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We are convinced that you will be satisfied with our product!**

NIVOCAP CK

RF - CAPACITIVE
LEVEL SWITCH

USER'S MANUAL



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1. APPLICATION

The NIVOCAP CK capacitive level switches operate in the RF (radio-frequency) ~ 130 kHz range. The instrument is less sensitive to material adhesions caused by the measuring probe's design and the so-called reference probe-based operating principle. The device is capable of level switching in solids and powders with a dielectric constant greater than 1.5 relative permittivity (ϵ_r) and to a limited extent in liquids (see 2.1 General data).

The device needs to be calibrated after it is installed.

During operation, the device evaluates the capacitance difference of the connected probe continuously. Until the probe is in the air (the medium does not reach the probe) the measuring and reference probe is at the minimal capacitance value ($\epsilon_{\text{relative}}=1$) relative to the instrument housing. When the medium reaches the probe, the capacitance will increase ($\epsilon_{\text{relative}} \geq 1$). The device measures the capacitance change relative to the reference value stored during the calibration procedure.

The reference probe is designed so that the material deposits on the probe are ignored, preventing any false switching.

There are four measuring ranges switchable on the device (see Chapter 4: Sensitivity Ranges)

4th sensitivity range: 0.5 pF, $\epsilon_{\text{relative}} = 1.5 \dots 2.0$

3rd sensitivity range: 2.5 pF, $\epsilon_{\text{relative}} = 2.0 \dots 4.0$

2nd sensitivity range: 8.0 pF, $\epsilon_{\text{relative}} = 4.0 \dots 7.0$

1st sensitivity range: 18 pF, $\epsilon_{\text{relative}} > 7.0$

2. TECHNICAL DATA

2.1 GENERAL DATA

Type	Standard CK(D,G,M,P,H,N)-1□□-1 CM(D,G,M,P,H,N)-1□□-1	With Extension Rod CK(R,L,E,F,V,Z)-1□□-1, CM(R,L,E,F,V,Z)-1□□-1	With Extension Cable CKK-1□□-1 CKC-1□□-1
Probe length	0.3...0.6 m (1.3...2 ft)	0.7...3 m (2.3...10 ft)	1...10 m (3.3...33 ft)
Material of wetted parts	1.4571 (316Ti) stainless steel + PPS insulation		1.4571 (316Ti) + PPS Insulation; Cable: PE-coating
Process connection	As per order code (see 2.5 Order Codes)		
Ambient temperature ⁽¹⁾	-30...+65 °C (-22...+149 °F)		
Medium temperature ⁽¹⁾ (for solids)	-30...+110 °C (-22...+230 °F)		-25...+80 °C (-13...+176 °F)
Medium temperature for high-temperature version ⁽¹⁾ (for solids)	-30...+235 °C (-22...+455 °F)		-
Medium temperature ⁽¹⁾ (for liquids)	0...+65 °C (+32...+149 °F)		
Max. process pressure	16 bar (1.6 MPa, 232 psi)		
Response time (selectable)	0.15...15 sec		
Power supply (universal)	20...250 V AC (50/60 Hz) or 20...50 V DC		
Power consumption	≤ 2.5 VA / 2 W		
Housing material	Powder-coated aluminum		
Electrical connection ⁽¹⁾	2x M20x1.5 plastic cable glands, for cable Ø6...Ø12 mm (.236"... .472"), 2x terminal blocks for 0.5...1.5 mm ² (AWG20...15) wire cross section		
Electrical protection	Class I.		
Ingress protection	IP67		
Weight	2 kg (4.4 lb)	2 kg + 1.4 kg/m (4.4 lb + 1 lb/ft)	2 kg + 0.6 kg/m (4.4 lb + 0.4 lb/ft)

⁽¹⁾ For explosion-proof design, see section 2.3 Ex information

2.3 EX INFORMATION

		C□□-1□□-5Ex, C□□-1□□-7Ex	Reference document
Ex marking	ATEX	II 1/2D Ex ta/tb IIIC T85°C...T220°C Da/Db	ckm1051m060bh_06
	IEC Ex	Ex ta IIIC T85°C...T220°C Da/Db	ckm1051a0600h_02
Electrical connection	2x M20x1.5 metal cable glands for Ø8...Ø13 mm (Ø.315... Ø.5") cable		-

