

## 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  $-50\text{ °C}$  to  $150\text{ °C}$  ( $-58$  to  $302\text{ °F}$ )
- 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

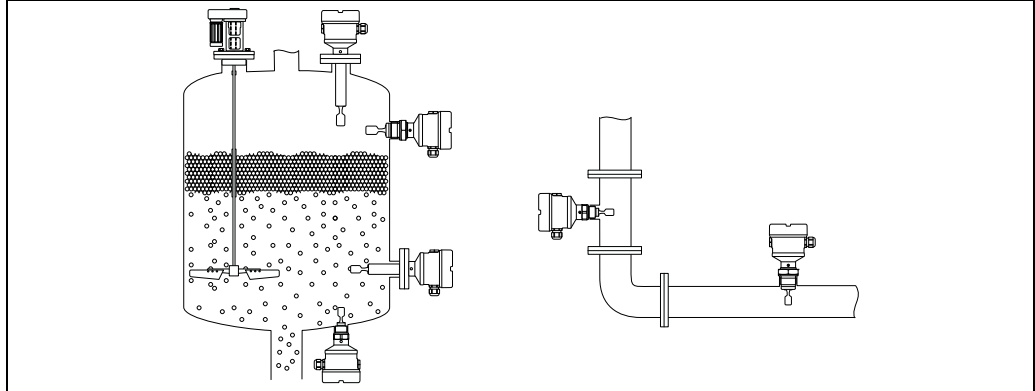
<b>Application</b> .....	<b>4</b>	Connectable load .....	12
Point level detection .....	4	<b>Electronic insert FEL57 (PFM)</b> .....	<b>13</b>
<b>Function and system design</b> .....	<b>4</b>	Power supply .....	13
Measuring principle .....	4	Electrical connection .....	13
Modularity .....	4	Output signal .....	13
Electronic versions .....	5	Signal on alarm .....	13
Electronic version for density measurement .....	5	Connectable load .....	13
Galvanic isolation .....	5	<b>Electronic insert FEL50A (PROFIBUS PA)</b> .....	<b>14</b>
Design .....	5	Power supply .....	14
<b>Input</b> .....	<b>5</b>	Electrical connection .....	14
Measured variable .....	5	Output signal .....	15
Measuring range (detection range) .....	5	Signal on alarm .....	15
Density .....	5	<b>Electronic insert FEL50D (density)</b> .....	<b>16</b>
<b>Electronic insert FEL51 (AC 2-wire)</b> .....	<b>6</b>	Power supply .....	16
Power supply .....	6	Electrical connection .....	16
Electrical connection .....	6	Signal on alarm .....	16
Output signal .....	6	Adjustment .....	16
Signal on alarm .....	6	Operating principle .....	17
Connectable load .....	6	Light signals .....	17
<b>Electronic insert FEL52 (DC PNP)</b> .....	<b>8</b>	<b>Connection and function</b> .....	<b>18</b>
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	<b>Performance characteristics</b> .....	<b>18</b>
<b>Electronic insert FEL54 (AC/DC with relay output)</b> ..	<b>9</b>	Reference operating conditions .....	18
Power supply .....	9	Maximum measured error .....	18
Electrical connection .....	9	Repeatability .....	18
Output signal .....	9	Hysteresis .....	18
Signal on alarm .....	9	Influence of medium temperature .....	18
Connectable load .....	9	Influence of medium density .....	18
<b>Electronic insert FEL55 (8/16 mA)</b> .....	<b>10</b>	Influence of medium pressure .....	18
Power supply .....	10	Switching delay .....	18
Electrical connection .....	10	<b>Operating conditions</b> .....	<b>19</b>
Output signal .....	10	Installation instructions .....	19
Signal on alarm .....	10	Examples of mounting .....	19
Connectable load .....	10	Orientation .....	21
<b>Electronic insert FEL56 (NAMUR L-H edge)</b> .....	<b>11</b>	<b>Environment</b> .....	<b>22</b>
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
<b>Electronic insert FEL58 (NAMUR H-L edge)</b> .....	<b>12</b>	Vibration resistance .....	22
Power supply .....	12	Electromagnetic compatibility .....	22
Electrical connection .....	12	<b>Medium conditions</b> .....	<b>23</b>
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
<b>Mechanical construction .....</b>	<b>24</b>
Design .....	24
Dimensions .....	25
Weights .....	27
Material .....	28
Process connections .....	28
<b>Human interface .....</b>	<b>29</b>
Electronic inserts .....	29
Operating concept .....	29
<b>Certificates and approvals .....</b>	<b>30</b>
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
<b>Ordering information .....</b>	<b>31</b>
<b>Accessories .....</b>	<b>32</b>
Transparent cover .....	32
Cover with sight glass .....	32
Weather protection cover .....	32
<b>Documentation .....</b>	<b>33</b>
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

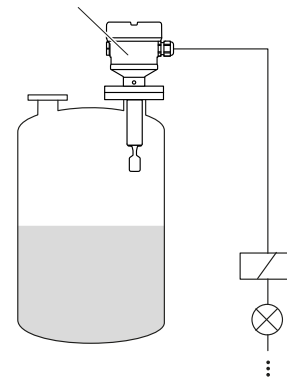
The sensor's fork vibrates at its intrinsic frequency. This frequency is reduced when covered with liquid. This change in frequency causes the point level switch to switch.

### Modularity

#### Point level switch

Liquiphant M FTL with electronic versions  
FEL51, FEL52, FEL54

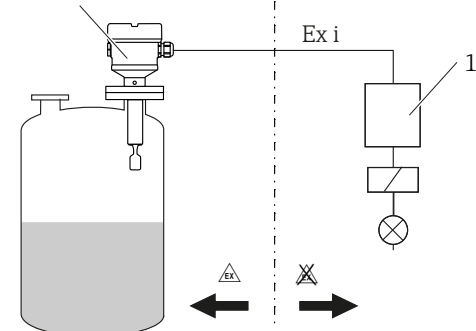
FEL51/52/54



#### 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

FEL55/56/57/58/50A



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

<b>Electronic versions</b>	<p>FEL51: Two-wire AC version; Switches the load directly into the power supply circuit via an electronic switch.</p> <p>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.</p> <p>FEL54: Universal current version with relay output; Switches the loads via 2 floating change-over contacts.</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>FEL50A: For connecting to PROFIBUS PA; Cyclic and acyclic data exchange acc. to PROFIBUS-PA Profile 3.0; Discrete Input.</p>
<b>Electronic version for density measurement</b>	FEL50D: For connecting to Density Computer FML621
<b>Galvanic isolation</b>	<p>FEL51, FEL52, FEL50A: between sensor and power supply</p> <p>FEL54: between sensor and power supply and load</p> <p>FEL55, FEL56, FEL57, FEL58, FEL50D: see connected switching unit</p>
<b>Design</b>	FTL51C: flange, extension pipe and tuning fork are coated.

