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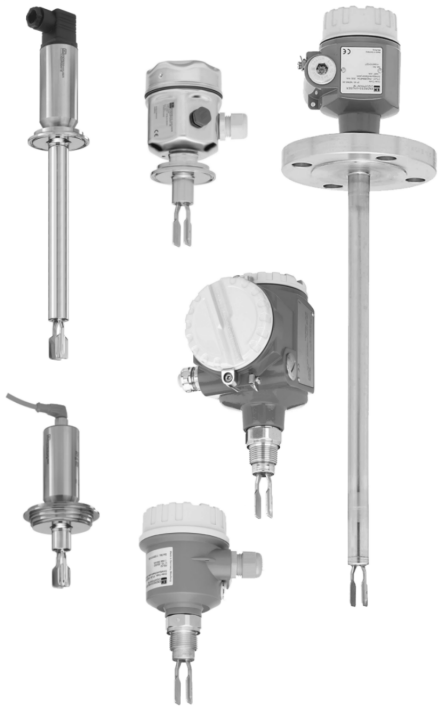
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Technical Information

# Liquiphant M
# FTL50, FTL51, FTL50H, FTL51H

Vibronic



## Point level switch for all kinds of liquids

**Application**

- Process temperatures from −50 °C to 150 °C (-58 to 302 °F)
- Pressures up to 100 bar (1450 psi)
- Viscosities up to 10,000 $mm^2/s$ (cSt)
- For liquids with densities ≥ 0.5 $g/cm^3$(SGU)

FTL50: Compact design
FTL51: Extension pipe up to 3 m (9.8 ft) and up to 6 m (20 ft) on request
FTL50H, FTL51H: Certified for the food and pharmaceutical industries

Ideal substitute for float switches, as reliable function not affected by flow, turbulence, bubbles, foam, vibration, solids content or buildup.

**Your benefits**

- Recommended for safety systems requiring functional safety to SIL2/SIL3 as per IEC 61508/IEC 61511-1
- Design in accordance with ASME B31.3
- Recommended for use in sterile applications in the life science industry (design in accordance with ASME BPE)
- No adjustment: quick, low-cost startup
- No mechanically moving parts: no maintenance, no wear, long operating life
- Functional safety: Monitoring of tuning fork for damage
- Compact stainless steel housing (optional): the IP69 protection rating guarantees that the unit remains impermeable, even in the event of intensive cleaning or flooding for several hours

Endress+Hauser
People for Process Automation

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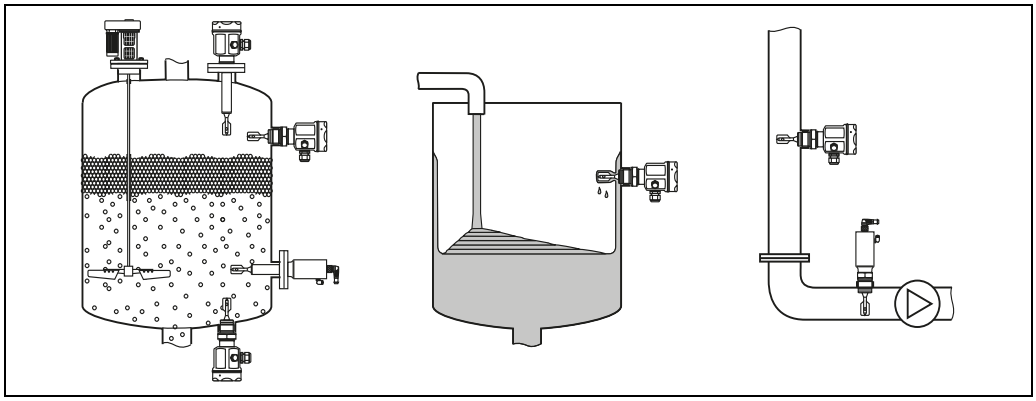
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# Application

**Point level detection**

Maximum or minimum detection in tanks or pipes containing all kinds of liquids, including use in hazardous areas, food and pharmaceuticals.



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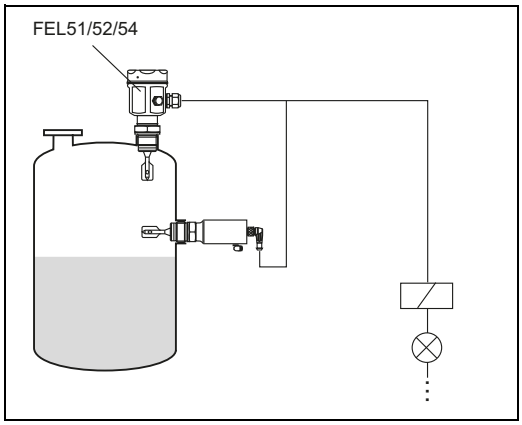
# Function and system design

**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.

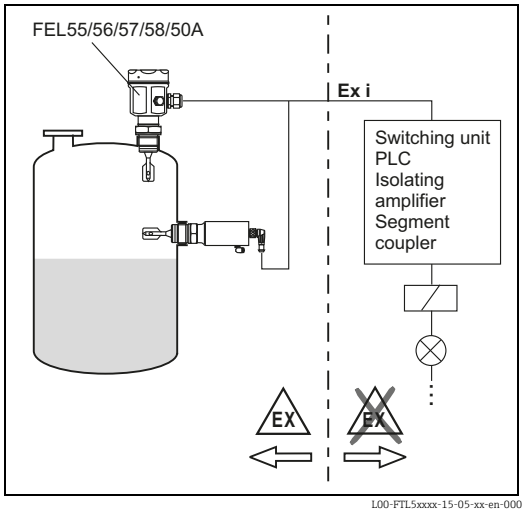
**Modularity**

**Point level switch**
Liquiphant M FTL with electronic versions
FEL51, FEL52, FEL54




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**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




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| | |
|---|---|
| **Electronic versions** | FEL51:<br>Two-wire AC version;<br>Switches the load directly into the power supply circuit via an electronic switch.<br><br>FEL52:<br>Three-wire DC version;<br>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.<br><br>FEL54:<br>Universal current version with relay output;<br>Switches the loads via 2 floating change-over contacts.<br><br>FEL55:<br>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.<br><br>FEL56:<br>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.<br><br>FEL58:<br>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.<br>Checking of connecting cabling and other devices by pressing a key on the electronic insert.<br><br>FEL57:<br>For separate switching unit; PFM signal transmission;<br>Current pulses superposed on the power supply along the two-wire cabling.<br>Proof test from the switching unit without changing levels.<br><br>FEL50A:<br>For connecting to PROFIBUS PA;<br>Cyclic and acyclic data exchange acc. to PROFIBUS-PA Profile 3.0<br>Discrete Input |
| **Electronics for continuous density measurement** | FEL50D:<br>For connecting to Density Computer FML621 |
| **Galvanic isolation** | FEL51, FEL52, FEL50A: between sensor and power supply<br><br>FEL54: between sensor and power supply and load<br><br>FEL55, FEL56, FEL57, FEL58, FEL50D: see connected switching unit |
| **Design** | FTL50: Compact<br><br>FTL51: With extension pipe<br><br>FTL50H: Compact, with polished tuning fork and hygienic process connections<br><br>FTL51H: With extension pipe, polished tuning fork and hygienic process connections |

# Input

| | |
|---|---|
| **Measured variable** | Level (limit value) |
| **Measuring range (detection range)** | FTL50: dependent on mounting point<br><br>FTL51: dependent on mounting point and the extension pipe ordered.<br>Standard extension pipe up to 3 m (9.8 ft) and up to 6 m (20 ft) on request. |
| **Density** | Setting on the electronic insert > 0.5 g/cm³ (SGU) or > 0.7 g/cm³ (SGU) (others 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

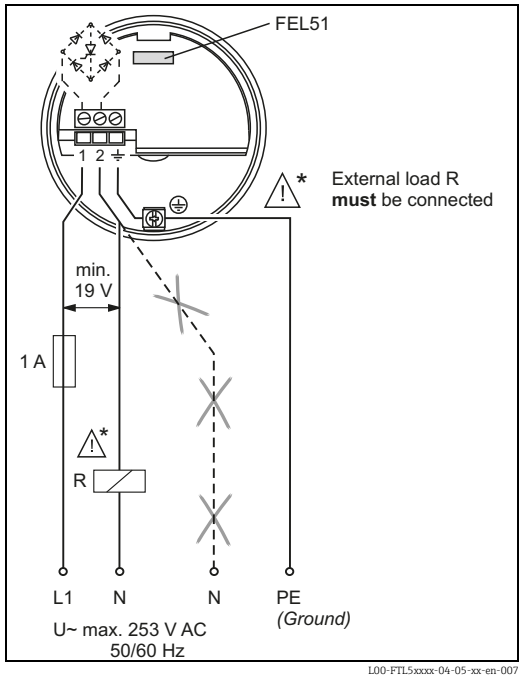
**Electrical connection**

**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")




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**Output signal**

$I_L$ = load current (switched through)

< 3.8 mA = residual current (blocked)

☼ = lit

● = unlit

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| 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 | ☼ | ☼ |

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**Signal on alarm**

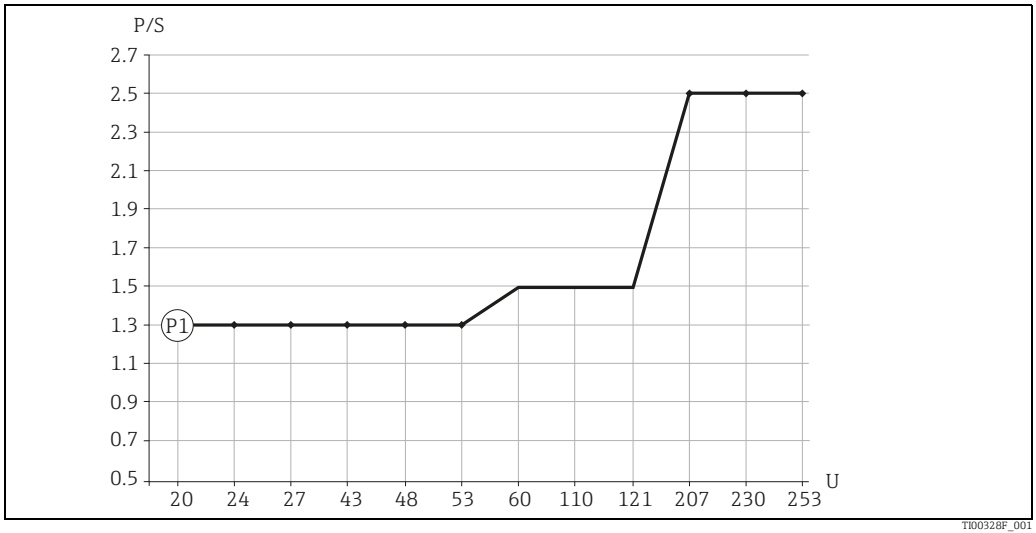
Output signal on power failure or in the event of damaged sensor: < 3.8 mA

**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).

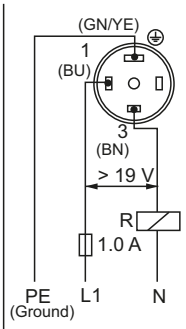
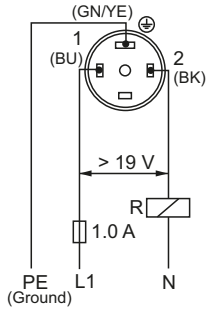
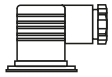
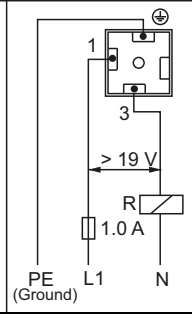
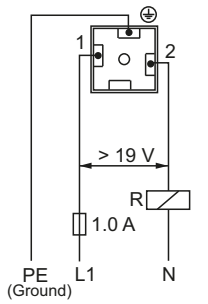
# Electronics FEL51 (AC, in compact housing)

**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**

| | Connector | MAX | MIN |
|---|---|---|---|
| Switches the load directly into the power supply circuit via an electronic switch.<br><br>Always connect in series with a load!<br><br>Check the following:<br>▪ The residual current in blocked state (up to 3.8 mA)<br>▪ That for low connection voltage<br>– the voltage drop across the load is such that the minimum terminal voltage at the electronic insert (19 V) when blocked is not undershot.<br>– the voltage drop across the electronics when switched through is observed (up to 12 V) | FTL5#(H)- #######C3# |  |  |
| | FTL5#(H)- #######D3# (Pg11)<br>oder<br>FTL5#(H)- #######E3# (NPT ½")<br><br>-30°C ≤ TA ≤ +70°C<br>-22° F ≤ TA ≤ +158°F |  |  |

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- 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 (e.g. RC module: part number 71107226).
- When using in conjunction with a cable end (FTL5#(H)- #######C3#), the compact housing should only be used in enclosed areas.

**Output signal**

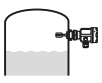
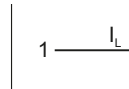
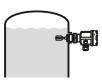
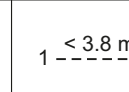
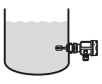
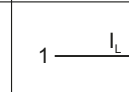
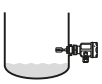
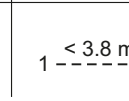
$I_L$ = load current (switched through)

< 3.8 mA = residual current (blocked)

☼ = lit

● = unlit

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| Safety mode | Level | Output signal | LEDs green | LEDs red |
|---|---|---|---|---|
| MAX |  |  | ☼ | ● |
| |  |  | ☼ | ☼ |
| MIN |  |  | ☼ | ● |
| |  |  | ☼ | ☼ |

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**Signal on alarm**

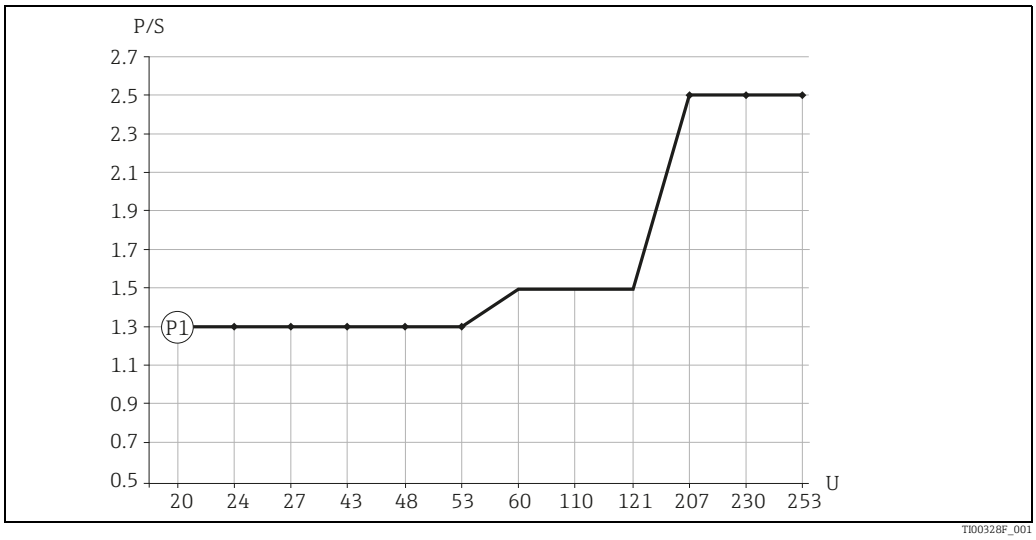
Output signal on power failure or in the event of damaged sensor: < 3.8 mA

**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)

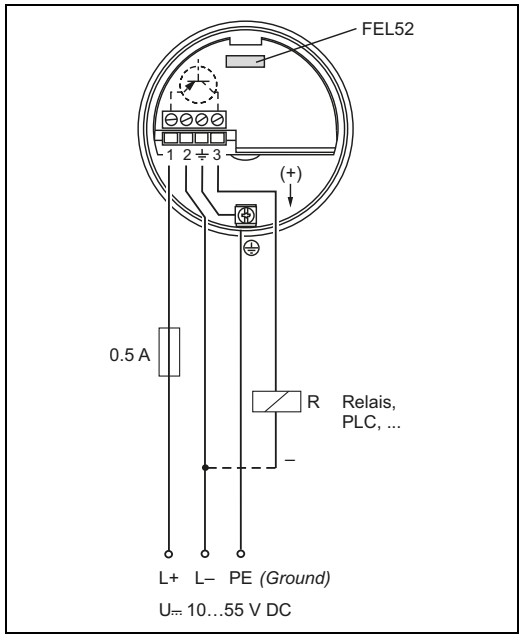
**Power supply**

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 switching output of the electronics (PNP); Output blocked on reaching point level.




