



Level



Pressure



Flow



Temperature

Liquid
Analysis

Registration

Systems
Components

Services



Solutions

Technical Information

Liquiphant S FTL70, FTL71

Vibration Limit Switch

High-temperature level limit switch for all liquids.

Also for use in hazardous areas.



The function is not affected by flow, turbulence, bubbles, foam, vibration, bulk solids content or buildup. The Liquiphant is thus the ideal substitute for float switches.

FTL70:

Compact design, also for pipes

FTL71:

With extension pipe up to 3 m (6 m on request)

High corrosion-resistant Alloy C4 (2.4610) is available for the fork and process connections for applications in very aggressive liquids.

EEx ia, EEx de and EEx d protection enable it to be used in hazardous areas.

Your benefits

- Use in safety systems requiring functional safety to SIL2 in accordance with IEC 61508/IEC 61511-1
- With high-temperature resistant components: for process temperatures **to 280 °C** (300 °C for max. 50 h cumulative)
- With welded gas-tight bushing: maximum safety in the event of damaged sensor
- Process connections from 3/4" and small tuning fork dimensions: also for areas difficult to access
- Large number of process connections to choose from: universal usage
- Wide variety of electronics, e.g. NAMUR, relay, DC-PMP, thyristor, PFM signal output: the right connection for every process control system
- PROFIBUS PA interface: for optimum startup and maintenance
- No calibration: quick, low-cost startup
- No mechanically moving parts: no maintenance, no wear, long operating life
- Monitoring of fork for damage: guaranteed function

Application

The Liquiphant S is a level limit switch which can be used in all liquids

- for process temperatures between -60 °C and 280 °C (300 °C for max. 50 h cumulative; without thermal shock restriction)
- for pressures up to 100 bar
- for viscosity up to 10,000 mm²/s
- for density of 0.5 g/cm³ or 0.7 g/cm³, other settings on request
- foam detection on request

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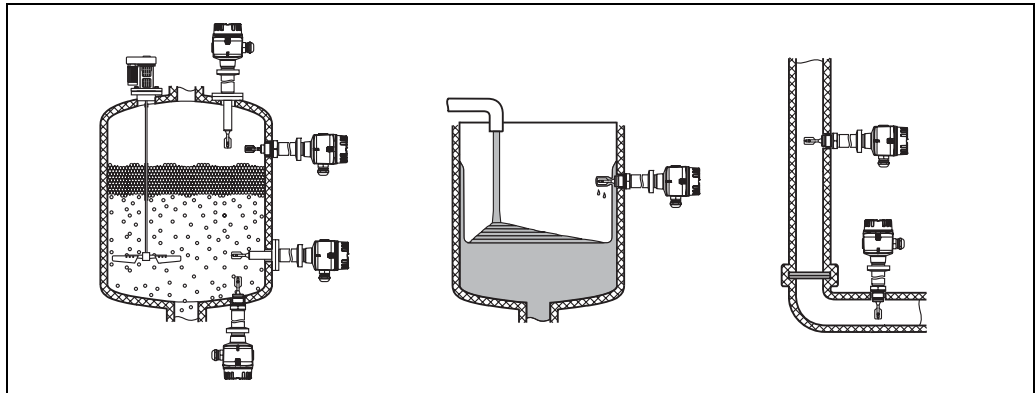
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Application

Level limit detection

Maximum or minimum detection in tanks or pipes containing all kinds of liquids from cold to very hot. The devices are also suitable for use in hazardous areas and for applications with high pressures.



