

Capacitive Level DATASHEET

JUNHO 2013

Tel: (+351) 21 843 64 00
Fax: (+351) 21 843 64 09
geral@bhb.pt www.bhb.pt

- For continuous level measurement of liquid and bulk-solid materials
- Direct mounting into containers, silos, vessels, basins, reservoirs, etc
- Easy and quick connecting by connector
- Continuous adjustment of initial capacity
- Variants for usage in explosive areas, high temperature performance
- Current (4 ... 20 mA) or voltage (0 ... 10 V) output



Capacitive level meters CLM® are designed for continuous level measurement of liquids, powders and bulk-solid materials in vessels, tanks, sumps, containers, silos, etc. CLM consists of the stainless steel housing with electronic module and the measuring electrode. Type of measuring electrode is defined by kind of use and type of measured media.

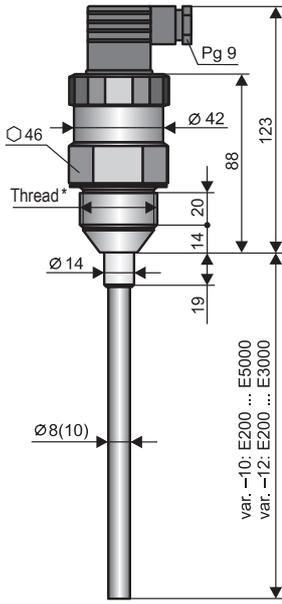
Sensitivity (SPAN) and initial capacity compensation (ZERO) can be fluently set. CLMs are offered in version (N) for non-hazardous environments or (Xi) version to explosive areas up to zone 0 or zone 20, high temperature performance and several types of process coupling are also available.

FEATURES OF VARIANTS

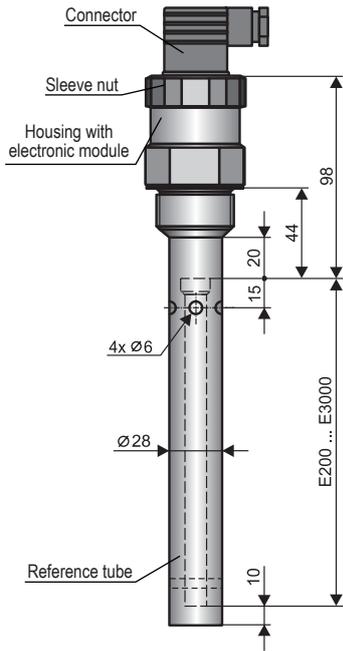
- **CLM-36_-10** **With uncoated rod electrode** for level measurement of non-conductive liquids (oils, diesel, petrol) and powder or bulk-solid materials (flour, sand, cement, plastic granulates, etc.).
Max. length 5 m.
- **CLM-36_-11** **With fully (PFA) coated rod electrode** for level measurement of water and conductive liquids incl. wasted liquids in metallic vessels, concrete sumps, reservoirs, etc., better behaviour against aggressive media, lower adhesion to some complicated media, chemical resistance.
Max. length 3 m.
- **CLM-36_-12** **With fully (FEP) coated rod electrode** for level measurement of water and conductive liquids incl. wasted liquids in metallic vessels, concrete sumps, reservoirs, etc., better behaviour against aggressive media, lower adhesion to some complicated media, chemical resistance.
Max. length 3 m.
- **CLM-36_-20** **With uncoated rod electrode and reference tube** for accurate level measurement of clean non-conductive liquids (oils, diesel, petrol). By means of reference tube the output signal does not depend on the dimensions and shapes of a vessel.
Max. length 3 m.
- **CLM-36_-22** **With fully FEP coated rod electrode and reference tube** for accurate level measurement of conductive liquids. Main use is for measurement in plastic vessels or tanks. Impossible to use for waste and high viscosity liquids and bulk-solid materials.
Max. length 3 m.
- **CLM-36_-30** **With uncoated stainless steel rope electrode and uncoated weight** for level measurement of bulk-solid materials (grains, sand, flour, cement, etc.).
Max. length 20 m.
- **CLM-36_-31** **With uncoated stainless steel rope electrode and coated dynamic anchorage** for level measurement of bulk-solid materials in higher silos.
Max. length 20 m.
- **CLM-36_-32** **With fully coated rope electrode and coated weight** (rope insulation FEP, weight insulation PTFE), for level measurement of electrically conductive and non-conductive liquids.
Max. length 20 m.
- **CLM-36_-40** **With two coated electrodes** (rope insulation FEP, head fully PTFE), for level measurement of aggressive liquids. Performance for non-explosive areas only.
Max. length 2 m.