L00-FTL5xxxx-04-05-xx-xx-030

**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 | ☼ | ☼ |

L00-FTL5xxxx-04-05-xx-xx-004

**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);

# Electronics FEL52 (DC PNP, in compact housing)

**Power supply**

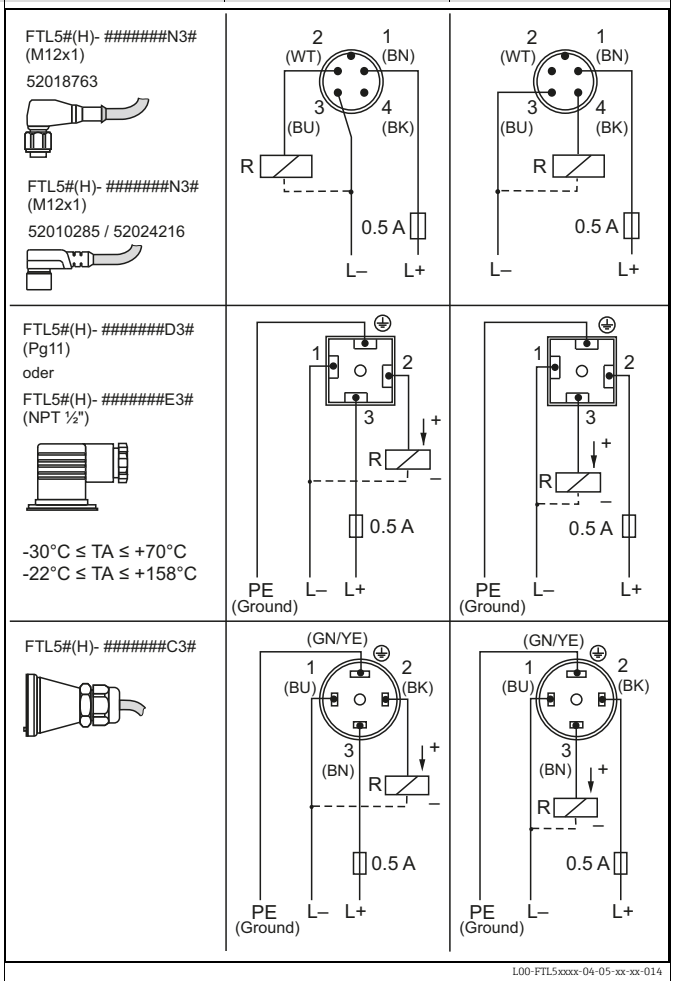
Supply voltage: DC 10 to 55 V
Ripple: ≤ 1.7 V, 0 to 400 Hz
Current consumption: ≤ 15 mA
Power consumption: ≤ 0.83 W
Reverse polarity protection
Overvoltage protection FEL52: overvoltage category III

**Electrical connection**

**Three-wire DC connection**

Preferably used with programmable logic controllers (PLC), DI module as per EN 61131-2.
Positive signal at switching output of the electronics (PNP);
Output blocked on reaching point level.

Note!
When using in conjunction with a cable end (FTL5#(H)-#######C3#), the compact housing should only be used in enclosed areas.




**Output signal**

**With valve connector or cable tail**

$I_L$ = 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+ 3 → $I_L$ → 2 + | ☼ | ● |
| | | L+ 3 --- < 100 µA → 2 + | ☼ | ☼ |
| MIN | | L+ 2 → $I_L$ → 3 + | ☼ | ● |
| | | L+ 2 --- < 100 µA → 3 + | ☼ | ☼ |

L00-FTL5xxxx-04-05-xx-xx-004a

**With M12x1 connector 52010285 / 52024216 (without LEDs)**




L00-FTL5xxxx-16-05-xx-xx-002

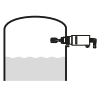
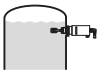
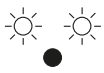
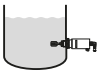
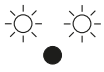
$I_L$ = load current (switched through)

< 100 µA = residual current (blocked)

☼ = lit

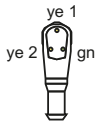
● = unlit

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

| Safety mode | Level | Output signal | LEDs |
|---|---|---|---|
| MAX |  | L+ 1 —$I_L$→ – 2 |  |
| |  | L+ 1 - - < 100 µA → – 2 |  |
| MIN |  | L+ 1 —$I_L$→ – 4 |  |
| |  | L+ 1 - - < 100 µA → – 4 |  |

L00-FTL5xxxx-04-05-xx-xx-010

**With M12x1 connector 52018763 (with LEDs)**




L00-FTL5xxxx-16-05-xx-xx-001

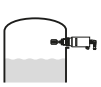
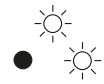
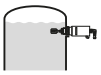
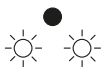
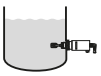
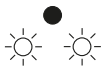
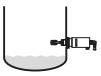
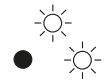
$I_L$ = load current (switched through)

< 100 µA = residual current (blocked)

☼ = lit

● = unlit

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

| Safety mode | Level | Output signal | LEDs |
|---|---|---|---|
| MAX |  | L+ 1 —$I_L$→ – 2 |  |
| |  | L+ 1 - - < 100 µA → – 2 |  |
| MIN |  | L+ 1 —$I_L$→ – 4 |  |
| |  | L+ 1 - - < 100 µA → – 4 |  |

L00-FTL5xxxx-04-05-xx-xx-011

**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**

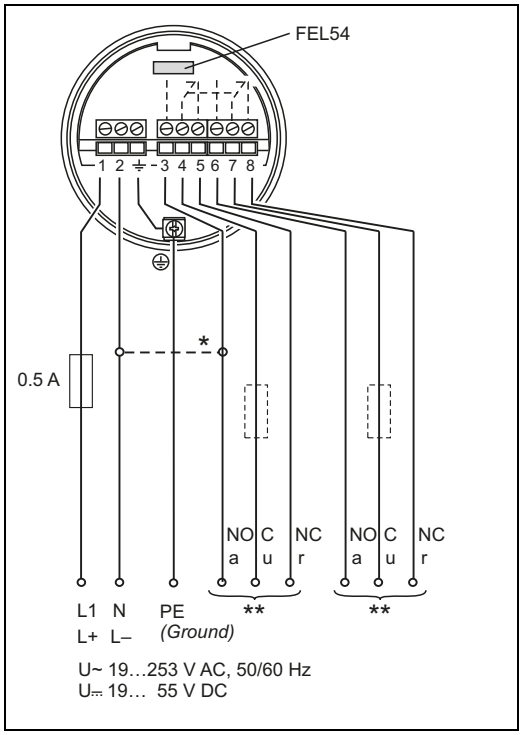
**Universal current connection with relay output**

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

Output:
When connecting an instrument with high inductance, provide a spark arrester to protect the relay contact.
A fine-wire fuse (depending on the load connected) protects the relay contact on short-circuiting.
Both relay contacts switch simultaneously.

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

** See "Connectable load"

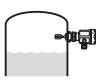
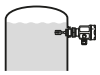
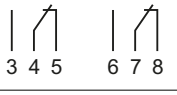
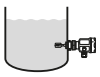
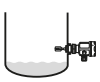
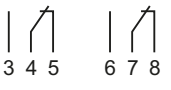



L00-FTL5xxxx-04-05-xx-xx-002

**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 | ☼ | ☼ |

L00-FTL5xxxx-04-05-xx-xx-005

**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**

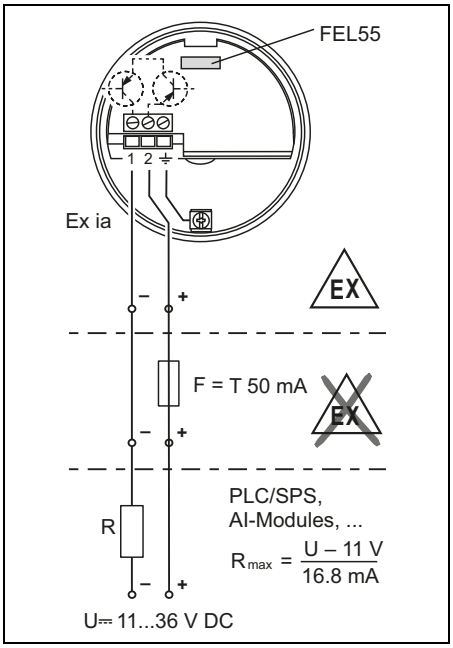
Supply voltage: DC 11 to 36 V
Power consumption: < 600 mW
Reverse polarity protection
Overvoltage protection FEL55: overvoltage category III

**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).




L00-FTL5xxxx-04-05-xx-en-000

**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 | ☼ | ☼ |

L00-FTL5xxxx-04-05-xx-xx-006

**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

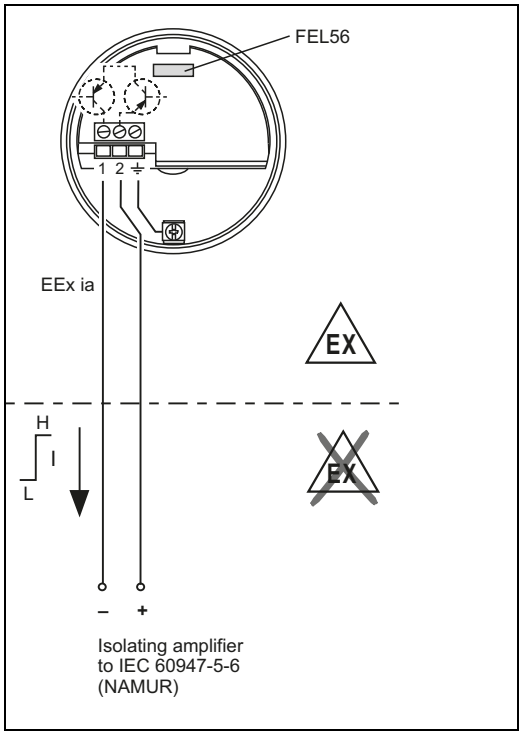
**Electrical connection**

**Two-wire connection for separate switching unit**

For connecting to isolating amplifiers acc. to NAMUR (IEC 60947-5-6), e.g. FTL325N, FTL375N 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.




L00-FTL5xxxx-04-05-xx-en-004

**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 | ☼ | ☼ |

L00-FTL5xxxx-04-05-xx-xx-003

**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**

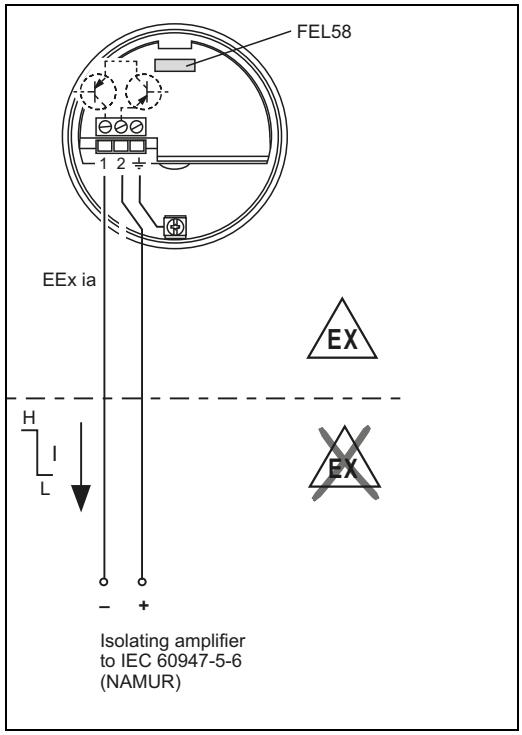
For connecting to isolating amplifiers as per NAMUR (IEC 60947-5-6), e.g. FTL325N, FTL375N from Endress+Hauser.
Output signal jump from high to low current on point level.

**(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.




L00-FTL5xxxx-04-05-xx-en-002

**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 | ◪ | ● |

L00-FTL5xxxx-04-05-xx-xx-007

**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)

# Electronics FEL58 (NAMUR H-L edge, compact housing)

**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**

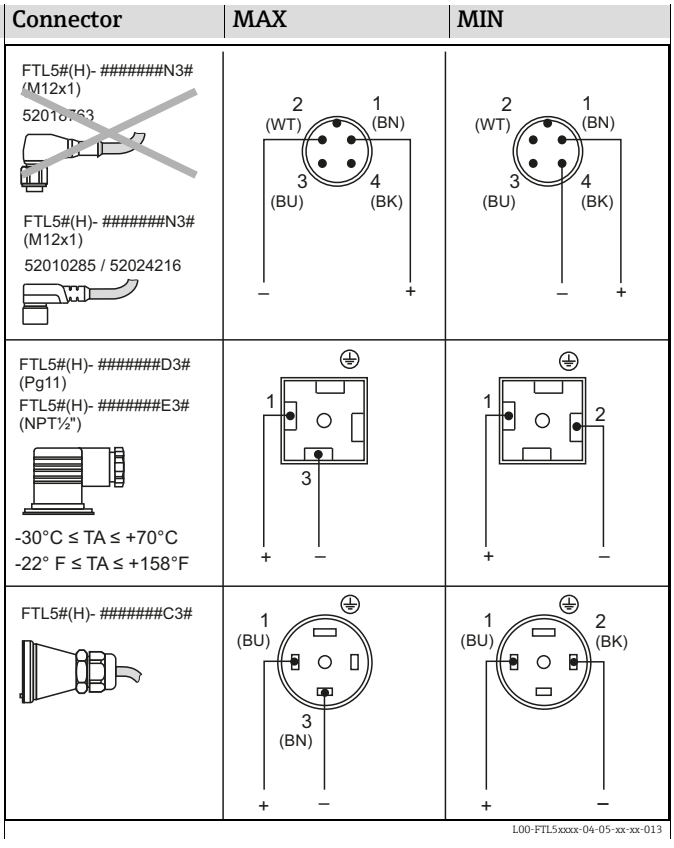
For connecting to isolating amplifiers acc. to NAMUR (IEC 60947-5-6), e.g. FTL325N, FTL375N from Endress+Hauser.
Output signal jump from high to low current on point level.

**(H–L edge)**

Additional function:
If the test magnet is held against the
marking on the nameplate,
the output signal is inverted.

Connecting to multiplexer:
Set clock time to min. 3 s.

The NAMUR interface has
a defined power consumption rate.
Thus, it is not possible to use the M12 connector
with an integrated LED
(52018763).




**Output signal**

| Safety mode | Level | Output signal | LEDs green | LEDs yellow |
|---|---|---|---|---|
| MAX | | + 1 2.2… 3.5 mA – 3 | ☼ | ☼ |
| | | + 1 0.6… 1.0 mA – 3 | ☼ | ● |
| MIN | | + 1 2.2… 3.5 mA – 2 | ☼ | ☼ |
| | | + 1 0.6… 1.0 mA – 2 | ☼ | ● |

L00-FTL5xxxx-04-05-xx-xx-007a

☼ = lit
☼ = flashes
● = unlit

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

Note!
The light emitting diodes are not readable on the version FTL5x(H)-## ## ## #C 3# (compact IP66/68 316L with a 5 m cable).

