Capacitive level meters CLM-36

Description

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 removable electronic module and the measuring electrode. Type of measuring electrode is defined by kind of use and type of measured media. The electrode and its surroundings (the wall of vessel, the reference tube, etc.) make a capacitor. The value of which is proportional to the depth of immersion of the electrode.
The dielectric is made either from the medium (non-conductive materials) or from the coating of the electrode (conductive materials). Electronic module transforms the capacity to output current signal 4 ÷ 20 mA, (2-wire connection) or to voltage signal 0 ÷ 5 V (3-wire connection). Current signal is transmittable to long distances. The sensitivity of the CLM can be selected from 8 ranges. 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.)
- **CLM-36_ _-12-_** with fully FEP - coated rod electrode - for level measurement of water and electrically conductive liquids incl. wasted liquids in metallic vessels, concrete sumps, reservoirs, etc., 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. Impossible to use for waste and high viscosity liquids and bulk solid materials.
- **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.
- **CLM-36_ _-30-_** with rope electrode with polyolefin-coated steel rope and stainless steel weight, for level measurement of various bulk-solid materials (grain, plastic granulates, sand, cement, flour, etc.) and non-conductive liquids.
- **CLM-36_ _-31-_** as the type 30, in addition dynamic anchorage, for higher silos - up to 20 m
- **CLM-36_ _-32-_** with fully coated rope electrode (rope insulation FEP, weight insulation PTFE), for level measurement of electrically conductive and non-conductive liquids - lengths up to 20 m
- **CLM-36_ _-40-_** with 2 coated electrodes (rode insulation FEP, head fully PTFE), for level measurement of agressive liquids up to 2 m

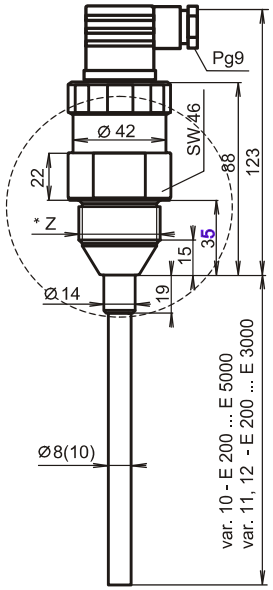
Proprocess connection

- **CLM-36_ _-_ _-M** thread process coupling M36x2
- **CLM-36_ _-_ _-G** thread process coupling G1"
- **CLM-36_ _-_ _-Cl** sanitary Triclamp process coupling

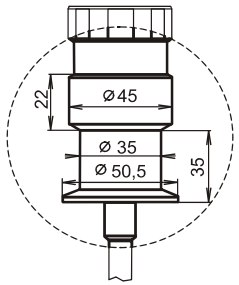
Performance

- **CLM-36N_-_ _-_** performance for normal areas
- **CLM-36Xi_-_ _-_** performance for explosive areas (combustible dusts, gases or vapours)
- **CLM-36_T-_ _-_** high-temperature performance, for max. temperatures in coupling place +200°C

