



Technical Information

LiquiphantM

FTL51C

Vibronic

Point level switch for all kinds of liquids
with high corrosion-resistant coating

Application

The Liquiphant M is a point level switch for use in all liquids

- for temperatures of -50°C to 150°C (-58 to 302°F)
- for pressure up to 40 bar (580 psi)
- for viscosities up to $10000\text{ mm}^2/\text{s}$ (cSt)
- for densities of $\geq 0.5\text{ g/cm}^3$ (SGU) or $\geq 0.7\text{ g/cm}^3$ (SGU)

The device functions reliably regardless of flow, turbulence, bubbles, foam, vibration, solids content or buildup, making the Liquiphant an ideal substitute for float switches.

All the wetted parts of the sensor (process connection, extension pipe and tuning fork) are coated in enamel or various synthetic materials, making the point level switch suitable for applications in very aggressive liquids.

International approvals certify use in hazardous areas.

Your benefits

- Use in safety systems requiring functional safety to SIL2/SIL3 in accordance with IEC 61508/IEC 61511-1
- Optimally adapted to the process with a wide range of materials for corrosion-resistant coating
- Large number of process connections to choose from
 - Flanges for various standards
 - Universal usage
- No adjustment: quick, low-cost startup
- No mechanically moving parts: no maintenance, no wear, long operating life
- FDA-approved material (PFA Edlon)



Table of contents

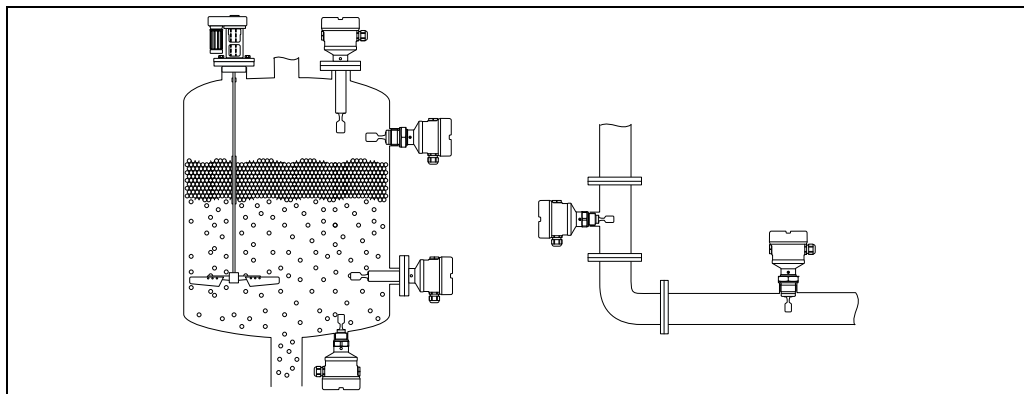
Application	4	Connectable load	12
Point level detection	4		
Function and system design	4	Electronic insert FEL57 (PFM)	13
Measuring principle	4	Power supply	13
Modularity	4	Electrical connection	13
Electronic versions	5	Output signal	13
Electronic version for density measurement	5	Signal on alarm	13
Galvanic isolation	5	Connectable load	13
Design	5		
Input	5	Electronic insert FEL50A (PROFIBUS PA)	14
Measured variable	5	Power supply	14
Measuring range (detection range)	5	Electrical connection	14
Density	5	Output signal	15
		Signal on alarm	15
Electronic insert FEL51 (AC 2-wire)	6	Electronic insert FEL50D (density)	16
Power supply	6	Power supply	16
Electrical connection	6	Electrical connection	16
Output signal	6	Signal on alarm	16
Signal on alarm	6	Adjustment	16
Connectable load	6	Operating principle	17
		Light signals	17
Electronic insert FEL52 (DC PNP)	8	Connection and function	18
Power supply	8	Connecting cables	18
Electrical connection	8	Safety mode	18
Output signal	8	Switching time	18
Signal on alarm	8	Switch-on behavior	18
Connectable load	8		
Electronic insert FEL54 (AC/DC with relay output) ..	9	Performance characteristics	18
Power supply	9	Reference operating conditions	18
Electrical connection	9	Maximum measured error	18
Output signal	9	Repeatability	18
Signal on alarm	9	Hysteresis	18
Connectable load	9	Influence of medium temperature	18
		Influence of medium density	18
Electronic insert FEL55 (8/16 mA)	10	Influence of medium pressure	18
Power supply	10	Switching delay	18
Electrical connection	10		
Output signal	10	Operating conditions	19
Signal on alarm	10	Installation instructions	19
Connectable load	10	Examples of mounting	19
		Orientation	21
Electronic insert FEL56 (NAMUR L-H edge)	11	Environment	22
Power supply	11	Ambient temperature range	22
Electrical connection	11	Storage temperature	22
Output signal	11	Operating altitude as per IEC61010-1 Ed.3	22
Signal on alarm	11	Climate class	22
Connectable load	11	Degree of protection	22
		Vibration resistance	22
Electronic insert FEL58 (NAMUR H-L edge)	12	Electromagnetic compatibility	22
Power supply	12		
Electrical connection	12	Medium conditions	23
Output signal	12	Medium temperature	23
Signal on alarm	12	Thermal shock	23

Medium pressure pe	23
Test pressure	23
Pressure shock	23
State of aggregation	23
Density	23
Viscosity	23
Solids content	23
Lateral loading capacity	23
 Mechanical construction	 24
Design	24
Dimensions	25
Weights	27
Material	28
Process connections	28
 Human interface	 29
Electronic inserts	29
Operating concept	29
 Certificates and approvals	 30
Certificates	30
CE mark	30
RoHS	30
RCM-tick mark	30
EAC conformity	30
CRN approval	30
Pressure Equipment Directive 2014/68/EU (PED)	31
Process seal according to ANSI/ISA 12.27.01	31
Other certificates	31
Manufacturer declarations	31
Use in hazardous zones	31
 Ordering information	 31
 Accessories	 32
Transparent cover	32
Cover with sight glass	32
Weather protection cover	32
 Documentation	 33
Operating Instructions	33
Technical Information	33
Functional safety (SIL)	34
Safety Instructions (ATEX)	34
Safety Instructions (NEPSI)	34
Control Drawings	35

Application

Point level detection

Maximum or minimum detection in tanks or pipes containing all kinds of liquids, including use in hazardous areas. Particularly suitable for very aggressive liquids thanks to high level of corrosion protection.



Function and system design

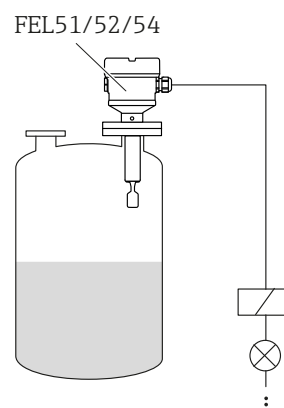
Measuring principle

The sensor's fork vibrates at its intrinsic frequency. This frequency is reduced when covered with liquid. This change in frequency causes the point level switch to switch.

Modularity

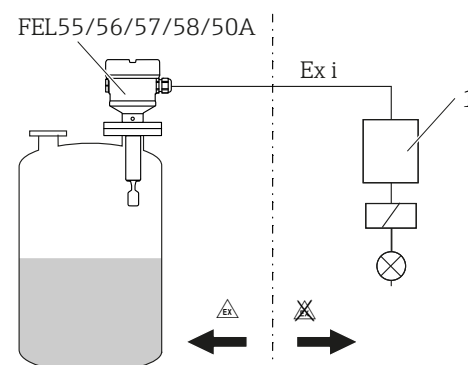
Point level switch

Liquiphant M FTL with electronic versions
FEL51, FEL52, FEL54



Point level switch

Liquiphant M FTL with electronic versions
FEL55, FEL56, FEL57, FEL58
for connecting to a separate switching unit
or an isolating amplifier FEL50A
for connecting to a PROFIBUS PA segment



1 = Switching unit, PLC, isolating amplifier, segment coupler

Electronic versions	FEL51: Two-wire AC version; Switches the load directly into the power supply circuit via an electronic switch. FEL52: Three-wire DC version; Switches the load via the transistor (PNP) and separate connection e.g. in conjunction with programmable logic controllers (PLCs), DI modules as per EN 61131-2. FEL54: Universal current version with relay output; Switches the loads via 2 floating change-over contacts. FEL55: Signal transmission 16/8 mA on two-wire cabling e.g. in conjunction with programmable logic controllers (PLCs), AI modules 4 to 20 mA as per EN 61131-2. FEL56: For separate switching unit; signal transmission L-H edge 0.6 to 1.0 / 2.2 to 2.8 mA to EN 50227 (NAMUR) on two-wire cabling. FEL58: For separate switching unit; signal transmission H-L edge 2.2 to 3.5 / 0.6 to 1.0 mA to EN 50227 (NAMUR) on two-wire cabling. Connection cabling and slave devices tested by pressing a key on the electronic insert. FEL57: For separate switching unit; PFM signal transmission; Current pulses superimposed on the power supply along the two-wire cabling. Proof testing from the switching unit without changing levels. FEL50A: For connecting to PROFIBUS PA; Cyclic and acyclic data exchange acc. to PROFIBUS-PA Profile 3.0; Discrete Input.
Electronic version for density measurement	FEL50D: For connecting to Density Computer FML621
Galvanic isolation	FEL51, FEL52, FEL50A: between sensor and power supply FEL54: between sensor and power supply and load FEL55, FEL56, FEL57, FEL58, FEL50D: see connected switching unit
Design	FTL51C: flange, extension pipe and tuning fork are coated.

Input

Measured variable	Level (limit value)
Measuring range (detection range)	Depends on the mounting point or the length of the sensor with extension pipe. Up to 3000 mm (118 in) for synthetic coating, up to 1200 mm (47.2 in) for enamel coating
Density	Setting on the electronic insert > 0.5 g/cm ³ or > 0.7 g/cm ³ (other on request)

Electronic insert FEL51 (AC 2-wire)

Power supply

Supply voltage: AC 19 to 253 V
 Power consumption: < 0.83 W
 Residual current consumption: < 3.8 mA
 Short-circuit protection
 Overvoltage protection FEL51: overvoltage category III

Electrical connection

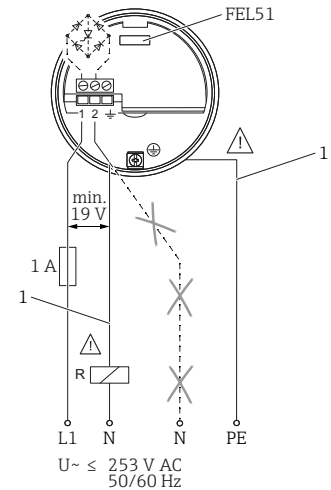
Two-wire AC connection

Switches the load directly into the power supply circuit via an electronic switch.

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-energize with holding power below 3.8 mA.
 If this is the case, a resistor should be connected parallel to the relay. An RC module is available under the part number: 71107226.
- When selecting the relay, pay attention to the holding power / rated power (see "Connectable load")



I = External load must be connected.

