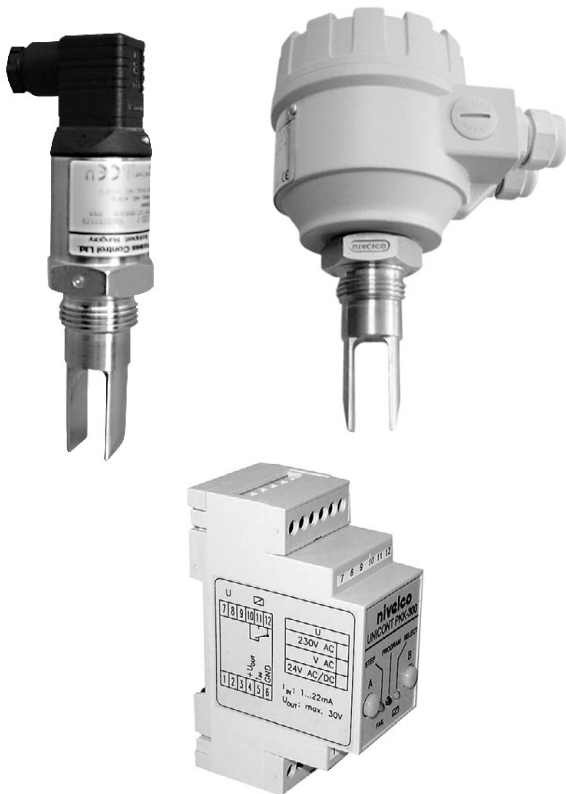




# NIVOSWITCH R-400/R-500

## VIBRATION FORK LEVEL SWITCHES



- ◆ **Electronic level switches for liquids**
- ◆ **Excellent vibration immunity**
- ◆ **Various output versions:**
  - 2-wire AC, 2-wire DC
  - 3-wire PNP/NPN transistor
  - up to 2 SPDT power relays
- ◆ **Polished probe as standard**
- ◆ **ECTFE (HALAR®) coated flanged versions and hygienic connections**
- ◆ **Flange and process connections for the food industry**
- ◆ **ATEX EEx ia certified versions**

## ABOUT NIVOSWITCH

Revamped NIVOSWITCH range of Vibrating Forks for an even greater flexibility of use. The reengineered extreme short fork section enables applications in tight spaces and also on pipes. The 6 times increased excitation frequency will ensure interference-free operation if used on vibrating structures.

**NIVOSWITCH** can be used in almost all liquids whether explosive or non-explosive, aggressive (acids, solvents), high viscosity liquids.

It can also be used on light and medium density free flowing granules and powders.



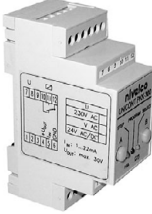
**NIVOSWITCH** covers a large variety of level detection applications such as high/low fail safe limit switch, overflow or dry run protection, pump controls.

Highlights of the NIVOSWITCH:

- Simple installation, no maintenance device
- Switching performance does not depend on the change of liquid conductivity, dielectric constant, viscosity, pressure and temperature.
- Probe extension up to 3 m length.
- Flange or sliding sleeve options.
- ECTFE (HALAR®) coated versions for aggressive or sticky media.
- Hygienic versions with various process connections and 0.5 micron fine polishing.
- Switch over between high and low fail-safe mode
- Operation test of installed units can be performed with the help of a test magnet on some of the models.

# GENERAL

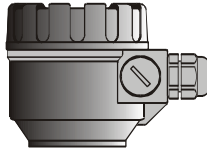




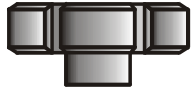





NIVOSWITCH vibrating level switch is offered in the following versions:

NIVOSWITCH RF-400 or RF-500	A NIVOSWITCH RC-400	UNICONT PKK-312-8 Ex
 <p><b>NIVOSWITCH RF-400 or RF-500</b> is the "Standard" version with paint coated, robust Aluminium or plastic housing; visible, large bicolour output state indication LED; 1 or 2 power relay output and universal AC/DC power supply.</p>	 <p><b>NIVOSWITCH RC-400</b> is the "Mini" version incorporating a stainless steel tube housing, visible bicolour output state indication LED, and 2-wire AC, 2-wire DC or 3-wire PNP/NPN transistor output.</p>	 <p><b>UNICONT PKK-312-8Ex</b> ATEX [EEEx ia] II C certified galvanically isolated power supply with relay output for level switches of type RC-400Ex used in hazardous areas.</p>

## PRODUCT OVERVIEW

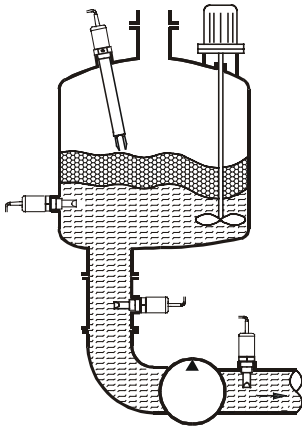
The **NIVOSWITCH** is made to vibrate at its resonant frequency by a pair of piezoceramic discs. By coming in contact with the medium, the frequency and amplitude of the vibration changes. This change is detected, processed and converted into a switch signal by the integral electronics built in SM (Surface Mount) technology.

