plug and 1x banana plug Ø 4 mm and PG 13.5 thread, pressure-resistant to 6 bar
GE 100 BNC	Standard electrode, BNC plug (for technical data, see GE 100)

Electrode adapter accessories

GEAK-2S7-BNC	Adapter cable S7-BNC, 2 m
GEAK-5S7-BNC	Adapter cable S7-BNC, 5 m
GWA1Z	Thread adapter from PG13.5 to G1", plastic
PG 13.5	Plug-in thread adapter for pressureless insert, with PG 13.5 male thread (electrode plug-in without adapter)

Consumable accessories

Ready-to-use buffer solutions and working sets, see extra data sheet

Redox Measuring Transducer GRMU

- **Galvanic isolation**
- **Optional local display**
- **4 to 20 mA version with 2 wires: Power supply via current loop (optionally with 0-10V 3-wire)**

Features

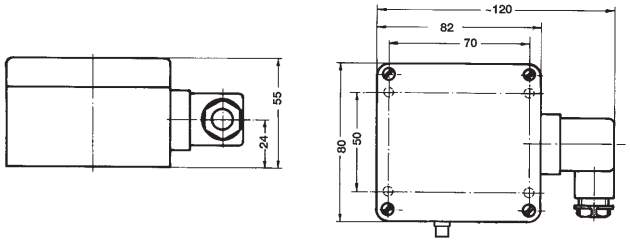
The GRMU is used in control, measurement and monitoring tasks, e.g. in environmental and medical technology.

Any standard Redox electrode with a BNC or Cinch socket can be used for the GRMU.

Technical data

Measuring range	:	±2000 mV
Accuracy	:	0.2 % FS
Output signal	:	4..20 mA, (2-wire) 0..10 V (3-wire)
Galvanic Isolation	:	Galvanically isolated input
Auxiliary energy	:	12..30 V DC at 4..20 mA 18..30 V DC at 0..10 V
Permissible resistance	:	R_A [Ω] = (U_V [V] - 12V) / 0.02 A
Permissible load	:	R_L > 3000 Ω
Electrode	:	all stand. Redox electrodes are suitable no Redox electrodes included
Input resistance	:	10^{12} Ω
Electrode connection socket	:	BNC / Cinch
Display	:	10 mm height, 4-digit display
Electrical connection	:	Angle connector EN 175301-803 / A
Housing	:	ABS
Working temperature	:	0 – 50 °C
Ingress protection	:	IP65 (excluding electrode connection sockets)

Dimension



Ordering code

GRMU2000MP - 1. ☐ - 2. ☐ - 3. ☐

1.	**Electrode connection socket**	
	BNC	BNC socket
	CINCH	Cinch jack
2.	**Output signal**	
	A1	4..20 mA
	V2	0..10 V
3.	**Option**	
	00	No options
	VO	Local display
	MB	Limited measuring range (please specify range separately)

Order example:
GRMU2000MP-CINCH-A1-VO

Accessories

GR 105-BNC art. no. 607798

Redox electrode with BNC plug
Measuring range ±2000 mV
Temperature range 0 ... 80 °C
Medium conductivity > 25 µS/cm, not pressure-resistant, 1m cable

GR 175-BNC

Redox electrode with BNC plug, thread PG 13.5
Measuring range ±2000 mV, temperature range 0 ... 80 °C
Medium conductivity > 25 µS/cm, pressure-resistant to 6 bar, 1m cable
(also available in S7 version)

GWA1Z art. no. 602914

Thread adapter from PG13.5 to G1", plastic

PG 13.5 art. no. 603205

Plug-in thread adapter for pressureless insert, for electrode Ø12 mm for connection without adapter

GRP 100 art. no. 601424

Redox testing solution (220 mV at 25°C), 100ml

Standard pH and Redox Single Rod Electrodes

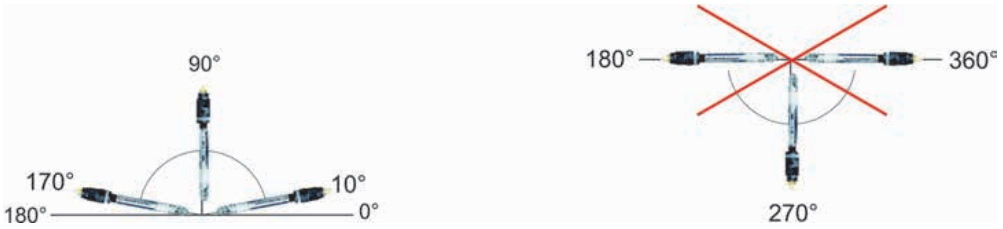
pH single rod electrodes

Technical data

Type	AL70pH-00	EGA142-VP	EGAT173-VP-X	SL81-120pHT-VP	APS-X1Q2K1A-00	L9080
Range of application	2 - 13 pH	0 - 14 pH	0 - 14 pH	0 - 14 pH	1 - 12 pH	0 - 12 pH
Area of application	water	water, swimming pool, sewer	heavily contaminated waste water electroplating	foods (sterilisable) water, waste water	refrigeration	purest water boiler feed water
Working temperature	-5..+80 °C	-5..+80 °C	-5..+80 °C	0..135 °C	-15..+80 °C	-30..+80 °C
Max. pressure	3 bar	6 bar	6 bar	10 bar	6 bar	6 bar
Installation location	120 mm	120 mm	120 mm	120 mm	120 mm	120 mm
Process connection	PG13.5	PG13.5	PG13.5	PG13.5	PG13.5	PG13.5
Temperature sensor	-	Pt1000	Pt1000	Pt1000	-	-
Electrical connection*	S7	VP	VP	VP	S7	S7
Reference system	Silver/silver chloride (Ag/AGCl) electrode zero point pH7.00					
Reference electrodes Electrolyte	Gel	Gel	Gel	Gel	Gel	Liquid
Diaphragm	ceramic	ceramic	cut	ceramic	PTFE	ceramic
Min. media conductivity	50 µS/cm	100 µS/cm	50 µS/cm	50 µS/cm	50 µS/cm	< 1 µS/cm
Installation location	10..170°	30..150°	30..150°	10..170°	10..170°	10..170°

Patch cords, refer to page Fehler: Referenz nicht gefunden

Installation location



Redox Redox Single Rod Electrodes

Technical data

Type	AL79Pt-00	Pt8281HD-00
Range of application	2 - 13 pH	2 - 13 pH
Area of application	Environmental technology, disinfection	Environmental technology, disinfection
Working temperature	-5..+80 °C	-5..+100 °C
Max. pressure	3 bar	10 bar
Installation location	120 mm	120 mm
Process connection	PG13.5	PG13.5
Temperature sensor	-	-
Electrical connection*	S7	S7
Reference system	Silver/silver chloride (Ag/AGCl) electrode zero point pH7.00	
Reference electrodes Electrolyte	Polymer (Referid)	Polymer (Referid)
Diaphragm	ceramic	KPG
Min. media conductivity	50 µS/cm	50 µS/cm
Installation location (see previous page)	10..170°	10..170°

Patch cords, refer to page Fehler: Referenz nicht gefunden

pH and Redox Single Rod Electrodes Instructions for Use

1.) pH and Redox Single Rod Electrodes are delivered with a protective cap filled with a 3 mole KCL solution. The electrodes can be stored for up to 1 year in this state. Therefore, the protective cap should only be removed immediately before installation and use.
2.) The shaft of the single rod electrodes is made of glass and breaks easily. It must be ensured that the tips do not strike against anything during installation.
3.) Since the characteristics of single rod electrodes deviate from the ideal line, they must be calibrated at the time of commissioning and on a regular basis thereafter in order to provide exact measurements.
4.) The tip of single rod electrodes must not dry out; otherwise they are unusable. The active area of the electrode is immersed in a 3 mole KCL storage solution for approximately 24 hours for regeneration. Then calibration is necessary, because the zero point and transadmittance may have shifted.
5.) The electrodes must be cleaned from time to time when used in dirty media and media containing proteins. We offer a special cleaning solution for this purpose. The electrodes must be rinsed off with water after cleaning.

Important!

pH and Redox electrodes have a limited service life. This depends on the usage conditions, such as medium, pressure, and temperature, and can vary from a few weeks to several years. There are special cases in which a service life of only a few days can be achieved due to extreme usage conditions. The characteristic and adjusting time of the electrode shaft due to ageing. The resulting error due to recalibration in combination with downstream electronics (e.g. UNICON-pH converter) can be compensated up to a certain degree of ageing.

pH and Redox single rod electrodes are consumables and not subject to the normal guarantee.
No returns or exchanges are accepted.

Our offer also includes technical advice on the selection of the optimal pH and Redox single rod electrodes, free of charge. In addition to the standard electrodes indicated in the list, we also provide versions specially adapted to the respective usage conditions.

In-line Fitting EA1200 / EA2200

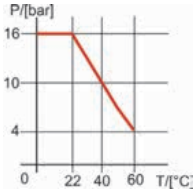
Characteristics

For flow fittings with outer pipe diameter from 20mm up to 63 mm.
This In-line fitting has been designed for electrochemical cells like pH/ORP-, conductivity-cells with PG13.5 process connection. It protects the sensor and ensures a proper measurement.
The fitting fits for operating at the flow-fitting DFA32. The application field includes swimming pools technology and drinking water measurement.

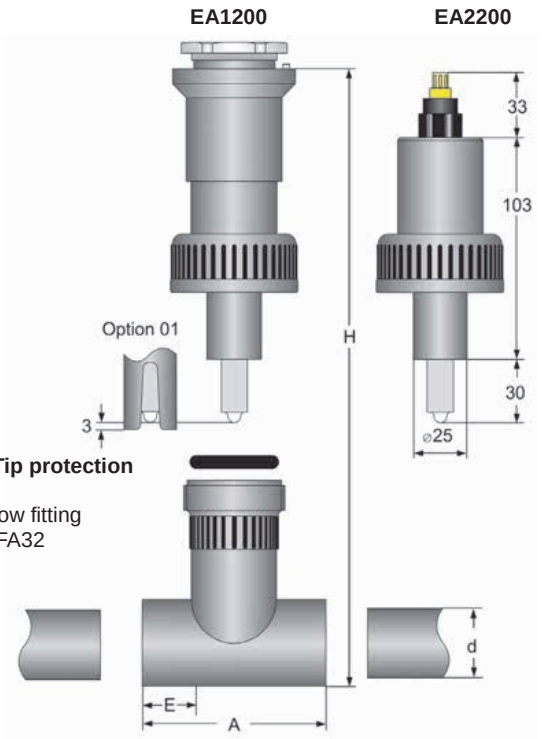
Technical data

Sensor connection	:	PG13.5
Process connection	:	screw cap for adhesive coupling
Process material	:	PVC-U acc. to DIN 8061 and 8062
Screw cap	:	PVC-U
Operating temperature	:	0..60 °C
Process pressure	:	max. 16 bar at 22 °C

Pressure-temperature table PVC-U



Dimensions



Dimensions [mm]

d	H	A	E
20	180	78	22
25	180	78	22
32	180	78	22
40	192	98	26
50	202	118	31
63	216	144	38

Ordering code

	1.		2.		3.
EA		-		-	

1.	**Model**	
	1200	head mounting at UNICON-pH, incl. cap nut
	2200	field mounting, incl. cap nut
2.	**Sensor type**	
	0	standard pH / ORP combined-electrodes
3.	**Options**	
	00	without option
	01	with integrated tip protection (only for pH and ORP combined-electrodes)
	Accessories	flow fitting DFA32 material PVC-U
	DFA32-20-1-1	outer pipe diameter d=20 mm
	DFA32-25-1-1	outer pipe diameter d=25 mm
	DFA32-32-1-1	outer pipe diameter d=32 mm
	DFA32-40-1-1	outer pipe diameter d=40 mm
	DFA32-50-1-1	outer pipe diameter d=50 mm
	DFA32-63-1-1	outer pipe diameter d=63 mm

In-line Fitting EA1630 / EA2630

Characteristics

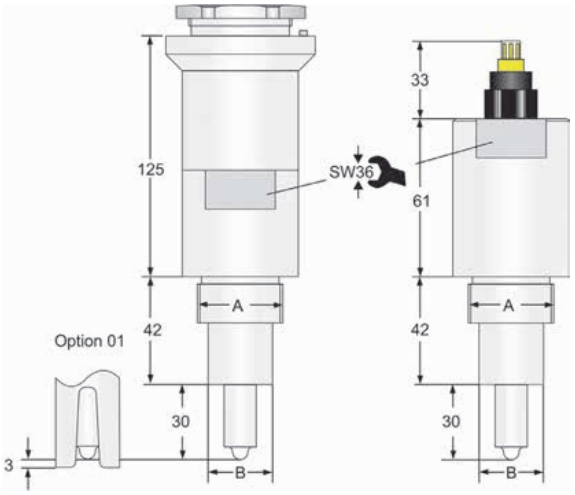
Compact fitting with Whitworth process connection acc. to DIN ISO 228.
This In-line fitting has been designed for electrochemical cells like pH/ORP-, conductivity-cells with PG13.5 process connection. It protects the sensor and ensures a proper measurement.
The fitting is conceived for the application in the chemical industry.

Technical data

Process connection : pipe thread acc. to DIN ISO 228
Process material : PVDF
Operating temperature : -10..+120 °C
steam sterilization 140 °C < 1 h
Process pressure : max. 16 bar

Dimensions

EA1630 EA2630



Tip protection

Process connection

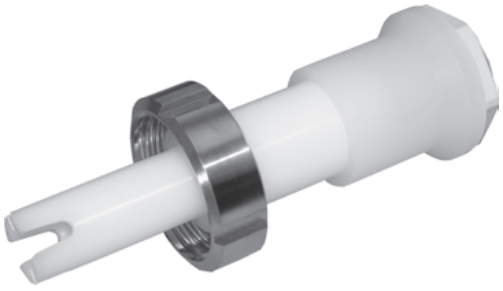
A	B
G ¾ A	Ø23.5
G 1 A	Ø25

Ordering code

EA 1. [ ] - 2. [ ] - 3. [ ] - 4. [ ]

1.	**Model**	
	1630	head mounting at UNICON-pH
	2630	field mounting
2.	**Process connection (A)**	
	G ¾ A	
	G 1 A	
3.	**Sensor type**	
	0	standard pH / ORP combined-electrodes
4.	**Options**	
	00	without option
	01	with integrated tip protection (only for pH and ORP combined-electrodes)

In-line Fitting EA1730 / EA2730



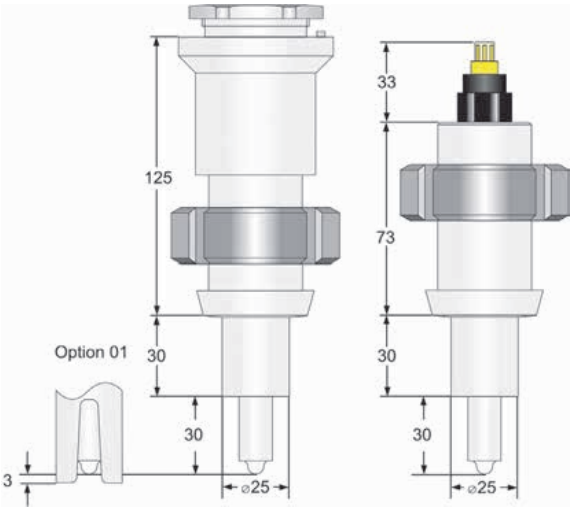
Characteristics

Hygienic fitting; material PVDF for milk-pipe connection acc. to DIN 11887.
This In-line fitting has been designed for electrochemical cells like pH/ORP-, conductivity-cells with PG13.5 process connection. It protects the sensor and ensures a proper measurement.
The application field includes food and chemical technology.

Technical data

Process connection	:	milk pipe acc. to DIN 11887
Process material	:	PVDF FDA compliant
Cap nut	:	stainless steel 1.4301
Operating temperature	:	-10..+120 °C steam sterilization 140 °C < 1 h
Process pressure	:	max. 16 bar

Dimensions



Tip protection

Ordering code

EA [1.] - [2.] - [3.] - [4.]

1.	**Model**	
	1730	head mounting at UNICON-pH, incl. Cap nut
	2730	field mounting, incl. cap nut
2.	**Process connection**	
	DN25	
	DN40	
	DN50	
	DN65	
3.	**Sensor type**	
	0	standard pH / ORP combined-electrodes
4.	**Options**	
	00	without option
	01	with integrated tip protection (only for pH and ORP combined-electrodes)

In-line Fitting EA2650

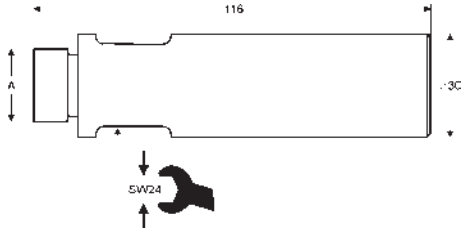
Characteristics

This In-line fitting has been designed for electrochemical cells like pH/ORP-, conductivity-cells with PG13.5 process connection.

Technical data

Material	:	stainless steel 1.4571, seal Viton®
Process pressure	:	max. 16 bar
Operating temperature	:	depends to the sensor
Process connection	:	G ½ A, G ¾ A, G 1 A

Dimensions



Ordering code

	1.		2.		3.		4.
EA		-		-		-	

1.	**Model**	
	2650	field mounting
2.	**Process connection (A)**	
	G ½ A	
	G ¾ A	
	G1 A	
3.	**Cells/combined electrodes**	
	0	for standard pH / ORP electrodes
4.	**Options**	
	00	without option

Flow-Tank DFG

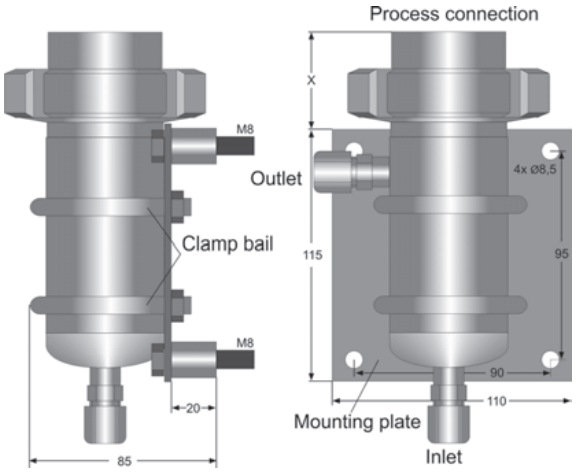
Characteristics

For continuous analysis measurement with pH-, ORP-cells in liquid media with installation length of max. 120 mm.

Technical data

Material	: stainless steel 1.4571
Process pressure	: max. 16 bar
Operating temperature	: max. 140 °C
Process connection	: PG 13.5, G ¼ B or G1A
Inlet-, outlet	: clamping sleeve for pipes 10x2 mm
Tank diameter	: 54 mm

Dimensions



Accessories

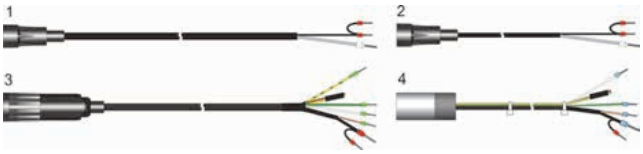
Lid with 3 x PG13.5 process connections and blind gland VS

Ordering code

DFG - 1. - 2. - 3.

1.	**Model**	
	50	measuring tank D=54 mm
2.	**Process connection**	
	1 x PG13.5	*X = 45 mm
	3 x PG13.5	*X = 45 mm
	3 x G ¼ B	*X = 45 mm
	1 x G 1 A	*X = 27 mm
3.	**Options**	
	00	without option
	Accessories	(stainless steel 1.4571)
	MP50	mounting plate incl. Mounting parts
	RSB50	2 clamp bails incl. Bolt nuts
	VS PG13,5	blind glands PG13.5

Connection cable



Connection cable 1
for electrodes with S7-connector

Order no.	Length [m]	Protection class
S7-02	2	IP67
S7-05	5	IP67

Connection cable 2
for electrodes with S7-connector at UNICON-pH, head mounting.

Order no.	Length [m]	Protection class
S7-K	-	-

Connection cable 3
for electrodes with SMEK-VP-connector

Order no.	Length [m]	Protection class
KVP-03	3	IP67
KVP-05	5	IP67
KVP-10	10	IP67

(not used cables could be cutting)

Connection cable 4
for electrodes with SMEK-VP-connector at UNICON-pH, head mounting.