DIMENSIONS DRAWINGS

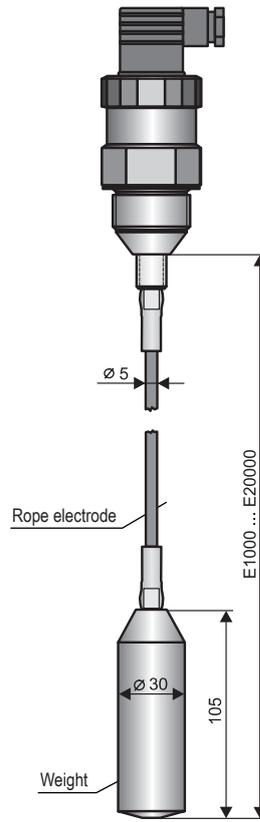
CLM-36_-10, 11, 12



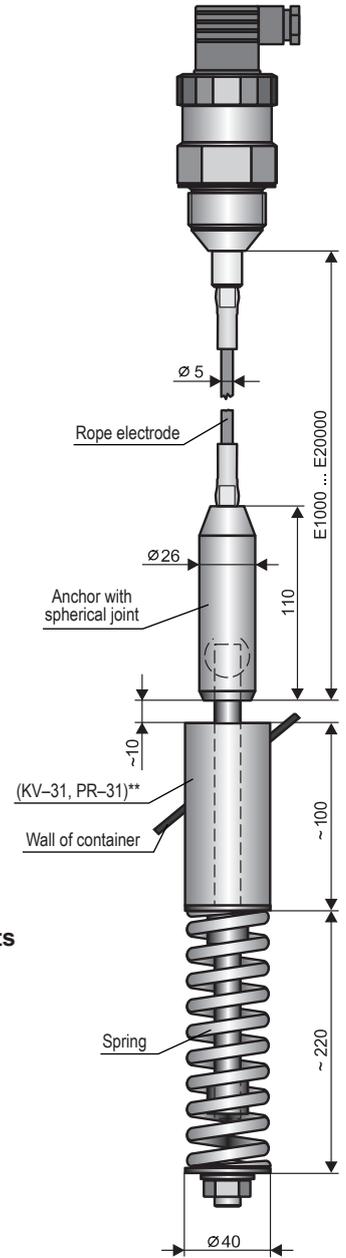
CLM-36_-20, 22



CLM-36_-30



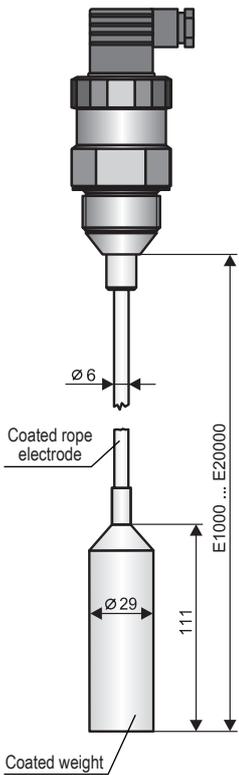
CLM-36_-31



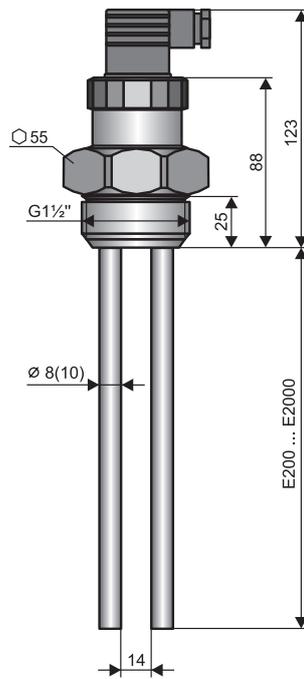
* Threads M36x2 or G1"