*As a standard feature, all forks are polished. A highly polished version for hygienic applications are available with all wetted parts highly polished.*

	"STANDARD" models Aluminium or Plastic housing	"MINI" models Stainless steel tube housing		
<b>Housing / Electronics</b>	 <ul style="list-style-type: none"> <li>Potential free relay output (SPDT or DPDT)</li> <li>Universal power supply</li> </ul>	 <p>Connector output</p> <ul style="list-style-type: none"> <li>3-wire PNP/NPN transistor output</li> <li>2-wire AC output</li> </ul>	 <p>Integrated cable output</p> <ul style="list-style-type: none"> <li>2-wire DC output</li> <li>2 wire Ex (intrinsically safe)</li> </ul>	
<b>Process connections</b>	 <ul style="list-style-type: none"> <li>Stainless steel 1" BSP or NPT male threads</li> </ul>	 <ul style="list-style-type: none"> <li>DIN, ANSI and JIS flanges</li> <li>Stainless steel, PP or ECTFE (HALAR®) coated st. st.</li> </ul>	 <ul style="list-style-type: none"> <li>DN 40 and DN 50 round thread connections (DIN 11851)</li> </ul>	 <ul style="list-style-type: none"> <li>1 1/2" and 2" Triclamp connections (ISO 2852)</li> <li>other hygienic fittings</li> </ul>
<b>Extension</b>	<ul style="list-style-type: none"> <li>up to 3 m</li> <li>Stainless steel or PFA coated st. st.</li> </ul> 			
<b>Fork</b>	 <ul style="list-style-type: none"> <li>Stainless steel</li> <li>ECTFE (HALAR®) coated st. st. Version</li> <li>Highly polished version</li> <li>Protrusion length without extension: 69 mm</li> </ul>			
<b>Accessories</b>	 <ul style="list-style-type: none"> <li>Stainless steel weld-in socket with O-ring for flush mounting</li> </ul> <p>Order code: <b>RPG-101</b></p>	 <ul style="list-style-type: none"> <li>Stainless steel sliding sleeve to adjust switching point with the extended model for atmospheric pressure only</li> </ul> <p>Order codes: <b>RPH-112</b> 1 1/2" BSP <b>RPN-112</b> 1 1/2" NPT</p>		

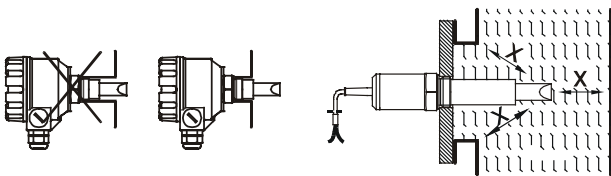
# APPLICATION AND INSTALLATION

## Application



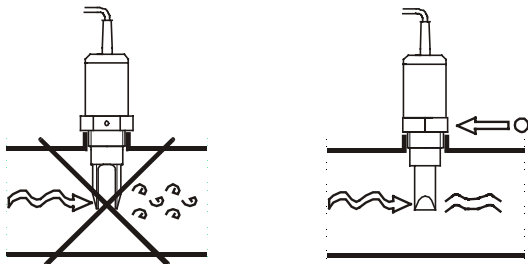
- In applications with
- *low viscosity material* (no risk of hang-over remaining on the fork-tines) any of the mounting shown beside is possible,
  - *high viscosity material* (risk of hang-over remaining on the fork-tines) only vertical (top) mounting can be suggested.
  - In applications with side mounting take care of the positioning mark.

## Installation



Installation with threaded stub

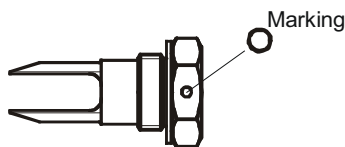
X > 5



For material detection in pipes the fork-tines should be parallel to the direction of flow

## POSITIONING AND SWITCHING POINT

For correct positioning of the fork-tine the O marking on the hexagon can be used.



TEFLON (PTFE) tape should be applied to aid positioning of the fork-tines. If the fork-tine position is irrelevant, use the sealing ring provided.

# EXPLANATION OF THE LED SIGNALS

Working state of the vibrating switch will be indicated by a bicolour LED

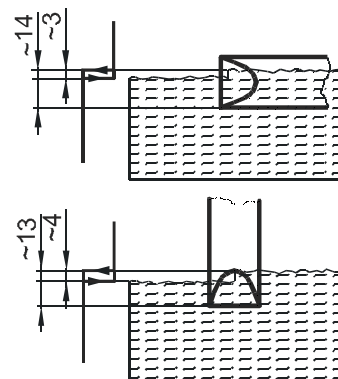
Signals indicate the followings:

## 3-wire AC and DC version

Powering	Fork	Operation	LED colour	Output
ON	immersed	H	RED	OFF
		L	GREEN	ON
	Free	H	GREEN	ON
		L	RED	OFF
OFF	immersed or free	H or L	NONE	OFF

## 2-wire DC version

Fork	LED colour	Output
Immersed	RED	14 ± 1 mA
Free	GREEN	9 ± 1 mA



Values are for water at 25 °C

Switching point as well as the switching difference slightly depends on liquid density and mounting position.