Order no.	Length [m]	Protection class
KVP-K	-	-

Calibrations tools

WTW technical buffer, 1000 ml with dosing container

Order no.	PH-buffer value
TEP-4	4.01
TEP-7	7.00
TEP-10	10.00

WTW ORP-buffer 250 ml bottle

Order no.	Buffer value [mV]
RH28	427 (pH7)

Storage solutions 250 ml DURAN-glass bottle,
3 mol KCL sterilized

Order no.
pH-AL-250

Cleaning solution 250 ml DURAN-glass bottle,
Pepsin / hydrochloride acid

Order no.
pH-RL-250

Calibration container
for in-front-calibration material PMMA with level sign(20ml) and screw-cap PG13.5.
(the pH-electrode must be screwed-in with the filled container).

Order no.
pH-KR-250

Cleaning container 250 ml, to rinse the electrodes with water, material PP

Order no.
pH-SB-250

Analysis

www.ghm-group.de

GHMGROUP
Specialists by Competence.

Product information

Analysis Conductivity

Characteristics

System
- 2- and 4- electrode measurement,
- calibration acc. to USP<645>

Interpretation
- Conductivity from 50 µS up to 2000 mS/cm

Process connection
- G ½ A , G ¾ A, G 1A Clamp
- VARIVENT®
- Milk pipe

MediA
- Ultra pure water up to seawater/sewage

Process pressure
- 10 bar up to 60 bar

Medium temperature
- -10 °C up to +200°C

Applications

- **Ultra pure water**
- **Food - and Pharmaceutical industry**
- **Chemical industry**
- **Drinking water preparation**
- **Desalination of sea water**
- **Sewage treatment**

Functions
The conductive measurement of the conductivity of liquids for monitoring and controlling in the ongoing process is a varied measurement process in industry.
By the increasing strict conditions and purity requirements of authorities ever increasing standards have been created for the food and beverage industry for the purity and hygiene in production. For this reason process engineering demands that plants and measurement must comply with a specified cleaning and sterilization procedure (CIP, SIP). In the pharmaceutical industry a high degree of hygiene and cleaning of the plants is necessary. This process is fulfilled by ultra-pure water.
As a standard for the purity of the water a standard of the United States Pharmacopeia <USP> recognized worldwide applies. Our measurement devices have the corresponding parameters to monitor pharmaceutical water and rinsing water.

Advantages
- Various standardized process connections
- Measuring cells for the most varying applications
- Measuring cells with integrated transmitter and digital interface
- FDA compatible measuring cells
- Ultra-pure water measurement
- High level of precision and long-term stability measureme achieved by 4-electrodes
- Temperature-compensated measurement by PT1000 sensor
- CIP-/SIP capable

Device Overview

Device	2-electrode	4-electrode	Process connection	Measuring range	Max. Temperature	Max. Pressure	Page
Display devices							
LF9648	●	●	Clamp terminals	2 S/cm	55 °C	-	34
LF1010	●	●	Clamp terminals	2 S/cm	55 °C	-	36
UNICON-LF	●	●	Clamp terminals	500 mS/cm	50 °C	-	37
GLMU	●	●	Round plug	500 mS/cm		-	39
Digital Conductivity Converter							
CONDIX4213		●	PVC-U fittings	500 mS/cm	60 °C	16 bar	41
CONDIX4613		●	G ½ A	200 mS/cm	60 °C	16 bar	43
CONDIX4623		●	G ¾ A, G1A	500 mS/cm	60 °C	16 bar	45
Conductivity cells							
LF2203	●		PVC-U fittings	2 mS/cm	60 °C	16 bar	47
LF2603	●		G ½A, R ½A, G ¾A, R ¾A	100 µS/cm	60 °C	16 bar	48
LF2613	●		G ½A, R ½A, G ¾A, R ¾A	2 mS/cm	60 °C	16 bar	49
LF2653HT	●		G ¾A, G 1A, G1 ¼A	50 µS/cm	200 °C	20 bar	50
LF1453 / LF2453	●		Clamp	50 µS/cm	120 °C	16 bar	51
LF1553 / LF2553	●		VARIVENT®	50 µS/cm	120 °C	16 bar	52
LF1653 / LF2653	●		G ¾ A, G1A	50 µS/cm	120 °C	16 bar	53
LF4003		●	Immersion cell	500 mS/cm	60 °C	10 bar	54
LF3043 / LF4043		●	Immersion cell	500 mS/cm	60 °C	-	55
LF3213 / LF4213		●	PVC-U fittings	500 mS/cm	60 °C	16 bar	56
LF3433 / LF4433		●	Clamp	500 mS/cm	120 °C	16 bar	57
LF3533 / LF4533		●	VARIVENT®	500 mS/cm	120 °C	16 bar	58
LF3623 / LF4623		●	G ¾A, G 1A	500 mS/cm	120 °C	16 bar	59
LF3733 / LF4733		●	Milk-pipe	500 mS/cm	120 °C	16 bar	60
Accessories							
Accessories Conductivity Measurement							61
Connection diagram Terminals B-D, LF9648							35
Connection diagram cells							38
EYY220 Programing Adapter			USB adapter / Round plug				62

Errors and technical modifications reserved.

Conductivity Meter LF9648

Characteristics

The Conductivity Meter LF9648 has been designed for the measurement of conductivity, as a degree of the purity or concentration of a liquid. In connection with 4-electrode-conductivity cells a high accuracy and insensitivity of contamination can be achieved. A further advantage is a broad range of application with only one cell. Only for measurement in ultra-pure water a special 2-electrode conductivity cell must be used.

Technical data

Power supply

Supply voltage	: 230 V AC ±10 %; 115 V AC ±10 %; 24 V AC ±10 % or 24 V DC ±15 %
Power consumption	: max. 3.5 VA, 5 VA with analog output
Operating temp.	: -10..+55 °C
CE-conformity	: EN 61326-1:2013 EN 60664-1:2007

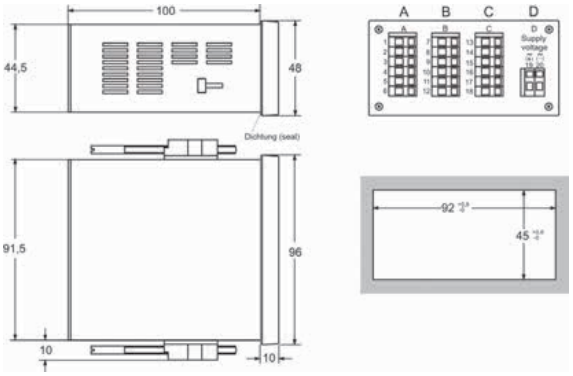
Inputs

MR conductivity	: 0..2.000(0) µS/cm up to 0..2000 / 200(0) mS/cm (at 25 °C)
-Cell constant	: 0.080..9.999
-Accuracy	: 0.5 % of the measuring value, ±2 Digit
-Temperature comp.	: non linear for ultra pure water and natural water or linear programmable from 0.000..9.999 %/K
MR temperature	: -50.0..+200.0 °C; Sensor Pt100 or Pt1000
-Accuracy	: ±0.2 °C
Display	: LED red, 14.2 mm
Indicating range	: 2000(0) Digit with leading zero suppression
Parameter display	: LED 2-digit red, 7 mm (parameter - and output indicator)

Outputs

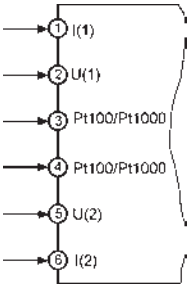
Relay	: SPDT < 250 V AC < 250 VA < 2 A, < 300 V DC < 50 W < 2 A
Transistor	: transistor, <35 V AC/DC, max.100 mA, short circuit protected
Analog output	
Active	: 0/4..20 mA burden ≤500 Ω; 0/2..10 V burden >500 Ω, isolated automatic burden changing (burden dependent)
Passive	: 4..20 mA, ext. burden = RA[Ω]≤ (supply - 5 V) ÷ 0.02 A ; supply voltage 5..30 V DC,
Accuracy	: 0.1 %; TK 0.01 %/K
Case	: panel mounting DIN 96x48 mm, material PA6-GF; UL94V-0
Dimensions	: front 96x48 mm, mounting depth 100 mm,
Weight	: max. 390 g
Connection	: clamp terminals, 0.08..1.5 mm², AWG28..AWG14

Dimensions



Connection diagram

Terminal strip A



Ordering code

	1.		2.		3.		4.		5.		6.		7.
LF9648	-		-		-		-		-		-		

1.	**Terminal strip A**		
	1	input for 2- or 4-electrode-cells, temperature compensation via Pt100	
	3	as 1, but temperature compensation via Pt1000	
2.	**Terminal strip B**		
	00	not installed	
	2R	2 relay outputs	
	2T	2 electronic outputs	
3.	**Terminal strip C**		
	00	not installed	
	2R	2 relay outputs	
	2T	2 electronic outputs	
	AO	analog output 0/4..20 mA, 0/2..10 V DC	
	2A	2 analog outputs 4..20 mA passive	
4.	**Terminal strip D Supply voltage**		
	0	230 V AC	±10 % 50-60Hz
	1	115 V AC	±10 % 50-60Hz
	4	24 V AC	±10 % 50-60Hz
	5	24 V DC	±15 %
5.	**Options**		
	00	without option	
	01	min- and max-peak hold	
	14	measuring/monitoring acc. to USP<645>	
6.	**Unit** appears on the unit field		
7.	**Additional text** above the display (3x90 mm HxW)		

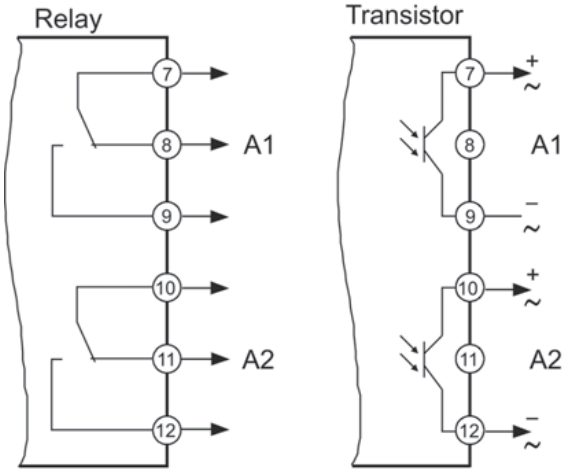
Connection diagram for terminal strip B-D see page Fehler: Referenz nicht gefunden

Connection Diagrams X9648, Terminals B-D

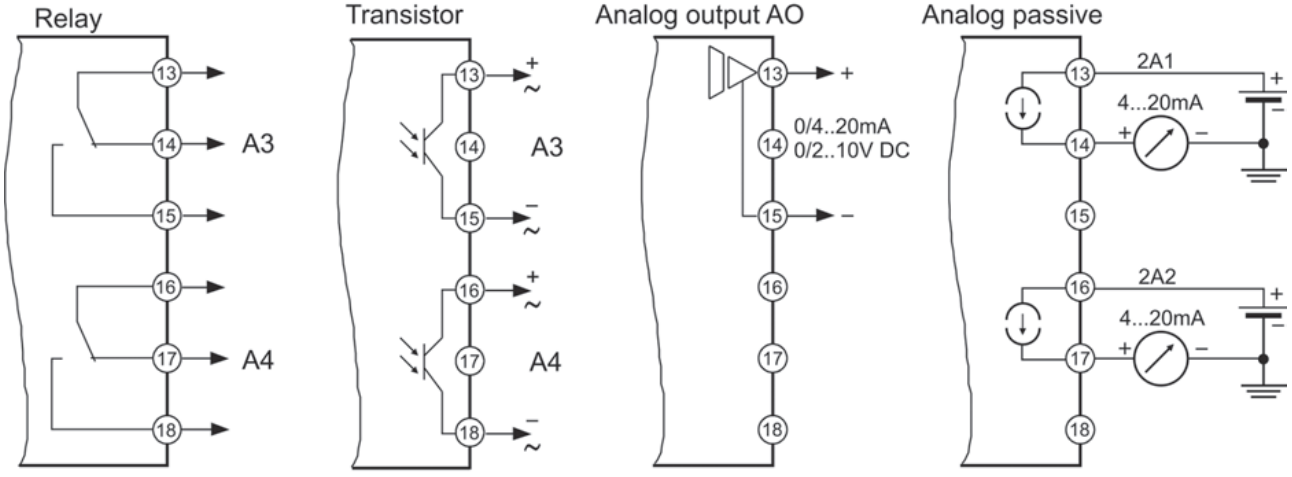
Terminal strips B, C, D

Terminal strip A belongs to each article.

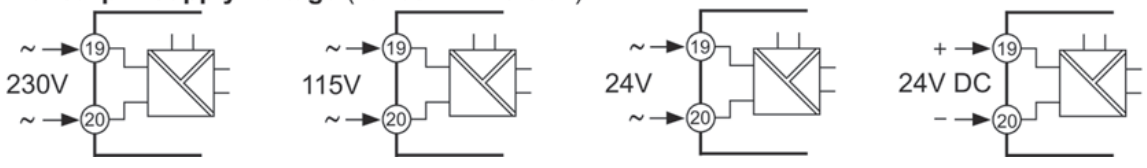
Ternminal strip B (varies with versions)
2 alarm outputs



Terminal strip C (varies with versions)
2 alarm outputs



Terminal strip D supply voltage (varies with version)



Conductivity Meter LF1010

Characteristics

The Conductivity-Meter LF1010 has been designed for the measurement of conductivity, as a degree of the purity or concentration of a liquid. In connection with 4-electrode-conductivity cells a high accuracy and insensitivity of contamination can be achieved. A further advantage is a broad range of application with only one cell. Only for measurement in ultra-pure water a special 2-electrode conductivity cell must be used.

Technical data

Power supply

Supply voltage	: 230 V AC ±10 %; 115 V AC ±10 %; 24 V AC ±10 % or 24 V DC ±15 %	
Power consumption	: max. 3.5 VA	
Operating temp.	: -20..+55 °C	
CE-conformity	: EN 61326-1:2013 EN 60664-1:2007	

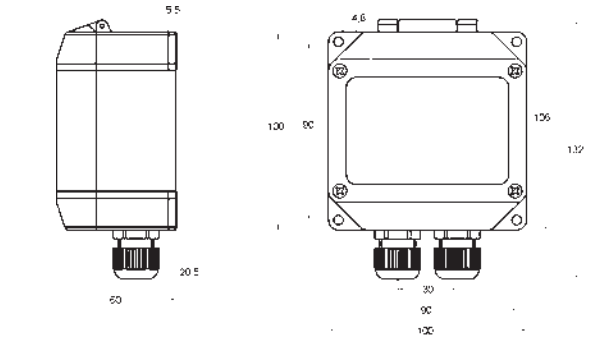
Inputs

MR conductivity	: 0..2.000(0) µS/cm up to 0..2000 / 200(0) mS/cm (at 25 °C)	
-Cell constant	: 0.080..9.999	
-Accuracy	: 0.5 % of the measuring value, ±2 Digit	
-Temperature comp.	: non linear for ultra pure water and natural water or linear programmable from 0.000..9.999 %/K	
MR temperature	: -50.0..200.0 °C; Sensor Pt100 or Pt1000	
-Accuracy	: ±0.2 °C	
Display	: LED red, 14.2 mm	
Indicating range	: 2000(0) Digit with leading zero suppression	
Parameter display	: LED 2-digit red, 7 mm (Parameter - and output indicator)	

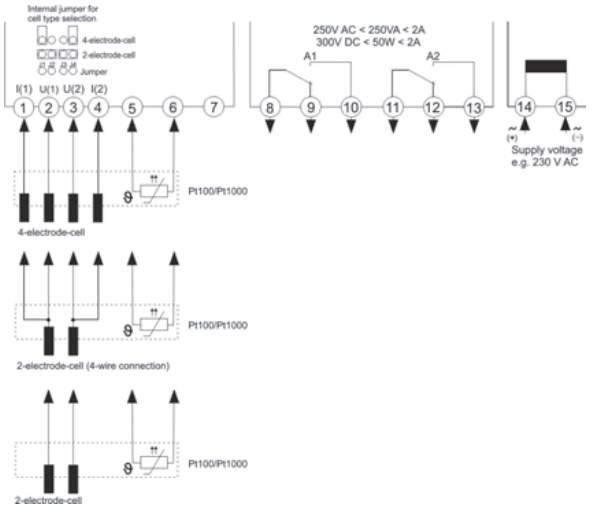
Outputs

Relay	: SPDT < 250 V AC < 250 VA < 2 A, < 300 V DC < 50 W < 2 A	
Field case	: Material PA6-GF15/15, keypad polyester	
Dimensions	: 100x100x60 mm	
Weight	: max. 450 g	
Connection	: clamp terminals	
	single wire	*flexi wire*
Terminals 1-4	0.75 mm², AWG18	0.5 mm², AWG 20
Terminals 5-15	2.5 mm², AWG13	1.5 mm², AWG 15
Protection class	: IP65, terminals IP20 acc. to BGV A3	

Dimensions



Connection diagram



Ordering code

LF1010 - 1. - 2. - 3. - 4. - 5. - 6.

1.	**Input**		
	1	input for 2- or 4-electrode-cells, temperature compensation via Pt100	
	3	as 1, but temperature compensation via Pt1000	
2.	**Alarm output**		
	00	not installed	
	2R	2 relay	
3.	**Supply voltage**		
	0	230 V AC	±10 % 50-60Hz
	1	115 V AC	±10 % 50-60Hz
	4	24 V AC	±10 % 50-60Hz
	5	24 V DC	±15 %
4.	**Options**		
	00	without option	
	01	min- and max-peak hold	
	09	1xM20x1.5 Multi (2xØ6 mm), 1xM20x1.5	
	14	measuring and monitoring of ultra-pure water acc. to USP<645>	
5.	**Unit** appears on the unit field		
6.	**Additional text** above the display (3x70 mm HxW)		

Conductivity Converter UNICON®-LF

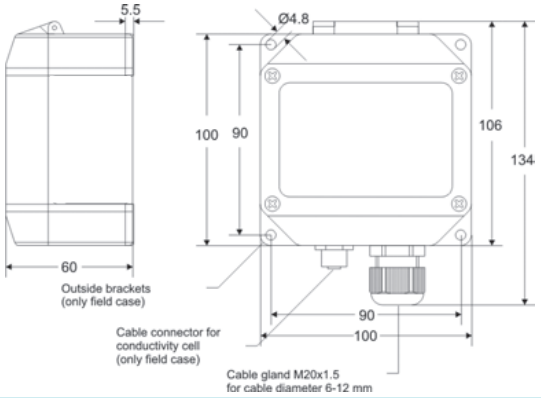
Characteristics

The Conductivity Converter UNICON-LF has been designed for the measurement of conductivity, as a degree of the purity or concentration of a liquid. In connection with 4-electrode-conductivity cells a high accuracy and insensitivity of contamination can be achieved. A further advantage is a broad range of application with only one cell. Only for measurement in ultra-pure water a special 2-electrode conductivity cell must be used.