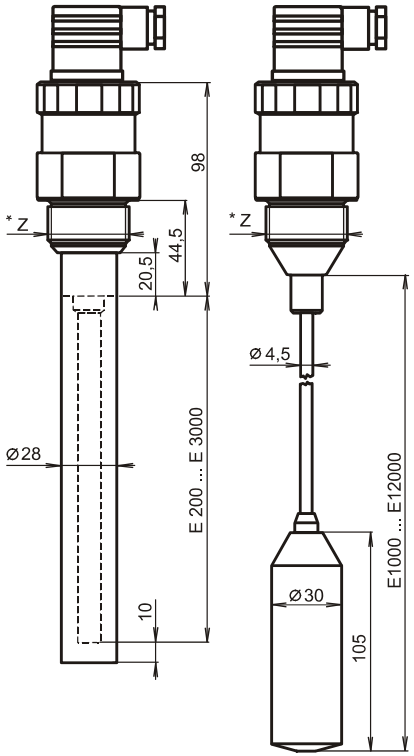
Variants of constructional design



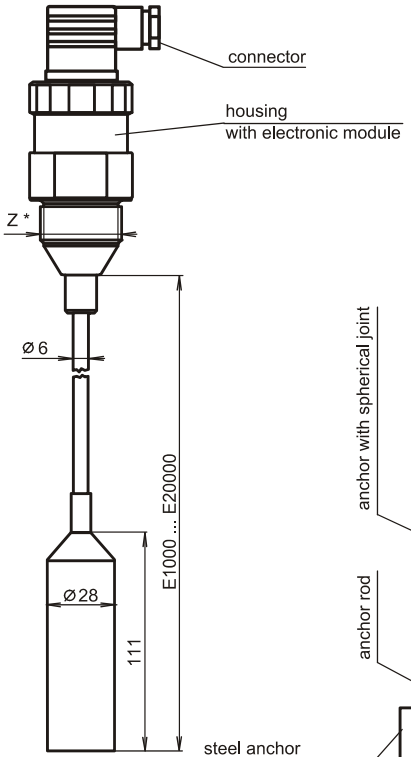
ver. M, G - housing with thread

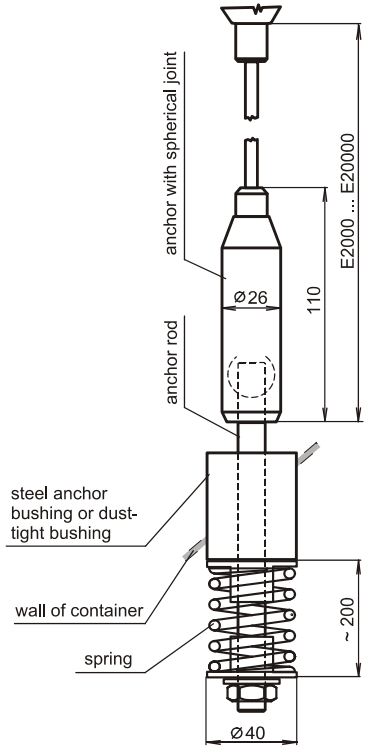


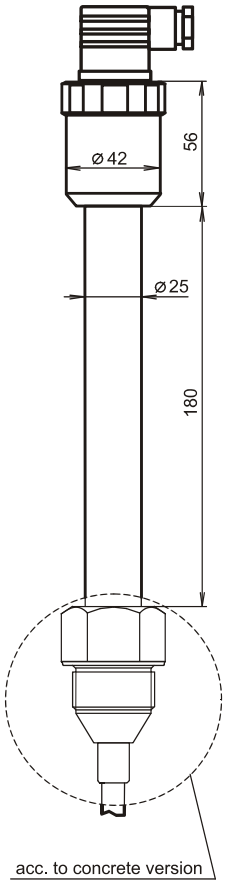
ver. CI - housing with Triclamp coupling

