



Level



Pressure



Flow



Temperature

Liquid
Analysis

Registration

Systems
Components

Services



Solutions

Technical Information

Liquiphant M FTL50(H), FTL51(H)

Vibration Limit Switch

Level limit switch for all liquids, suitable for use in hazardous areas, food and pharmaceuticals



Application

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

- Process temperatures between -58 to +300°F (-50°C to +150°C)
- Pressures up to 1450 psi (100 bar)
- Viscosity up to 10,000 cP (10000 mm²/s)
- Densities from 0.5 to 0.7 SGU (0.5 g/cm³ or 0.7 g/cm³), other settings available on request
- Foam detection on request

The function is not affected by flow, turbulence, bubbles, foam, vibration, bulk solids content or build-up.

The Liquiphant is thus an ideal replacement for float switches, gap switches, capacitance, and other technologies.

FTL50:

Compact design, ideal for mounting in pipes and for installation in areas difficult to access

FTL51:

With extension pipe up to 115 inches (3 m). Optional lengths up to 235" (6 m) available.

FTL50H, FTL51H:

With polished tuning fork and easy-to-clean process connections and housings for food and pharmaceutical applications. 3-A and EHEDG compliant using FDA listed materials.

High corrosion-resistant AlloyC4 (2.4610) is available for the fork and process connections for applications in very aggressive liquids.

The Liquiphant M includes versions for use in hazardous areas, including intrinsically safe and explosion proof.

Your benefits

- Use in safety systems requiring functional safety to SIL2/SIL3 in accordance with IEC 61508/IEC 61511-1
- Large selection of process connections to choose for universal use
- Wide variety of electronics, e.g. DPDT relay, 8 to 16 mA switch, NAMUR, PFM signal output, transistor; the right electronics for every process control system
- No calibration required; quick, low-cost start-up
- No mechanically moving parts; no maintenance, no wear, economical long operating life
- Monitoring of fork for damage, heavy buildup and chemical corrosion; guaranteed safe operation
- FDA approved materials (PFA Edlon)

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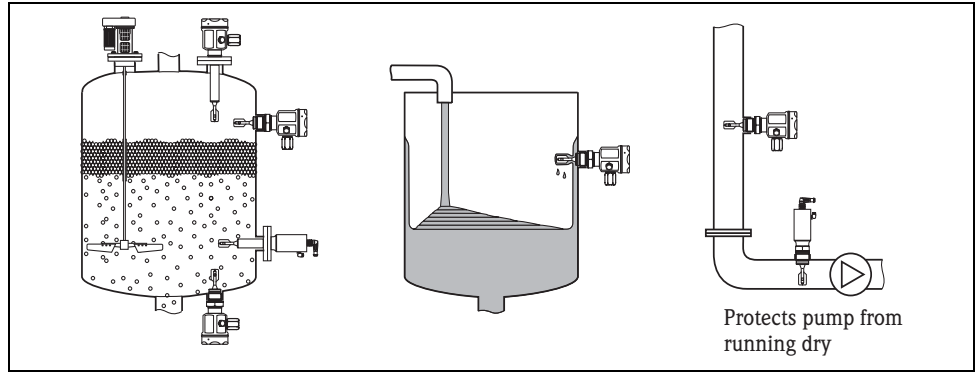
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Application

Level limit detection

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



L00-FTL5xxxx-11-05-xx-xx-000

Function and system design

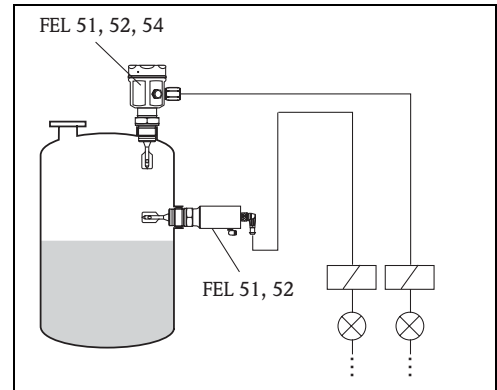
Measuring principle

The sensor's fork vibrates at its resonance frequency. This frequency is reduced when covered with liquid. The change in frequency then activates a limit switch.

Modularity

Level limit switch

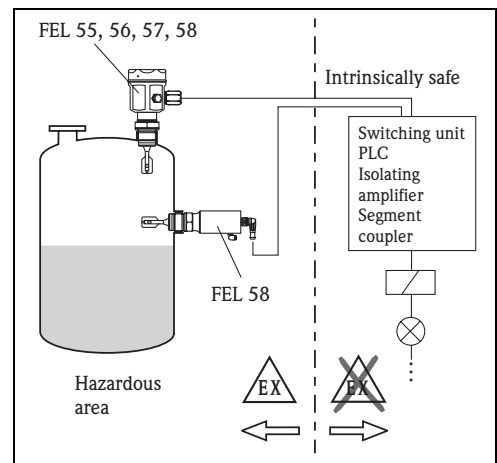
Liquiphant M FTL with electronic versions FEL51, FEL52, FEL54



L00-FTL5xxxx-15-05-xx-xx-000

Level sensor

Liquiphant M FTL with electronic versions FEL55, FEL56, FEL57, FEL58 for connecting to a separate switching unit.



L00-FTL5xxxx-15-05-xx-xx-000

Electronic versions for level limit switches	<p>FEL51: Two-wire AC version; Switch the load directly into the power supply circuit via the thyristor.</p> <p>FEL52: Three-wire DC version; Switch the load via the transistor (PNP) and separate connection.</p> <p>FEL54: Universal current version with relay output; Switch the loads via 2 floating change-over contacts.</p>
Electronic versions for level sensor	<p>FEL55: For separate switching unit; signal transmission 16/8 mA along two-wire cabling.</p> <p>FEL56: For separate switching unit; signal transmission L-H edge 0.6 to 1.0 / 2.2 to 2.8 mA to EN 50227 (NAMUR) along two-wire cabling.</p> <p>FEL58: For separate switching unit; signal transmission H-L edge 2.2 to 3.5 / 0.6 to 1.0 mA to EN 50227 (NAMUR) along two-wire cabling. Checking of connecting cabling and other devices by pressing a key on the electronic insert.</p> <p>FEL57: For separate switching unit; PFM signal transmission; Current pulses superposed on the power supply along the two-wire cabling. Cyclical checking from the switching unit without changing levels.</p>
Galvanic isolation	<p>FEL51, FEL52: Between sensor and power supply</p> <p>FEL54: Between sensor and power supply and load</p> <p>FEL55, FEL56, FEL57, FEL58: See Switching unit connected</p>
Design	<p>FTL50: Compact</p> <p>FTL51: With extension pipe</p> <p>FTL50H: Compact, with polished tuning fork and hygienic process connections</p> <p>FTL51H: With extension pipe, polished tuning fork and hygienic process connections</p>

Input

Measured variable	Level (limit value)
Measuring range (detection range)	<p>FTL50: Depends on mounting point.</p> <p>FTL51: Depends on mounting point and the pipe extension. Standard 115" (3000 mm), up to 235" (6000 mm) on request.</p>
Product density	Adjustment on the electronic insert > 0.5 SGU (0.5 g/cm ³) or > 0.7 SGU (0.7 g/cm ³), other on request.

Electronic insert FEL51 (AC 2-wire)

Power supply

Supply voltage: 19 to 253 V AC
 Power consumption: < 0.83 W
 Residual current consumption: < 3.8 mA
 Short-circuit protection
 FEM51 overvoltage protection: overvoltage category III

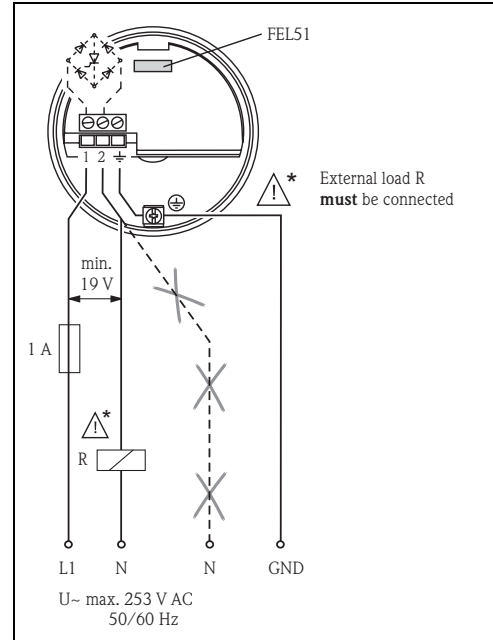
Electrical connection

Two-wire AC connection

Always connect in series with a load!

Check the following:

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



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

Output signal

I_L = load current (switched through)

< 3.8 mA = residual current (blocked)



= lit



= unlit

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

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

L00-FTL5xxxx-04-05-xx-xx-001

Signal on alarm

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

Connectable load

- For relays with a minimum holding power/rated power > 2.5 VA at 253 V AC (10 mA) or > 0.5 VA at 24 V AC (20 mA)
- Relays with a lower holding power/rated power can be operated by means of an RC module connected in parallel
- For relays with a maximum holding power/rated power < 89 VA at 253 V AC or < 8.4 VA at 24 V AC
- Voltage drop across FEL51 max. 12 V
- Residual current with blocked thyristor max. 3.8 mA
- Load switched directly into the power supply circuit via the thyristor.
 Transient (40 ms) max. 1.5 A, max. 375 VA at 253 V or max. 36 VA at 24 V (not short-circuit proof)

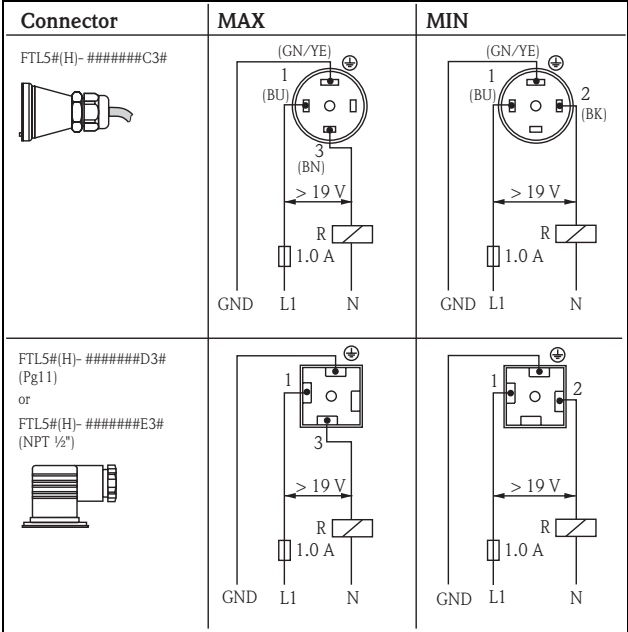
Electronics FEL51 (AC, in compact housing)

Power supply
Supply voltage: 19 to 253 V AC
Power consumption: < 0.83 W
Residual current consumption: < 3.8 mA
Short-circuit protection
FEM51 overvoltage protection: overvoltage category III

Electrical connection
Two-wire AC connection
Always connect in series with a load!

Check the following:

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



100-FTL5xxxx-04-05-xx-en-008

Output signal

I_L = load current (switched through)
< 3.8 mA = residual current (blocked)

= lit
 = unlit

100-FTL2xxxx-07-05-xx-xx-000

Safety mode	Level	Output signal	LEDs green	red
Max.		1 $\xrightarrow{I_L}$ 3		
		1 $\xrightarrow{< 3.8 \text{ mA}}$ 3		
Min.		1 $\xrightarrow{I_L}$ 2		
		1 $\xrightarrow{< 3.8 \text{ mA}}$ 2		

100-FTL5xxxx-04-05-xx-xx-001a

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

Connectable load

- For relays with a minimum holding power/rated power > 2.5 VA at 253 V AC (10 mA) or > 0.5 VA at 24 V AC (20 mA)
- Relays with a lower holding power/rated power can be operated by means of an RC module connected inparallel
- For relays with a maximum holding power/rated power < 89 VA at 253 V AC or < 8.4 VA at 24 V AC
- Voltage drop across FEL51 max. 12 V
- Residual current with blocked thyristor max. 3.8 mA
- Load switched directly into the power supply circuit via the thyristor.
Transient (40 ms) max. 1.5 A, max. 375 VA at 253 V or max. 36 VA at 24 V (not short-circuit proof).