## Input

<b>Measured variable</b>	Level (limit value)
<b>Measuring range (detection range)</b>	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
<b>Density</b>	Setting on the electronic insert > 0.5 g/cm <sup>3</sup> or > 0.7 g/cm <sup>3</sup> (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

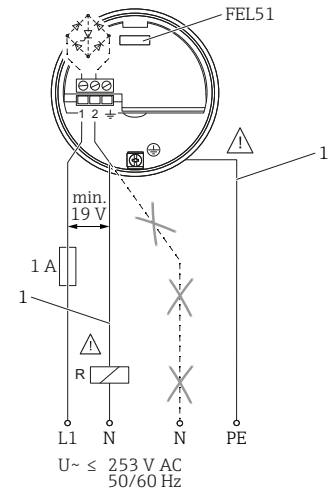
#### Two-wire AC connection

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

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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

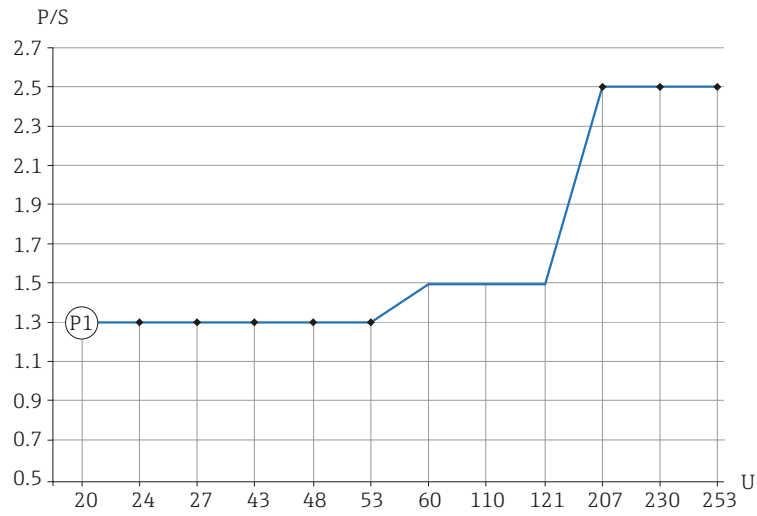
- Voltage drop via FEL51  $\leq 12 \text{ V}$
- Residual current if electrical switch is blocked:  $\leq 3.8 \text{ mA}$
- Load switched directly into the power supply circuit via the thyristor.  
 Transient (40 ms)  $\leq 1.5 \text{ A}$ ,  $\leq 375 \text{ VA}$  at 253 V or  $\leq 36 \text{ VA}$  at 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**



*Minimum nominal power of load*  
*P/S nominal power in [W] / [VA]*  
*U operating voltage in [V]*

Position	Operating voltage	Nominal power	
		min.	max.
P1	24 V	> 1.3 VA	< 8.4 VA
AC operation	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)

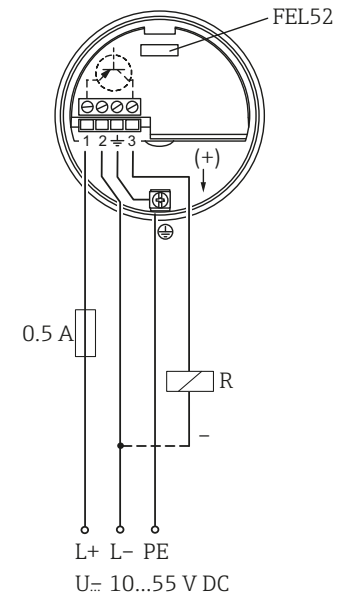
### Power supply

Supply voltage: DC 10 to 55 V  
 Ripple:  $\leq 1.7$  V, 0 to 400 Hz  
 Current consumption:  $\leq 15$  mA  
 Power consumption:  $\leq 0.83$  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 = Relay, PLC, ...*

### Output signal

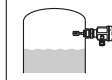


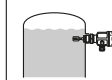


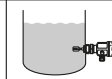


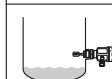


$I_L$  = load current  
 (switched through)

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

 = lit

 = unlit

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 xx-xx-000

Safety mode	Level	Output signal	LEDs	
			green	red
MAX		$L+ \xrightarrow{I_L} +$ 1 → 3		
		$< 100 \mu\text{A}$ 1 → 3		
MIN		$L+ \xrightarrow{I_L} +$ 1 → 3		
		$< 100 \mu\text{A}$ 1 → 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  $\leq 350$  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)



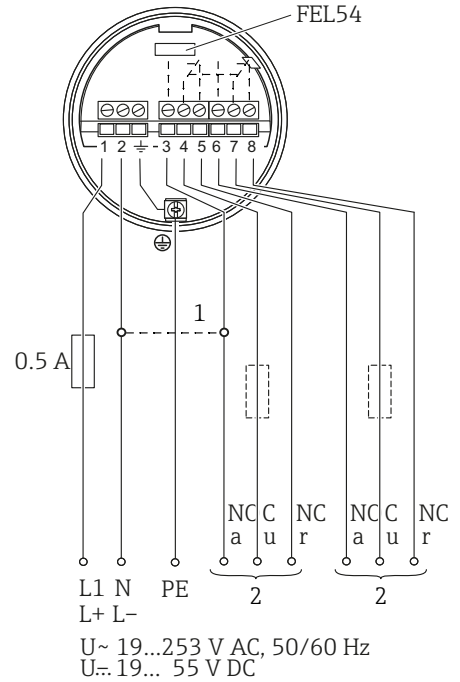
## Electronic insert FEL54 (AC/DC with relay output)

**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**

= relay energized  
 = relay de-energized  
 = lit  
 = unlit

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)
  - $I_{\sim} \leq 6$  A (Ex de 4 A),  $U_{\sim} \leq$  AC 253 V;  $P_{\sim} \leq$  1500 VA,  $\cos \varphi = 1$ ,  $P_{-} \leq$  750 VA,  $\cos \varphi > 0.7$
  - $I_{-} \leq 6$  A (Ex de 4 A) to DC 30 V,  $I_{-} \leq 0.2$  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 ≤ 300 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

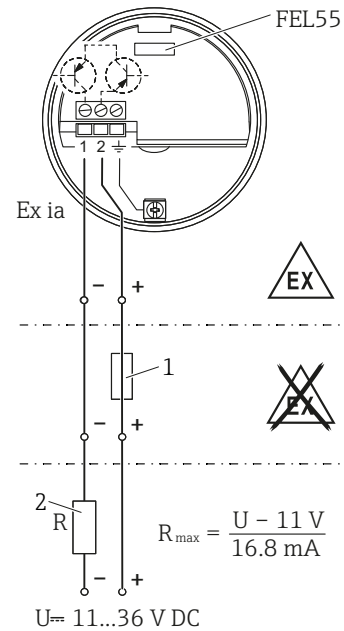
Supply voltage: DC 11 to 36 V  
 Power consumption: < 600 mW  
 Reverse polarity protection  
 Overvoltage protection FEL55: overvoltage category III