**Signal on alarm**

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

**Connectable load**

- See Technical Data of the isolating amplifier 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**

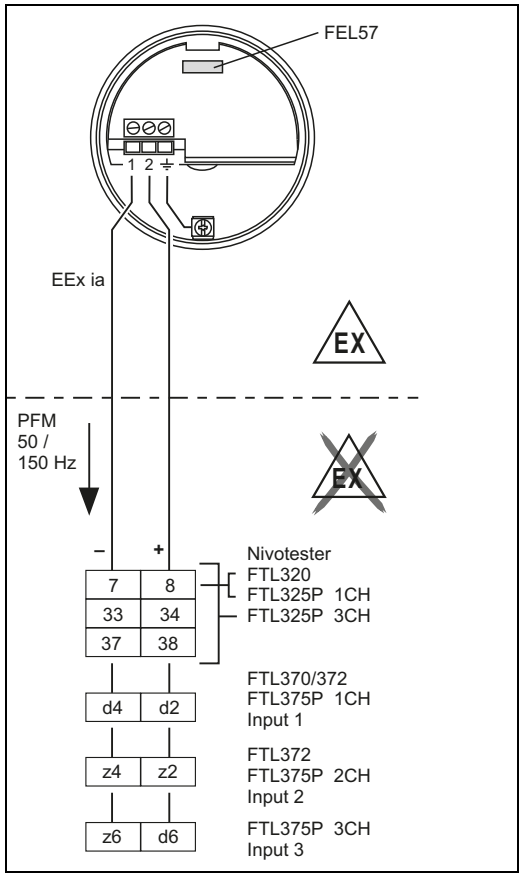
**Two-wire connection for separate switching unit**

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 test”:
After interruption of the power supply, a test cycle is activated which checks the sensor and electronics without any change in level. Approved for overfill protection acc. to WHG (German Water Resources Act). The following can be switched at the electronic insert:

- **Standard (STD):**
  Corrosion of the fork unlikely;
  simulation approx. 8 s
  tuning fork exposed – covered – exposed.
  For proof testing, the Nivotester tests the sensor's level notification function.
- **Extended (EXT)**:
  Corrosion of the fork possible;
  Simulation approx. 41 s: tuning fork exposed – covered – corroded – exposed.
  For proof testing, the Nivotester tests the sensor's level notification function and fault notification (alarm) function.

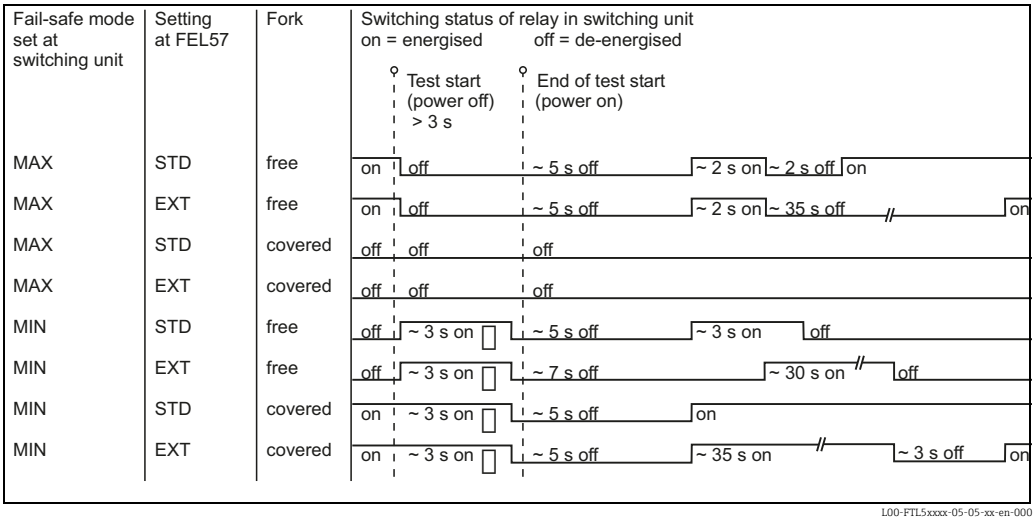



The check is activated and monitored at the switching unit.

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.
Maximum cable length up to 1000 m (3281 ft).

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.

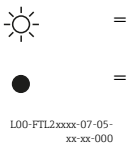
**Switching behavior of the connected device:**

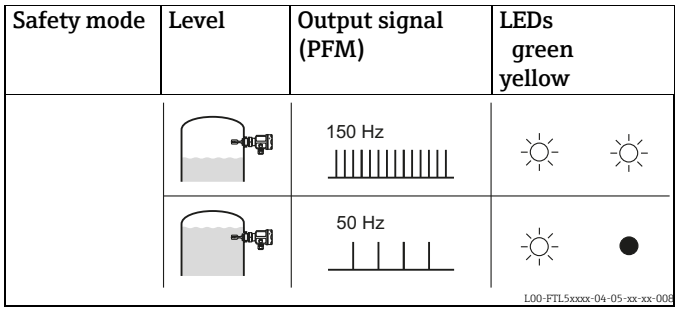



* De-energized on power supply failure

Please note this switching response and function of the plant especially when replacing a Liquiphant incorporating electronic insert EL17Z or FEL37 with a Liquiphant M incorporating electronic insert FEL57.

**Output signal**




**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**

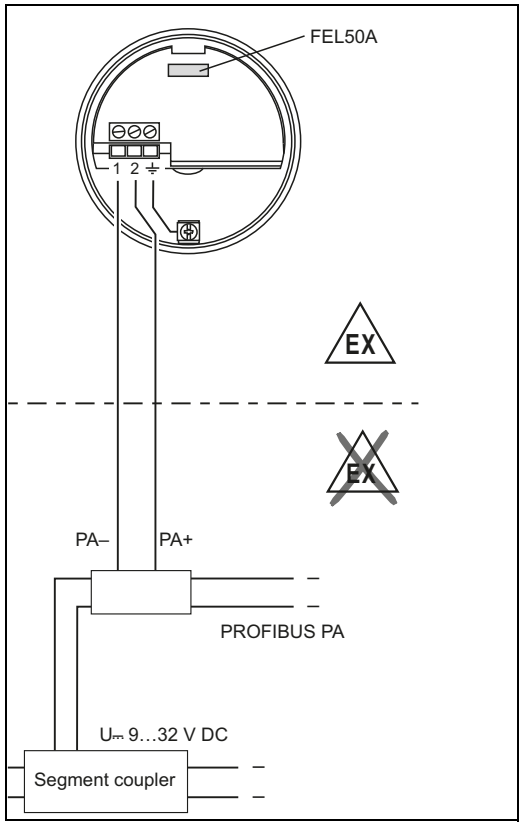
**Two-wire connection for power supply and data transfer**

For connecting to PROFIBUS PA

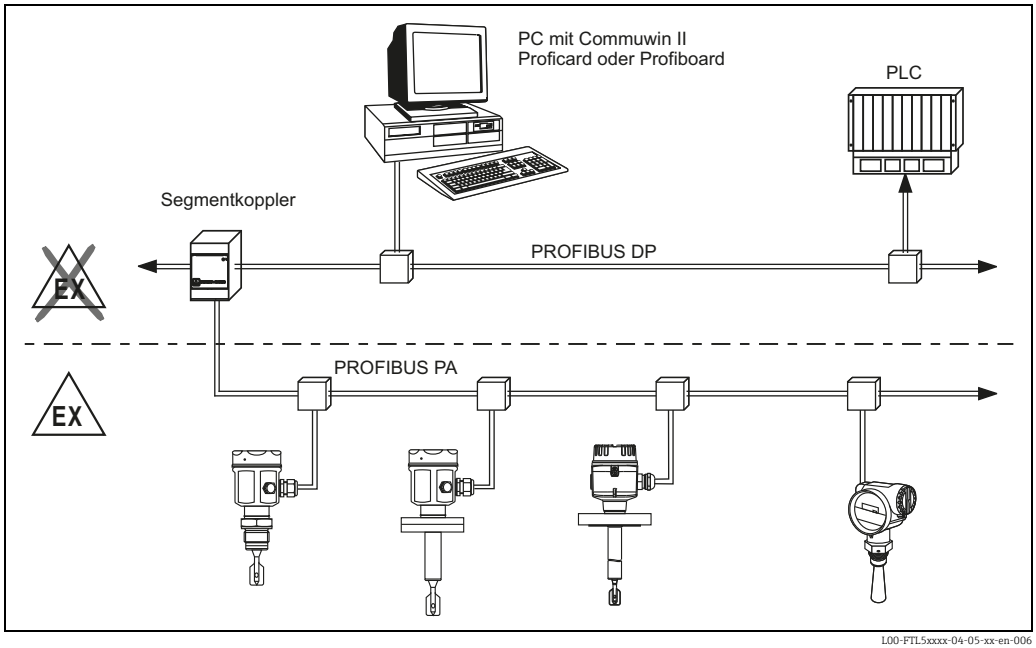
Additional functions:

– 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 switch.

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




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**Output signal**

☼ = lit

● = unlit

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| Setting | Level | LEDs green | LEDs yellow | FEL50A |
|---|---|---|---|---|
| not inverted |  | ☼ | ● | OUT_D = 0<br>PA bus signal |
| |  | ☼ | ☼ | OUT_D = 1<br>PA bus signal |
| inverted |  | ☼ | ☼ | OUT_D = 0<br>PA bus signal |
| |  | ☼ | ● | OUT_D = 1<br>PA bus signal |

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**Signal on alarm**

Failure information can be opened using the following interfaces:
Yellow LED flashing, status code, diagnostic code; see BA00198F

# Electronic insert FEL50D (density)

**Power supply**

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

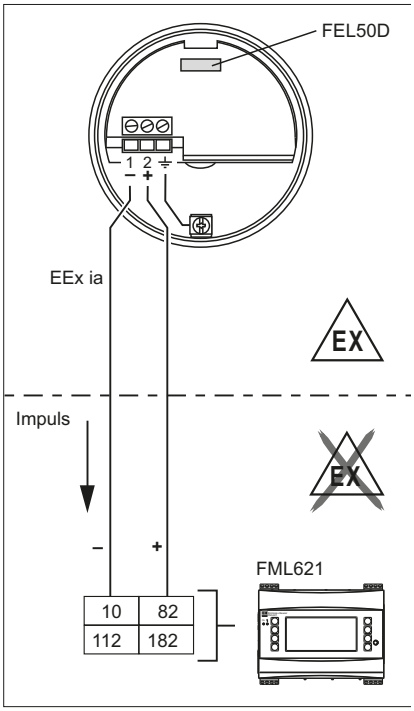
**Electrical connection**

**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




**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 option, 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 transmitted to the Density Computer FML621.

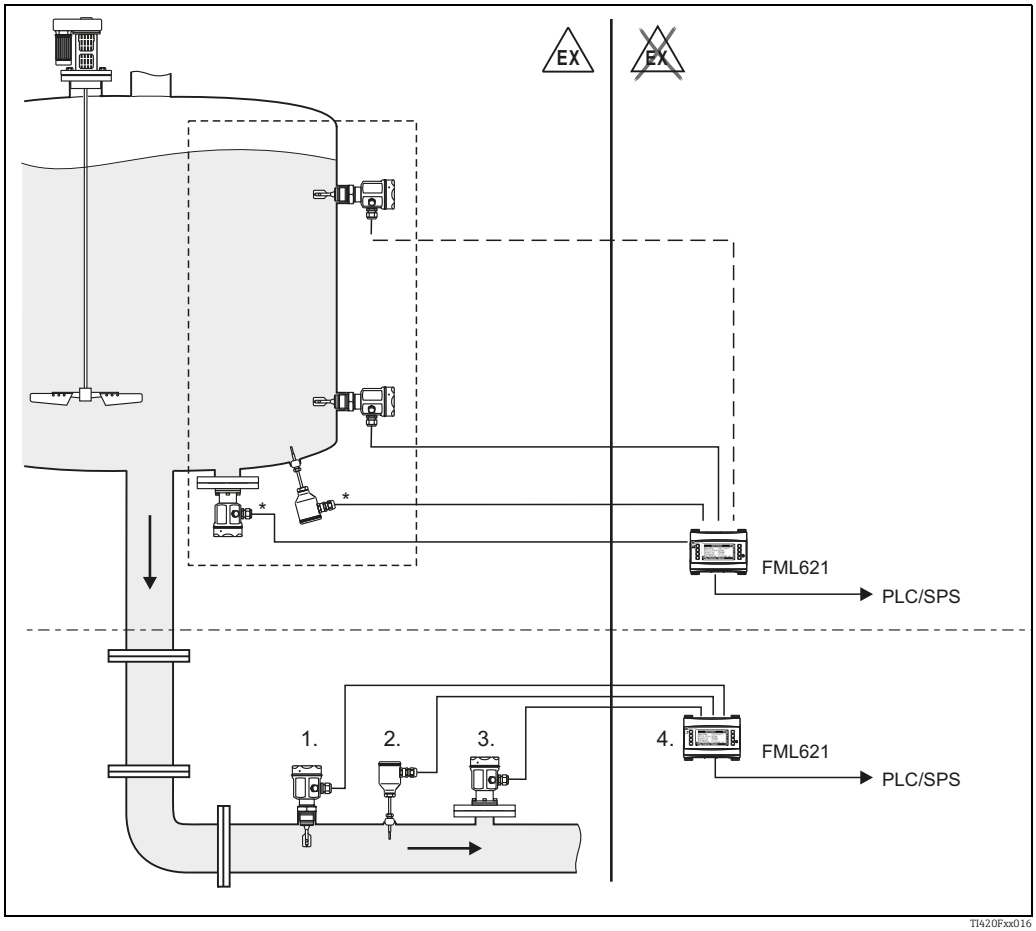
**Special adjustment** (see ordering information for additional option, special adjustment, density $H_2O$ (K) or special adjustment, density $H_2O$ with 3.1 certificate (L))
- Here, three fork parameters are determined to describe the sensor characteristics, indicated in the adjustment report and provided with the product.
  These parameters must be transmitted 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 can be downloaded from www.endress.com => Download.

**Operating principle**

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




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

**Light signals**

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

# Connection and function

**Connecting cables**

- Electronic inserts: cross-section ≤ 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 protection for example

MIN = minimum safety:
The output switches to the power fail response when the fork is exposed
For use with dry running protection for example

**Switching time**

When fork is covered: approx. 0.5 s
When fork is exposed: approx. 1.0 s
Additionally configurable for PROFIBUS PA:
0.5-60 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)

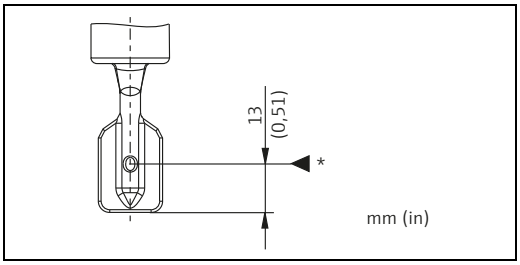
Medium density (water): 1 g/cm³ (SGU)

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)




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** 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**

approx. 2 mm (0.08 in)

**Influence of medium temperature**

max. +1.8 to −2.8 mm (−50 to +150 °C / -58 to 302 °F)

**Influence of medium density**

max. +4.8 to −3.5 mm ((0.5 to 1.5 g/cm³ (SGU))
max. +0.19 to -0.14 in

**Influence of medium pressure**

max. 0 to −2.5 mm (−1 to 64 bar (-14.5 to 928 psi))
max. 0 to -0.1 in

**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)

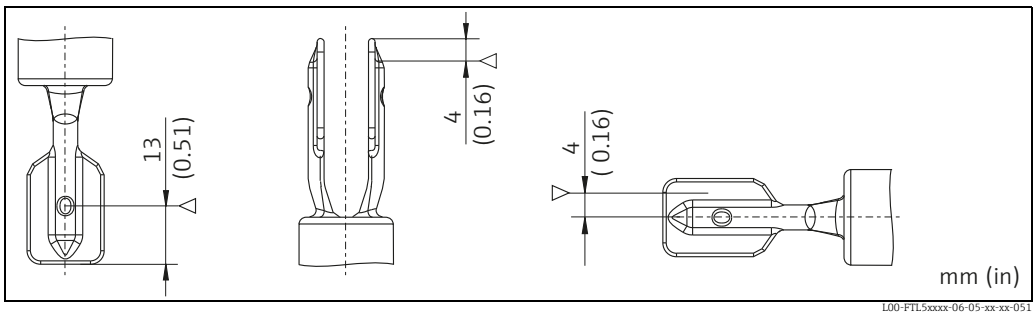
# Operating conditions

## Installation

### 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).




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

Note!