L00-FTL7xxxx-11-05-xx-xx-001

Function and system design

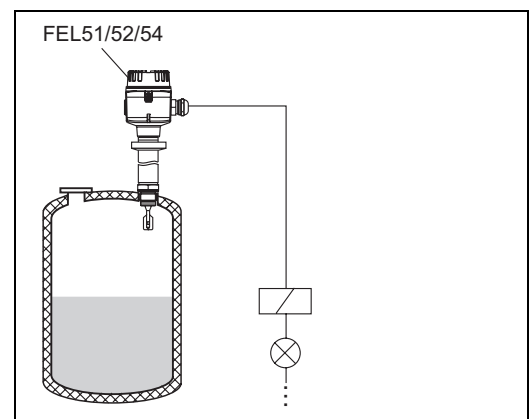
Measuring principle

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

Modularity

Level limit switch

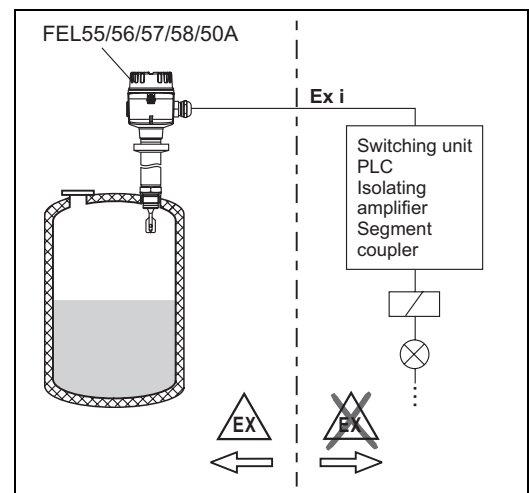
Liquiphant S FTL7x with electronic inserts FEL51, FEL52, FEL54



L00-FTL7xxxx-15-05-xx-xx-000

Level sensor

Liquiphant S FTL7x with electronic inserts FEL55, FEL56, FEL57, FEL58, FEL50A for connecting to a separate switching unit, an isolating amplifier or for connecting to a PROFIBUS PA segment coupler



L00-FTL7xxxx-15-05-xx-en-000

Electronics versions for level limit switch	<p>FEL51: Two-wire AC version; Switches the load directly into the power supply circuit via the thyristor.</p> <p>FEL52: Three-wire DC version; Switches the load via the transistor (PNP) and separate connection.</p> <p>FEL54: Universal current version with relay output; Switches the loads via 2 floating change-over contacts.</p>
Electronics versions for level sensor	<p>FEL55: For separate switching unit; signal transmission 16/8 mA on two-wire cabling.</p> <p>FEL56: For separate switching unit; signal transmission L-H edge 0.6...1.0/2.2...2.8 mA to EN 50227 (NAMUR) on two-wire cabling.</p> <p>FEL58: For separate switching unit; signal transmission H-L edge 2.2...3.5 / 0.6...1.0 mA to EN 50227 (NAMUR) on 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> <p>FEL50A: For connecting to PROFIBUS PA; Cyclic and acyclic data exchange acc. to PROFIBUS-PA Profile 3.0 Discrete Input</p>
Galvanic isolation	<p>FEL51, FEL52, FEL50A: Between sensor and power supply</p> <p>FEL54: Between sensor and power supply and load</p> <p>FEL55, FEL56, FEL57, FEL58: See connected switching unit</p>
Design	<p>FTL70: Compact</p> <p>FTL71: With extension pipe</p>

Input

Measured variable	Level (limit value)
Measuring range (detection range)	<p>FTL70: Depends on mounting point.</p> <p>FTL71: Depends on mounting point and the pipe extension. Standard 3000 mm (up to 6000 mm on request)</p>
Process density	Adjustment on the electronic insert > 0.5 g/cm ³ or > 0.7 g/cm ³ (other on request)

Electronic insert AC, FEL51

Power supply

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

Electrical connection

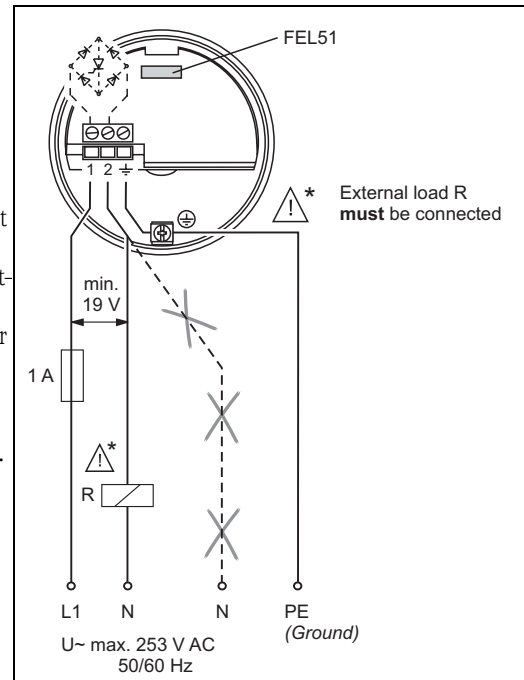
Two-wire AC connection

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 => MVT291278).
- When selecting the relay, pay attention to the holding power/ rated power

