

Features

- Limit switch for liquids
- Corrosion resistant coating (HALAR): ideally suited for the process
- Large selection of process connections: universal use
- Wide variety of electronic modules (e. g., relay, thyristor signal output): the right connection for every process control system
- No calibration: quick and low-cost start up
- No mechanically moving parts: maintenance-free, no wear, long operating life
- Monitoring of the vibrating fork for damage: guaranteed function
- PROFIBUS PA protocol: commissioning and maintenance quick and easy
- Up to SIL 2 acc. to IEC 61508

Function

The device is a limit switch for use in all liquids

- for temperature of -50 °C to +120 °C
- for pressures up to 40 bar
- for viscosities up to 10000 mm²/s
- for density up to 0.5 g/cm³ (other settings available on request)

The function is not affected by flow, turbulence, bubbles, foam, vibration, bulk solids content or build-up, the device is thus the ideal replacement for float switches.

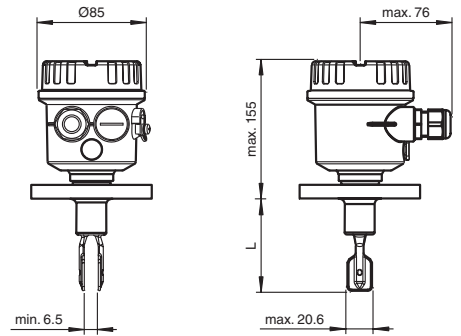
The device is available with extension tube up to 3 m (larger sizes on request).

The coating of all device wetted parts (process connections, extension pipe and vibration fork) is made of synthetic material to ensure it can be used for highly aggressive liquids.

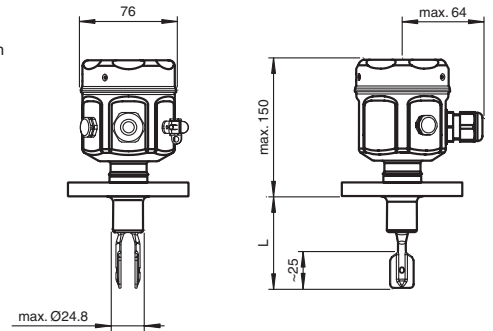
Devices with protection EEx ia and EEx d are available for use in explosion hazardous areas.

Assembly

Device with polyester housing P* and process connection with flange

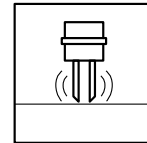


Device with stainless steel housing E* and process connection with flange



Additional dimensions see section dimensions.

L = 148 mm ... 3000 mm

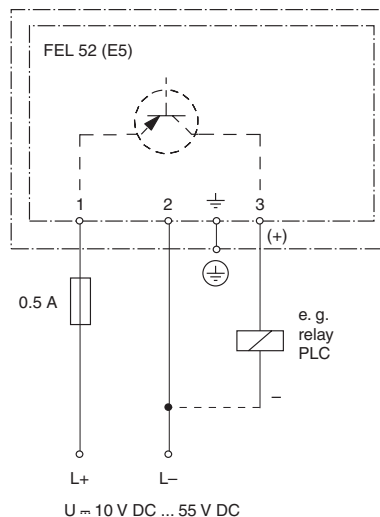


SIL 2

Connection

Connection FEL 52 (E5) 3-wire DC connection (example)

- preferably for use with memory programmable controls (PLC)
- positive signal at the switch output of the electronics (PNP)
- Output blocked on reaching limit level.
- also in compact housing with plug connection available



Other connection types see section electrical connection.