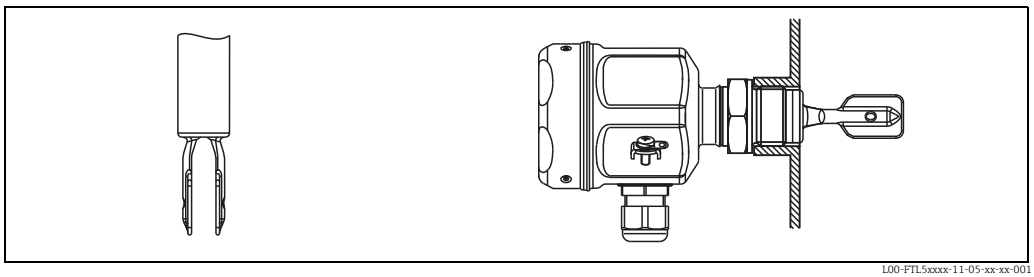
- The switch points of the Liquiphant **M** are at other positions to those of the previous version Liquiphant **II**.
- Minimum distance between the tip of the fork and the tank wall or pipe wall: 10 mm

## Examples of mounting

Examples of mounting with regard to the viscosity ν of the liquid and the tendency to form buildup

**Optimum mounting, without problem even with high viscosity:**

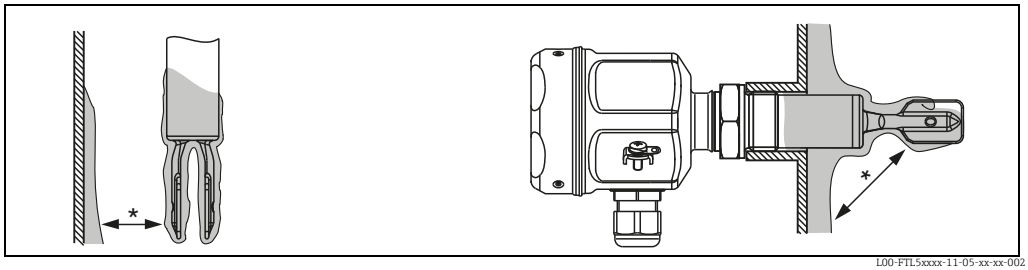
Position the fork so that the narrow edge of the tines is vertical to ensure that the liquid can run off easily.




*Vertical from above* *Flush-mounted from the side*

**With buildup on the tank walls:**

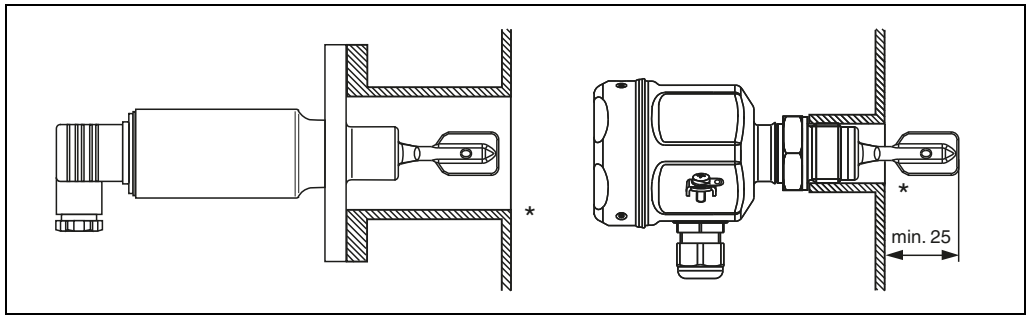
* Ensure that there is sufficient distance between the buildup expected on the tank wall and the fork.




*Vertical from above* *Protruding into the tank from the side*

**Mounting positions in the case of low viscosity up to 2000 mm²/s (cSt):**

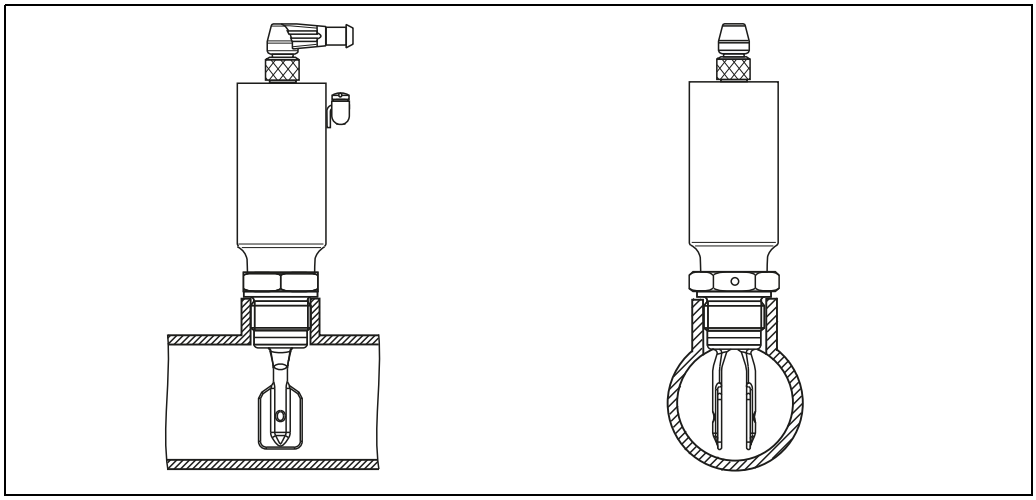
* Deburr the nozzle surfaces




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**Mounting in piping from 2"**

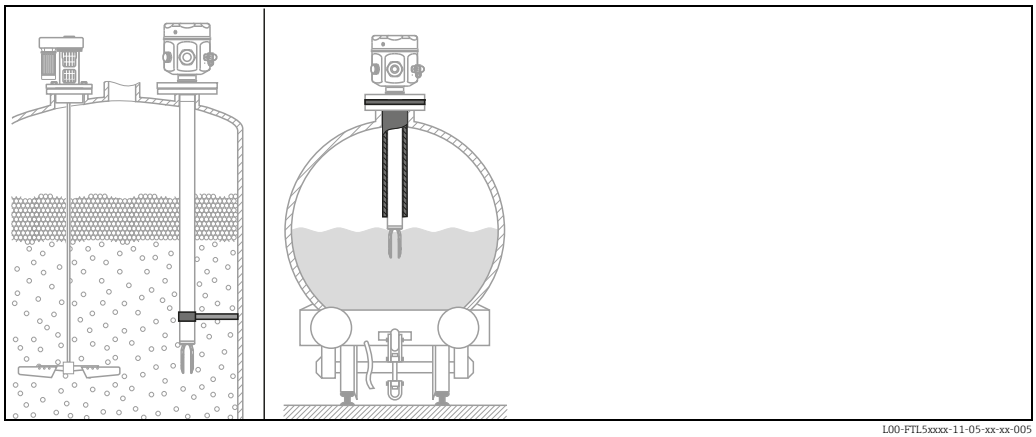
Flow velocities up to 5 m/s for viscosity of 1 mm²/s (cSt) and density 1 g/cm³ (SGU).
(Check the function for other medium conditions.)



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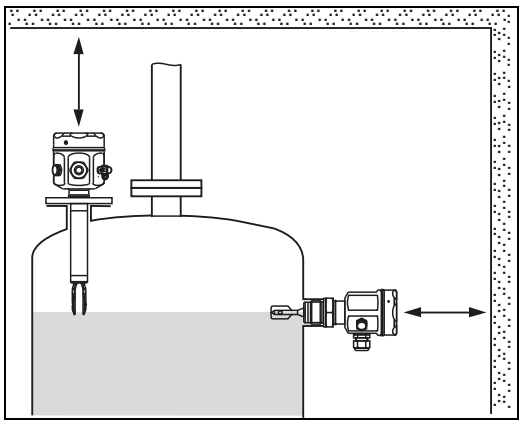
**Dynamic load**

Support the Liquiphant M FTL51(H) in the event of a severe dynamic load.



L00-FTL5xxxx-11-05-xx-xx-005

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



L00-FTL5xxxx-11-05-xx-xx-006

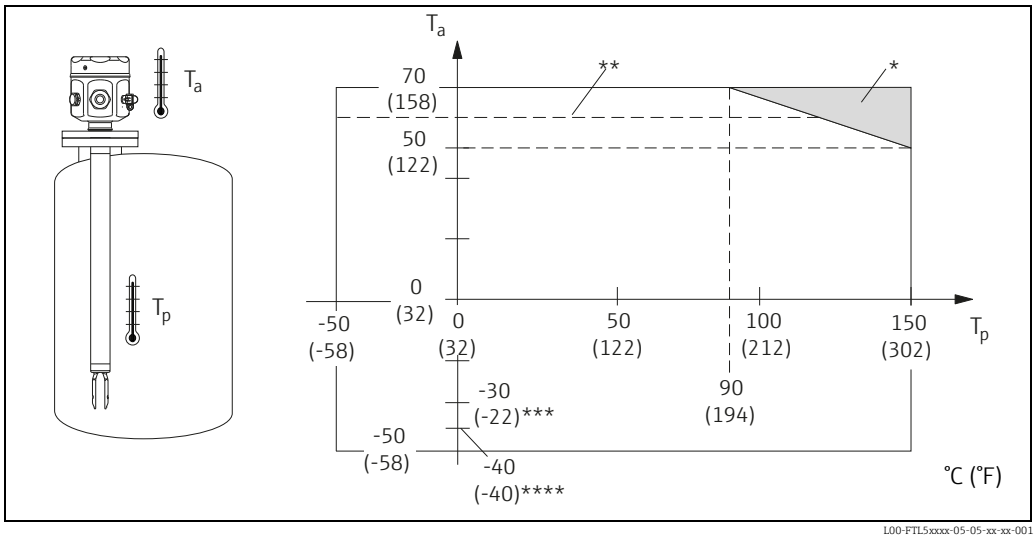
**Orientation**

- FTL50(H) and FTL51(H) with short pipe up to approx. 500 mm (19.7 in): any position
- FTL51(H) 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:




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* Additional temperature range for devices with a temperature spacer or pressure-tight feedthrough.
** Maximum ambient temperature with FEL50D/FEL50A in hazardous areas.
*** The following applies for devices with a compact housing according to version D3, E3: -30 °C ≤ Ta ≤ +70 °C
**** The following applies for the F16 housing: -40 °C ≤ Ta ≤ +70 °C

**Storage temperature**

−50 to +80 °C (-58 to 176 °F)

**Installation height 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** |
|---|---|---|---|---|---|---|
| Compact housing with valve connector Pg11/NPT ½ | X | – | – | – | – | – |
| Compact housing with 5 m (16 ft) cable tail | – | X | – | X | – | – |
| Compact housing with M12x1 connector (52010285) 316L (metal) | – | X | – | X | – | – |
| Compact housing with elbowed connector (52024216) / L= 5 m (16 ft), without integrated LEDs | – | X | – | X | X | – |
| Compact housing with elbowed connector (52018763) / L= 5 m (16 ft), with integrated LEDs | – | X | – | X | X | – |
| 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)
In the event of increased vibrations, the following additional option is recommended: feature "060" version "P" 100 bar (1450 psi) process pressure.

**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

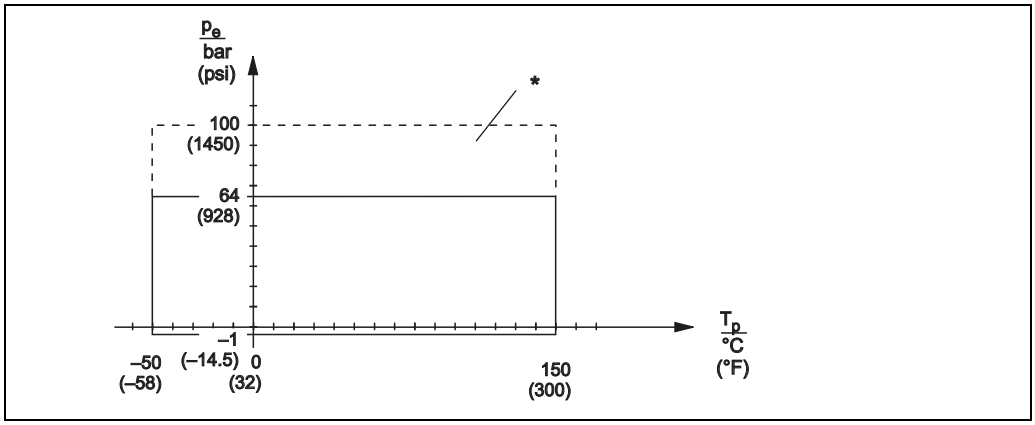
**Medium temperature**

−50 to +150 °C (-58 to 302 °F); for exceptions, see "Process connections"

**Thermal shock**

≤ 120 °C/s (248 °F/s)

**Medium pressure $p_e$**




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* Permitted pressure rating when the "100 bar (1450 psi)" option is selected (see "Product structure FTL51", feature 060, from → 📄 44). See "Process connections" → 📄 33 for exceptions.
Canadian CRN approval: Details about the maximum pressure values are available in the download area at "www.endress.com/download".

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 their stability-temperature property, the materials 1.4435 and 1.4404 are identical and are grouped together in EN 1092-1 Tab. 18 under 13E0. The chemical composition of the two materials can be identical.
- ASME B 16.5 - 2013 Tab. 2-2.2 F316
- ASME B 16.5 - 2013 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.

**Test pressure**

$p_e$ = 64 bar (928 psi):
- ≤ 100 bar (1450 psi) or 1.5 times the medium pressure $p_e$
- Sensor burst pressure at 200 bar (2900 psi)

$p_e$ = 100 bar (1450 psi):
- ≤ 150 bar (2175 psi) or 1.5 times the medium pressure $p_e$)
- Sensor burst pressure at 400 bar (5800 psi)

Note!
The device function is restricted during pressure testing.

**State of aggregation**

Liquid

**Density**

0.7 g/cm³ (SGU) = delivery status

0.5 g/cm³* (SGU) can be adjusted via switches

* Density settings for the compact housing on request

**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.

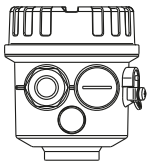
**Design**

**Summary of all electrical and mechanical versions**

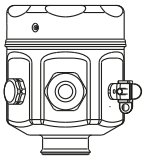
*Housing*


L00-FTL5xxxx-03-05-xx-xx-019

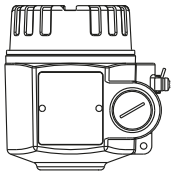
**Compact**
Pipe housing (316L)


L00-FTL5xxxx-03-05-xx-xx-001

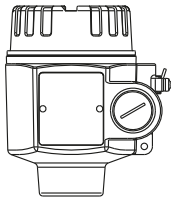
**F16**
Polyester (PBT)


L00-FTL5xxxx-03-05-xx-xx-002

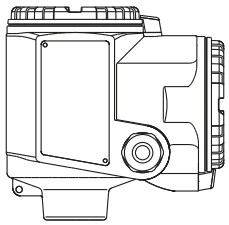
**F15**
Stainless steel (316L)


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**F17**
Aluminum
Housing coated


L00-FTL5xxxx-03-05-xx-xx-033

**F27**
Stainless steel (316L)
**F13**
Aluminum
(also for Ex d/XP),
housing coated


L00-FTL5xxxx-03-05-xx-xx-004

**T13**
Aluminum with separate connection compartment (also Ex de and Ex d), housing coated

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

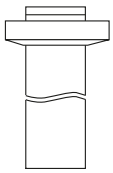

L00-FTL5xxxx-03-05-xx-xx-000

| | |
|---|---|
| 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 |

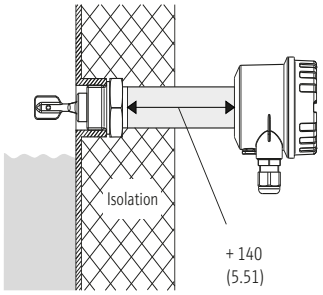
* Electronics also available as compact housing. The electronics cannot be exchanged!
If the housing is ordered with a cable gland: the cable gland is ready-mounted upon delivery. A second cable gland is included in conjunction with FEL54.

*Temperature spacer and pressure-tight feedthrough*

**Temperature spacer** (optional)
Provides sealed insulation for the vessel and normal ambient temperatures for the housing.


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**Pressure-tight feedthrough** (optional)
Protects the housing from pressures up to 100 bar (1450 psi) if the sensor is damaged. Provides sealed insulation for the vessel and normal ambient temperatures for the housing.



