NIVOSWITCH

VIBRATING FORK LEVEL SWITCHES FOR LIQUIDS

3 YEARS WARRANTY

NIVELCO

LEVEL SWITCHES

NIVOSWITCH R–400/500 vibrating fork level switches with parallel vibrating fork are suitable for detecting the level of liquids. Mounted on pipes, tanks it can control filling/emptying, can also generate fail-safe alarms providing overfill- or dry run protection. The operating principle is based on that the electronic circuit excites a vibration in the fork probe. When the medium reaches and covers the fork, its vibration changes. The fork will start vibrating freely again as the medium sets it free. The electronics senses the change of vibration and gives output signal after a selected delay. The plastic-coated version is recommended for use in aggressive media, the highly polished version is recommended for use in abrasive media. The PNP/NPN transistor output versions can be connected directly to a PLC, or relay unit.

Certain types of **NIVOSWITCH** vibrating forks are able to solve switching tasks of high-current loads with the help of **UNICONT PKK** switching amplifiers. UNICONT PKK–312–8 Ex is a recommended intrinsic safety switching unit designed for Ex rated vibrating forks.

FEATURES

- Compact and mini compact version
- Rod length up to 3 meters *(10 ft)*
- ECTFE/PFA-coated version
- Polished vibrating part
- Hygienic versions with various process connections and 0.5 micron fine polishing
- Selectable sensitivity
- Relay or electronic output
- Switching performance does not depend on the change of liquid conductivity, dielectric constant, pressure and temperature
- Process temperature max. +130 °C *(+266 °F)*
- Output can be toggled by test magnet
- Ex, DNV variants
- IP67, IP65/IP68

APPLICATIONS

- Min. 0.7 kg/dm^3 density *(specific gravity)* and max. 10^4 mm^2/s *(0.1 ft^2/s)* viscosity
- Food & beverages industry, water industry, chemical industry, oil industry
- For normal or hazardous, aggressive *(acids, solvents)* liquids
- Covers a large variety of level detection, applications such as high/low fail-safe limit switch, overfill or dry-run protection, pump controls

VARIANTS

This chart will help you select the correct version for a given level switching application. The most important consideration is the consistency of the medium.

Features		Liquids		
		Mini compact	Compact	
		RC□–400	RF□–400/500	RN□–400 Ex
Metal housing		■	■	■
Plastic housing		–	■	–
Extension		■	■	■
High-polished version		■	■	■
Plastic-coated fork		■	■	–
2" process connection		■	■	■
1", 1½" process connection		■	■	■
Relay output		–	■	■
Electronic output		■	–	–
Electrical connection	Terminal	–	■	■
	DIN connector	■	–	–
	M12 connector	■	–	–
	Cable	■	–	–
Intrinsic safety version		■	–	–
Flameproof enclosure		–	–	■
DNV		–	■	–
Function setting *(low-high level)*		■ [1]	■	■
Function indication		■	■	■
Output test magnet		■	–	–

[1] *Only for 3-wire DC versions*

CERTIFICATES

- ATEX (Ex ia G)
- ATEX (Ex d G)
- IEC Ex (Ex d G)
- UKCA Ex (Ex ia G)
- DNV *(only for RF–400 compact types for liquids)*

