Thank you for choosing a NIVELCO instrument.
We are sure that you will be satisfied throughout its use.

NIVOCAP

CT-100 AND CH-100 SERIES
CAPACITANCE LEVEL PROBES

1. TECHNICAL DATA

		Rod probe		Light cable probe		Heavy duty cable probe	
Unit type		**C..R-100 C..S-100**	**C..P-100 C..T-100**	**C..K-100 C..V-100**	**C..L-100 C..W-100**	**C..N-100**	**C..M-100**
Probe type		Insulated	Partially insulated	Insulated	Partially insulated	Insulated	Partially insulated
Probe length		0.2 to 3 m		1 to 20 m			
Material of vetted parts	Process connection	SS316Ti					
	Probe	Steel	SS316Ti	Steel	S316S31	Steel	S316S31
Insulation		PFA	-	FEP	-	PE	-
Mechanical strength		-	-	5 kN	5 kN	45 kN	35 kN
Capacity of insulated probe		≈600 pF/m	-	≈200 pF/m	-	≈1500 pF/m	-
Medium temperature		**CT**/**CN**: -25 to +120°C; **CH**/**CL**: -25 to +200°C				-25 to +80°C	
Medium pressure		max. 16 bar @ 200°C					
Ambient temperature		-25 to +85°C					
Output		4 to 20 mA					
Capacitance ranges		200 pF / 1 nF / 5 nF; selectable					
ZERO setting (4 mA)		0 to 80% of measuring range					
SPAN setting (20 mA)		20 to 100% of measuring range					
Measuring frequency		25 kHz					
Supply voltage		U_S=12...30 V DC, max. 25 mA					
Maximum load resistance		$R_L = \frac{U_S - 12V}{0.02A}$					
Non-linearity		<0,5%					
Temp. Coeff. of ZERO		2 µA/°C					
Temp. Coeff. of SPAN		3 µA/°C					
Electric connection		Pg16 for ∅8 to 15 mm cables; with 0.75 to 2.5mm^2 wire cross section					
Enclosure		IP65					
Electrical	normal vers.	Class III.					
protection	Ex version	Intrinsically safe					
Ex protection mark		**CT**: EEx ia/ib IIB T4, issued: TÜV-A Nr.96.C.003X				-	
Mass		0.4 kg + 0.1 kg/10cm		0.4 kg + 0.15 kg/m		0.4 kg + 0.8 kg/m	

Note: The 4 mA output current is scaled to the 0.2-fold value of the 1 nF range, whereas the 20 mA output current is scaled to the nominal length of the unit.

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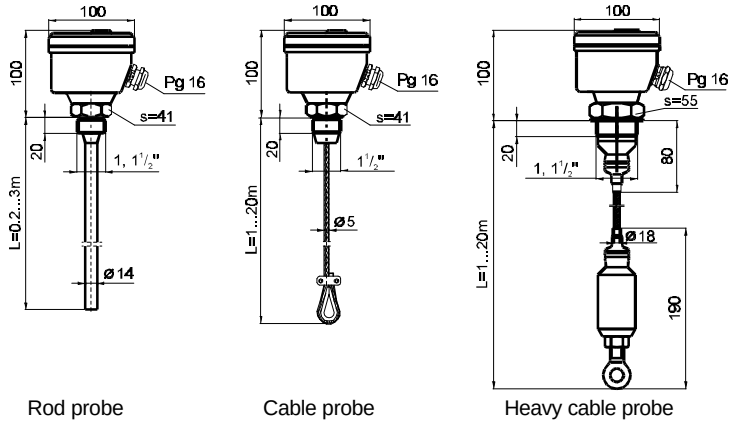
2. ACCESSORIES

- User's Manual
- 1pc. Plug-in type screw terminal

3. OPERATION

The capacitance probe constitutes a capacitor together with the electrically conducting tank or the auxiliary probe. Any changes exhibited by the current generated by the measuring voltage and flowing through this capacitor are proportional to the level variations of the substance between the electrodes.