Thermal Properties	With extension cable			Standard, or with extension rod				
	CKK-1□□-5, 7Ex CKC-1□□-5, 7Ex			CK(D,G,M,P,H,N)-1□□-5, 7Ex CK(R,L,E,F,V,Z)-1□□-5, 7Ex			High-temperature version	
							CM(D,G,M,P,H,N)-1□□-5, 7Ex CM(R,L,E,F,V,Z)-1□□-5, 7Ex	
Medium temperature min.: -30 °C (-22 °F); max.:	+60 °C (+140 °F)	+70 °C (+158 °F)	+80 °C (+176 °F)	+60 °C (+140 °F)	+70 °C (+158 °F)	+95 °C (+203 °F)	+110 °C (+230 °F)	+220 °C (+428 °F)
Ambient temperature min.: -30 °C (-22 °F); max.:	+65 °C (+149 °F)	+60 °C (+140 °F)		+65 °C (+149 °F)	+60 °C (+140 °F)	+60 °C (+140 °F)	+50 °C (+140 °F)	+35 °C (+95 °F)
Highest permissible surface temperature of the process connection	+80 °C (+176 °F)		+90 °C (+194 °F)	+80 °C (+176 °F)		+90 °C (+194 °F)	+95 °C (+203 °F)	+195 °C (+383 °F)
Temperature classes	T85°C	T85°C	T95°C	T85°C	T85°C	T95°C	T110°C	T220°C

2.4 OUTPUT DATA

	Relay	Solid-state output
	C□□-1□□-1, C□□-1□□-5Ex	C□□-1□□-3, C□□-1□□-7Ex
Output type	SPDT (potential-free)	SPST (electronic)
Output rating	250 V AC, 8 A, AC 1	250 V AC, 50 V DC, 1 A
Output protection	—	—

2.5 ORDER CODES (NOT ALL COMBINATIONS ARE POSSIBLE!)

NIVOCAP C - - Ex^(*)

VERSION	CODE	PROBE TYPE	CODE	HOUSING	CODE	PROBE LENGTH [m (ft)]				OUTPUT / EX	CODE
Standard	K	Standard 3/4" BSP	D	Aluminum	1	CODE		CODE		SPDT, potential-free relay	1
High-temp.	M	Standard 3/4" NPT	G			0	0 (0)	0	0 (0)	SPST, solid-state output	3
		Standard / 1" BSP	M			1	1 (3.3)	1	0.1 (0.33)	SPDT, potential-free relay / Ex ta/tb IIIC	5
		Standard / 1" NPT	P			2	2 (6.6)	2	0.2 (0.66)	SPST, solid-state output / Ex ta/tb IIIC	7
		Standard / 1 1/2" BSP	H			3	3 (10)	3	0.3 (1)		
		Standard / 1 1/2" NPT	N			4	4 (13)	4	0.4 (1.3)		
		With extension rod / 1 1/2" BSP	R			5	5 (16.3)	5	0.5 (1.63)		
		With extension rod / 1 1/2" NPT	L			6	6 (19.7)	6	0.6 (1.67)		
		With extension cable / 1 1/2" BSP	K			7	7 (23)	7	0.7 (2.3)		
		With extension cable / 1 1/2" NPT	C			8	8 (26)	8	0.8 (2.6)		
		With extension rod 3/4" BSP	E			9	9 (29.5)	9	0.9 (2.95)		
		With extension rod 3/4" NPT	F			A	10 (33)				
		With extension rod 1" BSP	V								
		With extension rod 1" NPT	Z								

^(*) The order code of an Ex-version should end in 'Ex'

Variants with extension cable types: from 1 m up to 10 m (3.3...33 ft), by 0.5 m (1.64 ft) steps!

Variants with extension rod types: from 0.7 m up to 3 m (2.3...10 ft), by 0.1 m (0.32 ft) steps!

