

FOR LIQUIDS

# NIVOCAP

CAPACITIVE LEVEL TRANSMITTERS



3 YEARS WARRANTY @ NIVELCO – WHERE ELSE?

# NIVELCO

LEVEL TRANSMITTERS

## NIVOCAP CAPACITIVE LEVEL TRANSMITTERS

### MAIN FEATURES

- Max. 20 m (65.5 ft) measurement range
- Vertical mounting
- Rod or cable probe versions
- -30...+200°C (-22...+392 °F) medium temperature
- Max. 40 bar g (580 psi g) medium pressure
- 32-point linearization table
- Indirect assignment of 0% and 100%
- 4-20 mA + HART output
- Ex version
- IP67 protection

### APPLICATIONS

- Level and volume measurement
- Level measurement of conductive and non-conductive materials
- Level measurement of liquids
- For high pressure and high temperature mediums



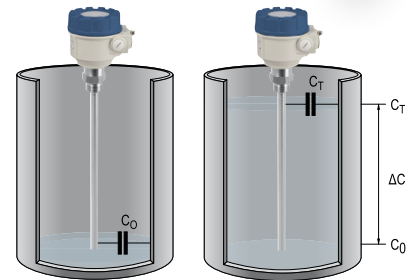
### GENERAL DESCRIPTION

NIVOCAP 2-wire capacitive level transmitters provide an ideal solution for level measurement of conductive or non-conductive liquids. The probe of the instrument and the reference probe (which can be either the metal wall of the tank or installed separately) operate as opposing plates of a capacitor. Between the plates of this capacitor the air is replaced by a medium with greater dielectric constant than the air during filling the tank, therefore the capacitance is changing directly proportional to the level. The incorporated electronic circuitry measures the capacitance difference and converts it to an output signal proportional to level.

### OPERATION, SETTING UP

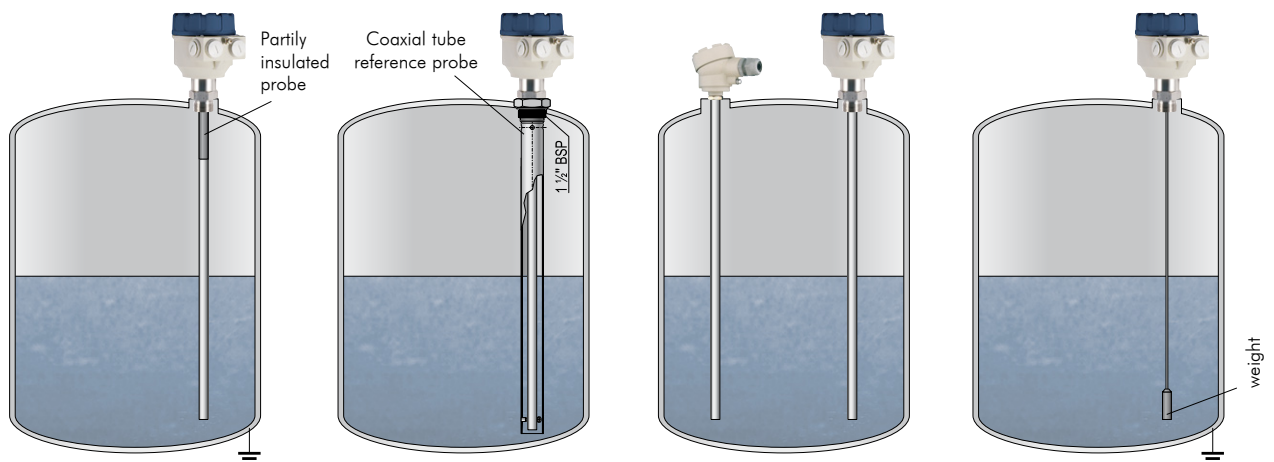
The plates of the capacitor are the probe and the reference probe (wall of the tank). The dielectric constant of the air is  $\epsilon_r = 1$ . The basic capacity of the probe mounted in empty tank is  $C_0$ , which depends on the relative dielectric constant of the air and the mounting position. During filling the capacitance between probe and reference will increase proportionally with the level and the ( $\epsilon_r$ ) relative dielectric constant of the medium.

The condition of an accurate level metering is that the change of capacity has to be proportional to the change in level. To comply with the above the probe and the referential probe have to be parallel, because capacity depends on the distance between the two plates. Best suited for the most accurate level measurement is the so called coaxial arrangement. Setting up the NIVOCAP is easy. Using a simple technique the unit is to be "taught" the minimal (close to minimal) and maximal (close to maximal) levels. If fully filling and draining is inconvenient or not feasible, the teaching is possible at any odd levels with the help of indirect assignment feature.