4. DIMENSIONS



Rod probe Cable probe Heavy cable probe

Fig. 1 Outline drawings

Type code	Process connection	Type code	Process connection
CTR/CHR CTP/CHP	1" BSP	CNR/CLR CNP/CLP	1" NPT
CTS/CHS CTP/CTT	1 1/2" BSP	CNS/CLS CNP/CLT	1 1/2" NPT

5. INSTALLATION

Mounting:

The probe must be mounted in parallel with the reference electrode (tank wall, reference probe).

Cable probes must either be attached to the tank bottom by the attachment facility provided on the rope end; or, by a weight.

Probes in general, need to be protected from the intensity of the process medium influx, thus should be installed in a location where it is not subject to excessive mechanical loads.

In case a tank may be subject to intensive mechanical vibrations, provision has to be made for the damping of such vibrations (by the insertion of a rubber washer, for instance).

Reference probe:

As a reference probe, an insulated or uninsulated probe can be used, placed parallel to the measuring probe in a close distance.

In case of tanks with spherical sides (lying cylindrical tanks), or where the tank wall can not be used as a reference probe, a pipe around the measuring probe is recommended to be used as a reference probe. The inner diameter for the reference tube (probe) should be selected to be a value in the 36 to 500 mm range, depending upon the viscosity and the dielectric constant of the process medium.

6. WIRING

Remove housing cover and connect device to current loop. Make sure to carry out the wiring with correct polarity.

The probe must be electrically connected to the reference probe !

Connect reference probe to grounding screw on the outside of housing.
Using the tank as a reference probe, electrical connection between device and reference probe is maintained via the process connection.

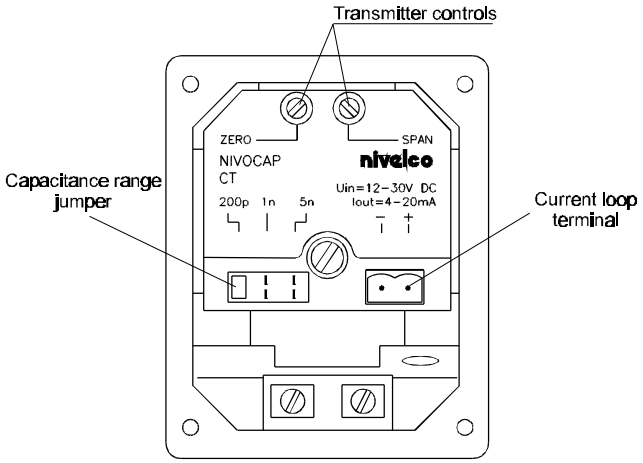


Fig. 2
Probe housing with removed cover

In Ex applications, either use an intrinsically safe supply unit, or insert a Zener-barrier between an ordinary supply unit and the device.

Recommended Zener-barrier:

Type	Manufacturer
728	MTL
8901/31-280/075/00	Stahl
Recommended isolated server unit:	
4041	MTL

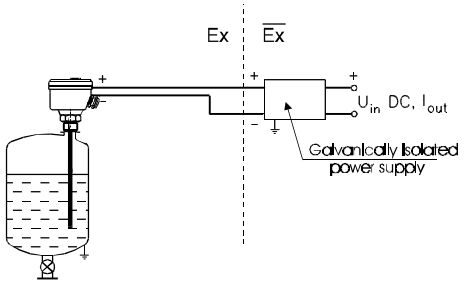


Fig. 3
Ex installation

In case of measuring potentially explosive materials, only partially insulated probes can be applied without any limitation. The insulated probes are only applicable for level measurements on process media that are capable, in the possible event of the probe insulation getting electrically charged, of leading away the charges, i.e. that have specific resistance under 10^4 Ohmmeter.

