

ARTISAN®
TECHNOLOGY GROUP

Your **definitive** source for quality pre-owned equipment.

Artisan Technology Group
(217) 352-9330 | sales@artisantg.com | artisantg.com

Full-service, independent repair center
with experienced engineers and technicians on staff.

We buy your excess, underutilized, and idle equipment
along with credit for buybacks and trade-ins.

Custom engineering
so your equipment works exactly as you specify.

- Critical and expedited services
- In stock / Ready-to-ship
- Leasing / Rentals / Demos
- ITAR-certified secure asset solutions

Expert team | Trust guarantee | 100% satisfaction

All trademarks, brand names, and brands appearing herein are the property of their respective owners.

Visit our website - *Click HERE*

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 mm^2/s (cSt)
- for densities of ≥ 0.5 g/cm^3 (SGU) or ≥ 0.7 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)

Endress+Hauser
People for Process Automation

Table of contents

Application 4
Point level detection 4

Function and system design 4
Measuring principle 4
Modularity 4
Electronic versions 5
Electronic version for density measurement 5
Galvanic isolation 5
Design 5

Input 5
Measured variable 5
Measuring range (detection range) 5
Density 5

Electronic insert FEL51 (AC 2-wire) 6
Power supply 6
Electrical connection 6
Output signal 6
Signal on alarm 6
Connectable load 6

Electronic insert FEL52 (DC PNP) 8
Power supply 8
Electrical connection 8
Output signal 8
Signal on alarm 8
Connectable load 8

Electronic insert FEL54 (AC/DC with relay output) . . . 9
Power supply 9
Electrical connection 9
Output signal 9
Signal on alarm 9
Connectable load 9

Electronic insert FEL55 (8/16 mA) 10
Power supply 10
Electrical connection 10
Output signal 10
Signal on alarm 10
Connectable load 10

Electronic insert FEL56 (NAMUR L-H edge) 11
Power supply 11
Electrical connection 11
Output signal 11
Signal on alarm 11
Connectable load 11

Electronic insert FEL58 (NAMUR H-L edge) 12
Power supply 12
Electrical connection 12
Output signal 12
Signal on alarm 12
Connectable load 12

Electronic insert FEL57 (PFM) 13
Power supply 13
Electrical connection 13
Output signal 13
Signal on alarm 13
Connectable load 13

Electronic insert FEL50A (PROFIBUS PA) 14
Power supply 14
Electrical connection 14
Output signal 15
Signal on alarm 15

Electronic insert FEL50D (density) 16
Power supply 16
Electrical connection 16
Signal on alarm 16
Adjustment 16
Operating principle 17
Light signals 17

Connection and function 18
Connecting cables 18
Safety mode 18
Switching time 18
Switch-on behavior 18

Performance characteristics 18
Reference operating conditions 18
Maximum measured error 18
Repeatability 18
Hysteresis 18
Influence of medium temperature 18
Influence of medium density 18
Influence of medium pressure 18
Switching delay 18

Operating conditions 19
Installation instructions 19
Examples of mounting 19
Orientation 21

Environment 22
Ambient temperature range 22
Storage temperature 22
Operating altitude as per IEC61010-1 Ed.3 22
Climate class 22
Degree of protection 22
Vibration resistance 22
Electromagnetic compatibility 22

Medium conditions 23
Medium temperature 23
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

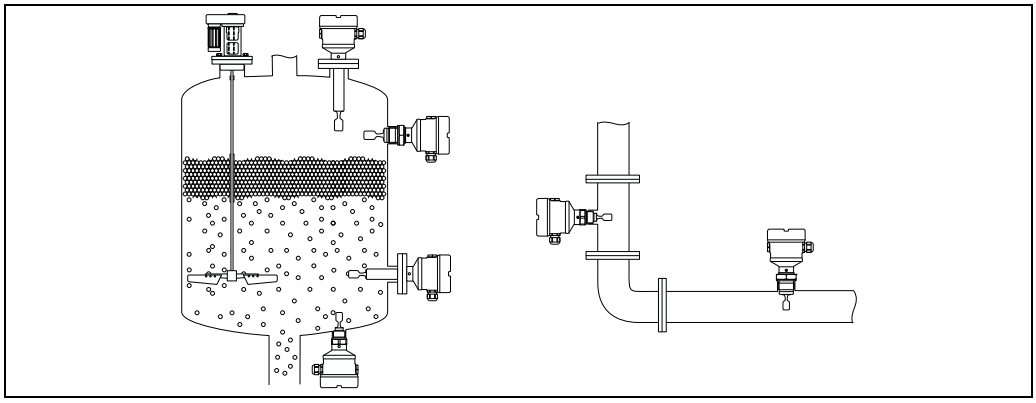
Accessories 32
Transparent cover 32
Cover with sight glass 32
Weather protection cover 32

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.



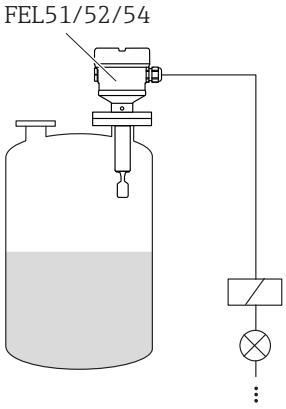
Function and system design

Measuring principle

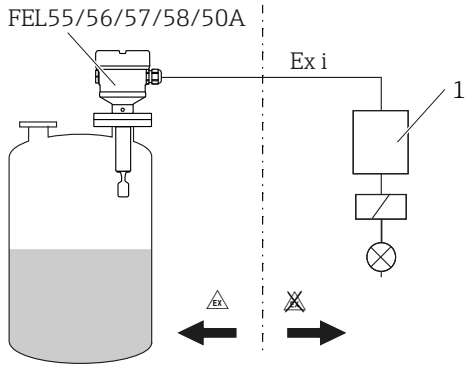
The sensor's fork vibrates at its intrinsic frequency.
This frequency is reduced when covered with liquid. This change in frequency causes the point level switch to switch.