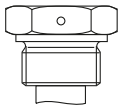
L00-FTL5xxxx-06-05-xx-xx-091

*Process connections*



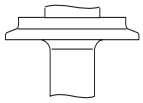
L00-FTL5xxxx-03-05-xx-xx-006

G ¾, DIN ISO 228/I
R ¾, EN10226
NPT ¾, ASME B 1.20.1
(AF 32)



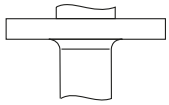
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G 1, DIN ISO 228/I
R 1, EN10226
NPT 1, ASME B 1.20.1
(AF 41)



L00-FTL5xxxx-03-05-xx-xx-008

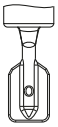
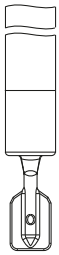
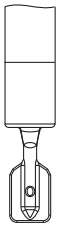
Diverse
hygienic and
aseptic
connections



L00-FTL5xxxx-03-05-xx-xx-009

Flanges as per DIN,
ASME,
JIS
from DN 25 / 1"

*Sensors*

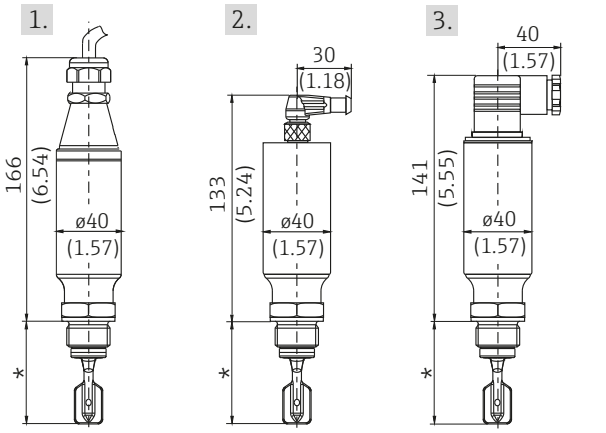
| Compact, with extension pipe up to 3 m (up to 6 m on request) or special "length L II" (see → 🖹 33ff.) | Compact | Length L | Length L II |
|---|---|---|---|
| |  |  |  |
| | | L00-FTL5xxxx-03-05-xx-xx-018 | |
| $p_e$ = bar/psi | 64/928 | 64/928<br>100/1450 | 64/928<br>100/1450 |

**Dimensions**

Dimensions in mm (in)!

**Housing FTL50(H), FTL51(H) with sensor FTL50(H)**

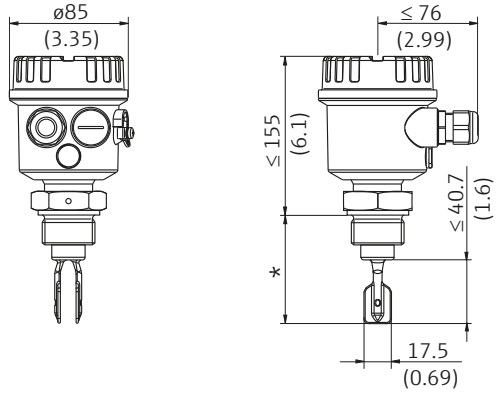
*Compact housing, primarily for hygiene applications*




L00-FTL5xxxx-06-05-xx-xx-085

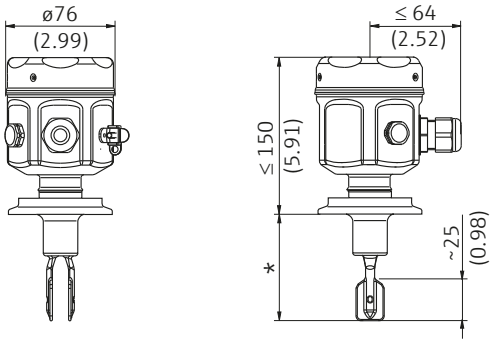
1. 5 m cable
2. M12 connector
3. Pg11/NPT ½ connector

*Polyester housing F16*



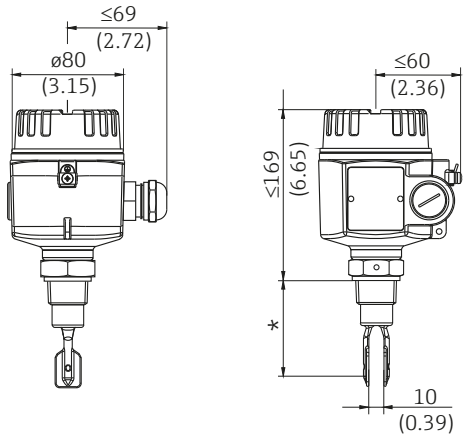

L00-FTL5xxxx-06-05-xx-xx-086

*F15 stainless steel housing primarily for hygiene applications*



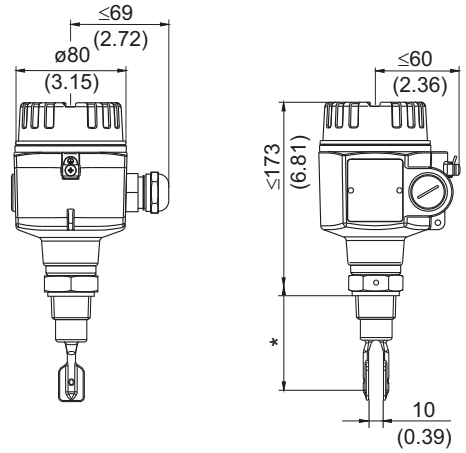

L00-FTL5xxxx-06-05-xx-xx-087

*Aluminum housing F17*



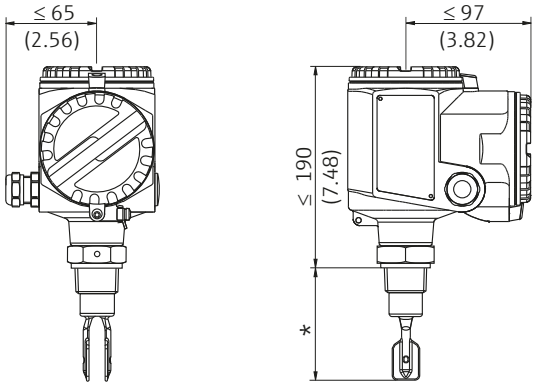

L00-FTL5xxxx-06-05-xx-xx-088

*Stainless steel housing (316L) F27*
*Aluminum housing F13*




L00-FTL5xxxx-06-05-xx-xx-089

*Aluminum housing T13*
*with separate connection compartment*

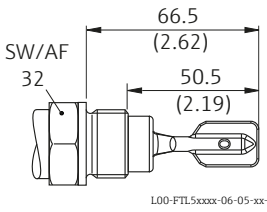
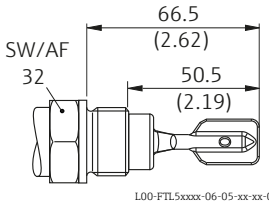
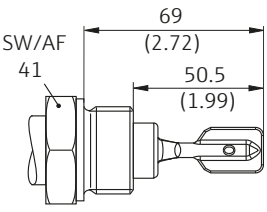
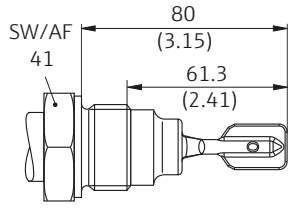
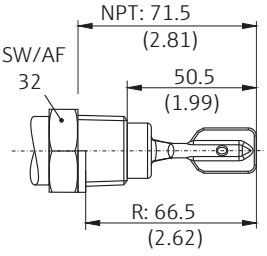
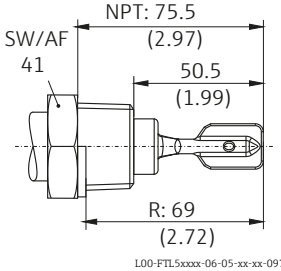


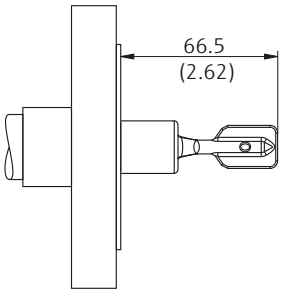
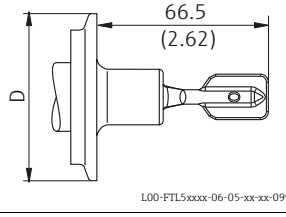
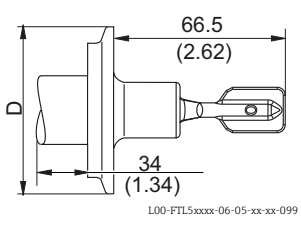
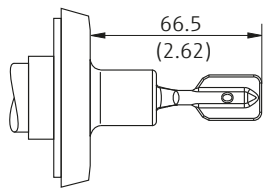
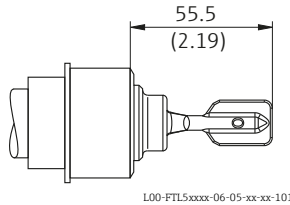

L00-FTL5xxxx-06-05-xx-xx-090

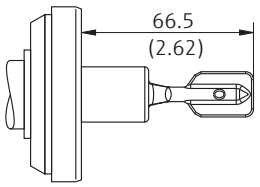
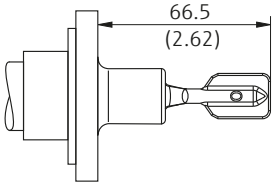
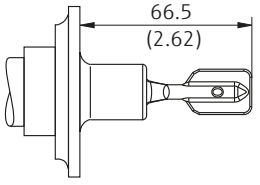
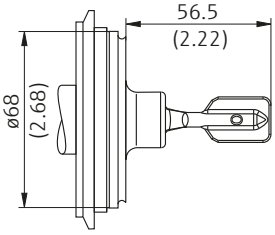
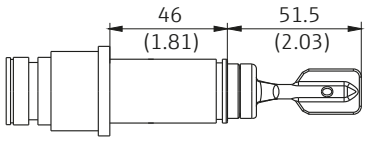
* See "Process connections"

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

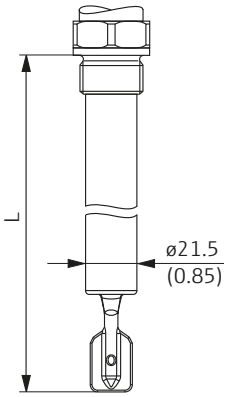
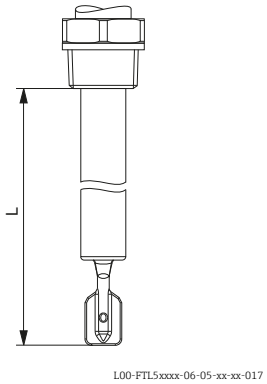
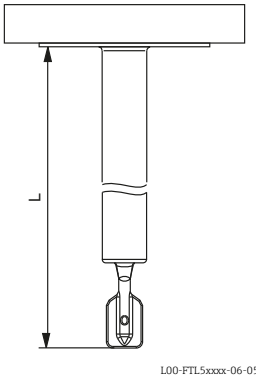
**Process connections for FTL50(H) and FTL51(H)**

| Process connection | | Dimensions | Accessories | Pressure<br>Temperature |
|---|---|---|---|---|
| **G ¾**<br>DIN ISO 228/1<br>with defined<br>thread start;<br>Flat seal to DIN 7603:<br>supplied | GQ2<br>GQ6 |  | | ≤ 100 bar / only FTL51<br>(≤ 1450 psi)<br><br>≤ 150 °C (302 °F) |
| **G ¾**<br>DIN ISO 228/1<br>with defined<br>thread start<br><br>for flush-mounted<br>installation in<br>weld-in adapter | GQ2<br>GQ6 |  | **Weld-in adapter**<br>(with defined<br>thread start)<br>with silicone O-<br>ring only FTL50,<br>FTL50H<br><br>See "Accessories"<br>In conformity with<br>FDA* | ≤ 25 bar (363 psi)<br>≤ 150 °C (302 °F)<br><br>≤ 40 bar (580 psi)<br>≤ 100 °C (212 °F) |
| **G 1**<br>DIN ISO 228/1<br><br>Flat seal to DIN 7603:<br>supplied | GR2<br>GR6 |  | | ≤ 100 bar / only FTL51<br>(1450 psi)<br><br>≤ 150 °C (302 °F) |
| **G 1**<br>DIN ISO 228/1<br>with defined<br>thread start<br><br>With seal surface<br>for flush-mounted<br>installation in<br>weld-in adapter | GW2 |  | **Weld-in adapter**<br>(with defined<br>thread start)<br>with silicone O-<br>ring<br><br>See "Accessories"<br>In conformity with<br>FDA* | ≤ 25 bar (363 psi)<br>≤ 150 °C (302 °F)<br><br>≤ 40 bar (580 psi)<br>≤ 100 °C (212 °F) |
| **NPT ¾**<br>ASME B 1.20.1<br><br>or<br><br>**R ¾**<br>DIN/EN 10226 | GM2<br>GM6<br><br>GE2<br>GE6 |  | | ≤ 100 bar / only FTL51<br>(1450 psi)<br><br>≤ 150 °C (302 °F) |
| **NPT1**<br>ASME B 1.20.1<br><br>or<br><br>**R 1**<br>DIN/EN 10226 | GN2<br>GN6<br><br>GF2<br>GF6 |  | | ≤ 100 bar / only FTL51<br>(1450 psi)<br><br>≤ 150 °C (302 °F) |
| * FDA-compliant material in accordance with 21 CFR Part 177.2600 (silicone) | | | | |

| Process connection | | Dimensions | Accessories | Pressure<br>Temperature |
|---|---|---|---|---|
| **Flanges**<br>ASME B 16.5<br>EN 1092-1<br>(DIN 2527 B)<br>JIS B2220 | A##<br>B##<br>C##<br>F##<br>N##<br>K## |  | Seal<br>depending on<br>design<br>installed on site | See nominal pressure<br>of flange, however<br>≤ 100 bar (1450 psi)<br>(only FTL51)<br>≤ 150 °C (302 °F) |
| | For higher chemical-resistance, AlloyC22-plated flanges are available. The flange carrier material is made of 316L and is welded with a 2 to 3 mm (0.08 to 0.12 in) thick AlloyC22 disk. | | | |
| **Tri-Clamp**<br>ISO 2852 DN25-38<br>(1 to 1 ½")<br>DIN 32676 DN25-40<br>ø D = 50.5 mm<br>(1.99 in)<br><br>ISO 2852 DN40-51<br>(2")<br>DIN 32676 DN50<br>ø D = 64.0 mm<br>(2.52 in) | TC2<br>TE2 |  | Clamping ring and<br>front seal<br>installed on site** | ≤ 25 bar (363 psi)<br>≤ 150 °C (302 °F) |
| | TE2: Mounting with NA connector only in conjunction with housing T13, F13 and compact housing.<br>TC2: Mounting with NA connector only in conjunction with compact housing. | | | |
| **Tri-Clamp NA Connect** only for<br>FTL50H, FTL51H<br>ISO 2852 DN25-38<br>(1 to 1 ½")<br>DIN 32676 DN25-40<br>ø D = 50.5 mm<br>(1.99 in)<br><br>ISO 2852 DN40-51<br>(2")<br>DIN 32676 DN50<br>ø D = 64.0 mm<br>(2.52 in) | TD2<br>TF2 |  | Clamping ring and<br>front seal<br>installed on site** | ≤ 25 bar (363 psi)<br>≤ 150 °C (302 °F) |
| | TD2, TF2: Mounting with NA connector only in conjunction with housing F15, F16 and F17. | | | |
| **Threaded pipe joint**<br>DN 32<br>DN 40<br>DN 50<br>DIN 11851<br><br>with thread adapter nut | MA2<br>MC2<br>ME2 |  | Sealing ring with<br>collar,<br>installed on site** | DN 32, DN 40:<br>≤ 40 bar (580 psi) up to<br>100 °C (212 °F)<br>≤ 25 bar (363 psi) up to<br>140 °C (284 °F)<br><br>DN 50:<br>≤ 25 bar (363 psi)<br>≤ 140 °C (284 °F) |
| **Flush-mounted for weld-in adapter**<br>Factory standard<br>Endress+Hauser with<br>silicone seal<br>and thread adapter nut:<br>supplied | EE2 |  | **Weld-in adapter**<br>(fork can be<br>positioned)<br><br>See "Accessories"<br>In conformity with<br>FDA* | ≤ 40 bar (580 psi)<br>≤ 100 °C (212 °F)<br><br>≤ 25 bar (363 psi)<br>≤ 150 °C (302 °F) |