U = 10 V DC ... 55 V DC

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General specifications	
Function principle	limit detection Maximum or minimum detection in tanks or pipelines containing all types of liquids including use in explosion hazardous areas. Particularly suited to very aggressive liquids thanks to high degree of corrosion protection.
Measuring method	The forks of the sensors vibrate at their intrinsic frequency. This frequency is reduced when covered with liquid. The change in frequency then activates the limit switch.
Construction type	device with extension tube, coated with ECTFE
Supply	
Rated voltage U_r	electronic insert FEL50A (PA): 9 ... 32 V DC electronic insert FEL51 (AC): 253 V AC, 50/60 Hz electronic insert FEL52 (E5): 10 ... 55 V DC electronic insert FEL54 (WA): 19 ... 253 V AC, 50/60 Hz or 19 ... 55 V DC electronic insert FEL55 (SI): 11 ... 36 V DC, PLC electronic insert FEL56 (N1), FEL58 (N2): isolating amplifier acc. to EN 60947-5-6 (NAMUR)
Current consumption	electronic insert FEL52 (E5): max. 15 mA
Power consumption	electronic insert FEL52 (E5): max. 0.83 W electronic insert FEL54 (WA): max. 1.3 W
Electrical specifications	
Surge protection	electronic insert FEL51 (AC), electronic insert FEL52 (E5), electronic insert FEL54 (WA), electronic insert FEL55 (SI): overvoltage category III
Input	
Switching point	see section switch point
Measured variable	limit level (limit value)
Measurement range	depends on mounting point and pipe extension up to 3000 mm , larger sizes on request
Output	
Switching delay	when fork is covered: approx. 0.5 s, when fork is exposed: approx. 1.0 s (other switching times on request) additionally configurable for PROFIBUS PA (electronic insert FEL50A (PA)): 0.5 ... 60 s
Switch behaviour	switch-over for minimum/maximum residual current safety on electronic insert MAX = maximum safety: The output switches to the power fail response when the fork is covered. for use with overspill protection for example MIN = minimum safety: The output switches to the power fail response when the fork is exposed. for use with dry running protection for example When switching on the power supply the output assumes the alarm signal. After max. 2 s it assumes the correct switching mode.
Directive conformity	
Electromagnetic compatibility	
Directive 89/336/EEC	EN 61326 If the fork tines are joined together on account of build-up, the useful signal is attenuated to such an extent that the original EMC values can no longer be completely observed (EN 61000-4-3 electromagnetic fields, EN 61000-4-6 HF coupling).
Low voltage	
Directive 73/23/EEC	EN 61010-1
Conformity	
Electromagnetic compatibility	NE 21
Degree of protection	IEC 60529
Vibration resistance	EN 60068-2-6
Climate class	DIN EN 60068-2-38/IEC 68-2-38
Measurement accuracy	
Reference operating conditions	ambient temperature: 23 °C (73.4 °F), medium temperature: 23 °C (73.4 °F), product density: 1 g/cm ³ (water), viscosity: 1 mm ² /s, medium pressure p_e : 0 bar, sensor mounting: vertical from above, density switch: to > 0.7 g/cm ³
Maximum measured error	max. ± 1 mm, specified by mounting position
Non-repeatability	0.1 mm
Hysteresis	approx. 2 mm
Influence of medium density	max. +4.8 ... -3.5 mm (0.5 ... 1.5 g/cm ³)
Influence of medium temperature	max. 1.4 ... -2.8 mm (-40 ... 120 °C (-40 ... 248 °F))
Influence of medium pressure	max. 0 ... -2 mm (0 ... 40 bar)
Operating conditions	
Installation conditions	
Installation position	with short pipe (up to 500 mm (19.7 inch)) any position, with long pipe vertical
Process conditions	
Medium temperature	-50 ... 150 °C (-58 ... 302 °F) , exceptions see process connections
Medium pressure	p_e = -1 ... 40 bar (-14.5 ... 580.2 psi) over the entire temperature range , exceptions see process connections
Test pressure	max. 100 bar (1.5 times the medium pressure p_e), no function during test pressure, burst pressure of diaphragm 200 bar
Pressure surge	max. 20 bar/s