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/cm³ or > 0.7 g/cm³ (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

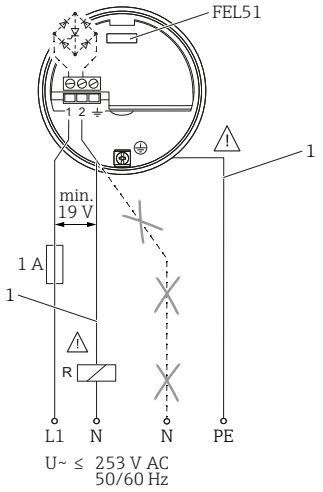
Electrical connection

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")



1 = 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	LEDs red
MAX		1 —I_L→ 2	☼	●
		1 - - < 3.8 mA - - → 2	☼	☼
MIN		1 —I_L→ 2	☼	●
		1 - - < 3.8 mA - - → 2	☼	☼

Signal on alarm

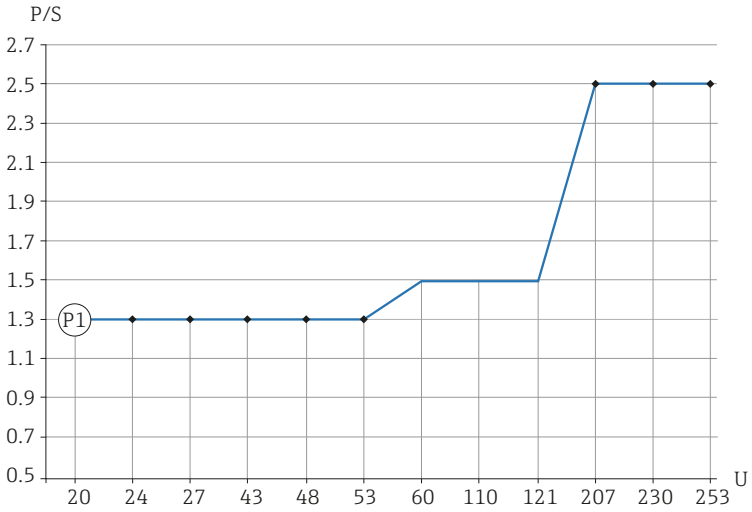
Output signal on power failure or in the event of damaged sensor: < 3.8 mA

Connectable load

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

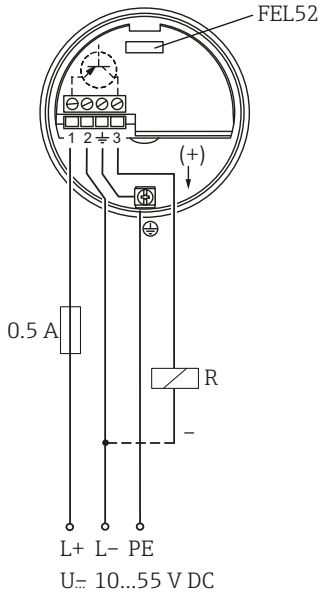
Power supply

Supply voltage: DC 10 to 55 V
Ripple: ≤ 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 = Relay, PLC, ...

Output signal

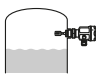
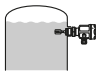
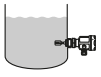
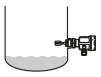
I_L = load current (switched through)

< 100 µA = residual current (blocked)

☼ = lit

● = unlit

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

Safety mode	Level	Output signal	LEDs green	LEDs red
MAX		L+ 1 I_L + 3	☼	●
		1 < 100 µA 3	☼	☼
MIN		L+ 1 I_L + 3	☼	●
		1 < 100 µA 3	☼	☼

Signal on alarm

Output signal on power failure or in the event of damaged sensor: < 100 µA

Connectable load

- Load switched via the transistor and separate PNP connection, ≤ DC 55 V
- Load current ≤ 350 mA (pulsed overload and short-circuit protection)
- Residual current < 100 µA (with transistor blocked)
- Capacitance load ≤ 0.5 µF at 55 V, ≤ 1.0 µF at 24 V
- Residual voltage < 3 V (with transistor switched through)

Electronic insert FEL54 (AC/DC with relay output)

Power supply

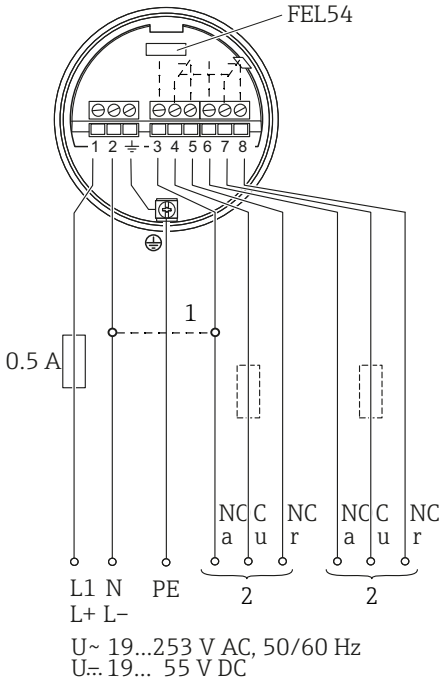
Supply voltage: AC 19 to 253 V, 50/60 Hz or DC 19 to 55 V
Power consumption: ≤ 1.3 W
Reverse polarity protection
Overvoltage protection FEL54: overvoltage category III

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.

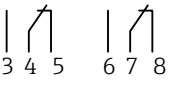
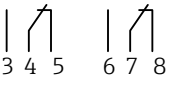


1 = When jumpered, the relay output works with NPN logic.
2 = See below: "Connectable load"

Output signal

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

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

Safety mode	Level	Output signal	LEDs green	LEDs red
MAX		 3 4 5 6 7 8	☼	●
		 3 4 5 6 7 8	☼	☼
MIN		 3 4 5 6 7 8	☼	●
		 3 4 5 6 7 8	☼	☼

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~ ≤ 6 A (Ex de 4 A), U~ ≤ AC 253 V; P~ ≤ 1500 VA, cos φ = 1, P~ ≤ 750 VA, cos φ > 0.7
- I⎓ ≤ 6 A (Ex de 4 A) to DC 30 V , I⎓ ≤ 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

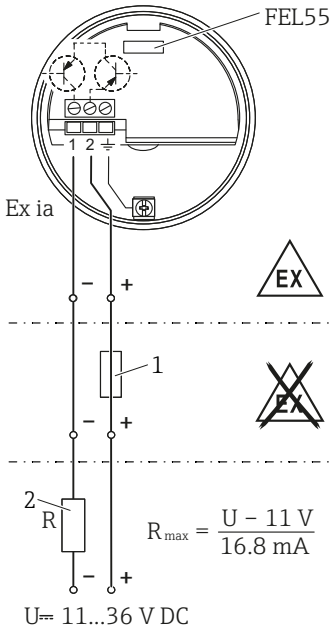
Supply voltage: DC 11 to 36 V
Power consumption: < 600 mW
Reverse polarity protection
Overvoltage protection FEL55: overvoltage category III