### 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

~ 16 mA = 16 mA ± 5 %

~ 8 mA = 8 mA ± 6 %

= lit

= unlit

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

Safety mode	Level	Output signal	LEDs	
			green	red
MAX		+ 2 → ~16 mA → 1		
		+ 2 → ~8 mA → 1		
MIN		+ 2 → ~16 mA → 1		
		+ 2 → ~8 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

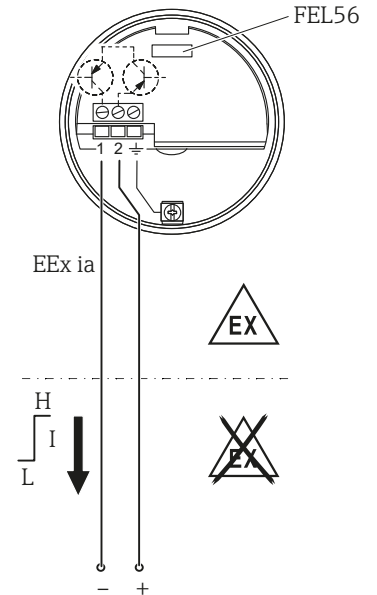
**Electrical connection**

**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		+ 0.6 ... 2 1.0 mA → 1		
		+ 2.2 ... 2 2.8 mA → 1		
MIN		+ 0.6 ... 2 1.0 mA → 1		
		+ 2.2 ... 2 2.8 mA → 1		

**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:

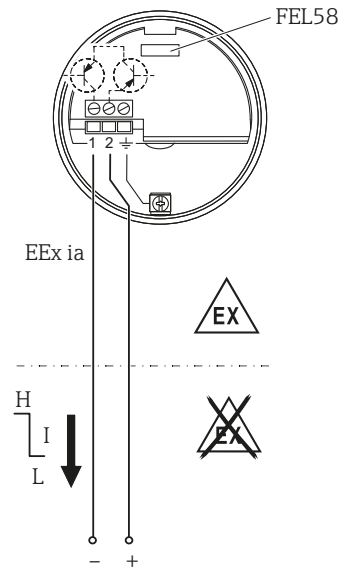
Test key on the electronic insert.

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.

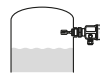


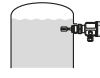


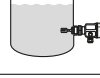


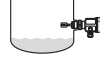


Connecting to multiplexer: Set clock time to min. 2 s.



### Output signal

 = lit  
 = flashes  
 = unlit

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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).

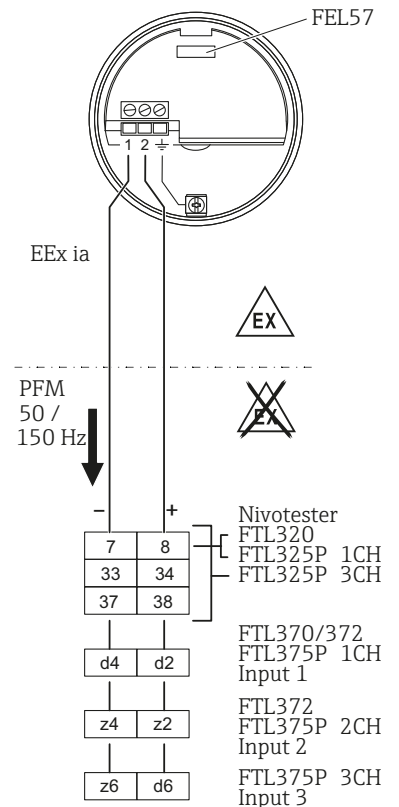
The following can be switched at the electronic insert:

- **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.

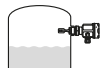



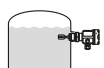



The twin-core connecting cable (instrument cable) with a cable resistance of  $\leq 25 \Omega$  per core is connected to the screw terminals (conductor cross-sections 0.5 to 2.5 mm / 0.02 to 0.1 in) in the connection compartment. Protective circuits against reverse polarity, HF influences and overvoltage 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).



### 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 +/- 1.0 mA (software version: 01.03.00, hardware version: 02.00)
- 10.5 mA +/- 1.0 mA (software version: 01.03.00, hardware version: 01.00)

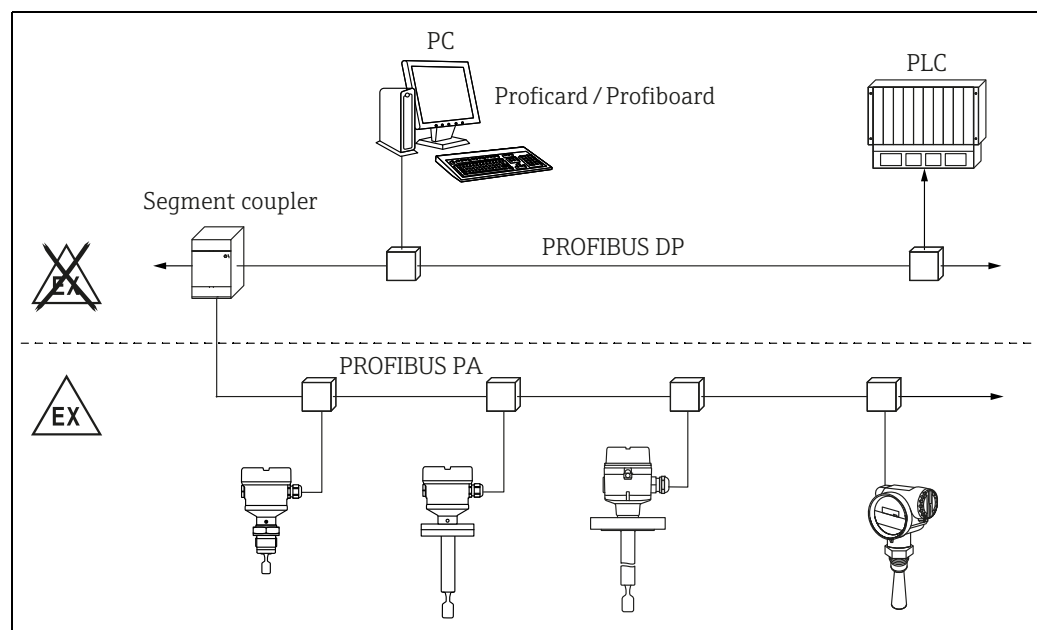
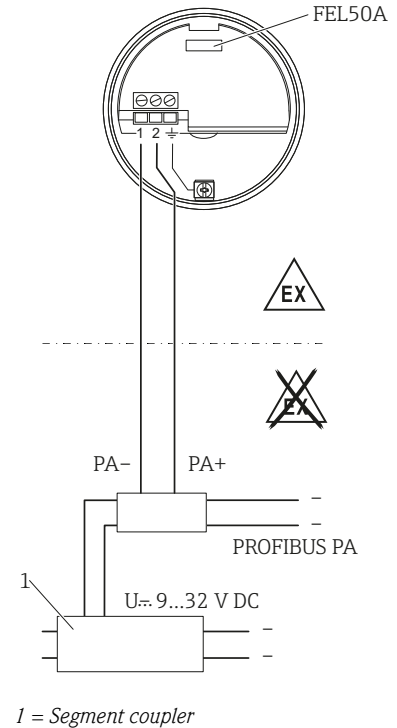
### Electrical connection

#### 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  $\mu$ S

### Electrical connection

#### Two-wire connection at Density Computer FML621

For connecting to the Density and Concentration Computer FML621.