| Process connection | | Dimensions | Accessories | Pressure<br>Temperature |
|---|---|---|---|---|
| **Aseptic**<br>DN 50<br>DIN 11864-1<br>Form A<br>for pipe DIN 11850<br>with thread adapter nut | HE2 |  | sealing ring<br>installed on site** | ≤ 25 bar (363 psi)<br>≤ 140 °C (284 °F) |
| **DRD**<br>With clamped flange | PE2 |  | Welding flange with<br>PTFE flat seal<br>(fork can be positioned)<br><br>See "Accessories" (or installed on site)**<br><br>In conformity with FDA* | ≤ 40 bar (580 psi)<br>≤ 100 °C (212 °F)<br><br>≤ 25 bar (363 psi)<br>≤ 150 °C (302 °F) |
| * FDA-compliant material in accordance with 21 CFR Part 177/2600 (silicone), 21 CFR Part 177.1550 (PTFE)<br>** The maximum temperature and the maximum pressure are dependent on the clamping ring used and the seal used. The lowest value applies in each case. | | | | |
| **SMS**<br>2"<br>(DN 51)<br>with thread adapter nut | UE2 |  | sealing ring<br>installed on site** | ≤ 25 bar (363 psi)<br>≤ 140 °C (284 °F) |
| **Varivent**<br>for piping<br>≥ DN 65<br>≥ O.D. 3"<br>≥ I.P.S. 3" | WE2 |  | Clamping ring and O-ring seal,<br>installed on site** | However, see specification as per Tuchenhagen VARIVENT-Inline housing:<br><br>≤ 25 bar (363 psi)<br>≤ 150 °C (302 °F) |
| **Ingold fitting**<br><br>DN 25<br>Fitting length 46 mm (2.52 in)<br><br>Thread adapter nut G 1 ¼<br><br>with O-ring seal, EPDM (FDA-compliant, USP Class VI*) | TT2 |  | | ≤ 16 bar (232 psi)<br>≤ 150 °C (302 °F) |
| * FDA-compliant material in accordance with 21 CFR Part 177/2600 (EPDM)<br>** The maximum temperature and the maximum pressure are dependent on the clamping ring used and the seal used. The lowest value applies in each case. | | | | |

Sensor length L for FTL51 and FTL51H, depending on process connection

| Thread: G ¾ G 1 | Thread: NPT ¾ NPT1 R ¾ R 1 | Flanges and flange-like process connections |
|---|---|---|
|  |  |  |
| From seal surface of thread adapter | From lower edge of thread | |

Customized length L:
- 117 mm to 3000 mm (4,6 to 115 in); special version (TSP) on request up to 6000 mm (235 in)
- Length tolerances L: < 1 m (–5 mm), 1 to 3 m (–10 mm) / < 3.3 ft (-0.2 in), 3.3 to 9.8 ft (-0.39 in)

Note!
The switch points of Liquiphant **M** are at other positions to those of the previous version Liquiphant **II**.
Special length "L II":
With vertical mounting from above approximately the same switch point as for the Liquiphant II FTL360, FTL365, FDL30, FDL35

*"L II" depends on process connection:*

L = 115 mm (4.53 in) for flanges and flange-like process connections such as Clamp, DRD...
L = 99 mm (3.9 in) for threads NPT and R (BSPT)
L = 118 mm (4.65 in) for threads G1 (BSP 1)
L = 115 mm (4.53 in) for threads G ¾ (BSP ¾)
L = 104 mm (4.09 in) for flush-mounted 1" (G1" Endress+Hauser welding bosses)

**Weights**

See "Ordering information" → 44ff

**Materials and surfaces**

Material specifications as per AISI and DIN-EN.

**Parts in contact with process**

- Process connection and extension pipe:
  - FTL5x → 316L (1.4404 or 1.4435) optional 2.4602 (AlloyC22)
  - FTL5xH → 316L (1.4435)
- Tuning fork: 316L (1.4435) optional 2.4602 (AlloyC22)
- Flanges:
  - ASME: 316/316L
  - EN: 316L (1.4404)
  - JIS: 316L (1.4404)
- Flange plating: AlloyC22 (2.4602)
- Flat seal for process connection G ¾ or G 1: elastomer fiber, asbestos-free

*Surface roughness*

Choice of mechanically polished surface roughness (version → probe length → type):

- Ra < 1.5 µm (59.1 µin)
- Ra < 0.3 µm (11.8 µin), 3-A and EHEDG approval and CoC-ASME-BPE

Note!
The surface is electropolished if the additional option "B" or "E" (CoC - ASME BPE) is selected in addition to surface roughness quality Ra < 0.3 µm (11.8 µin). The surface roughness is then: Ra < 0.38 µm (15.0 µin).
With this combination, the wetted parts are made of 316L (1.4435) in accordance with BN2 (delta-ferrite content < 1 %).

**Parts with no process contact**

- Tuning fork/housing seal: EPDM
- Temperature spacer: 316 L (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)
    With B or C approval (→ 📄 44 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
- 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
- Compact housing (valve connector or M12 connector): 316L (1.4435)

**Process connections**

- Parallel thread G ¾, G 1 to DIN ISO 228/I with flat seal to DIN 7603
- Tapered thread R ¾, R 1 to EN10226
- Tapered thread ¾ -14 NPT, 1 - 11½ NPT as per ASME B 1.20.1
- Flush-mounted installation with weld-in adapter to factory standard Endress+Hauser (G ¾, G 1)
- Flush-mounted installation with weld-in adapter to factory standard Endress+Hauser (1"), sensor can be positioned
- Tri-Clamp 1½", 2" to ISO 2852
- Threaded pipe joint DN 32, 40, 50 to DIN 11851
- Aseptic connection DN 50 to DIN 11864-1
  Form A for pipe DIN 11850
- SMS connection 2" (DN 51)
- DRD flange
- Varivent® DN 50 (50/40) to factory standard Tuchenhagen
- Flanges: as per EN/DIN 1092-1 from DN 25, as per ASME B 16.5 from 1", as per JIS B2220 (RF)
- Ingold DN25 fitting length 46 mm (1.81 in) with thread adapter nut G1 ¼

Further details at Ordering information → 📄 44.

# Human interface

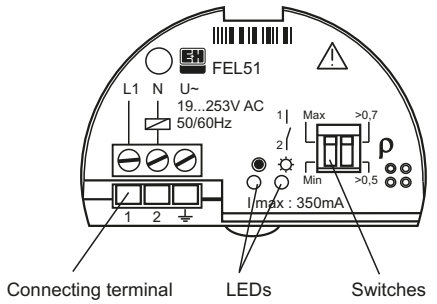
## Electronic inserts

**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




L00-FTL5xxxx-03-05-xx-en-001

**With FEL57:**

- 2 switches for density change and 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



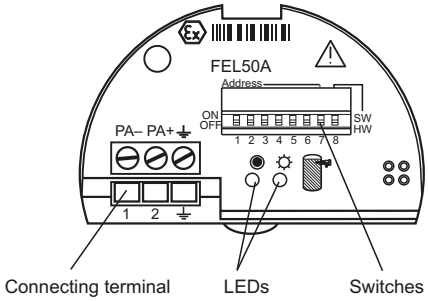
L00-FTL5xxxx-03-05-xx-xx-013

**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:**

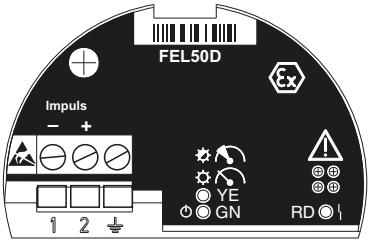
- 8 switches for configuring the device address
- green LED to indicate operational status, pulsing to indicate communication;
- yellow LED to indicate the switching status, flashes in the event of corrosion damage on sensor or if the electronics are defective




L00-FTL5xxxx-03-05-xx-en-002

**With FEL50D:**

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




TI328Fxx004

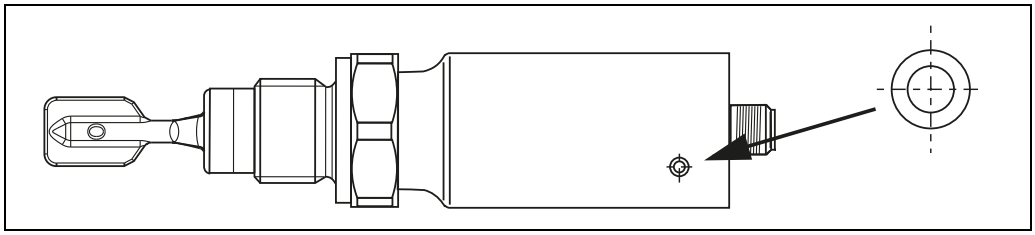
## Compact housing

**Function test with test magnet**

*Versions AC, DC-PNP and NAMUR:*

During the test, the current state of the electronic switch is reversed.

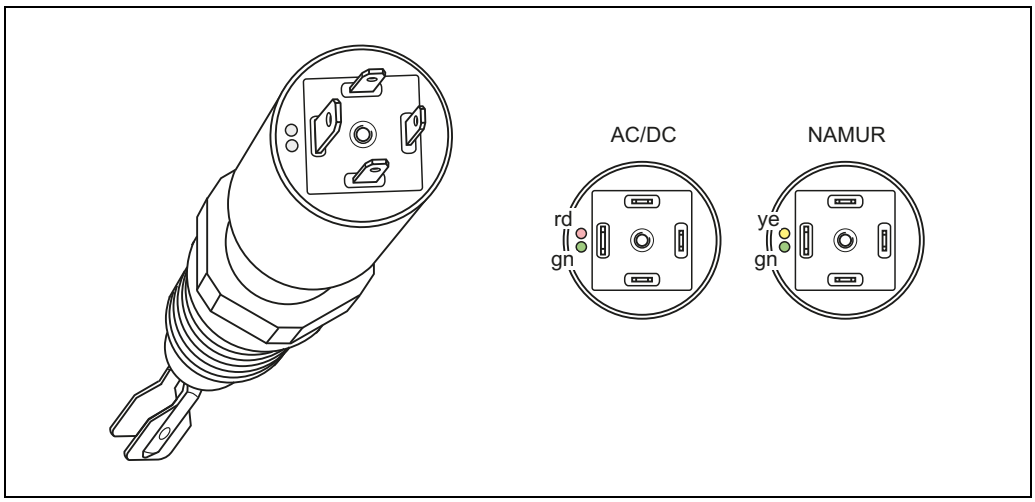
Hold the test magnet against the marking on the nameplate: The switching status is changed.



L00-FTL5xxxx-19-05-xx-xx-001

### Light signals

*Versions AC and DC-PNP with valve connector or cable tail*




L00-FTL5xxxx-07-05-xx-xx-005

**Green light (gn) lights up (AC/DC):**

Liquiphant M is connected to the power supply and is operational.

**Green light (gn) flashing (NAMUR):**

Liquiphant M is connected to the power supply and is operational.

**Red light (rd) lights up (AC/DC):**

MAX application mode (overfill protection): sensor is immersed in liquid.
MIN application mode (dry running protection): sensor is not immersed in liquid.

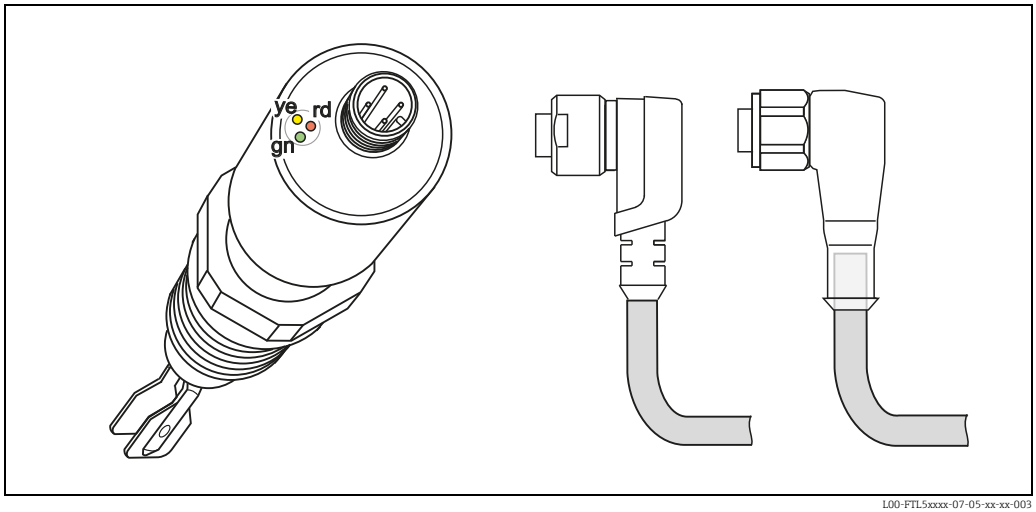
**Yellow light (ye) lights up (NAMUR):**

MAX application mode (overfill protection): sensor is not immersed in liquid.
MIN application mode (dry running protection): sensor is immersed in liquid.

**Red light (rd) flashing (AC/DC):**

Liquiphant M has detected a fault.

*Version NAMUR and DC-PNP with M12x1 round connector 316L*




L00-FTL5xxxx-07-05-xx-xx-003

**Green light (gn) lights up (DC-PNP):**

Liquiphant M is connected to the power supply and is operational.

**Green light (gn) flashing with 1 Hz (NAMUR):**

Liquiphant M is connected to the power supply and is operational.

**Yellow light (ye) lights up (DC-PNP):**

Sensor is immersed in liquid.

**Yellow light (ye) lights up (NAMUR):**

MAX application mode (overfill protection): sensor is not immersed in liquid.
MIN application mode (dry running protection): sensor is immersed in liquid.

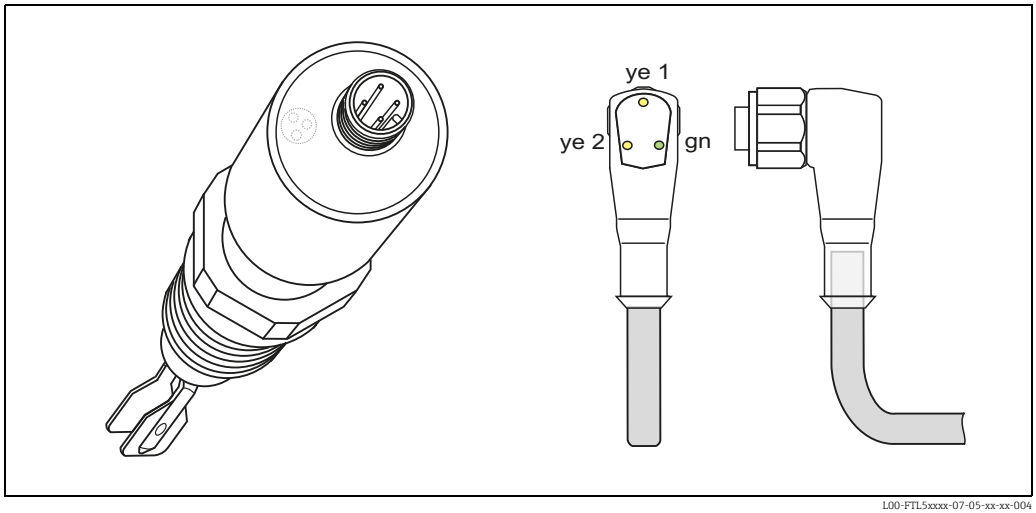
**Red light (rd) flashing (DC-PNP):**

Liquiphant M has detected a fault.

**Green light (gn) flashing with 0.3 Hz (NAMUR):**

Liquiphant M has detected a fault.

*Version DC-PNP with M12x1 round connector 316L*




L00-FTL5xxxx-07-05-xx-xx-004

**Green light (gn) lights up:**

Liquiphant M is connected to the power supply and is operational.

**Yellow light (ye 1) lights up:**

MAX application mode (overfill protection): sensor is not immersed in liquid.
MIN application mode (dry running protection): sensor is not immersed in liquid.