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	LEDs 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 V) : 16.8 mA
- U = 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 Ω = (U – 11V) / 16.8 mA
4.2 [Ω /A] = U – 11 V
U = 15.2 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

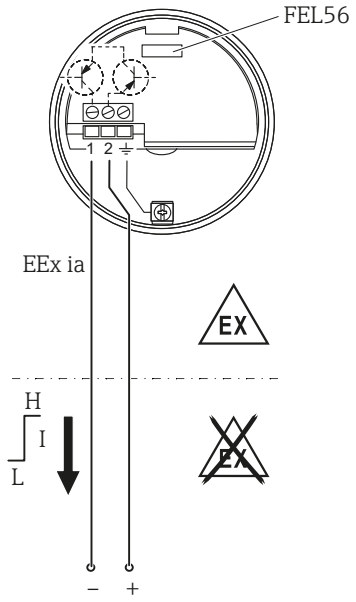
Electrical connection

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)

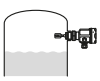
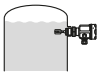
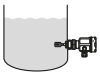
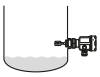
Connecting to multiplexer: Set clock time to min. 2 s.



Output signal

= lit
= flashes
= unlit

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

Safety mode	Level	Output signal	LEDs green	LEDs red
MAX		+ 2 — 0.6 … 1.0 mA → 1	☼	●
		+ 2 — 2.2 … 2.8 mA → 1	☼	☼
MIN		+ 2 — 0.6 … 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 ±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

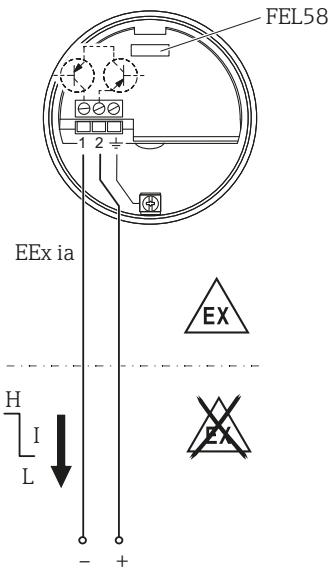
For connection to isolating amplifiers according to NAMUR (IEC 60947-5-6), e.g. FTL325N, FTL375N from Endress+Hauser.
Output signal jump from high to low current on point level.

(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	LEDs yellow
MAX		+ 2 → 1 2.2 … 3.5 mA	☼	☼
		+ 2 → 1 0.6 … 1.0 mA	☼	●
MIN		+ 2 → 1 2.2 … 3.5 mA	☼	☼
		+ 2 → 1 0.6 … 1.0 mA	☼	●

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).

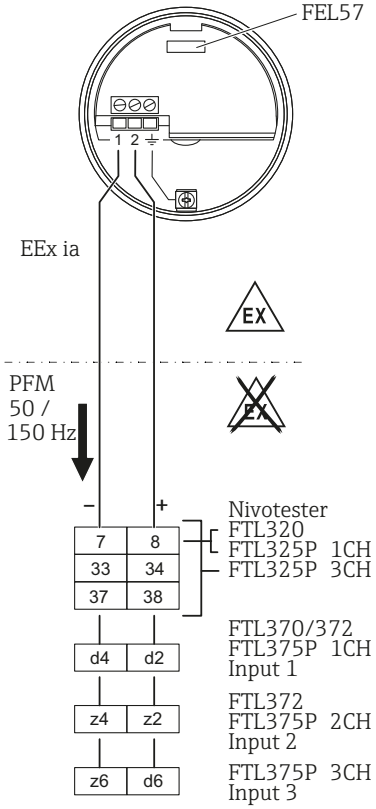
Output signal jump of the PFM signal from high to low frequency when sensor is covered. Switching between minimum/maximum safety in the Nivotester.

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.

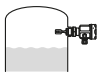
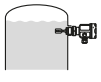
The twin-core connecting cable (instrument cable) with a cable resistance of ≤ 25 Ω per core is connected to the screw terminals (conductor cross-sections 0.5 to 2.5 mm / 0.02 to 0.1 in) in the connection compartment. Protective circuits against reverse polarity, HF influences and overvoltage peaks are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