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Thermal shock resistance	max. 120 °C/s
State of aggregation	liquid
Density	min. 0.5 g/cm ³ , other density settings on request
Viscosity	max. 10000 mm ² /s
Solid contents	< Ø5 mm
Ambient conditions	
Ambient temperature	-50 ... 70 °C (-58 ... 158 °F), function with reduced data values see section ambient temperature
Storage temperature	-50 ... 80 °C (-58 ... 176 °F)
Vibration resistance	10 ... 50 Hz, 0.15 mm, 100 cycles
Mechanical specifications	
Degree of protection	polyester, steel, and aluminum housing: IP66/IP67
Connection	electronic inserts: cross section max. 2.5 mm ² , lace in end splice in acc. with DIN 46228 ground lead in housing: cross section max. 2.5 mm ² external equipotential bonding: cross section 4 mm ²
Material	wetted parts: - process connection and extension pipe: 1.4435/316L with ECTFE coating - vibration fork: 1.4435/316L with ECTFE coating housings: - polyester housing: PBT-FR with PBT-FR cover or with PA12 cover with sight glass, cover seal: EPDM - stainless steel housing: 1.4301/304, cover seal: silicone - aluminum housing: EN-AC-AISi10Mg, plastic-coated, cover seal: EPDM cable gland: polyamide or brass, nickel-plated temperature spacer: 1.4435/316L flameproof bushing: 1.4435/316L
Surface quality	R _a < 3.2 µm
Mass	800 g, basic weight: compact version (length type II), electronic insert, plastic housing, without flange, additional weight is dependent on extension tube, housing and process connection process connections: - A3H 1000 g, A5H 1500 g, A6H 2400 g, A6I 3200 g, A8H 4900 g - H35 1400 g, H65 2400 g, H71 1600 g, H75 3200 g, H95 5900 g, HA3 5600 g - J1H 1700 g extension tube, temperature spacer, flameproof bushing: - BK* 900 g/m - CK* 2300 g/100 in - DKA 100 g, DKB 700 g, DKC 800 g
Dimensions	housing: diameter max. 85 mm, height max. 173 mm temperature separator, flameproof bushing: additional length L 140 mm process connection: length L min. 115 mm extension: any length L from 148 ... 3000 mm, larger sizes on request extension: length type II, for vertical installation from above same switching point as Vibracon LVL2 vibration fork: width 20.6 mm, fork width 6.5 mm, length 25 mm
Process connection	flanges to EN 1092-1 from DN25, to ANSI B 16.5 from 1 inch, to JIS B 2238 (RF) from DN50 For further information see type code.
Data for application in connection with hazardous areas	
EU-Type Examination Certificate	see instruction manuals (SI)
International approvals	
FM approval	see control drawings (ZD)
CSA approval	see control drawings (ZD)
IECEx approval	see instruction manuals (SI)
Indication and operation	
Display elements	electronic inserts: - electronic inserts FEL50 A (PA), FEL58 (N2): green LED, yellow LED - electronic inserts FEL51 (AC), FEL52 (E5), FEL54 (WA), FEL55 (SI), FEL56 (N1): green LED, red LED
Control elements	electronic insert FEL50A (PA): 8 switches for device address setting electronic inserts FEL51 (AC), FEL52 (E5), FEL54 (WA), FEL55 (SI), FEL56 (N1): two switches for fail-safe mode and density change electronic insert FEL58 (N2): two switches for fail-safe mode and density change and one test button interrupts lead
Certificates and approvals	
SIL classification	up to SIL2 acc. to IEC 61508
Overspill protection	see approval (ZE)
General information	
Supplementary documentation	technical information (TI) manuals, brief instructions (BA, KA) instruction manuals (SI) control drawings (ZD)
Supplementary information	EC-Type Examination Certificate, Statement of Conformity, Declaration of Conformity, Attestation of Conformity and instructions have to be observed where applicable. For information see www.pepperl-fuchs.com.

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Accessories

Designation	see technical information (TI)
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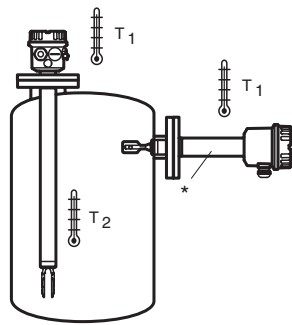
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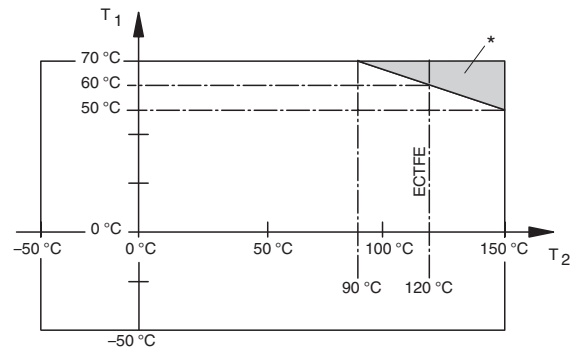
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Ambient temperature

