

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



NIVOSWITCH

Vibrating fork level switches

Series:

R-400-1, R-400-2
R-400-3, R-400-4
R-400-6, R-400-7

1. OPERATION

The **NIVOSWITCH** is a mechanical resonance system; excited, and kept in resonance by an electronic circuitry. The process medium, when reaching the tines of vibration fork, will modify the vibration. This variation is sensed by an electronic circuit; which, on the elapse of the delay time, actuates the output circuit.

The **NIVOSWITCH** can cover the majority of industrial level detecting applications. Overfill or dry run protection as well as pump control is made possible with the versatile level switch.

2. TECHNICAL DATA

2.1. General specification

Materials	See chapter 6. Materials	
Maximum pressure	40 bar, for derating see Derating diagrams	
Medium temperature range	-40°C to +130°C for derating see Derating diagrams	
Ambient temperature range	-40°C to +70°C for derating see Derating diagrams	
Medium density	Liquids	$\geq 0.7 \text{ kg/dm}^3$
	Solids*	$\geq 0.05 \text{ kg/dm}^3$
Liquid viscosity	$\leq 10000 \text{ mm}^2/\text{s}$ (cSt)	
Response time	When immersed	0.5 sec
	When free	$\leq 1 \text{ sec}$ at low sensitivity setting ($\rho \geq 0.5 \text{ kg/dm}^3$)
		$\leq 2 \text{ sec}$ at high sensitivity setting ($\rho < 0.5 \text{ kg/dm}^3$)
Operation mode indicator	Bi-colour LED	
Function test	Optional test magnet	

USER'S MANUAL



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2.2. 2 wire AC and 3 wire DC version

Version	2 wire AC		3 wire DC	
	R□□-4□□-1	R□□-4□□-2	R□□-4□□-3	R□□-4□□-4
Electric connections (wire cross section)	Connector	Integral cable (4 x 0.75 mm ²)	Connector	Integral cable (5 x 0.5 mm ²)
Mechanical protection	IP 65	IP 68	IP 65	IP 68
High/low mode setting	Connection within connector	Wire selectable	DIP switch selectable	Wire selectable
Sensitivity programming	Not possible, fixed to: Liquids: $\rho \geq 0.7 \text{ kg/dm}^3$ Solids: $\rho \geq 0.5 \text{ kg/dm}^3$ *		DIP switch selectable	Wire selectable
Output	2-wire AC, for serial connection		Field selectable, PNP/NPN transistor	Field selectable, galvanically isolated PNP/NPN transistor
Output protection	-		Reverse polarity, overcurrent and overload protection	
Supply voltage	20...255 V AC, 50/60 Hz		12...55 V DC	
Consumption	Depending on load		< 0.6 W	
Voltage drop in switched-on state	< 10.5 V		< 4.5 V	
Electrical protection	Class I.		Class III.	
Current load	max. continuous	350 mA AC13	350 mA / 55 V DC	
	min. continuous	10 mA / 255 V AC; 25 mA / 24 V AC	-	
	max. impulse	1.5 A / 40 ms	-	
Residual current (in switched off state)	< 6 mA		< 100 μ A	

2.3. 2 wire DC versions

Version	2 wire DC	
	R□□-4□□-6	R□□-4□□-7
Electric connections (wire cross section)	Connector	Integral cable (2 x 0.5 mm ²)
Mechanical protection	IP 65	IP 68
Output	Type	2-wire DC
	Data	When free: $9 \pm 1 \text{ mA}$; when immersed: $14 \pm 1 \text{ mA}$
Consumption	< 0.5 W	
Supply voltage	15 ...27 V DC	

3. ORDER CODES

TYPE ORDER CODE
NIVOSWITCH
R
□
□
- 4
□
□
-
□

Type	Code	Connecti	Cod
Standard	C	1" BSP threa	M
Highly polished	G	1" NPT threa	P
e	g	DINrDN50 PN16 st.st fl	G
		2" ANSI st.st flange	B
e	g	50A JIS st.st flange	K
		DIN DN50 PN 16 pp flange	F
e	g	2" ANSI pp flange	A
		50A JIS pp flange	J
e	g	1 1/2" Triclamp (ISO 28 5 2)	T
		2" Triclamp (ISO 28 5 2)	R
5	8	DN40 Rp1/2 coupling (DI)	D
		DN50 Rp1/2 coupling (DI)	E