Output signal

I_L = load current (switched through)

< 3.8 mA = residual current (blocked)



= lit



= unlit

L00-FTL2xxxx-07-05-
xx-xx-000

Safety mode	Level	Output signal	LEDs	
			green	red
MAX		1 $\xrightarrow{I_L}$ 2		
		1 $\xrightarrow{< 3.8 \text{ mA}}$ 2		
MIN		1 $\xrightarrow{I_L}$ 2		
		1 $\xrightarrow{< 3.8 \text{ mA}}$ 2		

Signal on alarm

Output signal on power failure or in the event of damaged sensor: < 3.8 mA

Connectable load

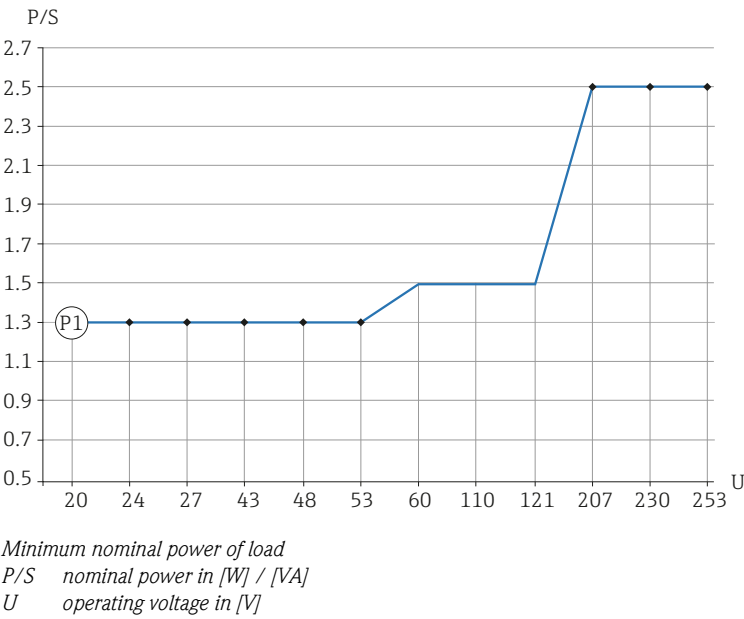
- Voltage drop via FEL51 $\leq 12 \text{ V}$
- Residual current if electrical switch is blocked: $\leq 3.8 \text{ mA}$
- Load switched directly into the power supply circuit via the thyristor.
 Transient (40 ms) $\leq 1.5 \text{ A}$, $\leq 375 \text{ VA}$ at 253 V or $\leq 36 \text{ VA}$ at 24 V (not short-circuit-proof)

The load is switched via an electronic switch directly in the power circuit.

Always connect in series with a load!

Not suitable for connection to low-voltage PLC inputs!

Selection guide for relays



Position	Operating voltage	Nominal power	
		min.	max.
P1 AC operation	24 V	> 1.3 VA	< 8.4 VA
	110 V	> 1.5 VA	< 38.5 VA
	230 V	> 2.5 VA	< 80.5 VA

Relays with less nominal power can be operated via an RC module connected in parallel (optional).

Electronic insert FEL52 (DC PNP)

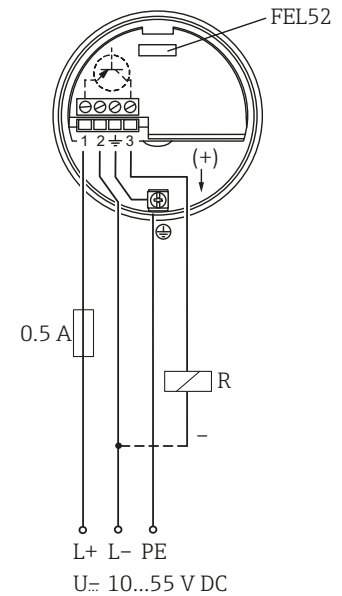
Power supply

Supply voltage: DC 10 to 55 V
 Ripple: ≤ 1.7 V, 0 to 400 Hz
 Current consumption: ≤ 15 mA
 Power consumption: ≤ 0.83 W
 Reverse polarity protection
 Overvoltage protection FEL52: overvoltage category III

Electrical connection

Three-wire DC connection

Switches the load via the transistor (PNP) and separate connection.
 Preferably used with programmable logic controllers (PLC),
 DI modules as per EN 61131-2.
 Positive signal at the switch output of the electronics (PNP);
 output blocked when point level is reached.



$R = \text{Relay, PLC, ...}$

Output signal

I_L = load current
(switched through)

$< 100 \mu\text{A}$ = residual current
(blocked)



= lit



= unlit

L00-FTL2xxxx-07-05-
xx-xx-000

Safety mode	Level	Output signal	LEDs	
			green	red
MAX		$L+ \xrightarrow{I_L} +$ 1 3		
		$1 \xrightarrow{< 100 \mu\text{A}} 3$		
MIN		$L+ \xrightarrow{I_L} +$ 1 3		
		$1 \xrightarrow{< 100 \mu\text{A}} 3$		

Signal on alarm

Output signal on power failure or in the event of damaged sensor: $< 100 \mu\text{A}$

Connectable load

- Load switched via the transistor and separate PNP connection, $\leq$ DC 55 V
- Load current ≤ 350 mA (pulsed overload and short-circuit protection)
- Residual current $< 100 \mu\text{A}$ (with transistor blocked)
- Capacitance load $\leq 0.5 \mu\text{F}$ at 55 V, $\leq 1.0 \mu\text{F}$ at 24 V
- Residual voltage < 3 V (with transistor switched through)

Electronic insert FEL54 (AC/DC with relay output)

Power supply

Supply voltage: AC 19 to 253 V, 50/60 Hz or DC 19 to 55 V
Power consumption: ≤ 1.3 W
Reverse polarity protection
Overvoltage protection FEL54: overvoltage category III

Electrical connection

Universal current connection with relay output

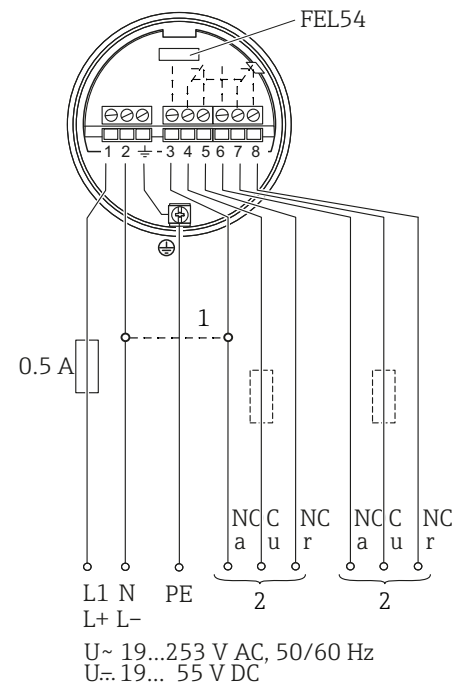
Power supply:
Please note the different voltage ranges for
AC and DC.

Output:

When connecting an instrument with high inductance, provide a spark arrester to protect the relay contact.

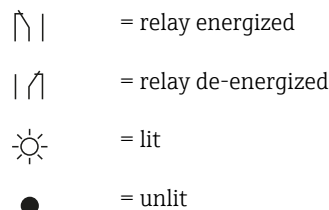
A fine-wire fuse (depending on the load connected) protects the relay on short-circuiting.

Both relay contacts switch simultaneously.

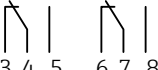
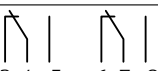


1 = When jumpered, the relay output works with NPN logic.
2 = See below: "Connectable load"

Output signal



L00-FTL2xxxx-07-05-
xx-xx-001

Safety mode	Level	Output signal	LEDs green red
MAX			
			
MIN			
			

Signal on alarm

Output signal on power failure or in the event of damaged sensor: relay de-energized

Connectable load

- Loads switched via 2 floating change-over contacts (DPDT)
- $I \leq 6 \text{ A}$ (Ex de 4 A), $U \leq \text{AC } 253 \text{ V}$; $P \leq 1500 \text{ VA}$, $\cos \varphi = 1$, $P \leq 750 \text{ VA}$, $\cos \varphi > 0.7$
- $I \leq 6 \text{ A}$ (Ex de 4 A) to DC 30 V, $I \leq 0.2 \text{ A}$ to 125 V
- When connecting a low-voltage circuit with double insulation according to IEC 1010, the following applies: the sum of the voltages of the relay output and power supply is $\leq 300 \text{ V}$
- The electronic insert FEL52 DC-PNP is preferred for low DC load currents (e.g. when connecting to a PLC)
- Relay contact material: silver/nickel AgNi 90/10

Electronic insert FEL55 (8/16 mA)

Power supply

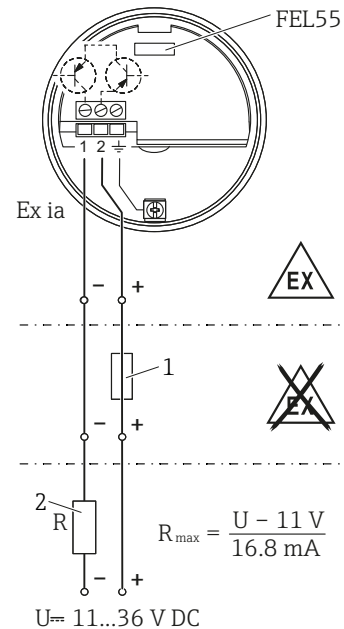
Supply voltage: DC 11 to 36 V
 Power consumption: < 600 mW
 Reverse polarity protection
 Overvoltage protection FEL55: overvoltage category III

Electrical connection

Two-wire connection for separate switching unit

For separate switching unit.
 Signal transmission 16/8 mA on two-wire cabling.
 For connection to programmable logic controllers (PLC) for example, AI modules 4 to 20 mA to EN 61131-2.
 Output signal jump from high to low current on point level.

Fuse required for non-Ex applications!
 Only use power units with safe galvanic isolation (e.g. SELV).



1 = F = T 50 mA

2 = PLC, AI modules,...

Output signal

$\sim 16 \text{ mA} = 16 \text{ mA} \pm 5 \%$

$\sim 8 \text{ mA} = 8 \text{ mA} \pm 6 \%$



= lit



= unlit

L00-FTL2xxxx-07-05-
xx-xx-000

Safety mode	Level	Output signal	LEDs	
			green	red
MAX		$\begin{matrix} + \\ 2 \end{matrix} \xrightarrow{\sim 16 \text{ mA}} 1$		
		$\begin{matrix} + \\ 2 \end{matrix} \xrightarrow{\sim 8 \text{ mA}} 1$		
MIN		$\begin{matrix} + \\ 2 \end{matrix} \xrightarrow{\sim 16 \text{ mA}} 1$		
		$\begin{matrix} + \\ 2 \end{matrix} \xrightarrow{\sim 8 \text{ mA}} 1$		

Signal on alarm

Output signal on power failure or in the event of damaged sensor: < 3.6 mA

Connectable load

- $R = (U - 11 \text{ V}) : 16.8 \text{ mA}$
- $U = \text{connection voltage: DC 11 to 36 V (in wet environments DC 11 to 35 V)}$

Example: PLC with 250 Ω with 2-wire version

$$250 \Omega = (U - 11 \text{ V}) / 16.8 \text{ mA}$$

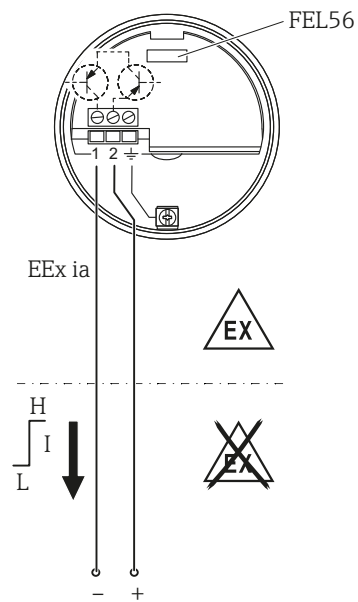
$$4.2 [\Omega / \text{A}] = U - 11 \text{ V}$$

$$U = 15.2 \text{ V}$$

Electronic insert FEL56 (NAMUR L-H edge)

Power supply Supply voltage: DC 8.2 V ±20 %
Power consumption: < 6 mW at I < 1 mA; < 38 mW at I = 2.8 mA
Connection data interface: IEC 60947-5-6

Electrical connection **Two-wire connection for separate switching unit**
For connection to isolating amplifiers according to NAMUR (IEC 60947-5-6), e.g. FTL325N from Endress+Hauser.
Output signal jump from low to high current on point level.
(L-H edge)
Connecting to multiplexer: Set clock time to min. 2 s.



