Technical Information
TI 364O/98/en/11.07
189205 11/07 02

*Vibracon LVL-A**

Level limit switch for liquids, compact design

Application

The Vibracon LVL-A* is a level limit switch for all kinds of fluids and is used in tanks, containers and pipelines. It is used in cleaning and filtering systems and coolant and lubricant tanks as an overspill protection or as a pump protector.

The LVL-A* is ideal for applications which previously used float switches and conductive, capacitive and optical sensors.

It also works in applications which are unsuitable for these measuring methods due to conductivity, build-ups, turbulence, flows or air bubbles.

The LVL-A* is not suitable for hazardous areas and areas where the medium temperature is above 150 °C.

For hygienic areas the use of LVL-AH is recommended.

Features

- Operational safety, reliability and universal applicability through use of the tuning fork measuring principle
- External test option using test magnet
- On-site control using external LED display
- Easy to install even at points difficult to access due to compact construction
- Rugged stainless steel housing (316L)
- Service-friendly plug-in connections
- For medium temperatures up to 150 °C

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Function and system design

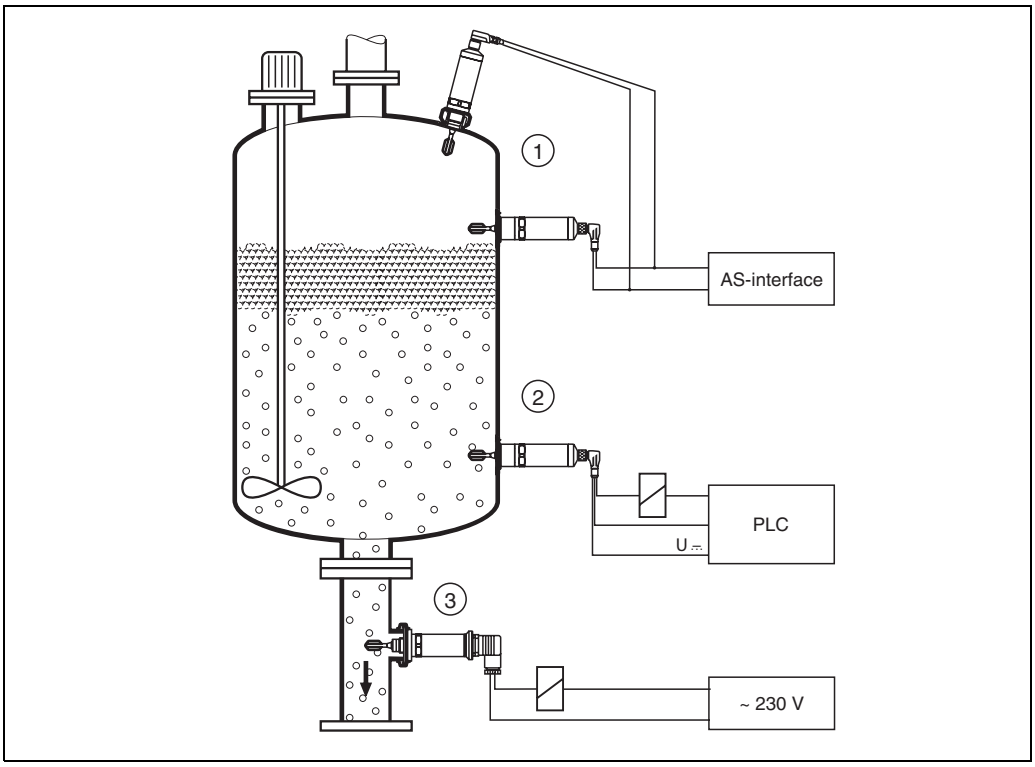
Measuring principle

The tuning fork of the LVL-A* is brought to its resonance frequency by means of a piezoelectric drive. If the tuning fork is covered by liquid, this frequency changes. The electronics of the LVL-A* monitor the resonance frequency and indicate whether the tuning fork is freely vibrating or is covered by liquid

Measuring system

The measuring system comprises:

- Vibracon LVL-A* limit switch
- Progammable logic control (PLC), miniature contactor, solenoid valve or AS-interface bus



Example 1: Overfill protection or top level detection
Example 2: Lower level detection or dry running protection
Example 3: Dry running protection for pump