Standard types: CK□-103, CK□-104, CK□-105, CK□-106

2.6 DIMENSIONS

Standard	With Extension Rod	With Extension Cable	High-temperature version with standard probe	High-temperature version with rod probe extension
CKM-1□□-1, CKP-1□□-1	CKR-1□□-1, CKL-1□□-1	CKK-1□□-1, CKC-1□□-1	CMM-1□□-1, CMP-1□□-1	CMR-1□□-1, CML-1□□-1

3. MOUNTING

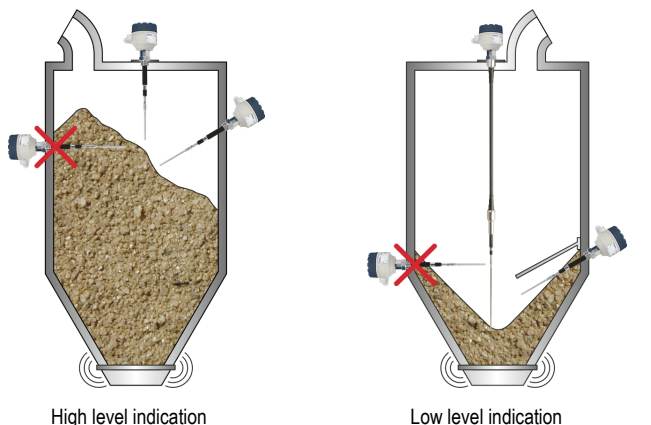
It is advised to check if the device is working properly on a sample quantity of material before installing the device.

WARNING!

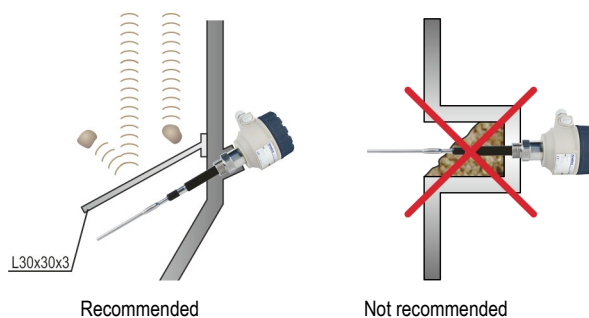
- Handle the device with great care, with special attention to the probe. Any strong impact or bending to the probe may damage the device.
- A protective shield must be installed (see the figure) if the probe is exposed to falling material or excessive mechanical load.
- For tanks where strong vibration may occur, use the vibration-resistant version with the solid-state switch (see sections 2.4 and 2.5).
- The device is rated IP67 - in the case of liquids, only the lower metal part of the probe may touch the liquid continuously!

Screw in the device by its hexagonal neck. After screwing process connection in tightly, the housing can be rotated (max. 300°), to adjust the cable gland to the required position.

It might become necessary to install the device at an offset level position relative to the switching level taking the coning and caving of the material in the silo into account.



In the case of powders, the angle of the side-mounted device's probe must be greater than that of the coning of the medium (or, in the case of high-level detection, vertical) to prevent powder deposition on the probe that might cause false switching. Avoid mounting the unit near recesses any surface that facilitates forming deposits.



4. INSTALLING AND COMMISSIONING

4.1. BASIC CONCEPTS

Response (delay) time adjustment potentiometer: DELAY

The instrument senses the material when it reaches the probe and the switching is performed only after a predefined time (0...15 sec). This delay time can be set by the user with the delay time potentiometer between 0 and 15 sec.. The delay time can be increased by turning the potentiometer to the right.

When the level of the material drops below the probe, the switching is also performed only after the selected time delay.

If the "material present" and the „material not present" state changes during the set time interval, the delay timer restarts.

Sensitivity fine adjustment potentiometer: FINE SENS

Further fine sensitivity settings can be set within the selected sensitivity range with a potentiometer. The sensitivity is increased by turning the potentiometer to the right.

Sensitivity range button: SENS

This button selects the required sensitivity range. To cycle through the ranges, press the button repeatedly.

This setting is stored even if the unit is turned off.

Fail-safe switch: F – S (H – S)

The low and high fail-safe mode can be selected with the fail-safe switch.

The fail-safe indication is activated, when the relay is in a de-energized state (see the operation diagram table).

High fail-safe:

The probe senses the material, but the relay remains in a de-energized state like in case of a power failure.

Low fail-safe:

The probe does not sense the material, but the relay remains in a de-energized state like in case of a power failure.

4.2. COMMISSIONING

Remove the housing cover to access the terminals and buttons.

In case of electronic (solid-state) output versions the output must be protected by a 1.25 A fuse!