RPS–101–0
test magnet

PKK–312–8Ex
Ex ia power supply
for Ex ia vibrating forks

RFM–500

RNM–402

RBM–401–3

RCM–401
cable version

RCM–402
with M12
connector

RCM–400
with DIN connector

TECHNICAL DATA

	Mini compact	Compact	
	RC□–400	RF□–400/500	RN□–400 Ex
Insertion length	69…3000 mm (2.72"…10 ft)		
Material of wetted parts	1.4571 stainless steel or ECTFE/PFA-coating		1.4571
Process connection	As per order code		
Process temperature	–40…+130 °C [–40…+266 °F] (see "Thermal properties"), for ECTFE-coated versions: –40…+120 °C (–40…+248 °F)		
Ambient temperature	–40…+70 °C [–40…+158 °F] (see temperature diagrams) With M12 connector: –25…+70 °C (–13…+158 °F)	–30…+70 °C (–22…+158 °F)	
Medium pressure	Up to 40 bar [580 psi] (4 MPa) (see pressure diagrams)		
Medium density	> 0.7 kg/dm³ (>0.7 S.G.)		
Medium viscosity	≤ 10 000 mm²/s (cSt)		
Supply voltage	2-wire DC: 15…29 V DC 2-wire AC: 20…255 V AC; 3-wire DC: 12…55 V DC	20…255 V AC / 20…60 V DC	
Power consumption	AC: depending on load; DC: < 0.6 W	< 3 W	
Housing material	1.4571 stainless steel	Painted aluminum or plastic (PBT)	Painted aluminum
Electrical connection	DIN / M12 connector, or 3 m (10 ft) integrated cable[1] 2× 0.5 mm² (AWG20) / 4× 0.75 mm² (AWG19) / 5× 0.5 mm² (AWG20)	2× M20×1.5 plastic cable glands for Ø6…Ø12 mm (0.236"…0.472") cable, 2× terminal blocks for max. 2.5 mm² (AWG14) wire cross section, 2× internally threaded ½" NPT connection for protective pipes	
Electrical protection	AC version: Class I, DC version: Class III	Class I	
Ingress protection	DIN connector: IP65; M12 connector: IP67; cable: IP68	IP67	
Weight	~0.5 kg + 1.2 kg/m extension (~1.1 lb + 1 lb/ft extension)	~1.3 kg + 1.2 kg/m extension (~2.85 lb + 0.8 lb/ft extension)	~2.1 kg + 1.2 kg/m extension (~4.63 lb + 0.8 lb/ft extension)

[1] Available cable length: up to 30 m (100 ft).

Ex INFORMATION

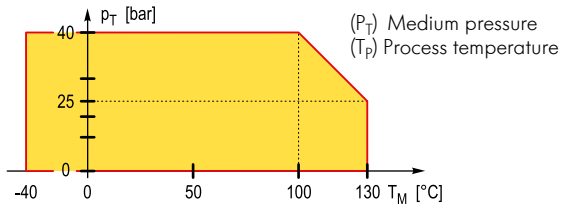
		Mini compact version		Compact version (metal housing)
		RC□–400–8 Ex / L Ex (connector type)	RC□–400–9 Ex (cable type)	RN□–400–N Ex, RN□–400–P Ex, RM□–400–N Ex, RM□–400–P Ex
Explosion protection		Intrinsically safe[2]		Flame-proof housing
Ex marking	IEC Ex	-		Ex d IIB T6…T4 Ga/Gb, –40 °C ≤ T_{amb} ≤ +70 °C (–40 °F ≤ T_{amb} ≤ +158 °F)
	ATEX	⟨Ex⟩ II 1G Ex ia IIB T6…T4 Ga	⟨Ex⟩ II 1G Ex ia IIC T6…T4 Ga	⟨Ex⟩ II 1/2 G Ex d IIB T6…T4 Ga/Gb
Intrinsic safety limits		U_i = 29 V; I_i = 100 mA; P_i = 1.4 W; C_i = 7 nF; L_i = 0 mH	U_i = 29 V; I_i = 100 mA; P_i = 1.4 W; C_i = 15 nF; L_i = 0 mH	-
Supply voltage		15…29 V DC		20…250 V AC (50/60 Hz) / 20…36 V DC
Electrical connection		DIN connector or M12 connector	3 m (10 ft) integrated cable[1]	2× M20×1.5 cable glands for Ø7…Ø12 mm (0.275"…0.472") cable with Ex d IIC protection 2× terminal blocks for max. 1.5 mm² (AWG16) wire cross section, 2× ½" NPT internal threads for cable protective pipes.