** Anchor welding cylinder KV-31 or Dust-tight bushing PR-31 (see accessories)

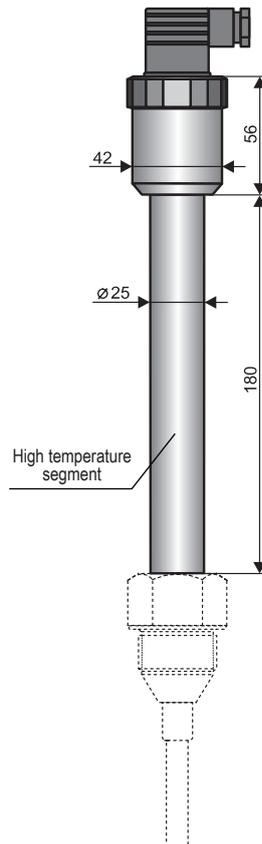
CLM-36_-32



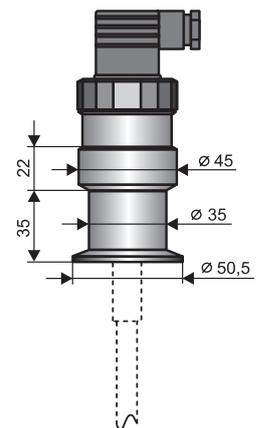
CLM-36_-40



**High temperature variants
CLM-36_T**



**Housing with
Tri-clamp coupling**



TECHNICAL SPECIFICATION (variants N, NT)		
Supply voltage	CLM-36N(T)-__-_-I CLM-36N(T)-__-_-U	9 ... 36 V DC 16 ... 36 V DC
Current output Voltage output		4 ... 20 mA 0 ... 10 V
Power consumption (off-load)	CLM-36N(T)-__-_-U	approx. 8 mA
Sensitivity ranges		20 ; 30 ; 50 ; 100 ; 150 ; 300 ; 500 ; 1000 pF
Initial capacity regulation ratio		min. 1:2
Nonlinearity		max. 1 %
Temperature error		max. 0.05% / K
Voltage error for current and voltage output		max. 0.3 μ A/V and 0.1 mV/V
Internal resistance / Electric strength (Electrode – Housing)		1 M Ω / 250 V AC
Coupling capacity / Electric strength (Housing – Supply leads)		51 nF / 250 V AC
Protection class	Standard Optional (Connector GAN-DADE 7A or GAN-DAEE 7A)	IP67 (Housing), IP65 (Connector) IP67
Maximal load (serial) resistance for current output (U = 24 V)		R _{max} = 750 Ω
Minimal load resistance for voltage output		R _{min} > 1 k Ω
Weight (exclude electrode)	Version N, Xi Version NT, XiT	approx. 0.5 kg approx. 1 kg

ELECTRICAL PARAMETERS (variants Xi, XiT)	
Supply voltage	9 ... 30 V DC
Max. internal values	U _i = 30 V DC; I _i = 132 mA; P _i = 0.99 W; C _i = 370 nF; L _i = 0.9 mH
Internal resistance / Electric strength (Electrode – Housing)	1 M Ω / 250 V AC
Coupling capacity / Electric strength (Housing – Supply leads)	26 nF / 500 V AC
Allowed temperature range in zone 0 (EN 50284)	-20 ... +60°C
Allowed pressure range in zone 0 (EN 50284)	0.08 ... 0.11 MPa