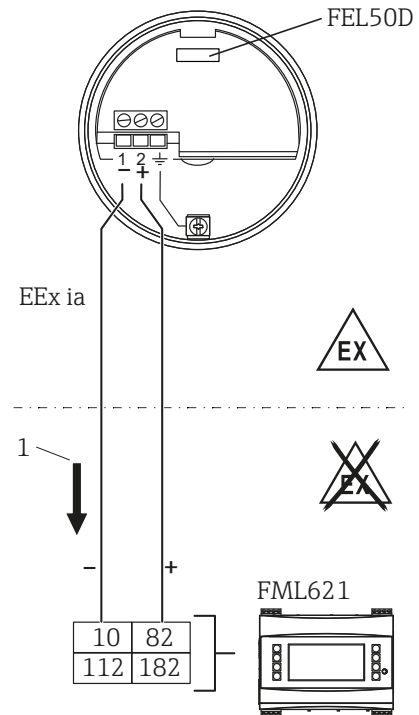
The output signal is based on pulse technology. With the aid of this signal, the fork frequency is constantly forwarded to the switching unit.



#### 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 H<sub>2</sub>O (K) or special adjustment, density H<sub>2</sub>O 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).



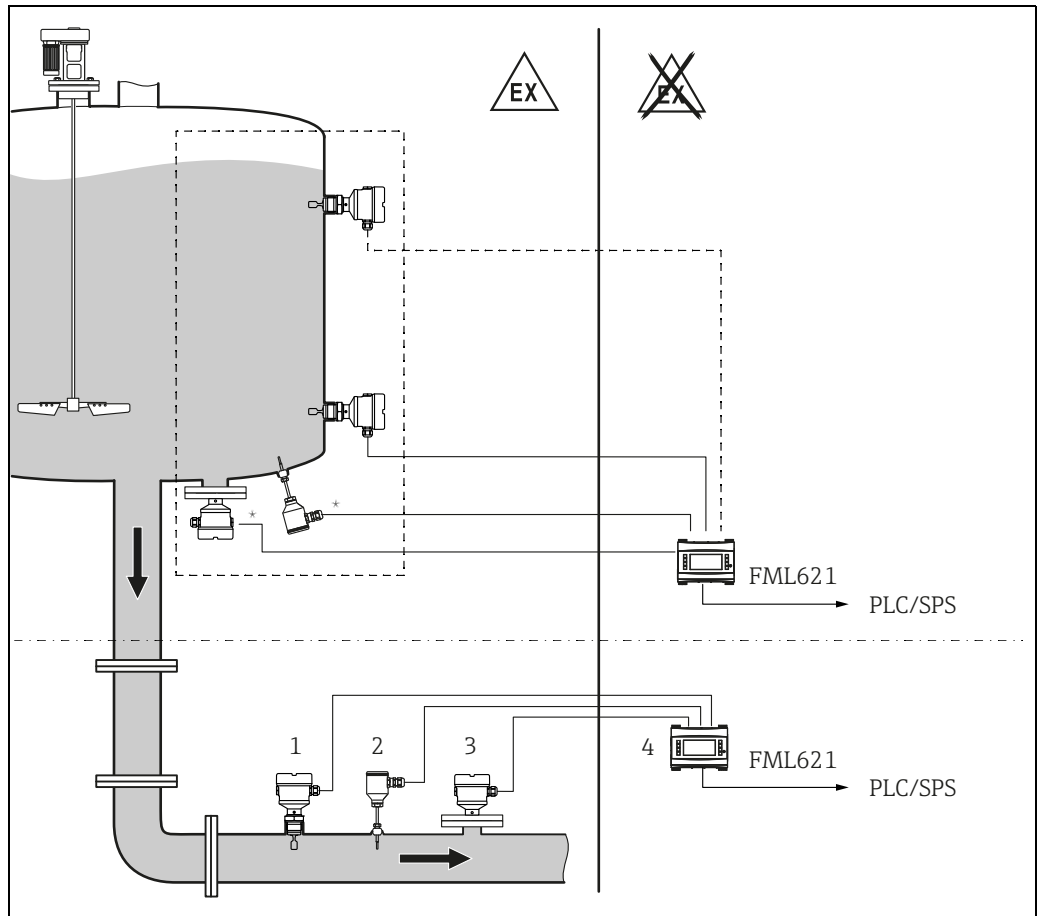
#### Note!

More information on Liquiphant M Density is available in Technical Information TI00420F. This document is available for download at [www.endress.com](http://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

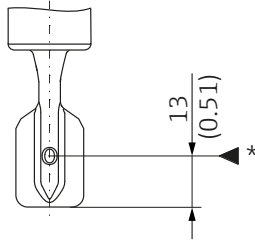
**Light signals**

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

<b>Connecting cables</b>	<ul style="list-style-type: none"> <li>Electronic inserts: cross-section <math>\leq 2.5 \text{ mm}^2</math> (14 AWG); strand in ferrule as per DIN 46228</li> <li>Protective ground in housing: cross-section <math>\leq 2.5 \text{ mm}^2</math> (14 AWG)</li> <li>External equipotential bonding connection on housing: cross-section <math>\leq 4 \text{ mm}^2</math> (12 AWG)</li> </ul>
<b>Safety mode</b>	<p>Minimum/maximum residual current safety selectable on electronic insert (with FEL57 on Nivotester only)</p> <p>MAX = maximum safety: The output switches to the power fail response when the fork is covered For use with overflow prevention for example</p> <p>MIN = minimum safety: The output switches to the power fail response when the fork is exposed For use with dry running protection for example</p>
<b>Switching time</b>	<p>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</p> <p>Other switching times available on request.</p>
<b>Switch-on behavior</b>	<p>When switching on the power supply, the output assumes the alarm signal. After <math>\leq 3</math> s it assumes the correct switching mode (exception: FEL57)</p>