[1] Available cable length: up to 30 m (100 ft).
[2] Intrinsically *safe* vibrating forks must be powered by [Ex ia] certified devices, for example by UNICONT PKK–312–8 Ex.

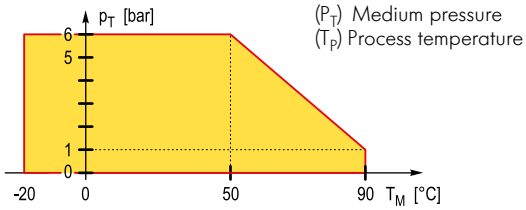
Temperature classes	T6		T5	T4
Mini compact version for liquids (Ex ia)				
Highest ambient temperature	+70 °C (+158 °F)		+60 °C (+140 °F)	
Highest process temperature	+70 °C (+158 °F)	+75 °C (+167 °F)	+95 °C (+203 °F)	+130 °C (+266 °F)
Compact version with flameproof enclosure (Ex d)				
Process temperature minimum: –40 °C (–40 °F); Maximum:	+70 °C (+158 °F)	+80 °C (+176 °F)	+95 °C (+203 °F)	+130 °C (+266 °F)
Ambient temperature minimum: –40 °C (–40 °F); Maximum:	+65 °C (+149 °F)	+50 °C (+122 °F)	+65 °C (+149 °F)	+70 °C (+158 °F)
Highest surface temperature of the process connection	+70 °C (+158 °F)	+80 °C (+176 °F)	+95 °C (+203 °F)	+125 °C (+257 °F)
Highest surface temperature	+75 °C (+167 °F)			+130 °C (+266 °F)

THERMAL PROPERTIES

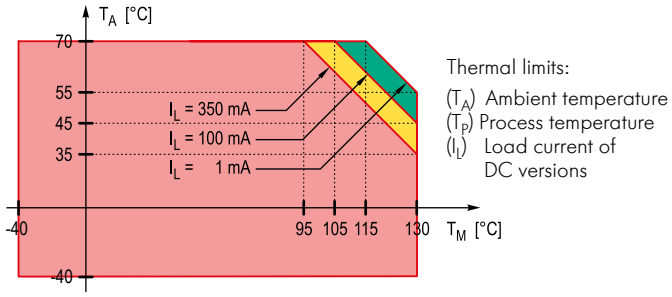
Medium pressure – Process temperature



Medium pressure – Process temperature PP flange version



Mini compact version



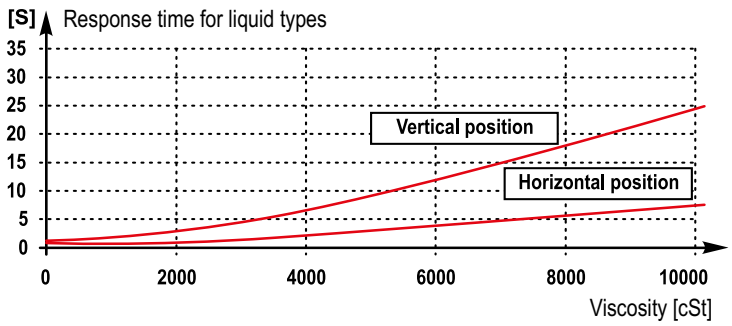
OUTPUT PROPERTIES

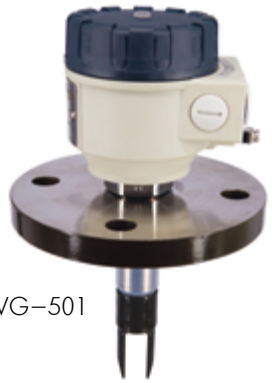
		Compact type
Output		**RF□, RV□, RJ□–400/500**
Relay		1 or 2 (SPDT) relays 250 V AC, 8 A, AC1 / 250 V AC, 6 A, AC1
Response time	when immersed	≤ 0.5 s
	when free	≤ 1 s[1]