Input

Measured variable

Density

Measuring range

> 0.7 g/cm^3
other density settings on request, e. g. 0.5 g/cm^3

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Output

Switching outputs

	DC-PNP valve connector	DC-PNP M12 x 1	AC 2-wire	AS-interface
Function	Positive voltage signal at the switch output of the electronics (PNP)		Switching the power supply line	Switching the D0 bit
Switch behaviour	ON/OFF			0/1 (free/covered)
Relay switching capacity	250 mA			D0 bit
Fail-safe mode	MIN/MAX (see below)			D1 bit D1: 0 error
Switching delay	approx. 0.5 s on coverage/approx. 1.0 s on tuning fork becoming uncovered, other switching time on request			
Switching threshold	with vertical orientation: 13.0 mm (0.5 in) from top of fork with horizontal orientation: 3.5 mm (0.14 in) from fork centre			
Hysteresis	3 mm ± 0.5 mm (0.12 in ± 0.02 in)			

Operating modes for versions AC and DC-PNP

The LVL-A* can be connected in two operating modes. By choosing the suitable operating mode (MAX or MIN safety), you ensure that the LVL-A* switches safely even in the event of a fault (e. g. if the power supply line is disconnected).

MAX - maximum safety

The LVL-A* keeps the electronic switch closed as long as the liquid level is below the fork.
Example of an application: overfill protection

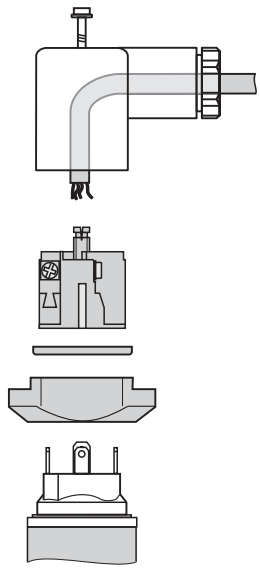
MIN - minimum safety

The LVL-A* keeps the electronic switch closed as long as the fork is immersed in liquid.
Example of an application: dry running protection for pumps

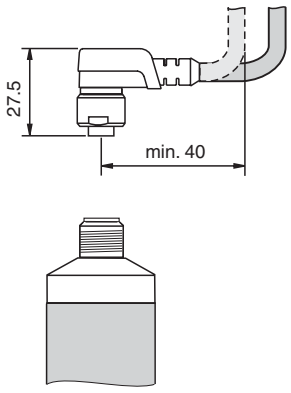
The electronic switch opens if the limit is reached, if a fault occurs or the power fails.

Power supply

Cable entry



PG11/½ NPT
QUICKON



M12 x 1*
Plastic

Accessory:
*M12 connector, angled, cable 4 x 0.34

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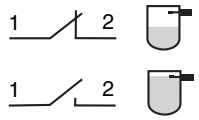
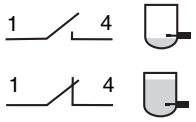
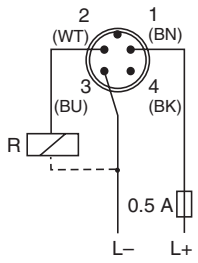
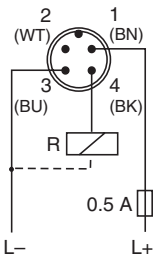
Electrical connection

Version DC-PNP (direct current) with M12 x 1 connector

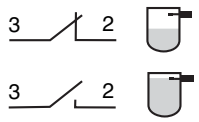
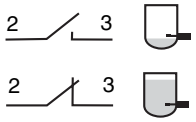
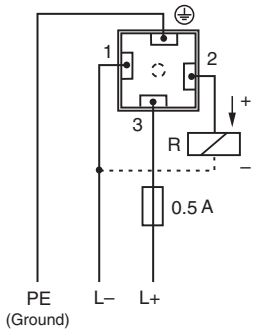
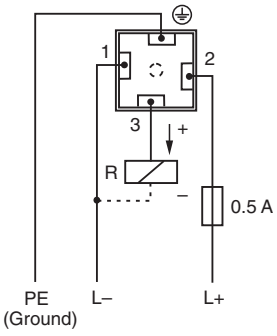
Voltage source: shock-protected voltage or class 2 circuit (North America)

Suitable for use in non-equivalent operation:
When both outputs are connected, the MIN and MAX outputs take on opposite states in trouble-free operation. In the event of an alarm condition or a line break, both electronic switches are open.

In addition to level monitoring, function-dependent sensor monitoring can also be performed with the aid of 2-channel evaluation.