## Performance characteristics

<b>Reference operating conditions</b>	<p>Ambient temperature: 23 °C (73 °F) Medium temperature: 23 °C (73 °F) Medium density (water): 1 g/cm<sup>3</sup> (SGU) Medium viscosity: 1 mm<sup>2</sup>/s (cSt) Medium pressure <math>p_e</math>: 0 bar (0 psi) Sensor mounting: vertical from above Density switch: to <math>&gt; 0.7 \text{ g/cm}^3</math> (SGU)</p>	
		<i>* Switch point under reference operating conditions</i>
<b>Maximum measured error</b>	Under reference operating conditions: max. $\pm 1 \text{ mm}$ (0.04 in)	
<b>Repeatability</b>	0.1 mm (0.004 in)	
<b>Hysteresis</b>	<p><b>ECTFE and PFA:</b> approx. 2 mm (0.08 in) <b>Enamel:</b> approx. 2.5 mm (0.1 in)</p>	
<b>Influence of medium temperature</b>	<p><b>ECTFE and PFA:</b> max. +1.4 mm to -2.8 mm (-50 to +120 °C / -58 to 248 °F) <b>Enamel:</b> max. +0.6 mm to -1.5 mm (-50 to +150 °C / -58 to 302 °F)</p>	
<b>Influence of medium density</b>	<p>max. +4.8 mm to -3.5 mm ((0.5 to 1.5 g/cm<sup>3</sup> (SGU)) max. +0.19 in to -0.14 in</p>	
<b>Influence of medium pressure</b>	<p><b>ECTFE and PFA:</b> max. 0 mm to -2.0 mm (0 bar to 40 bar) max. 0 in to -0.08 in (0 psi to 580 psi) <b>Enamel:</b> max. 0 mm to -1.0 mm (0 bar to 25 bar) max. 0 in to -0.04 in (0 psi to 363 psi)</p>	
<b>Switching delay</b>	<ul style="list-style-type: none"> <li>When fork is covered: 0.5 s</li> </ul>	

- 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

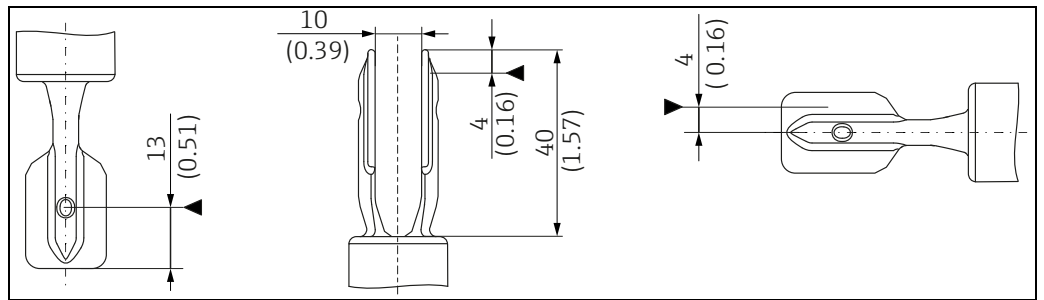
Switch points  $\triangleright$  on the sensor depend on the mounting position, with reference to water, density  $1 \text{ g/cm}^3$  (SGU),  $23 \text{ }^\circ\text{C}$  ( $73 \text{ }^\circ\text{F}$ ),  $p_e$  0 bar (0 psi).



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:

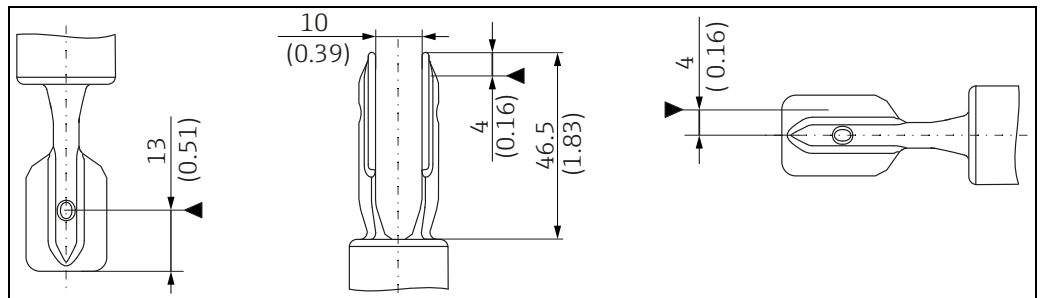


Mounting from above

Mounting from below

Mounting from the side

### Enamel coating:



Mounting from above

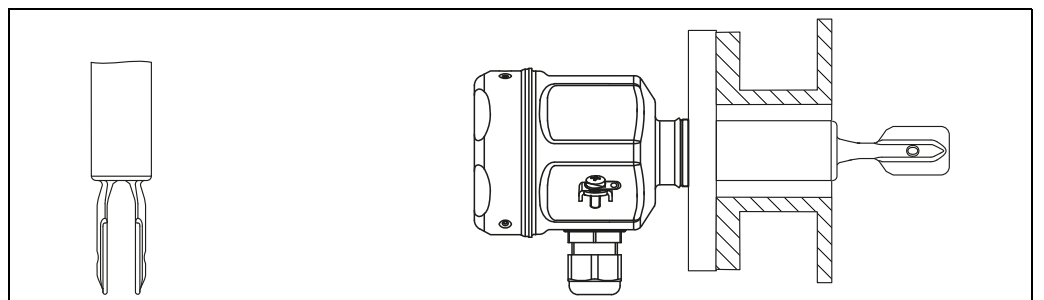
Mounting from below

Mounting from the side

### Examples of mounting

Examples of mounting depending on the viscosity  $\nu$  of the liquid and the tendency to form buildup

#### Optimum mounting, problem-free even with high viscosity:



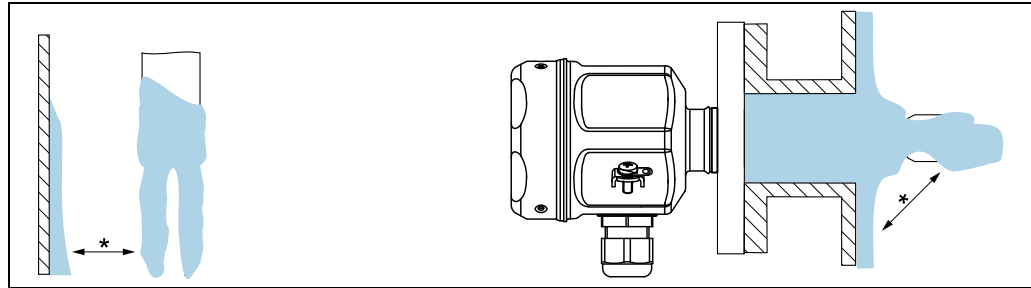
Vertical from above

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:

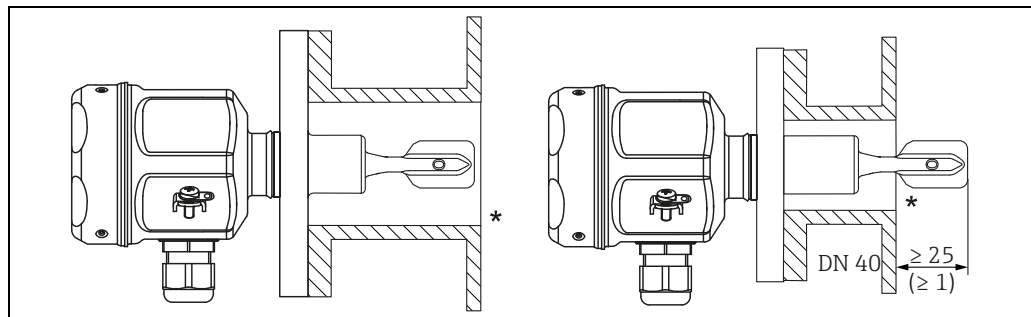
\* Ensure that there is sufficient distance between the buildup expected on the tank wall and the fork.