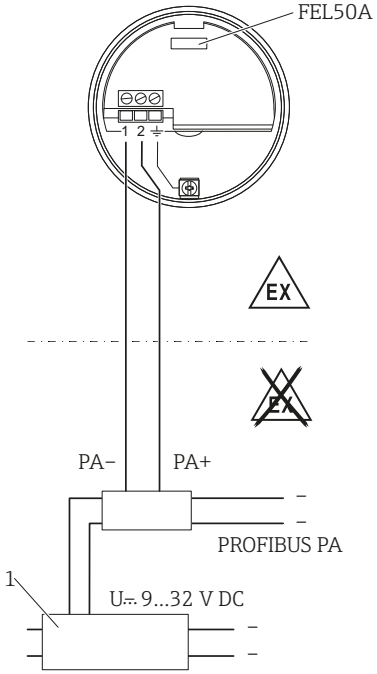
Electrical connection

Two-wire connection for power supply and data transfer

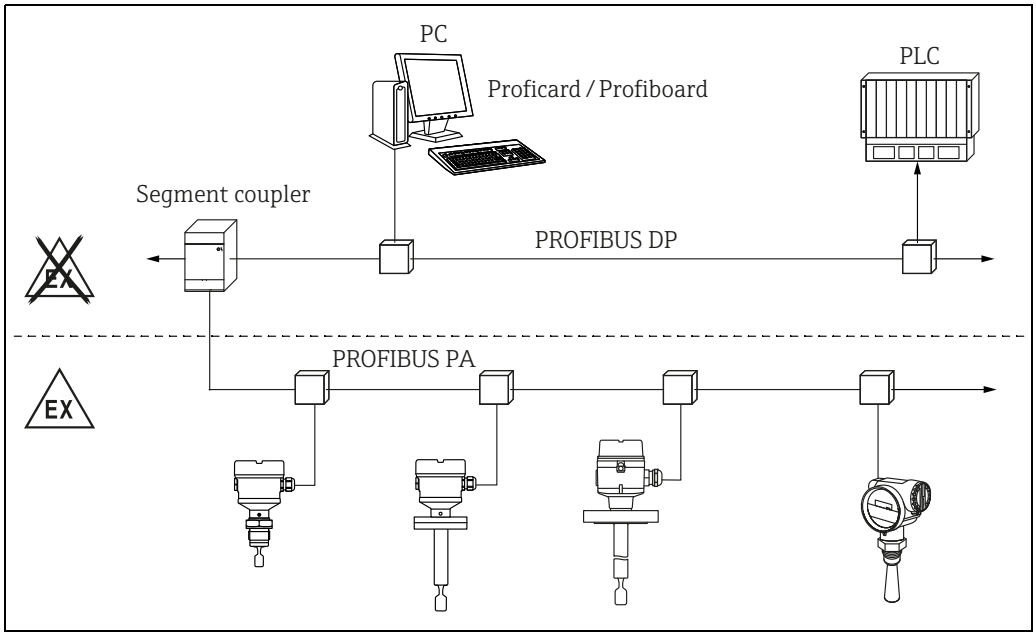
For connecting to PROFIBUS PA

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



1 = Segment coupler

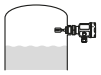
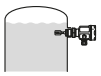
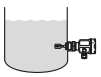
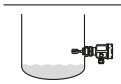


Output signal

☼ = lit

● = unlit

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

Setting	Level	LEDs green	LEDs yellow	FEL50A
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 µS

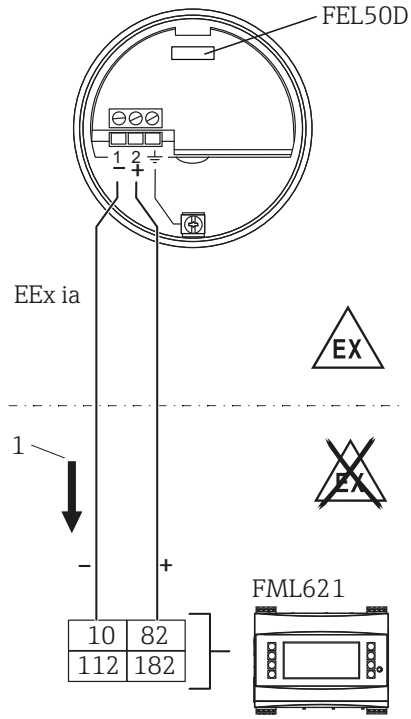
Electrical connection

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.

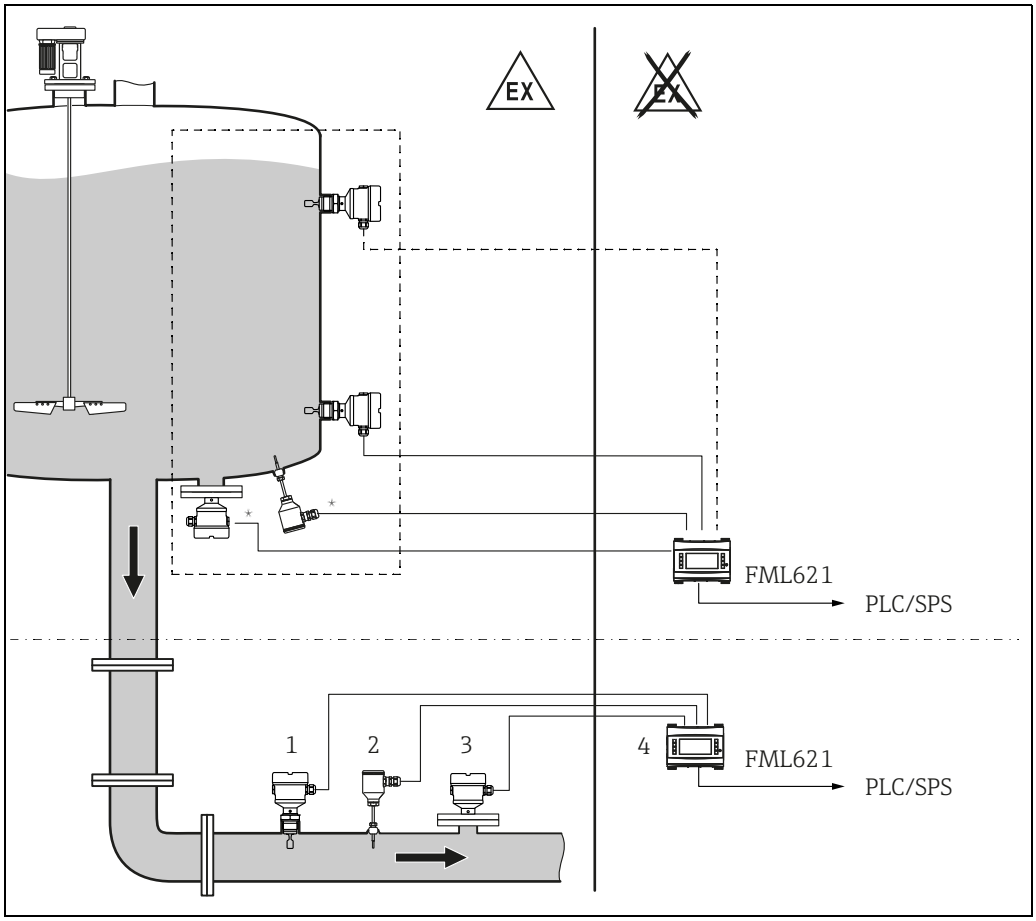
Special adjustment (see ordering information for additional options, special adjustment, density H_2O (K) or special adjustment, density H_2O with 3.1 certificate (L))
- Here, three fork parameters are determined to describe the sensor characteristics, indicated in the adjustment report and provided 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	ϟ ●	No fault
	◔	Maintenance required
	☼	Device failure

Connection and function

Connecting cables

- Electronic inserts: cross-section ≤ 2.5 mm² (14 AWG); strand in ferrule as per DIN 46228
- Protective ground in housing: cross-section ≤ 2.5 mm² (14 AWG)
- External equipotential bonding connection on housing: cross-section ≤ 4 mm² (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 ≤ 3 s it assumes the correct switching mode (exception: FEL57)

Performance characteristics

Reference operating conditions

Ambient temperature: 23 °C (73 °F)

Medium temperature: 23 °C (73 °F)

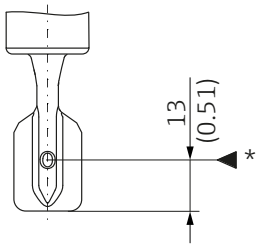
Medium density (water): 1 g/cm³ (SGU)