Output signal

☀ = lit
⚡ = flashes
● = unlit

L00-FTL5xxxx-07-05-
xx-xx-002

Safety mode	Level	Output signal	LEDs	
			green	red
MAX		$\begin{matrix} + & 0.6 \dots & 1.0 \text{ mA} \\ 2 & \xrightarrow{\hspace{1cm}} & 1 \end{matrix}$		
		$\begin{matrix} + & 2.2 \dots & 2.8 \text{ mA} \\ 2 & \xrightarrow{\hspace{1cm}} & 1 \end{matrix}$		
MIN		$\begin{matrix} + & 0.6 \dots & 1.0 \text{ mA} \\ 2 & \xrightarrow{\hspace{1cm}} & 1 \end{matrix}$		
		$\begin{matrix} + & 2.2 \dots & 2.8 \text{ mA} \\ 2 & \xrightarrow{\hspace{1cm}} & 1 \end{matrix}$		

Signal on alarm Output signal in the event of damaged sensor: > 2.2 mA

Connectable load See Technical Data of the isolating amplifier connected according to IEC 60947-5-6 (NAMUR)

Electronic insert FEL58 (NAMUR H-L edge)

Power supply

Supply voltage: DC 8.2 V $\pm$ 20 %
 Power consumption: < 6 mW at I < 1 mA; < 38 mW at I = 3.5 mA
 Connection data interface: IEC 60947-5-6

Electrical connection

Two-wire connection for separate switching unit

For connection to isolating amplifiers according to NAMUR (IEC 60947-5-6), e.g. FTL325N, FTL375N from Endress+Hauser.
 Output signal jump from high to low current on point level.

(H-L edge)

Additional function:

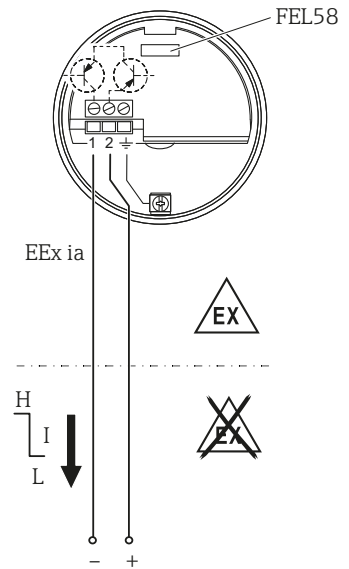
Test key on the electronic insert.

Pressing the key breaks the connection to the isolating amplifier.

 Note!

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

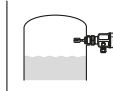
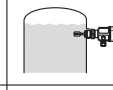
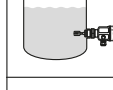
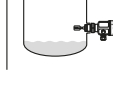
Connecting to multiplexer: Set clock time to min. 2 s.



Output signal

 = lit
 = flashes
 = unlit

L00-FTL5xxxx-07-05-
xx-xx-002

Safety mode	Level	Output signal	LEDs green yellow	
MAX		+ 2.2 ... 3.5 mA → 1		
		+ 0.6 ... 1.0 mA → 1		
MIN		+ 2.2 ... 3.5 mA → 1		
		+ 0.6 ... 1.0 mA → 1		

Signal on alarm

Output signal in the event of damaged sensor: < 1.0 mA

Connectable load

- See Technical Data of the isolating amplifier connected according to IEC 60947-5-6 (NAMUR)
- Connection also to isolating amplifiers which have special safety circuits (I > 3.0 mA)

Electronic insert FEL57 (PFM)

Power supply	Supply voltage: DC 9.5 to 12.5 V Current consumption: 10 to 13 mA Power consumption: < 150 mW Reverse polarity protection
--------------	--

Electrical connection	Two-wire connection for separate switching unit For connecting to Endress+Hauser switching units Nivotester FTL320, FTL325P, FTL370, FTL372, FTL375P (also with proof test). Output signal jump of the PFM signal from high to low frequency when sensor is covered. Switching between minimum/maximum safety in the Nivotester. Additional function “Proof testing”: Following an interruption in the power supply, a test cycle is activated, which tests the sensor and electronics without any change in level. Approved for overfill prevention acc. to WHG (German Water Resources Act). The following can be switched at the electronic insert: – Standard (STD): Simulation approx. 8 s tuning fork exposed – covered – exposed. For proof testing, the Nivotester tests the sensor's level notification function. – Extended (EXT): Simulation approx. 41 s: tuning fork exposed – covered – alarm – exposed. For proof testing, the Nivotester tests the sensor's level notification function and fault notification (alarm) function. The check is activated and monitored at the switching unit. The twin-core connecting cable (instrument cable) with a cable resistance of $\leq 25\ \Omega$ per core is connected to the screw terminals (conductor cross-sections 0.5 to 2.5 mm / 0.02 to 0.1 in) in the connection compartment. Protective circuits against reverse polarity, HF influences and overvoltage peaks are installed. A shielded connecting cable is recommended in the event of strong electromagnetic interference. Here the shielding must be connected to the sensor and the power supply. Maximum cable length up to 1000 m (3281 ft).	Diagram showing the FEL57 electronic insert connected to a switching unit. The insert has terminals 1, 2, 3, 4, 5, 6, 7, 8. The switching unit has terminals 7, 8, 33, 34, 37, 38, d4, d2, z4, z2, z6, d6. The PFM signal is shown as a pulse train. The switching unit is labeled with EX and EX with a cross. The Nivotester models and their input channels are listed: FTL320, FTL325P 1CH, FTL325P 3CH, FTL370/372, FTL375P 1CH Input 1, FTL372, FTL375P 2CH Input 2, FTL375P 3CH Input 3.
-----------------------	---	--

Output signal



= lit



= unlit

L00-FTL2xxxx-07-05-
xx-xx-000

Safety mode	Level	Output signal (PFM)	LEDs green yellow
		150 Hz 	 
		50 Hz 	 

Signal on alarm	Output signal on power failure or in the event of damaged sensor: 0 Hz
Connectable load	■ Floating relay contacts in the connected switching unit Nivotester FTL325P, FTL375P ■ For contact load, see the Technical Data of the switching unit.

Electronic insert FEL50A (PROFIBUS PA)

Power supply

Bus voltage: DC 9 to 32 V

Bus current:

- 12.5 mA $\pm$ 1.0 mA (software version: 01.03.00, hardware version: 02.00)
- 10.5 mA $\pm$ 1.0 mA (software version: 01.03.00, hardware version: 01.00)

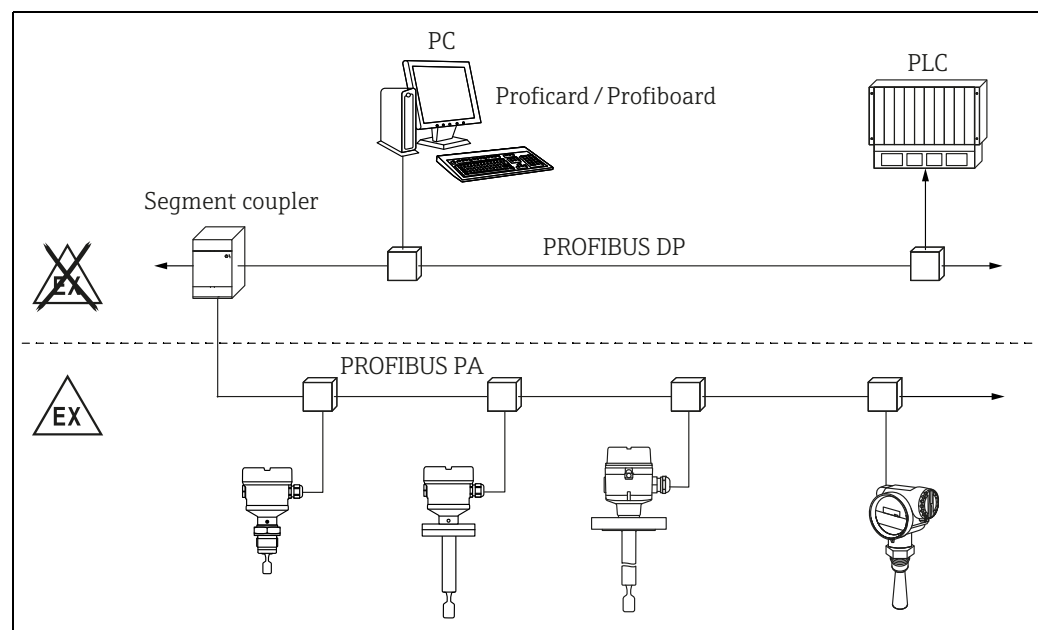
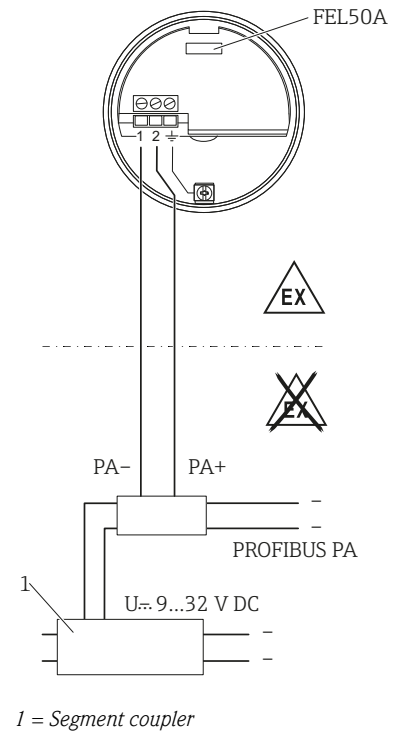
Electrical connection

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 change
- Matrix locking possible
- Switch to WHG mode possible (WHG approval)
- For a detailed description, see BA00198F

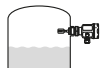
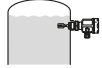
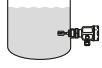
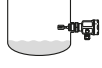


Output signal

 = lit

 = unlit

L00-FTL2xxxx-07-05-
xx-xx-000

Setting	Level	LEDs		FEL50A
		green	yellow	
not inverted				OUT_D = 0 PA bus signal
				OUT_D = 1 PA bus signal
inverted				OUT_D = 0 PA bus signal
				OUT_D = 1 PA bus signal

Signal on alarm

Failure information can be accessed using the following interfaces:

- Yellow LED flashing,
- Status code
- Diagnostic code

Electronic insert FEL50D (density)

Power supply

Frequency range: 300 to 1500 Hz
 Signal level: 4 mA
 Pulse height: 16 mA
 Pulse width: 20 μ S

Electrical connection

Two-wire connection at Density Computer FML621

For connecting to the Density and Concentration Computer FML621.

