## Thank you for choosing a NIVELCO instrument.

 We are sure that you will be satisfied throughout its use!
## 1. APPLICATION

A NIVOSWITCH R-400 type vibration forks are applicable for level switching or flow switching tasks of normal and explosive liquids. Overfill or dry run protection as well as pump control is also possible with the NIVOSWITCH vibration forks in low/high fail-safe operation mode.

## 2. TECHNICAL DATA

2.1 General data
2.2 Two-wire DC,

NORMAL AND EX APPROVED VERSION

| R-400 / R-400 Ex |  |  |
| :---: | :---: | :---: |
| Medium pressure |  | 40 bar, PP flange: 6 bar see „Temperature diagrams" |
| Probe length |  | $0.69 \mathrm{~m} . . .3 \mathrm{~m}$ |
| Material of wetted parts |  | DIN 1.4571, PFA coating |
| Medium temperature |  | $-40^{\circ} \mathrm{C} \ldots+130^{\circ} \mathrm{C}$ <br> see table in 5.1 and diagrams |
| Ambient temperature |  | $\begin{gathered} -40^{\circ} \mathrm{C} . .+70^{\circ} \mathrm{C} \\ \text { see table in } 5.1 \text { and diagrams } \\ R^{* *}-4^{* *}-\mathrm{LEx} \\ \mathrm{R}^{*}-4^{* *}-\mathrm{M} \text { and } \mathrm{R}^{*}-4^{* *}-\mathrm{K} \\ -25^{\circ} \mathrm{C} . .+70^{\circ} \mathrm{C} \\ \hline \end{gathered}$ |
| Liquid density |  | $\geq 0.7 \mathrm{~kg} / \mathrm{dm}^{3}$ |
| Liquid viscosity |  | $\leq 10000 \mathrm{~mm}^{2} / \mathrm{s}$ (cSt) |
| Response time | $\begin{array}{l}\text { When } \\ \text { immersed }\end{array}$ | 0.5 sec |
|  | When free | When free: $\leq 1 \mathrm{~s}$ see response time diagram |
| Output mode indication |  | Bi-colour (LED) |
| Operation test |  | Output can be changed by test magnet |


| TYPE | 2-wire DC |  |  |
| :---: | :---: | :---: | :---: |
|  | $\begin{aligned} & \mathbf{R}^{* *}-4 * *-6 \\ & \mathbf{R}^{* *}-4 *-8 \mathrm{Ex} \\ & \hline \end{aligned}$ | $\begin{aligned} & R^{* *}-4^{* *}-\mathrm{K} \\ & \mathbf{R}^{* *}-4^{* *}-\mathrm{LEx} \end{aligned}$ | $\begin{aligned} & \mathbf{R}^{* *}-4 * *-7 \\ & \mathbf{R}^{* *}-4^{* *}-9 \mathrm{Ex} \\ & \hline \end{aligned}$ |
| Electric connections | Connector |  | $\begin{gathered} 3 \mathrm{~m} \text { cable } \\ \left(2 \times 0.5 \mathrm{~mm}^{2}\right) \end{gathered}$ |
| Ingress Protection | IP 65 | IP 67 | IP 68 |
| Output | DC current change: When free: $9 \pm 1 \mathrm{~mA}$; When immersed: $14 \pm 1 \mathrm{~mA}$ |  |  |
| Consumption | <0,5 W |  |  |
| Power supply (U) | 15 ... 29 V DC <br> Provided by the PKK-312-8 Ex remote switching unit for the Ex version |  |  |
| Setting operation mode | By switch on the remote switching unit (Low fail-safe, High fail-safe) |  |  |
| Electrical protection | Class III. |  |  |
| Ex protection mark of RC**-4*** x and $\mathrm{RG}^{*}-4$ **** Ex | 〔x II 1G Ex ia IIC T6...T4 Ga |  |  |
| Ex protection mark of RA*-4 **** | 〔(x) II 1G Ex ia IIB T6...T4 Ga |  |  |
| Intrinsically safe data | $\begin{gathered} \mathrm{U}<29 \mathrm{~V}, \mathrm{l}<100 \mathrm{~mA} \mathrm{P}<1,4 \mathrm{~W}, \\ \mathrm{Ceq}_{\text {eq }}<7 \mathrm{nF} \mathrm{~L}_{\text {eq }} \approx 0 \\ \text { For temperature classes see 5.1. } \end{gathered}$ |  |  |

NIVOSWITCH
SERIES R-400, R-400 EX VIBRATING FORK LEVEL SWITCHES

User's manual


Manufacturer
NIVELCO Process Control Co. H-1043 Budapest, Dugonics u. 11. Phone: (36-1) 889-0100 $\quad$ Fax: (36-1) 889-0200 E-mail: sales@nivelo.com | www.nivelo.com