Electronic insert FEL52 (DC PNP)

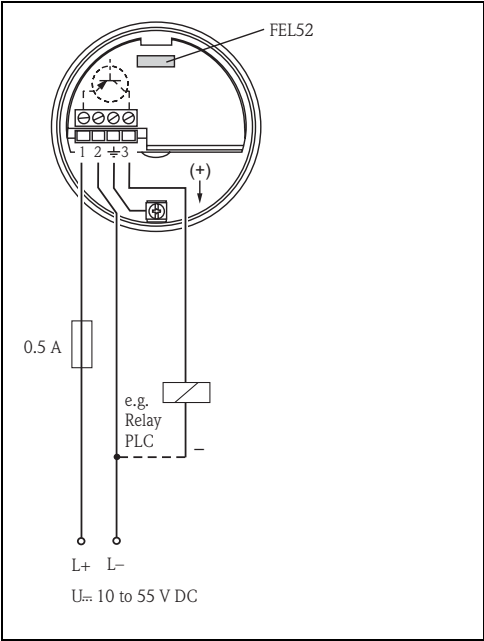
Power supply

Supply voltage: 10 to 55 V DC
Ripple: max. 1.7 V, 0 to 400 Hz
Current consumption: max. 15 mA
Power consumption: max. 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 limit.



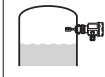


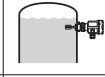


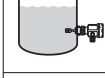


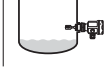


L00-FTL5xxxx-04-05-xx-en-001

Output signal

I_L = load current (switched through)
 $< 100 \mu A$ = residual current (blocked)

 = lit
 = unlit

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

Safety mode	Level	Output signal	LEDs	
			green	red
Max.		$L+ \xrightarrow{I_L} +$ 1 ————— 3		
		$1 \xrightarrow{< 100 \mu A} 3$		
Min.		$L+ \xrightarrow{I_L} +$ 1 ————— 3		
		$1 \xrightarrow{< 100 \mu A} 3$		

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

Signal on alarm

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

Connectable load

- Load switched via the transistor and separate PNP connection, max. 55 V DC
- Load current max. 350 mA (pulsed overload and short-circuit protection)
- Residual current $< 100 \mu A$ (with transistor blocked)
- Capacitive load max. 0.5 μF at 55 V, max. 1.0 μF at 24 V
- Residual voltage $< 3 V$ (with transistor switched through)

Electronics FEL52 (DC PNP, in compact housing)

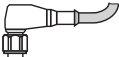
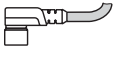
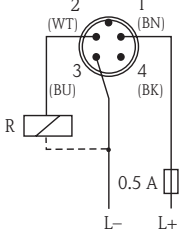
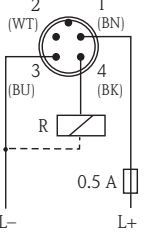
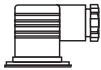
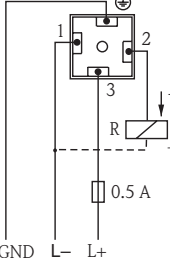
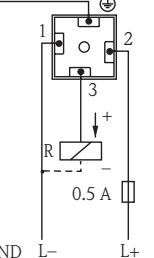
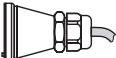
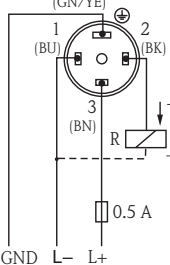
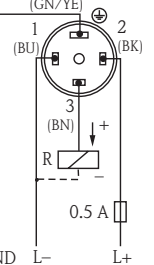
Power supply

Supply voltage: 10 to 55 V DC
Ripple: max. 1.7 V, 0 to 400 Hz
Current consumption: max. 15 mA
Power consumption: max. 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 limit.

Connector	MAX	MIN
FTL5#(H)- #####N3# (M12x1) 52018763  FTL5#(H)- #####N3# (M12x1) 52010285 / 52024216 		
FTL5#(H)- #####D3# (Pg11) or FTL5#(H)- #####E3# (NPT 1/2") 		
FTL5#(H)- #####C3# 		













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

Output signal

With valve connector or cable tail

I_L = load current
(switched through)
 $< 100 \mu A$ = residual current
(blocked)
 = lit
 = unlit

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

Safety mode	Level	Output signal	LEDs	
			green	red
Max.		$L+ \xrightarrow{I_L} 2$ 3		
		$L+ \xrightarrow{< 100 \mu A} 2$ 3		
Min.		$L+ \xrightarrow{I_L} 3$ 2		
		$L+ \xrightarrow{< 100 \mu A} 3$ 2		

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

With M12x1 connector 52010285 / 52024216 (without LEDs)

I_L = load current
(switched through)

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



= lit



= unlit

100-FTL2xxxx-07-05-xx-xx-000

Safety mode	Level	Output signal	LEDs
Max.		$L+ \xrightarrow{I_L} -$ 1 2	
		$L+ < 100 \mu A \xrightarrow{-}$ 1 2	
Min.		$L+ \xrightarrow{I_L} -$ 1 4	
		$L+ < 100 \mu A \xrightarrow{-}$ 1 4	

100-FTL5xxxx-04-05-xx-xx-010

With M12x1 connector 52018763 (with LEDs)

I_L = load current
(switched through)

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



= lit



= unlit

100-FTL2xxxx-07-05-xx-xx-000

Safety mode	Level	Output signal	LEDs
Max.		$L+ \xrightarrow{I_L} -$ 1 2	
		$L+ < 100 \mu A \xrightarrow{-}$ 1 2	
Min.		$L+ \xrightarrow{I_L} -$ 1 4	
		$L+ < 100 \mu A \xrightarrow{-}$ 1 4	

100-FTL5xxxx-04-05-xx-xx-011

Signal on alarm

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

Connectable load

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

Electronic insert FEL54 (AC/DC with relay output)

Power supply

Supply voltage: 19 to 253 V AC, 50/60 Hz or 19 to 55 V DC

Power consumption: max. 1.3 W

Reverse polarity protection

Overvoltage protection FEL54: overvoltage category III

Electrical connection

Universal current connection with relay output

Power supply:

Please note the different voltage ranges for AC and DC.

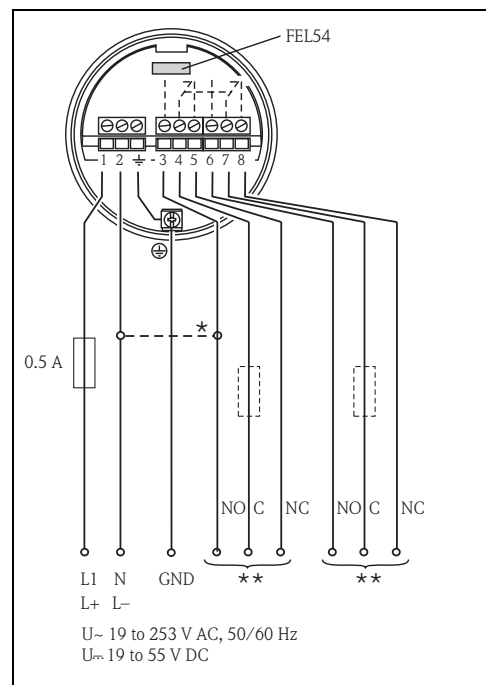
Output:

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

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

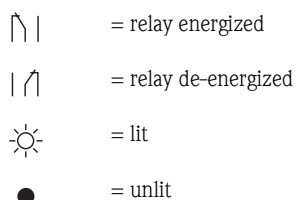
Both relay contacts switch simultaneously.

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








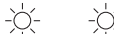










L00-FTLSxxxx-04-05-xx-xx-002

Output signal



L00-FTL2xxx-07-05-
xx-xx-001

Safety mode	Level	Output signal	LEDs green	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	

100-ET15xxxx-04-05-xx-xx-009

Signal on alarm

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

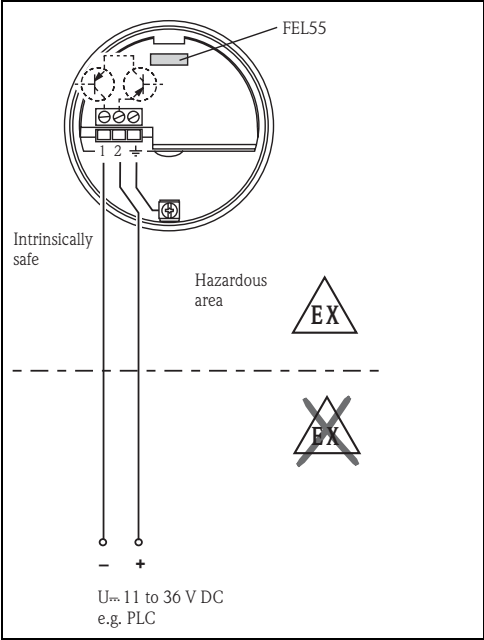
Connectable load

- Loads switched via 2 floating change-over contacts (DPDT)
- $I \sim$ max. 6 A (EEEx d 4 A), $U \sim$ max. 253 V AC; $P \sim$ max. 1500 VA, $\cos \varphi = 1$, $P \sim$ max. 750 VA, $\cos \varphi > 0.7$
- $I \sim$ max. 6 A (EEEx d 4 A) to 30 V, $I \sim$ max. 0.2 A to 125 V
- When connecting a low-voltage circuit with double isolation according to IEC 1010 the following applies:
total of voltages of relay output and power supply max. 300 V

Electronic insert FEL55 (8/16 mA)



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

Electrical connection
Two-wire connection for separate switching unit
For connecting to programmable logic controllers (PLC).
AI module 4 to 20 mA to EN 61131-2.
Output signal jump from high to low current on limit.

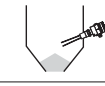


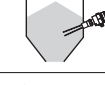





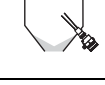




L00-FTL5xxxx-04-05-en-000

Output signal

$\sim 16 \text{ mA} = 16 \text{ mA} \pm 5 \%$
 $\sim 8 \text{ mA} = 8 \text{ mA} \pm 6 \%$
 = lit
 = unlit

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

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

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

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

Connectable load
■ $R = (U - 11 \text{ V}) : 16.8 \text{ mA}$
■ U = connection voltage: 11 to 36 V DC

Electronic insert FEL56 (NAMUR L-H edge)

Power supply

Power consumption: < 6 mW at I < 1 mA; < 38 mW at I = 2.2 to 4 mA
Connection data interface: IEC 60947-5-6

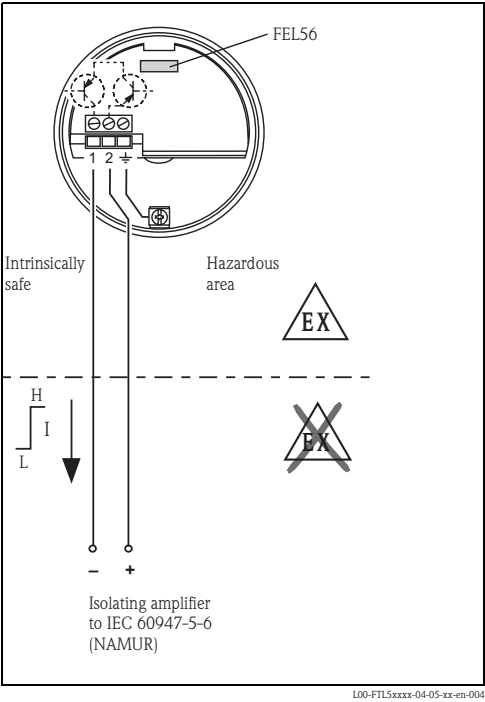
Electrical connection

Two-wire connection for separate switching unit

For connecting to isolating amplifiers acc. to NAMUR (IEC 60947-5-6), e.g. FXN421, FXN422, FTL325N, FTL375N or Commutec SIN100, SIN110 from Endress+Hauser. Output signal jump from low to high current on limit.