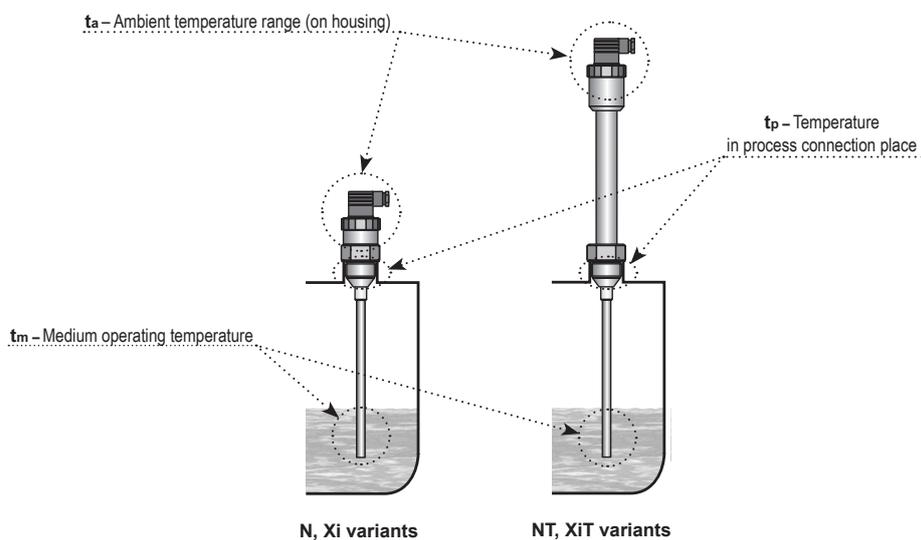
USED MATERIALS			
Sensor part	Variants	Standard material	Optional (on request)
Housing	All types, except CLM-36_-40	St. Steel W. Nr. 1.4301 (AISI 304)	St. Steel W. Nr. 1.4571 (AISI 316 Ti) St. Steel W. Nr. 2.4858 (Incoloy 825)
	CLM-36_-40	PTFE	–
Insulating bushing	All types, except CLM-36_-40	PTFE	–
Electrode	CLM-36_-10, 12, 20, 22, 40	St. Steel W. Nr. 1.4301 (AISI 304)	St. Steel W. Nr. 1.4571 (AISI 316 Ti)
	CLM-36_-30, 31	St. Steel W. Nr. 1.4404 (AISI 316 L)	–
	CLM-36_-32	Zinc Steel rope	–
Electrode coating	CLM-36_-12, 22, 32, 40	FEP	–
	CLM-36_-11	PFA	–
	CLM-36_-31	Polyolefin (modified PE)	PTFE
Weight insulation	CLM-36_-32	PTFE	–
Weight / Anchor mechanism	CLM-36_-30, 31, 32	St. Steel W. Nr. 1.4301 (AISI 304)	–
Reference tube	CLM-36_-20, 22	St. Steel W. Nr. 1.4301 (AISI 304)	St. Steel W. Nr. 1.4571 (AISI 316 Ti)

WORKING AREAS (acc. to EN 60079-14 and EN 50281-1-2)	
CLM-36N	Performance for non-explosive areas
CLM-36NT	High temperature performance, for max. temperatures in coupling place 200°C
CLM-36Xi	Performance for explosive areas (combustible dusts, gases or vapours) ⊕ II 1 GD T 83°C Ex ia IIB T5 with isolating repeater (e.g. IRU-420). Whole CLM in zone 0 and 20
CLM-36XiT	High temperature performance (max. 200°C) for explosive areas ⊕ II 1/2 GD T 83°C Ex ia IIB T5 isolating repeater (e.g. IRU-420). Electrode part zone 0 and 20, housing zone 1 and 21

PROCESS CONNECTION		
Type	Size	Marking
Metric thread	M36x2	M
Pipe thread	G 1"	G
Pipe thread for CLM-36N-40	G 1½"	G
Tri-clamp (standards DN 20)	–	Cl