Operating mode MAX (NC contact)	Operatig mode MIN (NO contact)
	
	

Version DC-PNP (direct current) with valve connector

Operating mode MAX (NC contact)	Operatig mode MIN (NO contact)
	
	

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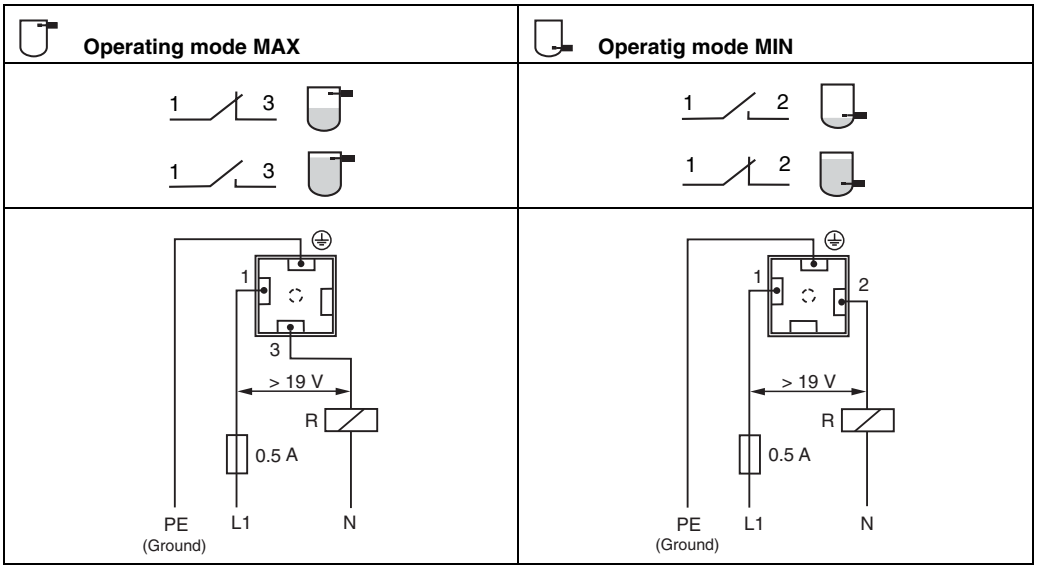
Version AC (alternating current) with valve connector

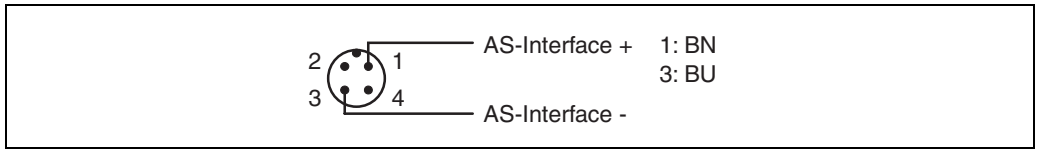


Note!

Approved for relays with a holding power/rated power > 2.5 VA (253 V) or > 0.5 VA (24 V).

Relays with lower holding power/rated power can be operated via a parallel-connected RC-element (option).

Connect AS-interface bus



Programming instructions for the AS-interface

AS-interface profile: S-3.A.1

The address is defaulted to 0 (HEX). It is changeable via the bus master or programming unit.

Data bit:

D0: 1, sensor covered	D1: 1, status = O.K.
D0: 0, sensor free	D1: 0, status = error
D2 and D3 are not used.	

Parameter bits (P0 ... P3) are not used.

Electrical connection	DC-PNP valve connector	DC-PNP M12 x 1	AC 2-wire	AS-interface
Supply voltage	10 V DC ... 35 V DC	10 V DC ... 35 V DC	19 V AC ... 253 V AC	24.5 V DC ... 31 V DC
Cable entry	PG11/½ NPT	M12 x 1	PG11/½ NPT	M12 x 1
Cable specification	max 1.5 mm² and Ø3.5 mm ... 6.5 mm (Ø0.14 in ... 0.26 in)	IEC 60947-5-2	max 1.5 mm² and Ø3.5 mm ... 6.5 mm (Ø0.14 in ... 0.26 in)	IEC 62026-2
Power consumption	< 825 mW	< 825 mW	< 810 mW	< 825 mW
Current consumption	< 15 mA	< 15 mA	< 3.8 mA	< 25 mA
Residual ripple	5 V_{ss} at 0 Hz ... 400 Hz	5 V_{ss} at 0 Hz ... 400 Hz	–	–