Permissible ambient temperature T_1 at the housing depends on the product temperature T_2 in the vessel:



* additional temperature range for sensors with a temperature separator or pressure-tight bushing



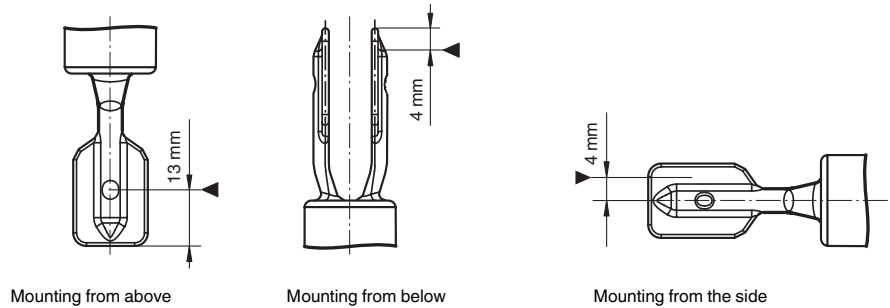
The temperature difference between the process side and the ambient side ($T_2 - T_1$) of the flange may not exceed max. 60 °C). For this reason, the flange may have to be included in the tank insulation if necessary.

Switch point

Switch point ► on the sensor depend on the mounting position, with reference to water, density 1 g/cm³, 23 °C, p_e 0 bar.

Note:

The switch points of the Vibracon LVL-M2C are at other positions to those of the previous version LVL2.



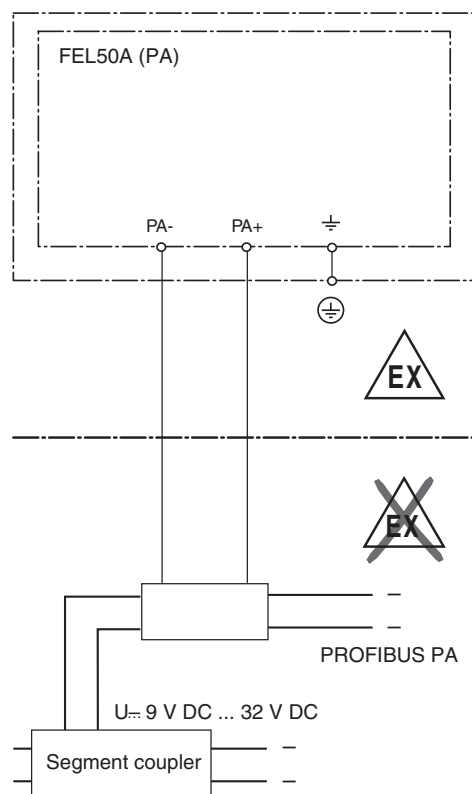
Electrical connection

Electronic insert FEL50A (PA)

Two-wire connection for power supply and data transfer for connecting to PROFIBUS PA

Additional functions:

- Digital communication enables the representation, reading and editing of the following parameters: fork frequency, switch-on frequency, switch-off frequency, switch-on time and switch-off time, status, measured value, density switch.
- Matrix locking possible.
- Switch to WHG mode possible (WHG approval).
- You can also visit www.profibus.com for more information.