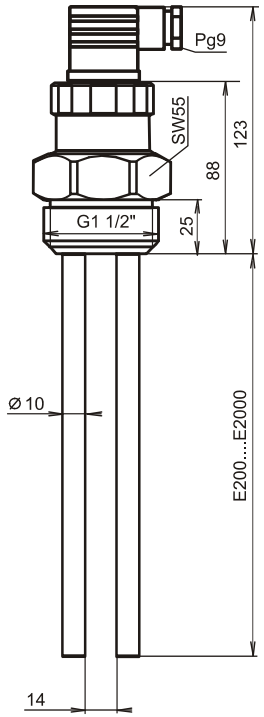


Z * - ver. M - metric thread M-36x2
ver. G - G1" thread









version with rod electrode

CLM-36_ _-10-_
CLM-36_ _-11-_
CLM-36_ _-12-_

version with rod electrode and reference tube

CLM-36_ _-20-_
CLM-36_ _-21-_
CLM-36_ _-22-_

versions with rope electrode

CLM-36_ _-30-_
CLM-36_ _-32-_

version with rope electrode with anchor

CLM-36_ _-31-_

high temperature performance

CLM-36_T-_ _-_

Version with two coated electrodes
- measuring and reference

CLM-36N-40-G

Technical specifications

Working areas (acc. to EN 60079-14, EN 50281-1-2) and performance

CLM-36N(T)-_ _-_				non-explosive
CLM-36Xi-_ _-_	Ⓔx II1GDT83°CEEXiaIIBT5	with isolating repeater (e.g. IRU-420)	whole CLM	zone 0, zone 20
CLM-36XiT-_ _-_	Ⓔx II1/2GDT83°CEEXiaIIBT5	with isolating repeater (e.g. IRU-420)	electrode part	zone 0, zone 20
			housing	zone 1, zone 21

Supply voltage: CLM-36N(T)-_ _-_ CLM-36Xi(T)-_ _-_	9 ÷ 36 V DC 9 ÷ 30 V DC
Current output Voltage output	4 mA ÷ 20 mA 0 V ÷ 5 V
Max. internal values of Xi version (only for current output)	Ui=30VDC Ii=132mA Pi=0,99W Ci=370nF Li=0,9mH
Sensitivity ranges	20, 30, 50, 100, 150, 300, 500, 1000 pF
Maximum capacity of medium overrun level	70, 250, 600, 1200, 3000, 7000, 18000, 36000 pF
Initial capacity regulation ratio	min. 1:2
Nonlinearity	max. 1 %
Temperature error	max. 0,05% / K
Voltage error for I-output and U-output	max. 0,3 µA / V and 0,1 mV / V
Internal resistance / electric strength (electrode - housing)	1 MΩ / 250 V AC
Coupling capacity / electric strength (housing - supply leads)	var. N 51 nF / 250 V AC var. Xi 26 nF / 500 V AC
Allowed temperature range in zone 0 (EN 50284)	-20 to +60°C
Allowed pressure range in zone 0 (EN 50284)	0,8 to 1,1 bar (0,08 to 0,11 MPa)
Protection class: - housing - connector type GDM 2009 (I-output), GDM 3009 (U-output) - connector type GDM-K 2000 (I-output), GDM-K 3000 (U-output)	IP 67 IP 65 (standard) IP 67 (optional)
Recommended cable	2 x 0,75 mm^2
Max. load (serial) resistance for I-output (U = 24 V)	R_{max} = 750 Ω
Max. load current of voltage output	I_{max} = 10 mA
Weight of the housing: - excl. electrode	ca. 0,5 kg
- high temperature performance NT, XiT	ca. 1 kg

Temperature and pressure durability

variant / performance	oper. temperature range (on electrode)	ambient temperature range (ta) variant N	variant Xi	max. oper. pressure for ta = -40 to +20°C	max. oper. pressure for ta = -40 to +85°C
CLM-36_ _-10, 20-_	-40 up to +200°C	-40 up to +85°C	-40 up to +75°C	3 MPa	1 MPa
CLM-36_ _-12, 22-_	-40 up to +120°C	-40 up to +85°C	-40 up to +75°C	3 MPa	1 MPa
CLM-36_ _-30, 31, 32-_	-40 up to +105°C	-40 up to +85°C	-40 up to +75°C	1 MPa	0,5 MPa
CLM-36_ _-40-_	-40 up to +120°C	-40 up to +85°C	-	0,1 MPa	0,1 MPa