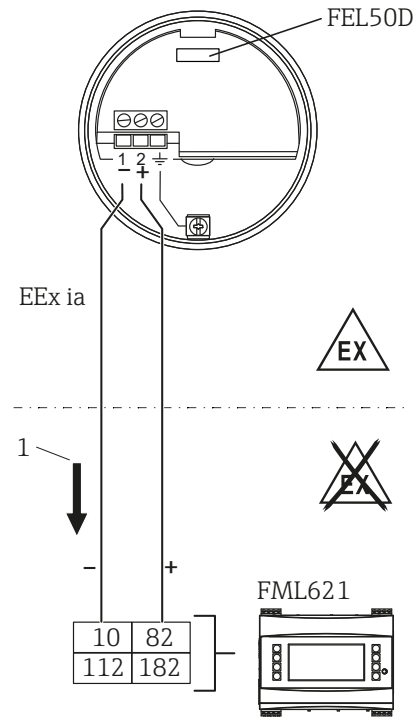
The output signal is based on pulse technology. With the aid of this signal, the fork frequency is constantly forwarded to the switching unit.



Caution!

Operation with other switching units, such as FTL325P, is not permitted.

This electronic insert cannot be installed in devices that were originally used as a point level switch.



1 = Pulse

Signal on alarm

Output signal on power failure or in the event of damaged sensor: 0 Hz

Adjustment

In the Liquiphant M modular system, the option of an adjustment is also provided in addition to the electronics (see feature 60: "Accessories").

There are three types of adjustment:

Standard adjustment (see ordering information for additional options, basic version A)

- Here, two fork parameters are determined to describe the sensor characteristics, indicated in the adjustment report and provided with the product. These parameters must be transferred to the Density Computer FML621.

Special adjustment (see ordering information for additional options, special adjustment, density H₂O (K) or special adjustment, density H₂O with 3.1 certificate (L))

- Here, three fork parameters are determined to describe the sensor characteristics, indicated in the adjustment report and provided with the product. These parameters must be transferred to the Density Computer FML621. Greater accuracy is achieved with this type of adjustment (see also "Performance characteristics").

Field adjustment

- During field adjustment, a density value actually determined by the customer is entered and the system is automatically adjusted to this value (wet adjustment).

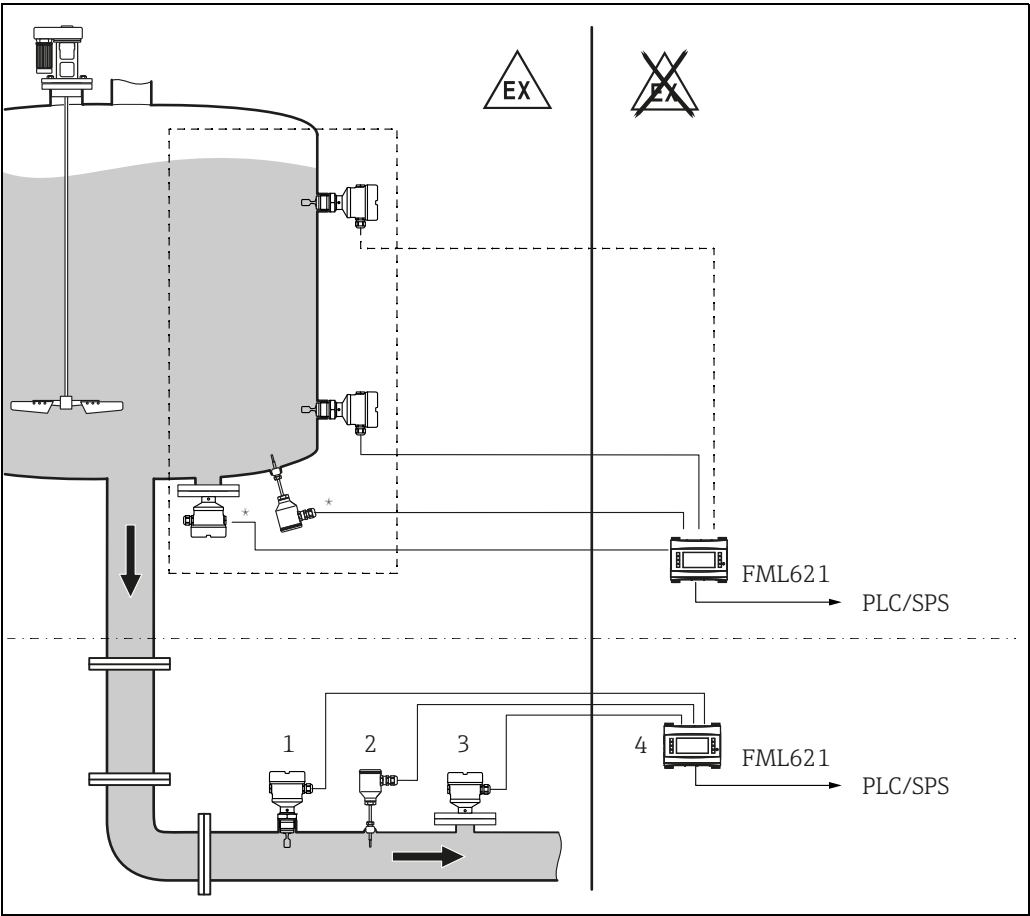


Note!

More information on Liquiphant M Density is available in Technical Information TI00420F. This document is available for download at www.endress.com => Download.

Operating principle

Measuring the density of a liquid medium in pipes and tanks. Also suitable for use in hazardous areas, and preferably for applications in the chemical and food industry.



- * Pressure and temperature information required depending on the application.*
- 1. Liquiphant M sensor with electronic insert FEL50D (pulse output);
 - 2. Temperature sensor (e.g. 4 to 20 mA output);
 - 3. Pressure transmitter (4 to 20 mA output);
 - 4. Liquiphant Density and Concentration Computer FML621 with display and operating unit

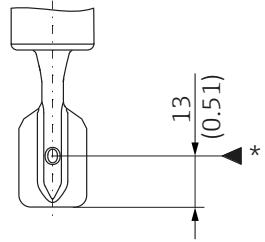
Light signals

LED	Symbol	Information
Yellow		Measurement valid
		Unstable process situation
		Maintenance required
Green		Power on
		Power off
Red		No fault
		Maintenance required
		Device failure

Connection and function

Connecting cables	- Electronic inserts: cross-section $\leq 2.5 \text{ mm}^2$ (14 AWG); strand in ferrule as per DIN 46228 - Protective ground in housing: cross-section $\leq 2.5 \text{ mm}^2$ (14 AWG) - External equipotential bonding connection on housing: cross-section $\leq 4 \text{ mm}^2$ (12 AWG)
Safety mode	Minimum/maximum residual current safety selectable on electronic insert (with FEL57 on Nivotester only) MAX = maximum safety: The output switches to the power fail response when the fork is covered For use with overfill prevention 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
Switching time	When fork is covered: approx. 0.5 s When fork is exposed: approx. 1.0 s Additionally configurable for PROFIBUS PA: 0.5 to 60 s Other switching times available on request.
Switch-on behavior	When switching on the power supply, the output assumes the alarm signal. After $\leq 3 \text{ s}$ it assumes the correct switching mode (exception: FEL57)

Performance characteristics

Reference operating conditions	Ambient temperature: $23 \text{ }^{\circ}\text{C}$ ($73 \text{ }^{\circ}\text{F}$) Medium temperature: $23 \text{ }^{\circ}\text{C}$ ($73 \text{ }^{\circ}\text{F}$) Medium density (water): 1 g/cm^3 (SGU) Medium viscosity: $1 \text{ mm}^2/\text{s}$ (cSt) Medium pressure p_e: 0 bar (0 psi) Sensor mounting: vertical from above Density switch: to $> 0.7 \text{ g/cm}^3$ (SGU)	 * Switch point under reference operating conditions
Maximum measured error	Under reference operating conditions: max. $\pm 1 \text{ mm}$ (0.04 in)	
Repeatability	0.1 mm (0.004 in)	
Hysteresis	ECTFE and PFA: approx. 2 mm (0.08 in) Enamel: approx. 2.5 mm (0.1 in)	
Influence of medium temperature	ECTFE and PFA: max. $+1.4 \text{ mm}$ to -2.8 mm (-50 to $+120 \text{ }^{\circ}\text{C}$ / -58 to $248 \text{ }^{\circ}\text{F}$) Enamel: max. $+0.6 \text{ mm}$ to -1.5 mm (-50 to $+150 \text{ }^{\circ}\text{C}$ / -58 to $302 \text{ }^{\circ}\text{F}$)	
Influence of medium density	max. $+4.8 \text{ mm}$ to -3.5 mm (0.5 to 1.5 g/cm^3 (SGU)) max. $+0.19 \text{ in}$ to -0.14 in	
Influence of medium pressure	ECTFE and PFA: max. 0 mm to -2.0 mm (0 bar to 40 bar) max. 0 in to -0.08 in (0 psi to 580 psi) Enamel: max. 0 mm to -1.0 mm (0 bar to 25 bar) max. 0 in to -0.04 in (0 psi to 363 psi)	
Switching delay	When fork is covered: 0.5 s	

- When fork is exposed: 1.0 s
- Available on request: 0.2 s; 1.5 s or 5 s (when the tuning fork is covered or exposed)

Operating conditions

Installation instructions

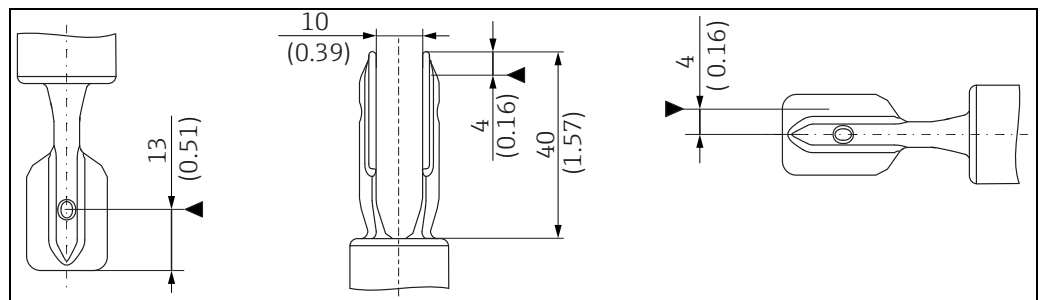


Switch points $\triangleright$ on the sensor depend on the mounting position, with reference to water, density 1 g/cm³ (SGU), 23 °C (73 °F), p_e 0 bar (0 psi).

Note!