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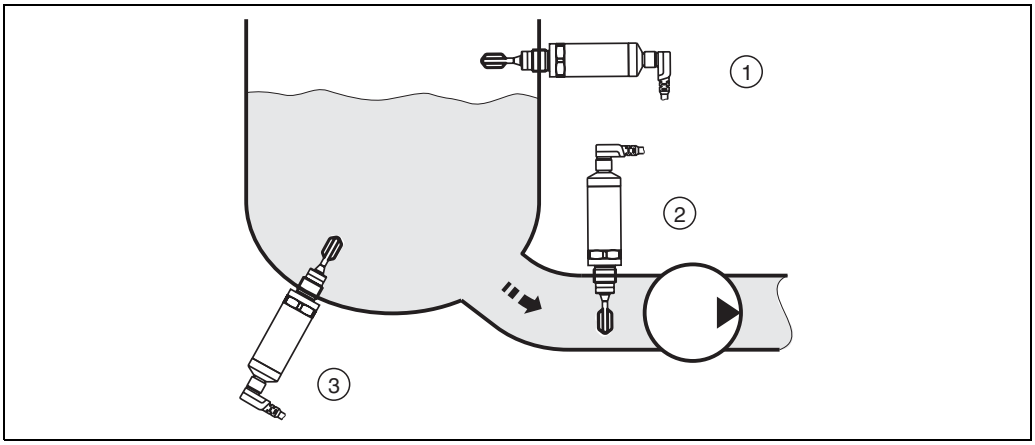
Performance characteristics

Switching delay	0.5 s when covering 1.0 s when becoming free other switching time on request
Reference operating conditions	Ambient temperature: 23 °C (296 K) Process pressure: 1 bar Medium: water Medium density: 1 Medium temperature: 23 °C (296 K) Installation from above/vertical Density setting: > 0.7
Measured value resolution	< 0.5 mm (0.02 in)
Measuring frequency	approx. 1100 Hz in air
Maximum measured error	13.0 mm ± 1 mm (0.5 in ± 0.04 in)
Repeatability	±0.5 mm (0.02 in)
Hysteresis	3.0 mm ± 0.5 mm (0.12 in ± 0.02 in)
Settling time	< 2 s
Influence of ambient temperature	negligible
Influence of medium temperature	-29.6×10^{-3} mm/°C
Influence of medium pressure	-55.2×10^{-3} mm/bar

Operating conditions: installation

Orientation

The Vibracon LVL-A* can be installed in any position in a container or pipe. The formation of foam does not impair its function.



Example 1: Overfill protection or top level detection
Example 2: Dry running protection for pump
Example 3: Lower level detection

Connecting cable	Up to 1000 m (3000 ft) with AC/DC-PNP, AS-interface to IEC 62026-2

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Operating conditions: environment

Ambient temperature range	-40 °C ... +70 °C (233 K ... 343 K) -25 °C ... +70 °C (2248 K ... 343 K) (AS-interface)
Ambient temperature limits for 150 °C version	Derating from 90.0 °C (363 K) process temperature: reduction to max. 50.0 °C (323 K) ambient Derating from 90.0 °C (363 K) process temperature: reduction to max. 150 mA relay switching capacity
Ambient temperature limits for 100 °C version	Derating from 80.0 °C (353 K) process temperature: reduction to max. 50.0 °C (323 K) ambient Derating from 80.0 °C (353 K) process temperature: reduction to max. 150 mA relay switching capacity
Storage temperature	-40 °C ... +85 °C (233 K ... 358 K)
Degree of protection	IP65 with valve connector IP66/67 with M12 x 1 connector PPSU (plastic)
Shock resistance	to EN 60068-2-27 (30 g)
Vibration resistance	to EN 60068-2-64
Electromagnetic compatibility	Interference emission to EN 61326, electrical equipment class B, Interference immunity to EN 61326, annex A (Industrial) and NAMUR recommendation NE 21 (EMC). AS-interface to EN 50295.
Overvoltage protection	Overvoltage category III

Operating conditions: process

Medium temperature range for 150 °C version	-40 °C ... +150 °C (233 K ... 423 K) see ambient temperature limits
Medium temperature range for 100 °C version	-40 °C ... +100 °C (233 K ... 373 K) see ambient temperature limits
Process pressure	-1 bar ... 40 bar
State of aggregation	liquid
Density	> 0.7 g/cm^3 (other density setting on request)
Viscosity	1 cst ... 10000 cst
Gas content	stagnant mineral water
Solids content	< Ø5 mm (0.2 in)