Max. operational pressure of high temperature performance CLM-36_T-_ _-_

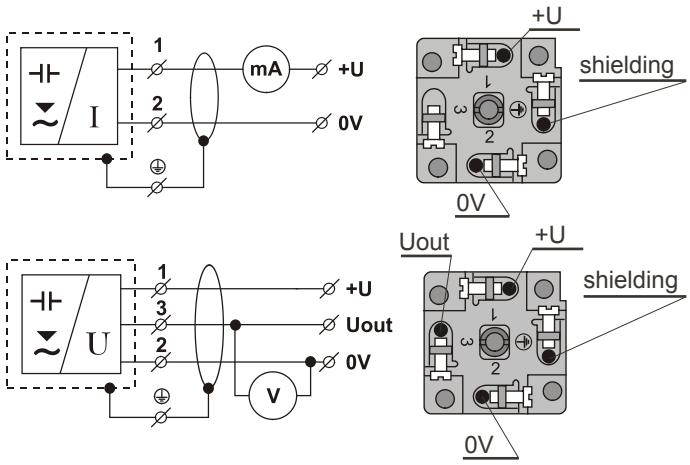
temperature in coupling place	+ 100°C	+120°C	+150°C	+180°C
max. pressure	3,0 MPa	2,0 MPa	1,5 MPa	0,5 MPa

Used materials

part of the CLM	type	standard material	optional (on request)
housing	all type, except CLM-36N-40	St. steel W. Nr. 1.4301 (AISI316)	St. steel W. Nr. 1.4571 (AISI316Ti)
	CLM-36N-40	PTFE	-
insulating bushing	all type, except CLM-36N-40	PTFE	-
electrode	CLM-36_ _-10, 12, 20, 22, 40-_	St. steel W. Nr. 1.4301 (AISI316)	St. steel W. Nr. 1.4571 (AISI316Ti)
	CLM-36_ _-30, 31, 32-_	zinc coated steel rope	-
elektrode coating	CLM-36_ _-12, 22, 32, 40-_	FEP	-
	CLM-36_ _-30, 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 (AISI316)	-
reference tube	CLM-36_ _-20, 22-_	St. steel W. Nr. 1.4306 (AISI316)	St. steel W. Nr. 1.4571 (AISI316Ti)

Electric connection

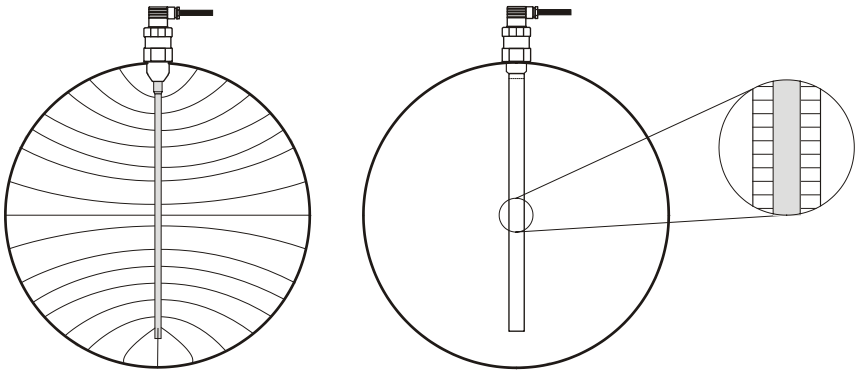
The CLM is designed to be connected to supply unit or to controller through cable with outer diameter 6-8 mm (recommended cross section of cores 0,5 - 0,75mm^2) by means of connector GDM (DIN 43650) which is included in delivery. The scheme and the inside of the connector are on pictures.
Shielded cable is necessary to use when the cable length is over 30m.
Connect shielding to the socket ⏚, shielding do not connect to the power panel.



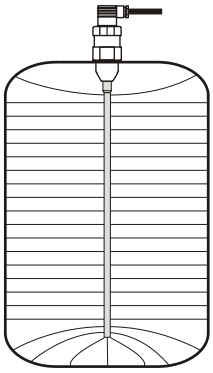
Connection scheme

The inside of the connector socket

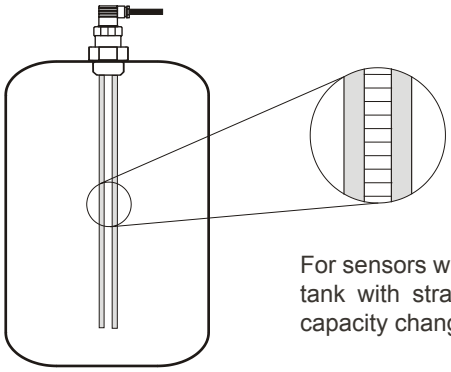
Influence of the tank shape on a linearity of measured capacity



In a curved tanks (most frequently horizontal cylinder) capacity change during measurement of electrically nonconductive material is nonlinear. Linearity is done through the use of reference tube (CLM-36_ _-20, 22-_). Linearization can be done also by reference electrode (CLM-36_ _-40)



In the tank with straight wall and with the sensor placed parallel with the wall capacity change is linear.