- The switch points of the Liquiphant **M** are at other positions to those of the previous version Liquiphant **II**.
- Minimum distance between the tip of the fork and the tank wall or pipe wall: 10 mm

Synthetic coating:

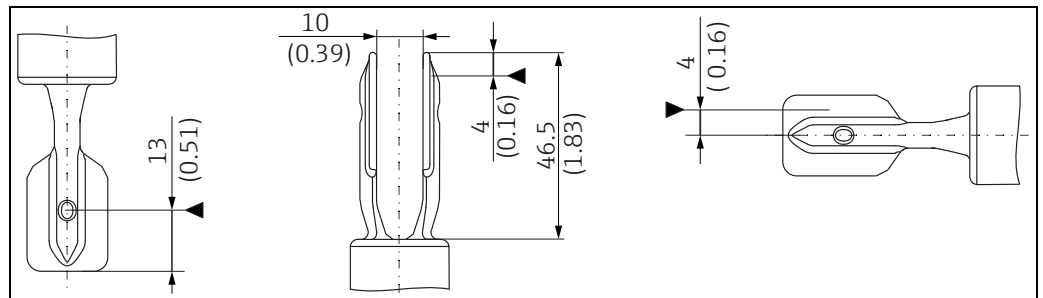


Mounting from above

Mounting from below

Mounting from the side

Enamel coating:



Mounting from above

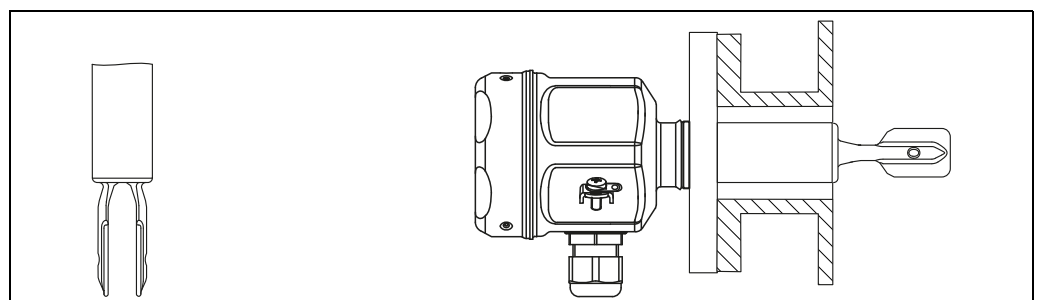
Mounting from below

Mounting from the side

Examples of mounting

Examples of mounting depending on the viscosity ν of the liquid and the tendency to form buildup

Optimum mounting, problem-free even with high viscosity:



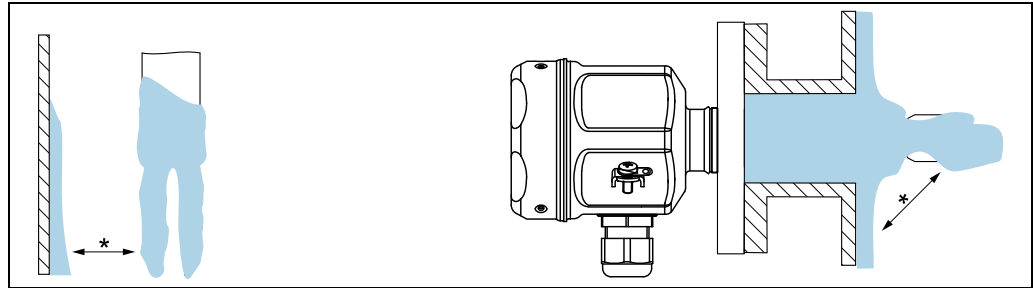
Vertical from above

Flush-mounted from the side

Position the fork so that the narrow edge of the tines is vertical to ensure that the liquid can run off easily.

With buildup on the tank walls:

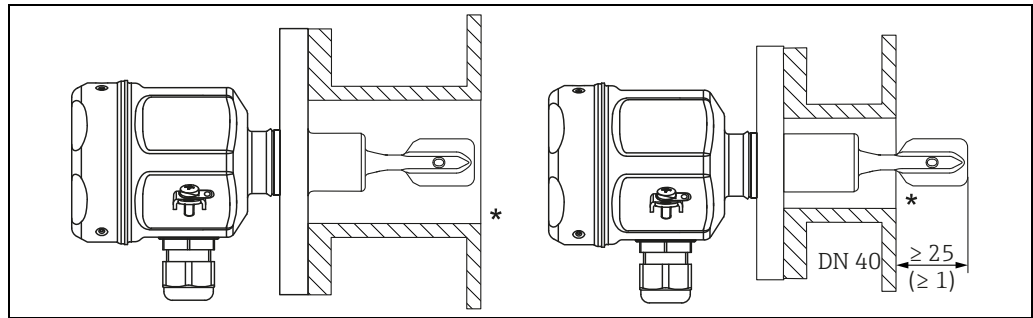
* Ensure that there is sufficient distance between the buildup expected on the tank wall and the fork.



Vertical from above

Protruding into the tank from the side

Mounting positions with low viscosity (up to 2000 mm²/s):

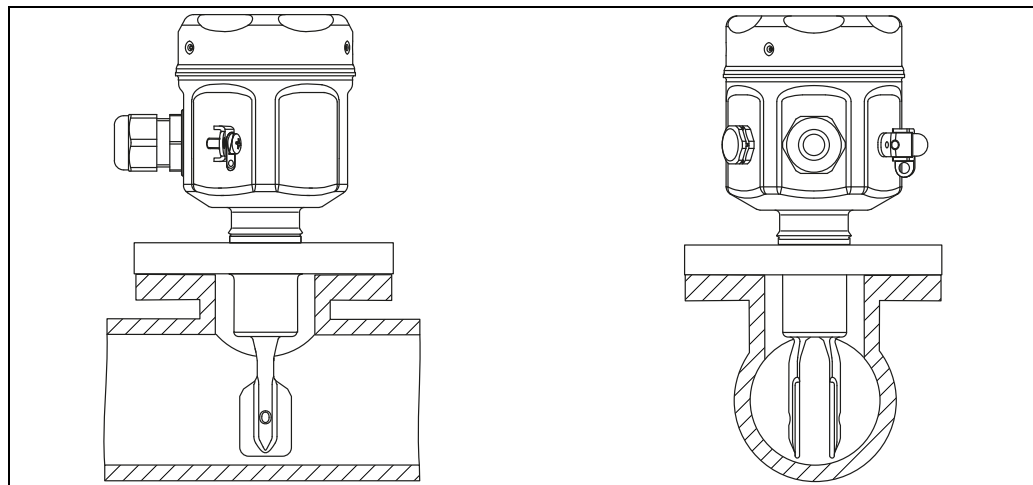


Dimensions: mm (in)

* Deburr the nozzle surfaces

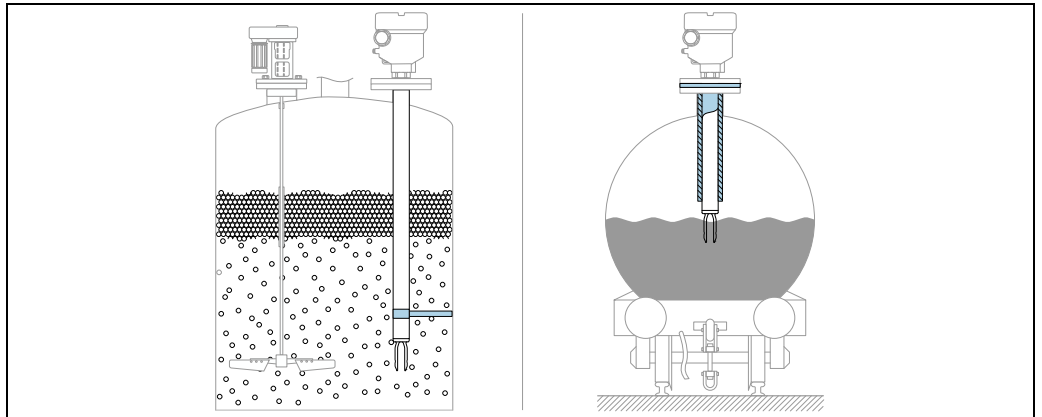
Mounting in piping from 2"

Flow velocities up to 5 m/s (16.4 ft/s) with a viscosity of 1 mm²/s and density of 1 g/cm³. (Check the function in the case of other medium conditions.)



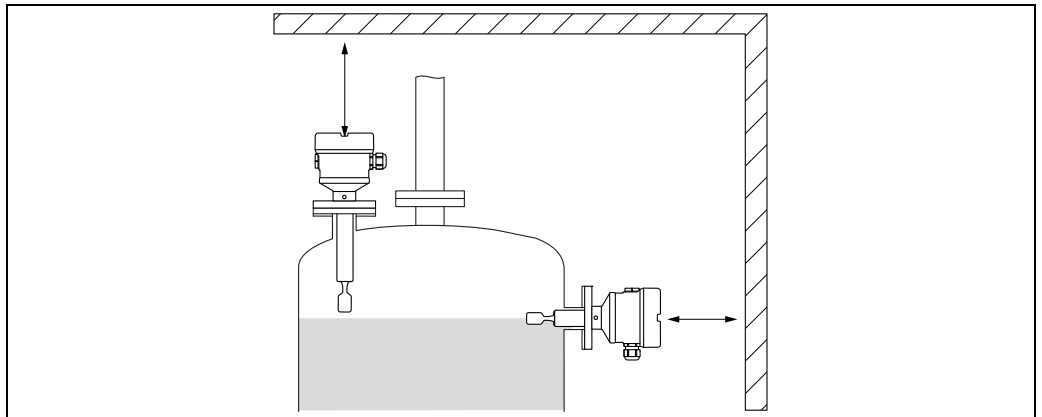
Support the device in the event of a severe dynamic load.

Support is possible only in conjunction with **ECTFE or PFA** synthetic coating.



Installation location

Ensure that there is adequate space outside the tank for mounting, connection and configuration.



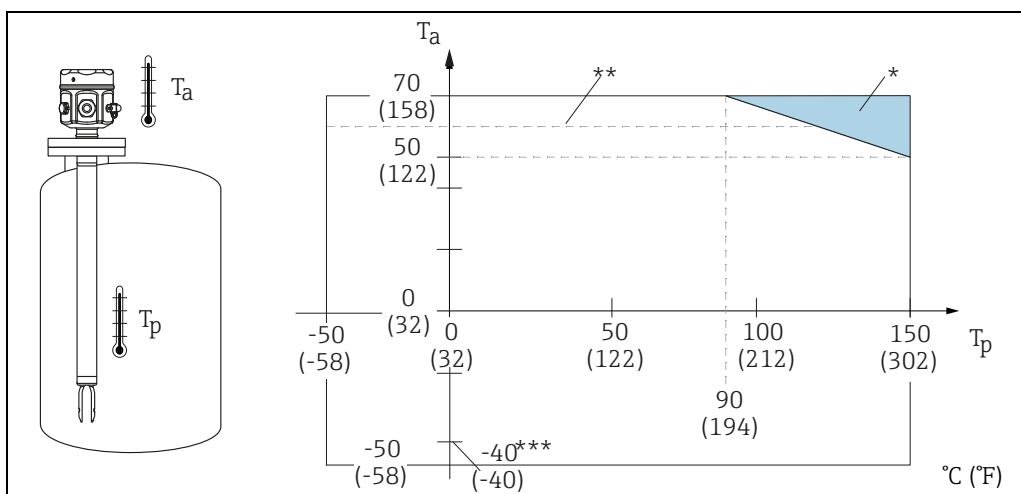
Orientation

FTL51C with short pipe up to approx. 500 (19.7 mm): any position
FTL51C with long pipe: vertical

Environment

Ambient temperature range

Permitted ambient temperature T_a at the housing depending on the medium temperature T_p in the tank:



* Additional temperature range for devices with a temperature spacer or pressure tight feed-through.