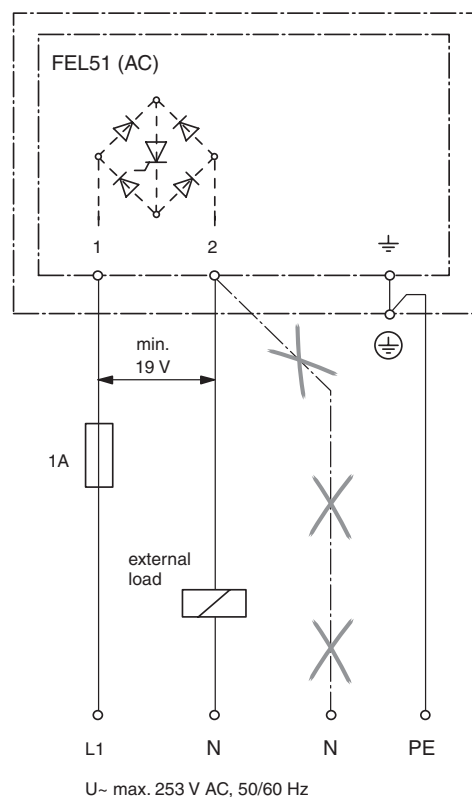
Electronic insert FEL51 (AC)

Two-wire AC connection

Always connect in series with a load!

Check the following:

- the residual current in blocked state (up to 3.8 mA)
- that for low voltage
 - The voltage drop across the load is such that the minimum terminal voltage at the electronic insert (19 V) when blocked is not undershot.
 - The voltage drop across the electronics when switched through is observed (up to 12 V).
- that a relay cannot de-energise with holding power below 3.8 mA
If this is the case, a resistor should be connected parallel to the relay (RC module available on request).
- When selecting the relay, pay attention to the holding power/rated power (see connectable load).



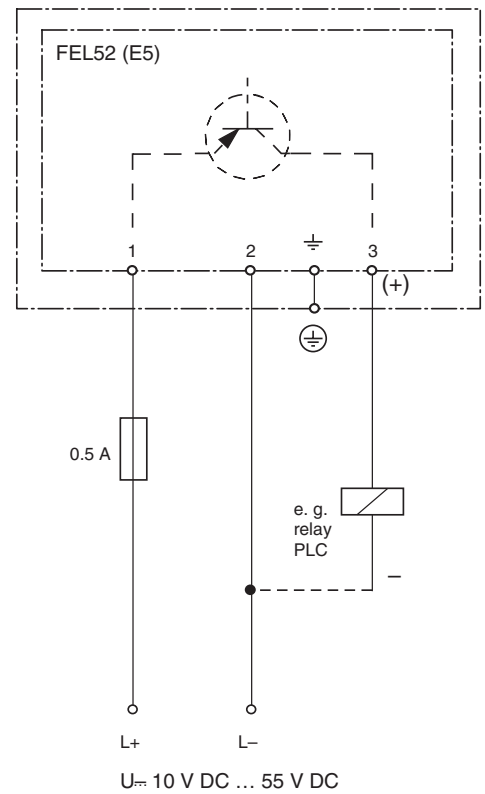
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Electrical connection

Electronic insert FEL52 (E5)

Three-wire DC connection

- preferably used with programmable logic controllers (PLC), DI module as per EN 61131-2.
- positive signal at switching output of the electronics (PNP)
- Output blocked on reaching limit.

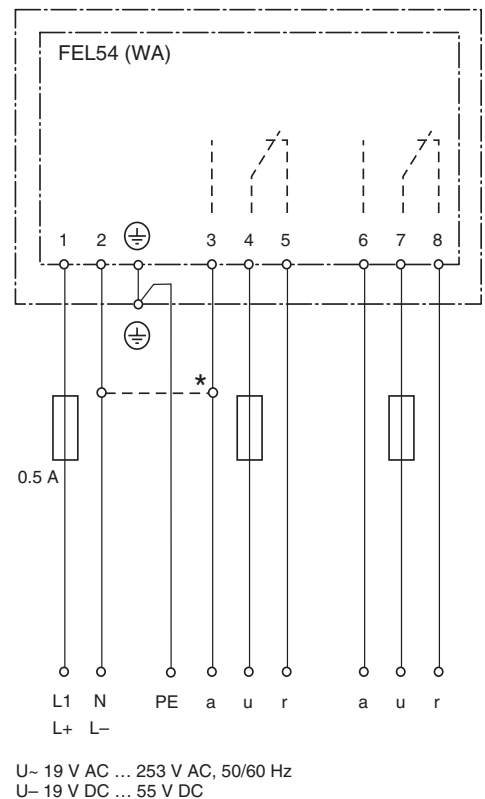


Electronic insert FEL54 (WA)

Universal current connection with relay output

- Power supply: Please note the different voltage ranges for AC and DC.
- Output: When connecting an instrument with high inductance, provide a spark arrester to protect the relay contact. A fine-wire fuse (depending on the load connected) protects the relay contact on short-circuiting. Both relay contacts switch simultaneously.