Medium viscosity: 1 mm²/s (cSt)

Medium pressure p_e: 0 bar (0 psi)

Sensor mounting: vertical from above

Density switch: to > 0.7 g/cm³ (SGU)



** Switch point under reference operating conditions*

Maximum measured error

Under reference operating conditions: max. +/−1 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 mm to −2.8 mm (−50 to +120 °C / -58 to 248 °F)
Enamel: max. +0.6 mm to −1.5 mm (−50 to +150 °C / -58 to 302 °F)

Influence of medium density

max. +4.8 mm to −3.5 mm ((0.5 to 1.5 g/cm³ (SGU))
max. +0.19 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)

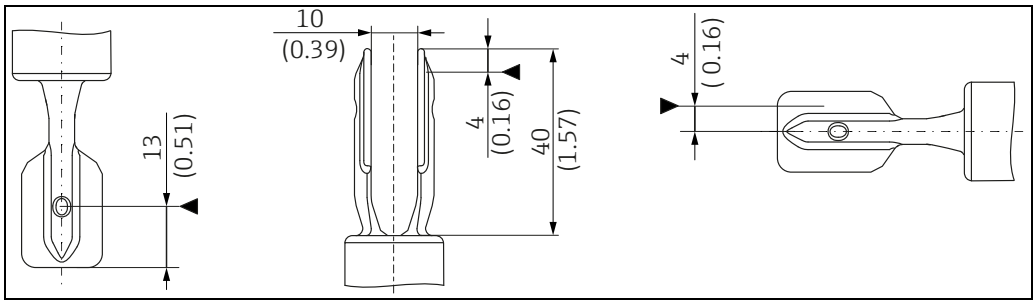
Operating conditions

Installation instructions

Switch points ▷ 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).

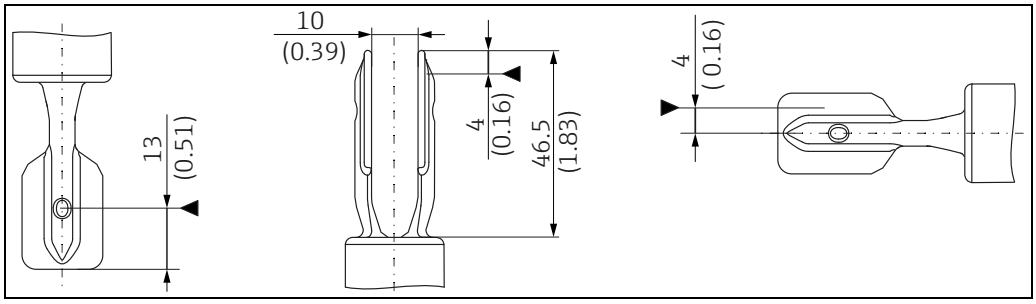
Note!
- The switch points of the Liquiphant **M** are at other positions to those of the previous version Liquiphant **II**.
- Minimum distance between the tip of the fork and the tank wall or pipe wall: 10 mm

Synthetic coating:



Mounting from above *Mounting from below* *Mounting from the side*

Enamel coating:

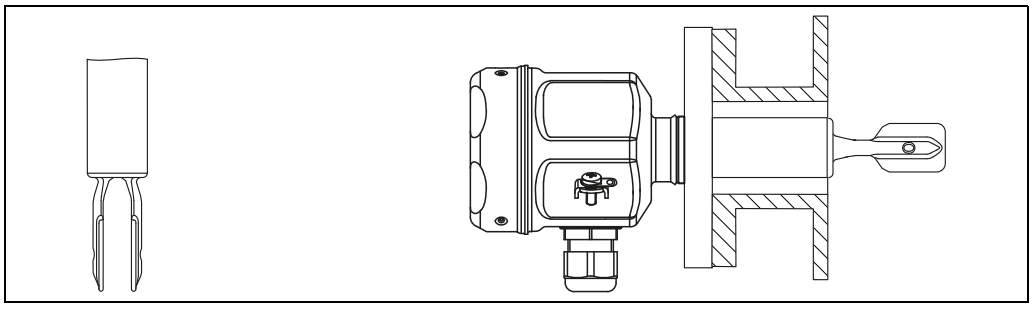


Mounting from above *Mounting from below* *Mounting from the side*

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:

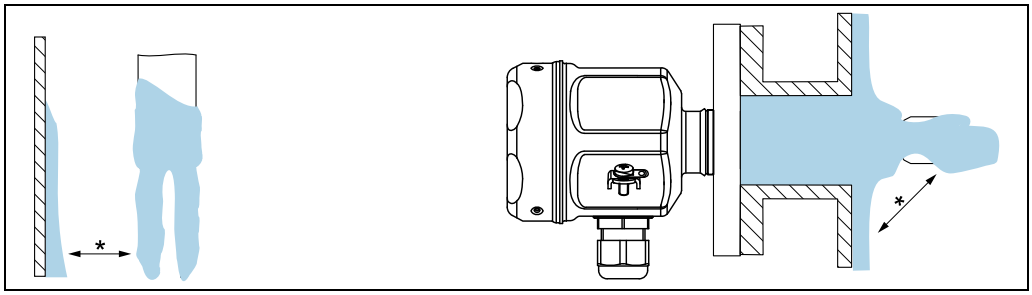


Vertical from above *Flush-mounted from the side*

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

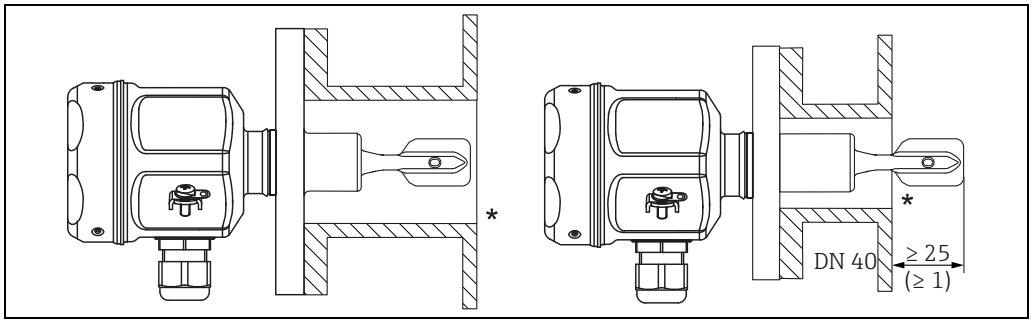
With buildup on the tank walls:

* 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):

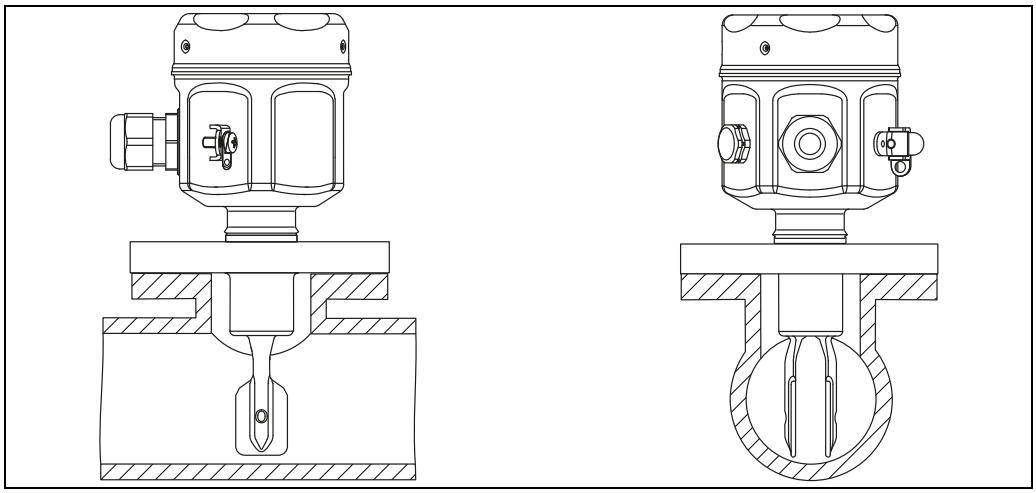


Dimensions: mm (in)

** Deburr the nozzle surfaces*

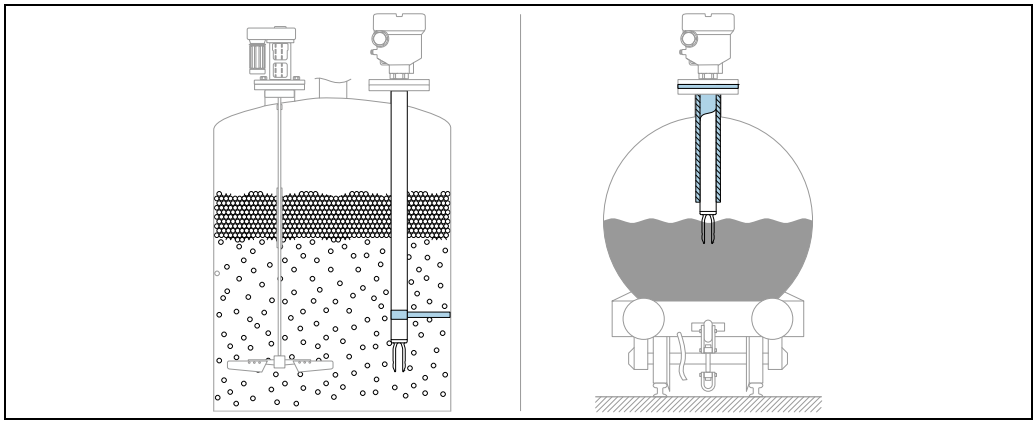
Mounting in piping from 2"

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.)



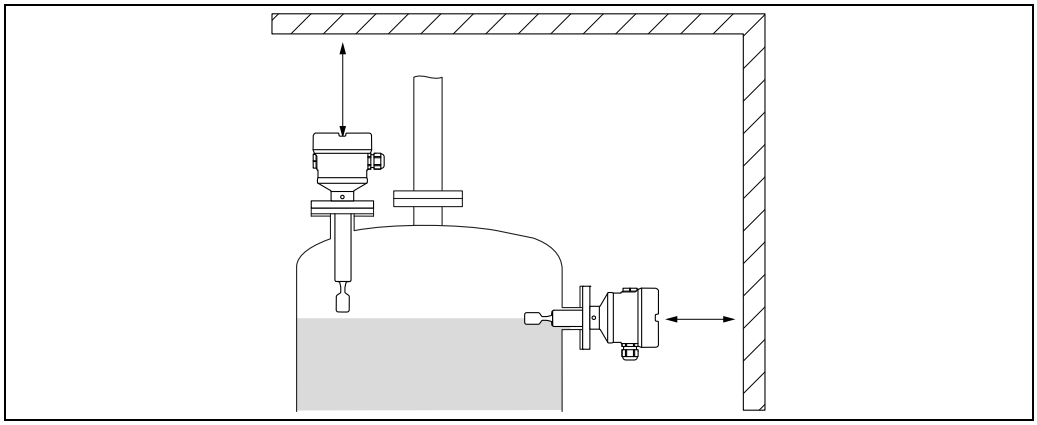
Support the device in the event of a severe dynamic load.

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.



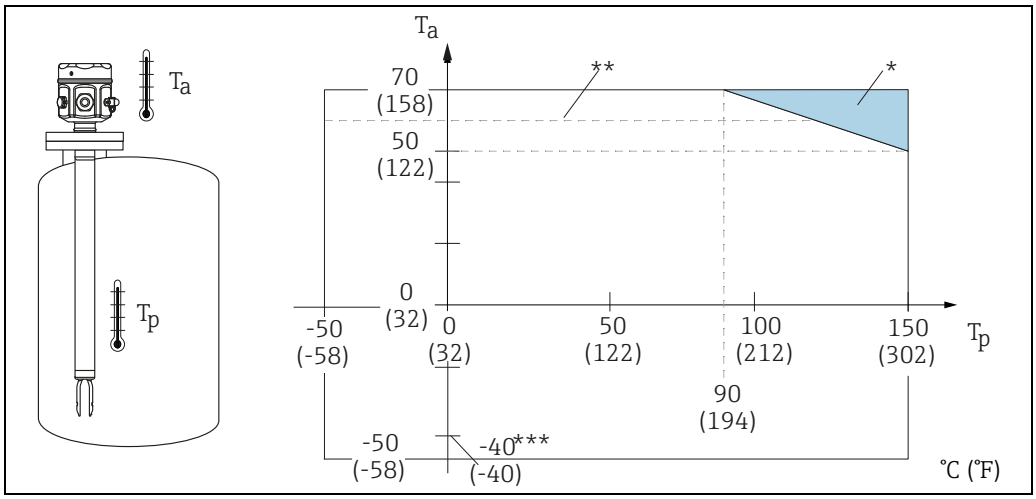
Orientation

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 °C ≤ Ta ≤ +70 °C (-40 °F ≤ Ta ≤ +158 °F)