Vertical from above

Protruding into the tank from the side

#### Mounting positions with low viscosity (up to 2000 mm<sup>2</sup>/s):

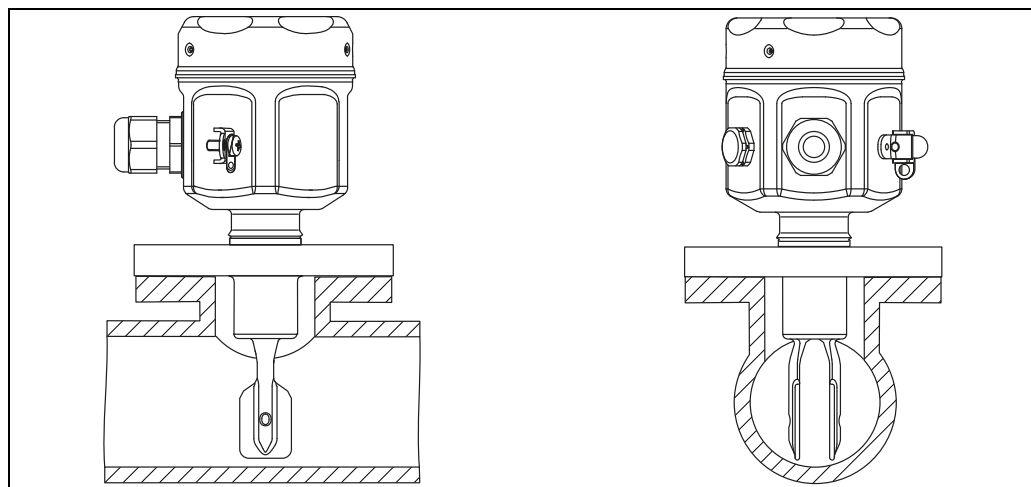


Dimensions: mm (in)

\* Deburr the nozzle surfaces

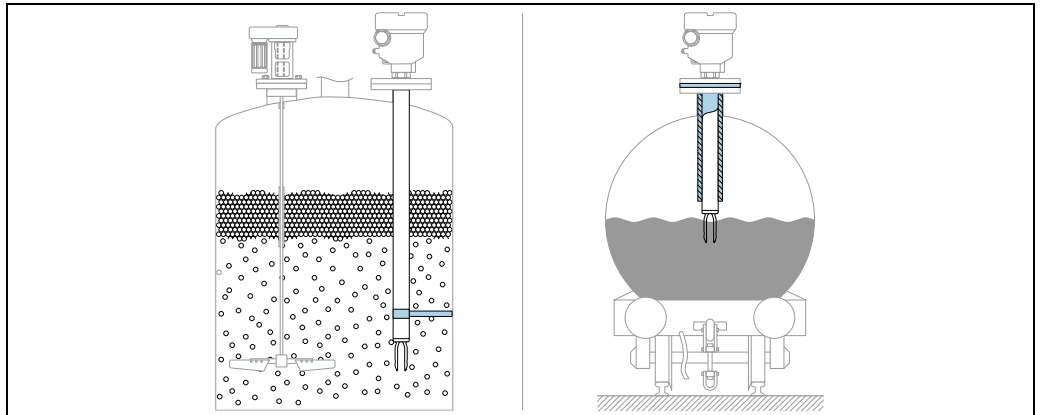
#### Mounting in piping from 2"

Flow velocities up to 5 m/s (16.4 ft/s) with a viscosity of 1 mm<sup>2</sup>/s and density of 1 g/cm<sup>3</sup>. (Check the function in the case of other medium conditions.)



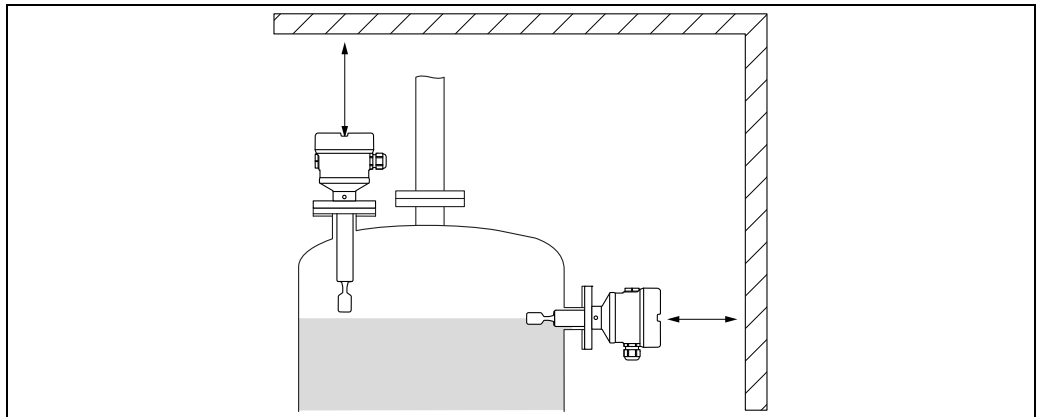
**Support the device in the event of a severe dynamic load.**

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.

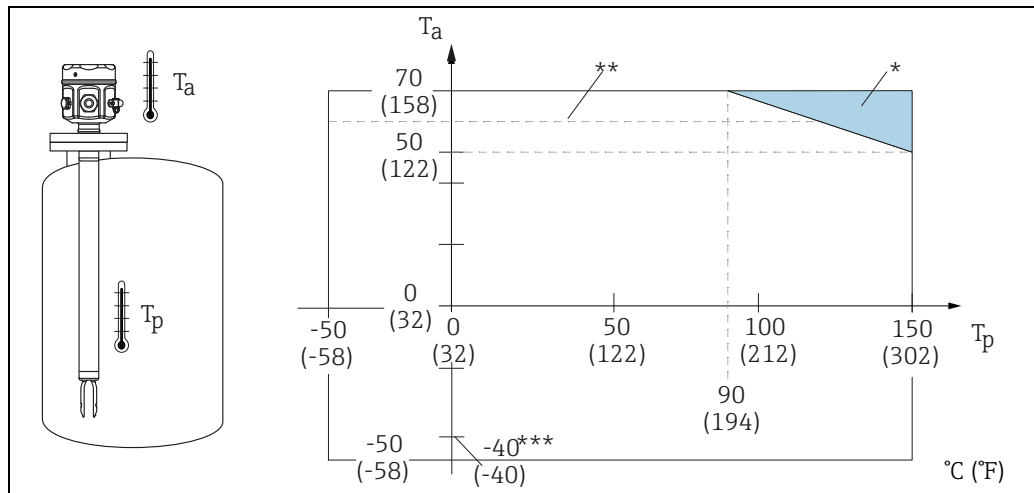


**Orientation**

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:  $-40\text{ °C} \leq T_a \leq +70\text{ °C}$  ( $-40\text{ °F} \leq T_a \leq +158\text{ °F}$ )