			Mini compact type
Type	**Output**		**RC□, RG□, RB□, RE□–400/500**
2-wire DC	DC current change		When immersed: 14 mA ±1 mA
			When free: 9 mA ±1 mA
2-wire AC	AC output for serial connection		Voltage drop *(in switched-on state)*: < 10.5 V
			Residual current *(in switched-off state)*: < 6 mA
	Current load	max. continuous	350 mA, AC 13
		min. continuous	10 mA / 255 V; 25 mA / 24 V
		max. impulse	1.5 A / 40 ms
3-wire DC	Transistor switch		NPN or PNP output can be realized with appropriate wiring
	Voltage drop (in switched-on state)		< 4.5 V
	Current load (max. continuous)		350 mA / U_{max} = 55 V
	Residual current (in switched-off state)		< 100 µA
	Response time	when immersed	0.5 s
		when free	< 1 s[1]

[1] See viscosity diagram

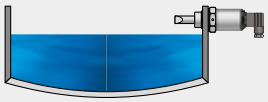
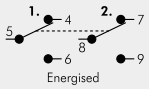
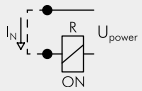
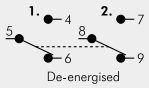
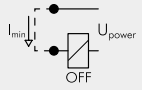
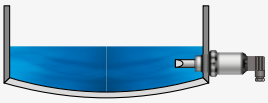
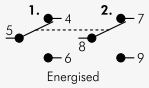
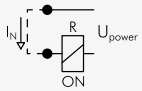
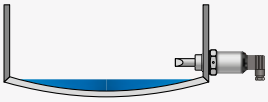
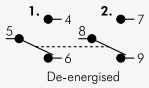
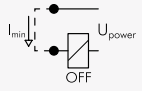
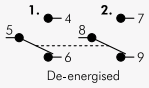
RESPONSE TIME DIAGRAM

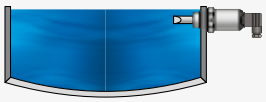




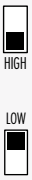
RVG–501

OPERATION

Compact and Mini compact version						
Power supply	Switching		Fail-Safe setting [2]	Status LED	Output	
					Relay	Electronic [3]
ON	High level		 HIGH		 Energised	 ON
			 HIGH		 De-energised	 OFF
	Low level		 LOW		 Energised	 ON
			 LOW		 De-energised	 OFF
OFF	–	–	High / Low		 De-energised	 OFF

2-wire DC version			
Power supply	Switching	Status LED	Output
ON			14 ±1 mA
			9 ±1 mA
OFF	Fork immersed, or fork is free		–

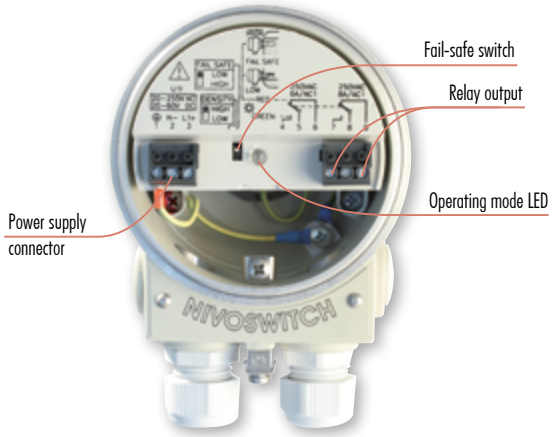
OPERATING MODE SWITCH

Compact	
Fail-safe	
 HIGH LOW	Fail-safe alarm is indicated with de-energized relay or open state of the output

[2] In the case of the mini-compact version with integrated cable, it is determined by the appropriate wiring. [3] Only for 2-wire AC version.