**Yellow light (ye 2) lights up:**

MAX application mode (overfill protection): sensor is immersed in liquid.
MIN application mode (dry running protection): sensor is immersed in liquid.

**Green light (gn) lights up, both yellow lights (ye 1+2) do not light up:**

Liquiphant M has detected a fault.

**Operating concept**

Onsite configuration

# Certificates and approvals

**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**

The approved process connections are listed in the CRN-approval (Canadian Registration Number). Details about the maximum pressure values are available in the download area at "www.endress.com/download".
CRN-approved devices are marked on the name plate with the registration number
CRN: 0F15899.2C.

**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.

**Note:**

A separate analysis must be performed for pressure instruments that are part of safety equipment designed to protect a pipe or vessel from exceeding allowable limits (safety accessory in accordance with Pressure Equipment Directive 2014/68/EU, Article 2, point 4).

## 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 for 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 is provided in the Safety Instructions (XA) for the specific device → 51 ff.

| Product | Type | Max. process pressure | Marking | Listing |
|---|---|---|---|---|
| Liquiphant M | FTL50-S/T##...<br>FTL50-P/Q/R##... | 64 bar (928 psi) | Single Seal | CSA/FM |
| | FTL51-S/T##...<br>FTL51-P/Q/R##... | 64/100 bar<br>(928/1450 psi) | Single Seal | CSA/FM |
| | FTL50H-S/T##...<br>FTL50H-P/Q/R##... | 64 bar (928 psi) | Single Seal | CSA/FM |
| | FTL51H-S/T##...<br>FTL51H-P/Q/R##... | 64 bar (928 psi) | Single Seal | CSA/FM |

## General approvals

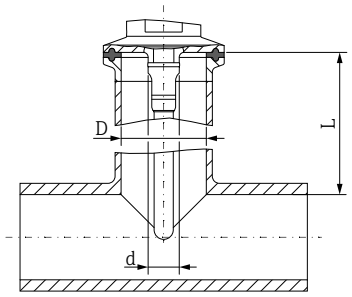
The following approvals are available for Liquiphant M FTL50H, FTL51H:

- EHEDG: certificate
- 3A: 3A certificate (USA), Authorization no. 459: 74-xx Sensors and Sensor Fittings and Connections
- Certificate of Compliance as per ASME BPE-2012. (Order code: additional option = "B" or "E")

| Process connections | Order code | EHEDG + 3A | ASME BPE + CoC | | |
|---|---|---|---|---|---|
| | | | Ra (µm) | | |
| | | | <0.3 | < 0.38 | < 1.5 |
| Thread ISO228 G3/4, 316L, installation<br>Thread ISO228 G1, 316L, installation<br>Accessories: weld-in adapter | GQ2<br>GW2 | X | X | – | X |
| Tri-Clamp ISO2852 DN25-38 (1 to 1-1/2"), 316L<br>Tri-Clamp ISO2852 DN40-51 (2"), 316L | TC2<br>TE2 | X | X | X | X |
| DIN11851 DN32 PN25 slotted nut, 316L<br>DIN11851 DN40 PN25 slotted nut, 316L<br>DIN11851 DN50 PN25 slotted nut, 316L | MA2<br>MC2<br>ME2 | X | X | X | X |
| Flush-mounted, 316L, installation<br>Accessories, weld-in adapter | EE2 | X | X | X | X |
| DIN11864-1 A DN50 pipe DIN11850,<br>Slotted nut, 316L | HE2 | X | X | X | X |
| DRD 65mm, 316L | PE2 | – | – | – | X |
| SMS 2" PN25, 316L | UE2 | – | X | X | X |
| Varivent N pipe DN65-162 PN10, 316L | WE2 | X | X | X | X |
| Ingold fitting 25x46mm, 316L | TT2 | – | – | X | – |

Note!
- Suitable fittings and seals must be used to ensure hygiene-compliant design according ASME BPE etc.
- Surfaces with ASME-BPE option: Ra < 0.38 µm (< 15 µin) electropolished and passivated or Ra < 1.5 µm (59 µin) mechanically polished.
- To avoid risk of contamination, install according to the “Hygienic Equipment Design Criteria (HDC)” as stated in the Subgroup Design Principles of the EHEDG, Doc. 8.

- Suitable fittings and seals must be used to ensure hygiene-compliant design according to the specifications of 3-A SSI and EHEDG Position Paper in its most actual version.
- The leak-tight connections can be cleaned with the cleaning methods (CIP and SIP) usually used in this industry. For CIP (Clean in Place) and SIP (Sterilize in Place) processes the pressure and temperature specifications of the sensor and the process connections must be observed.
- The device has been developed for use in hygienic processes. The wetted materials meet the requirements of FDA and 3-A-Sanitary Standard No. 74-XX. Endress+Hauser confirms this by affixing the 3-A sign to the device!
- For T-piece installation of the sensor in combination with EHEDG certificate, note:
  The T-piece must be smaller with L / (D- d) ≤ 1.




A0041791

**Certificate of current Good Manufacturing Practises (cGMP)**

Product Configurator, Ordering information "Additional option" "H" or "I"

- The declaration is available in English only
- Materials of construction of product wetted parts
- TSE compliance
- Polishing and surface finish
- Material/ compound compliance table (USP Class VI, FDA conformity)

**Other certificates**

- Material certificate as per EN 10204/3.1 for all wetted parts NACE MR0175/MR0103, AD2000
- Leak detection system in conjunction with WHG approval
  Approval number: Z–65.40–446 (see also "Ordering information" → 44)
- TSE Certificate of Suitability
  The following applies to wetted device components:
  – They do not contain any materials derived from animals.
  – No additives or operating materials derived from animals are used in production or processing.

Note!
Wetted device components are listed in the "Mechanical construction" (→ 30 ff.) and "Ordering information" (→ 44) sections.

**Manufacturer declarations**

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

- FDA conformity
- TSE-free: Materials not derived from animals
- Regulation (EC) no. 2023/2006 (GMP)
- Regulation (EC) No. 1935/2004 materials in contact with food

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

Regulation (EU) No. 10/2011: The regulation on plastic materials does not apply to the Liquiphant FTL5x, as the wetted materials are made exclusively of stainless steel.
The silicone seals supplied comply with BFR recommendation XV (commodities based on silicones from the Federal Institute for Risk Assessment - BFR), and the EPDM seals provided comply with BFR recommendation XXI (commodities based on natural and synthetic rubber).

**Use in hazardous zones**

Pay particular attention to the information provided in the documentation: Safety Instructions, Control Drawings etc. → 51

**ASME B 31.3**

Design and materials in accordance with ASME B31.3 The welding seals are through-penetration welded and comply with ASME Boiler and Pressure Vessel Code Section IX and EN ISO 15614-1.

**Pressure equipment directive**

The Pressure Equipment Directive 97/23/EC does not apply to the Liquiphant FTL5x, as it does not have a pressurized housing in accordance with Article 1, Paragraph 2.1.4 of the directive.

# Ordering information

Detailed ordering information is available from the following sources:

- In the Product Configurator on the Endress+Hauser website: www.endress.com → Click "Corporate" → Select your country → Click "Products" → Select the product using the filters and search mask → Open the product page → The "Configuration" button to the right of the product image 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 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 from the Endress+Hauser online shop

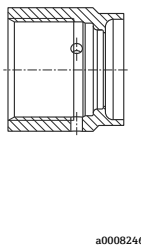
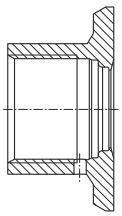
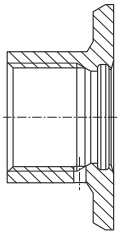
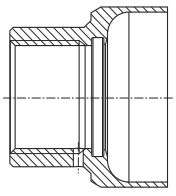
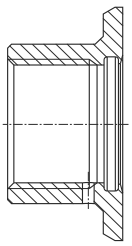
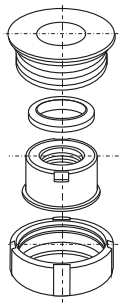
# Accessories

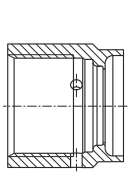
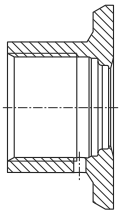
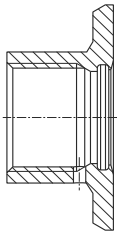
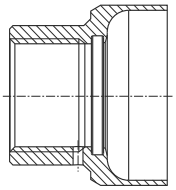
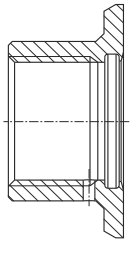
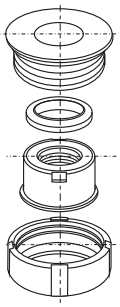
Note!

- All dimensions in mm (in)!
- For additional information on weld-in adapters, refer to TI00426F.
- The tolerance of the thread start between the weld-in adapter and sensor is ± 15°.

**Weld-in adapter**

**Overview**

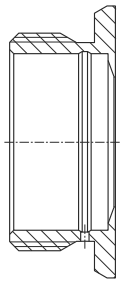
| |  a0008246 |  a0008251 |  a0008256 |  a0011924 |  a0008248 |  a0008253 |
|---|---|---|---|---|---|---|
| | **G¾, d=29 (1.14) without flange** | **G¾, d=50 (1.97) with flange** | **G¾, d=55 (2.17) with flange** | **G1, d=53 (2.09) without flange** | **G1, d=60 (2.36) with flange** | **G1 can be positioned** |
| Material<br>roughness µm (µin) | 316L<br>1.5 (59.1) | 316L<br>0.8 (31.5) | 316L<br>0.8 (31.5) | 316L<br>0.8 (31.5) | 316L<br>0.8 (31.5) | 316L<br>0.8 (31.5) |
| Without inspection certificate<br>EN10204-3.1 material | 71258357 | 71258355 | 52001052[3)] | 71258358 | 52001051[1), 3)] | 52001221[2), 3)] |
| With inspection certificate<br>EN10204-3.1 material | 52028295[3)] | 52018765[3)] | 52011897[3)] | 71093129[1), 3)] | 52011896[1), 3)] | 52011898[2), 3)] |
| Seal (replacement part: set of 5) | Silicone O-ring<br>52021717 | Silicone O-ring<br>52021717 | Silicone O-ring<br>52014473 | Silicone O-ring<br>52014472 | Silicone O-ring<br>52014472 | Silicone profile gasket<br>52014424) |

| | |  a0008246 |  a0008251 |  a0008256 |  a0011924 |  a0008248 |  a0008253 |
|---|---|---|---|---|---|---|---|
| | | **G¾, d=29 (1.14) without flange** | **G¾, d=50 (1.97) with flange** | **G¾, d=55 (2.17) with flange** | **G1, d=53 (2.09) without flange** | **G1, d=60 (2.36) with flange** | **G1 can be positioned** |
| Weld-in dummy | | – | – | 71168889 | 71166879 | 71166879 | 71181945 |
| **Liquiphant M** | Feature | **Version** | | | | | |
| FTL50 | 020 | | | GQ2 | | | |
| FTL5x | | | | | GW2 | GW2 | GW2 |
| FTL50H | | | | GQ2 | | | |
| FTL5xH | | | | | GW2 | GW2 | GW2 |

1) This weld-in adapter replaces the weld-in adapter with the order number 917969-1000.

2) This weld-in adapter replaces the weld-in adapter with the order number 215159-0000.

3) A seal is included in the delivery.

| | |  a0008252 |  a0008254 |
|---|---|---|---|
| | | **RD52** | **DRD DN50 65 (2.56) (welding flange)** |
| Material<br>roughness µm (µin), process side | | 316L<br>0.8 (31.5) | 316L/304<br>0.8 (31.5) |
| Without inspection certificate<br>EN10204-3.1 material | | 52001047 [1), 2)] | 52002041[2)]/<br>916743-0000 |
| With inspection certificate<br>EN10204-3.1 material | | 52006909 [1), 2)] | 52011899[2)]/ – |
| Seal (replacement part: set of 5) | | Silicone<br>profile gasket<br>52014424 | PTFE<br>flat seal<br>52024228 |
| Weld-in dummy | | M40167 | – |
| **Device** | Feature | **Version** | |
| **Liquiphant M** | | | |
| FTL5xH | 020 | EE2 | PE2 |

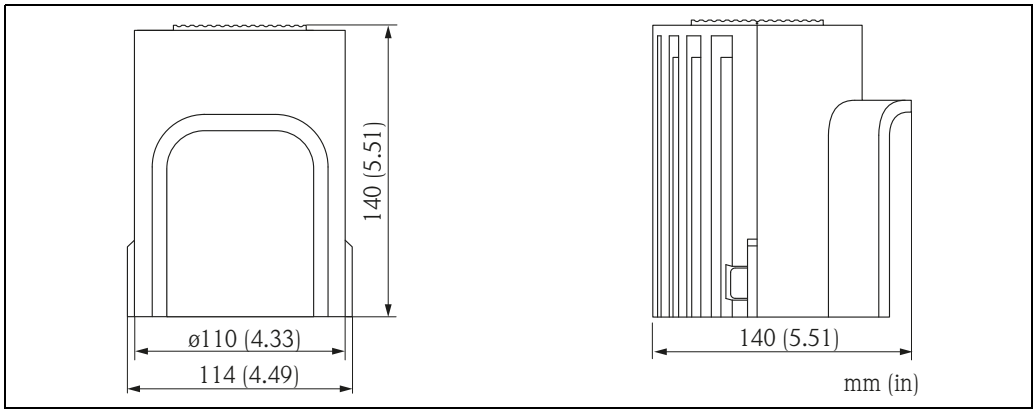
1) This weld-in adapter replaces the weld-in adapter with the order number 942329-0001.

2) A seal is included in the delivery.

Note!
All the weld-in adapters available are described in document TI00426F.
www.endress.com --> Download -->Advanced--> Documentation code --> TI00426F.