Storage temperature

−50 to +80 °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/cm³ (SGU) = delivery status
0.5 g/cm³ (SGU) can be adjusted via switch

Viscosity

≤ 10,000 mm²/s (cSt)

Solids content

≤ ø5 mm (0.2 in)

Lateral loading capacity

≤ 75 Nm

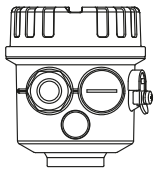
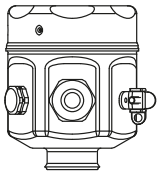
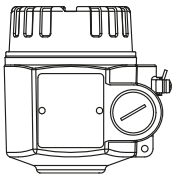
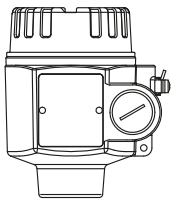
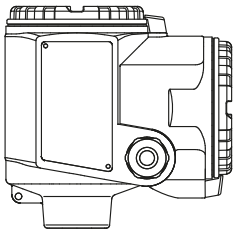
Mechanical construction

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.

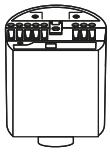
Design

Summary of all electrical and mechanical versions

Housing

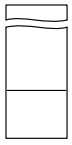
				
F16 Polyester (PBT)	**F15** Stainless steel (316L)	**F17** Aluminum Coated housing	**F27** Stainless steel (316L) **F13** Aluminum (also for Ex d/XP), coated housing	**T13** Aluminum with separate connection compartment (also Ex de and Ex d), coated housing

Plug-in electronic inserts to mount in the housing

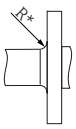


FEL51:	Two-wire AC connection
FEL52:	Three-wire DC connection PNP
FEL54:	Universal current connection, 2 relay outputs
FEL55:	Output 16/8 mA for separate switching unit
FEL56:	Output 0.6 to 1.0 / 2.2 to 2.8 mA for separate switching unit (NAMUR)
FEL58:	Output 2.2 to 3.5 / 0.6 to 1.0 mA for separate switching 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

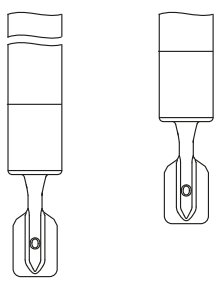
Bushings
Temperature spacer and pressure-tight feedthrough: enables closed tank insulation and normal ambient temperature for the housing.



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!



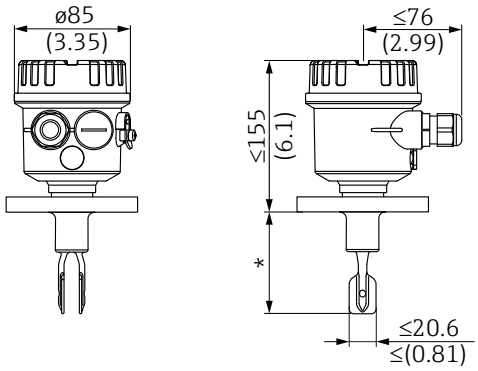
Sensors
With extension pipe up to 3 m
or special "length L II" (see also Page 24)



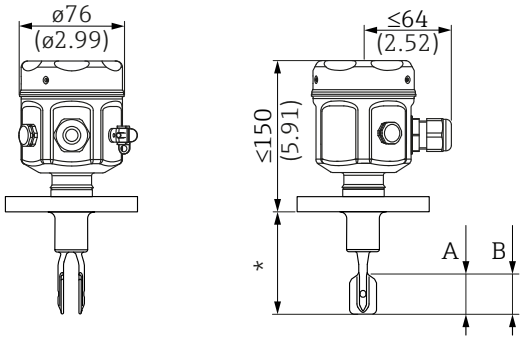
Dimensions

Dimensions in mm (in)!

Polyester housing F16

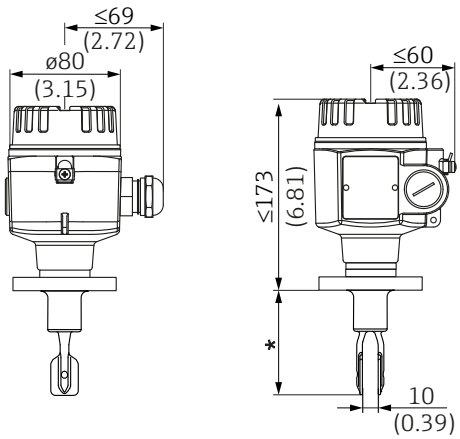


Stainless steel housing F15

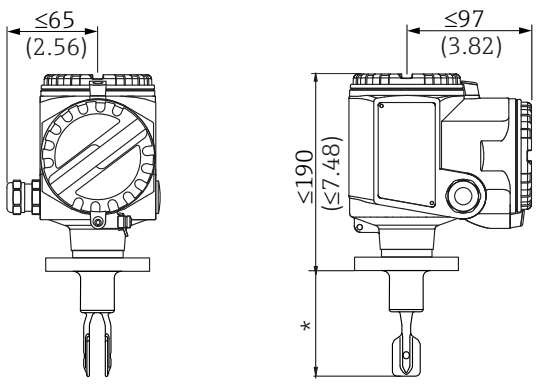


1. = approx. 25 (0.98) ECTFE, PFA
2. = approx. 29 (1.14) enamel

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



Aluminum housing T13 with separate connection compartment



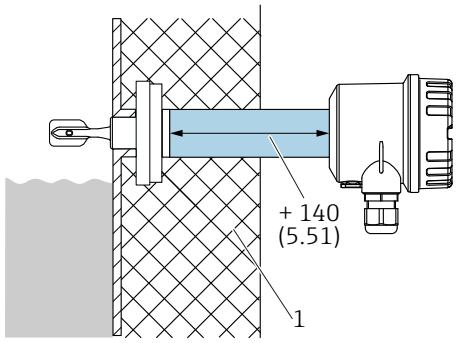
* This length is customer-specific.