** Maximum ambient temperature with FEL50D/FEL50A in hazardous areas.

*** For F16 housing, the following applies: $-40^\circ\text{C} \leq T_a \leq +70^\circ\text{C}$ ($-40^\circ\text{F} \leq T_a \leq +158^\circ\text{F}$)

Storage temperature

-50 to $+80^\circ\text{C}$ (-58 to 176°F)

Operating altitude as per IEC61010-1 Ed.3

Up to 2000 m (6600 ft) above sea level.

Can be extended up to 3000 m (9800 ft) above sea level if overvoltage protection is used, for example HAW562 or HAW569.

Climate class

Climate protection to IEC 68, Part 2-38, Fig. 2a

Degree of protection

Types of housing	IP65	IP66*	IP67*	IP68*	IP69	NEMA type**
Polyester housing F16	–	X	X	–	–	4X
Stainless steel housing F15	–	X	X	–	–	4X
Aluminum housing F17	–	X	X	–	–	4X
Aluminum housing F13****	–	X	–	X***	–	4X/6P
Stainless steel housing F27	–	X	–	X	–	4X/6P
Aluminum housing T13 with separate connection compartment (Ex d)	–	X	–	X***	–	4X/6P

* As per EN60529

** As per NEMA 250

*** Only with M20 cable entry or G1/2 thread

**** F13 housing only in conjunction with XP or Ex d approval

Vibration resistance

As per IEC 68, parts 2-6 (10 to 55 Hz, 0.15 mm (0.01 in), 100 cycles)

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)

Medium conditions

Medium temperature	ECTFE: -50 °C to +120 °C (-58 °F to +248 °F) PFA: -50 °C to +150 °C (-58 °F to +302 °F) Enamel: max. -50 °C to +150 °C (-58 °F to +302 °F)
Thermal shock	≤ 120 °C/s (248 °F/s)
Medium pressure p_e	The following values apply over the entire temperature range. Pay attention to exceptions for flange process connections! ■ ECTFE and PFA: -1 to +40 bar (-14.5 to 580 psi) ■ Enamel: max. -1 to +25 bar (-14.5 to 363 psi) Please refer to the standards listed for the permitted pressure values of the flanges at higher temperatures: ■ pR EN 1092-1: 2005 With regard to its stability-temperature property, the material 1.4435 is identical to 1.4404, which is classed under 13E0 in EN 1092-1 Tab. 18. The chemical composition of the two materials can be identical. ■ ASME B 16.5a - 1998 Tab. 2-2.2 F316 ■ ASME B 16.5a - 1998 Tab. 2.3.8 N10276 ■ JIS B 2220 The lowest value from the derating curves of the device and selected flange applies in each case. Canadian CRN approval: Additional details on maximum pressure values are available in the download area of the product page at "www.endress.com".
Test pressure	$p_e = 100$ bar (1450 psi): ■ ≤ 150 bar (2175 psi) or 1.5 times the medium pressure p_e ■ Membrane burst pressure at 200 bar (2900 psi)
	 Note! Device function is not available during pressure testing.
Pressure shock	≤ 20 bar/s (≤ 290 psi)
State of aggregation	Liquid
Density	0.7 g/cm ³ (SGU) = delivery status 0.5 g/cm ³ (SGU) can be adjusted via switch
Viscosity	$\leq 10,000$ mm ² /s (cSt)
Solids content	$\leq \varnothing 5$ mm (0.2 in)
Lateral loading capacity	≤ 75 Nm

Mechanical construction



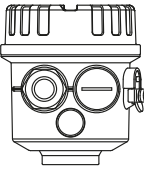
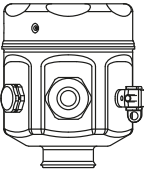
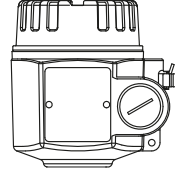
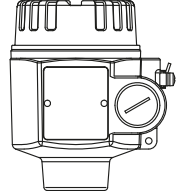
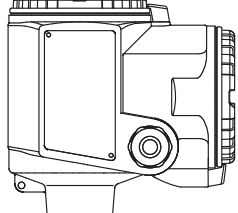
Note!

2D and 3D drawings containing individual dimensions can be generated and downloaded in the Configurator on the product pages of the Liquiphant FTL5x at www.endress.com.

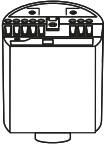
Design

Summary of all electrical and mechanical versions

Housing

				
F16 Polyester (PBT)	F15 Stainless steel (316L)	F17 Aluminum Coated housing	F27 Stainless steel (316L) F13 Aluminum (also for Ex d/XP), coated housing	T13 Aluminum with separate connection compartment (also Ex de and Ex d), coated housing

Plug-in electronic inserts to mount in the housing

	FEL51: Two-wire AC connection FEL52: Three-wire DC connection PNP FEL54: Universal current connection, 2 relay outputs FEL55: Output 16/8 mA for separate switching unit FEL56: Output 0.6 to 1.0 / 2.2 to 2.8 mA for separate switching unit (NAMUR) FEL58: Output 2.2 to 3.5 / 0.6 to 1.0 mA for separate switching unit (NAMUR) FEL57: Output 150/50 Hz, PFM, for separate switching unit (Nivotester) FEL50A: Digital communication PROFIBUS PA FEL50D: Pulse output for Density Computer FML621
---	---

Bushings

Temperature spacer and pressure-tight feedthrough: enables closed tank insulation and normal ambient temperature for the housing.



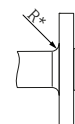
Process connections

Flanges* according to DIN/EN, ASME, JIS from DN 40 / 1½"

* The following applies for DN 25/ASME 1":

Radius (R) ≤ 4 mm.

Take into account for counterflange!



Sensors

With extension pipe up to 3 m
or special "length L II" (see also Page 24)

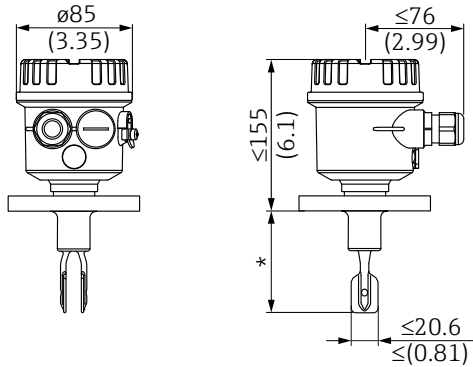
Length L

Length L II

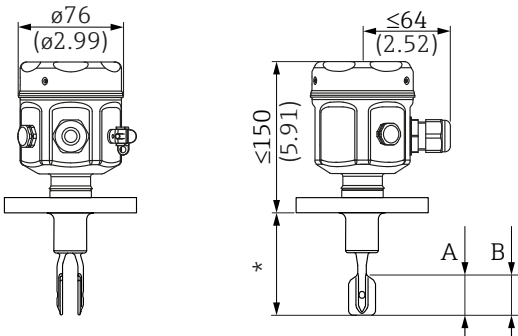


Dimensions

Dimensions in mm (in)!
Polyester housing F16

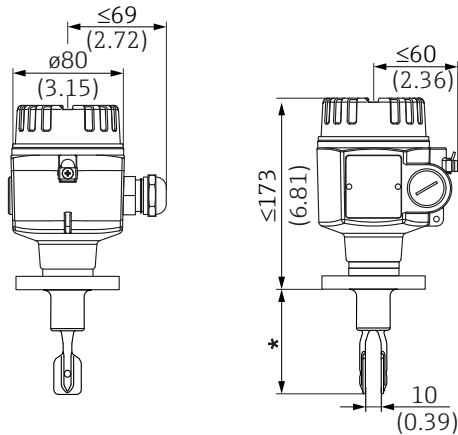


Stainless steel housing F15

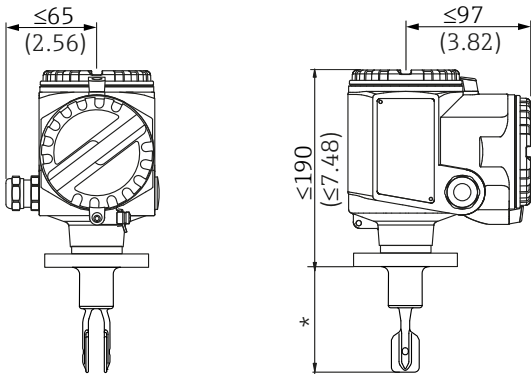


1. = approx. 25 (0.98) ECTFE, PFA
2. = approx. 29 (1.14) enamel

Aluminum housing F17/F13
Stainless steel housing (316L) F27



Aluminum housing T13 with separate
connection compartment



* This length is customer-specific.



Note!
The switch points of the Liquiphant **M** are at other positions to those of the previous version Liquiphant **II**.

Bushings: temperature spacer, pressure tight feed-through

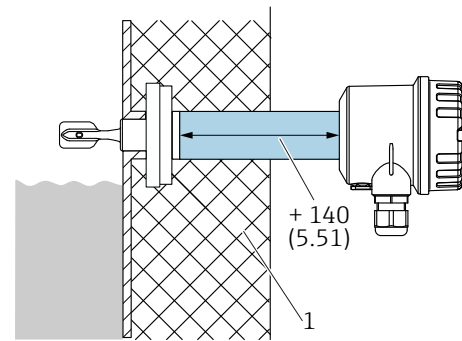
Temperature spacer

Provides sealed insulation for the vessel and normal ambient temperatures for the housing.

Pressure tight feed-through

Protects the housing from vessel pressures up to 40 bar (580 psi) if the sensor is damaged.

Provides sealed insulation for the vessel and normal ambient temperatures for the housing.

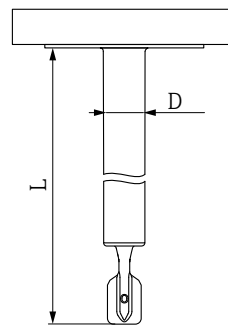


I. = Insulation

Process connections

Process connection		Dimensions	Accessories	Pressure Temperature
Flanges: Synthetic coating ASME B16.5 (RF) EN 1092-1 (Form A) JIS B 2220 (RF) Enamel coating ASME B16.5 (RF) EN 1092-1 (Form B) JIS B 2220 (RF)	A# # B# # C## K# #		For synthetic coating: seal made of PTFE supplied For enamel coating: Seal provided by the customer	See nominal pressure of flange, however For ECTFE: ≤ 40 bar ≤ 120 °C For PFA (Edlon*): ≤ 40 bar ≤ 150 °C For enamel: ≤ 25 bar ≤ 150 °C
*) FDA-compliant material in accordance with 21 CFR Part 177.1550/2600				

Sensor length L and pipe diameter D



The maximum diameter D depends on the coating material.