WIRING

Compact

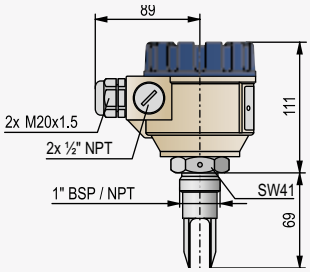


Mini compact (connector version)

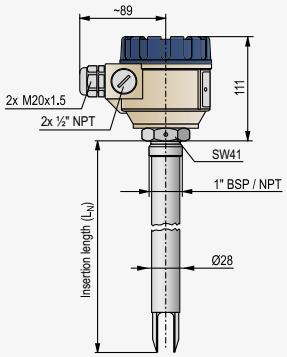
DIMENSIONS

Compact

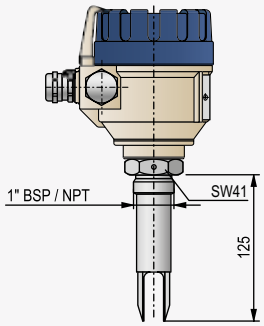
Standard version



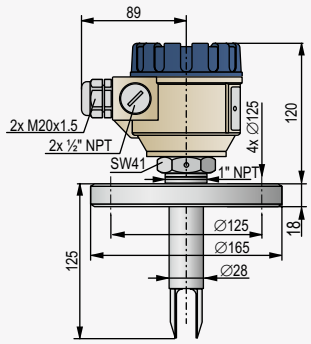
Extension rod version



Ex d version

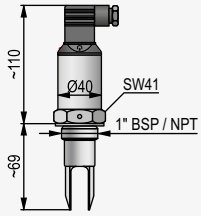


Flanged version

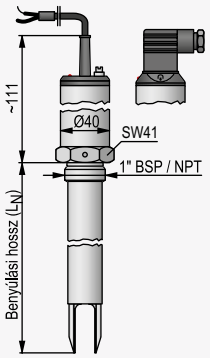


Mini compact

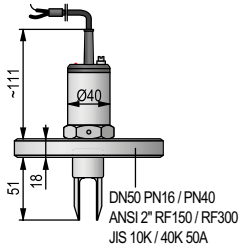
Standard version



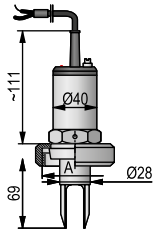
Extension rod version



Flanged version



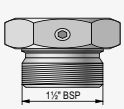
Sanitary version



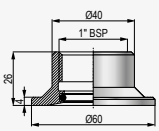
Other process connections

- DIN, ANSI and JIS flanges stainless steel, PP/PFA-coated stainless steel
- DN40 and DN50 pipe-coupling process
- connections (DIN 11851)
- 1½" and 2" TriClamp process connections (ISO 2852)
- Other hygienic *(food industry)* process connections