TEPLOTNÍ A TLAKOVÁ ODOLNOST

varianta provedení	teplota t_p	teplota t_m	teplota t_a	maximální přetlak pro teplotu t_p				
				do 30°C	do 85°C	do 130°C	do 160°C	do 200°C
CLM-36N-10, 20	-40°C ... +85°C	-40°C ... +300°C	-40°C ... +85°C	7 MPa	5 MPa	–	–	–
CLM-36N-11, 12, 22	-40°C ... +85°C	-40°C ... +200°C	-40°C ... +85°C	4 MPa	2 MPa	–	–	–
CLM-36N-30	-40°C ... +85°C	-40°C ... +200°C	-40°C ... +85°C	7 MPa	5 MPa	–	–	–
CLM-36N-31 (vč. PR-31)	-40°C ... +85°C	-40°C ... +130°C	-40°C ... +85°C	–	–	–	–	–
CLM-36N-31 (vč. KV-31)	-40°C ... +85°C	-40°C ... +250°C	-40°C ... +85°C	–	–	–	–	–
CLM-36N-32	-40°C ... +85°C	-40°C ... +130°C	-40°C ... +85°C	1 MPa	0.5 MPa	–	–	–
CLM-36N-40	-40°C ... +85°C	-40°C ... +100°C	-40°C ... +85°C	0.1 MPa	0.1 MPa	–	–	–
CLM-36Xi-10, 20	-40°C ... +75°C	-40°C ... +200°C	-40°C ... +75°C	7 MPa	5 MPa	–	–	–
CLM-36Xi-11, 12, 22	-40°C ... +75°C	-40°C ... +120°C	-40°C ... +75°C	4 MPa	2 MPa	–	–	–
CLM-36Xi-30	-40°C ... +75°C	-40°C ... +105°C	-40°C ... +75°C	7 MPa	5 MPa	–	–	–
CLM-36Xi-31 (vč. PR-31)	-40°C ... +75°C	-40°C ... +105°C	-40°C ... +75°C	–	–	–	–	–
CLM-36Xi-31 (vč. KV-31)	-40°C ... +75°C	-40°C ... +105°C	-40°C ... +75°C	–	–	–	–	–
CLM-36Xi-32	-40°C ... +75°C	-40°C ... +105°C	-40°C ... +75°C	1 MPa	0.5 MPa	–	–	–
CLM-36NT-10, 20	-40°C ... +200°C	-40°C ... +300°C	-40°C ... +85°C	7 MPa	5 MPa	3 MPa	2 MPa	1 MPa
CLM-36NT-11, 12, 22	-40°C ... +200°C	-40°C ... +200°C	-40°C ... +85°C	6 MPa	4 MPa	2 MPa	1.5 MPa	0.3 MPa
CLM-36NT-30	-40°C ... +130°C	-40°C ... +250°C	-40°C ... +85°C	7 MPa	5 MPa	3 MPa	–	–
CLM-36NT-31 (vč. PR-31)	-40°C ... +130°C	-40°C ... +130°C	-40°C ... +85°C	–	–	–	–	–
CLM-36NT-31 (vč. KV-31)	-40°C ... +130°C	-40°C ... +250°C	-40°C ... +85°C	–	–	–	–	–
CLM-36NT-32	-40°C ... +130°C	-40°C ... +130°C	-40°C ... +85°C	1 MPa	0.5 MPa	0,1 MPa	–	–
CLM-36XiT-10, 20	-40°C ... +200°C	-40°C ... +200°C	-40°C ... +75°C	7 MPa	5 MPa	3 MPa	2 MPa	1 MPa
CLM-36XiT-11, 12, 22	-40°C ... +200°C	-40°C ... +120°C	-40°C ... +75°C	6 MPa	4 MPa	2 MPa	1.5 MPa	0.3 MPa
CLM-36XiT-30	-40°C ... +130°C	-40°C ... +250°C	-40°C ... +75°C	7 MPa	5 MPa	3 MPa	–	–
CLM-36XiT-31 (vč. PR-31)	-40°C ... +130°C	-40°C ... +130°C	-40°C ... +75°C	–	–	–	–	–
CLM-36XiT-31 (vč. KV-31)	-40°C ... +130°C	-40°C ... +250°C	-40°C ... +75°C	–	–	–	–	–
CLM-36XiT-32	-40°C ... +130°C	-40°C ... +130°C	-40°C ... +75°C	1 MPa	0.5 MPa	0.1 MPa	–	–

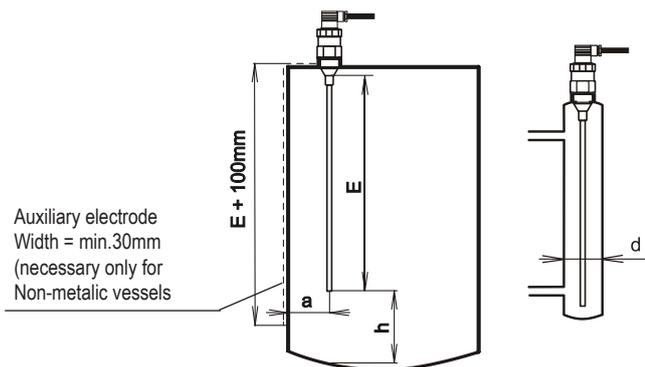


INSTALLATION

Level meters are designed to mounting in vertical position on the top lid of a tank or a container by means of welding flanges, stainless steel fixing nuts or Triclamp coupling. When installed into metallic wall vessel it is not necessary to ground the housing of CLM. In the case of use in concrete basins or silos it is recommended to install the CLM on metallic bracket or auxiliary metallic construction electrically connected with the liquid (water), or connected with metallic armour of silo. In the case of measuring in glass or plastic vessels by CLM without the reference tube (electrode) it is necessary to build up an auxiliary electrode (metallic tape) on outer wall of a vessel and connect it with CLM housing (by screw located on the housing). Material of auxiliary electrode is necessary to choose in accordance with working environment or character of measured material. Orientation dimension drawings for mounting you can see below.