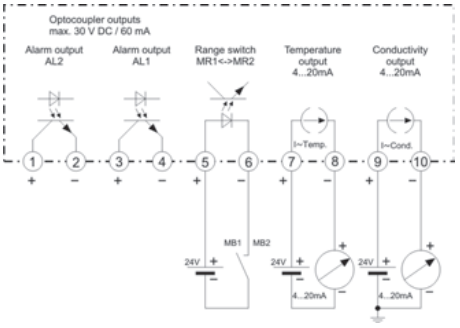
Technical data

Power supply
Loop voltage : U_B 14..30 V DC, 2-wire connection
Operating temperature : 0..50 °C
CE- conformity : EN 61326-1:2013
Conductivity output
Current : 4..20 mA
Unit : programmable µS/cm; mS/cm; kΩ/cm; MΩ/cm
Decimals : 0..3 digit (unit depending)
Indicating range : 500..9999 Digit (unit and decimals depending)
min./max. MR : 0..5.00 µS/cm bis 0..500.0 mS/cm; 0..0.500 µS/cm / 0..50.0 µS/cm with ultra-pure cell
Temperature comp. : non linear for ultra pure water and natural water or linear programmable from 0.000..8.000 %/°C
-Cell constant : 0.080..9.999
-Accuracy : ±0.5 % of the measuring value, ±2 Digit
Temperature output
Current : 4..20 mA
Burden : RA ≤ (U_B-14 V) ÷ 0.02 A
Temperature sensor : RTD Pt100 or Pt1000 acc. to DIN IEC 751
Unit : °C, °F programmable
Measuring range : -40.0..+160.0 °C
Alarm outputs
Transistor : 14..30 V DC, max. 60 mA
Voltage drop : < 2V
MR switch over
R_i : >10 kΩ
MB1 active : U = 0..3 V DC
MB2 active : U = 12..30 V DC
Display : LCD-dot matrix, 3.8mm characters
Range : 2 lines 16 characters each
Case : head case / field case
Material : case polyamide with fiber glass PA6-GF/GK 15/15, front foil polyester
Dimensions : 100 x 100 x 60 mm (WxHxD)
Weight : max. 360 g
Connection : screw terminal with pressure plate, 2.5 mm² flexible wire, 4 mm² single wire and plug-in cable for sensor
Protection class : IP65, terminals IP20 acc. to BGV A3

Dimensions



Connection diagram



Ordering code

UNICON-LF - 1. [ ] - 2. [ ] - 3. [ ] - 4. [ ] - 5. [ ]

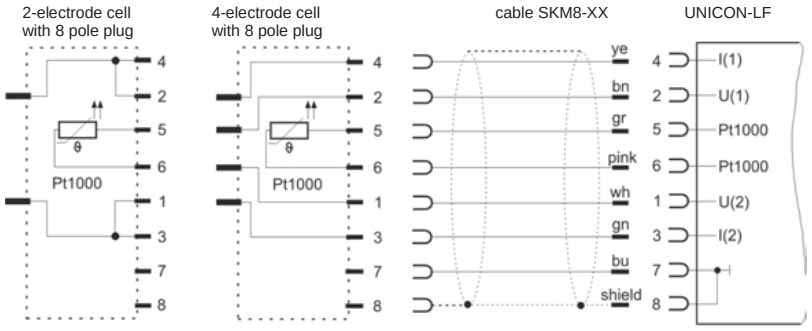
1.	**Model**	
	1	output 4..20 mA for conductivity 2 electronic alarm outputs
	2	as 1, but 2nd measuring range for conductivity, output 4..20 mA for temperature
2.	**Mounting**	
	01	head mounting, on the cell
	02	field mounting, separate connection cable page Fehler: Referenz nicht gefunden
	03	as 02, but plug stainless steel
3.	**Measuring principle**	
	4	4-electrode measurement (2-electrode cell connectable)
4.	**Temperature compensation**	
	1	RTD Pt100
	3	RTD Pt1000
5.	**Options**	
	00	without option
	14	measurement/monitoring acc. to USP<645>

Accessories see page Fehler: Referenz nicht gefunden
Connection diagrams see page Fehler: Referenz nicht gefunden

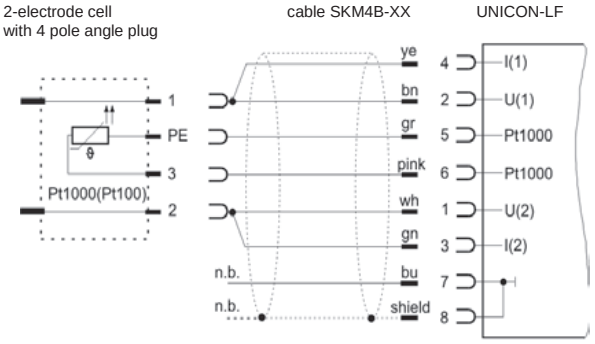
Connection Diagrams Conductivity Measurement

Connection at UNICON-LF field case

A

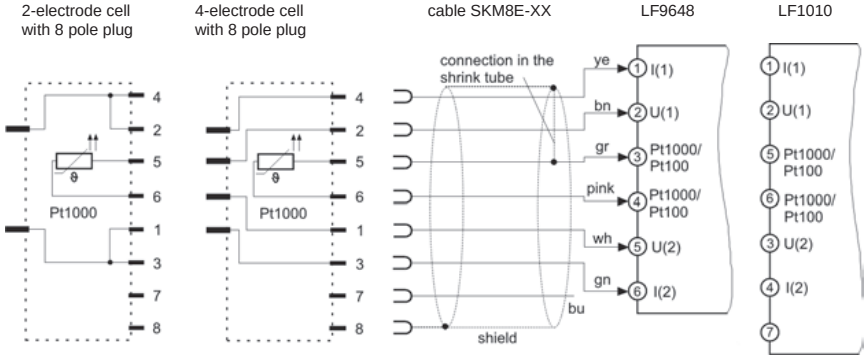


B

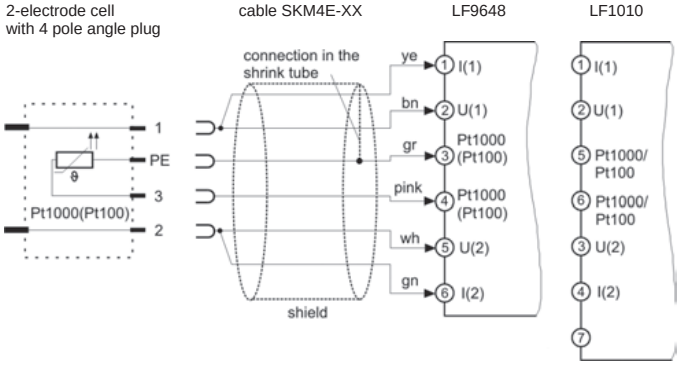


Connection at LF1010 and LF9648

D



E



Compact Conductivity Measuring Transducer GLMU

- **Local display of conductivity and temperature**
- **Freely scalable output scales**
- **Variable temperature-compensation type**
- **With local display and galvanic isolation**
- **4 to 20 mA version with 2 wires: Power supply via current loop (optionally with 0-10V 3-wire)**

Features

The GLMU is used for drinking water and surface water monitoring, fish husbandry, aquariums and measurement in contaminated solutions and waste water or monitoring of neutralisation.

The 4-pole measuring cell of the GLMU-400-MP is especially well-suited for use for higher salt concentrations based on the insensitivity to dirt.

The GLMU has a local display of conductivity and temperature. The output signal is freely scalable and the measuring range and temperature compensation type can be selected by the customer.

Versions

GLMU-200-MP	GLMU-400-MP	GLMU-400-MP-UNI
Incl. 2-pole conductivity measuring cell, compact, single measuring cell	Incl. 4-pole conductivity measuring cell, high-quality, dirt-resistant measuring cell	Universally configurable measuring transducer without measuring cell, for connection of arbitrary measuring cells

Technical data

	GLMU-200-MP	GLMU-400-MP	GLMU-200-MP-RW
Measuring ranges	(Decimal point and resolution can be selected by the customer. Specification of the min. and max. possible measuring range)		
Conduc-tivity	In µS /cm: 0.0..200.0 0..2000 In mS/ cm: 0.00..20.00 0.0..200.0	In µS /cm: 0.0 ... 200.0 0 ... 2000 In mS/ cm: 0.00..20.00 0.0..200.0 0..500	In µS /cm: 0.0..200.0 0.0..20.00
Spec. resistance	In kOhm*cm: 5.0..100.0 0.50..10.00 In Ohm*cm: 50..1000 5.0..100.0	In kOhm*cm: 0.0..200.0 0.00..20.00 In Ohm*cm: 1..5000 1.0..500.0 1.00..50.00	In kOhm*cm: 0..200 0..2000
TDS	In mg / l: 0.0..200.0 0..2000	In mg / l: 0.0..200.0 0..500.0 0..2000 In g / l: 0.0..20.0 0..200	In mg / l: 0.0..200.0 0.0..20.00
Salinity	0.0..70.0 (PSU)	0.0..70.0 (PSU)	
Tempera-ture	-25..+50 °C (device) 0.0..80.0 °C (measuring cell)		

Measuring cell : Conductivity measuring cell with 2/4-pole for various applications

Accuracy

Conductivity : ± 0.5 % of measured value ± 0.3 % FS (-RW: -1 % of measured value ±0,3 % FS)

Temperature : ±0.2 °C ±1 digit

Measuring cell connection : 7-pole diode socket

Cell constant : K = 0.30..1.20 freely selectable (-RW: 0.03..0.12)

Temperature compensation

off : No compensation

Lin : Linear compensation (of 0.3..3.0 %/K)

nLF : non-linear compensation for natural water according to EN27888 (DIN 38404)

Output signal : 4..20 mA, (2-wire)
0..1 V or 0..10 V (3-wire)

Auxiliary energy : 12..30 V DC at 4..20 mA
18..30 V DC at 0..10 V

Permissible resistance : $R_A[\Omega] = (U_V [V] - 12V) / 0.02 A$

Permissible load : $R_L > 3000 \Omega$

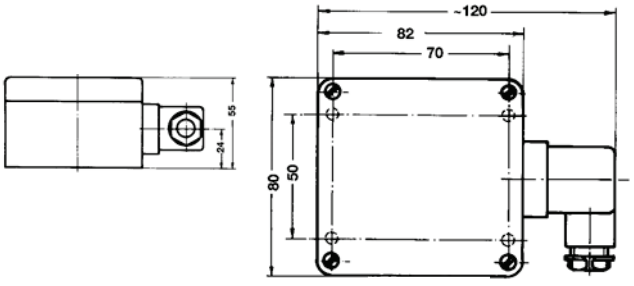
Display : 10 mm height, 4-digit display

Electrical connection : Angle connector according to EN 175301-803/A,

Housing : ABS

Ingress protection : IP65 (excluding 7-pole measuring cell connection socket)

Dimension



Conductivity

Measuring cells

2-pin measuring cell

4-pin measuring cell

Ordering code

GLMU - [1.] - MP - [2.] - [3.] - [4.] - [5.]

1.	**Version**			
	200	Incl. 2-pole measuring cell		
	400	Incl. 4-pole measuring cell		
2.	**Measuring cell**			
	TR	Drinking/fresh water		•
	TRP	Drinking/fresh water, screw-in measuring cell		•
	LTG	Organic substances		•
	RW	Purest water		•
	RWP	Purest water, screw-in measuring cell		•
	SW	Dirty/salt water	•	
	SWP	Dirty/salt water, screw measuring cell	•	
3.	**Output signal**			
	A1	4..20 mA		
	AV01	0..1 V		
	AV010	0..10 V		
4.	**Cable length**			
	L01	1m		
	L02	2m		
	L03	3m		
	L04	4m		
	L05	5m		
	L05L	5m cable for -SWP, - RWP and -TRP		
5.	**Options**			
	00	No options		
	PG	Measuring cell with fixed PG13.5 thread for pressure applications (up to max. 6 bar)		

GLMU - [400] MP - UNI - [1.] - [2.] - [3.] - [4.]

1.	**Measuring cell**	
		Measuring transducer without measuring cell
2.	**Output signal**	
	A1	4..20 mA, 2 wire
	AV010	0..10 V, 3 wire
	AV01	0..1 V, 3 wire
3.	**Electrical connection**	
		Angle connector EN 175301-803 / A
	EM16	Angeled plug connector, short, DIN-43650-A special M16, cable socket with metric screw connection
4.	**Connection sensor**	
	M16	M16 socket, 7- pole, standard
	M12	M12 socket, 8 pole, e. g. for connection cable A SK8M

Accessories / Spare parts

LFE 202 art. no. 604344

2-pole spare measuring cell (for GLMU-200-MP-TR)

LFE 202-PG art. no. 603594

2-pole spare measuring cell (for GLMU-200-MP-TR-PG)

LFE 210 art. no. 606911

2-pole spare measuring cell (for GLMU-200-MP-LTG)

LFE 220art. no. 607829

2-pole spare measuring cell (for GLMU-200-MP-RW-RWP)

LFE 230 art. no. 607825

2-pole spare measuring cell (for GLMU-200-MP-RWP)

LFE 240 art. no. 607828

2-pole spare measuring cell (for GLMU-200-MP-RW)

LFE 400 art. no. 604635

4-pole spare measuring cell (for GLMU-400-MP-TR)

LFE 400-PG art. no. 603565

4-pole spare measuring cell (for GLMU-400-MP-SW-PG)

LFE 430-PG art. no. 607827

4-pole spare measuring cell (for GLMU-400-MP-SWP)

PG 13.5 art. no. 603205

Plug-in thread adapter for pressureless insert, for electrode Ø12 mm for connection without adapter

GWA1Z art. no. 602914

Thread adapter PG 13.5 to G1", plastic

GKL 100 art. no. 601396

Conductivity control solution
(100 ml bottle with 1413 µS / cm, in accordance with DIN EN 27888)
Surface water / drinking water applications, among others

GKL 101 art no. 601398

Conductivity control solution
(250 ml bottle with 84 µS / cm)
Purest water, osmosis system applications, among others

GKL 102 art no. 601400

Conductivity control solution (100 ml bottle with 50 mS / cm)
Salt water aquarium applications, among others

Digital Conductivity-Converter CONDIX4213

- **Digital, conductive 4-electrode flow-converter for outer pipe diameter from 20 mm up to 63 mm**
- **6 types of temperature compensation selectable**
- **Status LED**
- **RS485 Interface with MODBUS RTU-protocol**
- **Installation with PVC-U standard fittings**
- **Flow fitting DFA32 as option accessories**
- **Suitable for conductivities in a range of 0..20 µS/cm up to 0..500 mS/cm**
- **Resistant against pollution**
- **Not influenced by polarisation effect or wire resistive**

Characterisitcs

The digital conductivity converter CONDIX4213 is used for the conductivity measurement of liquids. The integrated digital transmitter submits values and parameters to a master (e.g. PLC, SCADA). Device parameters and input configuration are adjustable via the interface or GHMware configuration software.
Application dependent six different types of temperature compensation are available.
The 4-electrode measurement principle with a cell constant of C0.5 1/cm is suitable for a range of applications up to 500 mS/cm. Applications can be found in the water treatment of landfill seeping water, seawater or black water treatment on ships

Technical Data

Power supply

Supply voltage	:	4,7..28 V DC, max. 60 mA
CE-conformity	:	EN 61326-1:2013 EN 61326-2-3:2013
Inputs		
Cell constant	:	C = 0,5 1/cm (exact cell constant labelled on the type plate)
Measuring range		
Conductivity	:	0..20 µS/cm up to 0..500 mS/cm
Temperature	:	-50..+200°C
Basic accurac		
Conductivity	:	1% of the measuring value
Temperature	:	0,2 K
Linearization errors		
Temperature	:	0,1%
Operating temperature	:	0..+60 °C
Ambient temperature	:	-10..60 °C
Storage temperature	:	-10..60°C
Condensation	:	not allowed
Climate classification	:	EN 60068-2-38:2010-6
Vibrations	:	EN 60068-2-6, GL test 2
Process connection	:	PVC fitting with cap nut
Process pressure	:	max. -1..16 bar

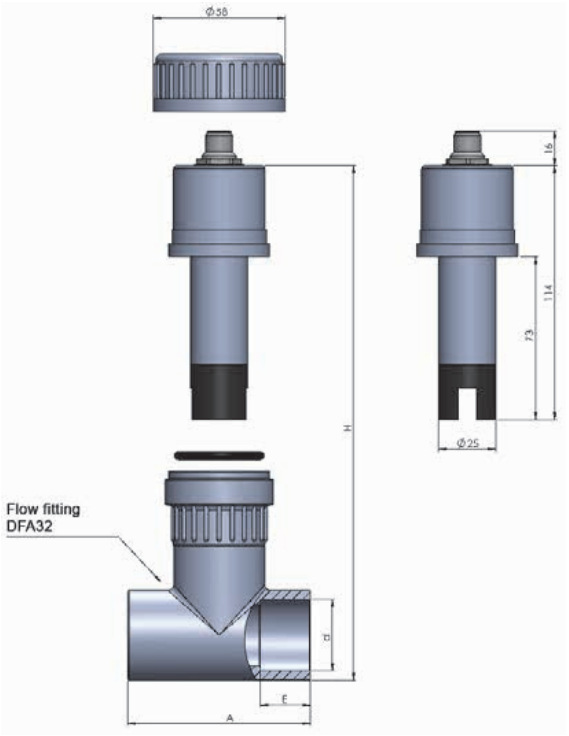
Materials

Process material	:	PVC-U, casting resin, graphite (electrodes)
Viewing window	:	Acrylic glass (PMMA)

Electrical connection

Design	:	8 pole round connector plug
Materials	:	brass nickel plated
Interface	:	RS485, Half-Duplex
Protokoll	:	MODBUS RTU
Baud rates	:	1200, 2400, 4800, 9600, 19200
Total weight	:	ca. 160 g
Protection class	:	IP67
Temperature comp. Selectable	:	- without temperature compensation - linear temperature coefficient - compensation of natural waters - ASTM-D1125 ultra-pure water - NaCl diluted solution - ASTM-D5391 acidic pure water - ASTM-D5391 alkaline pure water

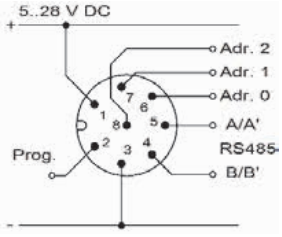
Dimensions



d	H	A	E
20	135	78	22
25	135	78	22
32	135	78	22
40	140	98	26
50	155	118	31
63	169	144	38

Connection diagram

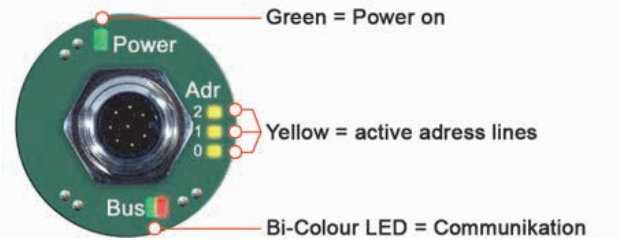
MB-type with
RS485, MODBUS RTU interface



PIN	Signal	Cable color ACI113
1	+ Supply voltage	White
2	Programming PIN (normally not connected)	Brown
3	- Supply voltage, Ground (C / C')	Green
4	B / B' Bus	Yellow
5	A / A' Bus	Grey
6	Adr. 0	Pink
7	Adr. 1	Blue
8	Adr. 2	Red (shield)

The addressing of the CONDIX can be realized with a field attachable female connector (see accessories) or in a junction box.

Optical signaling



Top view CONDIX4213: Optical signalling for supply voltage, bus communication and addressing.

Ordering code

CONDIX 1. [ ] - 2. [ ] - 3. [ ] - 4. [ ]

1.	**Model**	
	4213	
2.	**Cell constant**	
	C0,5	
3.	**Interface**	
	MB	RS 485, MODBUS RTU
4.	**Options**	
	00	Without option

Accessories

Art. No.	Type	Description
-	GHM*ware*	Download: www.ghm-group.de/en/info-desk/
475291	EYY220	Programming adapter
Diverse	DFA32	Flow fitting for CONDIX4213
476332	ACI113-00	Field attachable 8-pole female connector, Belden RKC8/9, Brass nickel plated
476331	ACI113-VA	Field attachable 8-pole female connector, Binder 713, stainless steel
476533	ACI113-002-1-00	8-pole female connector M12 (Brass nickel plated) with shielded cable and wire-end ferrules: 2 m
476116	ACI113-005-1-00	8-pole female connector M12 (Brass nickel plated) with shielded cable and wire-end ferrules: 5 m
476117	ACI113-010-1-00	8-pole female connector M12 (Brass nickel plated) with shielded cable and wire-end ferrules: 10 m
476118	ACI113-025-1-00	8-pole female connector M12 (Brass nickel plated) with shielded cable and wire-end ferrules: 25 m

Digital Conductivity-Converter CONDIX4613

- **Digital, conductive 4-electrode flow-converter**
- **Compact design**
- **6 types of temperature compensation selectable**
- **Status LED**
- **RS485 Interface with MODBUS RTU-protocol**
- **Installation with pipe thread DIN ISO 228 (DIN 259; BSP)**
- **Suitable for conductivities in a range of 0..20 µS/cm up to 0..200 mS/cm**
- **Resistant against pollution**
- **Not influenced by polarisation effect or wire resistive**

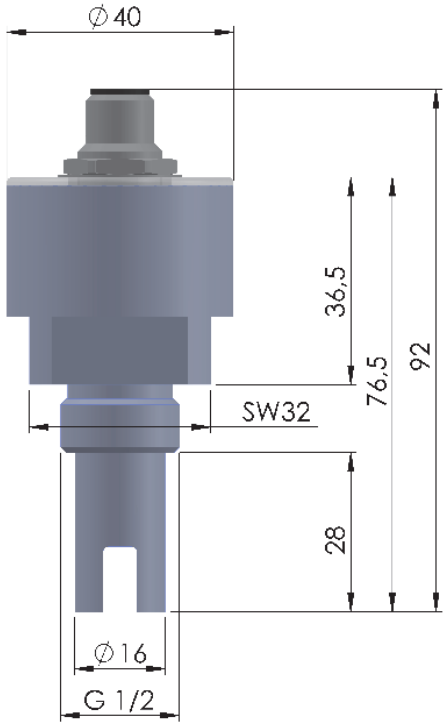
Characterisitcs

The digital conductivity converter CONDIX4613 is used for the conductivity measurement of liquids. The integrated digital transmitter submits values and parameters to a master (e.g. PLC, SCADA).
Device parameters and input configuration are adjustable via the interface or GHMware configuration software.
Application dependent six different types of temperature compensation are available.
The 4-electrode measurement principle with a cell constant of C0.4 1/cm is suitable for a range of applications up to 200 mS/cm.
Applications can be found in the water treatment of landfill seeping water, seawater or black water treatment on ships.