(L-H edge)

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















100-FTL5xxxx-04-05-xx-en-004

Output signal

 = lit
 = flashes
 = unlit

100-FTL5xxxx-07-05-xx-xx-002

Safety mode	Level	Output signal	LEDs	
			green	red
Max.		+ 0.6 to 1.0 mA 2 → 1		
		+ 2.2 to 2.8 mA 2 → 1		
Min.		+ 0.6 to 1.0 mA 2 → 1		
		+ 2.2 to 2.8 mA 2 → 1		

100-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 isolating amplifier connected according to IEC 60947-5-6 (NAMUR)

Electronic insert FEL58 (NAMUR H-L edge)

Power supply

Power consumption: < 6 mW at $I < 1 \text{ mA}$; < 38 mW at $I = 2.2 \text{ to } 4 \text{ mA}$
 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. FXN421, FXN422, FTL325N, FTL375N or Commutec SIN100, SIN110 from Endress+Hauser. Output signal jump from high to low current on limit.

(H-L edge)

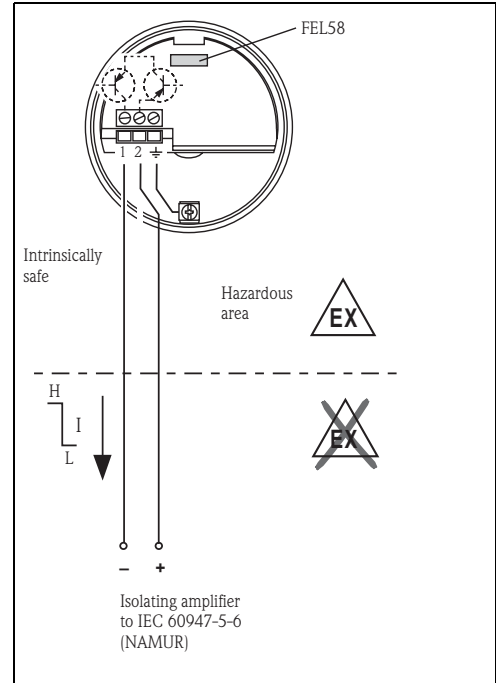
Additional function:
 Test key on the electronic insert.
 Pressing the key breaks the connection to the isolating amplifier.



Note!

For hazardous 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-xx-002

Output signal

= lit
 = flashes
 = unlit

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

Safety mode	Level	Output signal	LEDs green yellow
Max.		$\begin{matrix} + \\ 2 \end{matrix} \xrightarrow{2.2 \text{ to } 3.5 \text{ mA}} 1$	
		$\begin{matrix} + \\ 2 \end{matrix} \xrightarrow{0.6 \text{ to } 1.0 \text{ mA}} 1$	
Min.		$\begin{matrix} + \\ 2 \end{matrix} \xrightarrow{2.2 \text{ to } 3.5 \text{ mA}} 1$	
		$\begin{matrix} + \\ 2 \end{matrix} \xrightarrow{0.6 \text{ to } 1.0 \text{ mA}} 1$	

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 isolating amplifier connected according to IEC 60947-5-6 (NAMUR)
- Connection also to isolating amplifiers which have special safety circuits ($I > 3.0 \text{ mA}$)

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

Power supply

Power consumption: < 6 mW at I < 1 mA; < 38 mW at I = 2.2 to 4 mA
Connection data interface: IEC 60947-5-6

Electrical connection

Two-wire connection for separate switching unit


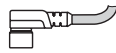
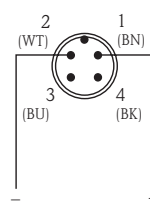
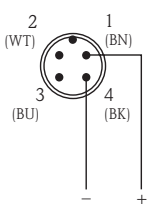

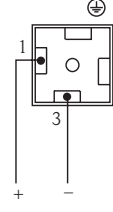
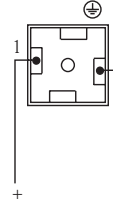
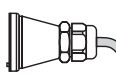
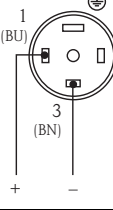
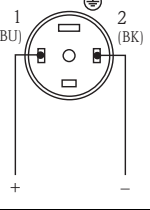
For connecting to isolating amplifiers acc. to NAMUR (IEC 60947-5-6), e.g. FXN421, FXN422, FTL325N, FTL375N or Commutec SIN100, SIN110 from Endress+Hauser. Output signal jump from high to low current on limit.

(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. Thus, it is not possible to use the M12 connector with integrated LED (52018763).


Connector	MAX	MIN
<div>FTL5#(H)- #####N3# (M12x1) 52018763</div> <div></div> <div>FTL5#(H)- #####N3# (M12x1) 52010285 / 52024216</div> <div></div>		
<div>FTL5#(H)- #####D3# (Pg11) or FTL5#(H)- #####E3# (NPT 1/2")</div> <div></div>		
<div>FTL5#(H)- #####C3#</div> <div></div>		

100-FTL5xxxx-04-05-xx-en-009

Output signal













 = lit

 = flashes

 = unlit

100-FTL5xxxx-07-05-xx-xx-002

100-FTL5xxxx-04-05-xx-xx-007a

Safety mode	Level	Output signal	LEDs green yellow
Max.		$\xrightarrow{+ \begin{smallmatrix} 2.2 \text{ to } 3.5 \text{ mA} \end{smallmatrix} -} 1 \quad 3$	 
		$\xrightarrow{+ \begin{smallmatrix} 0.6 \text{ to } 1.0 \text{ mA} \end{smallmatrix} -} 1 \quad 3$	 
Min.		$\xrightarrow{+ \begin{smallmatrix} 2.2 \text{ to } 3.5 \text{ mA} \end{smallmatrix} -} 1 \quad 2$	 
		$\xrightarrow{+ \begin{smallmatrix} 0.6 \text{ to } 1.0 \text{ mA} \end{smallmatrix} -} 1 \quad 2$	 

Signal on alarm

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

Connectable load

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

Electronic insert FEL57 (PFM)

Power supply

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

Electrical connection

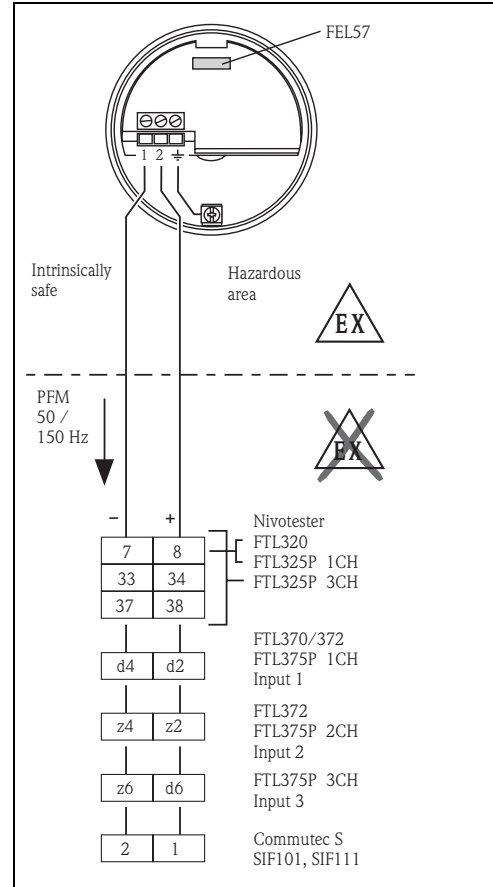
Two-wire connection for separate switching unit

For connecting to switching units
 Nivotester FTL320, FTL325P,
 FTL370, FTL372, FTL375P
 (also with cyclical checking)
 Commutec SIF101, SIN111
 from Endress+Hauser.
 Output signal jump of PFM signal
 from high to low frequency
 when sensor is covered.
 Switching between minimum/maximum
 safety in the Nivotester.

Additional function "cyclical checking":
 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,
 Germany.
 The following can be switched at the
 electronic insert:

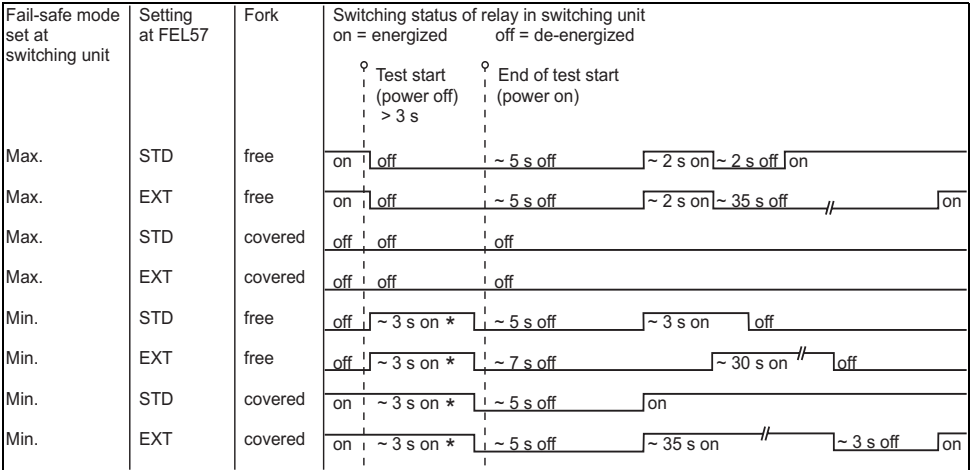
- Standard (STD):
 for low corrosive liquids;
 simulation approx. 8 s
 tuning fork exposed – covered – exposed.
- Extended (EXT):
 for highly corrosive liquids;
 simulation approx. 41 s
 tuning fork exposed – covered – corroded –
 exposed.

The check is activated and monitored at the
 switching unit.



L00-FTL5xxxx-04-05-zx-en-003

Switching behavior of the connected device:

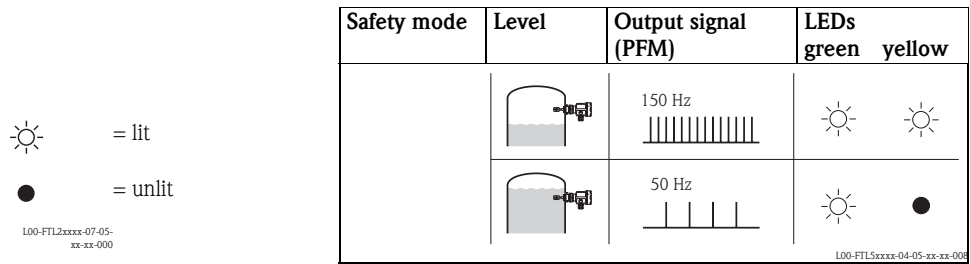


L00-FTL5xxxx-05-05-xx-en-000

* De-energized on power supply failure

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

Output signal



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

Connectable load

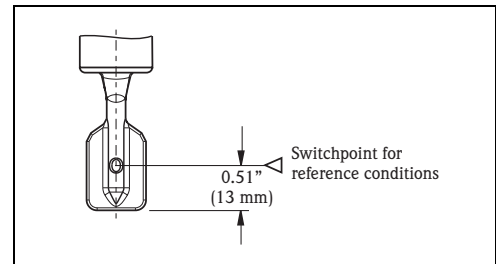
- Floating relay contacts in the connected switching unit Nivotester FTL320, FTL325P, FTL370, FTL372, FTL375P or Commutec SIF101, SIF111
- For contact load see the Technical Data of the switching unit

Connection and function

Connecting cables	<ul style="list-style-type: none"> ■ Electronic inserts: cross-section max. 14 AWG (2.5 mm²); strand in ferrule to DIN 46228 ■ Protective ground in housing: cross-section max. 14 AWG (2.5 mm²) ■ External equipotential bonding connection on housing: cross-section max. 12 AWG (4 mm²)
Fail-safe mode	<p>Minimum/maximum residual current safety selectable on electronic insert (with FEL57 on Nivotester only)</p> <p>Max. = maximum safety: The output switches to the power fail response when the fork is covered For use with overfill protection for example</p> <p>Max. = minimum safety: The output switches to the power fail response when the fork is exposed For use with dry running protection for example</p>
Switching time	<p>When fork is covered: approx. 0.5 s</p> <p>When fork is exposed: approx. 1.0 s</p> <p>Other switching times on request</p>
Switch-on behaviour	<p>When switching on the power supply, the output assumes the alarm signal.</p> <p>After max. 3 s it assumes the correct switching mode (Exception: FEL57)</p>