MOUNTING RECOMMENDATION

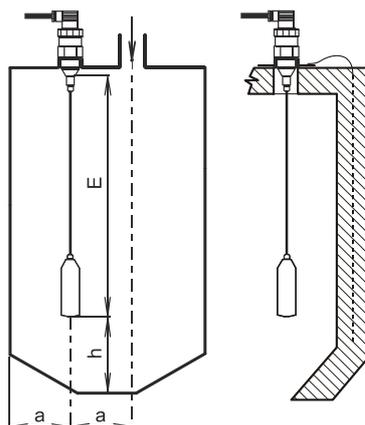
CLM-36_-10, 11, 12 Installation in metallic or non-metallic vessels



Auxiliary electrode
Width = min.30mm
(necessary only for
Non-metallic vessels)

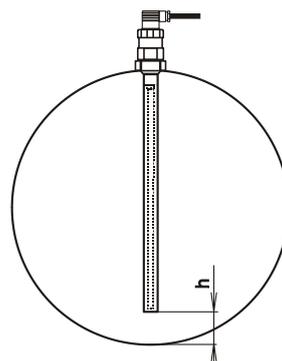
- E – The length of electrode - the lower end of the electrode has to be dipped min. 20 mm below the lowest measured level
- h – The distance from the bottom - min. 50 mm
- a – The distance from the wall - min. ca. E/20
- d – The diameter of auxiliary tube vessel - min. $40 + E/20$

CLM-36_-30 Installation in containers and silos CLM-36_-32 Installation in deep vessels and sumps



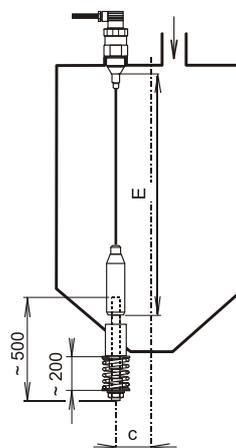
- E – The length of electrode - the lower end of the electrode has to be dipped - min. 20 mm below the lowest measured level
- h – The distance from the bottom - min. 100 mm
- a – The distance from the wall - at least E/20, as far as possible from the walls, to the middle between the wall and the vertical inlet

CLM-36_-20, 22 Variants with reference tube



- h – The distance from the bottom
min. 50 mm
- The distance from the wall is arbitrary.

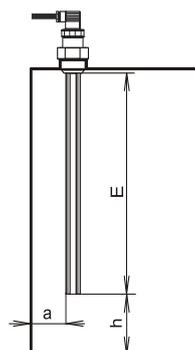
CLM-36_-31 Installation of rope electrode with anchor



- E – The length of electrode
- c – The distance from the axis of the silo (has to be minimised).

The length of the conduction rod ca. 500 mm. The length of the press spring ca. 200 mm. Steel anchor welding cylinder or dust-tight bushing (to be welded into the conical bottom wall).

CLM-36_-40-G Non-metallic vessels and aggressive liquids

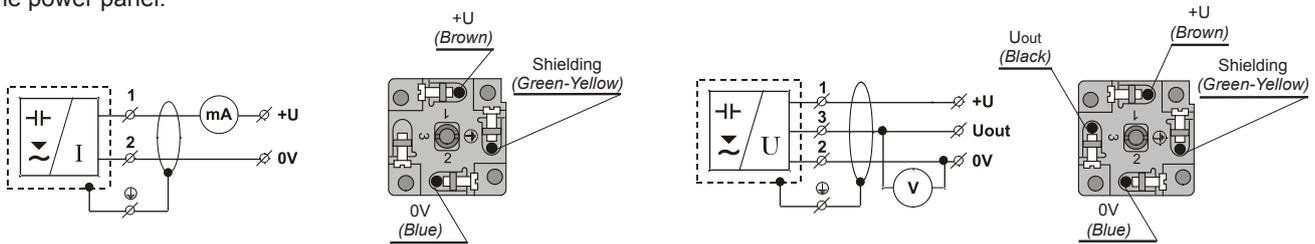


- E – The length of electrodes
the lower end of the electrodes have to be dipped min. 20 mm below the lowest measured level.
- h – The distance from the bottom
min. 30 mm
- a – The distance from the wall
(min. ca. E/20)