Technical data

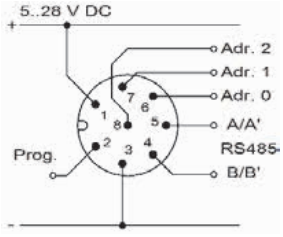
Power supply		
Supply voltage	:	4,7..28 V DC, max. 60 mA
CE-conformity	:	EN 61326-1:2013 EN 61326-2-3:2013
Inputs		
Cell constant	:	C = 0,4 1/cm (exact cell constant labelled on the type plate)
Measuring range		
Conductivity	:	0..20 µS/cm up to 0..200 mS/cm
Temperature	:	-50..+200°C
Basic accurac		
Conductivity	:	1% of the measuring value
Temperature	:	0,2 K
Linearization errors		
Temperature	:	0,1%
Operating temperature	:	0..+60 °C
Ambient temperature	:	-10..60 °C
Storage temperature	:	-10..60°C
Condensation	:	not allowed
Climate classification	:	EN 60068-2-38:2010-6
Vibrations	:	EN 60068-2-6, GL test 2
Process connection	:	pipe thread DIN ISO 228 (DIN 259; BSP)
Process pressure	:	max. -1..16 bar
Materials		
Process material	:	PVC-U, casting resin, graphite (electrodes)
Viewing window	:	Acrylic glass (PMMA)
Electrical connection		
Design	:	8 pole round connector plug, M12x1, IP67
Materials	:	brass nickel plated
Interface	:	RS485, Half-Duplex
Protokoll	:	MODBUS RTU
Baud rates	:	1200, 2400, 4800, 9600, 19200
Total weight	:	ca. 160 g
Protection class	:	IP67
Temperature comp. Selectable	:	- without temperature compensation - linear temperature coefficient - compensation of natural waters - ASTM-D1125 ultra-pure water - NaCl diluted solution - ASTM-D5391 acidic pure water - ASTM-D5391 alkaline pure water

Dimensions



Connection diagram

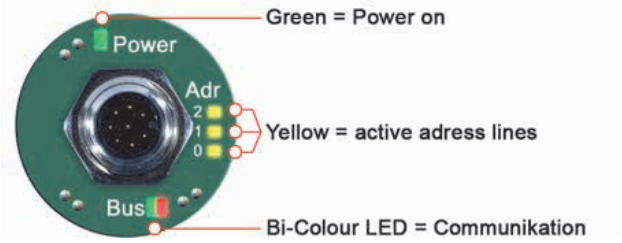
MB-type with
RS485, MODBUS RTU interface



PIN	Signal	Cable color ACI113
1	+ Supply voltage	White
2	Programming PIN (normally not connected)	Brown
3	- Supply voltage, Ground (C / C')	Green
4	B / B' Bus	Yellow
5	A / A' Bus	Grey
6	Adr. 0	Pink
7	Adr. 1	Blue
8	Adr. 2	Red (shield)

The addressing of the CONDIX can be realized with a field attachable female connector (see accessories) or in a junction box

Optical signaling



Top view CONDIX4613: Optical signalling for supply voltage, bus communication and addressing.

Ordering code

CONDIX 1. [ ] - 2. [ ] - 3. [ ] - 4. [ ] - 5. [ ]

1.	**Model**	
	4613	
2.	**Cell constant**	
	C0,4	
3.	**Process connection**	
	G ½ A	G ½ A
4.	**Interface**	
	MB	RS 485, MODBUS RTU
5.	**Options**	
	00	Without option

Accessories

Art. No.	Type	Description
-	GHM*ware*	Download: www.ghm-group.de/en/info-desk/
475291	EYY220	Programming adapter
476332	ACI113-00	Field attachable 8-pole female connector, Belden RKC8/9, Brass nickel plated
476331	ACI113-VA	Field attachable 8-pole female connector, Binder 713, stainless steel
476533	ACI113-002-1-00	8-pole female connector M12 (Brass nickel plated) with shielded cable and wire-end ferrules: 2 m
476116	ACI113-005-1-00	8-pole female connector M12 (Brass nickel plated) with shielded cable and wire-end ferrules: 5 m
476117	ACI113-010-1-00	8-pole female connector M12 (Brass nickel plated) with shielded cable and wire-end ferrules: 10 m
476118	ACI113-025-1-00	8-pole female connector M12 (Brass nickel plated) with shielded cable and wire-end ferrules: 25 m

Digital Conductivity-Converter CONDIX4623

- **Digital, conductive 4-electrode flow-converter**
- **6 types of temperature compensation selectable**
- **Status LED**
- **RS485 Interface with MODBUS RTU-protocol**
- **Installation with pipe thread DIN ISO 228 (DIN 259; BSP)**
- **Suitable for conductivities in a range of 0..20 µS/cm up to 0..500 mS/cm**
- **Resistant against pollution**
- **Not influenced by polarisation effect or wire resistive**

Characteristics

The digital conductivity converter CONDIX4623 is used for the conductivity measurement of liquids. The integrated digital transmitter submits values and parameters to a master (e.g. PLC, SCADA). Device parameters and input configuration are adjustable via the interface or GHMware configuration software.
Application dependent six different types of temperature compensation are available.
The 4-electrode measurement principle with a cell constant of C0.5 1/cm is suitable for a range of applications up to 500 mS/cm. Applications can be found in the water treatment of landfill seeping water, seawater or black water treatment on ships.

Technical data

Power supply
Supply voltage : 4,7..28 V DC, max. 60 mA
CE-conformity : EN 61326-1:2013
EN 61326-2-3:2013

Inputs
Cell constant : C = 0,5 1/cm (exact cell constant labelled on the type plate)

Measuring range
Conductivity : 0..20 µS/cm up to 0..500 mS/cm
Temperature : -50..+200°C

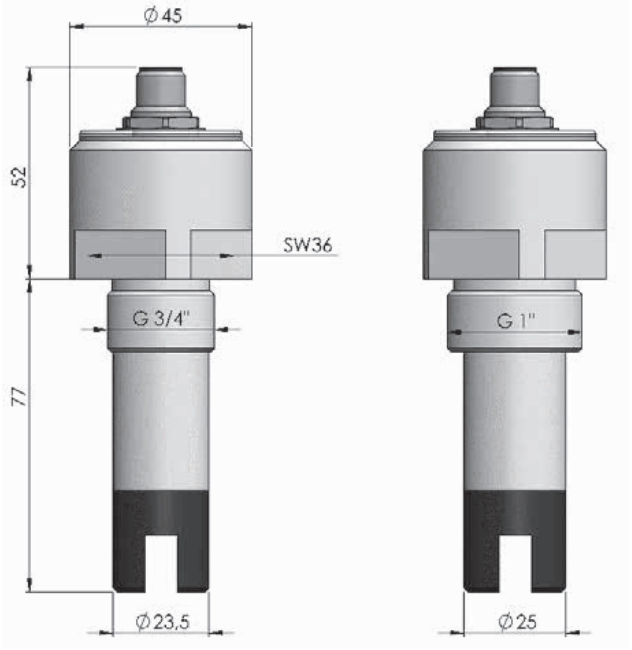
Basic accuracy
Conductivity : 1% of the measuring value
Temperature : 0,2 K

Linearization errors
Temperature : 0,1%
Operating temperature : 0..+60 °C
Ambient temperature : -10..60 °C
Storage temperature : -10..60°C
Condensation : not allowed
Climate classification : EN 60068-2-38:2010-6
Vibrations : EN 60068-2-6, GL test 2
Process connection : pipe thread DIN ISO 228 (DIN 259; BSP)
Process pressure : max. -1..16 bar

Material
Process material : PVDF, casting resin, graphite (electrodes)
Viewing window : Acrylic glass (PMMA)

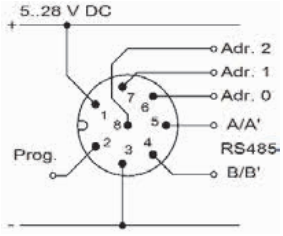
Electrical connection
Design : 8 pole round connector plug M12x1, IP67
Material : brass nickel plated
Interface : RS485, Half-Duplex
Protocol : MODBUS RTU
Baud rates : 1200, 2400, 4800, 9600, 19200
Total weight : ca. 160 g
Protection class : IP67
Temperature comp. selectable : - without temperature compensation
- linear temperature coefficient
- compensation of natural waters
- ASTM-D1125 ultra-pure water
- NaCl diluted solution
- ASTM-D5391 acidic pure water
- ASTM-D5391 alkaline pure water

Dimensions



Connection diagram

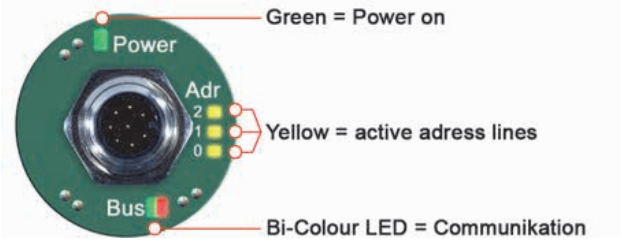
MB-type with
RS485, MODBUS RTU interface



PIN	Signal	Cable color ACI113
1	+ Supply voltage	White
2	Programming PIN (normally not connected)	Brown
3	- Supply voltage, Ground (C / C')	Green
4	B / B' Bus	Yellow
5	A / A' Bus	Grey
6	Adr. 0	Pink
7	Adr. 1	Blue
8	Adr. 2	Red (shield)

The addressing of the CONDIX can be realized with a field attachable female connector (see accessories) or in a junction box.

Optical signalling



Top view CONDIX4623: Optical signalling for supply voltage, bus communication and addressing.

Ordering code

CONDIX 1. [ ] - 2. [ ] - 3. [ ] - 4. [ ] - 5. [ ]

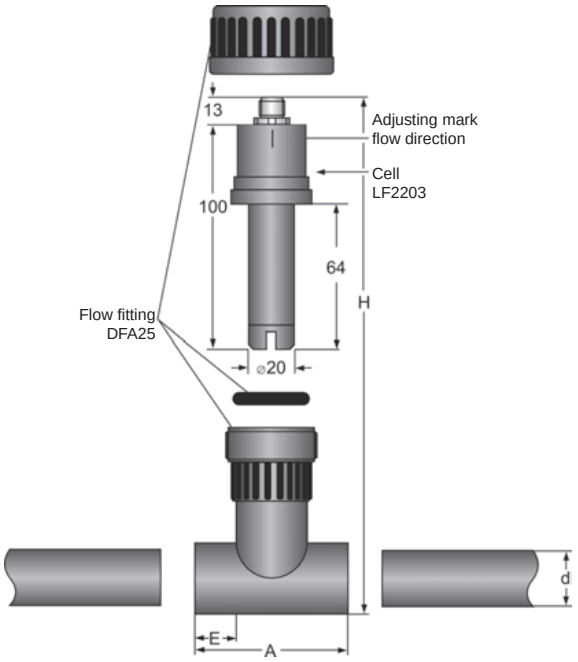
1.	**Model**	
	4623	
2.	**Cell constant**	
	C0,5	
3.	**Process connection**	
	G ¾ A	G ¾ A
	G 1 A	G 1 A
4.	**Interface**	
	MB	RS 485, MODBUS RTU
5.	**Options**	
	00	Without option

Accessories

Art. No.	Type	Description
-	GHM*ware*	Download: www.ghm-group.de/en/info-desk/
475291	EYY220	Programming adapter
476332	ACI113-00	Field attachable 8-pole female connector, Belden RKC8/9, Brass nickel plated
476331	ACI113-VA	Field attachable 8-pole female connector, Binder 713, stainless steel
476533	ACI113-002-1-00	8-pole female connector M12 (Brass nickel plated) with shielded cable and wire-end ferrules: 2 m
476116	ACI113-005-1-00	8-pole female connector M12 (Brass nickel plated) with shielded cable and wire-end ferrules: 5 m
476117	ACI113-010-1-00	8-pole female connector M12 (Brass nickel plated) with shielded cable and wire-end ferrules: 10 m
476118	ACI113-025-1-00	8-pole female connector M12 (Brass nickel plated) with shielded cable and wire-end ferrules: 25 m

Conductivity Cell LF2203

Dimensions



d	H	A	E
25	97	66	19
32	106	78	22
40	116	98	26
50	127	118	31
63	141	144	38

Characteristics

- **2-electrode conductive flow cell for pipe diameter 25-63 mm**
- **Measuring range 0..100 µS/cm up to 2 mS/cm**

Technical data

Cell constant	:	C = 1.0 ± 3.5 %
Operating temperature	:	0..60 °C
Process pressure	:	max. 16 bar at 22 °C
Process material	:	graphite (electrodes), PVC-U acc. to DIN8061/8062
Electrical connection	:	8 pole round connector plug, M12x1, IP67
-Material		brass nickel plated
Temperature measurement	:	integrated Pt1000 Sensor DIN IEC751, class A

Ordering code

LF2203 - C1.0 - 1. ☐

1.	Options	
	00	without option
	03	8 pole round plug SS-type
	Accessories Flow fitting DFA 25 d = outer pipe diameter	
	DFA25-25-1-1	d = 25 mm
	DFA25-32-1-1	d = 32 mm
	DFA25-40-1-1	d = 40 mm
	DFA25-50-1-1	d = 50 mm
	DFA25-63-1-1	d = 63 mm

Connection diagram see page Fehler: Referenz nicht gefunden

Additional accessories see page Fehler: Referenz nicht gefunden

Conductivity Cell LF2603

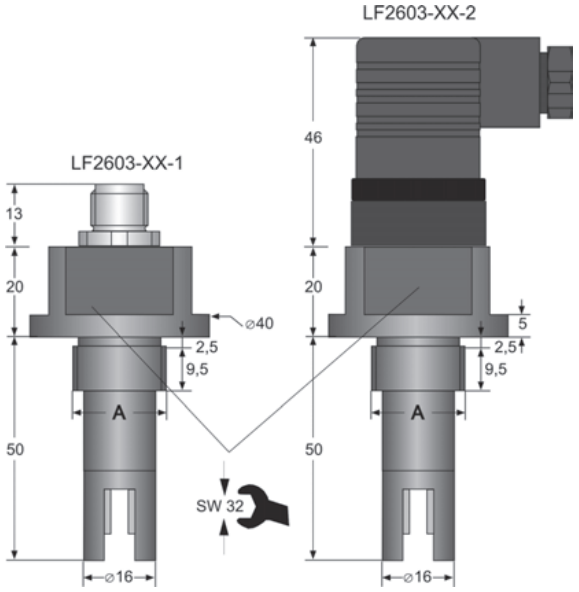
Characteristics

- **2-electrode conductive flow cell for pipe ultra pure water**
- **Measuring range 0..20 µS/cm up to 0..100 µS/cm**

Technical data

Cell constant	:	C = 0.5 ± 3.5%
Operating temperature	:	0..60 °C
Process pressure	:	max. 16 bar at 22°C
Process material	:	stainless steel (electrodes), PVC-U acc. to DIN8061/8062
Electrical connection	:	4 pole angle plug acc. to EN 175301-803/A, IP65 or 8 pole round connector plug M12x1, IP67
-Material	:	brass nickel plated
Temperature measurement	:	integrated Pt1000 Sensor DIN IEC751, class A

Dimensions



Ordering code

	1.		2.		3.
LF2603 - C0.5 -		**-**		**-**	

1.	**Process connection (A)**	
	G ½ A	cylindrical thread
	R ½	conical thread
	G ¾ A	cylindrical thread
	R ¾	conical thread
2.	**Electrical connection**	
	1	8 pole round connector
	2	4 pole angle entry plug
3.	**Options**	
	00	without option
	03	8 pole round connector plug SS-type

Connection diagram see page Fehler: Referenz nicht gefunden

Additional accessories see page Fehler: Referenz nicht gefunden

Conductivity Cell LF2613

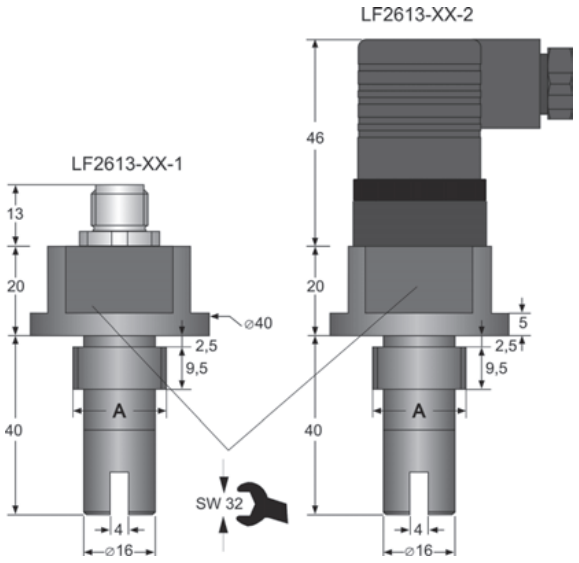
Characteristics

- **2-electrode conductive flow cell for drinking water**
- **Measuring range 0..100 µS/cm up to 0..2 mS/cm**

Technical data

Cell constant	:	C = 0.9 ± 3.5 %
Operating temperature	:	0..60 °C
Process pressure	:	max. 16 bar at 22 °C
Process material	:	Graphite electrodes, PVC-U acc. to DIN8061/8062
Electrical connection	:	4 pole angle entry plug EN 175301-803/A, IP65 or 8 pole round connector plug M12x1, IP67
-Material	:	brass nickel plated
Temperature measurement	:	integrated Pt1000 Sensor DIN IEC751, class A

Dimensions



Ordering code

LF2613 - C0.9 - 1. - 2. - 3.

1.	**Process connection (A)**	
	G ½ A	cylindrical thread
	R ½	conical thread
	G ¾ A	cylindrical thread
	R ¾	conical thread
2.	**Electrical connection**	
	1	8 pole round connector
	2	4 pole angle entry plug
3.	**Options**	
	00	without option
	03	8 pole round connector plug SS-type

Connection diagram see page Fehler: Referenz nicht gefunden

Additional accessories see page Fehler: Referenz nicht gefunden

Conductivity Cell LF2653HT

Characteristics

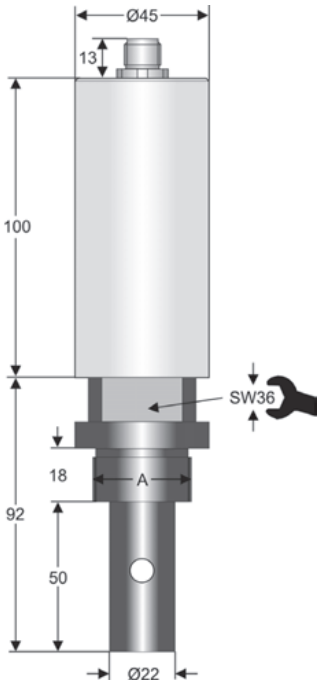
- **2-electrode conductive high temperature cell for pure- and ultra-pure water with pipe thread acc. to DIN ISO 228**
- **Measuring range 0..0.5 µS/cm up to 0..50 µS/cm**

Technical data

Cell constant	:	C = 0.1 exact cell constant labeled on the type plate
Operating temperature	:	0..200 °C
Process pressure	:	max. 20 bar
Process material	:	stainless steel 1.4404 (316L), ceramic, Kalrez
Electrical connection		
Field mounting	:	8 pole round connector plug M12x1, IP67
Material	:	brass nickel plated
Temperature measurement	:	integrated Pt1000 sensor DIN IEC751, Class A

Dimensions

Field mounting



Ordering code

LF [1.] - C0.1 - [2.] - [3.]

1.	**Model**	
	2653HT	field mounting
2.	**Process connection**	
	G ¾ A	
	G 1 A	
	G 1 ¼ A	
3.	**Options**	
	00	without option
	03	8 pole round connector plug SS-type

Connection diagram see page Fehler: Verweis nicht gefunden

Additional accessories see page Fehler: Verweis nicht gefunden

Conductivity Cell LF1453 / LF2453

Characteristics

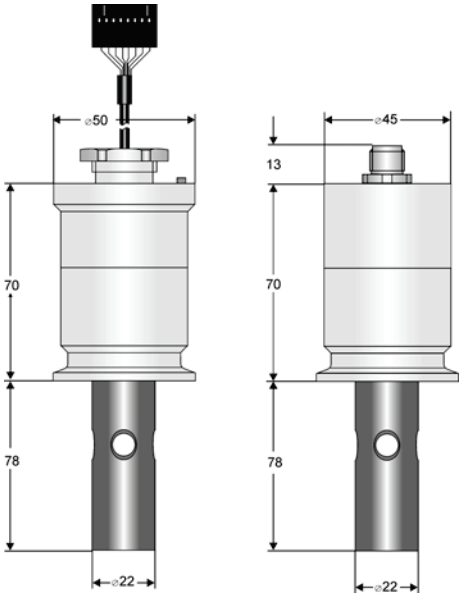
- **2-electrode ultra-pure water cell with Clamp connection acc. to DIN 32676 or Südmo Aseptic connection**
- **FDA compliant**
- **Application field: food industry**
- **Measuring range 0..0.5 µS/cm up to 0..50 µS/cm**

Technical data

Cell constant	:	C = 0.1 exact cell constant labeled on the type plate
Process temperature	:	-10..+120 °C CIP-/SIP-capable 140 °C < 1 h
Process pressure	:	max. 16 bar
Process material	:	stainless steel 1.4404 (316L), electropolished; PVDF; seal EPDM, FDA-certified, PEEK
Electrical connection		
LF1453	:	flat cable connector, only head mounting UNICON-LF
LF2453	:	8 pole round connector plug M12x1, IP67
Material	:	brass nickel plated
Temperature measurement	:	integrated Pt1000 sensor DIN IEC751, class A

Dimensions

Head mounting LF1453 | Field mounting LF2453



Ordering code

LF [1.] - C0.1 - [2.]