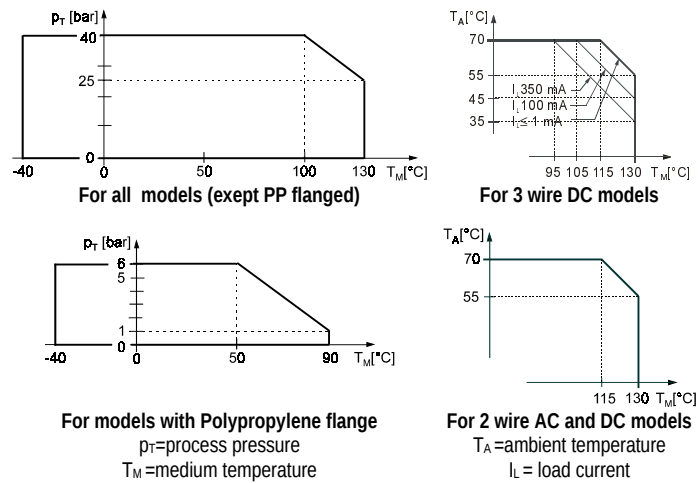
Length	Cod
SHORTY	00
Standard (125 mm)	01
0.2 to 3 m	02..3

Output	Code
2-wire AC with connector	1
2-wire AC with cable	2
3-wire PNP/NPN with connector	3
3-wire PNP/NPN with cable	4
2-wire DC with connector	6
2-wire DC with cable	7

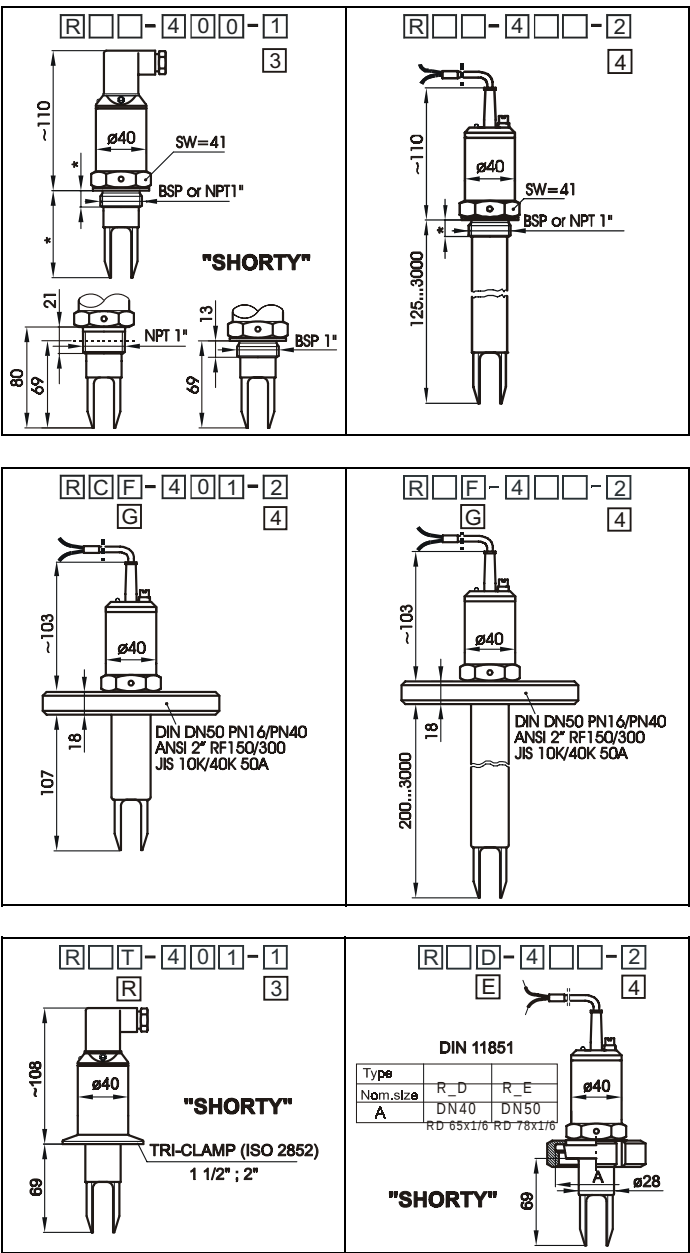
* The "SHORTY" models are not applicable for solids