Performance characteristics

Reference operating conditions	<p>Ambient temperature: 73°F (23°C)</p> <p>Medium temperature: 73°F (23°C)</p> <p>Product density: 1 SGU (water)</p> <p>Viscosity: 1 cP</p> <p>Medium pressure p_e: 0 psig</p> <p>Sensor mounting: vertical from above</p> <p>Density switch: to > 0.7</p>
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L00-FTL5xxxx-06-05-xx-en-000

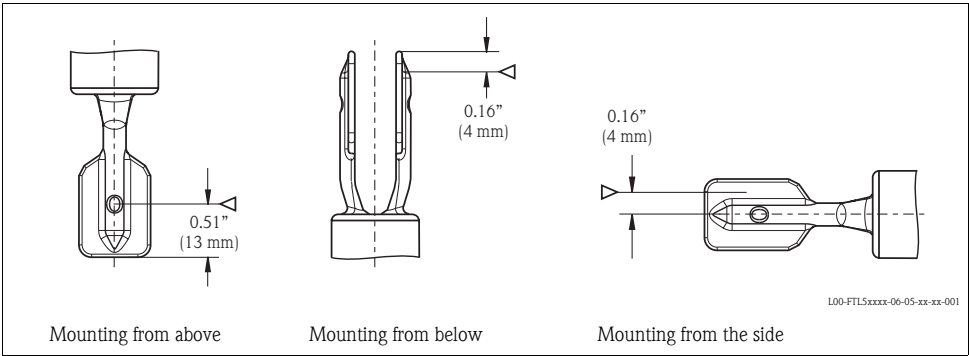
Maximum measured error	Specified by mounting position: max. $\pm 0.04"$ (1 mm)
Repeatability	0.004" (0.1 mm)
Hysteresis	Approx. 0.08" (2 mm)
Influence of medium temperature	Max. +0.05" to -0.11", -40 to +300°F (+1.8 to -2.8 mm, -50 to +150 °C)
Influence of product density	Max. +0.19" to -0.14" at 0.5 to 1.5 SGU (+4.8 to -3.5 mm, 0.5 to 1.5 g/cm ³)
Influence of medium pressure	Max. 0" to -0.09" at -14.5 to 930 psig (0 to -2.5 mm, -1 to 64 bar)

Operating conditions

Installation

Installation instructions

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



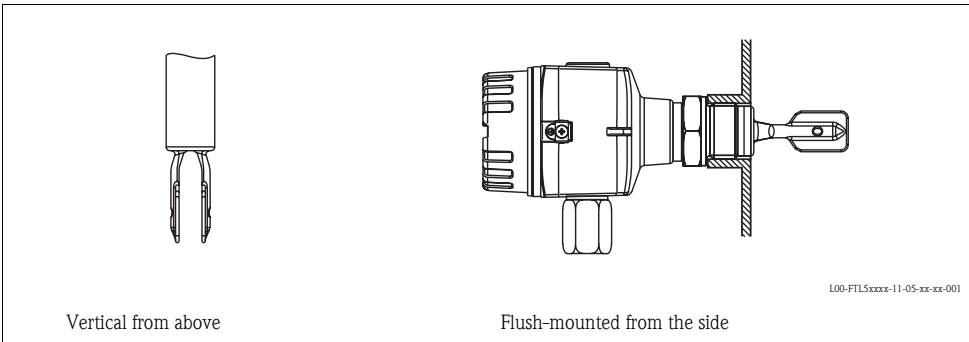
Note!
The switchpoints of the Liquiphant **M** are different than those of the previous version Liquiphant **II**.

Examples of mounting

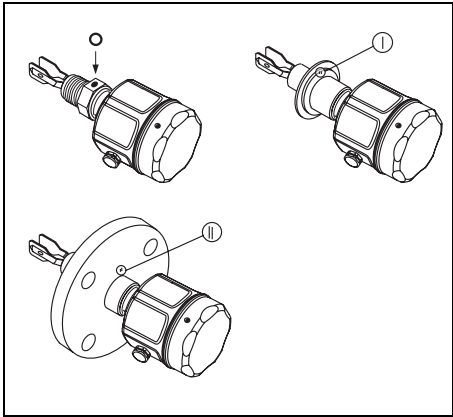
Examples of mounting with regard to the viscosity ν of the liquid and the amount of build-up

Optimum mounting, without problem even with high viscosity:

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

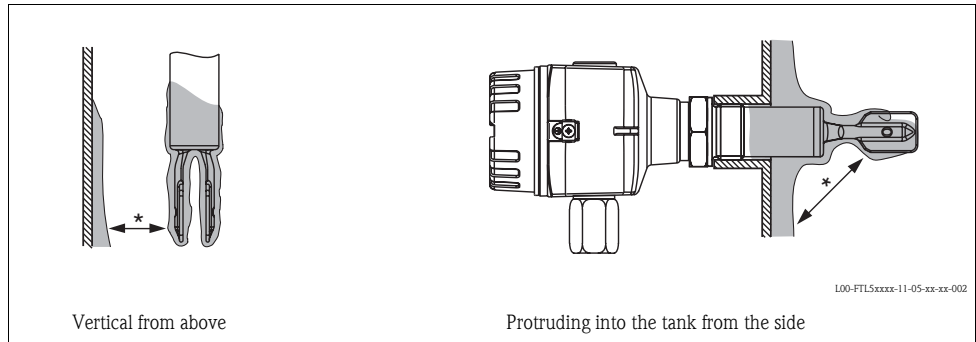


When installing the Liquiphant where the orientation of the tines is critical, such as in a pipeline, marks on the process connection indicate the tine orientation (see diagram)



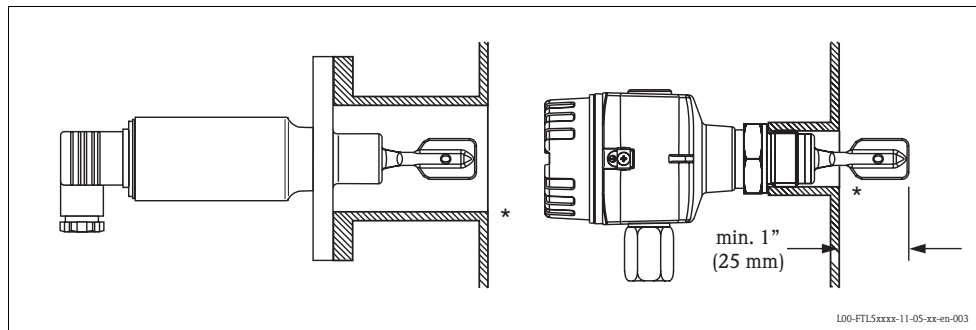
With build-up on the tank walls:

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



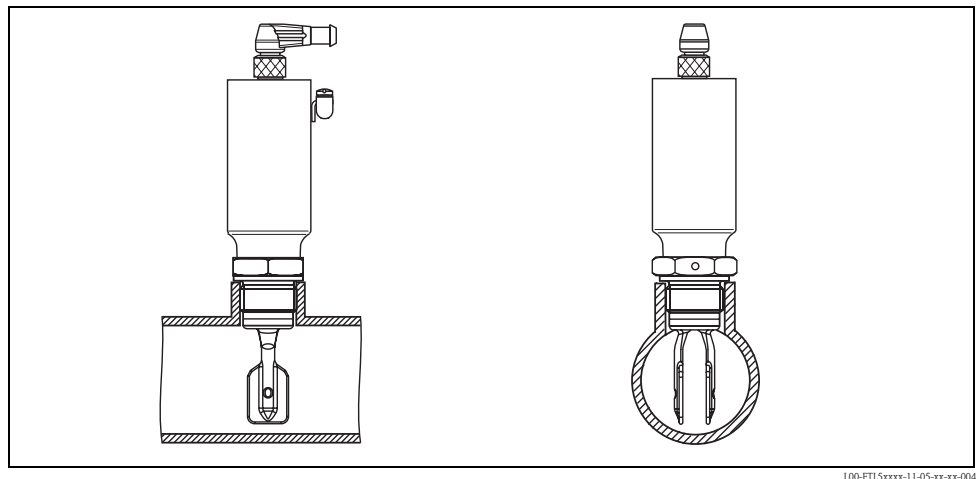
Mounting positions with low viscosity up to 2000 cP (up to 2000 mm²/s):

* Deburr the nozzle surfaces

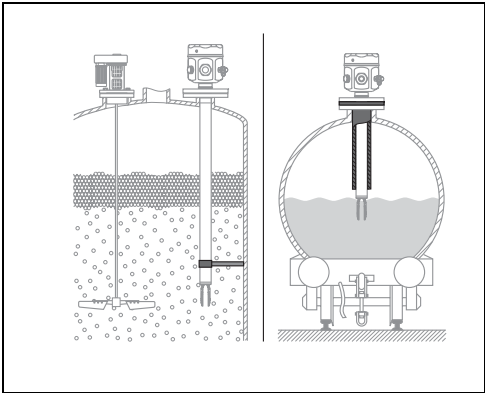


Mounting in piping from 2"

Fluid velocities up to 16 ft/s (5 m/s) for viscosity 1 cP (1 mm²/s) and density of 1 SGU (1 g/cm³).
(Check the function for other operating conditions.)

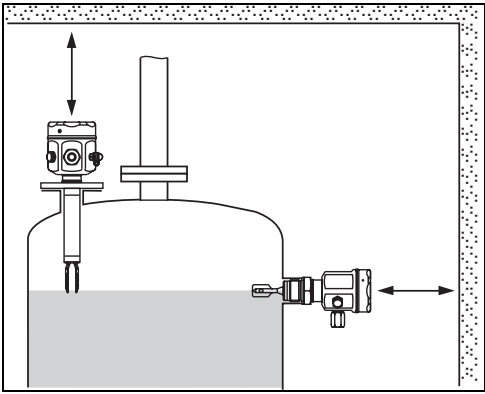


Support the Liquiphant M FTL51(H) in the event of high dynamic loads.