# WIRING

## 3-WIRE DC VERSION

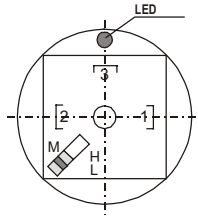
R □ □ - 4 □ □ - 3  
R □ □ - 4 □ □ - 4

Output short-circuit would lead to switch-on switch-off and LED flashing.

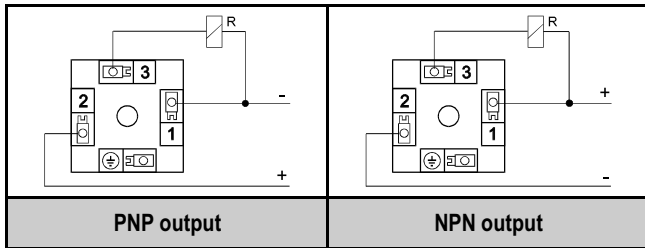
## CONNECTOR VERSION

R □ □ - 4 □ □ - 3

"M" - Function switch  
H = High fail-safe  
L = Low fail-safe

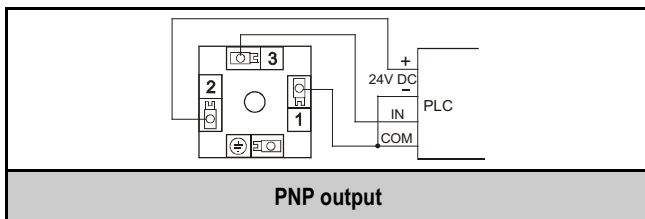


### Wiring with relay



The enclosure of the connector can be turned by maximum 90° so that the cable gland can be positioned in the required direction.

### Wiring with PLC

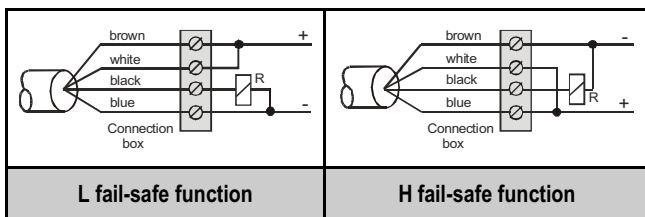


## INTEGRAL CABLE VERSION

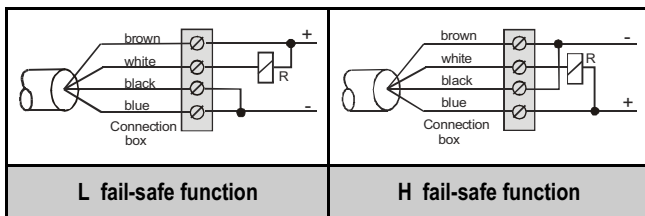
R □ □ - 4 □ □ - 4

### Wiring with relay

#### PNP output

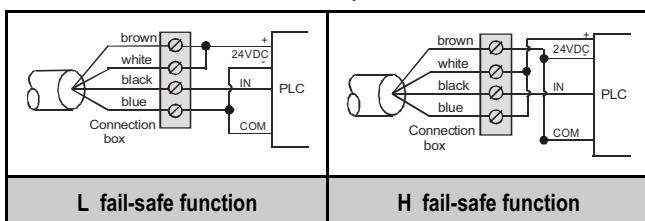


#### NPN output



### Wiring with PLC

#### PNP output



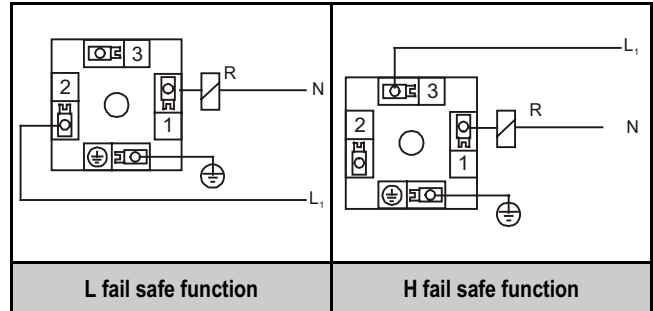
## 2-WIRE AC VERSION

R □ □ - 4 □ □ - 1 connector  
R □ □ - 4 □ □ - 2 cable

**DEVICE SHOULD NOT BE POWERED BEFORE PROPER GROUNDING!**

## CONNECTOR VERSION

R □ □ - 4 □ □ - 1

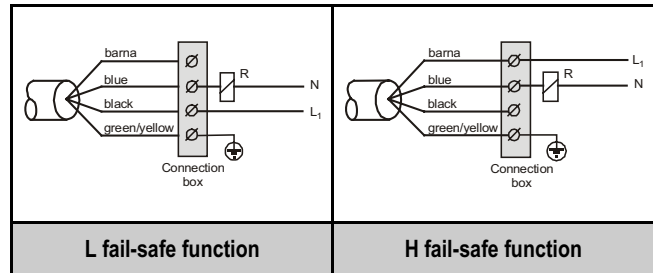


The enclosure of the connector can be turned by maximum 90° so that the cable gland can be positioned in the required direction.