* When jumpered, the relay output works with NPN logic.



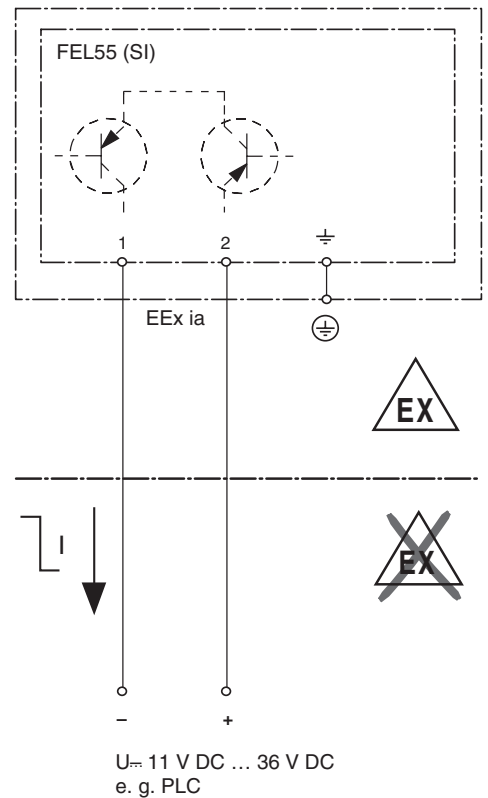
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Electrical connection

Electronic insert FEL55 (SI)

Two-wire connection for separate switching unit

- for connecting to programmable logic controllers (PLC) for example, AI module 4 mA ... 20 mA to EN 61131-2
- Output signal jump from high to low current on limit (**H-L edge**)

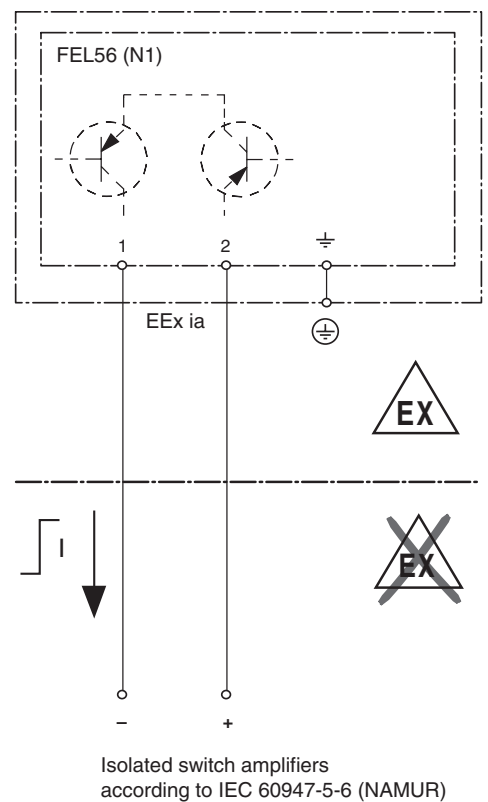


Electronic insert FEL56 (N1)

Two-wire connection for separate switching unit

- for connecting to isolating amplifiers acc. to NAMUR (IEC 60947-5-6), e. g. isolating amplifier KFD2-SR2-Ex1.W or remote process interface KSD-BI-Ex2 from Pepperl+Fuchs
- Output signal jump from low to high current on limit (**L-H edge**)

Connecting to multiplexer: set clock time to min. 2 s.