$C_0$  = basic capacitance  
 $C_T$  = end capacitance  
 $\Delta C$  = capacitance change

### MEASUREMENT ARRANGEMENTS



#### Rod probe

Metal tank and non-conductive medium.

The rod probe is insulated partly at the process connection.

#### Rod probe

With coaxial tube reference probe

#### Rod probe

With reference rod probe

#### Cable probe with weight


Metal tank

weight

## TECHNICAL DATA

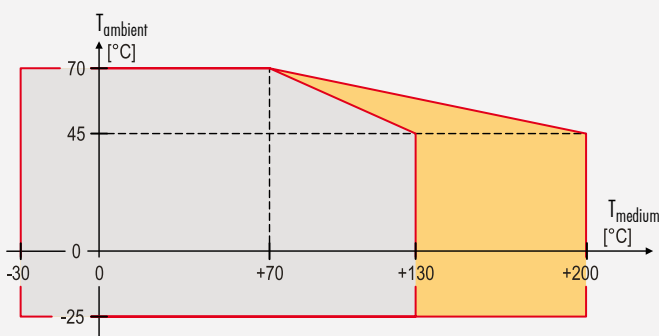
Version		Rod probe	High temp. type with rod probe	Cable probe
Measurement range ( $L_n$ )		0.2 – 3 m (7.85 - 120 inch)		1 – 20 m (3.3 - 65.5 ft)
Capacitance range		0 pF...5 nF		
Min. capacitance change		Max. (lout) SPAN: 10 pF or 10% FS		
Saturation capacitance of the insulated probe		~600 pF/m		~200 pF/m
Relative dielectric constant		$\epsilon_r$ , min. 1.5		
Process connection		As per order codes		
Material of wetted parts	Threaded part	1.4571 (316Ti) stainless steel		
	Probe	Fully or partially PFA coated 1.4301 (304) stainless steel		Fully FEP coated steel cable
Housing		Paint coated aluminium or plastic (PBT)		
Medium temperature (see: temperature diagram)		-30 °C ... +130 °C (-22 °F...+266 °F)	-30 °C ... +200 °C (-22 °F...+392 °F)	-30°C ... +130 °C (-22 °F...+266 °F)
Ambient temperature		-25°C ... +70 °C (-13 °F...+158 °F), see: temperature diagram		
Medium pressure		max. 4 MPa (40 bar g / 580 psi g), see: pressure diagram		max. 1.6 MPa (16 bar g / 232 psi g)
Power supply / consumption		12 – 36 V DC / max. 800 mW, overvoltage protection against transients		
Output data	Output signals	Analogue: 4–20 mA (3.9–20.5 mA) $R_{max} = U_I - 11.4 \text{ V} / 0.02 \text{ A}$ Error indication: 3.8 mA vagy 22 mA		
		Digital communication: 4–20 mA + HART		
		Display: SAP-202, 6-digit LCD, dimensions, bargraph		
	Damping time	0, 3, 6 ... 300 sec selectable		
	Linearity error	$\pm 0.3\%$ FS		
Temperature error	$\pm 0.02\%$ / °C			
Electrical connection		2x M20 x1.5 cable glands + internal thread for 2x 1/2" NPT cable protective pipe, cable outer diameter: $\varnothing 7 \dots \varnothing 13 \text{ mm}$ (0.3...0.5 inch), wire cross section: max. 1.5 mm <sup>2</sup> (AWG 15)		
Electrical connection		Class III.		
Ingress protection		IP67		
Mass		≈ 2.5 kg (5.5 lb) with 0.5 m (20 inch) probe	≈ 3 kg (6.6 lb) with 0.5 m (20 inch) probe	≈ 2 kg (4.4 lb) with 3 m (10 feet) probe

## SPECIAL DATA FOR Ex CERTIFIED MODELS

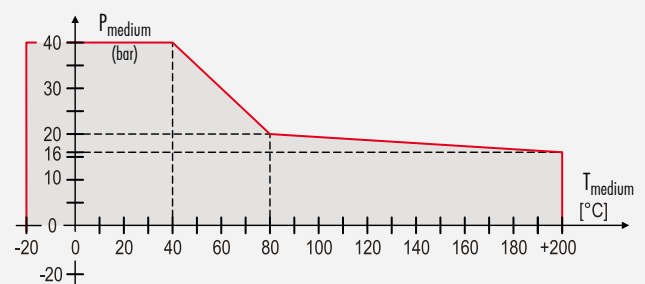
Protection type	ia
Ex marking	ATEX  II 1G EEx ia IIB T6
Intrinsically safe data	$C_i \leq 15 \text{ nF}$ ; $L_i \leq 200 \mu\text{H}$ ; $U_i \leq 30 \text{ V}$ ; $I_i \leq 140 \text{ mA}$ ; $P_i \leq 1 \text{ W}$
Ex approved power supply and limit data	$U_o < 30 \text{ V}$ ; $I_o < 140 \text{ mA}$ ; $P_o < 1 \text{ W}$
Temperature classification	Temperature class: T6; $T_{\text{ambient}} : 70 \text{ °C}$ (158 °F); $T_{\text{medium}} : 80 \text{ °C}$ (176 °F)