L00-FTL5xxxx-11-05-zx-zx-005

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



L00-FTL5xxxx-11-05-zx-zx-006

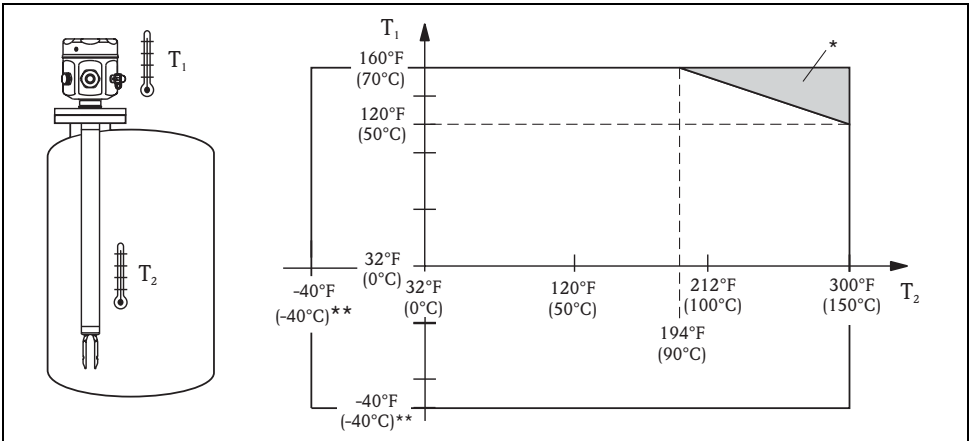
Orientation

FTL50(H) and FTL51(H) with short pipe (up to approx. 20" / 500 mm) – 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:



L00-FTL5xxxx-05-05-zx-zx-001

* Additional temperature range for devices with a temperature spacer or flameproof bushing

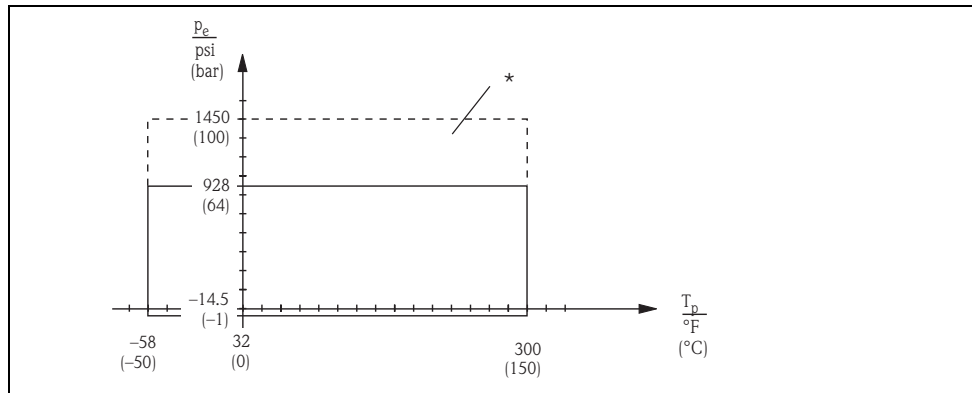
Ambient temperature limits

-58 to +160°F (-50 to +70°C), function with restricted data

Storage temperature	-58 to +180°F (-50 to +80°C)
Climate class	Climate protection to IEC 68, Part 2-38, Fig. 2a
Degree of protection	<ul style="list-style-type: none"> ■ Polyester, steel and aluminum housings: NEMA 4X (IP66/IP67) to EN 60529 ■ Aluminum housing (EEx d, EEx de): NEMA 4X/NEMA 6P (IP66/IP68) to EN 60529 (3 ft / 1 m, 24 h) ■ Compact housing: <ul style="list-style-type: none"> – NEMA 4 (IP65) with valve connector Pg11/NPT ½" – NEMA 4X/NEMA 6P (IP66/68) with 16 ft (5m) cable tail – NEMA 4X/NEMA 6P (IP66/68) with M12x1 connector (52010285) 316L SS (metal); – IP69k with connector (52024216), elbowed / L= 5 m, without built-in LEDs – IP69k with connector (52018763), elbowed / L= 5 m, with built-in LEDs
Vibration resistance	To IEC 68, Part 2-6 (10 to 55 Hz, 0.006" / 0.15 mm, 100 cycles)
Electromagnetic compatibility	<p>Interference emission to EN 61326, Electrical Equipment Class B</p> <p>Interference immunity to EN 61326; Annex A (Industrial) and NAMUR Recommendation NE 21 (EMC)</p> <p>If the fork tines are joined together on account of build-up, the useful signal is attenuated to such an extent that the original EMC values can no longer be completely observed.</p> <p>(EN 61000-4-3 Electromagnetic fields, EN 61000-4-6 HF coupling)</p>

Medium conditions

Medium temperature range	-58 to +300°F (-50 to +150°C); for exceptions, see "Process connections"
Thermal shock	Max. 250°F/s (120°C/s)
Medium pressure p_e	




* Allowed pressure rating by selecting the "1450 psi / 100 bar" option (see "Product structure" code 060)
Exceptions see "Process connections"

Test pressure	<p>$p_e = 928$ psi (64 bar): max. 1450 psi / 100 bar (1.5 times the medium pressure p_e); no function during test pressure Burst pressure of diaphragm 2900 psi (200 bar)</p> <p>$p_e = 1450$ psi (100 bar): max. 2175 psi / 150 bar (1.5 times the medium pressure p_e); no function during test pressure Burst pressure of diaphragm 5800 psi (400 bar)</p>
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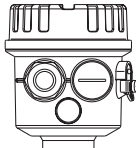
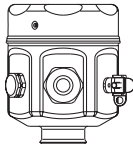
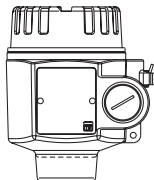
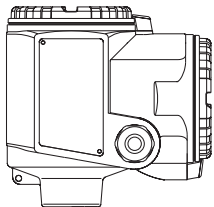
State of aggregation	Liquid
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Density	0.7 SGU (0.7 g/cm ³) = delivery status 0.5 SGU (0.5 g/cm ³)* adjustable over switches * Density settings for the compact housing on request
Viscosity	Max. 10,000 cp (10000 mm ² /s)
Solids content	Max. ø 0.2" (5 mm)


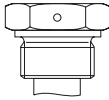
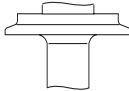
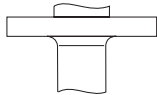
Mechanical construction

Design	Summary of all electrical and mechanical versions
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)
* Electronics also available as compact housing. The electronics for compact units are potted and sealed inside the pipe style housing and cannot be removed!	

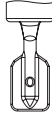


Housing

 L00-FTL5xxxx-03-05-xx-xx-019	 L00-FTL5xxxx-03-05-xx-xx-001	 L00-FTL5xxxx-03-05-xx-xx-002	 L00-FTL5xxxx-03-05-xx-xx-003	 L00-FTL5xxxx-03-05-xx-xx-004
Compact welded construction (316L)	F16 Polyester (PBT)	F15 Steel (316L)	F17/F13 Aluminum (also for hazardous area), coated	T13 Aluminum with separate connection compartment (also for hazardous area), coated

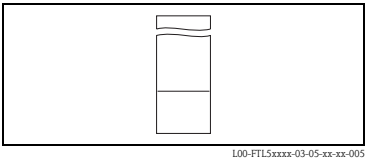
Process connections

 L00-FTL5xxxx-03-05-xx-xx-006	 L00-FTL5xxxx-03-05-xx-xx-007	 L00-FTL5xxxx-03-05-xx-xx-008	 L00-FTL5xxxx-03-05-xx-xx-009
G ¾, DIN ISO 228/1 R ¾, DIN 2999 ¾" NPT, ANSI B 1.20.1 (AF 32)	G 1, DIN ISO 228/1 R 1, DIN 2999 1" NPT, ANSI B 1.20.1 (AF 41)	Various hygienic and aseptic connections	Flanges to ANSI, DIN, JIS from 1" (DN 25)

Sensors
Compact (1.5"),
with extension pipe up to 115" (3 m) ,
to 236" (6 m) on request
or special length "L II" (see also page 27)

Compact	Length L	Length L II
		
<small>L00-FTL5xxxx-03-05-xx-xx-018</small>		
$p_e = 928 \text{ psi}$	928 psi 1450 psi	928 psi 1450 psi

Bushings
Temperature spacer and flameproof bushing

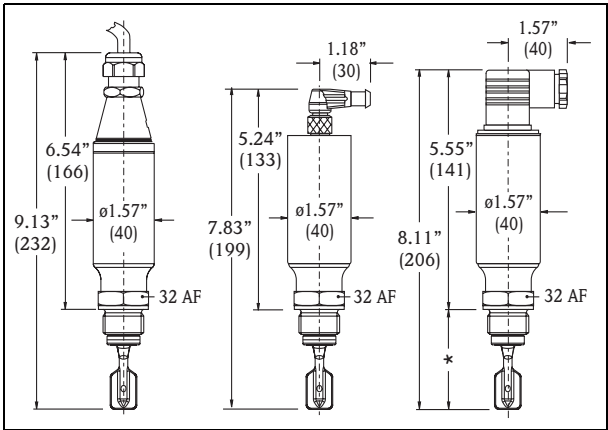


Dimensions
dimensions in inches (mm)

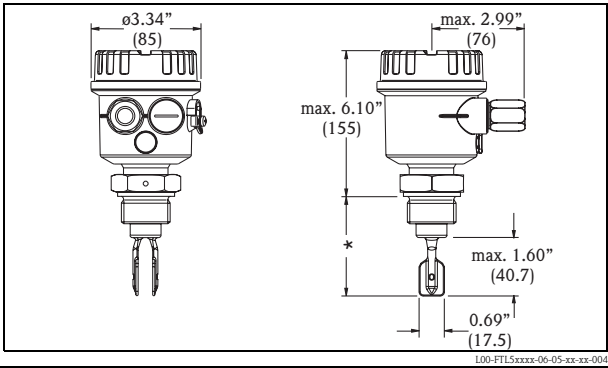
Housing and sensor FTL50(H)

Compact housing

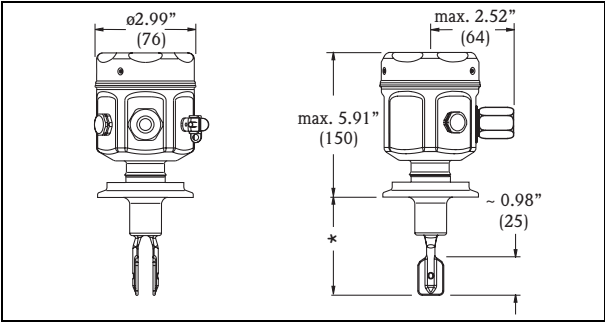
- 1. 16 ft (5 m) cable
- 2. M12 connector
- 3. 1/2" NPT (Pg11) connector



Polyester housing

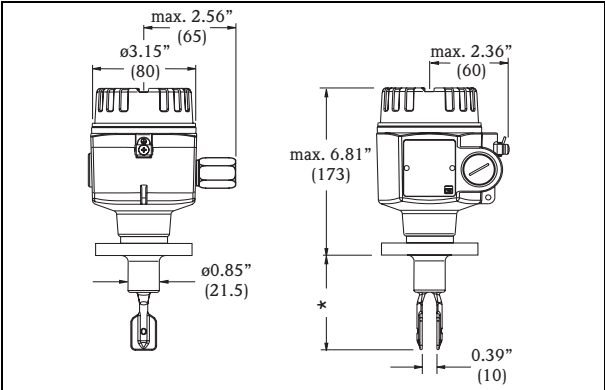


Stainless steel housing



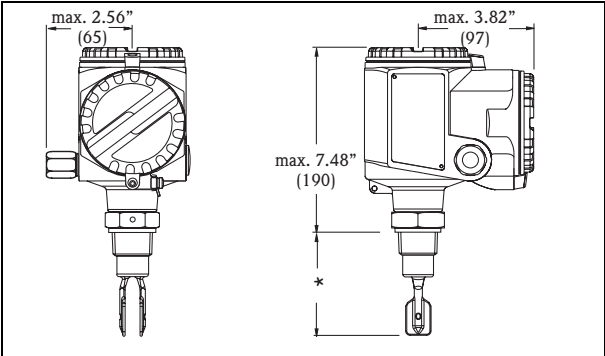
L00-FTL5xxxx-06-05-xx-xx-006

Aluminum housing



L00-FTL5xxxx-06-05-xx-xx-006

Aluminum housing
with separate
connection compartment



L00-FTL5xxxx-06-05-xx-xx-007

* see "Process connections"



Note!

The switchpoints of the Liquiphant **M** are at different positions than the previous version Liquiphant **II**.