ELECTRICAL CONNECTION

The CLM is designed to be connected to supply unit or to controller through cable with outer diameter 6 to 8 mm (recommended cross section of cores 0.5 to 0.75 mm²) by means of connector which is included in delivery. The scheme and the inside of the connector are on pictures.

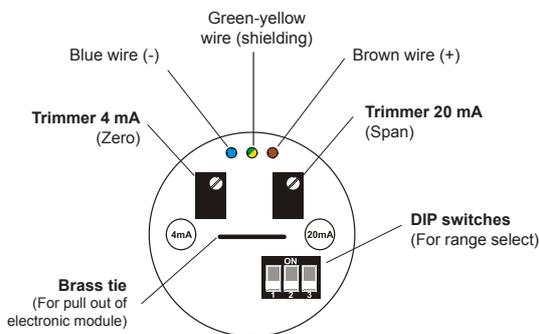
Shielded cable is necessary to use when the cable length is over 30 m. Connect shielding to the socket \oplus shielding do not connect to the power panel.



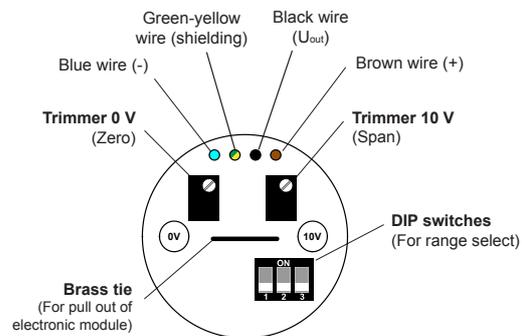
Connection scheme and inside of the connector socket

ADJUSTMENT ELEMENTS

The adjustment of level meter is by DIP switches and two trimmers 4 mA and 20 mA (to set min. and max. level). These adjustment elements are placed under outlet nut of level meter. For detailed information please read at the instructions.



The top view on the internal electronic module for current output (var. -I)



The top view on the internal electronic module for voltage output (var. -U)

ACCESSORIES

Standard – included in the level meter price

- 1x of seal, other seals are on request (PTFE, Al, etc.)
- 1x connector socket
- 1x screwdriver for adjustment (each 5 pcs)
- Distance element for rods longer than 50 cm (for CLM-36_-40)

Optional (see datasheets "Accessories")

- Connector with protection class IP67 (GAN-DADE 7A) with 5 m cable (current output)
- Connector with protection class IP67 (GAN-DAAE 7A) with 5 m cable (voltage output)
- Steel welding flange ON-36x2
- Stainless steel welding flange NN-36x2
- Stainless steel fixing nut UM-36x2
- Dust-tight bushing PR-31
- Anchor welding cylinder KV-31

SAFETY, PROTECTIONS, COMPATIBILITY AND EXPLOSION PROOF

Level meter CLM-36 is equipped with protection against electric shock on electrode, reverse polarity, output current overload, short circuit and short time over voltages.

Electromagnetic compatibility is provided by conformity with standards: EN 55022/B, EN 61326-1, EN 61000-4-2, EN 61000-4-3, EN 61000-4-4, EN 61000-4-5, EN 61000-4-6.

Explosion proof of CLM-36Xi is examined by FTZÚ-AO 210 Ostrava - Radvanice certificate No.: FTZÚ 02 ATEX 0235X.

Contactos/Contacts:

Comercial/Commercial:

Fernando Mena Costa
e-mail: fcosta@bhb.pt
Tel: (+351) 21 843 64 00
Fax: (+351) 21 843 64 09

Assistência/Service:

Patricia Costa
e-mail: ppcosta@bhb.pt
Tel: (+351) 21 843 64 00