## INTEGRAL CABLE VERSION R □ □ - 4 □ □ - 2

The integral cable is with four wire. The connection box should be provided with a four lot screw terminal so that all wires of the integral cable can be fastened.

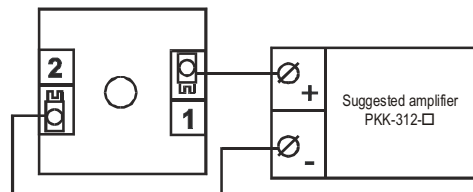
The interconnection cable can also be with 3 wires only..



## 2-WIRE DC VERSION, ORDINARY

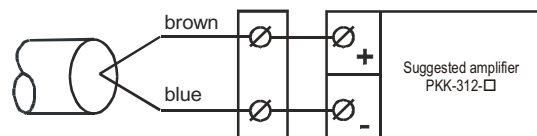
### CONNECTOR VERSION

R □ □ - 4 □ □ - 6



### INTEGRAL CABLE VERSION

R □ □ - 4 □ □ - 7



2-wire DC version require the use of DC switch and amplifier, type suggested UNICONT PKK-312.

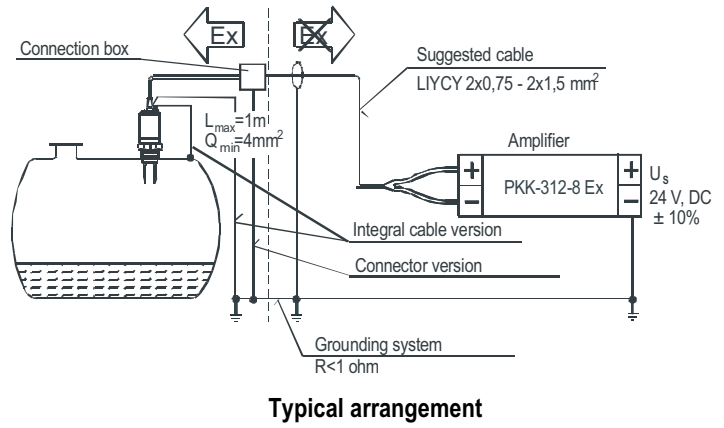
Fail-safe function will be set on the amplifier unit PKK-312.

## Wiring of Ex certified devices

Protection with: [EEx ia]  
Certified intrinsically safe current loop

Temperatures in the chart below should be taken into consideration.

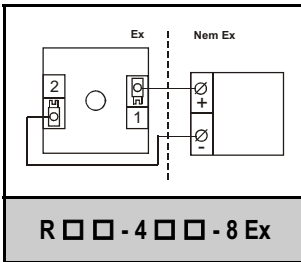
TEMPERATURE CLASS	T6		T5	T4
T <sub>ambient</sub>	70 °C	60 °C	60 °C	60 °C
T <sub>medium</sub>	70 °C	80 °C	95 °C	130 °C



Typical arrangement

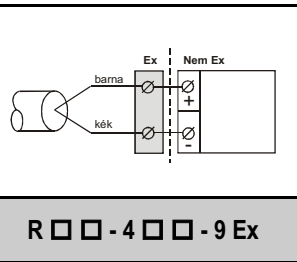
## Wiring

### CONNECTOR VERSION



R □ □ - 4 □ □ - 8 Ex

### INTEGRAL CABLE VERSION



R □ □ - 4 □ □ - 9 Ex

Intrinsically safe device is recommended to run with the isolator power supply unit, type PKK-213-8-Ex also performing remote switching by its SPDT dry contacts.

High or Low fail-safe function can be selected by the switch on the isolator power supply unit, while the sensitivity can be preset (for high or low density liquid) by the polarity of the powering.