(see "Connectable load")



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

Output signal

IL = 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 I_L 2		
		1 < 3.8 mA 2		
Min.		1 I_L 2		
		1 < 3.8 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 (10 mA) or > 0.5 VA at 24 V (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 or < 8.4 VA at 24 V
- Voltage drop across FEL51 max. 12V
- 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 DC PNP, FEL52

Power supply

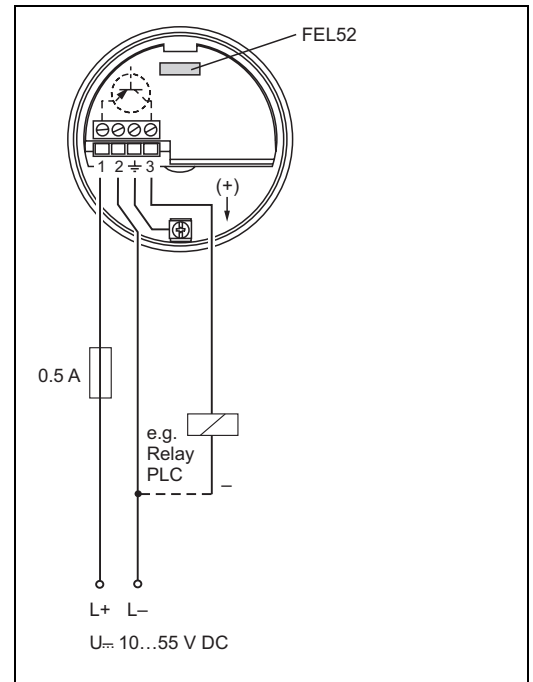
DC voltage: 10...55 V
 Ripple: max. 1.7 V, 0...400 Hz
 Current consumption: max. 15 mA
 Power consumption: max. 0.83 W
 Reverse polarity protection
 Overvoltage protection FEL52: overvoltage category III

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

IL = 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	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, max. 55 V
- Load current max. 350 mA (pulsed overload and short-circuit protection)
- Residual current < 100 μA (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);

Electronic insert AC/DC with relay output, FEL54

Power supply

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

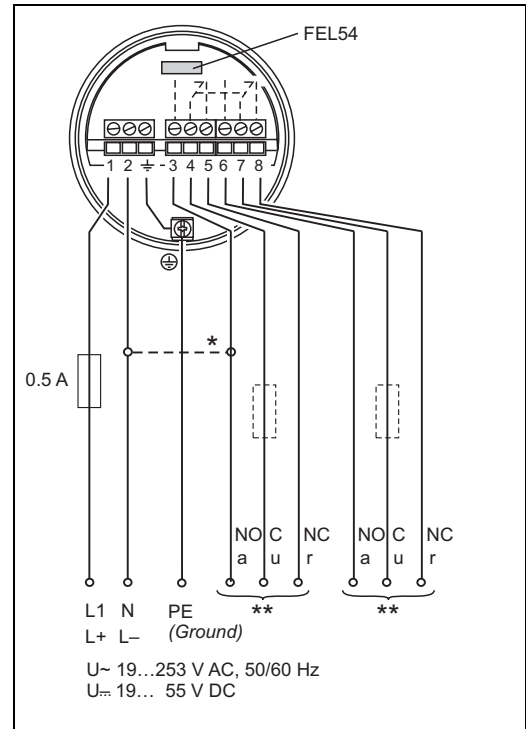
Electrical connection

Universal current connection with relay output

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



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	red
Max.				
Min.				