1.	Model	
	1453	head mounting UNICON-LF
	2453	field mounting
2.	**Options**	
	00	without option
	03	8 pole round plug SS-type
	11	Process connection Südmo Aseptic, DIN 11850

Connection diagram see page Fehler: Verweis nicht gefunden

Accessories see page Fehler: Verweis nicht gefunden

Conductivity Cell LF1553 / LF2553

Characteristics

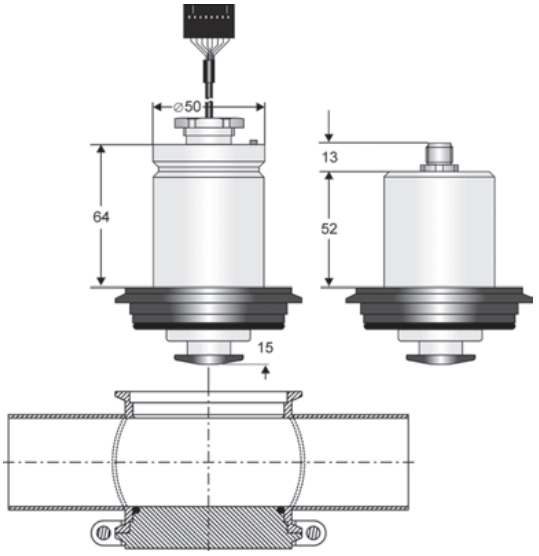
- **2-electrode ultra pure water cell for VARIVENT® Inline-case**
- **FDA compliant**
- **Application field food industry**
- **Measuring range 0..0.5 µS/cm up to 0..50 µS/cm**

Technical data

Cell constant	:	C = 0.1 exact cell constant labeled on the type plate
Process temperature	:	-10..+120 °C CIP-/SIP-capable 140 °C < 1 h
Process pressure	:	max. 16 bar
Process material	:	stainless steel 1.4404; PEEK; seal EPDM, FDA compliant
Electrical connection		
LF1553	:	flat cable connector, only head mounting UNICON-LF
LF2553	:	8 pole round connector plug M12x1, IP67
-Material	:	brass nickel plated
Temperature measurement	:	integrated Pt1000 sensor DIN IEC751, class A

Dimensions

Head mounting LF1553 | Field mounting LF2553



Ordering code

LF [1.] - C0.1 - [2.] - [3.]

1.	**Model**	
	1553	head mounting UNICON-LF
	2553	field mounting
2.	**Process connection**	
	DN25	VARIVENT® DN25
	DN40	VARIVENT® DN40..DN125
3.	**Options**	
	00	without option
	03	8 pole round plug SS-type

Connection diagram see page Fehler: Referenz nicht gefunden

Accessories see page Fehler: Referenz nicht gefunden

Note:
Conductivity cells LF1553 / LF2553 should **not** be mounted together with other cells in **one** VARIVENT® case.

Conductivity Cell LF1653 / LF2653

Characteristics

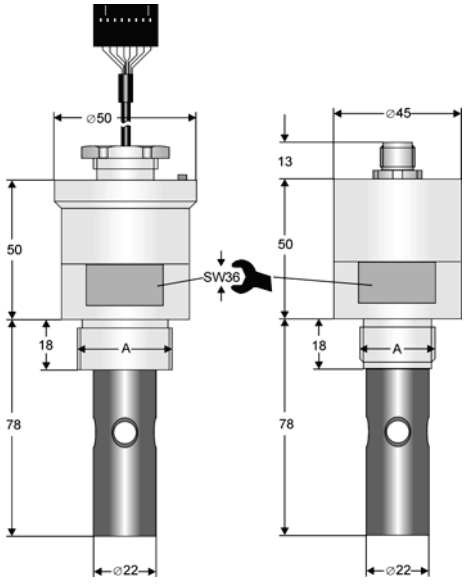
- **2-electrode ultra-pure water cell with pipe thread acc. to DIN ISO228**
- **Measuring range from 0..0.5 µS/cm up to0..50 µS/cm**

Technical data

Cell constant	:	C = 0.1 exact cell constant labeled on the type plate
Process temperature	:	-10..+120 °C CIP-/SIP-capable 140 °C < 1 h
Process pressure	:	max. 16 bar
Process material	:	stainless steel 1.4404 (316L), electropolished; PVDF; seal EPDM, PEEK
Electrical connection		
LF1653	:	flat cable connector, only head mounting UNICON-LF
LF2653	:	8 pole round connector plug M12x1, IP67
Material	:	brass nickel plated
Temperature measurement	:	integrated Pt1000 sensor DIN IEC751, class A

Dimensions

Head mounting LF1653 | Field mounting LF2653



Ordering code

LF [1.] - C0.1 - [2.] - [3.]

1.	**Model**	
	1653	head mounting UNICON-LF
	2653	field mounting
2.	**Process connection A**	
	G ¾ A	
	G 1 A	
3.	**Options**	
	00	without option
	03	8 pole round plug SS-type

Connection diagram see page Fehler: Verweis nicht gefunden

Accessories see page Fehler: Verweis nicht gefunden

Conductivity Cell LF4003

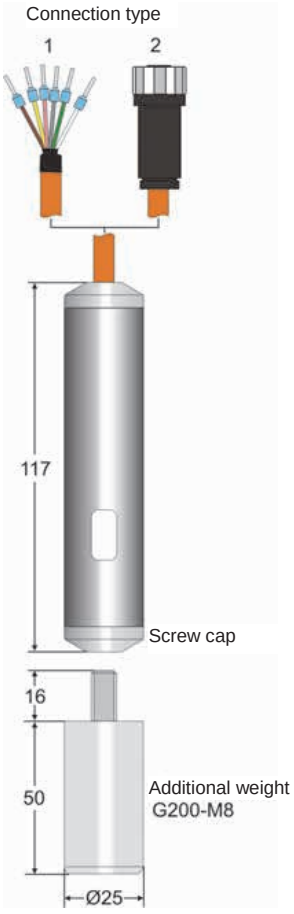
Characteristics

- **4-electrode immersion cell for wells and open systems up to 100 m depth of water**
- **Measuring range 0..20 µS/cm up to 0..500 mS/cm**
- **Insensitive against soiling**
- **No influence from polarization effects and line resistance**

Technical data

Cell constant	:	C = 0.5 exact cell constant labeled on the type plate
Operating temperature	:	0..60 °C
Process pressure	:	max. 10 bar
Process material	:	PVC-U acc. to DIN 8061/8062, casting resin, stainless steel 1.4305, graphite (electrodes), PUR cable
Electrical connection	:	8 pole round connector plug M12x1, IP67
-Material	:	brass nickel plated
Temperature measurement	:	integrated Pt1000 sensor DIN IEC751, Class A

Dimensions



Ordering code

LF4003 - C0.5 - 1. [ ] - 2. [ ] - 3. [ ]

1.	**Connection type**	
	1	cable with 6 pole pigtail, PU-cable
	2	8 pole cable plug for connection at UNICON-LF, field case, plug SS-type
2.	**Cable length** [m] please state in clear text	
3.	**Options**	
	00	without option
	Accessories	
	G200-M8	additional weight 200g with thread bolt, SS-type 1.4401
	ASK-6	anchor clamp, range 5.5..9.5 mm (steel zinc plated)

Connection diagram see page Fehler: Referenz nicht gefunden

Additional accessories see page Fehler: Referenz nicht gefunden

Conductivity Cell LF3043 / LF4043

Characteristics

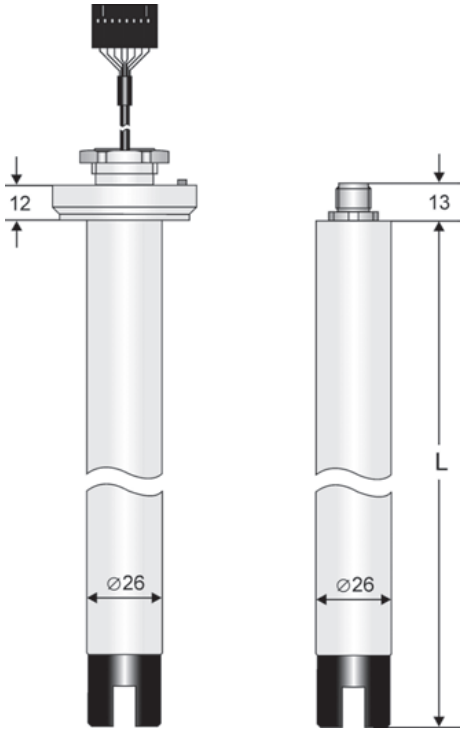
- **4-electrode immersion cell for wells and open systems**
- **Measuring range 0..20 µS/cm up to 0..500 mS/cm**
- **Insensitive against soiling**
- **No influence from polarization effects and line resistance**

Technical data

Cell constant	:	C = 0.5 exact cell constant labeled on the type plate
Operating temperature	:	-20..60 °C
Process material (electrodes)	:	PA polyamide, casting resin, graphite
Electrical connection		
LF3043	:	flat cable connector, only head mounting UNICON-LF
LF4043	:	8 pole round connector plug M12x1, IP67
-Material		brass nickel plated
Temperature measurement	:	integrated Pt1000 sensor DIN IEC751, class A

Dimensions

Head mounting LF3043 | Field mounting LF4043



Ordering code

LF [1.] - C0.5 - [2.] - [3.]

1.	**Model**	
	3043	head mounting UNICON-LF
	4043	field mounting
2.	**Process length (L) [mm]***	
	300	
	500	
	600	
	800	
	1000	
3.	**Options**	
	00	without option
	03	8 pole round plug SS-type

* custom length on request

Connection diagram see page Fehler: Referenz nicht gefunden

Additional accessories see page Fehler: Referenz nicht gefunden

Conductivity Cell LF3213 / LF4213

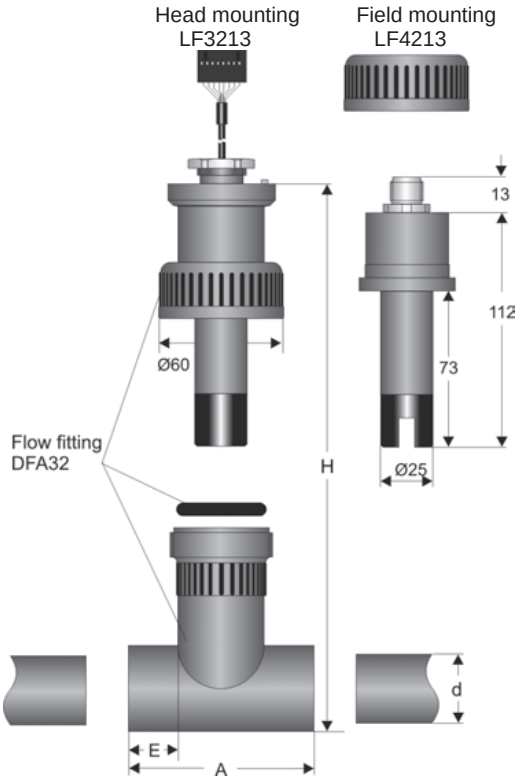
Characteristics

- **4-electrode flow cell for outer pipe diameter from 20 mm up to 63 mm**
- **Mounting with PVC-U standard fittings**
- **Measuring range from 0..20 µS/cm up to 0..500 mS/cm**
- **Insensitive against soiling**
- **No influence from polarization effects and line resistance**
- **Accessory flow fitting DFA32**

Technical data

Cell constant	:	C = 0.5 exact cell constant labeled on the type plate
Operating temperature	:	0..60 °C
Process pressure	:	max. 16 bar at 22°C
Process connection	:	PVC fitting with cap nut
Process material	:	PVC-U, casting resin, graphite (electrodes)
Electrical connection		
LF3213	:	flat cable connector, only head mounting UNICON-LF
LF4213	:	8 pole round connector plug M12x1, IP67
-Material	:	brass nickel plated
Temperature measurement	:	integrated Pt1000 sensor DIN IEC751, class A

Dimensions



d	H	A	E
20	142	78	22
25	142	78	22
32	142	78	22
40	154	98	26
50	165	118	31
63	179	144	38

Ordering code

1. 2.

LF [ ] **- C0.5 -** [ ]

1.	**Model** (including cap nut)	
	3213	head mounting UNICON-LF
	4213	field mounting
2.	**Options**	
	00	without option
	03	8 pole cable plug SS-type for connection at UNICON-LF, field case
	Accessory flow fitting DFA 32, PVC-U	
	DFA32-20-1-1	d = 20 mm
	DFA32-25-1-1	d = 25 mm
	DFA32-32-1-1	d = 32 mm
	DFA32-40-1-1	d = 40 mm
	DFA32-50-1-1	d = 50 mm
	DFA32-63-1-1	d = 63 mm

Connection diagram see page Fehler: Referenz nicht gefunden

Additional accessories see page Fehler: Referenz nicht gefunden

Conductivity Cell LF3433 / LF4433

Characteristics

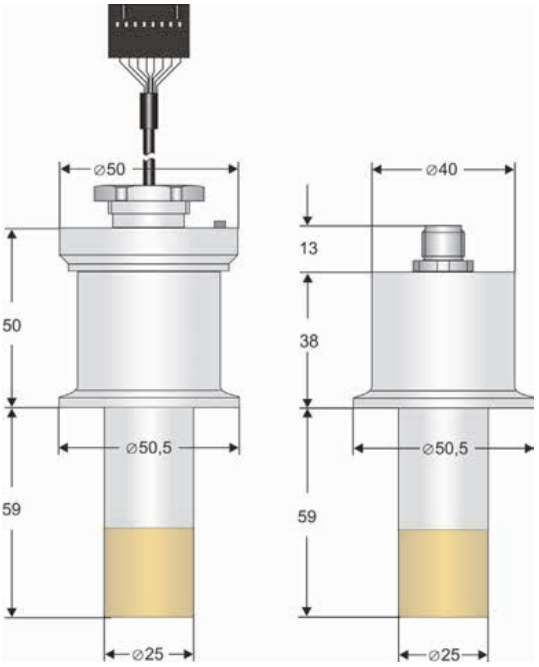
- **4-electrode conductive flow cell for pipe systems with Clamp-connection acc. to DIN 32676**
- **Measuring range 0..20 µS/cm up to 0..500 mS/cm**
- **Insensitive against soiling**
- **No influence from polarization effects and line resistance**

Technical data

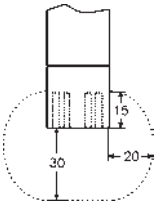
Cell constant	:	C = 0.4 exact cell constant labeled on the type plate
Operating temperature	:	-10..+120 °C CIP-/SIP-capable 140°C < 1h
Process pressure	:	max. 16 bar
Process connection	:	Clamp acc. to DIN 32676
Process material	:	PEEK, PVDF, stainless steel 1.4404, Graphite (electrodes), Seal EPDM
Electrical connection		
LF3433	:	flat cable connector, only head mounting UNICON-LF
LF4433	:	8 pole round connector plug M12x1, IP67
-Material	:	brass nickel plated
Temperature measurement	:	integrated Pt1000 sensor DIN IEC751, class A

Dimensions

Head mounting LF3433 | Field mounting LF4433



Mounting distance:



Note:
Cell constant must be checked again, if the free space is less than illustrated.

Ordering code

LF [1.] **-** **C0.4** **-** [2.]

1.	**Model**	
	3433	head mounting UNICON-LF
	4433	field mounting
2.	**Options**	
	00	without option
	03	8 pole round plug SS-type

Connection diagram see page Fehler: Referenz nicht gefunden

Accessories see page Fehler: Referenz nicht gefunden

Conductivity Cell LF3533 / LF4533

Characteristics

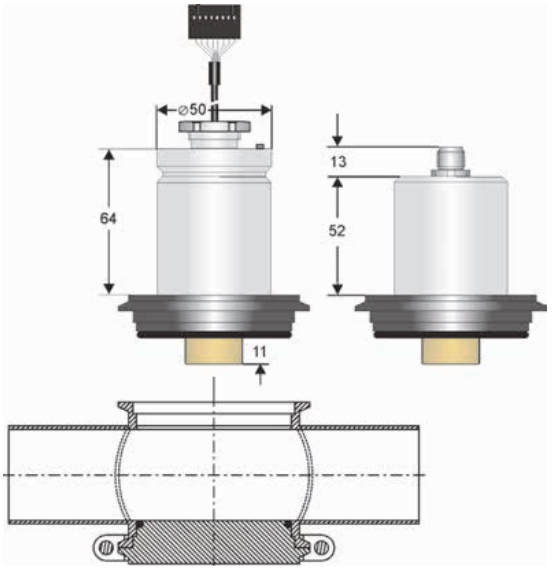
- **4-electrode hygienic flow-cell for VARIVENT®-Inline cases**
- **Application fields food- and chemical industry**
- **Measuring range from 0..20 µS/cm up to 0..500 mS/cm**
- **Insensitive against soiling**
- **No influence from polarization effects and line resistance**

Technical data

Cell constant	:	C = 0.4 exact cell constant labeled on the type plate
Process temperature	:	-10..+120 °C CIP-/SIP-capable 140°C < 1h
Process pressure	:	max. 16 bar
Process connection	:	VARIVENT® Inline case
Process material	:	PEEK, stainless steel 1.4404, graphite (electrodes) seal EPDM
Electrical connection		
LF3533	:	flat cable connector, only head mounting UNICON-LF
LF4533	:	8 pole round connector plug M12x1, IP67
-Material	:	brass nickel plated
Temperature measurement	:	integrated Pt1000 sensor DIN IEC751, class A

Dimensions

Head mounting LF3533 | Field mounting LF4533



Ordering code

LF [1.] - C0.4 - [2.] - [3.]

1.	**Model**	
	3533	head mounting UNICON-LF
	4533	field mounting
2.	**Process connection**	
	DN25	VARIVENT connection DN25
	DN40	VARIVENT connection DN40..DN125
3.	**Options**	
	00	without option
	03	8 pole round plug SS-type

Connection diagram see page Fehler: Referenz nicht gefunden

Accessories see page Fehler: Referenz nicht gefunden

Note:
Conductivity cells LF1553 / LF2553 should **not** be mounted together with other cells in **one** VARIVENT® case.

Conductivity Cell LF3623 / LF4623

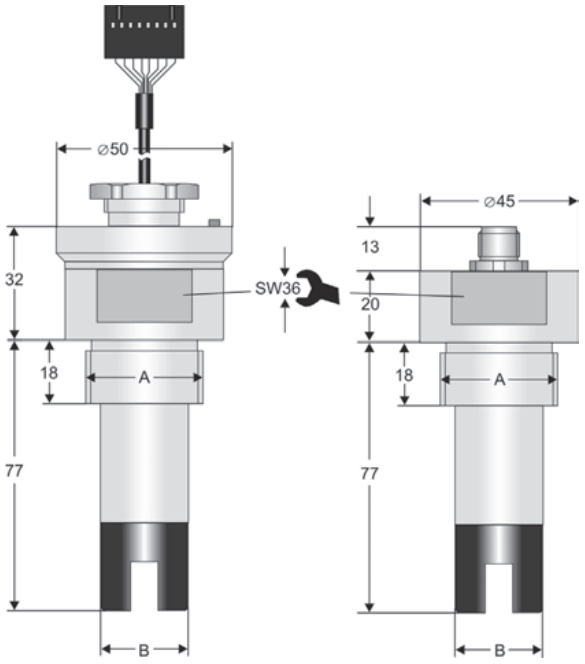
Characteristics

- **4-electrode screw-in cell; pipe thread acc. to DIN ISO 228**
- **Measuring range 0..20 µS/cm up to 0..500 mS/cm**
- **Insensitive against soiling**
- **No influence from polarization effects and line resistance**

Technical data

Cell constant	:	C = 0.5 exact cell constant labeled on the type plate
Process temperature	:	-10..+120 °C
Process pressure	:	max. 16 bar
Process connection	:	pipe thread acc. to DIN ISO228
Process material (electrodes)	:	PVDF, casting resin, graphite
Electrical connection		
LF3623	:	flat cable connector, only head mounting UNICON-LF
LF4623	:	8 pole round connector plug M12x1, IP67
-Material	:	brass nickel plated
Temperature measurement	:	integrated Pt1000 sensor DIN IEC751, class A

Dimensions



LF3623
for head mounting UNICON-LF

LF4623
for field mounting

Process connection

A	BØ [mm]
G ¾A	23,5
G 1A	25

Ordering code

LF [1.] - C0.5 - [2.] - [3.]