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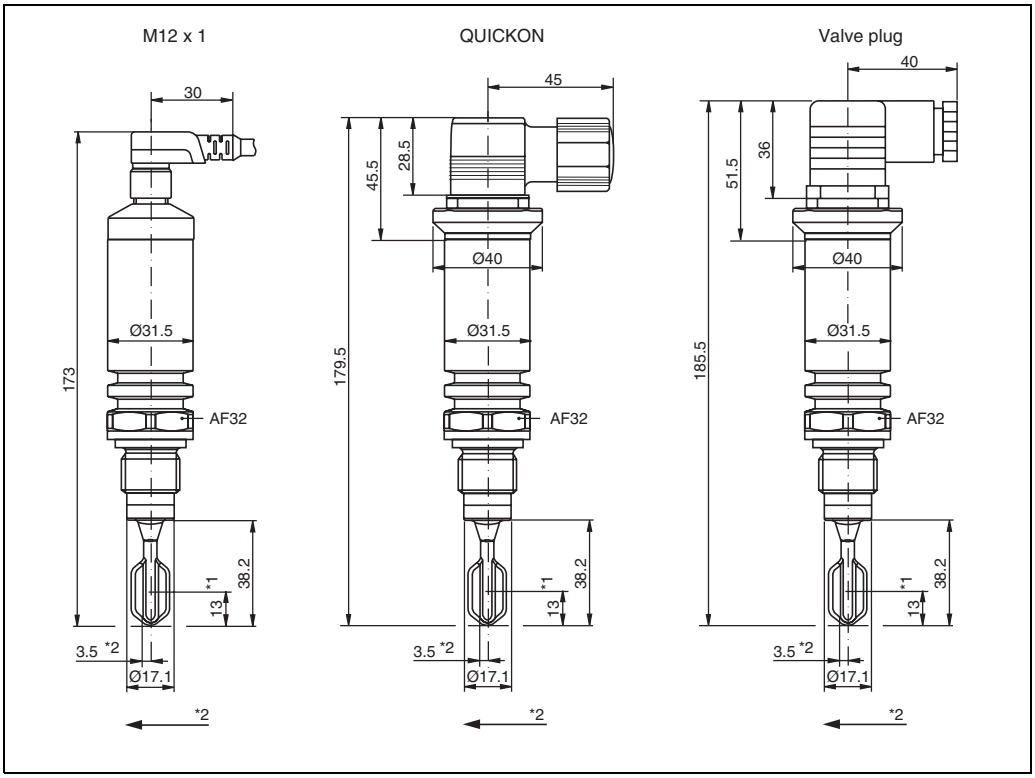
Mechanical construction

Note!

All dimensions in mm.

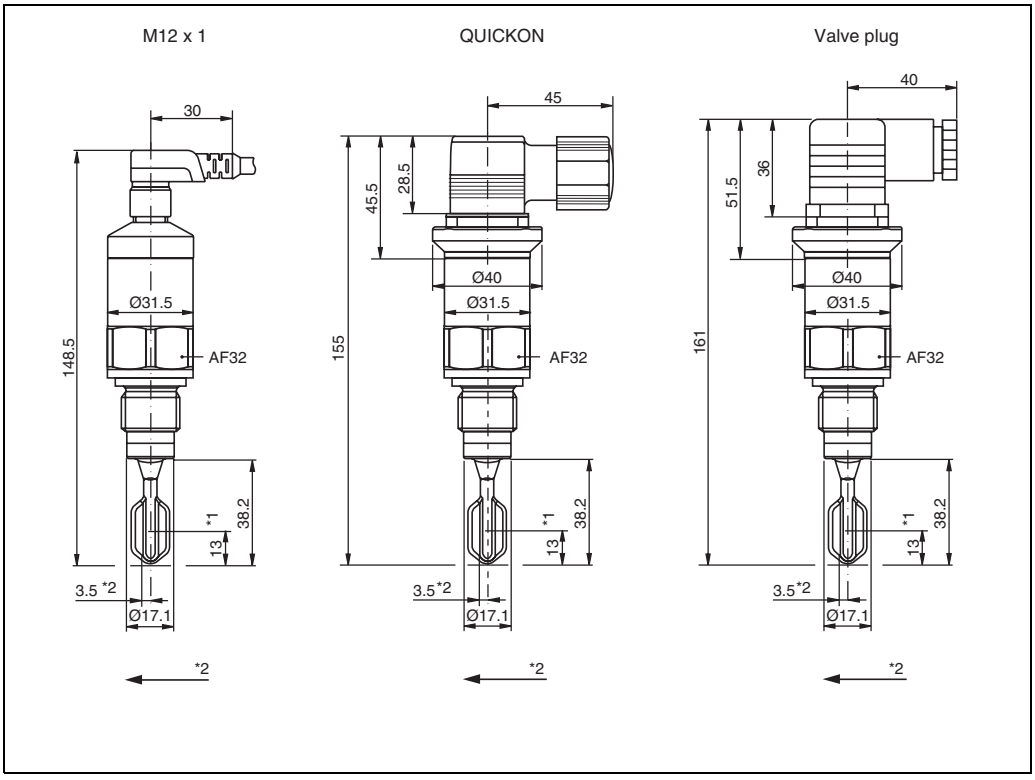
Design, dimensions of the 150 °C version



*1 Switch point with vertical installation
*2 Switch point with horizontal installation; the level increases in the direction of the arrow