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Electrical connection

Electronic insert FEL58 (N2)

Two-wire connection for separate switching unit

- for connecting to isolating amplifiers acc. to NAMUR (IEC 60947-5-6), e. g. Isolating amplifier KFD2-SR2-Ex1.W or remote process interface KSD-BI-Ex2 from Pepperl+Fuchs
- Output signal jump from high to low current on limit (**H-L edge**)

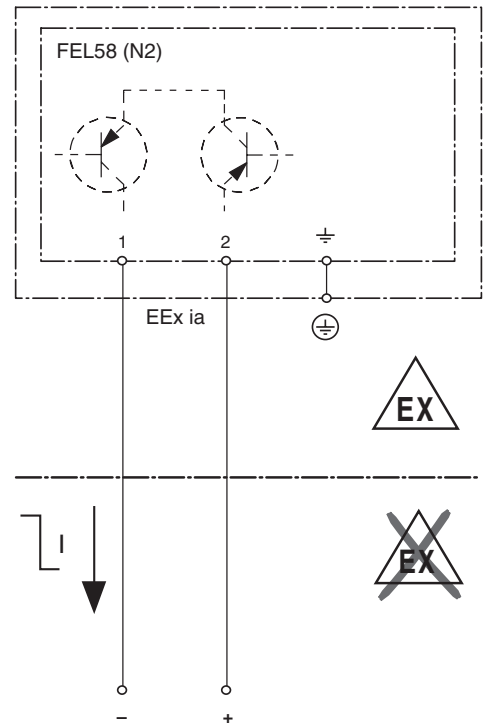
Additional function:

Test key on the electronic insert. Pressing the key breaks the connection to the isolating amplifier.

Connecting to multiplexer: set clock time to min. 2 s.

Note

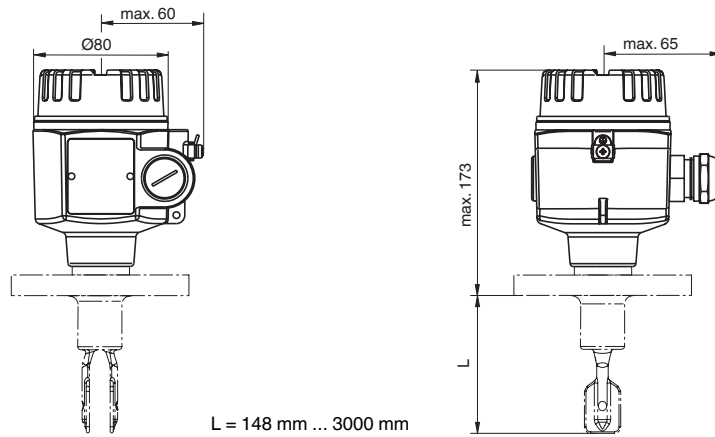
For Ex-d applications, the additional function can only be used if the housing is not exposed to an explosive atmosphere.



Isolated switch amplifiers according to IEC 60947-5-6 (NAMUR)

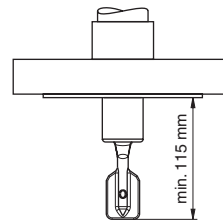
Dimensions

Aluminium housing A*



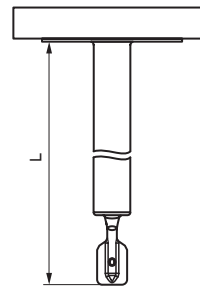
Process connections

A**, J**, H**



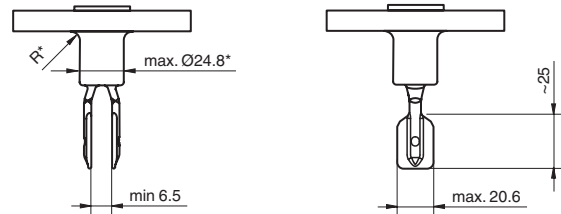
Extension tube

Flanges and flange-like process connections
L = 148 mm ... 3000 mm



Vibration fork

* The following applies to DN25/ANSI 1 inch:
max. pipe diameter 24.2 mm
radius R max. 4 mm
This is important when selecting the counter flange!