## Conditions of Ex application

- Device can exclusively be run by duly certified galvanically isolated, intrinsically safe power supply unit with [EEx ia] IIC marking
- Device is provided with arrester thus dielectric strength test should not be performed on the unit.
- The application of grounding cable with the required length would require the use of connection box.
- The cross section of the insulated grounding cable should be minimum 4 mm<sup>2</sup> and it should be connected to the metal tank outside of and nearest to the border of the zone zero. (See arrangement above)
- Only the fork and the extension is allowed to immerse in the hazardous medium.
- Plastic coated types of R□□-4□□-□ tend to static charge thus
  - they could only be used for conductive mediums with specific resistance not exceeding 10<sup>4</sup> Ωm.
  - filling and emptying velocity should be selected according to the features of the medium

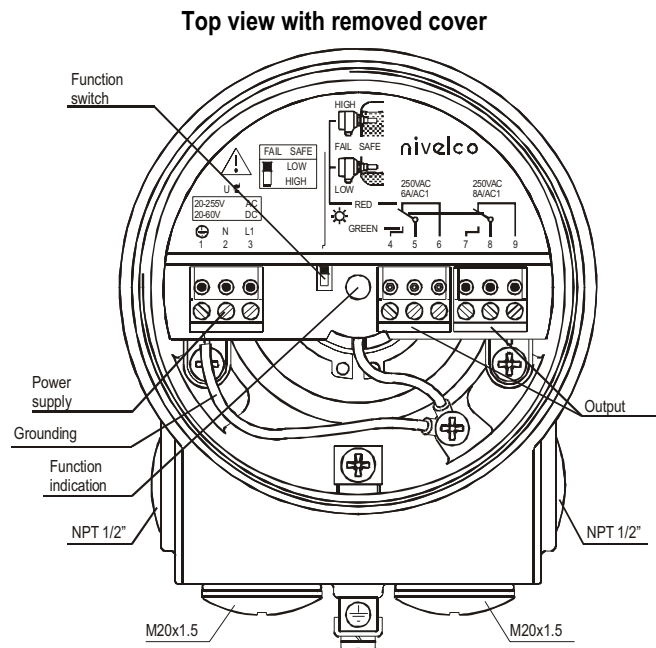
## Wiring of models with aluminium or plastic housing

Relay output versions:

R □ □ - 4 □ □ - 0      R □ □ - 4 □ □ - A  
R □ □ - 5 □ □ - 0      R □ □ - 5 □ □ - A

The cover should be removed for wiring with cable of outer diameter Ø 8 ... 15 mm and cross section 0,75 ... 2,5 mm<sup>2</sup>

Depending on the cable arrangement the outer or internal grounding screw should be used for grounding. Mains voltage, SELV and AC as well as DC must not be led in the same cable.



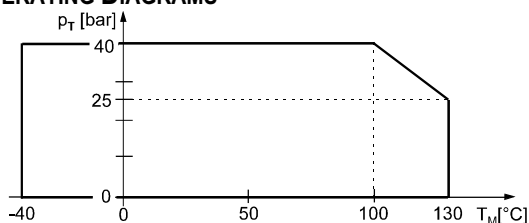
# TECHNICAL DATA

## GENERAL SPECIFICATION

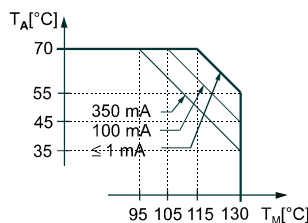
Model	Non-coated	ECTFE (HALAR) coated
Probe material	1.4571 (X 6 CrNiMoTi 17122)	1.4404 (X 2 CrNiMo 17132); ECTFE coated
Process connection material	1.4571 (X 6 CrNiMoTi 17122)	PP flange (max.: 6 bar) ECTFE coated St. St. flange
Probe extension material	1.4571 (X 6 CrNiMoTi 17122)	PFA coated St. St. tube
Maximum pressure	4 MPa (40 bar), See derating diagramme	PP flange: 6 bar, - St. St. flange: 40 bar, See derating diagramme
Medium temperature	-40 °C ... +130 °C	PP flange: -20 °C ... +90 °C Plastic coated St. St. flange: -40 °C ... +120 °C *
Ambient temperature range	Standard models in Alu-cast/plastic housing with relay output: -30 °C to +70 °C; "Mini" models in stainless steel housing with electronic output: -40 °C to +70 °C    Ex version: -20 °C to +60 °C	
Sealing material	VITON® <sup>1</sup>	
Probe length	69 ... 3000 mm	
Medium density	≥ 0,7 kg/dm <sup>3</sup>	
Liquid viscosity	≤ 10000 mm <sup>2</sup> /s (cSt) see diagramme below)	
Response time	When immersed	0,5 sec
	When free	≤ 1 sec (See diagramme)
Output mode indicator	Bi-colour Staus LED on outside of housing	

\* Please note, that temperature difference between inner and outer surface of ECTFE coated flanges must not exceed 60 °C. If necessary, insulate outer surface of flange.