* Flanges are screw-in type as standard

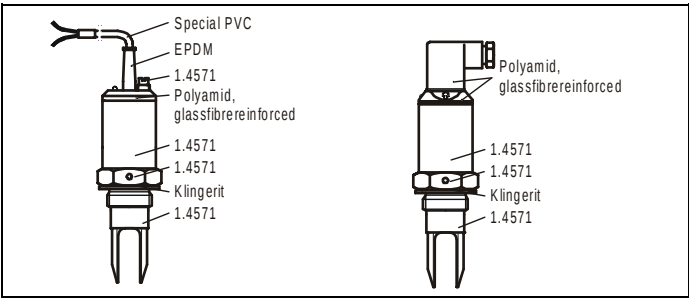
4. DERATING DIAGRAMS



5. DIMENSIONS

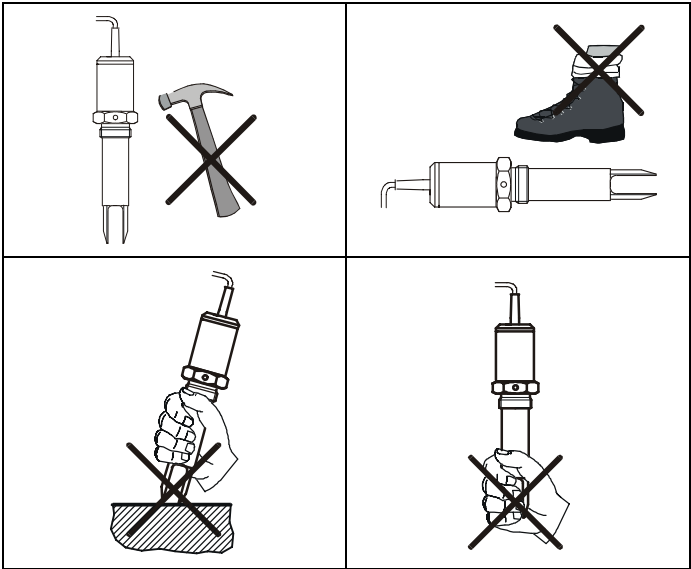


6. MATERIALS

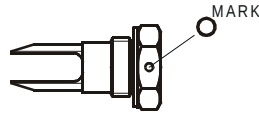


7. INSTALLATION

Prevent the device from any mechanical damage.



For positioning the fork-tines, use the marking on the hexagon neck.



- Use a TEFLON (PTFE) tape to aid the positioning of the fork-time.
- If the fork-time position is irrelevant, use the provided sealing ring

7.1. Installation on liquids

Always use the **LOW sensitivity mode!**

Low viscosity liquids

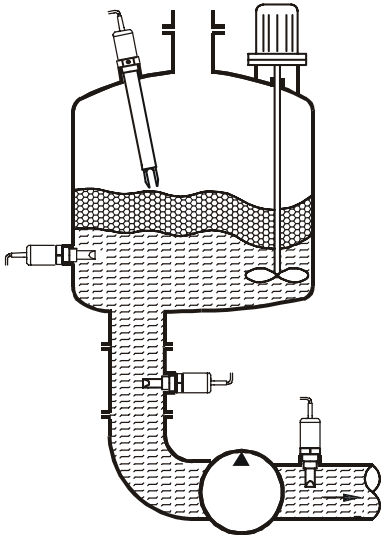
On applications, where the fork-tines are easily freed from the process medium, any of the mountings shown beside is possible.

High viscosity liquids

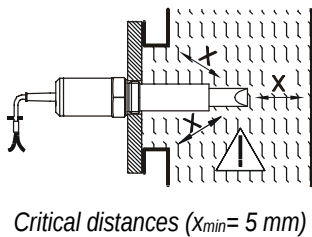
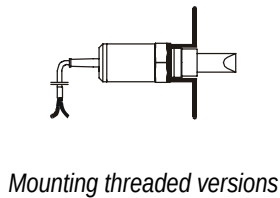
On applications, where the fork-tines are not freed easily from the process medium, only a vertical (top) mounting is recommended.

Side mounting

Only in case the fork-tines are easily freed from the process medium (look for the positioning marks).