Type Code



*This overview does not mark options which are mutually exclusive.
Option with * = on request/in preparation.*

Device	
LVL-M2C	Limit switch for liquids, device with extension tube and coating
Process connection	
A3H	Flange 1 inch, ANSI B 16.5, 150 lbs RF, 1.4435/316L, ECTFE coating
A5H	Flange 1-1/2 inch, ANSI B 16.5, 150 lbs RF, 1.4435/316L, ECTFE coating
A6H	Flange 2 inch, ANSI B 16.5, 150 lbs RF, 1.4435/316L, ECTFE coating
A6I	Flange 2 inch, ANSI B 16.5, 300 lbs RF, 1.4435/316L, ECTFE coating
A8H	Flange 3 inch, ANSI B 16.5, 150lbs RF, 1.4435/316L, ECTFE coating
H35	Flange DN25 PN25/40 A, EN 1092-1, 1.4435/316L, ECTFE coating
H55	Flange DN32 PN25/40 A, EN 1092-1, 1.4435/316L, ECTFE coating
H65	Flange DN40 PN25/40 A, EN 1092-1, 1.4435/316L, ECTFE coating
H71	Flange DN50 PN6 A, EN 1092-1, 1.4435/316L, ECTFE coating
H75	Flange DN50 PN25/40 A, EN 1092-1, 1.4435/316L, ECTFE coating
H95	Flange DN80 PN25/40 A, EN 1092-1, 1.4435/316L, ECTFE coating
HA3	Flange DN100 PN10/16, EN 1092-1, 1.4435/316L, ECTFE coating
J1H	Flange 10 K 50 A, JIS B 2238 RF, 1.4435/316L, ECTFE coating
XXX	Special version
Probe version	
BK	in mm L, ECTFE coating
CK	in inch L, ECTFE coating
DK	Special length L II, ECTFE coating, switch point = Vibracon compact
XX	Special version
Probe length	
L	Specified length, any length from 148 mm ... 3000 mm
Temperature spacer, flameproof bushing	
A	without
B	Temperature spacer
C	Flameproof bushing
Housing	
A1	Aluminium housing, IP66, thread M20
A2	Aluminium housing, NEMA 4X, thread 3/4NPT
A3	Aluminium housing, IP66, entry G1/2A
A4	Aluminium housing, IP66, plug M12 x 1
A5	Aluminium housing, IP66, PA plug M12 x 1
E1	Stainless steel housing, IP66, thread M20
E2	Stainless steel housing, NEMA 4X, thread 1/2NPT
E3	Stainless steel housing, IP66, entry G1/2A
E4	Stainless steel housing, IP66, plug M12 x 1
E5	Stainless steel housing, IP66, PA plug M12 x 1
P1	Polyester housing, IP66, thread M20
P2	Polyester housing, NEMA 4X, thread 1/2NPT
P3	Polyester housing, IP66, entry G1/2A
P4	Polyester housing, IP66, plug M12 x 1
P5	Polyester housing, IP66, PA plug M12 x 1
Electrical connection	
PA	FEL50A, PROFIBUS PA
AC	FEL51, contactless 2-wire switch, 19 V ... 253 V AC
E5	FEL52, PNP 3-wire, 10 V ... 55 V DC
WA	FEL54, potential-free change-over contact, DPDT, 19 V ... 253 V AC, 19 V ... 55 V DC
SI	FEL55, 8/16 mA, 11 V ... 36 V DC
N1	FEL56, NAMUR, L-H edge
N2	FEL58, NAMUR with push button, H-L edge

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Additional equipment	
NA	without additional equipment
TD	Special version

Approval	
NA	Version for non-hazardous area
WH	WHG overfill protection
EF	ATEX II 1/2G EEx ia IIB T6, WHG
EG	ATEX II 1/2G EEx d IIB T6, WHG
EI	ATEX II 1/2G EEx ia IIC T6, WHG
EK	ATEX II 1/2G EEx d IIC T6, WHG
EM	ATEX II 3G EEx nA IIC T6, WHG
EN	ATEX II 3G EEx nC IIC T6, WHG
FI	FM IS, Cl. I, II, III, Div. 1, Gr. A-G
FN	FM NI, Cl. I, Div. 2, Gr. A-D
FX	FM XP, Cl. I, II, III, Div. 1, Gr. A-G
CG	CSA General Purpose
CI	CSA IS, Cl. I, II, III, Div. 1, Gr. A-G
CX	CSA XP, Cl. I, II, III, Div. 1, Gr. A-G

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