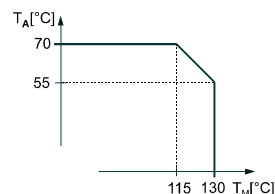
## DERATING DIAGRAMS



Process pressure ( $p_T$ ) versus medium temperature ( $T_M$ ) for all models (except ECTFE coated and PP flanged)

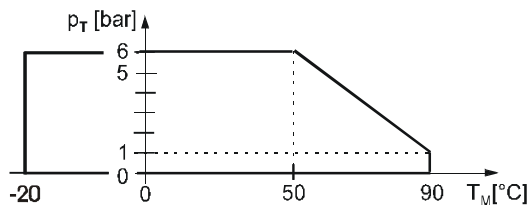


Current load, versus process- ( $p_T$ ) and medium temperature ( $T_M$ ) for transistor output DC versions

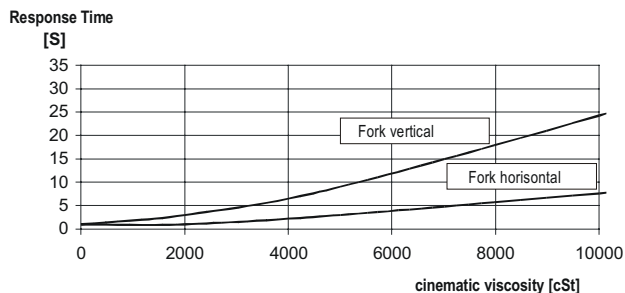


Temperature limits ( $T_M$  and  $T_A$ ) for 2-wire AC and EX versions

## RESPONSE TIME (WHEN GETTING FREE) VERSUS MEDIUM VISCOSITY



Process pressure ( $p_T$ ) versus medium temperature ( $T_M$ ) for models with Polypropylene flange



## Special data for various models

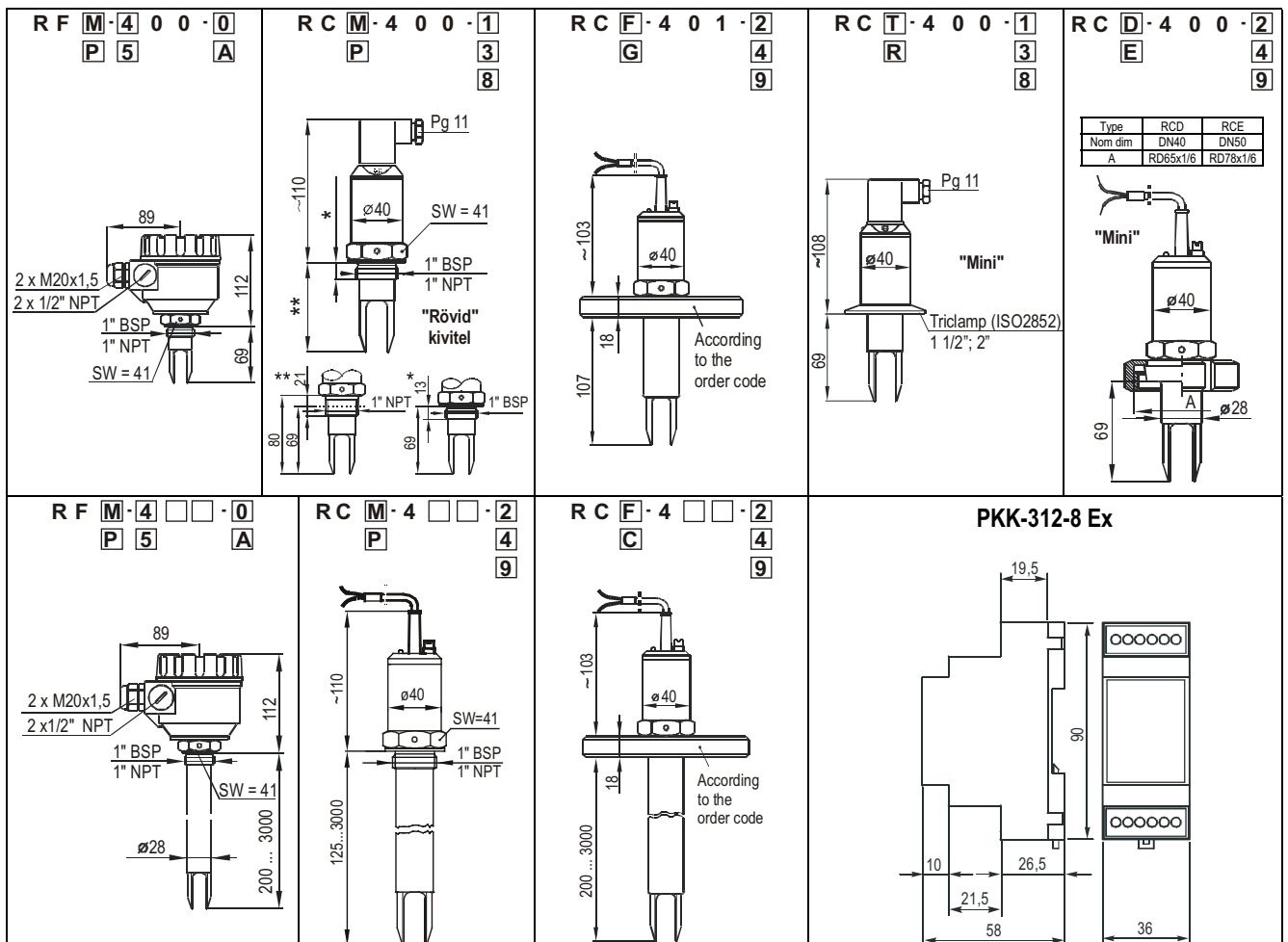
"Standard" Model	Relay output version R □ □ - 4 □ □ - 0 R □ □ - 5 □ □ - A
Housing material	Paint coated Aluminium (RF-400) or plastic (RF-500)
Selection of High/low fail safe	By switch
Output	1 or 2 SPDT relay
Output rating	Relay1: 250 V AC, 8 A, AC1 Relay2: 250 V AC, 6 A, AC1
Electric connections (wire cross section)	2 x M20x1,5 ∅ 7 ... 12 mm cable (0,75 ... 2,5 mm <sup>2</sup> )
Supply voltage	20 ... 255 V AC and 20 ... 60 V DC
Consumption	AC: 1,2 ... 17 VA ; DC: < 3 W
Electrical protection	Class I
Ingress protection	IP 67
Weight (threaded versions)	Aluminium housing: 1.3 kg + 1.2 kg/m Plastic housing: 0.95 + 1.2 kg/m