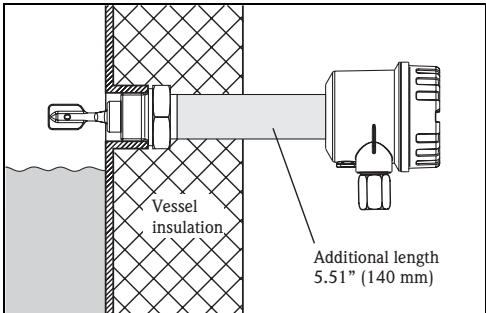
Bushings: temperature spacer, flameproof bushing

Temperature spacer

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

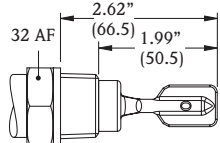
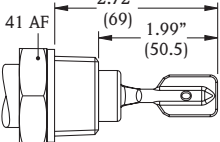
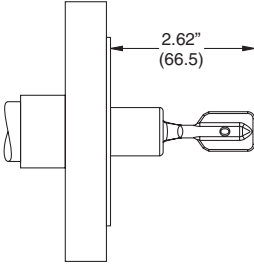
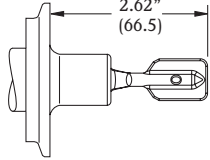
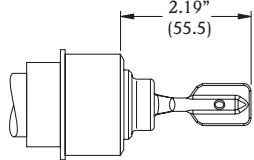
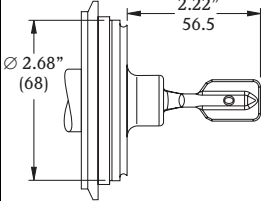
Flameproof bushing

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



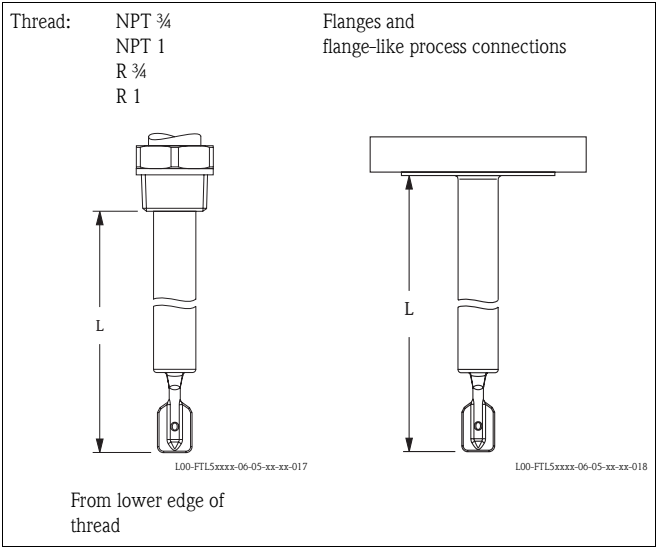
L00-FTL5xxxx-11-05-xx-xx-000

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

Process connection		Dimensions	Accessories	Pressure Temperature
3/4" NPT ANSI B 1.20.1 or R 3/4 DIN 2999	GM2 GM5 GE2 GE5	 L00-FTL5xxxx-06-05-xx-en-004	In conformity with FDA*	max. 1450 psi (100 bar) max. 300°F (150°C)
1" NPT ANSI B 1.20.1 or R 1 DIN 2999	GN2 GN5 GF2 GF5	 L00-FTL5xxxx-06-05-xx-en-005	In conformity with FDA*	max. 1450 psi (100 bar) max. 300°F (150°C)
Flanges ANSI B 16.5	A##	 L00-FTL5xxxx-06-05-xx-en-008	Seal according to design installed on site In conformity with FDA*	See nominal pressure of flange, however max. 1450 psi (100 bar) max. 300°F (150°C)
* FDA approved materials according to 21 CFR Part 177.1550/2600				
Tri-Clamp 1-1/2" = ø50.5 mm 2" = ø64.0 mm ISO 2852	TC2 TE2	 L00-FTL5xxxx-06-05-xx-xx-009	Clamping ring and front seal installed on site In conformity with FDA*	max. 232 psi (16 bar) max. 248°F (120°C) max. 30 psi (2 bar) max. 300°F (150°C)
Flush-mounted for 1" welding neck Factory standard Endress+Hauser with silicone seal and screw cap: supplied	EE2	 L00-FTL5xxxx-06-05-xx-xx-011	Welding neck (fork can be positioned) Endress+Hauser 52001047 In conformity with FDA* See "Accessories"	max. 600 psi (40 bar) max. 212°F (100°C) max. 360 psi (25 bar) max. 300°F (150°C)
Varivent for piping ≥ DN 65 ≥ O.D. 3" ≥ I.P.S. 3"	WE2	 L00-FTL5xxxx-06-05-xx-xx-015	Clamping ring and O-ring seal, installed on site In conformity with FDA*	See specification as per Tuchenhausen VARIVENT-Inline housing but: max. 928 psi (64 bar) max. 300°F (150°C)
* FDA approved materials according to 21 CFR Part 177.1550/2600				

NOTE: Other process connections are available e.g. DIN or JIS flanges, G 1 or G 3/4 threaded, aseptic, ORD, SMS – please contact Endress+Hauser.

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



Any length L:
6 to 115" (148 to 3000 mm); special version (TSP) on request up to 235" (6000 mm).



Note!
The switchpoints of the Liquiphant **M** are at different positions than the previous version Liquiphant **II**.

Special length "L II":
With vertical mounting from above the switchpoint is the same as the Liquiphant II
FTL360, FTL365, FDL30, FDL35

"L II" depends on process connection:
4.5" (115 mm) for flanges and flange-like process connections
4" (99 mm) for threads NPT and R (BSPT)
4.1" (104 mm) for flush-mounted 1" (Endress+Hauser)

Weights	See "Product structure"
Material	<ul style="list-style-type: none">– Wetted parts:<ul style="list-style-type: none">Process connection and extension pipe: AISI 316L SS (1.4435) or 2.4610 (AlloyC4)Tuning fork: AISI 316L SS (1.4435) or 2.4610 (AlloyC4)– Flat seal for process connection G $\frac{3}{4}$ or G 1: elastomer fiber, asbestos-free– Polyester housing: PBT-FR<ul style="list-style-type: none">with PBT-FR cover or with PA12 cover with sight glass,Cover seal: EPDM– Steel housing: AISI 316L SS,<ul style="list-style-type: none">Cover seal: silicone– Aluminum housing: EN-AC-AISi10Mg, plastic-coated,<ul style="list-style-type: none">Cover seal: EPDM– Compact housing: valve connector or M12 connector– Cable gland: polyamide or brass, nickel-plated– Temperature spacer: AISI 316L SS (1.4435)– Flameproof bushing: AISI 316L SS (1.4435)

Process connections

- Tapered thread $\frac{3}{4}$ -14 NPT, 1 - 1 1/2 NPT to ANSI B 1.20.1
- Flush-mounted with welding neck to factory standard Endress+Hauser (G $\frac{3}{4}$, G 1)
- Flush-mounted with welding neck to factory standard Endress+Hauser (1"),
Sensor can be positioned
- Tri-Clamp 1 1/2", 2" to ISO 2852
- Varivent® DN 50 (50/40) to factory standard Tuchenhausen
- Flanges to according ANSI B 16.5 from 1"

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 defect

With FEL56:

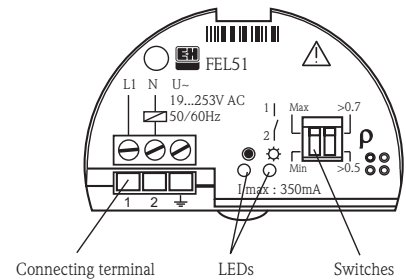
- 2 switches for safety mode and density change,
- green LED flashes to indicate operational status,
- red LED to indicate the switching status,
flashes in the event of corrosion damage
on sensor or if the electronics are defect

With FEL57:

- 2 switches for density change and cyclical checking,
- 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 defect

With FEL58:

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



L00-FTL5xxx-03-05-xx-en-001



L00-FTL5xxx-03-05-xx-xx-013

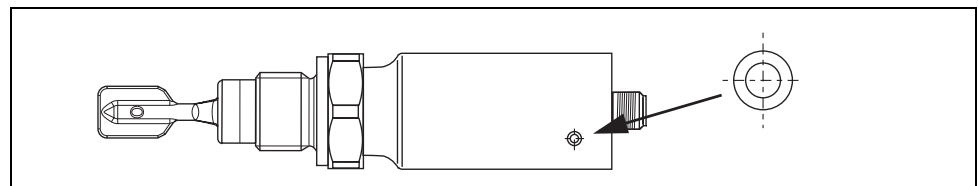
Compact housings**Function test with test magnet**

Versions AC, DC-PNP and NAMUR:

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

Performing the test

Hold the test magnet against the marking on the nameplate:

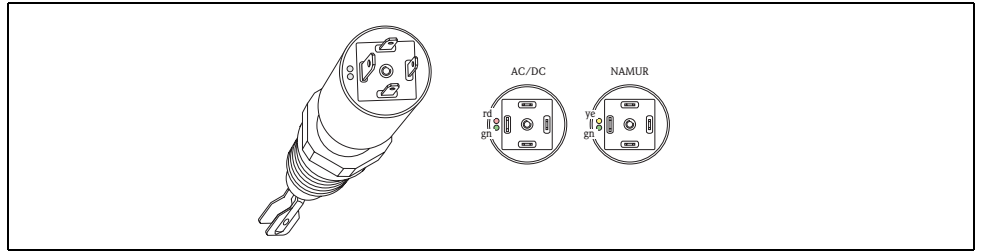


L00-FTL5xxx-19-05-xx-xx-001

The switching status is changed.

Light signals

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



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

Green light (gn) light 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 (overflow protection): sensor is immersed in liquid.

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

Yellow light (ye) lights up (NAMUR):

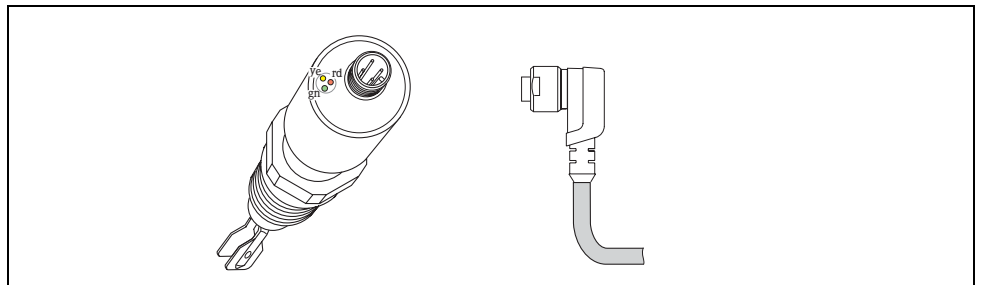
MAX application mode (overflow protection): sensor is not immersed in liquid.

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 (overflow protection): sensor is not immersed in liquid.

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

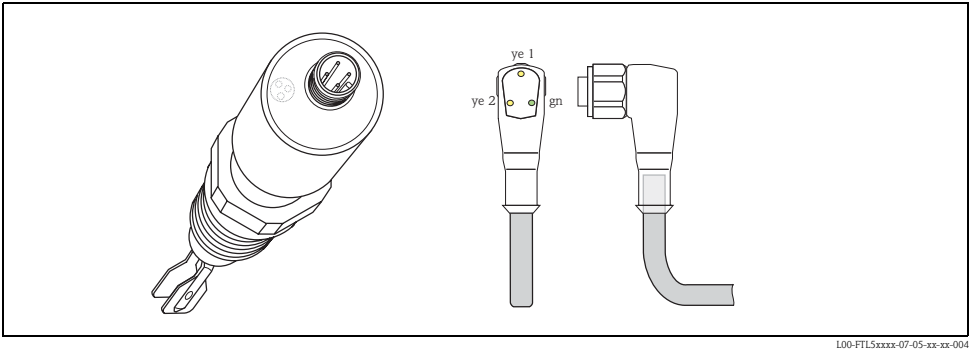
Red light (rd) flashing (DC-PNP):

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 (overflow 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 (overflow 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

Local configuration

Certificates and approvals

General approvals

For Liquiphant M FTL50H, FTL51H the following approvals are available:

- EHEDG: Certification (from TNO, The Netherlands), Report No. V99.394
- 3-A: 3-A Certificate (USA), Authorization No. 459

Process connections	Order Code	 <small>L00-FTL5xxxx-01-05-xx-xx-001</small>
Tri-Clamp 2" (special seal from Hyjoin Limited, UK)	TE2	X
Threaded pipe joint	MA2, MC2, ME2	X
Flush-mounted (fork can be positioned)	EE2	X
Varivent®	WE2	X



Note!

For CIP (Clean in Place) and SIP (Sterilize in Place) processes, the pressure and temperture specifications of the process connections must be observed.



Warning!

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, July 1993. The flow of liquid during cleaning is important and should be in compliance with HDC.