### 2.3 2-wire AC AND 3-WIRE DC VERSIONS

| TYPE |  | 2-WIRe AC |  | 3-WIRE DC |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | R**-4**-1 | R**-4**-2 | R**-4**-3 | R**-4**-M | R**-4**-4 |
| Electric connections (wire cross section) |  | Connector | Integral cable ( $4 \times 0.75 \mathrm{~mm}^{2}$ ) max length 30 m | Connector |  | Integral cable ( $5 \times 0.5 \mathrm{~mm}^{2}$ ) max length 30 m |
| Mechanical protection |  | IP 65 | IP 68 | IP 65 | IP67 | IP 68 |
| High/low mode setting |  | Connection within connector | Wire selectable | Switch selectable | Connection within connector | Wire selectable |
| Output |  | 2-wire AC, for serial connection |  | $\begin{array}{r} \text { Field } \\ \text { PNP/NPN } \end{array}$ | ble, or switch | Field selectable, galvanically isolated PNP/NPN transistor switch |
| Output protection |  | - |  | Reverse polarity, overcurrent and short-circuit protection |  |  |
| Supply voltag |  | $20 . . .255 \mathrm{~V} \mathrm{AC}, 50 / 60 \mathrm{~Hz}$ |  | $12 \ldots 55 \mathrm{VDC}$ |  |  |
| 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 AC 13 |  | $\mathrm{I}_{\max }=350 \mathrm{~mA} \mathrm{DC} / \mathrm{U}_{\text {max }}=55 \mathrm{VDC}$ |  |  |
|  | min. continuous | $10 \mathrm{~mA} / 255 \mathrm{~V}, 25 \mathrm{~mA} / 24 \mathrm{~V}$ |  | - |  |  |
|  | max. impulse | $1.5 \mathrm{~A} / 40 \mathrm{~ms}$ |  | - |  |  |
| Residual current (in switched off state) |  | $<6 \mathrm{~mA}$ |  | < $100 \mu \mathrm{~A}$ |  |  |

### 2.4 AcCESSORIES

| - User's manual | - Declaration of c |
| :---: | :---: |
| - Warranty Card | 1 type t |
| 2.5 Order Codes |  |
| TYPE | CODE |
| Tube + plastic (PFA) coated fork | A |
| Tube + 1.4571 fork | C |
| Tube + highly polished fork | G |

### 2.6 TEMPERATURE DIAGRAMS



Pressure [ $\mathrm{p}_{\mathrm{T}}$ ] as a function of temperature [ $T_{M}$ ] for all versions (except PP flanged version)


Temperature limits of DC versions, [IL] load current


Pressure $\left[p_{T}\right]$ as a function of temperature $\left[T_{M}\right]$ for $P P$ flanged version


Temperature limits of $A C$ versions, $\left[T_{A}\right]$ ambient temperature [TM] medium temperature

### 2.7 ReSPonse time diagram (When getting free)

Response time
[S]


### 2.8 Dimensions



2.9 MATERIALS


## 3. INSTALLATION

Prevent the device from any mechanical damage.


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

- If directional positioning of the fork-tines is needed (side mounting), use the TEFLON (PTFE) tape to seal the thread and position the fork-tines to the desired direction.
- In this case vertical positioning of the forktines is suggested.
possible. recommended.


## Low viscosity liquids

On applications, where the forktines are easily freed from the process medium, any of the mountings shown to the right is

High viscosity liquids
On applications, where the forktines are not freed easily from the process medium, the horizontal mounting is


Threaded version



Installation options


Flanged version, critical distances: $x>5 m m$


For pipe mounting, fork-tines must be parallel to the direction of flow


Switching point and differential for water at $25^{\circ} \mathrm{C}$
Switching point as well as the switching differential depends on liquid density and mounting position.

## 4. WIRING

$$
\begin{array}{ll}
\text { 4.1. } 2 \text { WIRE AC VERSIONS } & \mathrm{R}^{* *}-4^{* *}-1 \text { connector } \\
& \mathrm{R}^{* *}-4^{* *}-2 \text { cable }
\end{array}
$$

DO NOT POWER UP THE DEVICE WITHOUT A LOAD CONNECTED IN SERIES WITH THE UNIT AND WITHOUT GROUNDING IT!

### 4.1.1. Version with connector $\quad \mathbf{R}^{* *}-4^{* *}-1$



Terminal block cover can be rotated in $90^{\circ}$ steps to ensure appropriate cable positioning.