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

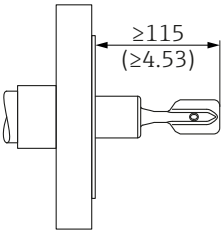
Temperature spacer
Provides sealed insulation for the vessel and normal ambient temperatures for the housing.

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.

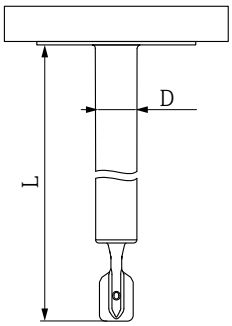


1. = Insulation

Process connections

Process connection		Dimensions	Accessories	Pressure Temperature
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: NPT¾, G½ or M20)	0.5 (1.1)
Stainless steel housing F15 (connection: NPT½, G½, M20 or M12 connector)	0.1 (0.2)
Aluminum housing F17 (connection: NPT¾, G½, M20 or M12 connector)	0.5 (1.1)
Stainless steel housing F27 (connection: NPT½, G½ or M20)	0.3 (0.7)
Aluminum housing T13 with separate connection compartment (connection: NPT¾, G½ 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:

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

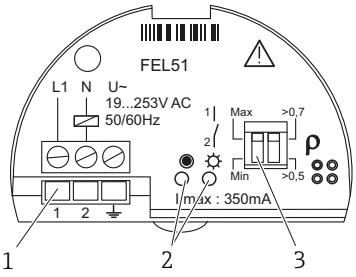
- Flanges made of 316L (1.4404) - synthetic coating; flanges made of 1.0487 (ASTMA 529) - enamel coating
- Flanges as per EN/DIN 1092-1 from DN 25, as per ASME B16.5 from 1", as per JIS B 2220 (RF) from 10K50

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



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

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

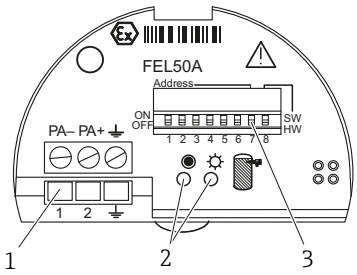


With FEL58:

- 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 of if the electronics are defective
- yellow LED to indicate the switching status, Test key – breaks the cable connection

With FEL50A:

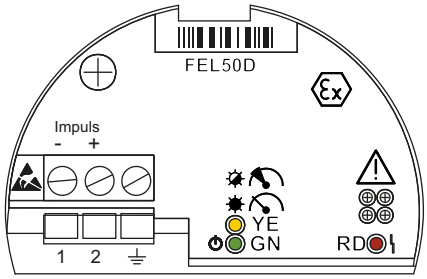
- 8 switches for configuring the device address
- green LED to indicate operational status, pulsing to indicate communication;
- yellow LED to indicate the switching status, flashes in the event of corrosion damage on sensor or if the electronics are defective



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

With FEL50D:

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



Operating concept

Onsite configuration

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

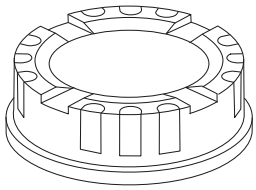
Transparent cover

For polyester housing F16

Material: PA 12

Weight: 0.04 kg

Order number: 943461-0001



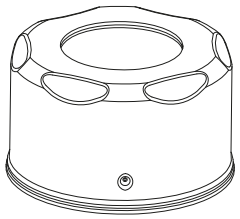
Cover with sight glass

For stainless steel housing F15

Material: AISI 316L

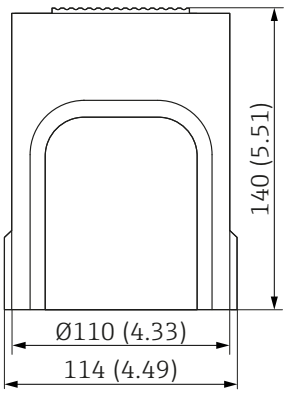
Weight: 0.16 kg

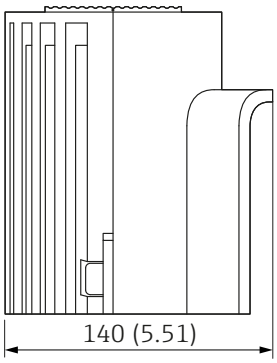
– With glass sight glass
  Order number: 943301-1000
– With PC sight glass
  Order number: 52001403
  (Not for CSA, General Purpose)



Weather protection cover

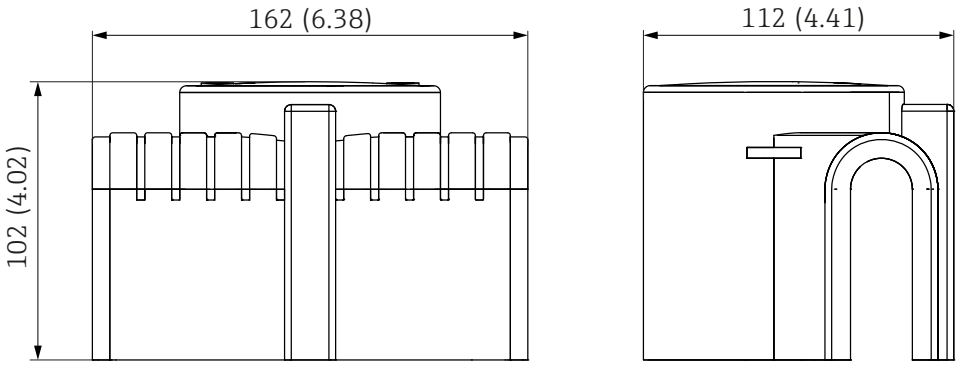
For F16 housing





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

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

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

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

CE ⟨Ex⟩ 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 FieldbusClass 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



www.addresses.endress.com

Endress+Hauser

People for Process Automation

Artisan Technology Group is an independent supplier of quality pre-owned equipment

Gold-standard solutions

Extend the life of your critical industrial, commercial, and military systems with our superior service and support.

We buy equipment

Planning to upgrade your current equipment? Have surplus equipment taking up shelf space? We'll give it a new home.

Learn more!

Visit us at **artisantg.com** for more info on price quotes, drivers, technical specifications, manuals, and documentation.

Artisan Scientific Corporation dba Artisan Technology Group is not an affiliate, representative, or authorized distributor for any manufacturer listed herein.

We're here to make your life easier. How can we help you today?

(217) 352-9330 | sales@artisantg.com | artisantg.com

ARTISAN® TECHNOLOGY GROUP