Other certificates See "Ordering information"

Combination of housings and electronic inserts

Based on the various certificates, permissible combinations of housings *) and electronic inserts are given in the following table.
*) Abbreviations: Polyester = PBT, Steel 316L = St., Aluminum = Alu
Aluminum housing with separate connection compartment = Alu/sep

Certificate, applications		Housing	Electronic inserts
A	Without any special certificate (for non-hazardous area)	PBT, St., Alu, Alu/sep.	FEL51/52/54, FEL55/56/57/58
P	FM, IS, Cl. I, II, III, Div. 1, Gr. A-G	PBT, St., Alu, Alu/sep. with NPT cable entry	FEL55/56/57/58
Q	FM, XP, Cl. I, II, III, Div. 1, Gr. A-G	Alu with NPT cable entry	FEL51/52/54, FEL55/56/57/58
R	FM, NI, Cl. I, Div. 2, Gr. A-D	St., Alu, Alu/sep. with NPT cable entry	FEL51/52/54, FEL55/56/57/58
		PBT with NPT cable entry	FEL55/56/57/58
U	CSA, General Purpose	St., Alu, Alu/sep. with NPT cable entry	FEL51/52/54, FEL55/56/57/58
		PBT with NPT cable entry	FEL51/52, FEL55/56/57/58
S	CSA, IS, Cl. I, II, III, Div. 1, Gr. A-G	PBT, St., Alu, Alu/sep. with NPT cable entry	FEL55/56/57/58
T	CSA, XP, Cl. I, II, III, Div. 1, Gr. A-G	Alu with NPT cable entry	FEL51/52/54, FEL55/56/57/58
Y	Other certificate (for non-hazardous area)	PBT, St., Alu, Alu/sep.	FEL51/52/54, FEL55/56/57/58



Note!
On polyester housing (PBT), electric connecting cables run in pipes:
Do not screw cable entries firmly to the piping. Use flexible connections (e.g. with flex steel conduit).
If the piping is used for grounding then ensure that there is a continuous electrical connection.



Note!
Despite the additional Dust-Ex-certificate, the FTL5x(H) is to be used as a liquid limit switch only.

Ordering information



Note!

This overview does not mark options which are mutually exclusive. Endress+Hauser reserves the right to change or modify product, specifications, and ordering information at any time without notice. Please consult Endress+Hauser or your local representative for the most recent information.

Product structure

Liquiphant M

FTL50

FTL51

Design		Basic weight	
FTL50	Compact	1.3 lb	0.6 kg
FTL51	With extension pipe	1.3 lb	0.6 kg

10	Approval:		
A	Non-hazardous area		
P	FM	IS, Class I, II, III	Division 1, Group A-G
Q	FM	XP, Class I, II, III	Division 1, Group B-G, for E5 housing Group A-G
R	FM	NI, Class I	Division 2, Group A-D
S	CSA	IS, Class I, II, III	Division 1, Group A-G
T	CSA	XP, Class I, II, III	Division 1, Group A-G
U	CSA	General Purpose	
Y	Special version ATEX and TIIS certified units available on request		

20	Process Connection:				Additional weight	
	Note!					
	For 1450 psi (100 bar) process pressure, please select the appropriate option under "Additional option"					
GM2	NPT ¾		316L	Thread ANSI		
GM5	NPT ¾		AlloyC4	Thread ANSI		
GN2	NPT 1		316L	Thread ANSI	0.4 lb	0.2 kg
GN5	NPT 1		AlloyC4	Thread ANSI	0.4 lb	0.2 kg
AA2	1-¼"	150 lbs	RF 316/316L	Flange ANSI B16.5	2.6 lb	1.2 kg
AB2	1-¼"	300 lbs	RF 316/316L (FTL51)	Flange ANSI B16.5	4.4 lb	2.0 kg
AC2	1-½"	150 lbs	RF 316/316L	Flange ANSI B16.5	3.3 lb	1.5 kg
AD2	1-½"	300 lbs	RF 316/316L (FTL51)	Flange ANSI B16.5	6.0 lb	2.7 kg
AE2	2"	150 lbs	RF 316/316L	Flange ANSI B16.5	5.3 lb	2.4 kg
AE5	2"	150 lbs	RF AlloyC4 >316/316L	Flange ANSI B16.5	5.3 lb	2.4 kg
AF2	2"	300 lbs	RF 316/316L	Flange ANSI B16.5	7.1 lb	3.2 kg
AG2	2"	600 lbs	RF 316/316L (FTL51)	Flange ANSI B16.5	9.3 lb	4.2 kg
AJ2	2-½"	300 lbs	RF 316/316L (FTL51)	Flange ANSI B16.5	10.6 lb	4.8 kg
AL2	3"	150 lbs	RF 316/316L	Flange ANSI B16.5	10.8 lb	4.9 kg
AM2	3"	300 lbs	RF 316/316L (FTL51)	Flange ANSI B16.5	15 lb	6.8 kg
AN2	3"	600 lbs	RF 316/316L (FTL51)	Flange ANSI B16.5		
AP2	4"	150 lbs	RF 316/316L	Flange ANSI B16.5	15.4 lb	7.0 kg
AQ2	4"	300 lbs	RF 316/316L (FTL51)	Flange ANSI B16.5	25.4 lb	11.5 kg
AR2	4"	600 lbs	RF 316/316L (FTL51)	Flange ANSI B16.5	38.1 lb	17.3 kg
A82	1"	150 lbs	RF 316/316L	Flange ANSI B16.5	2.2 lb	1.0 kg
TC2	DN25-38 (1 to 1-½")		316L	ISO 2852 Tri-Clamp	0.2 lb	0.1 kg
TE2	DN40-51 (2")		316L	ISO 2852 Tri-Clamp	0.7 lb	0.3 kg
YY9	Special version					
	Other process connections available, contact Endress+Hauser					

30	Probe Length; Type:				
	FTL50				
AA	Compact;		Ra <3.2 µm/80 grit		
IA	Compact;		temperature spacer	1.3 lb	0.6 kg
QA	Compact;		pressure tight feed through	1.5 lb	0.7 kg
	FTL51				
CB inch;	316L**	Ra <3.2 µm/80 grit		
CE inch;	AlloyC4**	Ra <3.2 µm/80 grit	5 lb/100 in	
DB	Length: type II*;	316L	Ra <3.2 µm/80 grit	0.2 lb	0.1 kg
DE	Length: type II*;	AlloyC4	Ra <3.2 µm/80 grit	0.2 lb	0.1 kg
KB inch;	316L**	+ temperature spacer	5 lb/100 in +1.3 lb	
KE inch;	AlloyC4**	+ temperature spacer	5 lb/100 in +1.3 lb	
LB	Length: type II*;	316L	+ temperature spacer	0.2 lb +1.3 lb	0.1 kg +0.6 kg
LE	Length: type II*;	AlloyC4	+ temperature spacer	0.2 lb +1.3 lb	0.1 kg +0.6 kg

[illegible]

Note!

The basic weight includes the compact sensor, thread adapter G ¾, electronic insert, polyester housing

Product structure
Liquiphant M
FTL50H
FTL51H

Design		Basic weight					
FTL50H	Compact			1.5 lb	0.7 kg		
FTL51H	With extension pipe			1.5 lb	0.7 kg		
10	Approval:						
	A	Non-hazardous area					
	P	FM	IS, Class I, II, III	Division 1, Group A-G			
	Q	FM	XP, Class I, II, III	Division 1, Group B-G, for E5 housing Group A-G			
	R	FM	NI, Class I	Division 2, Group A-D			
	S	CSA	IS, Class I, II, III	Division 1, Group A-G			
	T	CSA	XP, Class I, II, III	Division 1, Group A-G			
	U	CSA	General Purpose				
	Y	Special version					
	ATEX and TIIS certified units availableon request						
20		Process Connection:			Additional weight		
	EE2	1" flush-mounted (52001047)	316L		0.7 lb	0.3 kg	
	AA2	1¼" 150 lbs	RF 316/316L	Flange ANSI B16.5	2.6 lb	1.2 kg	
	AC2	1½" 150 lbs	RF 316/316L	Flange ANSI B16.5	3.3 lb	1.5 kg	
	AE2	2" 150 lbs	RF 316/316L	Flange ANSI B16.5	5.3 lb	2.4 kg	
	AF2	2" 300 lbs	RF 316/316L	Flange ANSI B16.5	7.1 lb	3.2 kg	
	AJ2	2½" 300 lbs	RF 316/316L (FTL51H)	Flange ANSI B16.5	10.6 lb	4.8 kg	
	AL2	3" 150 lbs	RF 316/316L	Flange ANSI B16.5	10.8 lb	4.9 kg	
	AM2	3" 300 lbs	RF 316/316L (FTL51H)	Flange ANSI B16.5	15.0 lb	6.8 kg	
	AP2	4" 150 lbs	RF 316/316L	Flange ANSI B16.5	15.4 lb	7.0 kg	
	AQ2	4" 300 lbs	RF 316/316L (FTL51H)	Flange ANSI B16.5	25.3 lb	11.5 kg	
	A82	1" 150 lbs	RF 316/316L	Flange ANSI B16.5	2.2 lb	1.0 kg	
	TC2	DN25-38 (1 to 1-½")	316L	ISO 2852 Tri-Clamp			
	TE2	DN40-51 (2")	316L	ISO 2852 Tri-Clamp	0.2 lb	0.1 kg	
	WE2	DN65-162 PN10	316L	Varivent N	1.1 lb	0.5 kg	
	YY9	Special version					
	Other process connections available, contact Endress+Hauser						
30		Probe Length; Type:					
		FTL50H					
	AC	Compact;	Ra <1.5 µm/120 grit				
	AD	Compact;	Ra <0.3 µm/320 grit / A3				
	IC	Compact;	Ra <1.5 µm/120 grit + temperature spacer		1.3 lb	0.6 kg	
	ID	Compact;	Ra <0.3 µm/320 grit / A3 + temperature spacer		1.3 lb	0.6 kg	
	QC	Compact;	Ra <1.5 µm/120 grit + pressure tight feed through		1.5 lb	0.7 kg	
	QD	Compact;	Ra <0.3 µm/320 grit / A3 + pressure tight feed through		1.5 lb	0.7 kg	
	FTL51H						
	CC inch;	Ra <1.5 µm/120 grit		5 lb/100 inches		
	CD inch;	Ra <0.3 µm/320 grit / A3		5 lb/100 inches		
	DC	Length: type II*	Ra <1.5 µm/120 grit		0.2 lb	0.1 kg	
	DD	Length: type II*	Ra <0.3 µm/320 grit / A3		0.2 lb	0.1 kg	
	KC inch;	Ra <1.5 µm/120 grit + temperature spacer		5 lb/100 inches	+1.3 lb	
	KD inch;	Ra <0.3 µm/320 grit + temperature spacer		5 lb/100 inches	+1.3 lb	
	LC	Length: type II*	Ra <1.5 µm/120 grit + temperature spacer		0.2 lb	0.1 kg	
	LD	Length: type II*	Ra <0.3 µm/320 grit + temperature spacer		+1.3 lb	+0.6 kg	
	SC inch;	Ra <1.5 µm/120 grit + pressure tight feed through		0.2 lb	0.1 kg	
	SD inch;	Ra <0.3 µm/320 grit + pressure tight feed through		+1.3 lb	+0.6 kg	
	TC	Length: type II*	Ra <1.5 µm/120 grit + pressure tight feed through		5 lb/100 inches	+1.5 lb	
	TD	Length: type II*	Ra <0.3 µm/320 grit + pressure tight feed through		5 lb/100 inches	+1.5 lb	
	YY	Special version					
	*) Replacing instruments: when vertically mounting a Liquiphant M FTL51H with length II, the switch point is at the same height as for the Liquiphant II FTL360, FTL365, FDL30, FDL35						



The basic weight includes the compact sensor, thread adapter G 3/4, electronic insert, steel housing

Accessories

Welding neck

Order number: 52001047
with 3.1.B material certificate: 52006909
for flush-mounting
a Liquiphant FTL50H, FTL51H
with process connection EE2