### 4.1.2. Version with cable $\quad R^{* *}-4$ **- 2

This version is with 4 wire cable equipped. Only one of the black and brown wires is used, dependent on the operating mode (High or Low).
Provide also a terminal block connection for the unused wire.

4.2. 3 WIRE DC VERSIONS

In case of overload caused by short circuit, transistor will switch on and off, and LED will start to blink.
4.2.1. Version with connector $R^{* *}-4^{* *}-M / R^{* *}-4^{* *}-3$

4.2.1.1. Wiring of 3 -wire $D C$ version with connector in case of relay application


Terminal block cover can be rotated in $90^{\circ}$ steps to ensure appropriate cable positioning.

PNP - wiring


NPN - wiring

4.2.1.2. Wiring of 3 -wire DC version with connector in case of PLC application

4.2.2. Version with cable

R**-4**-4
4.2.2.1. Wiring in case of relay applications

PNP-wiring


NPN-wiring

4.2.2.2. Wiring in case of PLC applications

PNP-wiring

4.3. 2-WIRE DC VERSIONS, NORMAL OR EX

### 4.3.1. Version with connector


4.3.2. Version with cable


## 5. PUTTING INTO OPERATION, ADJUSTMENT

Check connecting of the wires and position of the mode of operation switch (if there is). After connection and power up the tuning fork is operational. Operation diagram of the NIVOSWITCH:

| Power SUPPLY | Fork | Mode | DISPLAY <br> (LED) |  | Output |
| :---: | :---: | :---: | :---: | :---: | :---: |
| ON | Immersed | HIGH | RED | OFF |  |
|  |  | LOW | GREEN | ON |  |
|  | Free | HIGH | GREEN |  |  |
|  |  | LOW | RED | OFF |  |
| NONE | $\begin{gathered} \text { Free } \\ \text { or } \\ \text { immersed } \end{gathered}$ | $\begin{aligned} & \text { HIGH } \\ & \text { or } \\ & \text { LOW } \end{aligned}$ | NOT LIT |  |  |

Operation diagram of the 2-wire DC version

| Fork |  | DISPLAY (LED) | OUTPUT |
| :---: | :---: | :---: | :---: |
| Immersed | RED | $14 \pm 1 \mathrm{~mA}$ |  |
|  | GREEN | $9 \pm 1 \mathrm{~mA}$ |  |

## OPERATION TEST

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).

### 5.1. Applying Ex Approved Models

Applying Ex approved models take into consideration the table of allowed temperatures listed below.

| Temperature CLASSIFICATION | T6 |  | T5 | T4 |
| :--- | :---: | :---: | :---: | :---: |
| $T_{\text {ambient }}$ | $70^{\circ} \mathrm{C}$ | $60^{\circ} \mathrm{C}$ | $60^{\circ} \mathrm{C}$ | $60^{\circ} \mathrm{C}$ |
| $T_{\text {medium }}$ | $70^{\circ} \mathrm{C}$ | $75^{\circ} \mathrm{C}$ | $95^{\circ} \mathrm{C}$ | $130^{\circ} \mathrm{C}$ |

## Table of possible temperatures



### 5.2 Conditions of Safe Operation

ATEX II 1G Ex ia IIC T6...T4 Ga and II 1G Ex ia IIB T6...T4 Ga approved vibrating forks should be powered by intrinsically safe [Ex ia IIC or IIB] certified and approved devices.
The cleaning of these units are allowed only with a wet rag.
Junction box shall be applied for R **-4 **-9 Ex versions with cable connection. Junction box shall meet the appropriate protection requirements.
The instrument has built-in overvoltage protection, so:

- Outer grounding of the electric housing shall be connected to the steel silo wall with a minimal $4 \mathrm{~mm}^{2}$ cross sectioned, shielded copper cable - outside the Zone 0 - within the distance of 1 m from the boundary of the Zone 0 .
- According to point 6.3.12 of EN 60079-11 standard dielectric strength test is not allowed to perform with the instrument.
To avoid the danger of electrostatic charge accumulation, in case of the coated version RA *-4 **** type the following safety rule shall be observed:
- Measured medium shall be an electrostatic conductor, electrical resistivity of the medium shall be $\leq 10^{4} \Omega$.
- Speed of the filling and emptying process shall be chosen properly according to the measured medium.


## 6. MAINTENANCE, REPAIR

In some instances, 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.


## 7. STORAGE CONDITIONS

Ambient temperature: $\quad-25 \ldots+60^{\circ} \mathrm{C}$
Relative humidity: max. 98 \%

## 8. WARRANTY

NIVELCO provides warranty of 3 (three) years in compilance with details described in the Warranty Card.

rcm4004a0600h_08<br>2013. February

NIVELCO reserves the right to change technical specifications without notice.