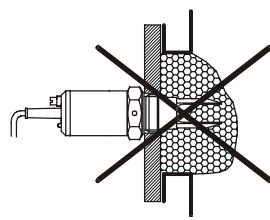
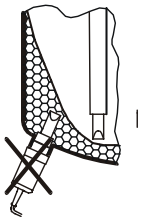


Possible ways of installation

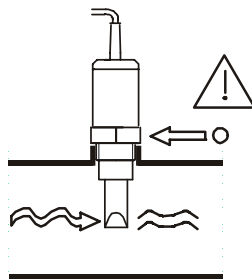
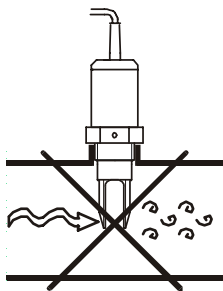


Mounting threaded versions

Critical distances ($x_{min} = 5 \text{ mm}$)



Mountings to be avoided in case of highly viscous liquids



Mounting in a pipe, fork-tines must be parallel to the direction of flow

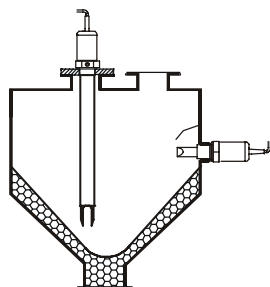
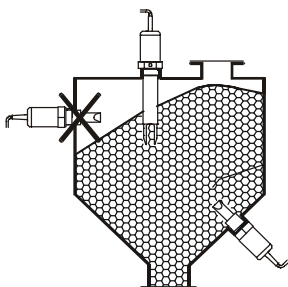
7.2. Installation on light, free flowing solids*

Before mounting the unit, it is advised to adjust the sensitivity (only DC and Ex versions) on a small sample of the material to be detected. E.g.: Immerse the unit into a bucket of material and check for reliable switching.

Sensitivity	Specific gravity
LOW	$\rho \geq 0.5 \text{ kg/dm}^3$
HIGH	$\rho < 0.5 \text{ kg/dm}^3$

Do not set a higher sensitivity than necessary, as this may result in the probe detecting even slight residues of material adhering to it.

The recommended mounting position on light, free flowing solids, is vertical (top) mounting. Side mounting is recommended only in case the fork-tines are easily freed from the process medium (ex. ∴ through gravity). In case of side mounting, the NIVOSWITCH must be mounted with the fork-tines standing vertically (look for the positioning marks).

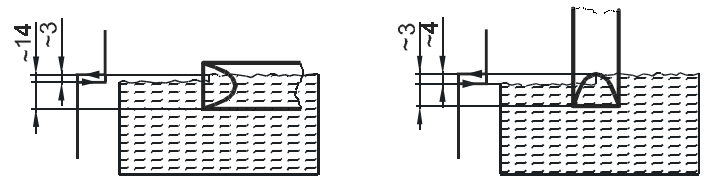


Protect the probe from underfalling material!
Fork-tines should not be exposed to mechanical load.

When determining the mounting location, take into account the caving or arching of the material in the tank. It might be necessary to install the device at an offset level position relative to the switching level actually required.

* The "SHORTY" models are not applicable for solids

8. SWITCHING POINT, SWITCH DIFFERENTIAL



(Values are for water at 25°C)

Liquids: switching point as well as the switch differential may depend on liquid density and mounting position.

Solids: switching point as well as the switch differential may depend on material features and mounting position

9. ELECTRICAL CONNECTIONS

9.1. AC versions

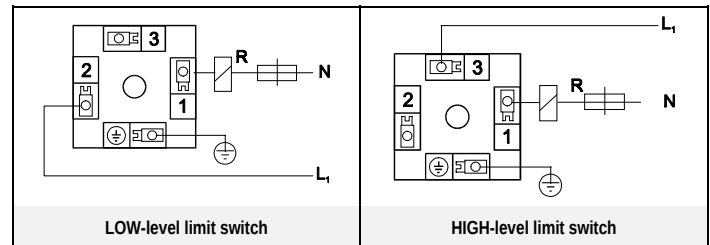
R□□-4□□-1

R□□-4□□-2

DO NOT USE WITHOUT EXTERNAL LOAD !