Switch points at: density 1/23 °C (296 K)/0 bar

Design, dimensions of the 100 °C version



*1 Switch point with vertical installation
*2 Switch point with horizontal installation; the level increases in the direction of the arrow

Switch points at: density 1/23 °C (296 K)/0 bar

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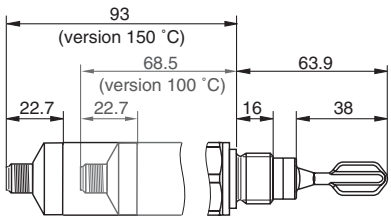
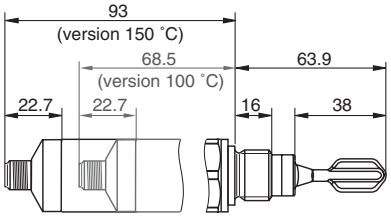
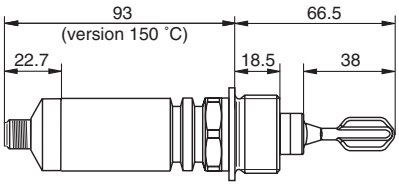
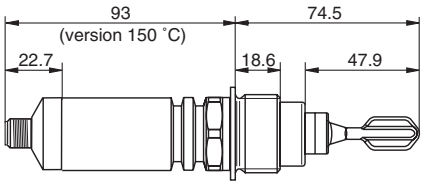
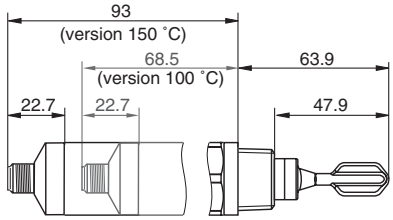
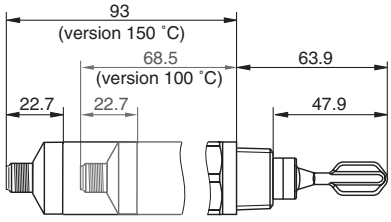
Process connections

Process connection/dimensions	Accessories (optional)	Pressure temperature
G½A, G¾A, DIN ISO 228/I 		max. 40 bar max. 150 °C (423 K)
G¾A, DIN ISO 228/I for flush-mounted installation in welding boss EHEDG with welding boss 	**Welding boss LVL-Z66** (without tuning fork alignment) with silicone O-ring FDA-listed materials as per 21 CFR Part 175-178	max. 25 bar max. 150 °C (423 K) max. 40 bar max. 100 °C (373 K)
G1A, DIN ISO 228/I 		max. 40 bar max. 150 °C (423 K)
G1A, DIN ISO 228/I with sealing surface for flush-mounted installation in welding boss EHEDG with welding boss 	**Welding boss LVL-Z101** (without tuning fork alignment) with silicone O-ring FDA-listed materials as per 21 CFR Part 175-178	max. 25 bar max. 150 °C (423 K) max. 40 bar max. 100 °C (373 K)
½ NPT, ANSI B 1.20.1 **R½,** DIN 2999 		max. 40 bar max. 150 °C (423 K)
¾ NPT, ANSI B 1.20.1 **R¾,** DIN 2999 		max. 40 bar max. 150 °C (423 K)

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Weight (150 °C version)	approx. 270 g
Weight (100 °C version)	approx. 210 g
Materials	Sensor and housing made of 1.4435 (AISI 316L), surface quality Ra < 3.2 µm
Housing	Pipe housing
Terminals	Valve connector, QUICKON, M12 x 1

Human interface

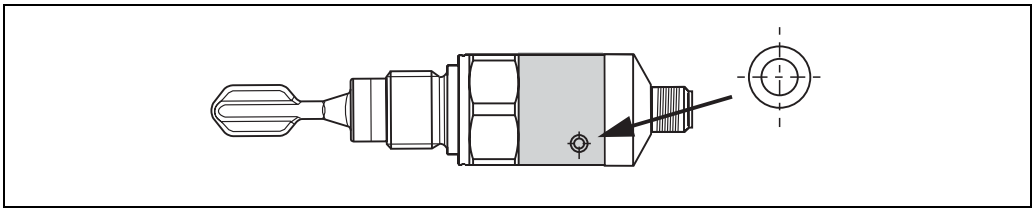
Function test with test magnet

Versions AC and DC-PNP:
On testing, the current state of the electronic switch is reversed.

Version AS-interface:
On testing, D0 is inverted.