7. CALIBRATION

1. Setting the "CAPACITANCE RANGE" jumper

In case of conducting medium:
Only insulated probes can be used.
The overall capacitance of the system depends practically only on the insulation of the probe.
By knowing the length of the probe and it's "capacitance per meter" value (see Technical Data table), the overall capacitance can be calculated and the Jumper can be set accordingly.

Overall capacitance (C)=
Probe length * Capacity of insulated probe per meter

Example: 2 m rod probe:
C = 2 m * 600 pF/m = 1200 pF = 1,2 nF
Select "5nF" measuring range with the jumper

In case of non conducting medium:
Always use a reference probe placed as close to the capacitance probe as possible. A coaxial reference probe provides the best sensitivity.
The overall capacitance of the system depends largely on the relative dielectric constant (ε_r) of the measured medium and the distance between the capacitance probe and the reference probe.

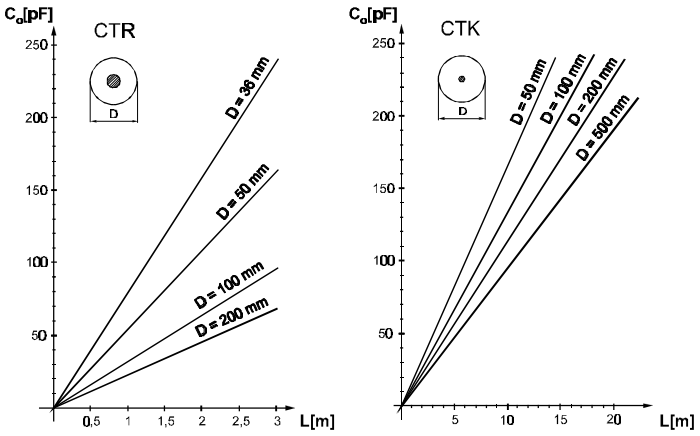
Overall capacitance = Base capacitance (see Fig. 4.) * relative dielectric constant (e_r) of the measured medium

$$C = e_r * c_o$$

Example: 10 m light cable probe used with a Æ100 mm coaxial reference electrode on heating oil:

Relative dielectric constant (e_r) of heating oil: 2.1
Base capacitance (C0)= 180 pF (see Fig. 4.)

C= 2.1 * 180 pF= 378 pF
Select "1nF" measuring range with the jumper



Base capacitance of CTR probe Base capacitance of CTK probe

Fig. .4
Base capacitance

The overall capacitance can typically only be calculated roughly, the best is to set the jumper to the center position (1 nF) prior to starting the 4-20 mA calibration.

2. Fill up tank to the required 4 mA (Low) level, insure that capacitance probe is in contact with the measured material.

3. Bring the multi-turn potentiometer "SPAN" approximately into its middle position.

4. Set 4 mA by the "ZERO" potentiometer.

5. Fill up tank to the required 20 mA (High) level.

6. Set 20 mA by the "SPAN" potentiometer.

7. The adjustment is considered as satisfactory if the active part of the probe (i.e. the length of the probe section between the calibrated 4 and 20 mA points) is not shorter than 0.3 times the overall probe length.

8. MAINTENANCE, REPAIR

The device does not require routine maintenance. In some instances, however, the sensor may need occasional cleaning to remove surface deposits

9. STORAGE CONDITIONS

Environment temperature: -25 to +60°C
Relative humidity: up to 98 %

10. WARRANTY

All Nivelco products are warranted free of defects in materials or workmanship for a period of two years from the date of purchase.
Repairs under guarantee are carried out at the Manufacturer's premises. Models returned to the manufacturer will not be handled unless they are cleaned and desinfected The Purchaser is liable for costs of dismantling and re-installation as well as transport costs.
Nivelco shall not be liable for misapplication, labour claims, direct or consequential damage or expense arising from the installation or use of equipment.

NIVELCO Process Control Co. Ltd.
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