Model	Remote switching unit (for Ex forks) J D T - 1 3 1 - Ex
Input	9 ± 1 mA ... to 14 ± 1 mA
Max. serial inductivity	L <sub>o</sub> < 4 mH
Max. parallel capacitance	C <sub>o</sub> < 50 nF
High/low fail safe function selection	By switch
Output	SPDT relay
Output rating	250 V AC, 8 A, AC1
Supply voltage/consumption	24 V AC ± 10 %; < 2,5 VA 24 V DC ± 15 %; < 2,5 W
Sensor voltage	15 ... 26 V DC
Electrical protection	Class III
Ex protection mark	ATEX II (1) G [Ex ia] IIC
Ambient temperature	-10 °C ... +55 °C
Mounting	DIN EN 50033-35 rail
Housing material	PA
Ingress protection	IP 20
Weight	~ 0,21 kg

<sup>1</sup> Viton® is a registered trademark from DuPont Performance Elastomers®

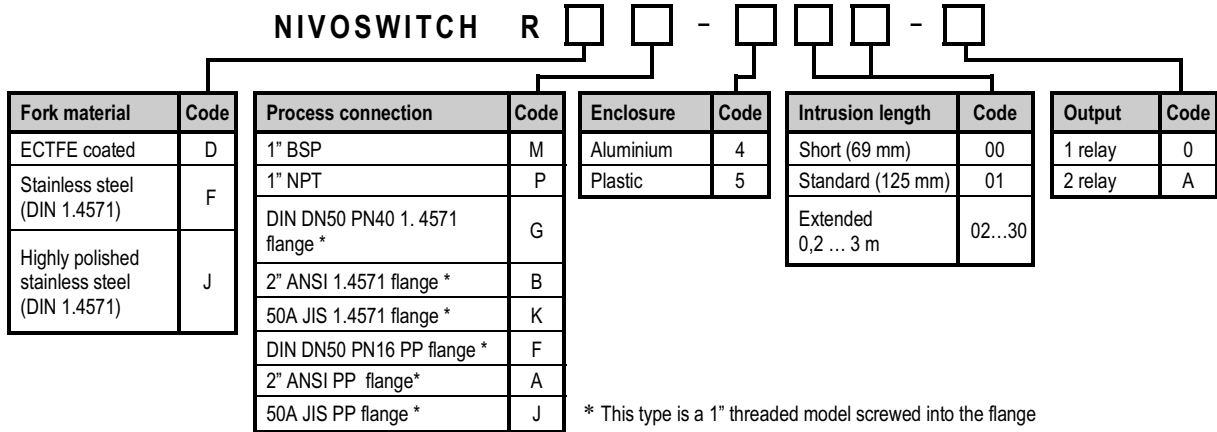
"Mini" Models	2-wire AC		3-wire DC (PNP/NPN transistor output)	
	R□□ - 4□□ - 1	R□□ - 4□□ - 2	R□□ - 4□□ - 3	R□□ - 4□□ - 4
Electric protection	DIN connector	3 m Integral cable (4 x 0,75 mm <sup>2</sup> ), ∅ 6 mm	DIN connector	3 m Integral cable (5 x 0,5 mm <sup>2</sup> ), ∅ 7 mm
Ingress protection	IP 65	IP 68	IP 65	IP 68
Selection of High/Low fail safe function	Within the connector	With cable polarity	Within the connector	With cable polarity
Output	2-wire AC, in serial connection with the load		Selection btw. PNP or NPN by polarity change	Selection btw. PNP or NPN by polarity change
Output protection	—		Reverse polarity, over-current 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 (switched-on state)	< 10,5 V		< 4,5 V	
Electrical protection	Class I		Class III	
Current load	Continuous	Max.: 350 mA AC13 Min.: 10 mA / 255 V AC; 25 mA / 24 V AC	I <sub>max</sub> : 350 mA / 55 V DC	
	Impulse	Max.: 1,5 A / 40 ms	—	
Residual current (switched off state)	< 6 mA		< 100 μA	
Function test	Optional test magnet (Order code: RPS-101)			
Weight (threaded versions)	0,5 kg + 0,1 kg / 100 mm			