■ Sensor can be positioned

Material: corrosion-resistant steel
AISI 316L SS

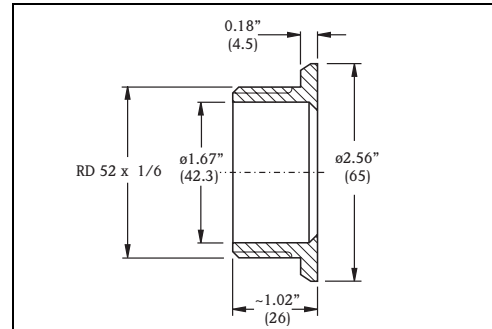
Weight: 0.3 lb (0.15 kg)

Seal on Liquiphant: silicone moulded seal
Order number: 942816-0000

FDA approved materials according to
21 CFR Part 177.1550/2600

max. 362 psi (25 bar) / max. 300°F (150°C)

max. 580 psi (40 bar) / max. 212°F (100°C)



L00-FTL5xxxx-06-05-xx-xx-022

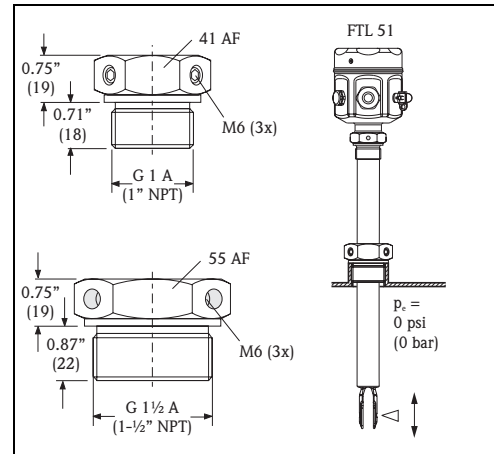
Sliding sleeves for unpressurised operation

for continuous adjustment of the switch point
of a Liquiphant M FTL51

Material: corrosion-resistant steel
AISI 316L SS

Weight for NPT 1": 0.5 lb (0.21 kg)

Weight for NPT 1-1/2": 1.2 lb (0.54 kg)



L00-FTL5xxxx-06-05-xx-en-006

Thread	Standard	Material	Order number	Approval
NPT 1	ANSI B 1.20.1	1.4435 (AISI 316L SS)	52003979	
NPT 1	ANSI B 1.20.1	1.4435 (AISI 316L SS)	52011889	3.1 material certificate
NPT 1-1/2	ANSI B 1.20.1	1.4435 (AISI 316L SS)	52003981	
NPT 1-1/2	ANSI B 1.20.1	1.4435 (AISI 316L SS)	52011891	3.1 material certificate

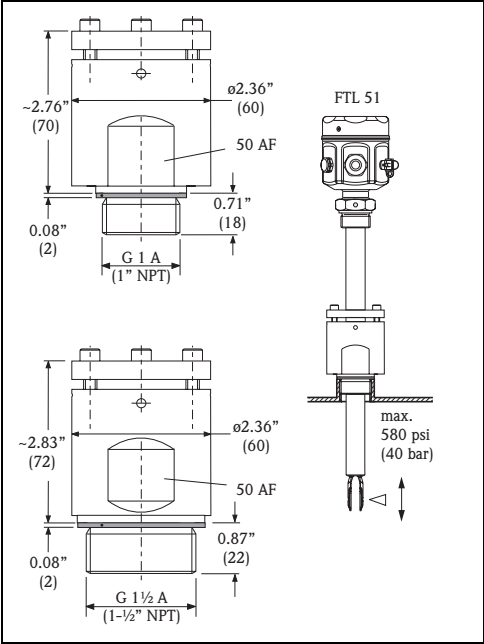
High pressure sliding sleeves

for continuous adjustment of the switch point of a Liquiphant M FTL51

Material: corrosion-resistant steel
AISI 316L SS or AlloyC4

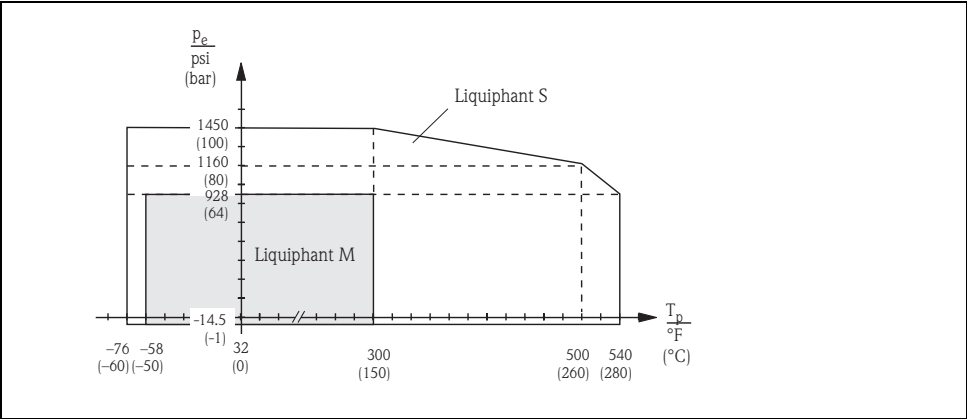
Weight for NPT 1": 2.5 lb (1.13 kg)
Weight for NPT 1-½": 3 lb (1.32 kg)

Seal package made of graphite



L00-FTL5xxxx-06-05-xx-en-007

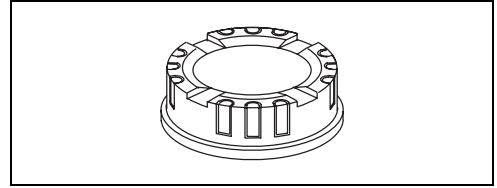
Thread	Standard	Material	Order number	Approval
NPT 1	ANSI B 1.20.1	1.4435 (AISI 316L SS)	52003667	
NPT 1	ANSI B 1.20.1	1.4435 (AISI 316L SS)	52011881	3.1 material certificate
NPT 1	ANSI B 1.20.1	AlloyC4	52003668	
NPT 1-½	ANSI B 1.20.1	1.4435 (AISI 316L SS)	52003669	
NPT 1-½	ANSI B 1.20.1	1.4435 (AISI 316L SS)	52011883	3.1 material certificate
NPT 1-½	ANSI B 1.20.1	AlloyC4	52003670	



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

Transparent cover

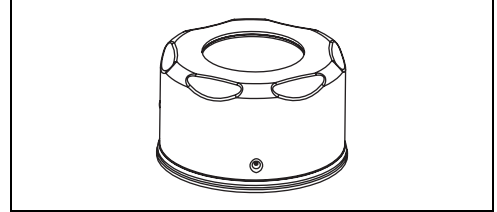
Order number: 943461-0001
for polyester housing
Material: PA 12
Weight: 0.1 lb (0.04 kg)



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

Cover with sight glass

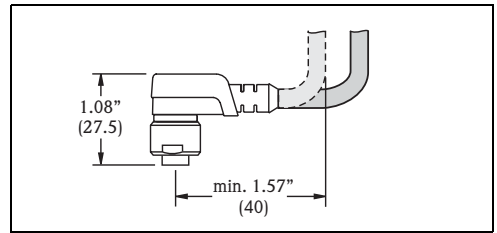
For steel housing
Material: AISI 316L SS
Weight: 0.4 lb (0.16 kg)
– Order number: 943301-1000
With glass sight glass
– Order number: 52001403
With PC sight glass
(Not for CSA, General Purpose)



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

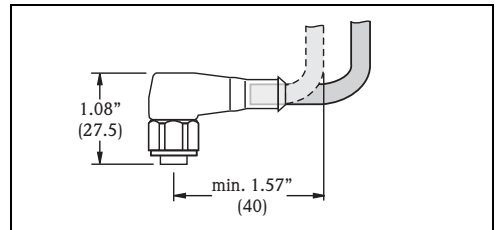
Circular wiring connector

Order number: 52010285
4 x 0.34 M12 socket
Cable: PVC (grey) 16 ft (5 m) length
Body: PUR (blue)
Coupling nut: Cu Sn/Ni
Protection: NEMA 4X (IP67)
Temperature range: -13 to +158°F (-25 to +70°C)



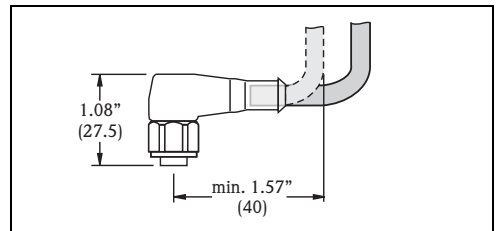
L00-FTL20Hxx-07-05-xx-xx-004

Order number: 52024216
4 x 0.34 M12 socket
Cable: PVC (orange) 16 ft (5 m) length
Body: PVC (orange)
Coupling nut: 316L SS
Protection: IP69K (fully locked)
Temperature range: -13 to +158°F (-25 to +70°C)



L00-FTL20Hxx-07-05-xx-xx-005

Order number: 52018763
4 x 0.34 M12 socket with integrated LEDs
Cable: PVC (orange) 16 ft (5 m) length
Body: PVC (transparent)
Coupling nut: 316L SS
Protection: IP69K (fully locked)
Temperature range: -13 to +158°F (-25 to +70°C)



L00-FTL20Hxx-07-05-xx-xx-005

Supplementary Documentation



Note!

This supplementary documentation can be found on our product pages on www.endress.com

Operating Instructions

Liquiphant M FTL50, FTL51

KA143F/00/a6

Liquiphant M FTL50(H), FTL51(H)

KA144F/00/a6

Liquiphant M FTL51C

KA162F/00/a6

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

KA163F/00/a6

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

KA164F/00/a6

Liquiphant M FTL51C-##### 7 ##

KA165F/00/a6

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

KA220F/00/a6

Technical Information

Nivotester FTL370/372, switching units in Racksyst design

for Liquiphant M with electronic insert FEL57

TI198F/00/en

Nivotester FTL320, switching unit in Minipac design

for Liquiphant M with electronic insert FEL57

TI203F/00/en

General instructions for electromagnetic compatibility

(Test procedure, installation recommendation)

TI241F/00/en

Isolating amplifier FXN421/422, switching units for top-hat rail mounting

for Liquiphant M with electronic insert FEL56, FEL58

TI332F/00/en

Liquiphant M FTL51C, wetted parts with highly corrosion-resistant coating

made of ECTFE, PFA or enamel

TI347F/00/en

Isolating amplifier FTL325P, 1 or 3-channel switching units for top-hat rail mounting

for Liquiphant M/S with electronic insert FEL57

TI350F/00/en

Isolating amplifier FTL325N, 1 or 3-channel switching units for top-hat rail mounting

for Liquiphant M/S with electronic insert FEL56, FEL58

TI353F/00/en

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

TI354F/00/en

Isolating amplifier FTL375P, 1 to 3-channel switching units for top-hat rail mounting

for Liquiphant M/S with electronic insert FEL57

TI360F/00/en

Isolating amplifier FTL375N, 1 to 3-channel switching units for top-hat rail mounting

for Liquiphant M/S with electronic insert FEL56, FEL58

TI361F/00/en

Functional Safety (SIL)

Liquiphant M/S + Nivotester FTL325P
SD111F/00/en

Liquiphant M/S + Nivotester FTL375P
SD113F/00/en

Liquiphant M/S with FEL58 + Nivotester FTL325N (MAX)
SD161F/00/en

Liquiphant M/S with electronic insert FEL54 (MAX)
SD162F/00/en

Liquiphant M/S with electronic insert FEL52 (MAX)
SD163F/00/en

Liquiphant M/S with electronic insert FEL51 (MAX)
SD164F/00/en

Liquiphant M/S with electronic insert FEL55 (MAX)
SD167F/00/en

Liquiphant M/S with FEL56 + Nivotester FTL325N (MAX)
SD168F/00/en

Liquiphant M/S with FEL58 + Nivotester FTL325N (MIN)
SD170F/00/en

Liquiphant M/S with electronic insert FEL51 (MIN)
SD185F/00/en

Liquiphant M/S with electronic insert FEL52 (MIN)
SD186F/00/en

Liquiphant M/S with electronic insert FEL54 (MIN)
SD187F/00/en

Liquiphant M/S with FEL56 + Nivotester FTL325N (MIN)
SD188F/00/en

System Information

Liquiphant M
SI040F/00/en

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