## TEMPERATURE AND PRESSURE DATA

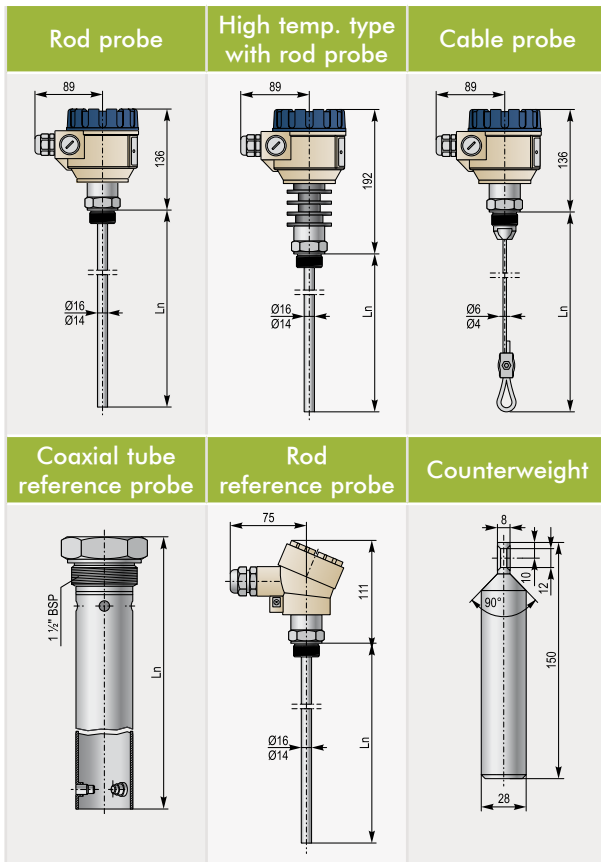
Temperature diagram



Pressure diagram



## DIMENSIONS



## PROBE SELECTION

Consequences of the capacitive operation principle: Relative dielectric constant of the medium should be taken into consideration. Measurement will be accurate only in case of suitable probe and reference probe selection.

	Medium		
	Conduc-tive	Non-conductive	
		$\epsilon_r > 2$	$2 > \epsilon_r > 1,5$
Insulated probe, reference probe	■	■	-
Partly insulated probe, reference probe	-	■	■

	Reference probe		
	Rod	Tube	Tank wall
Conductive tank	■	■	■
Non-conductive tank	■	■	-

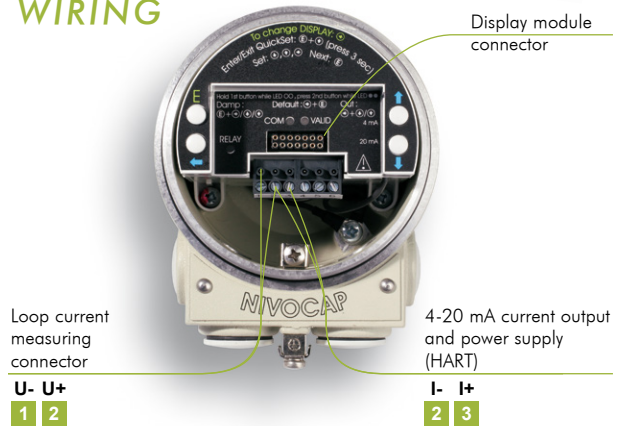
Informative $\epsilon_r$ values			
Air	1	Butanol	11
Liquid gases	1.2 – 1.7	Isopropyl alcohol	18
Fuel oil	1.9 – 4	Ammonia	21
Standard oils	2 – 4	Ethyl alcohol	24
Petrol	2.3	Glucose	30
Bitumen	2.6	Glycerol	37
Motor-oil	2.6	Water	80
Acids	4 – 6	Sulphuric acid (T=20°C)	84

## DISPLAY

Basic functions can be configured by the programming buttons. With the help of the SAP-202 plug-in display a simplified programming can be accomplished which covers full parameter programming.