1.	**Model**	
	3623	head mounting UNICON-LF
	4623	field mounting
2.	**Process connection A**	
	G ¾ A	
	G 1 A	
3.	**Options**	
	00	without option
	03	8 pole round plug SS-type

Conductivity Cell LF3733 / LF4733

Characteristics

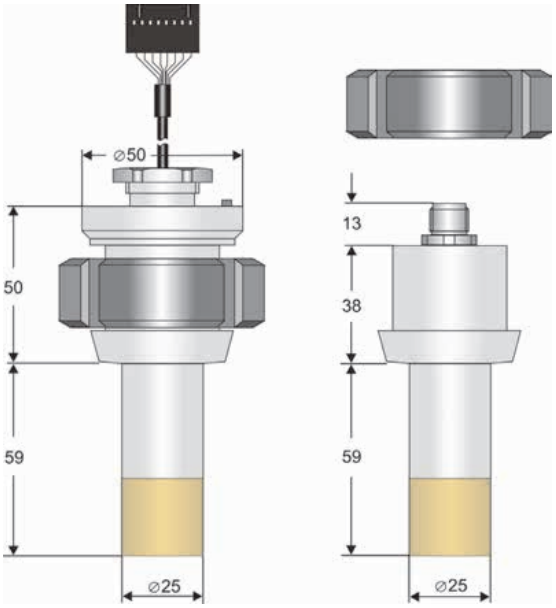
- **4-electrode hygienic cell for milk pipe connection acc. to DIN 11887**
- **Application fields: food- and chemical industry**
- **Measuring range from 0..20 µS/cm up to 0..500 mS/cm**
- **Insensitive against soiling**
- **No influence from polarization effects and line resistance**

Technical data

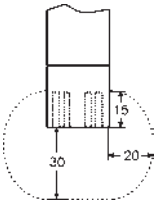
Cell constant	:	C = 0.4 exact cell constant labeled on the type plate
Process temperature	:	-10..+120 °C CIP-/SIP-capable 140°C < 1h
Process pressure	:	max. 16 bar
Process connection	:	milk pipe acc. to DIN 11887
Process material	:	PEEK, PVDF, stainless steel 1.4404 , graphite (electrodes), seal EPDM
Electrical connection		
LF3733	:	flat cable connector, only head mounting UNICON-LF
LF4733	:	8 pole round connector plug M12x1, IP67
-Material	:	brass nickel plated
Temperature measurement	:	integrated Pt1000 sensor DIN IEC751, class A

Dimensions

Head mounting LF3733 | Field mounting LF4733



Mounting distance:



Note:
Cell constant must be checked again, if the free space is less than illustrated.

Ordering code

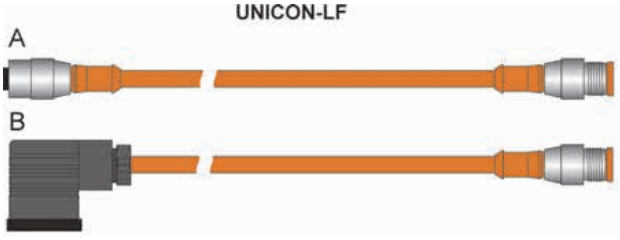
LF [1.] - C0.4 - [2.]

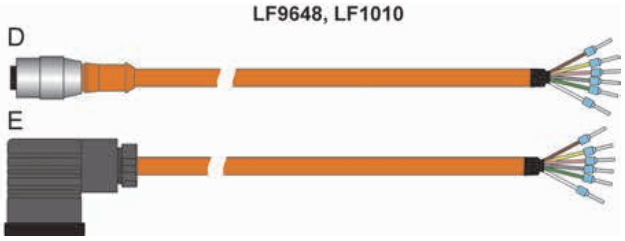
1.	**Model**	
	3733	head mounting UNICON-LF
	4733	field mounting
2.	**Process connection** (incl. Slot nut 1.4301))	
	DN25	
	DN40	
	DN50	
	DN65	
3.	**Options**	
	00	without option
	03	8 pole round plug SS-type

Connection diagram see page Fehler: Referenz nicht gefunden

Accessories see page Fehler: Referenz nicht gefunden

Accessories for Conductivity Measurement





Connection cable

Connection cable A
for 2- and 4-electrode cells at UNICON-LF field case with 8 pole cable socket and 8 pole cable plug, brass plated, PU-cable

Ordering No.	length [m]	protection class
SKM8-02	2	IP67
SKM8-05	5	IP67
as before, but plug SS-type, PVC cable		
SKM8-02-VA	2	IP67
SKM8-05-VA	5	IP67

Connection cable B
for 2-electrode-cells at UNICON-LF field case with 4 pole angle entry socket acc. to DIN EN 175301-803/A and 8 pole cable plug brass plated, PU-cable

Ordering No.	length [m]	protection class
SKM4B-02	2	IP65
SKM4B-05	5	IP65
as before, but plug SS-type, PVC cable		
SKM4B-02-VA	2	IP65
SKM4B-05-VA	5	IP65

Connection cable D
for 2- and 4-electrode-cells at LF1010/LF9648 with 8 pole cable socket brass plated and 6 pole pigtail, PU-cable

Ordering No.	length [m]	protection class
SKM8E-02	2	IP67
SKM8E-05	5	IP67
SKM8E-10	10	IP67
SKM8E-25	25	IP67
as before, but plug SS-type, PVC cable		
SKM8E-02-VA	2	IP67
SKM8E-05-VA	5	IP67
SKM8E-10-VA	10	IP67
SKM8E-25-VA	25	IP67

Connection cable E
for 2-electrode-cells at LF1010/LF9648 with 4 pole angle entry socket DIN EN 175301-803/A and 6 pole pigtail, PU-cable

Ordering No.	length [m]	protection class
SKM4E-02	2	IP65
SKM4E-05	5	IP65
SKM4E-10	10	IP65
SKM4E-25	25	IP65

Calibration accessories

Reference solution for calibration (250 ml)

Ordering No.	Conductivity [mS/cm] at 25°C
REF-LF-0001	0.147
REF-LF-0010	1.413
REF-LF-0100	12.88
REF-LF-1000	111.8

Reference solution for calibration acc. to USP<645>, (1000 ml)

Ordering No.	Conductivity [µS/cm] at 25°C
EC15	15,0

Precision-thermometer

Ordering No.	Measuring range °C
N63802	17.0..35.0 scale solution 0.05 °C accuracy ±0.1 °C

Programming Adapter EYY220

- **Universal adapter**
- **Sutiable for all digital sensors with MODBUS/RS485 interface**
- **USB 2.0 (3.x compatible**

Characteristics

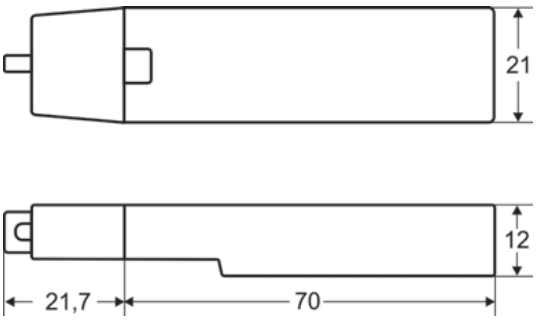
The Programming adapter fulfills all conditions for the configuration of digital sensors with MODBUS-interface. In conjunction with a PC or programming device and GHMware, parameters (e.g. cell constant, temperature compensation, measuring unit, etc.) can be adjusted and readings can be recorded.
The GHMware Programming Software could be downloaded free of charge at our homepage:
https://www.ghm-group.de/en/info-desk/

Technical Data

Power supply

Supply voltage	:	USB-Host
Power consumption	:	85mW (free running) – 400mW (with sensor connected)
Operat. temperature	:	-10..+55 °C
Storage temperature	:	-10..+60 °C
Relative humidity	:	< 95 %
Bedewing	:	not permissible
CE-conformity	:	EN 55022:2011-12 EN 55024:2011-09
Electrical connection	:	USB 2.0 (3.x compatible)
Sensor connection	:	8-pol. M12 round plug
Connection cable	:	PVC cable 1,5 m
Case	:	ABS, grey

Dimensions



Optical signalling

LED	Description
Green (dimly lit), permanantly	Adapter supplied via USB
Green (bright lit) flashing	Device sends data
Red flashing	Device receives data
Red & green (bright lit) flashing	EYY220 communicates with the MODBUS device
Green (dimly lit) flashing	Power supply unstable / too weak. Test other port, dispence on USB hub

Operation example

PC / Laptop EYY220 CONDIX4213

Ordering code

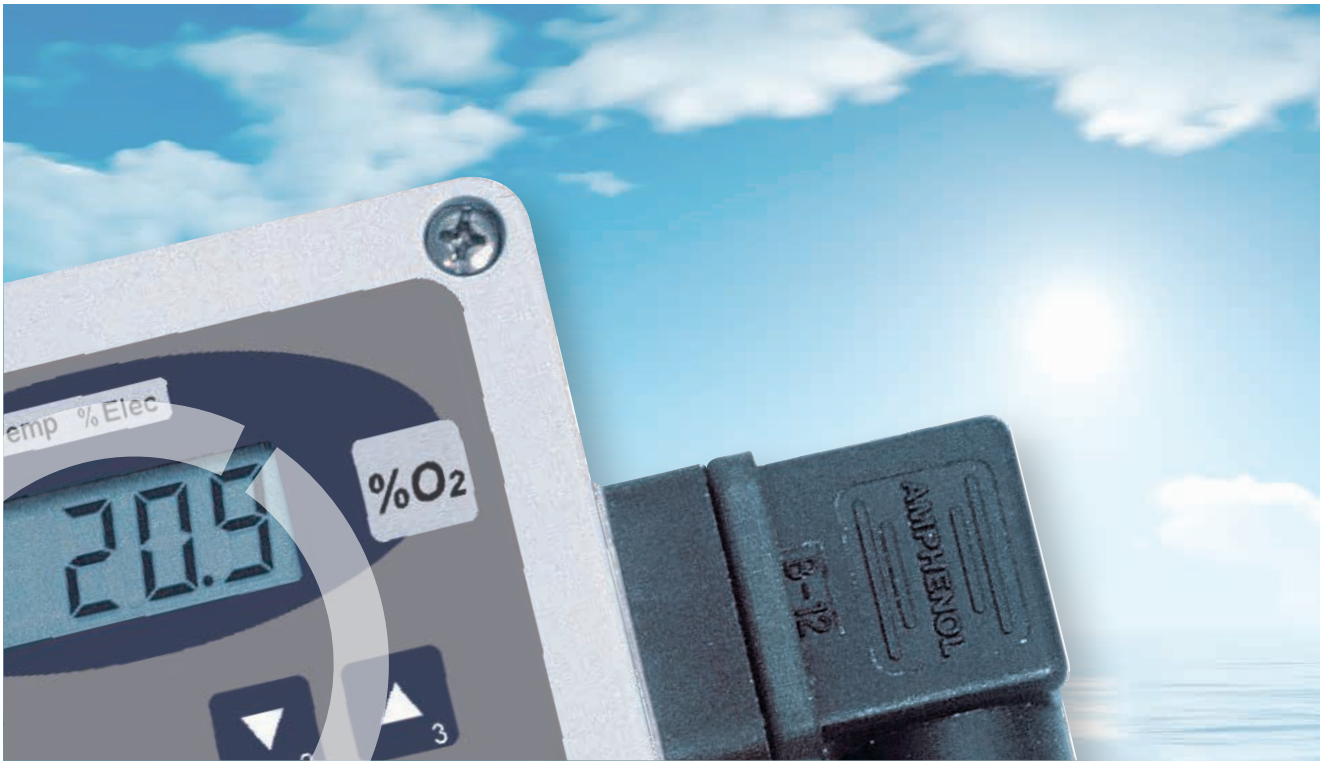
EYY [ ] (1.)

1.	Design type	
	220	Input USB 2.0

Analysis

www.ghm-group.de

GHMGROUP
Specialists by Competence.



O_2, CO, CO_2

Product information

Analysis O_2 / CO / CO_2

Characteristics

System

- Analysis oxygen, carbon monoxide and carbon dioxide

Measurands

- O_2, CO, CO_2 in air / gases
- O_2 (dissolved O_2) in liquids

Applications

Air monitoring

- Underground and parking garages
- Factory and office rooms
- Storage rooms
- Garages
- Green houses

Measurement in liquids

- Aquaristics
- Fish farming
- measurement of spring and well water

Function

Oxygen (O_2), carbon monoxide (CO) and carbon dioxide (CO_2) measurements are mainly used for ambient air monitoring.

CO_2 and O_2 are important indicators for ambient air quality and therefore important for modern climate control.
The recommended CO_2 limit for indoor air is 1000 ppm. Concentrations considerable above this limit causes fatigue and poor concentration.
At values considerably lower than that limit there is a high energy saving potential at the climate control with optimized air change rates.

Air is composed of approximately 21% O_2 and 78% nitrogen, beyond that it contains approximately 0.04% CO_2 and other components. CO is a toxic gas that is produced by incomplete combustion of fossil fuels. This gar is normally measured in underground and parking garages and motor vehicle workshops.

The oxygen measurement in liquids serves the monitoring of spring and well water quality as well as checking the water quality for fish farming.

Advantages

- Robust ABS housing
- Suitable for wall mounting
- On-site display and operating buttons
- Electric connection via elbow-type plug
- Transmitter incl. electrode, sensor or measuring cell
- Extensive range of accessories and spare parts

Device overview

Type	Measurand	Description	Measuring range	Page
OXY 3690 MP	O_2	Air oxygen transmitter incl. sensor	Oxygen concentration: 0.0..100.0 % O_2	70
OXY 3610 MP	O_2	Transmitter incl. sensor for dissolved oxygen in liquids	Oxygen concentration: 0.00..25.00 mg/l (dissolved)	71
GT10-CO2-1R	CO_2	CO_2-transmitter	Carbon dioxide: 0..2000 ppm CO_2 or 0..5000 ppm CO_2	72
GODOX200	O_2	Optical oxygen measuring transducer	Oxygen concentration: 0.00..20 mg/l (dissolved) Oxygen saturation: 0..200 % O_2	73

Air Oxygen Transmitter incl. Electrode OXY 3690 MP

- **O_2-sensor element exchangeable**
- **Appropriate to air with high CO_2-concentrations**
- **Input electrically isolated**

Characteristics

The OXY 3690 MP measures the oxygen concentration in air. Depending on the selected design type the device is appropriate to either pure oxygen (i.e. low CO_2 concentration) or to air with very high CO_2 concentration.

Technical data

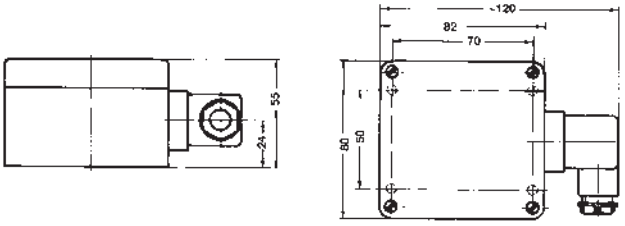
Measuring range		
Oxygen concentration	:	0.0..100.0 % O_2
Temperature	:	-20.0..+50.0 °C
Accuracy (transmitter)		at 20.9 % O_2, 1000 mbar abs.
Oxygen	:	±0.1 % ± 1 digit
Temperature	:	±0.1 °C ±1 digit
Output signal (only O_2)	:	4..20 mA (2-wire) 0..10 V (3-wire)
Electrical isolation	:	input electrically isolated
Working temperature	:	0..50 °C
Power supply	:	12..30 V DC at 4..20 mA 18..30 V DC at 0..10 V
Permissible impedance	:	R_A [Ω] = (U_V [V] - 12 V) / 0.02 mA
Permissible load	:	R_L > 3000 Ω
Reverse voltage protect.	:	50 V permanent
Display	:	10 mm high, 4-digit LCD display
Electric connection	:	elbow-type plug (EN 175301-803/A), max. wire cross-section: 1.5 mm², wire diameter from 4.5..7.0 mm
Sensor connection	:	5-pole screw-able diode socket
Calibration	:	1-point-calibration at atmospheric air
Air pressure compensat.	:	500..2000 hPa abs., manual input
Over- / under-pressure	:	max. 0.25 bar
Housing	:	ABS

O_2-sensor element

	GOEL 370
Measuring range	0.0..100.0 % O_2
Response time T_{90}	< 10 s
Application	for air or pure oxygen or for air or air with high CO_2-concentration
	GOEL 380
Measuring range	0.0..25.0 % O_2
Response time T_{90}	< 5 s
Application	for air with little CO_2-concentration, response time shoots

Temp. compensation	:	integrated in oxygen sensor
Connection cable	:	1.3 m with 5-pole screw-able diode plug
Working pressure	:	500..2000 hPa (static) for air or gas inflow option GOO (oxygen probe GOO … / MU) is needed

Dimensions



Measuring probe : Ø 40 x 103 mm
(153 mm incl. bend protection)

Ordering code

OXY3690MP - 1. - 2. - 3. - 4.

1.	**O_2-sensor element**	
	0	GOEL 370 for air and pure oxygen
	1	GOEL 380
2.	**Sensor design**	
	GGO	closed sensor design (suited for over- and under- pressure, used at gas-tight systems)
	GOO	open sensor design (e.g. suitable for air or gas inflow, pressure cannot be built up)
3.	**Output signal**	
	A1	4..20 mA (2-wire)
	V2	0..10 V (3-wire)
4.	**Cable length**	
	L01	1.3 m cable
	L10	10 m cable

Ordering example: OXY3690MP-0-GGO-A1-L01

Accessories / Spare parts

GOEL 370

Spare sensor element

Measuring transducer incl. electrode for dissolved oxygen in liquids OXY 3610 MP

- **Interchangeable O_2 electrode**
- **Electrode: active membrane type with integrated NTC resistance**
- **Galvanically isolated input**
- **Incl. galvanic oxygen sensor with temperature measurement**
- **Local display**

Features

The OXY 3610 MP is designed for measurement of oxygen concentrations in liquids. Depending on the accuracy requirement of the measurement, the sensor can simply be calibrated in air (ideally, use a calibration bottle) at the push of a button, e.g. once per week.
The OXY 3610 MP is used in aquariums, fish husbandry and in measurement of spring water and well water.

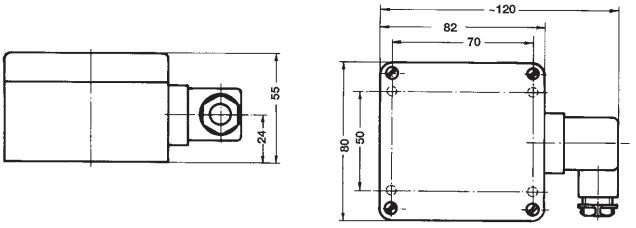
Technical data

Measuring range		
Oxygen concentration	:	0.00..25.00 mg/l (dissolved)
Temperature	:	0.0..50.0°C
Accuracy (measuring transducer)		
Oxygen	:	±1.5 % of measured value ±0.2 mg/l
Temperature	:	±0.1 °C ±1 digit
Output signal (only O_2)	:	4..20 mA, (2-wire) 0..10 V (3-wire option)
Galvanic Isolation	:	Galvanically isolated input
Working temperature	:	0 – 50 °C
Auxiliary energy	:	12..30 V DC at 4..20 mA 18..30 V DC at 0..10 V
Permissible resistance	:	R_A [Ω] = (U_V [V] - 12 V) / 0.02 mA
Permissible load	:	R_L > 3000 Ω
Reverse polarity protection Display	:	10 mm height, 4-digit display
Electrical connection	:	Angle connector acc. to EN 175301-803/A, maximum cable cross-section: 1.5 mm², cable diameter of 4.5..7.0 mm
Sensor connection	:	5-pole diode socket, screw-fitting
Calibration	:	1-point calibration in atmospheric air
Housing	:	ABS

O_2 electrode (GWO 3600 MU)

Electrode	:	Active membrane type, with integrated NTC resistance
Response time	:	95 % in 10 s, temperature-dependent
Operating pressure	:	max. 3 bar
Flow speed	:	min. 30 cm/s
Connection cable	:	4 m with 5-pole diode plug, screw-fitting

Dimension



Oxygen probe : Diameter Ø: 12.0 ±0.2 mm
Installation length: 110 mm
Overall length: 220 mm incl. anti-kink protection

Ordering code

OXY3610MP - 1. - 2.