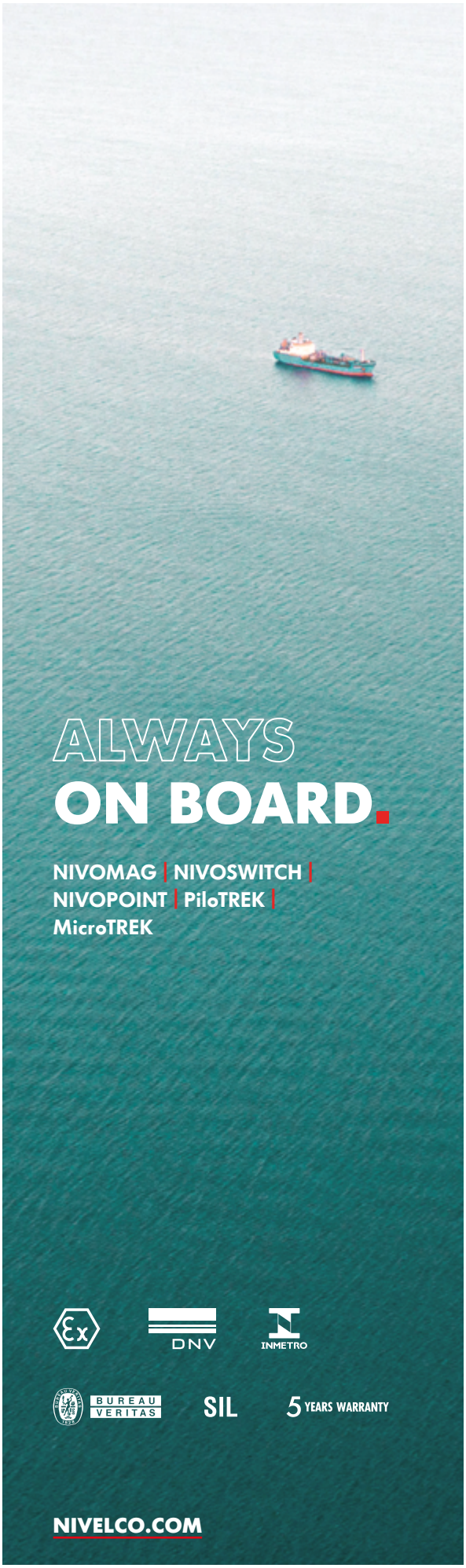
Accessories



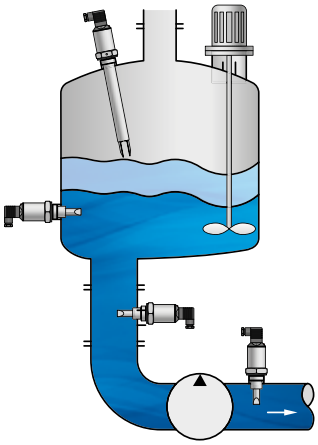
Sliding sleeve



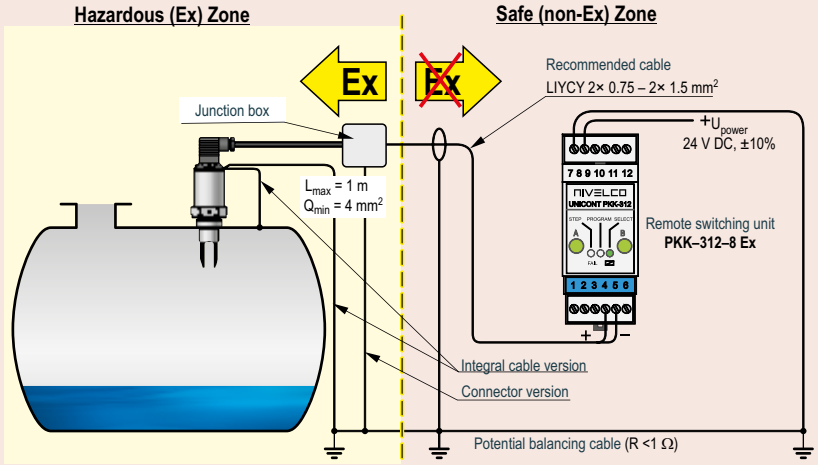
Weld-in socket



INSTALLATION



RECOMMENDED SET-UP VARIATION



- Applied in low viscosity medium *(no risk of subsidence remaining on the fork-tines)* any of the mounting varieties shown is possible.
- Applied in higher viscosity medium *(risk of subsidence remaining on the fork-tines)* only vertical (top) mounting can be suggested.
- In case of a horizontal installation or a mounting into a tube, the position marking ("O") should be taken into account.