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

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~ max. 6 A (Ex de 4 A), U~ max. 253 V AC; P~ max. 1500 VA, cos φ = 1, P~ max. 750 VA, cos φ > 0.7
- I= max. 6 A (Ex de 4 A) to 30 V DC, I= 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 8/16 mA, FEL55

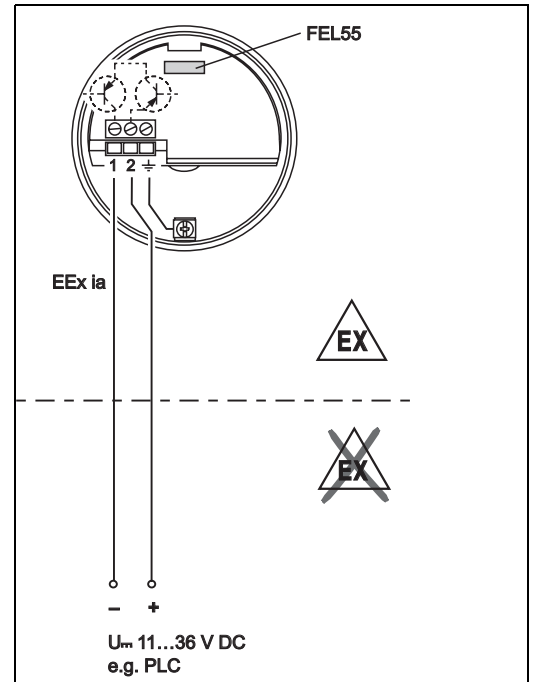
Power supply

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 (PLCs) for example, AI module 4 to 20 mA to EN 61131-2. Output signal jump from high to low current on limit.



L00-FTL5xxxx-04-05-xx-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.		+ 2 $\xrightarrow{\sim 16 \text{ mA}}$ 1		
		+ 2 $\xrightarrow{\sim 8 \text{ mA}}$ 1		
Min.		+ 2 $\xrightarrow{\sim 16 \text{ mA}}$ 1		
		+ 2 $\xrightarrow{\sim 8 \text{ mA}}$ 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

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

Example:
 PLC with 250 Ω with 2-wire version

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

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

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

Electronic insert NAMUR L-H edge, FEL56

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

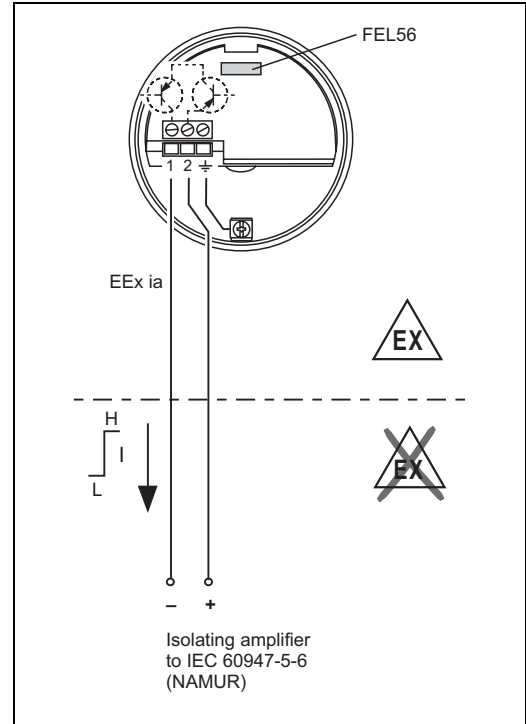
Electrical connection

Two-wire connection for separate switching unit

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



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

Output signal

- = lit
- = flashes
- = unlit

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

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

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 NAMUR L-H edge, FEL58

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

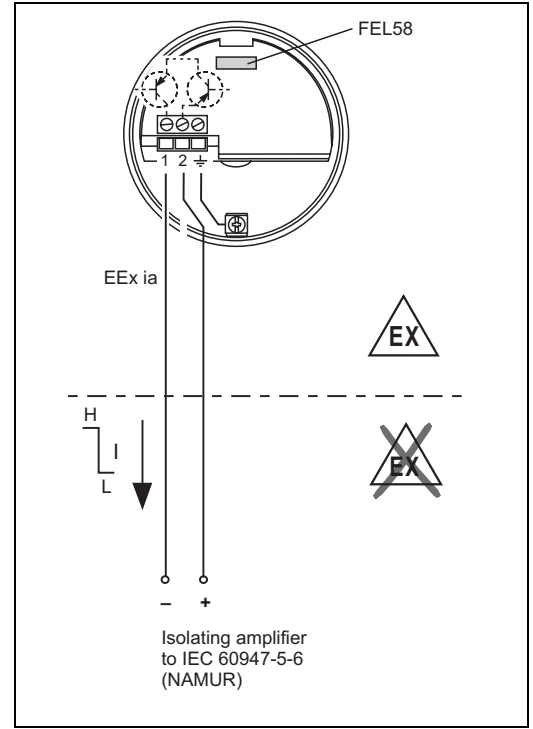
For connecting to isolating amplifiers acc. to NAMUR (IEC 60947-5-6), e.g. FTL325N, FTL375N from Endress+Hauser. Output signal jump from high to low current on limit.