"Mini" Models	2-wire Ex		2-wire DC	
	R□□ - 4□□ - 8	R□□ - 4□□ - 9	R□□ - 4□□ - 6	R□□ - 4□□ - 7
Electric connections (wire cross section)	DIN Connector	3 m Integral cable (2 x 0,5 mm <sup>2</sup> ), ∅ 5mm	DIN Connector	3 m Integral cable (2 x 0,5 mm <sup>2</sup> ), ∅ 5 mm
Ingress protection	IP 65	IP 68	IP 65	IP 68
High/Low failsafe function selection	with the switch on the isolator unit (e.g. PKK-312-8Ex)		With switch on the amplifier	
Output	Type	2-wire DC		
	Data	Depends on the state of the fork i.e. when free: 9 ±1 mA; when immersed: 14 ±1 mA Transient surge protection		
Supply voltage	Powered by PKK-312-8 Ex for instance		15 ... 27 V DC	
Consumption	< 0,5 W			
Electric protection	Class III			
Ex marking	Intrinsically safe, II 1 G EEx ia IIC T4...T6		—	
Intrinsically safe data	U <sub>max</sub> = 28 V DC; I <sub>max</sub> = 100 mA; P <sub>max</sub> = 1,4 W; Leq ≈ 0 μH Ceq <sub>max</sub> = 7 nF		—	
Weight (threaded versions)	0,5 kg + 0,1 kg / 100 mm			

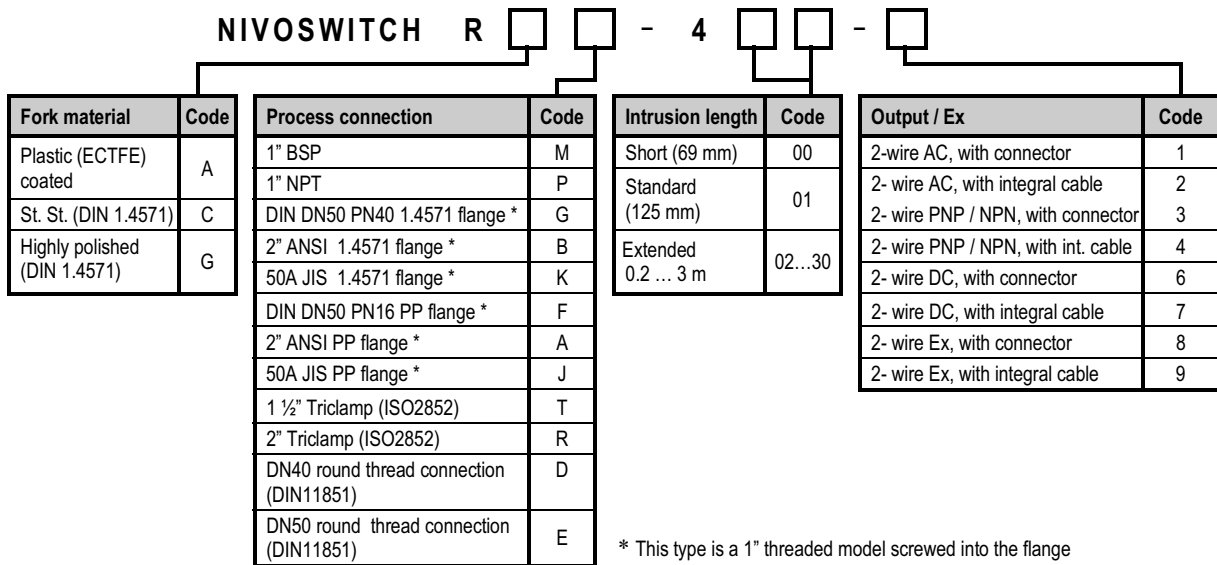


## ORDER CODES (NOT ALL COMBINATION POSSIBLE)

**NIVOSWITCH "Standard"** models in Aluminium / plastic housing:



**NIVOSWITCH "Mini"** models in stainless steel tube housing:



**Intrinsically safe amplifier:**

### UNICONT PKK-312-8 Ex

**Accessories to order**

- NIVOSWITCH RPS-101 testmagnet for the model „Mini“
- NIVOSWITCH RPG-101 weldable sliding sleeve 1.4571
- NIVOSWITCH RPH-112 1 1/2" BSP sliding sleeve 1.4571
- NIVOSWITCH RPN-112 1 1/2" NPT sliding sleeve 1.4571
- NIVOSWITCH RPH-122 1 1/2" BSP sliding sleeve 1.4571, for plastic coated
- NIVOSWITCH RPN-122 1 1/2" NPT sliding sleeve 1.4571, for plastic coated