Performing test

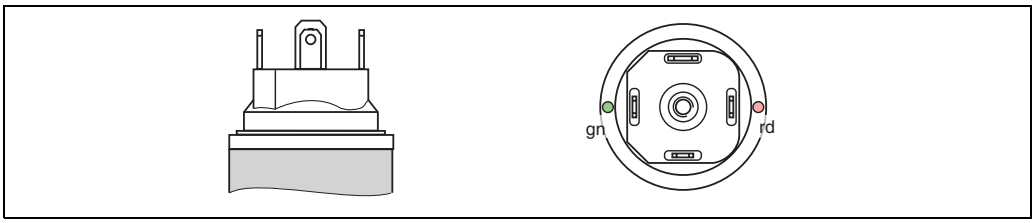
Hold the test magnet against the mark on the nameplate:



The switching state changes.

Light signals

Versions AC and DC-PNP with valve connector/QUICKON



Green light (gn) lighting:
LVL-A* is connected to the power supply and is operational.

Red light (rd) lighting:
Mode of operation MAX (overfill protection): sensor is immersed in liquid.
Mode of operation MIN (dry running protection): sensor is immersed in liquid.

Green light (gn) does not come on
Error: no power supply
➔ Check plug, cable and power supply.

Red light (rd) flashing:
Error: overload or short-circuit in load circuit
➔ Rectify the short-circuit,
➔ Reduce maximum load current to below 250 mA.
Error: internal sensor error or sensor corroded
➔ Replace device.

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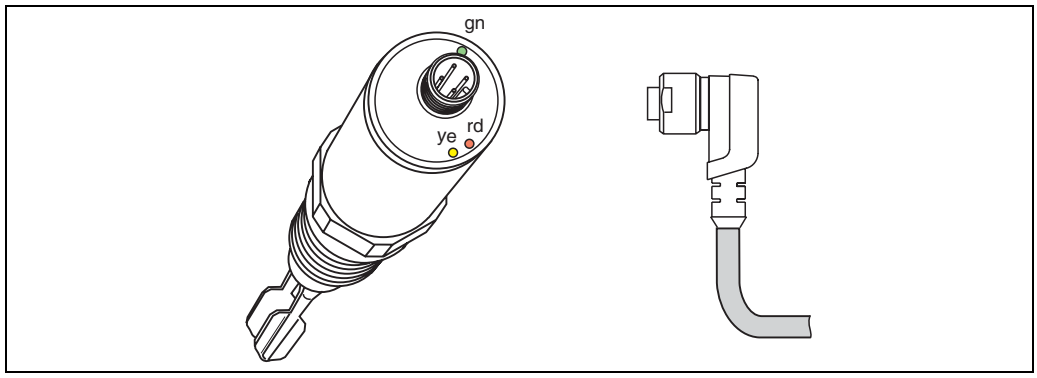
Version AS-interface and DC-PNP with M12 x 1 circular connector PPSU



Green light (gn) lighting:
LVL-A* is connected to the power supply and is operational.

Yellow light (ye) lighting:
Sensor is immersed in liquid.

Red light (rd) lighting with AS-interface:
Error: address 0 set or communication error
➔ Carry out addressing process,
➔ parameterise slave,
➔ or reduce line length (< 100 m (300 ft) total length).

Red light (rd) lighting with DC-PNP
Error: overload or short-circuit in load circuit
➔ Rectify the short-circuit,
➔ Reduce maximum load current to below 250 mA.

Green light (gn) does not come on
Error: no power supply
➔ Check plug, cable and power supply.

Red light (rd) flashing (2 Hz):
Error: internal sensor error or sensor corroded
➔ Replace device.

Certificates and approvals

Note!
The specified certificates and approvals are available on www.pepperl-fuchs.com.

CE approval	The device is in conformity with the statutory requirements of the EC Directives. Pepperl+Fuchs confirms successful testing of the device by affixing the CE mark.
Sanitary compatibility	EHEDG (see process connections pages 10)
Overspill protection	Z-65.11-314 (WHG) Z-65.40-315 (leakage)
Marine approval	German Lloyd (GL), approval number: 42855-02HH
Other standards and guidelines	AS-interface profile S-3.A.1 as per EN 50295 (limit switch)

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Ordering information

Product structure

L	V	L	–	A		–			S	–					–		

Approvals
CG CSA general purpose
WH overspill protection WHG

Electrical connection
PG valve plug PG11, ISO 4400, IP65
PN valve plug ½ NPT, ISO 4400, IP65
PS valve plug with QUICKON connection
V1 connector V1, M12 x 1, IP67