(H-L edge)

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




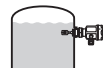








 **Note!**
 In Ex-d applications, the additional function can only be used if the housing is not exposed to an explosive atmosphere.




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



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

Output signal

Safety mode	Level	Output signal	LEDs	
			green	yellow
Max.		+ 2.2 ... 3.5 mA 2 → 1		
		+ 0.6 ... 1.0 mA 2 → 1		
Min.		+ 2.2 ... 3.5 mA 2 → 1		
		+ 0.6 ... 1.0 mA 2 → 1		

 = lit
 = flashes
 = unlit

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

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

Signal on alarm

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

Connectable load

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

Electronic insert PFM, FEL57

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 Nivotester switching units:
 FTL320, FTL325P, FTL370, FTL372, FTL375P
 (also with cyclical checking), from
 Endress+Hauser.

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 "cyclical checking":

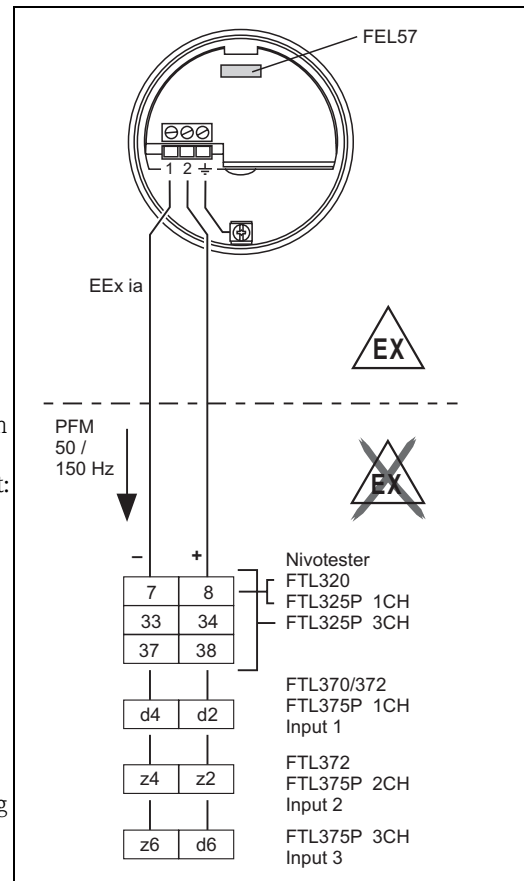
After interruption of the power supply, a test cycle is activated which checks the sensor and electronics without any change in level.

Approved for overfill protection acc. to WHG (German Water Resources Act).

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-xx-en-003

Switching behavior of the connected device:

Fail-safe mode set at switching unit	Setting at FEL57	Fork	Switching status of relay in switching unit	
			on = energised	off = de-energised
Max.	STD	free	on	off ~ 5 s off ~ 2 s on ~ 2 s off on
Max.	EXT	free	on	off ~ 5 s off ~ 2 s on ~ 35 s off // on
Max.	STD	covered	off	off
Max.	EXT	covered	off	off
Min.	STD	free	off	~ 3 s on * ~ 5 s off ~ 3 s on off
Min.	EXT	free	off	~ 3 s on * ~ 7 s off ~ 30 s on // off
Min.	STD	covered	on	~ 3 s on * ~ 5 s off on
Min.	EXT	covered	on	~ 3 s on * ~ 5 s off ~ 35 s on // ~ 3 s off on

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

* De-energised 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 using a Liquiphant S with FEL57 electronic insert.