1.	**Output signal**	
	A1	4..20 mA, (2-wire)
	V2	0..10 V (3-wire)
2.	**Cable length**	
	L04	4 m cable
	L10	10 m cable
	L20	20 m cable
	L30	30 m cable

Order example:
OXY3610MP-A1-L04

Accessories / Spare parts

GWO 3600-L04-MU (article no. 607198)
Spare electrode with 4 m cable

GWO 3600-L10-MU (article no. 610382)
Spare electrode with 10 m cable

GSKA 3600 (article no. 601414)
PVC protective cap, sinking

GAS 3600 (article no. 603497)
Working set (comprising 3 spare membrane heads and 100 ml of KOH electrolyte)

GWOK 01 (article no. 601411)
Spare membrane head

KOH 100 (article no. 603356)
Spare electrolyte KOH, 100 ml bottle

GCAL 3610 (article no. 611371)
Calibration bottle

CO_2 Transmitter GT10-CO2-1R

- **Excellent long term stability**
- **Auto-calibration procedure**
- **Output signal freely scalable**

Characteristics

The high-quality and precise CO_2 transmitter works according to the infrared principle (NDIR). An auto-calibration procedure compensates aging effects. This ensures the the excellent long-term stability of this transmitter.

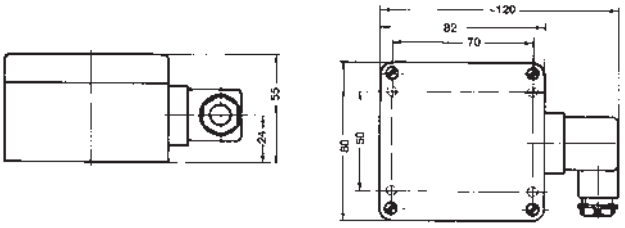
Due to the fact that CO_2 is an important indicator for air quality in rooms, it is very important for modern climate control to measures the CO_2 content.

Due to the freely adjustable output signal the transmitter can be used for nearly each existing controller input.
Additionally, there is an on-site display which shows beside the current CO_2 concentration the minimum and maximum values as well as an optical alarm.

Technical data

Measuring range		
MB1	:	0..2000 ppm CO_2
MB2	:	0..5000 ppm CO_2
Measuring principle	:	infrared principle (NDIR)
Accuracy		
MB1	:	±50 ppm ± 2 % of meas. value
MB2	:	±50 ppm ± 3 % of meas. value
Output signal (only O_2)	:	4..20 mA, 0..1 V, 0..10 V (3-wire)
Working temperature	:	-10..+50°C
Power supply	:	12..30 V DC at 4..20 mA and 0..1 V 18..30 V DC at 0..10 V max. 600 mA
Permissible burden	:	R_A < 200 Ω
Permissible load	:	R_L > 3000 Ω
Display	:	10 mm high, 4-digit LCD-display
Electric connection	:	elbow-type plug (EN 175301-803/A), max. wire cross section: 1.5 mm², wire diameter from 4.5..7.0 mm
Housing	:	ABS

Dimensions



Ordering code

GT10-CO2-1R - [1.] - [2.]

1.	**Measuring range**	
	MB1	MB1: 0..2000 ppm CO_2
	MB2	MB2: 0..5000 ppm CO_2
2.	**Output signal**	
	A1	4..20 mA (3-wire)
	V1	0..1 V (3-wire)
	V2	0..10 V (3-wire)

Ordering example:
GT10-CO2-1R-MB1-A1

Optical oxygen measuring transducer GODOX 200

Standard version – ST (with storage bottle)

Salt water version – PS (with storage bottle)

- **Low-maintenance optical measuring without electrolyte**
- **No flow required**
- **Two 4-20 mA (or 0-5V, switchable) outputs: concentration and saturation**
- **Full pressure and temperature compensation**
- **Salt water correction de/activatable**
- **Low-maintenance and durable**
- **Calibration only 1 time per year in many applications!**
- **Easily replaceable membrane heads**

Features

The GODOX 200 oxygen measuring transducer is a durable measuring system for low-maintenance continuous use in water.
In comparison with electrochemical sensors, it is provided without electrolyte, making it significantly more operationally stable and uncomplicated. Problems associated with flow are completely eliminated as a result!
Measurement takes place with a fluorescence run time method. Together with the complete data preparation, including automatic environmental pressure, temperature and activatable salt water compensation, it is a worry-free package for permanent measurement applications.
Measurement is possible to a maximum depth of 30 m.
The service life of the easily replaceable measuring membrane is normally 2 years.

The PS version is produced entirely in PVC and permanently resistant to salt water.

Technical data

Measuring ranges
(both can be used simultaneously)

Oxygen concentration	:	0..20 mg/l (=ppm)
Oxygen saturation	:	0..200 % O_2
Output signal	:	4..20mA or 0..5V (switchable)
Accuracy	:	±0.1 mg/l below 1 mg/l ±0.2 mg/l above 1 mg/l
Response time T90	:	<30 seconds
Operating temperature	:	0..65 ºC
Max. pressure	:	3 bar or 30 m water column
Protection rating		
Evaluation electronics protection with outdoor use)	:	IP40 (ensure adequate weather
Power supply	:	5..16 V DC, max. 160mA

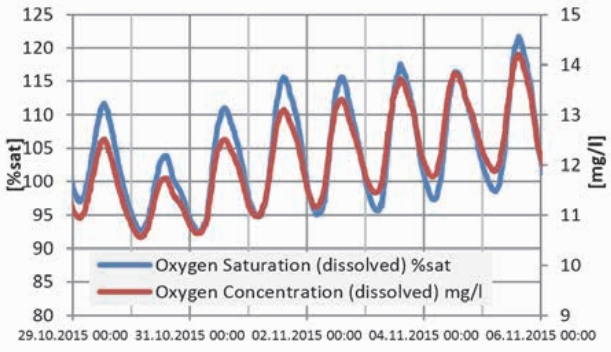
Material

Housing		
Standard version –ST	:	PVC/stainless steel
Salt water version –PS	:	PVC
Membrane	:	PET

Sensor dimensions

Length	:	225 mm length
Installation length	:	70.5 mm
Diameter	:	42.1 mm
Installation diameter	:	28.0 mm
Process connection (others available on request)	:	1" NPT front/rear

Data evaluation with data logger connected



„Sonniger Herbst am Fluss Regen in Regenstauf“

Connections

Loose cable ends:

No	Colour	Description
1	red	Power supply +
2	black	Power supply -, GND signal
3	green	O_2 concentration signal
4	white	O_2 saturation signal

Ordering code

GODOX 200

Standard version –ST
Article number 608019

Salt water version –PS
Article number 608020

Scope of delivery

- Measuring transducer, comprising sensor body and evaluation electronics, connected by cable
- Storage cap

Accessories

- **GSKA 200 (**article no. 607992)
  Stainless steel protective cap
  (mechanical protection / protection from animals)
- **EMS 200 (**article no. 607990**)**
  Spare membrane head set
- **Power supply: Mains adapter GNG 12/300**
  (article no. 600274)

Analysis

Optical oxygen measuring transducer GODOX 200

Standard version – ST (with storage bottle)

Salt water version – PS (with storage bottle)

- **Low-maintenance optical measuring without electrolyte**
- **No flow required**
- **Two 4-20 mA (or 0-5V, switchable) outputs: concentration and saturation**
- **Full pressure and temperature compensation**
- **Salt water correction de/activatable**
- **Low-maintenance and durable**
- **Calibration only 1 time per year in many applications!**
- **Easily replaceable membrane heads**

Features

The GODOX 200 oxygen measuring transducer is a durable measuring system for low-maintenance continuous use in water.
In comparison with electrochemical sensors, it is provided without electrolyte, making it significantly more operationally stable and uncomplicated. Problems associated with flow are completely eliminated as a result!
Measurement takes place with a fluorescence run time method. Together with the complete data preparation, including automatic environmental pressure, temperature and activatable salt water compensation, it is a worry-free package for permanent measurement applications.
Measurement is possible to a maximum depth of 30 m.
The service life of the easily replaceable measuring membrane is normally 2 years.

The PS version is produced entirely in PVC and permanently resistant to salt water.

Technical data

Measuring ranges
(both can be used simultaneously)

Oxygen concentration	:	0..20 mg/l (=ppm)
Oxygen saturation	:	0..200 % O_2
Output signal	:	4..20mA or 0..5V (switchable)
Accuracy	:	±0.1 mg/l below 1 mg/l ±0.2 mg/l above 1 mg/l
Response time T90	:	<30 seconds
Operating temperature	:	0..65 ºC
Max. pressure	:	3 bar or 30 m water column
Protection rating		
Evaluation electronics protection with outdoor use)	:	IP40 (ensure adequate weather
Power supply	:	5..16 V DC, max. 160mA

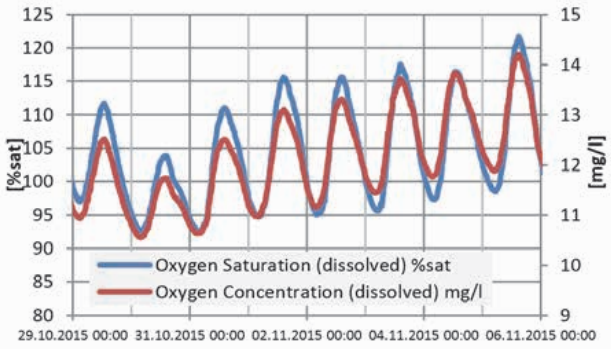
Material

Housing		
Standard version –ST	:	PVC/stainless steel
Salt water version –PS	:	PVC
Membrane	:	PET

Sensor dimensions

Length	:	225 mm length
Installation length	:	70.5 mm
Diameter	:	42.1 mm
Installation diameter	:	28.0 mm
Process connection (others available on request)	:	1" NPT front/rear

Data evaluation with data logger connected



„Sonniger Herbst am Fluss Regen in Regenstauf“

Connections

Loose cable ends:

No	Colour	Description
1	red	Power supply +
2	black	Power supply -, GND signal
3	green	O_2 concentration signal
4	white	O_2 saturation signal

Ordering code

GODOX 200

Standard version –ST
Article number 608019

Salt water version –PS
Article number 608020

Scope of delivery

- Measuring transducer, comprising sensor body and evaluation electronics, connected by cable
- Storage cap

Accessories

- **GSKA 200 (**article no. 607992)
  Stainless steel protective cap
  (mechanical protection / protection from animals)
- **EMS 200 (**article no. 607990**)**
  Spare membrane head set
- **Power supply: Mains adapter GNG 12/300**
  (article no. 600274)

Analysis

Waterproof pH Measuring Device G 1500 / G 1501

G 1500

G 1501

- **Made in Germany**
- **Modern and functional housing**
- **Outstanding price/performance ratio**
- **Waterproof (IP65 / IP67)**
- **3-line display / overhead display at the push of a button**
- **Backlighting**
- **Durable, long battery life**
- **BNC connection for alternating electrodes**
- **including low-maintenance pH electrode GE 114 WD**
- **Hold function for freezing of measurement values**
- **min/max function for minimum and maximum recorded measurements**

Features

The primary focus in the development of the new G 1000 series was placed on the essential functions of the measurement technology. Pure measurement with a focus on precision, speed and reliability packaged in a compact housing distinguish an impressive price/performance ratio, Made in Germany.
The new handheld measuring devices also impress with their ergonomic design, dust and water-protected design according to IP 65/67 and the illuminated display. The compact pH-meter is a real alternative to pH sticks and expensive, complex devices. The measuring device G 1500 enables measurements in the pH range; the G 1501 offers the additional option of measurements in the pH/ Redox range with a temperature input (Pt1000).
The measuring devices can be used in aquarium, aquaculture and surface water monitoring, plant cultivation, agricultural, laboratory, quality assurance, service and food applications.

Technical data

Measuring range	:	0.0..14.00 pH
Accuracy	:	±0.02 pH ± 1 digit (at nominal temperature of 25 °C)
Additional with G 1501	:	ORP ± 1500 mV
	:	Temperature -0.5 .. +105.0 °C
Display	:	3-line with battery status indicator, background light, protected by an unbreakable pane, overhead display at the push of a button
Sensors/ Measuring inputs	:	pH electrode connectible via BNC, standard GE 114 WD Temperature compensation can be set on the device or, with G 1501, automatically via temperature input
Additional with G 1501	:	ORP electrodes via BNC Temperature input Pt1000 via 2 x 4 mm socket, combination electrodes can be connected with a 4 mm plug
Operating conditions	:	-20..+50 °C
Power supply	:	2x AA battery, >3000 h battery life
Ingress protection	:	IP65 / IP67 (only with electrodes with waterproof BNC connection)
Housing	:	Break-proof ABS housing
Dimensions	:	108 x 54 x 28 mm (H x W x T) without sensor connection
Weight w/o electrode	:	approx. 130 g (G 1500), approx. 135 g (G 1501)

Electrode GE 114 WD (article no. 610460)

Low-maintenance gel electrode GE 114 WD (waterproof BNC connection)

Technical data

Measuring range	:	0.0..14.00 pH, 0..60 °C
Conductivity	:	>200 µS/ cm
Waterproof	:	waterproof according to IP 65/67
Pressure-proof	:	no
Cable	:	1 m
Electrolyte	:	Gel-Electrolyte
Diaphragm	:	1 x Pellon
Electrode shaft	:	Epoxy, Ø 12 mm x 120 mm
Characteristics	:	low cost, low maintenance

Scope of delivery

- **Dust-proof, water-protected handheld measuring device according to IP 65/67 with BNC connection for changeable electrodes**
- **GE 114 WD electrode**
- **Test report**
- **2x AA battery**
- **Operating manual**

Ordering code

	1.	
G 1500	–	

1.	Option	
		Device complete with pH electrode GE 114 WD
	GL	Device alone (without pH electrode)
	SET	Device complete with pH electrode GE 114 WD, GAK 1400 and case GKK 1001

	1.	
G 1501	–	

1.	Option	
		Device complete with pH electrode GE 114 WD
	G125	Device complete with pH electrode GE 125 WD (Pt1000)
	GL	Device alone (without pH electrode)
	SET	Device complete with electrode GE 114-WD + GF1T 3mm + GPH4.0/5+ GPH7.0/5 + 2x GPF100
	SET114	Device complete with pH electrode GE 114 WD, T-sensor GF1T-T3-B-BS, GAK 1400 and case GKK 1001
	SET 125	Device complete with pH electrode GE 125, GAK 1400 and case GKK 1001

Accessories

GE 100 BNC (article no. 600704)
Universal electrode, pH electrode replacement

PHL 4 (article no. 601370)
ready-to-use buffer solution (pH 4.01 / 25 °C), 250 ml

PHL 7 (article no. 601371)
ready-to-use buffer solution (pH 7.00 / 25 °C), 250 ml

PHL 10 (article no. 601373)
ready-to-use buffer solution (pH 10.01 / 25 °C), 250 ml

GAK 1400 (article no. 603523)
Working and calibration set consisting of:
5 of each of GPH 4.0, GPH 7.0 and GPH 10.0 buffer capsules, 3 x 100 ml plastic bottle GPF 100, 1 x 3 mol KCL electrolyte KCL3M and 1 x cleaning solution GRL 100

GB AA (article no. 610049)
Spare battery AA (2 batteries required)

Case for G 1501

GKK 1001 (article no. 611604)
With recesses for device and ample room for accessories (395 x 295 x 106 mm)

GKK 1002 (article no. 411907)
With recesses for a device with sensor of G1400/G1500/G1600 series. Additional recess for temperature sensor GF1T (235 x 185 x 48 mm)

GKK 1003 (article no. 411917)
With recesses for 2 devices with sensor of G1400/G1500/G1600 series. Additional recess for temperature sensor GF1T and 2 PHL buffer and accessories (450 x 360 x 106 mm)

GKK 1100 (article no. 601060)
Case with nap foam for universal application (340 x 275 x 83 mm), suitable to accommodate accessories

Additional accessories

GE 101 GE 120 GE 151 GE 125

	GE 101	GE 120	GE 151	GE 125
suitable for	Soil examination, food sample emulsions, sea water, suspensions	Measuring electrode for food samples	aquarium water, fish breeding, beverage, sea water, process chemistry	Low-maintenance universal pH electrode, incl. Pt1000 sensor
Measuring range	2 .. 11 pH 0 .. 60 °C	0 .. 14 pH 0 .. 60 °C	0 .. 14 pH 0 .. 80 °C	0 .. 14 pH 0 .. 70 °C
Conductivity	> 100 µS / cm	> 200 µS / cm	> 100 µS / cm	> 200 µS / cm
Temperature measurement	no	no	no	Integr. Pt100 sensor, 4mm banana connection
Waterproof	no	no	no	yes
Cable	1 m [1)]	1 m	1 m [1)]	2 m
Electrolyte	3 mol/l KCl	Gel-Electrolyte	3 mol/l KCl	Gel-Electrolyte
Diaphragm	2 x ceramic	2 x ceramic	1 x ceramic	1 x ceramic
Electrode shaft	Glass, Ø 12 or 6 mm x 120 mm	PVC, Ø 22 mm x 110 mm	Glass, Ø 12 mm x 120 mm	Epoxy, Ø 12 mm x 120 mm
Specific details	Tip Ø 6 mm, small sample volume	Insertion electrode, blade Ø13 mm x60mm	Chemical-resistant glass shaft	Waterproof, IP67 (also BNC plug)
Article no.	600693	600698	600727	600732

[1)] Cable lengths of up to 5 m available on request.

- Additional accessories on request or in our catalogue

Temperature Measuring Device G1700 Series

- **Available in 2 versions**
  - with permanently connected sensor
  - with BNC connection for quickly changing sensors and precise, waterproof measurement (IP65 / IP67)
- **Three-line display / overhead display at the push of a button**
- **Backlighting**
- **Sensor and cable temporarily (2 hours) resistant to temperatures up to 250°C; sensor and cable permanently resistant to temperatures up to 230°C, alarm function**
- **Hold function to freeze displayed measurements, min/ max function for minimum and maximum detected measurement**
- **Adjustable**

General information

The primary focus in the development of the new G 1000 series was place on the essential functions of the measurement technology. Pure measurement with a focus on precision, speed and reliability packaged in a compact housing distinguish an impressive price/performance ratio, Made in Germany.
The new handheld measuring devices also impress with their ergonomic design, dust and water-protected design according to IP 65/67 and the illuminated display.
The compact thermometer is available with a practical BNC connection for interchangeable sensors or as a complete device including sensor with maximum overall precision. The device redefines our entry-level measurement class - calibration log included.
The matching sensors can be used at temperatures of up to 250 °C (incl. handle and cable) and are distinguished by their compact design and small tube diameter. Integrated: High-quality Pt1000 sensors.

Application

Precise measurements in liquids and air, for measurement of core temperatures (with insertion probe) or application temperature
Sensor handle and cable withstand temperatures up to 250 °C (permanent application temperature 230 °C);
Laboratories, quality assurance, service, food, etc.