Layer thickness Coating material	ECTFE	PFA* (Edlon™)	PFA (RubyRed)	PFA (conductive)	Enamel
Lower limit	0.5 mm	0.45 mm	0.45 mm	0.45 mm	0.4 mm
Upper limit	1.6 mm	1.6 mm	1.6 mm	1.6 mm	0.8 mm
Maximum diameter D	24.6 mm	24.6 mm	24.6 mm	24.6 mm	23 mm

Any length L:

148 mm to 3000 mm (6 in to 115 in) for synthetic coating

148 mm to 1200 mm (6 in to 48 in) for enamel coating



Note!

The switch points of the Liquiphant **M** are at other positions to those of the previous version Liquiphant **II**.

Special length "L II": 115 mm (4.5 in)

If vertically mounted from above, the same switch point as for the Liquiphant II
FTL360, FTL365, FDL30, FDL35

Weights

The typical total weight of the Liquiphant can be calculated by adding the weights of the individual components to the basic weight.

Basic weight	Weight in kg (lbs)
The basic weight comprises: ■ Sensor (compact) ■ Electronic insert ■ Polyester housing F16 ■ Housing cover	0.6 (1.32)
Housing	kg (lbs)
Aluminum housing F13 (connection: NPT $\frac{3}{4}$, G $\frac{1}{2}$ or M20)	0.5 (1.1)
Stainless steel housing F15 (connection: NPT $\frac{1}{2}$, G $\frac{1}{2}$, M20 or M12 connector)	0.1 (0.2)
Aluminum housing F17 (connection: NPT $\frac{3}{4}$, G $\frac{1}{2}$, M20 or M12 connector)	0.5 (1.1)
Stainless steel housing F27 (connection: NPT $\frac{1}{2}$, G $\frac{1}{2}$ or M20)	0.3 (0.7)
Aluminum housing T13 with separate connection compartment (connection: NPT $\frac{3}{4}$, G $\frac{1}{2}$ or M20)	0.9 (2)
Temperature spacer	kg (lbs)
1 pc	0.6 (1.3)
Pressure-tight feedthrough	kg (lbs)
1 pc	0.7 (1.54)
Process connection: flanges ASME B16.5	kg (lbs)
NPS 1" Cl.150, 316/316L	1.0 (2.2)
NPS 1½" Cl.150, 316/316L	1.5 (3.3)
NPS 2" Cl.150, 316/316L	2.4 (5.3)
NPS 2" Cl.300, 316/316L	3.2 (7.1)
NPS 3" Cl.150, 316/316L	4.9 (10.8)
NPS 3" Cl.300, 316/316L	6.8 (15)
NPS 3" Cl.600, 316/316L	8.5 (18.7)
NPS 4" Cl.150, 316/316L	7.0 (15.4)
Process connection: flanges EN1092-1 (DIN2527)	kg (lbs)
DN25 PN25/40, 316L	1.4 (3.1)
DN32 PN25/40, 316L	2.0 (4.4)
DN40 PN25/40, 316L	2.4 (5.3)
DN50 PN6, 316L	4.5 (9.9)
DN50 PN25/40, 316L	3.2 (7.1)
DN80 PN25/40, 316L	5.9 (13)
DN100 PN10/16, 316L	10.1 (22.3)
DN100 PN25/40, 316L	7.5 (16.5)
Process connection: flanges JIS B220	kg (lbs)
10K 50A, 316L	1.9 (4.2)
Pipe extension	kg (lbs)
1 m	0.9 (2)
100 in	2.3 (5.1)
Weather protection cover	kg (lbs)
1 pc	0.3 (0.7)

Material	Material specifications as per AISI and DIN-EN.																
	Parts in contact with process ■ Extension pipe substrate Alloy C4 in the case of enamel coating: 316L (1.4435 or 1.4404) in the case of synthetic coating ■ Fork substrate Alloy C4 in the case of enamel coating: 316L (1.4435) in the case of synthetic coating ■ Flanges, coated:																
	<table border="1"> <thead> <tr> <th>Coating material</th><th>ECTFE</th><th>PFA* (Edlon™)</th><th>PFA (RubyRed)</th><th>PFA (conductive)</th><th>Enamel</th></tr> </thead> <tbody> <tr> <td>Substrate</td><td>316L (1.4404)</td><td>316L (1.4404)</td><td>316L (1.4404)</td><td>316L (1.4404)</td><td>1.0487</td></tr> </tbody> </table>					Coating material	ECTFE	PFA* (Edlon™)	PFA (RubyRed)	PFA (conductive)	Enamel	Substrate	316L (1.4404)	316L (1.4404)	316L (1.4404)	316L (1.4404)	1.0487
Coating material	ECTFE	PFA* (Edlon™)	PFA (RubyRed)	PFA (conductive)	Enamel												
Substrate	316L (1.4404)	316L (1.4404)	316L (1.4404)	316L (1.4404)	1.0487												
	* FDA-compliant in accordance with 21 CFR Part 177.1550																
	Parts with no process contact ■ Tuning fork/housing seal: EPDM ■ Temperature spacer: 316L (1.4435) ■ Pressure-tight feedthrough: 316L (1.4435) ■ Ground terminal on housing (external): 316L (1.4404) ■ Cable glands – Housing F13, F15, F16, F17: polyamide (PA) – In the case of approval B or C (→  31 Ordering information): nickel-plated brass – Housing F27: polyamide PA, with approval "B" or "C" 316L (1.4435) – Housing T13: nickel-plated brass ■ Polyester housing F16: PBT-FR with PBT-FR cover or with PA12 transparent cover – Cover seal: EPDM – Nameplate glued: polyester film (PET) – Pressure compensation filter: PBT-GF20 ■ Stainless steel housing F15: 316L (1.4404) – Cover seal: silicone – Safety claw: 304 (1.4301) – Pressure compensation filter: PBT-GF20, PA ■ Aluminum housing F17/F13: EN-AC-ALSi10Mg, plastic-coated – Nameplate: aluminum, anodized – Cover seal: EPDM – Safety claw: nickel-plated brass – Pressure compensation filter: silicone (F17 housing only) ■ Stainless steel housing F27: 316L – Nameplate: 316L (1.4404) – Cover seal: FVMQ (optional: EPDM seal available as spare part) – Safety claw: 316L (1.4435) ■ Aluminum housing T13: EN-AC-ALSi10Mg, plastic-coated, – Nameplate: aluminum, anodized – Cover seal: EPDM – Safety claw: nickel-plated brass																
Process connections	■ Flanges made of 316L (1.4404) - synthetic coating; flanges made of 1.0487 (ASTMA 529) - enamel coating ■ Flanges as per EN/DIN 1092-1 from DN 25, as per ASME B16.5 from 1", as per JIS B 2220 (RF) from 10K50																

Human interface

Electronic inserts

With FEL51, FEL52, FEL54, FEL55:

- 2 switches for safety mode and density change
- green LED to indicate operational status
- red LED to indicate the switching status, flashes in the event of corrosion damage on sensor or if the electronics are defective

With FEL56:

- 2 switches for safety mode and density change
- green LED flashes to indicate operational status
- red LED to indicate the switching status, flashes in the event of corrosion damage on sensor or if the electronics are defective

With FEL57:

- 2 switches for density change and proof testing
- green LED to indicate operational status
- yellow LED to indicate the covered status, flashes in the event of corrosion damage on sensor or if the electronics are defective

With FEL58:

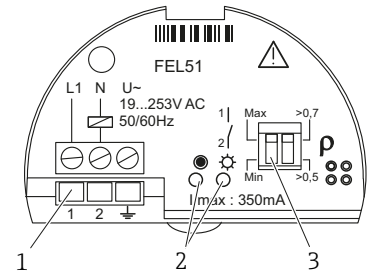
- 2 switches for safety mode and density change
- green LED
 - flashes quickly to indicate operational status,
 - flashes slowly in the event of corrosion damage to the sensor or if the electronics are defective
- yellow LED to indicate the switching status, Test key – breaks the cable connection

With FEL50A:

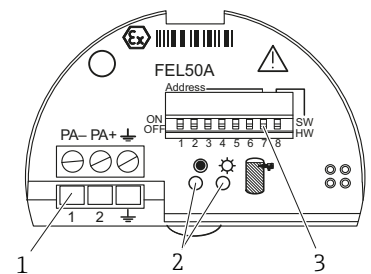
- 8 switches for configuring the device address
- green LED to indicate operational status, pulsing to indicate communication;
- yellow LED to indicate the switching status, flashes in the event of corrosion damage on sensor or if the electronics are defective

With FEL50D:

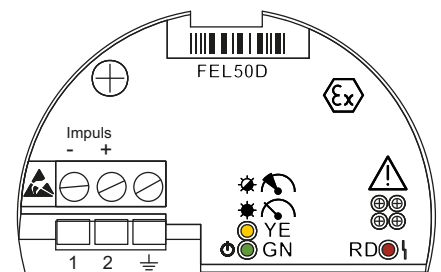
- yellow LED: to indicate the validation of the measurement
- green LED: to indicate the operational status
- red LED: to indicate faults



1. = Terminals, 2. = light emitting diodes, 3. = switches



1. = Terminals, 2. = light emitting diodes, 3. = switches



Certificates and approvals

Certificates	See Ordering information →  31.
CE mark	The measuring system meets the legal requirements of the applicable EC Directives. These are listed in the corresponding EC Declaration of Conformity along with the standards applied. Endress+Hauser confirms successful testing of the device by affixing to it the CE mark.
RoHS	The measuring system complies with the substance restrictions of the EU Directive on the restriction of the use of certain hazardous substances 2011/65/EU (RoHS 2).
RCM-tick mark	The product or measuring system supplied complies with the regulations of the Australian Communications and Media Authority (ACMA) for network integrity, performance characteristics and health and safety requirements. The specifications for electromagnetic compatibility, in particular, are observed. The products bear the RCM-tick mark on their nameplate.



A0029561

EAC conformity	The measuring system meets the legal requirements of the applicable EAC Directives. These are listed in the corresponding EAC Declaration of Conformity along with the standards applied. Endress+Hauser confirms successful testing of the device by affixing to it the EAC mark.
-----------------------	---

CRN approval	Device versions with a CRN approval (Canadian Registration Number) are listed in the following table.
---------------------	---

Order code	Process connection: flange ASME B16.5, > 316/316L		
ACK	1½"	150 lbs	ECTFE
ACL	1½"	150 lbs	PFA (Edlon™)
ACM	1½"	150 lbs	PFA (RubyRed)
ACN	1½"	150 lbs	PFA (conductive)
AEK	2"	150 lbs	ECTFE
AEL	2"	150 lbs	PFA (Edlon™)
AEM	2"	150 lbs	PFA (RubyRed)
AEN	2"	150 lbs	PFA (conductive)
AES	2"	150 lbs	Enamel
AFK	2"	300 lbs	ECTFE
AFL	2"	300 lbs	PFA (Edlon™)
AFM	2"	300 lbs	PFA (RubyRed)
AFN	2"	300 lbs	PFA (conductive)
AFS	2"	300 lbs	Enamel
ALK	3"	150 lbs	ECTFE
ALL	3"	150 lbs	PFA (Edlon™)
ALM	3"	150 lbs	PFA (RubyRed)
ALN	3"	150 lbs	PFA (conductive)
APK	4"	150 lbs	ECTFE
APL	4"	150 lbs	PFA (Edlon™)
APM	4"	150 lbs	PFA (RubyRed)
APN	4"	150 lbs	PFA (conductive)
A8K	1"	150 lbs	ECTFE
A8L	1"	150 lbs	PFA (Edlon™)
A8M	1"	150 lbs	PFA (RubyRed)
A8N	1"	150 lbs	PFA (conductive)
YY9	Special version		

The registration number CRN: 0F10904.5CADD1 is stamped on the nameplate of CRN-approved devices.