9.1.1. Connector version

R□□-4□□-1

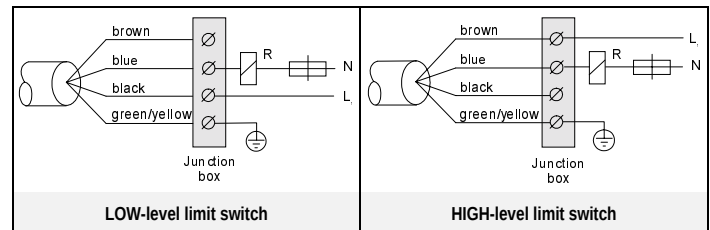


Terminal block cover can be rotated in 90° steps to ensure appropriate cable positioning

9.1.2. Integral cable version

R□□-4□□-2

Two of the signal wires (black and brown) are insulated. Only one of these two wires is used, dependent on the operating mode (High or Low). Remove the insulation only from the wire, corresponding to the desired operating mode.



9.2. 3 wire DC versions

R□□-4□□-3

R□□-4□□-4

In case of overload caused by short circuit, transistor will switch on and off, and LED will start to blink.

9.2.1. Connector version

R□□-4□□-3

All models expect the SHORTY

"M" - Operation mode

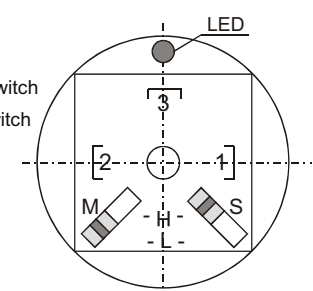
H= High - level limit switch

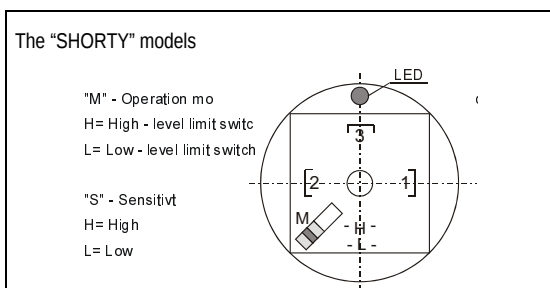
L= Low - level limit switch

"S" - Sensitivity

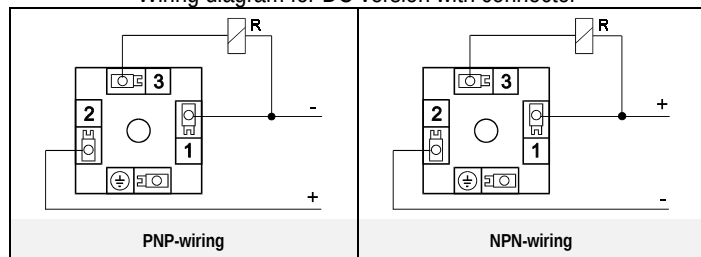
H= High

L= Low





Wiring diagram for DC version with connector

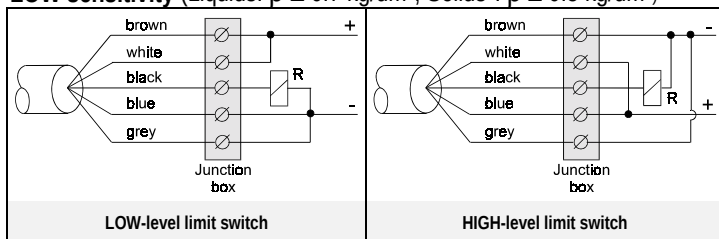


Terminal block cover can be rotated in 90° steps to ensure appropriate cable positioning

9.2.2. Integral cable version R□□-4□□-4

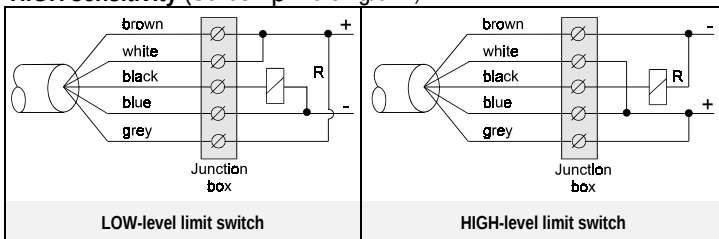
PNP mode

LOW sensitivity (Liquids: $\rho \geq 0.7 \text{ kg/dm}^3$; Solids*: $\rho \geq 0.5 \text{ kg/dm}^3$)