Electrical output
B3 AS-interface bus
E5 DC, PNP 3-wire
WA AC, 2-wire

Fork surface
S standard surface, Ra < 3.2 µm

Process connection
G1 thread G½, DIN ISO 228/1, 1.4435/316L
G2 thread G¾ with welding neck (accessory), DIN ISO 228/1, 1.4435/316L
G3 thread G1, DIN ISO 228/1, 1.4435/316L
G4 thread G1 with welding neck (accessory), DIN ISO 228/1, 1.4435/316L
N1 thread ½ NPT, ANSI, 1.4435/316L
N2 thread ¾ NPT, ANSI, 1.4435/316L
R1 thread R½ DIN 2999, 1.4435/316L
R2 thread R¾ DIN 2999, 1.4435/316L

Process temperature
1 up to 100 °C (373 K)
5 up to 150 °C (423 K)

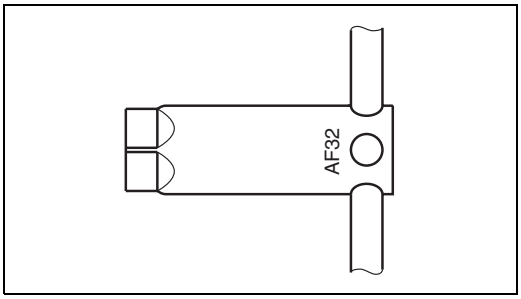
Accessories

Note!
All dimensions in mm.

Socket wrench

Order number: LVL-Z65

Socket wrench AF32

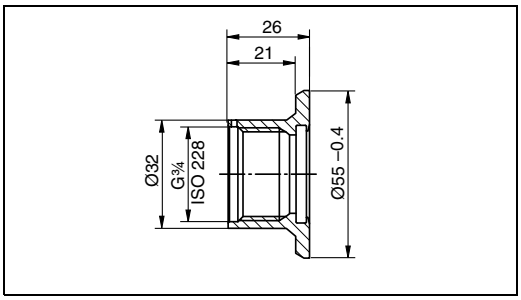


Welding boss G¾

Order number: LVL-Z66

max. 25 bar, max. 150 °C (413 K)
max. 40 bar, max. 100 °C (373 K)

for flush-mounted installation and sealing with process connection G2, sensor cannot be aligned
Material: corrosion-resistant steel 1.4435 (AISI 316L)
Weight: 0.13 kg
Seal: silicone O-ring, FDA-listed materials as per 21 CFR Part 175-178



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Welding boss G1

Order number: LVL-Z101

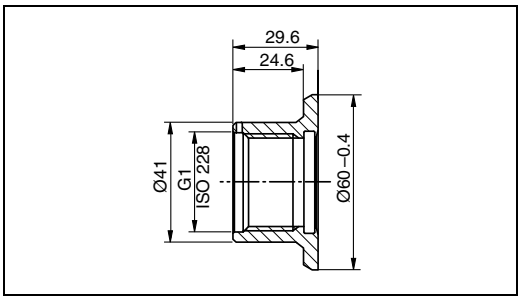
max. 25 bar, max. 150 °C (413 K)
max. 40 bar, max. 100 °C (373 K)

for flush-mounted installation and sealing with process connection G4, sensor cannot be aligned

Material: corrosion-resistant steel 1.4435 (AISI 316L)

Weight: 0.19 kg

Seal: silicone O-ring, FDA-listed materials as per 21 CFR Part 175-178



Connector (socket) with cable

M12 x 1 connector without LEDs

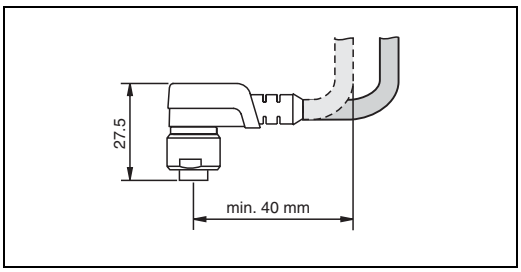
Material:

- Cable: PVC (grey) 5 m (15 ft) length
- Body: PUR (blue)
- Coupling nut: Cu Sn/Ni

Protection: IP67

Temperature range: -25 °C ... +70 °C (248 K ... 343 K)

Wire cross section: 4 x 0.34 mm^2



Supplementary documentation

Operating instructions

KA 213O for Vibracon LVL-A*
KA 219O for welding boss G¾ (LVL-Z66)
KA 186O for valve connector PG11

Safety information

ZE 247O (WHG) Z-65.11-314
ZE 248O (leakage) Z-65.40-315

Supplementary information

Statement of Conformity, Declaration of Conformity and instructions have to be observed.
For information see www.pepperl-fuchs.com.

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With regard to the supply of products, the current issue of the following document is applicable: The General Terms of Delivery for Products and Services of the Electrical Industry, published by the Central Association of the "Elektrotechnik und Elektroindustrie (ZVEI) e.V." including the supplementary clause: "Erweiterter Eigentumsvorbehalt".

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