Pressure Equipment Directive 2014/68/EU (PED)**Pressure instruments with permitted pressure ≤ 200 bar (2 900 psi)**

Pressure instruments with a flange and threaded boss that do not have a pressure-bearing housing do not fall within the scope of the Pressure Equipment Directive, irrespective of the maximum permitted pressure.

Reason:

According to Article 2, point 5 of EU Directive 2014/68/EU, pressure accessories are defined as "devices with an operational function and having pressure-bearing housings".

If a pressure instrument does not have a pressure-bearing housing (no identifiable pressure chamber of its own), there is no pressure accessory present within the meaning of the Directive.

Process seal according to ANSI/ISA 12.27.01

Practice in North America for the installation of process seals.

Endress+Hauser devices are designed as either single seal or dual seal devices with an alarm in accordance with ANSI/ISA 12.27.01. This means that the user does need to install, or bear the costs of, an external secondary process seal in the thermowell which is required in ANSI/NFPA 70 (NEC) and CSA 22.1 (CEC). These devices comply with installation practice in North America and enable very safe, low-cost installation in pressurized applications with hazardous media.

Further information on the specific device can be found in the following section: Safety Instructions (ATEX) → 34 ff.

Product	Type	Max. process pressure	Marking	Listing
Liquiphant M	FTL51-S/T##... FTL51-P/Q/R##...	64/100 bar (928/1450 psi)	Single Seal	CSA FM

Other certificates

- Material certificate as per EN 10204/3.1 for all pressure bearing parts
- Leak detection system in conjunction with WHG approval
Approval number: Z-65.40-446 (see also "Ordering information")

**Note!**

Device components in contact with the process are listed in the sections "Mechanical construction" (→ 24 ff.) and "Ordering information" (→ 31).

Manufacturer declarations

The following documents can be ordered together with the document, depending on the desired device configuration:

- FDA conformity

The applicable European guidelines and standards can be found in the relevant EU Declarations of Conformity.

Use in hazardous zones

Pay particular attention to the information provided in the documentation: Safety Instructions, Control Drawings etc. → 34

**Note!**

The use of the selected coating material affects the approved gas groups IIB/IIC. Please refer to the information in the safety documentation XA → 34 ff.

Ordering information

Detailed ordering information is available:

- In the Product Configurator on the Endress+Hauser website: www.endress.com → Click "Corporate" → Select your country → Click "Products" → Select the product using the filter and search field → Open the product page → The "Configuration" button on the right of the product picture opens the Product Configurator.
- From your Endress+Hauser Sales Center: www.addresses.endress.com

**Note!****Product Configurator - the tool for individual product configuration**

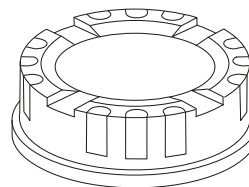
- Up-to-the-minute configuration data
- Depending on the device: direct input of information specific to the measuring point, such as measuring range or operating language

- Automatic verification of exclusion criteria
- Automatic creation of the order code and its breakdown in PDF or Excel output format
- Ability to order directly in the Endress+Hauser Online Shop

Accessories

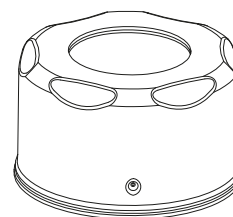
Transparent cover

For polyester housing F16
 Material: PA 12
 Weight: 0.04 kg
 Order number: 943461-0001



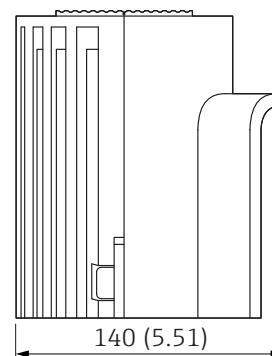
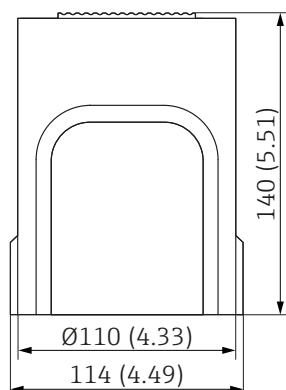
Cover with sight glass

For stainless steel housing F15
 Material: AISI 316L
 Weight: 0.16 kg
 – With glass sight glass
 Order number: 943301-1000
 – With PC sight glass
 Order number: 52001403
 (Not for CSA, General Purpose)



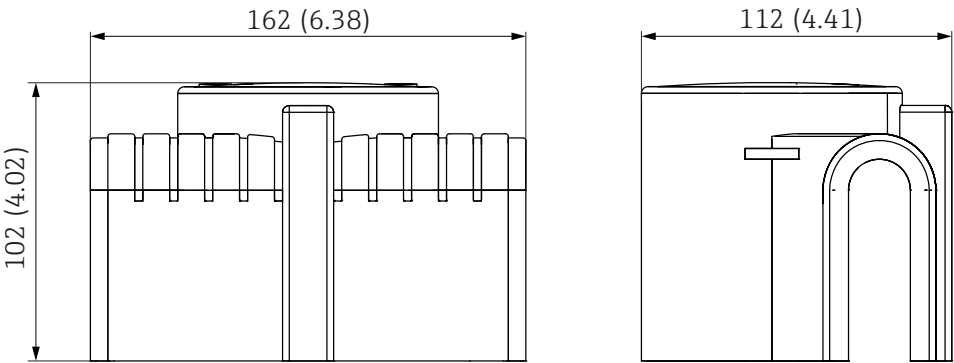
Weather protection cover

For F16 housing



Material	Order No.	Weight
PBT, gray	71127760	240 g (8.46 oz)

For F13, F17 and F27 housing



Material	Order No.	Weight
PA6, gray	71040497	300 g (10.58 oz)

Documentation



Note!
You can find supplementary documentation on the product pages at www.endress.com

Operating Instructions

Electronic insert FEL50A for Liquiphant M/S PROFIBUS PA
BA00141F/00/en

Liquiphant M Density, Density Computer FML621
BA00335F/00/en

Liquiphant M FTL51C
KA00162F/00/a6

Liquiphant M FTL51C-##### 7 ##
KA00165F/00/a6

Liquiphant M Density FTL50, FTL51
Electronic insert: FEL50D
KA00284F/00/a6

Liquiphant M Density FTL50H, FTL51H
Electronic insert: FEL50D
KA00285F/00/a6

Liquiphant M Density FTL51C
Electronic insert: FEL50D
KA00286F/00/a6

Technical Information

General instructions for electromagnetic compatibility
(Test procedure, installation recommendation)
TI00241F/00/en

Liquiphant M FTL50/51(H), for process temperatures up to 150 °C
TI00328F/00/en

Isolating amplifier FTL325P, 1 or 3-channel switching units for DIN rail mounting
for Liquiphant M/S with electronic insert FEL57
TI350F/00/en

Isolating amplifier FTL325N, 1 or 3-channel switching units for DIN rail mounting
for Liquiphant M/S with electronic insert FEL56, FEL58
TI353F/00/en

Liquiphant S FTL70/71, for medium temperatures up to 280 °C
TI354F/00/en

Isolating amplifier FTL375P, 1 to 3-channel switching units for DIN rail mounting
for Liquiphant M/S with electronic insert FEL57
TI360F/00/en

Liquiphant M Density, Density Computer FML621
TI420F/00/en

Weld-in adapter,
TI00426F

Functional safety (SIL)

Liquiphant M with electronic insert FEL51 (MAX)
SD00164F

Liquiphant M with electronic insert FEL51 (MIN)
SD00185F

Liquiphant M with electronic insert FEL52 (MAX)
SD00163F

Liquiphant M with electronic insert FEL52 (MIN)
SD00186F

Liquiphant M with electronic insert FEL54 (MAX)
SD00162F

Liquiphant M with electronic insert FEL54 (MIN)
SD00187F

Liquiphant M with electronic insert FEL55 (MAX)
SD00167F

Liquiphant M with electronic insert FEL55 (MIN)
SD00279F

Liquiphant M with electronic insert FEL57 + Nivotester FTL325P
SD01508F (MAX + MIN)

Liquiphant M with electronic insert FEL56 + Nivotester FTL325N
SD01521F (MAX + MIN)

Liquiphant M with electronic insert FEL58 + Nivotester FTL325N
SD01522F (MAX + MIN)

Safety Instructions (ATEX)

CE  II 1/2 G, Ex d IIC/B (KEMA 99 ATEX 1157)
XA00031F/00/a3

CE  II 1/2 G, Ex ia/ib IIC/B (KEMA 99 ATEX 0523)
XA00063F/00/a3

CE  II 1 G, Ex ia IIC/B (KEMA 99 ATEX 5172 X)
XA00064F/00/a3

CE  II 1/2 G, Ex de IIC/B (KEMA 00 ATEX 2035)
XA00108F/00/a3

CE  II 3 G, Ex nA/nC II (EG 01 007-a)
XA00182F/00/a3

Safety Instructions (NEPSI)

Ex d IIC/IIB T3-T6, Ex d IIC T2-T6
(NEPSI GYJ06424)
XA00401F/00/B2

Ex ia IIC T2-T6, Ex ia IIB T3-T6
(NEPSI GYJ05556, NEPSI GYJ06464),
XC00009F/00/b2

Ex nA II T3-T6, Ex nC/nL IIC T3-T6
(NEPSI GYJ04360, NEPSI GYJ071414)
XC00010F/00/b2

Control Drawings

Liquiphant M (IS and NI) Current output PFM, NAMUR Entity installation
Class I, Div. 1, 2, Groups A, B, C, D
Class I, Zone 0
Class II, Div. 1, 2, Groups E, F, G
Class III
ZD00041F

Liquiphant M, Liquiphant S (cCSAus / IS)
Class I, Div. 1, Groups A, B, C, D Ex ia IIC T6
Class II, Div. 1, Groups E, F, G
Class III
ZD00042F

Liquiphant M (NI), FTL50(H), FTL51(H), FTL51C, FTL70, FTL71
Class I, Div. 2, Groups A, B, C, D
Class II, Div. 2, Groups F, G
Class III
ZD00043F

Liquiphant M, Liquiphant S (cCSAus / XP)
Class I, Groups A, B, C, D
Class II, Groups E, F, G
Class III
ZD00240F

Liquiphant M (IS and NI) PROFIBUS PA, FOUNDATION Fieldbus
Class I, Zone 0, IIC
Class I, Division 1, 2, Groups A, B, C, D
Class II, Division 1, 2, Groups E, F, G
Class III
ZD00244F



info@lennotech.com Tel. +31-152-610-900
www.lennotech.com Fax. +31-152-616-289

Endress+Hauser 
People for Process Automation