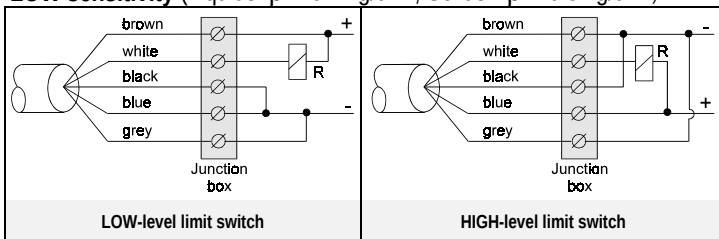
PNP mode

HIGH sensitivity (Solids*: $\rho < 0.5 \text{ kg/dm}^3$)



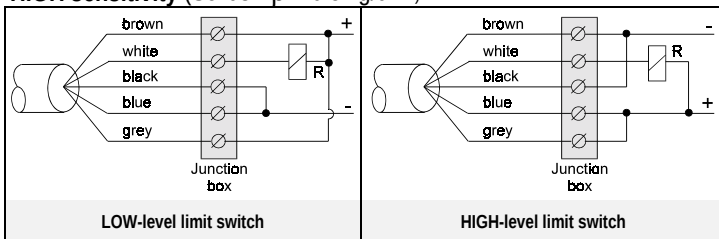
NPN mode

LOW sensitivity (Liquids: $\rho \geq 0.7 \text{ kg/dm}^3$; Solids*: $\rho \geq 0.5 \text{ kg/dm}^3$)



NPN mode

HIGH sensitivity (Solids*: $\rho < 0.5 \text{ kg/dm}^3$)



* The shorty models are not applicable for solids

9.3. 2 wire DC versions

R□□-4□□-6

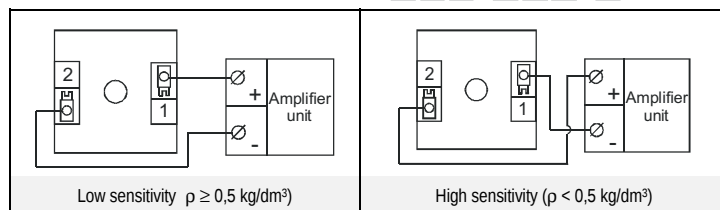
R□□-4□□-7

Operating diagram of the 2 wire DC version

Fork	LED	Output
Immersed	RED	$14 \pm 1 \text{ mA}$
Free	GREEN	$9 \pm 1 \text{ mA}$

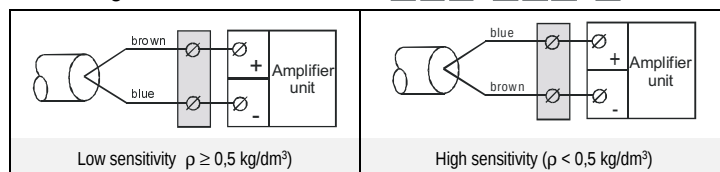
9.3.1. Connector version

R□□-4□□-6



9.3.2. Integral cable version

R□□-4□□-7



10. OPERATION TEST

Operating diagram of the NIVOSWITCH (except 2-wire DC versions)

Power supply	Fork	Operating mode	LED	Output
ON	Immersed	HIGH-level limit switch	RED	OFF
		LOW-level limit switch	GREEN	ON
	Free	HIGH-level limit switch	GREEN	ON
		LOW-level limit switch	RED	OFF
FAILS	Free or immersed	HIGH or LOW	NOT LIT	OFF

Correct operation of the switching circuit of an installed device can be tested with the optional test magnet (RPS-101).

Moving the test magnet in front of the marking on the cover of the housing the device must perform a switching (LED changes colour).

11. MAINTENANCE, REPAIR

The NIVOSWITCH R400 does not require routine maintenance. In some instances, however, the sensor probe may need occasional cleaning to remove surface deposits. This must be carried out gently, without harming the vibrating section of the vibrating fork.

12. STORAGE CONDITIONS

Environmental temperature range: -25 to $+60^\circ\text{C}$

Relative humidity: up to. 98 %

NIVELCO Process Control Ltd.

RC40G0A1

12/18/00