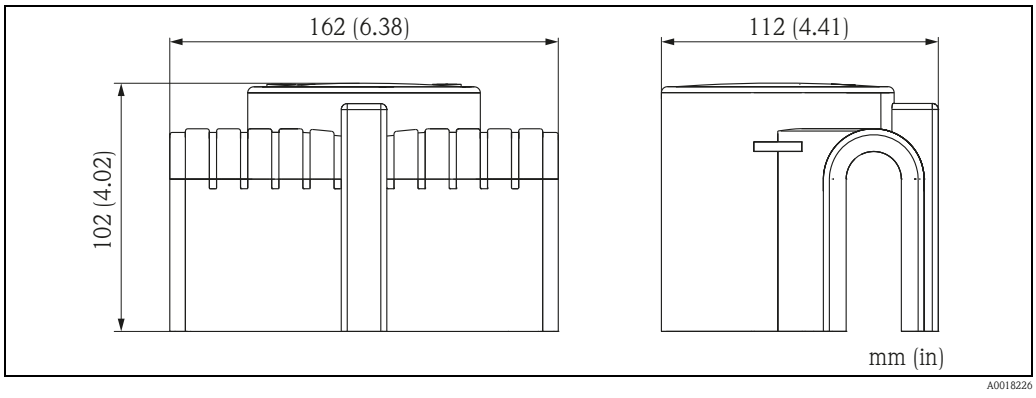
**Weather protection cover**

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) |

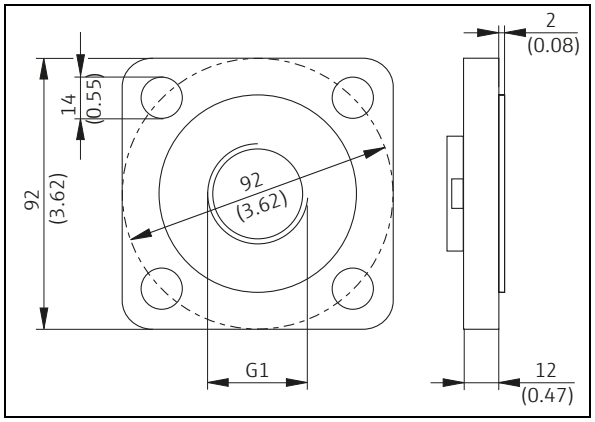
**Lap joint flange**

Order number: 918158-0000
With G 1 thread for mounting
a Liquiphant FTL50, FTL51
with process connection GR2

Pressure up to 40 bar (580 psi)

Material: corrosion-resistant steel
1.4301 (AISI 304)

Weight: 0.54 kg (1.19 lbs)



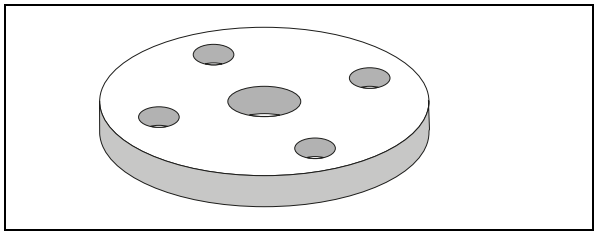

L00-FTL5xxxx-06-05-xx-xx-108

**Lap joint flanges**

With G 1 thread for mounting
a Liquiphant FTL50, FTL51
with process connection GR2

Material: corrosion-resistant steel
1.4571 (AISI 316Ti)

- Order number: 918143-0000
  Flange DN50 PN40, EN 1092-1
  Weight: 3.11 kg (6.86 lbs)
- Order number: 918144-0000
  Flange ASME 2", 150 psi, RF
  Weight: 2.38 kg (5.25 lbs)



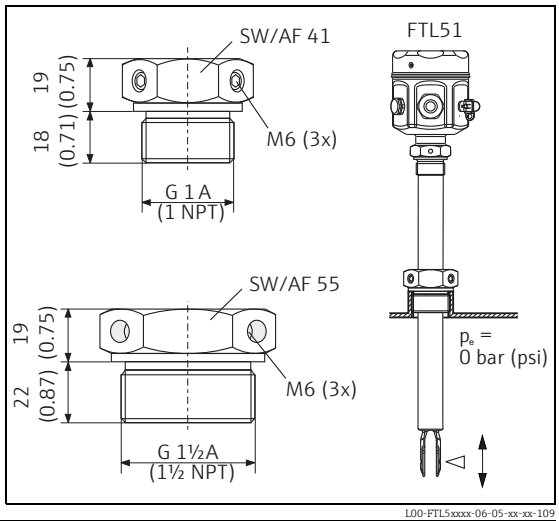
L00-FTL5xxxx-03-05-xx-xx-015

**Sliding sleeves for unpressurized operation**

Switch point infinitely variable for
Liquiphant MFTL51

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

Weight for G 1, NPT 1: 0.21 kg (0.46 lbs)
Weight for G 1½, NPT 1½: 0.54 kg (1.19 lbs)




L00-FTL5xxxx-06-05-xx-xx-109

| Thread | Standard | Material | Order number | Approval |
|---|---|---|---|---|
| G 1 | DIN ISO 228/I | 1.4435 (AISI 316 L) | 52003978 | |
| G 1 | DIN ISO 228/I | 1.4435 (AISI 316 L) | 52011888 | With inspection certificate EN 10204 - 3.1 material |
| NPT1 | ASME B 1.20.1 | 1.4435 (AISI 316 L) | 52003979 | |
| NPT1 | ASME B 1.20.1 | 1.4435 (AISI 316 L) | 52011889 | With inspection certificate EN 10204 - 3.1 material |
| G 1½ | DIN ISO 228/I | 1.4435 (AISI 316 L) | 52003980 | |
| G 1½ | DIN ISO 228/I | 1.4435 (AISI 316 L) | 52011890 | With inspection certificate EN 10204 - 3.1 material |

| Thread | Standard | Material | Order number | Approval |
|---|---|---|---|---|
| NPT1½ | ASME B 1.20.1 | 1.4435 (AISI 316 L) | 52003981 | |
| NPT1½ | ASME B 1.20.1 | 1.4435 (AISI 316 L) | 52011891 | With inspection certificate EN 10204 - 3.1 material |

**High pressure sliding sleeves**

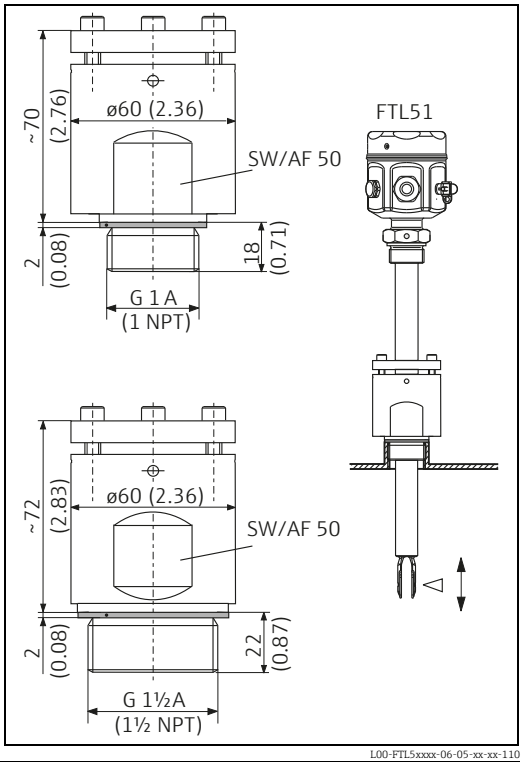
For continuous adjustment of the switch point of a Liquiphant M FTL51.
Also for use in hazardous areas. Additional information → 📄 51ff. (ATEX, NEPSI).

Material: corrosion-resistant steel 1.4435 (AISI 316L) or AlloyC22

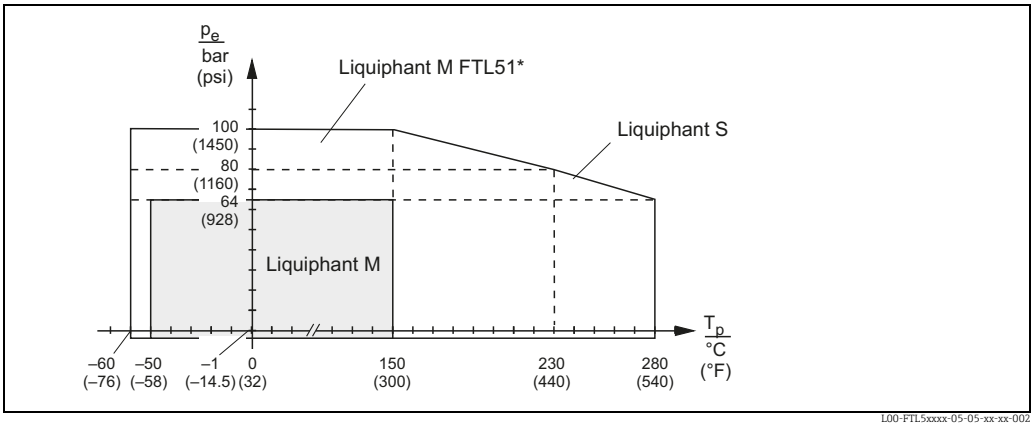
Weight for G 1, NPT 1: 1.13 kg (2.49 lbs)
Weight for G 1½, NPT 1½: 1.32 kg (2.91 lbs)

Seal package made of graphite.

For G1, G 1½:
Seal is included in the delivery.




| Thread | Standard | Material | Order number | Approval |
|---|---|---|---|---|
| G 1 | DIN ISO 228/1 | 1.4435 (AISI 316 L) | 52003663 | |
| G 1 | DIN ISO 228/1 | 1.4435 (AISI 316 L) | 52011880 | With inspection certificate EN 10204 - 3.1 material |
| G 1 | DIN ISO 228/1 | AlloyC22 | 71118691 | With inspection certificate EN 10204 - 3.1 material |
| NPT1 | ASME B 1.20.1 | 1.4435 (AISI 316 L) | 52003667 | |
| NPT1 | ASME B 1.20.1 | 1.4435 (AISI 316 L) | 52011881 | With inspection certificate EN 10204 - 3.1 material |
| NPT1 | ASME B 1.20.1 | AlloyC22 | 71118694 | With inspection certificate EN 10204 - 3.1 material |
| G 1½ | DIN ISO 228/1 | 1.4435 (AISI 316 L) | 52003665 | |
| G 1½ | DIN ISO 228/1 | 1.4435 (AISI 316 L) | 52011882 | With inspection certificate EN 10204 - 3.1 material |
| G 1½ | DIN ISO 228/1 | AlloyC22 | 71118693 | With inspection certificate EN 10204 - 3.1 material |
| NPT1½ | ASME B 1.20.1 | 1.4435 (AISI 316 L) | 52003669 | |
| NPT1½ | ASME B 1.20.1 | 1.4435 (AISI 316 L) | 52011883 | With inspection certificate EN 10204 - 3.1 material |
| NPT1½ | ASME B 1.20.1 | AlloyC22 | 71118695 | With inspection certificate EN 10204 - 3.1 material |




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

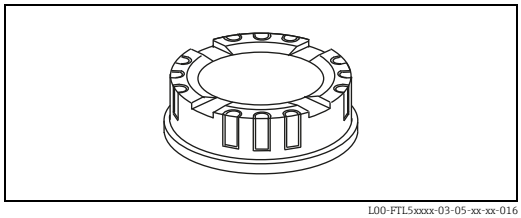
** FTL51 with high-pressure sliding sleeve (100 bar (1450 psi)). See "Additional option" option "P" or "R".l*

**Cover with sight glass**

Order number: 943461-0001
for polyester housing F16

Material: PA 12

Weight: 0.04 kg (0.09 lbs)



L00-FTL5xxxx-03-05-xx-xx-016

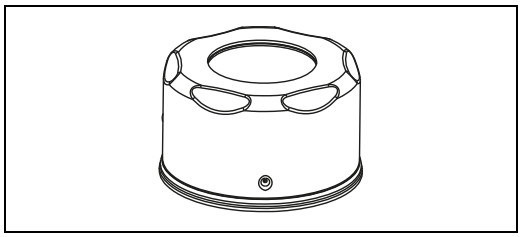
**Cover with sight glass**

For stainless steel housing F15

Material: AISI 316L

Weight: 0.16 kg (0.35 lbs)

- Order number: 52027002
  With glass sight glass
- Order number: 52028207
  With PC sight glass
  (Not for CSA, General Purpose)



L00-FTL5xxxx-03-05-xx-xx-017

**Circular connector**

Order number: 52010285

4x0.34 M12 socket

Cable: PVC (gray) 5 m (16 ft)

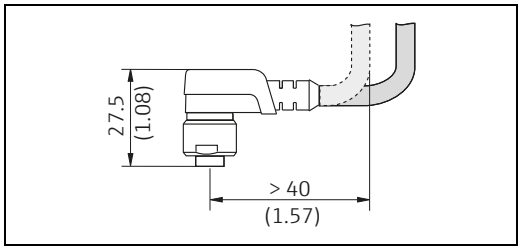
Body: PUR (blue)

Thread adapter nut: Cu Sn/Ni

Degree of protection: IP67

Temperature range with fixed cable:
–25 to +70 °C (-13 to +158 °F)

Temperature range with flexible cable:
–5 to +70 °C (23 to +158 °F)




L00-FTL5xxxx-06-05-xx-xx-111

Order number: 52024216

4x0.34 M12 socket

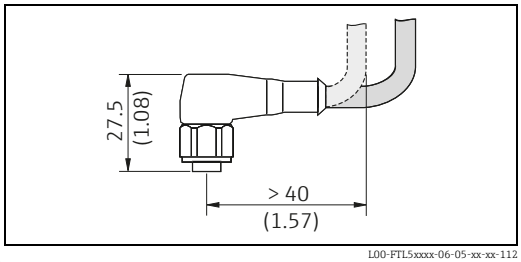
Cable: PVC (orange) 5 m (16 ft)

Body: PVC (orange)

Thread adapter nut: 316L

Degree of protection: IP69 (fully locked)

Temperature range: –25 to +70 °C (-13 to +158 °F)




L00-FTL5xxxx-06-05-xx-xx-112

Order number: 52018763

4x0.34 M12 socket with integrated LEDs

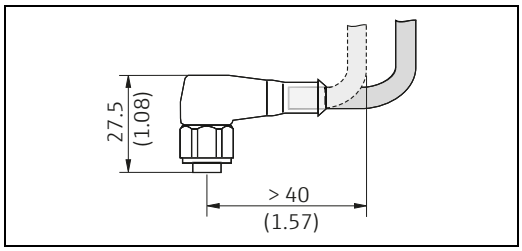
Cable: PVC (orange) 5 m (16 ft)

Body: PVC (transparent)

Thread adapter nut: 316L

Degree of protection: IP69IP69 (fully locked)

Temperature range: –25 to +70 °C (-13 to +158 °F)




# Documentation

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

**Operating Instructions**

BA00141F: Electronic insert FEL50A for Liquiphant M, PROFIBUS PA

BA00335F: Liquiphant M Density, density computer FML621

KA00143F: Liquiphant M FTL50, FTL51

KA00144F: Liquiphant M FTL50(H), FTL51(H)

KA00162F: Liquiphant M FTL51C

KA00163F: Liquiphant M FTL50-####### # 7 #, FTL51-####### # 7 #

KA00164F: Liquiphant M FTL50H-######## 7 #, FTL51H-######## 7 #

KA00165F: Liquiphant M FTL51C-######## 7 ##

KA00220F: Liquiphant M FTL5#-# ### ## # #3 #, FTL5#H-# ### ## # #3 #

KA00284F: Electronic insert FEL50D for Liquiphant M Density FTL50, FTL51

KA00285F: Electronic insert FEL50D for Liquiphant M Density FTL50H, FTL51H

KA00286F: Electronic insert: FEL50D for Liquiphant M Density FTL51C

KA00151F: Liquiphant M sliding sleeve for FTL51, G 1, NPT 1

KA00152F: Liquiphant M sliding sleeve for FTL51, G 1½, NPT 1½

KA00153F: Liquiphant M high-pressure sliding sleeve for FTL51, G 1, NPT 1

KA00154F: Liquiphant M high-pressure sliding sleeve for FTL51, G 1½, NPT 1½

**Technical Information**

TI00241F: General instructions for electromagnetic compatibility
(Test procedure, installation recommendation)

TI00347F: Liquiphant M FTL51C, wetted parts with highly corrosion-resistant coating
ECTFE, PFA or enamel coating

TI00350F: Isolating amplifier FTL325P, 1- or 3-channel switching units for top-hat rail mounting
for Liquiphant M with electronic insert FEL57

TI00353F: Isolating amplifier FTL325N, 1- or 3-channel switching units for top-hat rail mounting
for Liquiphant M with electronic insert FEL56, FEL58

TI00354F: Liquiphant S FTL70/71, for medium temperatures up to 280 °C (536 °F)

TI00360F: Isolating amplifier FTL375P, 1 to 3-channel switching units for top-hat rail mounting
for Liquiphant M with electronic insert FEL57

TI00420F: Liquiphant M Density, density computer FML621

TI00426F: Weld-in adapter

**Functional safety (SIL)**

SD00164F: Liquiphant M with electronic insert FEL51 (MAX)

SD00185F: Liquiphant M with electronic insert FEL51 (MIN)

SD00163F: Liquiphant M with electronic insert FEL52 (MAX)

SD00186F: Liquiphant M with electronic insert FEL52 (MIN)

SD00162F: Liquiphant M with electronic insert FEL54 (MAX)

SD00187F: Liquiphant M with electronic insert FEL54 (MIN)

SD00167F: Liquiphant M with electronic insert FEL55 (MAX)

SD00279F: Liquiphant M with electronic insert FEL55 (MIN)

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

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

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

**Safety Instructions**

**ATEX**

XA00115F, XA00114F, XA00108F, XA00031F: DEKRA 15 ATEX 0088
- Ex d, Ex de

XA00113F, XA00064F, XA00063F: KEMA 99 ATEX 0523 X
- Ex d, Ex de

XA00182F: EG 01 007 X
- Ex nA

**IEC Ex**

XA01371F, XA00114F, XA00108F, XA00031F: IECEx DEK 15.0060
- Ex d, Ex de

XA00113F, XA00064F, XA00063F: KEMA 99 ATEX 0523 X; IECEx DEK 15.0028X
- Ex d, Ex de

**Safety Instructions (NEPSI)**

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

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

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

**Control Drawings**

ZD00041F: 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

ZD00042F: 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

ZD00043F: 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

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

ZD00244F: 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




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