For sensors with two electrodes in the tank with straight and a curred wall capacity change is linear

Adjustment

The adjustment of level meter is by DIP switches and two trimmers - 4 mA and 20 mA (to sett min. and max. level). These adjustment elements are placed under outlet nut of level meter. The adjustment may be done by two ways:

1. Permitivity of measured medium is known (can be found from the table)
   - setting of 4 mA and 20 mA is in the given range specified by calculation (see instruction).

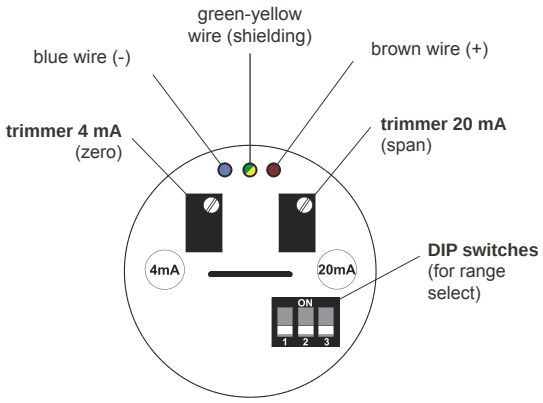
2. Permitivity of measured medium isn't known
   - setting of 4 mA is on depleted tank to minimum level (compensation of the beginning electrode capacity)
   - setting of 20 mA is on filled tank to maximum level. When it is impossible to fill up the tank at the maximum state you can set the level state at any known state and then to set the loop current obtained from the formula.

For more detailed adjustment about the product see in instruction.

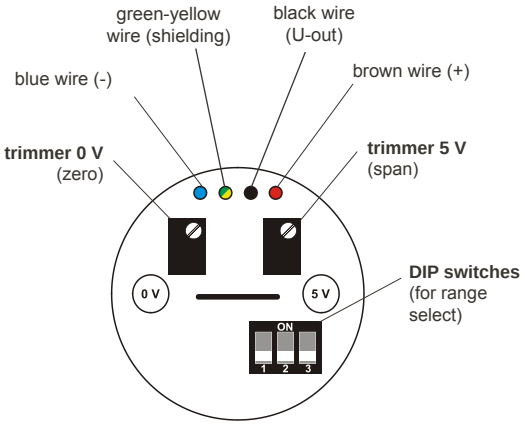
Range	Sensitivity*	Position of DIP switch
1	20 pF	
2	30 pF	
3	50 pF	
4	100 pF	
5	150 pF	
6	300 pF	
7	500 pF	
8	1000 pF	

**) Sensitivity: Minimal capacity change of electrode to reach current range 4 ÷ 20 mA.*

Adjustment elements



(the top view on the internal electronic module for I-output CLM - 36 _ _ - _ _ - _ - I)



(the top view on the internal electronic module for U-output CLM - 36N - _ _ - _ - U)

Accessories

standard - (no extra charges)

for each pc of CLM
- 1 pc of seal (asbestos free), other seals are on request (PTFE, Al, etc.)
- 1 pc connector socket GDM 2009

for each delivery (each 5 pcs)
- 1 pc screwdriver for adjustment

optional - (see datasheet "accessories")
- connector type GDM-K with protection class IP 67 - typ GDM-K 2000 with cable 5 m (for I-out)
- connector type GDM-K with protection class IP 67 - typ GDM-K 3000 with cable 5 m (for U-out)
- steel welding flange ON-36x2
- stainless steel welding flange NN-36x2
- stainless steel fixing nut UM-36x2
- distance element for rods longer than 50 cm