The instrument must be configured and calibrated after the installation and the wiring.

ATTENTION! Electrostatic discharge (ESD) may damage the device via its terminals. Therefore, observe the common precautions, e. g., touching a properly grounded point before removing the cover of the instrument.

The capacitive level switch will function incorrectly if:

- The relative dielectric constant of the measured medium is under 1.5.
- There is a conductive connection between the probe and the tank wall.
- The instrument has improper grounding.
- The insulation on the probe is damaged.
- The probe is not properly assembled.

4.3. CALIBRATION

Calibration button: CAL

The calibration must be performed after the installation.

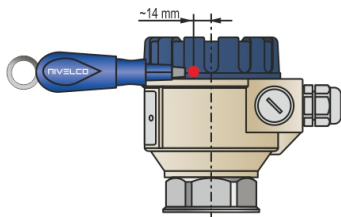
ATTENTION!
The instrument housing must be grounded!
The medium must not touch the probe during the calibration process!

Press and hold the CAL button for a few seconds.

First, the blue LED will come on, then it will blink and when the calibration is finished successfully, the LED will change to the color of the corresponding operating mode.

During the calibration process, the device learns the capacitance value of the empty tank, and it will be used as the reference capacitance value for measurements.

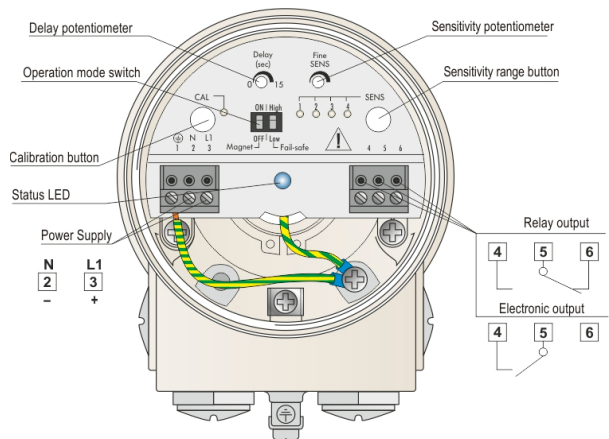
If the unit is installed in a hazardous (Dust-Ex) environment, the housing cover may not be removed as long as the unit is energized. However, the calibration process can be carried out with a magnet without removing the housing cover. The supplied magnetic screw is used to calibrate the device through the aluminum housing.



In this case, the status LED will blink in blue during the calibration process. All other configuration settings (sensitivity range selection, fine sensitivity adjustment, delay adjustment, failsafe operating mode selection, and switching the magnetic calibration switch on) must be carried out outside the hazardous environment (e. g., in the control room) before mounting the instrument.

Calibration can be performed multiple times.

5. WIRING



Wiring of relay and electronic output versions

5.1 OUTPUT STATE DIAGRAM

POWER	OPERATION	FAIL-SAFE MODE	STATUS LED	RELAY	SOLID-STATE OUTPUT
ON	High level	High	Green blinking	5-4-6 Energized	5 and 4 ON
		High	Red Light	5-4-6 De-energized	5 and 4 OFF
	Low level	Low	Green Light	5-4-6 Energized	5 and 4 ON
		Low	Red Blinking	5-4-6 De-energized	5 and 4 OFF
OFF	—	Low or high	OFF	5-4-6 De-energized	5 and 4 OFF

6. MAINTENANCE AND REPAIR

NIVOCAP CK-100 devices do not require regular maintenance. In some cases, however, the probe may need to be cleaned from deposits.

This must be carried out gently, without damaging the probe.

Repair during or after the warranty period must only be carried out by NIVELCO.

Before returning the device for repairs, it must be cleaned carefully. The parts in contact with the medium that might contain harmful substances must be decontaminated. Our official form ([Returned Equipment Handling Form](#)) must be filled and enclosed. Download it from our website www.nivelco.com. The device must be sent back with a declaration of decontamination. A statement must be provided in the declaration that the decontamination process was successfully completed, the device is clean and free from harmful materials, and there are no hazardous substances on it.

7. STORAGE

Ambient temperature: -35...+60°C (-31...+140°F)

Relative humidity: max. 98 %

ckm105en2106h

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NIVELCO reserves the right to change anything in this manual without notice.