**Storage temperature**  $-50$  to  $+80\text{ °C}$  ( $-58$  to  $176\text{ °F}$ )

**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

<b>Medium temperature</b>	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)
<b>Thermal shock</b>	≤ 120 °C/s (248 °F/s)
<b>Medium pressure p<sub>e</sub></b>	<p>The following values apply over the entire temperature range. Pay attention to exceptions for flange process connections!</p> <ul style="list-style-type: none"> <li>■ ECTFE and PFA: -1 to +40 bar (-14.5 to 580 psi)</li> <li>■ Enamel: max. -1 to +25 bar (-14.5 to 363 psi)</li> </ul> <p>Please refer to the standards listed for the permitted pressure values of the flanges at higher temperatures:</p> <ul style="list-style-type: none"> <li>■ 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.</li> <li>■ ASME B 16.5a - 1998 Tab. 2-2.2 F316</li> <li>■ ASME B 16.5a - 1998 Tab. 2.3.8 N10276</li> <li>■ JIS B 2220</li> </ul> <p>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".</p>
<b>Test pressure</b>	<p>p<sub>e</sub> = 100 bar (1450 psi):</p> <ul style="list-style-type: none"> <li>■ ≤ 150 bar (2175 psi) or 1.5 times the medium pressure p<sub>e</sub>)</li> <li>■ Membrane burst pressure at 200 bar (2900 psi)</li> </ul> <p> Note! Device function is not available during pressure testing.</p>
<b>Pressure shock</b>	≤ 20 bar/s (≤ 290 psi)
<b>State of aggregation</b>	Liquid
<b>Density</b>	0.7 g/cm <sup>3</sup> (SGU) = delivery status 0.5 g/cm <sup>3</sup> (SGU) can be adjusted via switch
<b>Viscosity</b>	≤ 10,000 mm <sup>2</sup> /s (cSt)
<b>Solids content</b>	≤ ø5 mm (0.2 in)
<b>Lateral loading capacity</b>	≤ 75 Nm

## Mechanical construction



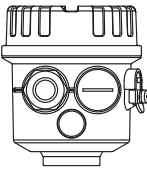
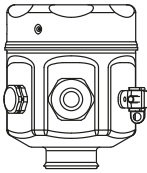
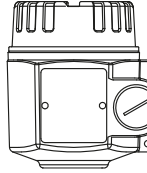
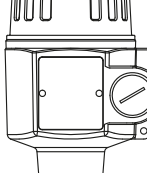
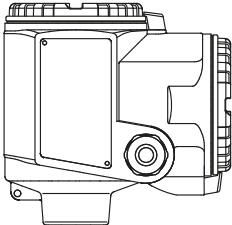
Note!

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](http://www.endress.com).

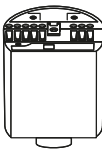
### Design

Summary of all electrical and mechanical versions

#### Housing

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

#### Plug-in electronic inserts to mount in the housing

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

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



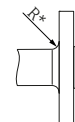
#### Process connections

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

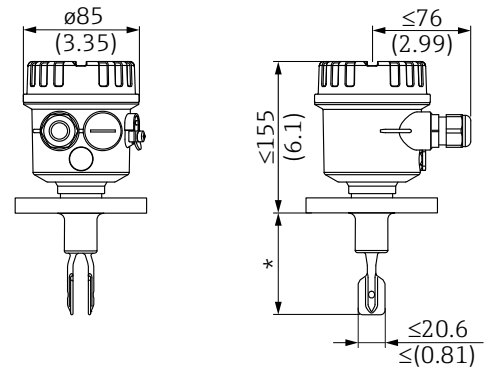




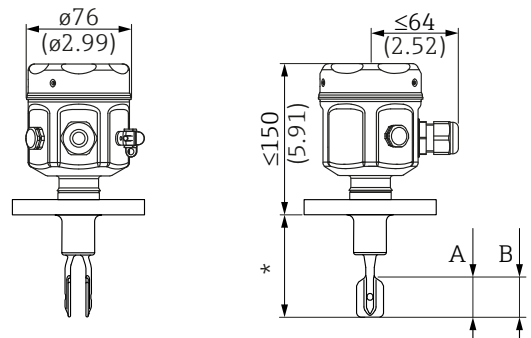
**Dimensions**

Dimensions in mm (in)!

Polyester housing F16

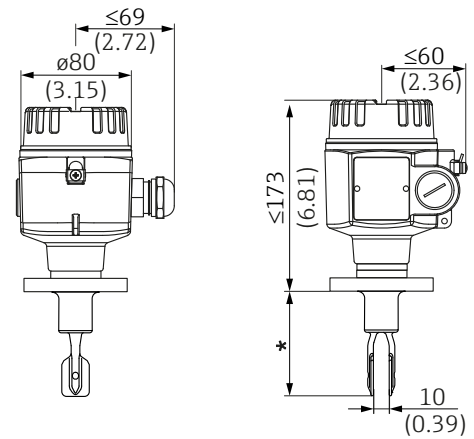


Stainless steel housing F15

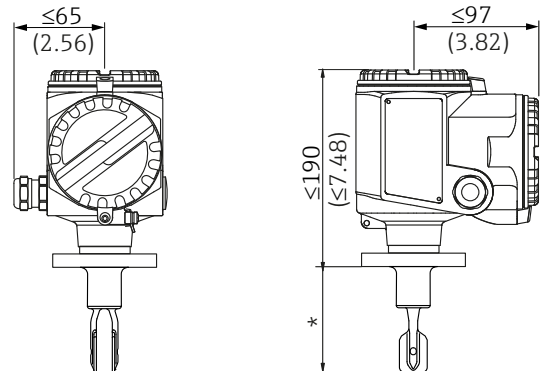


1. = approx. 25 (0.98) ECTFE, PFA  
2. = approx. 29 (1.14) enamel

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

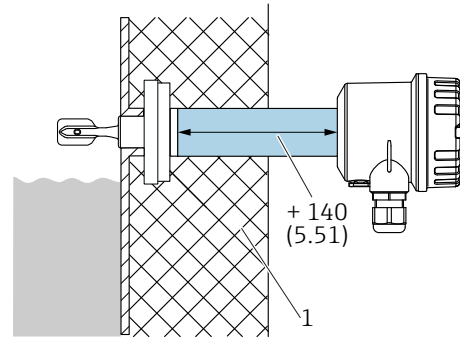
**Temperature spacer**

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.