Specification system

CLM-36 □□ - □□ - □ - □ □

E xxxx length of electrode in mm

I - output current signal 4 ÷ 20 mA, **U -** output current signal 0 ÷ 5 V

process connection: **M** - thread M36x2 / **G** - thread G1" / **Cl** - Triclamp / **G** - thread G1 1/2" for CLM-36N-40

performance:
- **N** - normal - for non-explosive areas
- **Xi** - explosion proof - intrinsically safe for hazardous (explosive) areas, only with I-output
- **NT, XiT** - high temperature

electrode performance
- **10** - rod, uncoated (lengths from 0,2 to 5 m)
- **12** - rod, FEP coated (lengths from 0,2 to 3 m)
- **20** - rod, uncoated, with ref. tube (lengths from 0,2 to 3 m)
- **22** - rod, FEP coated, with ref. tube (lengths from 0,2 to 3 m)
- **30** - rope, with coated rope uncoated weight (lengths from 1 to 12 m)
- **31** - as 30 with anchor (lengths from 2 to 20 m)
- **32** - rope, FEP coated rope, PTFE coated weight (lengths from 2 to 12 m)
- **40** - two rods, FEP coated (lengths from 0,2 to 2 m)

Examples of correct specification

CLM-36N-10-G-I E1100
CLM-36Xi-20-M-I E900
CLM-36N-12-Cl-I E2000
CLM-36NT-12-M-I E1500
CLM-36Xi-30-M-I E12000
CLM-36N-32-G-U E6000

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 overvoltages.

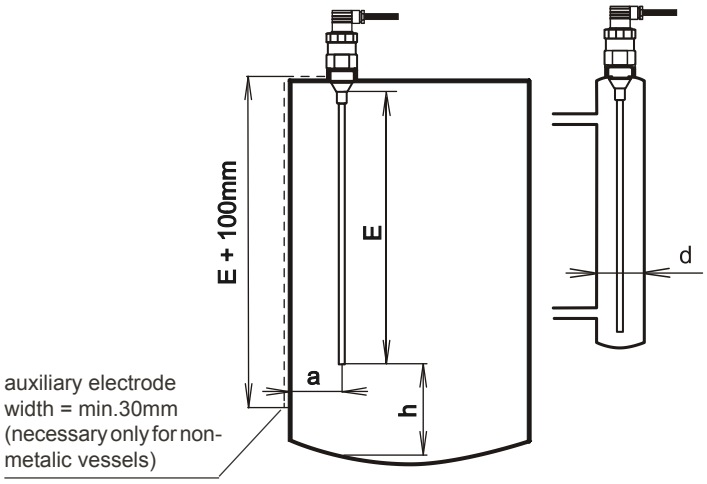
Electromagnetic compatibility is provided by conformity with standards: EN 55022/B, EN 61326-1, EN 61000-4-2, EN 61000-4-3, EN 61000-4-4, EN 61000-4-5, EN 61000-4-6.
Explosion proof of CLM-36Xi is examined by FTZÚ-AO 210 Ostrava - Radvanice certificate No.: FTZÚ 02 ATEX 0235X.

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 DN 32 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 accordiance with working environment or character of measured material.
Orientation dimension drawings for mounting you can see below.

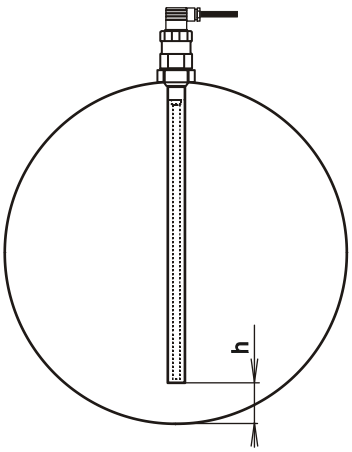
Mounting recommendation

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



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_ _-20, 21, 22-_ *variants with ref. tube*



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