## WIRING



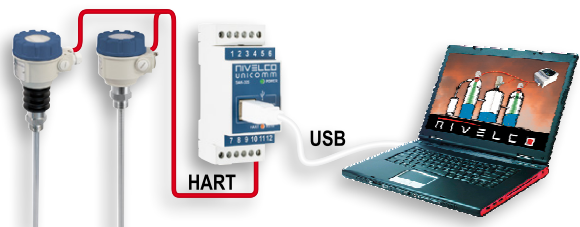
## NIVOCAP TRANSMITTERS IN HART MULTIDROP LOOP

The MultiCONT processes and displays measurement data supplied by NIVELCO's HART equipped transmitters connected to a Multidrop loop. Up to 15 transmitters (also mixed models) can be connected and remote programming can be also performed through the MultiCONT. Re-transmission of the data is possible via RS485 communication line to a PC or PLC when needed.



## NIVOCAP TRANSMITTERS IN SYSTEM WITH A PC

Instruments with HART output can be connected to a PC interfaced by a UNICOMM HART-USB modem. A HART multidrop loop can consist of a maximum of 15 transmitters. All measured values can be visualized and /or the NIVOCAP transmitters can be remote programmed by the PC. Applicable software: EView2 configuration software or NIVISION process visualization software.



## ORDER CODES (NOT ALL COMBINATIONS AVAILABLE)

### NIVOCAP capacitive level transmitters

NIVOCAP C ■ ■ ■ - ■ ■ ■ - ■ (1)

Type	Code
Transmitter	T
Transmitter+display	B
High temperature transmitter (2)	H
High temperature transmitter+display (2)	P

Housing	Code
Aluminium	2
Plastic	3

Probe		Code
Process connection (3)	1" BSP	Rod probe fully insulated R
		Rod probe partially insulated P
	Cable probe	fully insulated K
		partially insulated L
1" NPT	Rod probe	fully insulated A
		partially insulated C
	Cable probe	fully insulated E
		partially insulated G

Output / Ex	Code
4-20 mA	2
4-20 mA + HART	4
4-20 mA / Ex ia	6
4-20 mA +HART / Ex ia	8

Code	Probe length		Code
Rod			
0	0 m	0 m	0
1	1 m	0.1 m	1
2	2 m	0.2 m	2
3	3 m	0.3 m	3
		⋮	⋮
		0.9 m	9

Code	Cable		Code
0	0 m	0 m	0
1	10 m	1 m	1
2	20 m	2 m	2
		3 m	3
		⋮	⋮
		9 m	9

(1) The order code of an Ex version should end in „Ex”  
 (2) Not available in Ex version  
 (3) Special process connections are available on request, e.g.: TRICLAMP, sanitary

## ACCESSORIES

### NIVOCAP reference probes for capacitive rod probes

NIVOCAP C ■ ■ ■ - 1 ■ ■ ■

Process connection	Code
1 1/2" BSP	A
1 1/2" NPT	D
1" BSP	F
1" NPT	E

Probe type	Code
Coaxial (4)	F
Rod, fully insulated (5)	R
Rod, partially insulated (5)	P

(4) Only with 1 1/2" process connection  
 (5) Only with 1" process connection

Code	Probe length		Code
0	0 m	0 m	0
1	1 m	0.1 m	1
2	2 m	0.2 m	2
3	3 m	0.3 m	3
		⋮	⋮
		0.9 m	9

### Flanges

MFT- ■ ■ ■ - ■ ■ ■

Standard / Material	Code
DIN/1.0037 (A283)	1
DIN/1.4571 (316Ti)	2
DIN/PP	3
DIN/1.0037 (A283)+PTFE	4
ANSI/1.0037 (A283)	5
ANSI/1.4571 (316Ti)	6
ANSI/PP	7
ANSI/1.0037 (A283)+PTFE	8

Size			Code
DIN	ANSI		
DN50	2"		0
DN65	2 1/2"		1
DN80	3"		2
DN100	4"		3

Pressure	Code
PN16/150 psi	1
PN25/300 psi	2
PN40/600 psi	3

Instrument connection	Code
1" BSP	2
1" NPT	5
1 1/2" BSP	7
1 1/2" NPT	8

Other accessories	Order Code
Plug-in display module	SAP-202
Counterweight for cable probe	CTK-103-0M-400-01
Multichannel process controller and display unit	MultiCONT P-200
24V DC power supply module, DIN rail mountable	NIPOWER PPK-331
Intrinsically safe isolator power supply module, DIN rail mountable	UNICONT PGK-301 Ex
HART-USB/RS485 modem for remote programming with PC, DIN rail mountable	UNICOMM SAK-305
HART-USB modem for remote programming with PC	UNICOMM SAT-304
EView2 configuration software for remote programming with PC	FREE download!