ORDER CODES *(NOT ALL CODE VARIATION AVAILABLE)*

Vibrating fork level switches for liquids

NIVOSWITCH R□□–□□□–□ [1]

Fork material		Code
Mini compact	1.4571 fork	C
	1.4571 fork, highly polished	G
	ECTFE-coated fork	B[2]
	1.4571, without reed sensor	E[3]
Compact	1.4571 fork	F[3]
	ECTFE coated fork	V[2,3]
	1.4571 fork, highly polished	J[3]
	1.4571 fork / Ex d housing	N
	Stainless steel, highly polished / Ex d housing	M

Housing	Code
Painted aluminum	4
Plastic	5

Process connection		Code
BSP	1"	M
	1½"	H
	2"	C
NPT	1"	P
	1½"	N
	2"	L
1½" TriClamp		T[4]
2" TriClamp		R[4]
Dairy pipe DN40, DIN 11851		D[4]
Dairy pipe DN50, DIN 11851		E[4]
DN40 PN40/25		S
DN50 PN40, 1.4571		G
2" ANSI RF600, 1.4571		B
JIS 40K 50A, 1.4571		K
DN50 PN16, PP		F[5]
2" ANSI FF150, PP		A[5]
JIS 10K 50A, PP		J[5]
Stainless steel flanges; welded		U[6]

Probe length	Code	
69 mm (2.7")	0	0
125 mm (4.9")	0	1
200 mm (7.9")	0	2
⋮	⋮	⋮
900 mm (35.4")	0	9
1 m (39.4")	1	0
⋮	⋮	⋮
3 m (118")	3	0

Output / Ex			Code
Mini compact	DIN conn.	2-wire AC	1[7]
		3-wire DC	3[7]
		2-wire DC	6[7]
		2-wire DC / Ex ia	8[8]
	M12 conn.	2-wire DC	K[7]
		2-wire DC / Ex ia	L[8]
		3-wire DC	M[7]
	Cable	2-wire AC	2[7,13]
		3-wire DC	4[7,13]
		2-wire DC	7[7,13]
		2-wire DC / Ex ia	9[8,9]
Compact		1 relay	0[10]
		2 relays	A[10]
		1 relay / Ex d	N[11]
		2 relays / Ex d	P[11]
		1 relay / DNV	G[12]
		2 relays / DNV	H[12]

[1] The order code of an Ex version product should end in "Ex". [2] Only 1" BSP *(PVDF)* or flange *(PP or ECTFE-coated)* process connection. [3] Ex version not available.
[4] Only available for the codes that starting with RB, RC, RG, RF and RJ. [5] Max. 6 bar *(87 psi)*, –20…+90 °C *(–4…+194°F)*. [6] MF□–□□□–H type flanges *(available from size DN40)* should be ordered separately. [7] Only available for the codes that starting with RB, RC and RG. [8] Only available for the codes that starting with RC and RG.
[9] Cable length up to 3 m *(9.84 ft)*. [10] Not available for the codes that starting with RB, RC, RG. [11] Only available for the codes that starting with RN and RM.
[12] RF version only, 1" BSP / 1" NPT and stainless steel flanged version only, with DNV certification [13] Cable length maximum 30 m *(94.8 ft)*.

ACCESSORIES

DIN rail mountable current controlled switch module recommended for NIVOSWITCH vibrating forks

UNICONT PKK–312–□ [1]

Power supply	Code	Power supply	Code
230 V AC	1	24 V AC/DC	4
110 V AC	2	24 V AC/DC / Ex	8
24 V AC	3		

UNICONT PKK–312–8 Ex
Intrinsically safe remote switching unit dedicated to the Ex ia versions of the NIVOSWITCH vibrating forks.

		For vibrating forks	For coated vibrating forks
Weld-in socket (1" BSP)		RPG–101–0	–
Sliding sleeve for extended versions[14]	1½" BSP	RPH–112–0	RPH–122–0
	1½" NPT	RPN–112–0	RPN–122–0
Test magnet for mini compact versions		RPS–101–0	

[14] For minimum 300 mm *(12")* insertion length and up to 6 bar *(87 psi)* medium pressure.

RFM–500

RCM–401
cable version

rc45LQ23en01b // Specifications in metric & US units. NIVELCO reserves the right to change technical data without notice!

#NivelcoDevices

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