Technical Data

Measuring range	:	-70.0..+250.0 °C (-94.0..+482.0 °F) with fixed Pt1000 sensor; -200.0..+450.0 °C (-328.0..+842.0 °F) with BNC sensor (observe permissible range of the sensor!)
Accuracy (at nominal temperature = 25 °C)		
G 1700	:	-20 ... +100 °C: ±0.1 K ±1 digit (device otherwise with 0.1 % of measured value ±2 digits, BNC connection) plus sensor inaccuracy
G 1710 / 20 / 30	:	-20 .. +100 °C: ±0.1 K ±1 digit (device with fixed -70..+250 °C: ±0.2 % of measured value ±2 digit connected sensor)
Operating conditions	:	-20 ... +50 °C; 0..95 % r.h. (device) (non-condensing), temporarily usable up to 100% relative humidity
Display /Backlighting	:	3-line unit, with background light, protected by an unbreakable pane, overhead display at the push of a button
Power supply	:	2 x AA battery, approx. 5000 h operating time
Protection rating	:	IP65 / IP67 (only with waterproof sensors in the connected state for devices with BNC connection)
Housing	:	Break-proof ABS housing
Dimensions	:	108 x 54 x 28 mm (H x W x T) without sensor connection
Weight	:	130 g (without sensor)
Connection G 1700	:	BNC socket: for interchangeable sensors, see accessories / interchangeable sensors
Scope of delivery	:	- Dust-proof and waterproof handheld measuring device (with or without sensor) according to IP 65/67, calibration report 2x AA battery, operating manual

Sensors


G1710 sensor


G1720 sensor


G1730 sensor

Sensor technical data

G 1710 : Immersion sensor, Ø 3 mm, Pt1000 2-wire fixed connection, V4A, 1m cable

G 1720 : durable insertion sensor Ø 3 mm, Pt1000 2-wire fixed connection, V4A, 1m cable

G 1730 : extra-thin insertion sensor Ø 1.5 mm, Pt1000 2-wire fixed connection, V4A, 1 m cable

Sensor reaction time (T90) : Ø 3 mm: Water 0.4 m/s < 2 s; Ø 1.5 mm: Water 0.4 m/s < 1 s

Ordering code

G 1700 - 1. ☐

1.	Option	
	0	Waterproof alarm thermometer with BNC connection, without sensor

G 1710 - 1. ☐

1.	Option	
	0	Waterproof alarm thermometer with universal sensor, Ø3 mm, handle and cable temporarily resistant to temperatures up to 250°C, permanently resistant up to 230°C

G 1720 - 1. ☐

1.	Option	
	0	Waterproof alarm thermometer with universal sensor, Ø3 mm, handle and cable temporarily resistant to temperatures up to 250°C, permanently to 230°C

G 1730 - 1. ☐

1.	Option	
	0	Waterproof alarm thermometer with quick insertion probe, Ø1.5 mm, handle and cable temporarily resistant to temperatures up to 250°C, permanently resistant up to 230°C

Accessories / interchangeable sensors

1.	**Pt1000 immersion sensor, Art. no. 609549 (like G 1710)**
	Pt1000 insertion sensor, with BNC connector, Ø 3 mm GF 1T-T3-B-BNC
2.	**Pt1000 insertion sensor, Art. no. 609639 (like G 1720)**
	Pt1000 insertion sensor, with BNC connector, Ø 3 mm GF 1T-E3-B-BNC
3.	**Pt1000 insertion probe, extra thin, Art. no. 609645 (like G 1730)**
	Pt1000 insertion probe, with BNC connector, Ø 1.5 mm GF 1T-E1.5-B-BNC
4.	**GB AA, Art. no.: 610049**
	Spare battery AA (2 batteries required)

Other accuracy classes available on request

Additional beneficial accessories and services

1.	**Air/gas sensor, GLF 175-BNC, Art. no. 607162 Large sensor handle, not waterproof**
	for clean media, -70..+200 °C, Pt1000 class B
2.	**Frozen goods sensor GGF 175 -BNC, Art. no. 610397 Large sensor handle, plug connection not waterproof**
	for insertion into frozen goods, determines core temperature -70..+200 °C, Pt1000 class B
3.	**Air / pipe-mounted sensor GTF 2000-BNC, Art. no. 607164, plug connection not waterproof**
	-50..+200 °C, Pt1000 class B
4.	**Surface sensor GOF 175-BNC, Art. no. 607163 Large sensor handle, not waterproof**
	for solid surfaces, -70..+200 °C, Pt1000 class B
5.	**Calibration service with calibration certificate**

Additional accessories on request or in our catalogue.

GHM Messtechnik GmbH – General Terms and Conditions of Business

§ 1 Scope of Application and Definitions

1. These General Terms and Conditions of Business ("GTC") shall apply exclusively to legal relations between GHM Messtechnik GmbH ("GHM"), consisting of GHM Greisinger, GHM Honsberg, GHM Martens and GHM IMTRON, and customers. The GTC also apply to the sale of DELTA Ohm products as a member of the GHM Group via GHM Messtechnik GmbH. Any provisions which deviate from, contradict or supplement these GTC shall, even upon knowledge thereof, not be recognised and are hereby expressly objected to, unless there is express and written agreement to the customer's contradicting terms and conditions of business.
2. A customer within the meaning of these GTC is an entrepreneur (§ 14 BGB), legal person under public law or special fund under public law which submits an order to GHM or concludes a contract with GHM. GHM does not supply to consumers (§ 13 BGB).
3. GHM reserves the right to change the GTCs for future orders. In this regard, please check the GHM website.

§ 2 Conclusion of Contract

1. The product catalogues issued by GHM as well as other brochures and technical documentation do not constitute an offer to conclude a contract but rather merely an invitation to the customer to submit a written offer to GHM to conclude a contract.
2. Offers by GHM are subject to confirmation and are non-binding, unless expressly designated as binding by GHM. Contracts are only concluded by way of written order confirmation by GHM or by way of delivery. Orally issued orders shall only become effective once confirmed in writing by GHM. Amendments to a concluded contract must be confirmed in writing by GHM in order to be effective.
3. A customer order which qualifies as an offer to conclude a contract may be accepted by GHM within 2 weeks. Acceptance and dispatch of the ordered products shall have the same effect.

§ 3 Scope of performance obligation

1. The scope of the performance obligation of GHM shall be determined in accordance with the relevant contract. GHM reserves the right to make changes to technical data as well as changes to form, colour and/or weight within reasonable bounds.
2. GHM is entitled to render partial performance where this is reasonable according to the individual circumstances of the customer. The invoices issued in this regard are payable independently of the total delivery.
3. Product details and usage criteria in product catalogues, brochures and technical documentation as well as other information material provided by GHM to the customer and product descriptions are not to be understood as either guarantees of a particular quality of the products or as a simple agreement as to quality; such quality guarantees and quality agreements must be expressly agreed in writing.

§ 4 Prices / Payments / Interest on Late Payments / Set-off

1. All prices specified in the product catalogues, brochures and technical documentation as well as other information material issued by GHM are exclusive of the relevant applicable VAT, unless they are stated to include VAT. Packaging, freight, postage, requested export certificates as well as any other shipping costs and insurance are additionally to be paid by the customer unless otherwise agreed.
2. Unless fixed prices are expressly agreed, the specified prices are based on GHM's production costs at the time of order confirmation. In the event of unforeseeable increases in production costs that are beyond GHM's control, GHM reserves the right to increase prices accordingly where the delivery or service is not required to be rendered within 4 months of conclusion of the contract.
3. Unless otherwise agreed in writing, all payments must be made within 30 days of the date of invoice without deduction in full to the specified payment agent.
4. If payments are deferred or the customer is in default of payment, the statutory interest for late payment between businesses shall be due (currently 9 percentage points over the relevant base interest rate in accordance with § 288 para 2 BGB). According to § 286 para 3 BGB, default of payment – even without a notice – occurs where the customer does not make payment within 30 days of the due date for payment and receipt of an invoice or or an equivalent payment schedule.
5. The customer only has rights of set-off or retention to the extent that its claim is legally established or undisputed. In the event of defective delivery, the counter-rights of the customer in particular in accordance with § 8.2 of these GTC shall remain unaffected.

§ 5 Force Majeure

Unforeseen breakdowns, delayed deliveries or non-delivery by suppliers of GHM (including intra-group suppliers of GHM), shortage of labour, power or raw materials, strikes, lockouts, difficulties in providing means of transport, traffic disruptions, government orders, embargoes, boycotts and other events of force majeure shall relieve the party affected thereby of its obligation to supply or accept the items, as the case may be, for the duration of and to the extent of such hindrance. If, in consequence, delivery or acceptance is delayed by more than one month, either party may, to the exclusion of all further claims, withdraw from the contract in respect of the quantities affected by such delivery or acceptance hindrance.

§ 6 Delivery and Transfer of Risk

1. The place of performance and fulfilment is the place from which delivery is effected.
2. In the event that the customer requests that the contractual item is sent to another location, the risk of accidental loss passes to the customer upon handover of the item to the first freight carrier. This shall also apply if the customer refuses to accept the delivery. Unless agreed otherwise, GHM is free to select the manner of shipping. The packaging material is to be recycled or properly disposed of by the customer at its own cost. § 11 shall apply mutatis mutandis.
3. Delivery dates and deadlines are only binding if the contracting parties have made an express agreement to this effect. In case of doubt, delivery deadlines begin on the date of order confirmation. If there is a temporary hindrance to performance which is beyond GHM's control, the delivery dates and deadlines shall be extended correspondingly. This applies in particular in cases of force majeure within the meaning of § 5. Occurrence of delivery delay by GHM shall be determined in accordance with legal regulations. In any case a notice by the customer shall however be necessary.

§ 7 Retention of Ownership

1. Until full payment of all of our present and future claims arising out of the ongoing business relationship with the customer ("secured claims") we retain ownership of the contractual items. The customer shall handle the contractual items with care and shall store them safely at no cost.
2. Prior to full payment of the secured claims, the contractual items subject to retention of ownership may not be pledged to third parties or used as security. The customer shall notify GHM promptly in writing if an application is filed for the initiation of insolvency proceedings or where third parties have access (e.g. by way of pledges) to the contractual items belonging to GHM.
3. Where the customer is in breach of the contract, in particular in the case of non-payment of the due amount under the contract, GHM may in accordance with legal regulations withdraw from the contract and/or demand that contractual items be returned on the basis of the retention of ownership. The demand for return does not simultaneously constitute the withdrawal; GHM is moreover entitled to make the demand for return and reserve the right to withdraw. If the customer does not pay the due amount under the contract, GHM may only assert these rights if GHM has given the customer a reasonable deadline to make payment without success or where such a setting of a deadline is not required in accordance with legal regulations.
4. Until the time of withdrawal in accordance with (c) below, the customer is authorised to continue to sell on and/or to process the contractual items which are subject to retention of ownership within the ordinary course of business. In such a case the following supplemental provisions shall apply:

a) The retention of ownership shall extend to the full value of products resulting from the processing or combining of the contractual items, whereby GHM shall remain the manufacturer. In the event that processing or combining uses third party items which are subject to ownership rights, the customer hereby transfers to GHM co-ownership in the proportion of the invoice value of the processed or combined contractual items. GHM hereby accepts the transfer. Otherwise, the same shall apply to the resulting product as to the contractual items delivered under retention of ownership.

b) The customer hereby assigns to GHM as security any claims against third parties arising out of the onward sale of the contractual items in their entirety or in the amount of any proportion co-owned by GHM in accordance with the previous paragraph. GHM hereby accepts the assignment. The obligations of the customer set out in paragraph 2 shall also apply in regard to assigned claims.

c) The customer shall remain authorised to redeem the claim in addition to GHM. GHM is obliged not to redeem the claim as long as the customer meets its payment obligations to GHM, there is no defect in its ability to perform and GHM does not assert ownership by exercising a right in accordance with paragraph 3. If this is however the case, GHM may demand that the customer discloses the claims assigned to GHM and their creditors, provides all necessary information for redemption, hands over the associated documentation and informs the (third party) creditor of the assignment. Furthermore, in such a case GHM shall be entitled to revoke the authorisation of the customer for the onward sale and processing of the items subject to retention of ownership.

d) If the realisable value of the security exceeds the claims of GHM by more than 10%, GHM shall at the request of the customer select and release security.

§ 8 Guarantee

1. The customer shall check whether the delivered contractual item is in accordance with the contract and is suitable for the intended purpose. The obligation to inspect and issue a complaint in accordance with §§ 377, 381 HGB shall also apply to customers who are not fully vested commercial agents within the meaning of the law. Apparent defects shall be notified to GHM within two weeks and non-apparent defects promptly after discovery. Damage to packaging is to be noted in the freight paperwork or notified in writing to the delivery shipping service and to GHM by the 6th day after delivery at the latest.
2. In the case of duly notified defects, at its own choice and taking into consideration the interests of the customer, GHM shall either rectify the defect or deliver defect-free replacement items. If these measures are not successful after two attempts to rectify, the customer may exercise its statutory rights. The right of GHM to refuse to rectify in accordance with the statutory requirements shall remain unaffected.
3. All guarantee claims lapse 12 months after the statutory start date of the prescription period. This deadline does not apply if the law according to § 438 para 1 number 2 BGB (buildings and items for buildings) and § 634a para 1 no 2 BGB (building faults) prescribes longer deadlines, or in case of deliberate action, fraudulent concealment of the fault, or if a guarantee of quality has not been fulfilled.

§ 9 Exchanges and Repairs outside of the Guarantee

1. GHM is not obliged to give an exchange and in the event of custom orders, exchange shall be excluded.
2. Where GHM however voluntarily declares that it will take back a standard item, without any obligation in accordance with guarantee regulations or any guarantee given, 20% of the purchase price shall be retained where the item is undamaged. In the case of damaged goods, any additional necessary repair costs shall also be deducted.
3. Where GHM is to perform repairs for the customer which do not follow within the framework of the guarantee or any given guarantee, the repair item shall be sent back at the cost of the customer. Where a cost estimate is requested by the customer for the repair, GHM is entitled to additionally invoice this work in the amount actually incurred.

§ 10 Limitation of Liability

1. The liability of GHM for damages, regardless of the legal basis, in particular due to impossibility, delay, defective or incorrect delivery, breach of contract, breach of obligations in contractual negotiations and unlawful acts (unerlaubte Handlungen) is, to the extent that this involves culpability (Verschulden), limited in accordance with this § 10.
2. GHM is not liable in the case of simple negligence of its management bodies, legal representatives, employees or other vicarious agents (Erfüllungsgehilfen), to the extent that this does not relate to a breach of material contractual obligations (vertragswesentliche Pflichten). Material contractual obligations are obligations compliance with which facilitates proper performance of the contract, so in particular the obligation to deliver in a timely manner, the conformity of the delivered items with the agreed quality characteristics, as well as advisory, protective and due care obligations, and the protection of life or health of the customer's personnel or the protection of its property from material damage.
3. Where GHM is liable in accordance with and on the grounds of § 10.2, such liability shall be limited to damages which GHM foresaw upon conclusion of the contract as a possible consequence of a breach of contract or which GHM should have foreseen when exercising due care and attention (verkehrsübliche Sorgfalt). Indirect damages and consequential damages, which are the consequence of defects in the delivered item, shall only be compensated to the extent they are typically to be expected in the course of a proper use of the delivered item.
4. In the event of a delivery delay caused by our simple negligence, the amount of default damages which the customer may claim shall be limited to a maximum of 5 % of the agreed net contract price for each complete week of delivery delay and in total to a maximum of 20 % of the agreed net contract price.
5. Where we provide technical information or act in a consulting capacity and such information or consulting is not included in the contractually agreed scope of performance owed by us, this shall take place free of charge and under exclusion of any liability.
6. The aforementioned exclusions and limitations on liability shall apply to the same extent for the benefit of management bodies, legal representatives, employees or other vicarious agents (Erfüllungsgehilfen) of GHM.
7. The limitations set out in this § 10 shall not apply to liability of GHM for wilful misconduct, for guaranteed quality characteristics, for damage to life, body or health or in accordance with the German Product Liability Act (ProdHaftG).
8. If the customer sells the delivered item unchanged or after processing, transforming or combining with other items, the customer shall release us internally from all product liability claims by third parties, to the extent that the customer is responsible for the circumstances giving rise to the liability.

§ 11 Disposal of Electronic Devices

1. To the extent that electronic devices are the contractual items, the disposal of old devices (§ 3 no 3 ElektroG) used outside private households (§ 3 no 5 ElektroG) shall be subject to the following paragraphs. For any technical questions, please contact info@greisinger.de.
2. The customer shall dispose of the delivered electronic devices at the end of their useful lives at its own cost and in accordance with the relevant legal regulations. The customer shall release GHM from manufacturer obligations under § 19 ElektroG and in that context from any associated claims by third parties.
3. In the event that delivered devices are transferred to commercial third parties, the customer is obliged to also subject such third parties in writing to the obligation to properly dispose of the devices at the end of their useful lives, to bear the costs thereof and in the event of a further transfer, to effect a transfer of the obligation in accordance with this provision.
4. In the event that the customer fails to contractually oblige third parties to undertake proper disposal and to oblige third parties to pass on the obligation in accordance with § 11.2, the customer shall be obliged to take back the delivered goods at the end of their useful lives at its cost and to dispose of them properly in accordance with legal regulations. This shall also apply where the obligation of the third party was not made in writing and the third party disputes contractual assumption of the duty to dispose.
5. GHM's right to have the customer hold harmless and release GHM will not expire before two years have passed after the final use of the device. This two-year expiry restriction begins no earlier than the date of GHM receiving a written notification from the customer of the end of the device's use. However, the claim to hold harmless and release will expire no later than 30 years after it comes into existence.

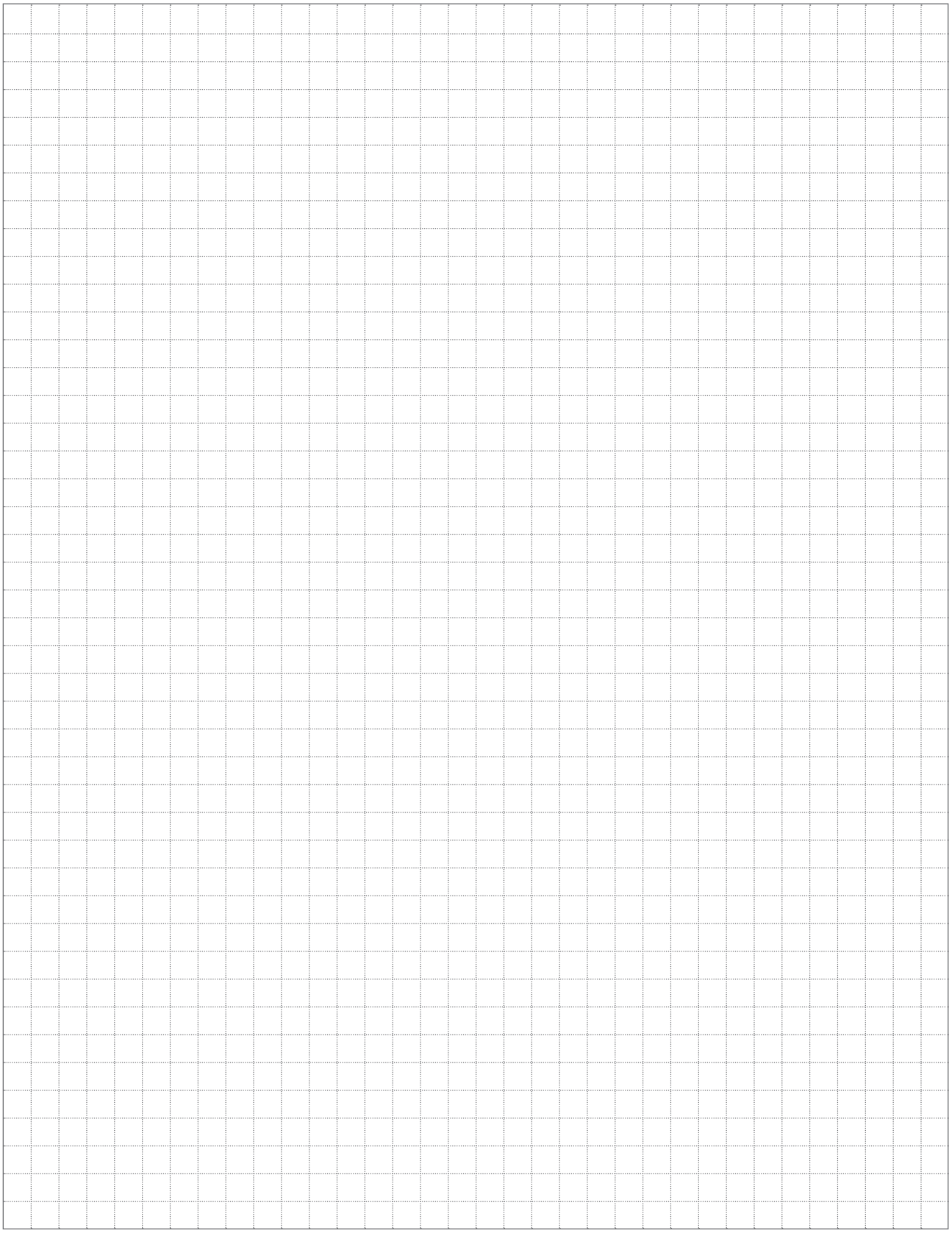
§ 12 Miscellaneous

1. Unless otherwise agreed, the law of the Federal Republic of Germany shall exclusively apply, under the exclusion of the rules concerning the conflict of laws applicable under that law. The United Nations Convention on Contracts for the International Sale of Goods of 11.04.1980 is not applicable.
2. The place of jurisdiction shall be Wuppertal or at the election of GHM, the competent court at the seat of the customer.
3. In the event that a provision of these GTC or of the contract is or becomes wholly or partly void, ineffective or unenforceable, the effectiveness and enforceability of all other remaining provisions shall not be affected thereby. The void, ineffective or unenforceable provision shall be deemed replaced by such effective and enforceable provision which comes as close as possible to the commercial meaning and purpose of the void, ineffective or unenforceable provision with regard to its object, scope, time, place and scope of application. This shall apply mutatis mutandis to any gaps in these GTC or the contract.
4. The contractual language shall be German. In the event that interpretation is necessary, only the German version of this text shall be relevant. Translations into other languages are exclusively for information purposes.

Status: 11 / 2018

Index

Notice



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