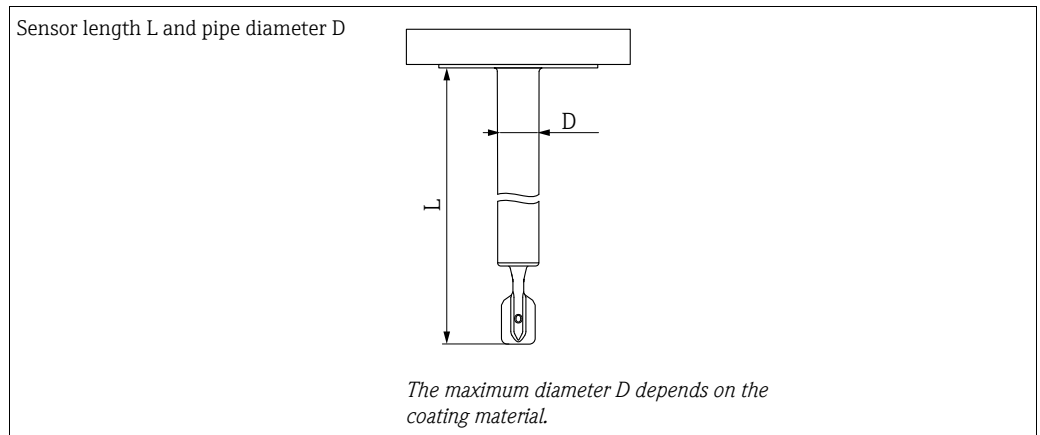
Provides sealed insulation for the vessel and normal ambient temperatures for the housing.



1. = Insulation

Process connections

Process connection		Dimensions	Accessories	Pressure Temperature
<b>Flanges:</b>  <b>Synthetic coating</b> ASME B16.5 (RF) EN 1092-1 (Form A) JIS B 2220 (RF)  <b>Enamel coating</b> 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				



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: <ul style="list-style-type: none"> <li>■ Sensor (compact)</li> <li>■ Electronic insert</li> <li>■ Polyester housing F16</li> <li>■ Housing cover</li> </ul>	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 1 $\frac{1}{2}$ " 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)

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**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:

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

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**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:

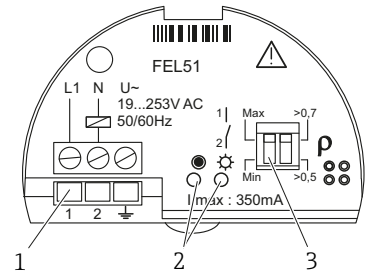
- 2 switches for safety mode and density change
- green LED
  - flashes quickly to indicate operational status,
  - flashes slowly in the event of corrosion damage to the sensor or if the electronics are defective
- yellow LED to indicate the switching status, Test key – breaks the cable connection

#### With FEL50A:

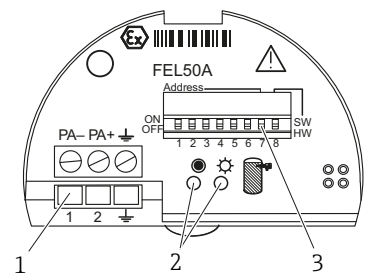
- 8 switches for configuring the device address
- green LED to indicate operational status, pulsing to indicate communication;
- yellow LED to indicate the switching status, flashes in the event of corrosion damage on sensor or if the electronics are defective

#### With FEL50D:

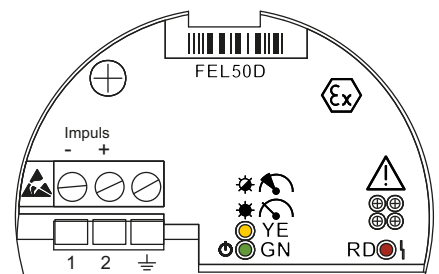
- yellow LED: to indicate the validation of the measurement
- green LED: to indicate the operational status
- red LED: to indicate faults



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



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



## Certificates and approvals

<b>Certificates</b>	See Ordering information → 31.
<b>CE mark</b>	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.
<b>RoHS</b>	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).
<b>RCM-tick mark</b>	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

<b>EAC conformity</b>	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.
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<b>CRN approval</b>	Device versions with a CRN approval (Canadian Registration Number) are listed in the following table.
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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  $\leq$  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](http://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](http://www.addresses.endress.com)

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

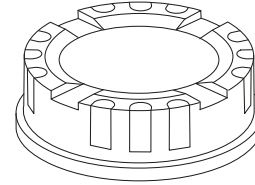
- Up-to-the-minute configuration data
- Depending on the device: direct input of information specific to the measuring point, such as measuring range or operating language

- 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

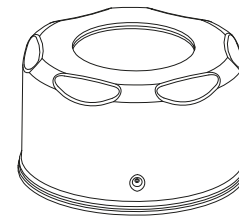
### Transparent cover

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



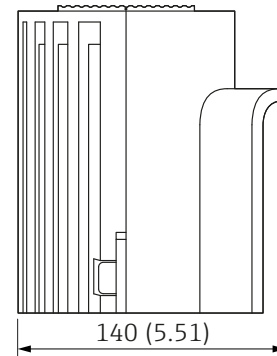
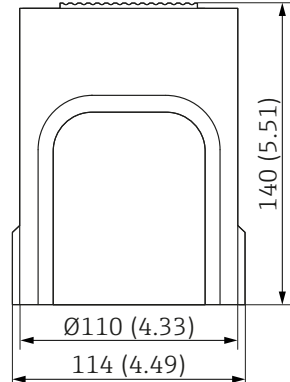
### Cover with sight glass

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

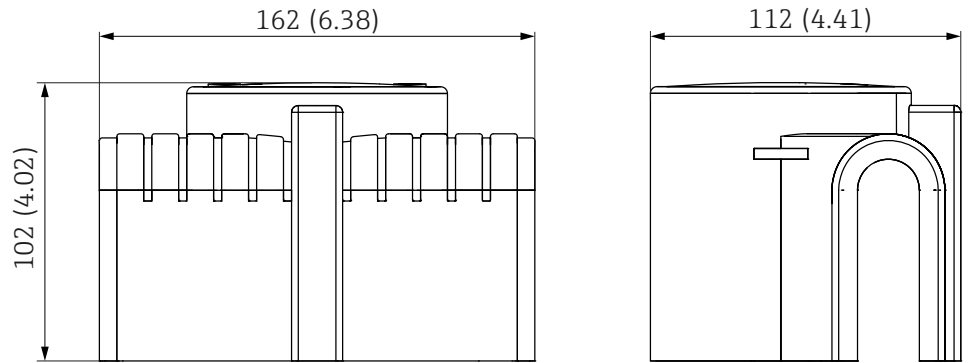
For F16 housing



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](http://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

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**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)

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**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

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**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



71412981

[www.addresses.endress.com](http://www.addresses.endress.com)

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