Output signal

= lit
 = unlit
L00-FTL5xxxx-07-05-xx-xx-000

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

L00-FTL5xxxx-04-05-xx-xx-008

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 device Nivotester FTL320, FTL325P, FTL370, FTL372, FTL375P
- For contact load, see the Technical Data of the switching unit.

Electronic insert PROFIBUS PA, FEL50A

Power supply

Bus voltage: 9 to 32 V DC

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)

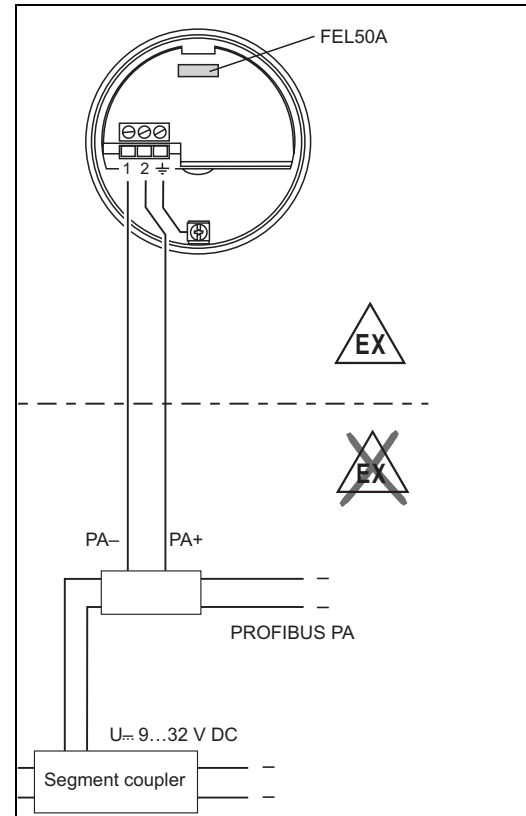
Electrical connection

Two-wire connection for power supply and data transfer

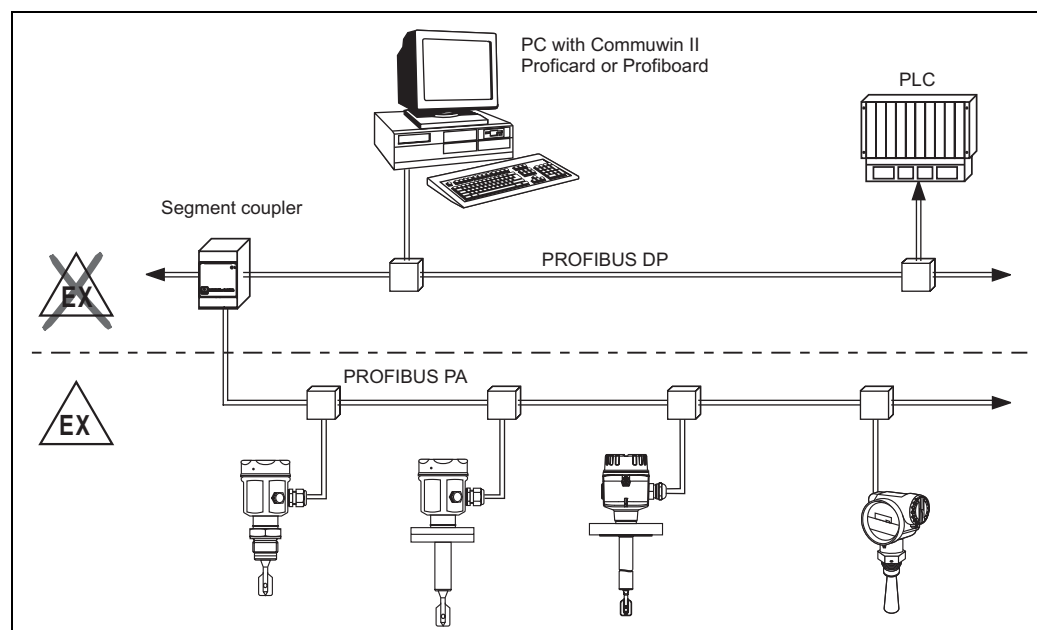
For connecting to PROFIBUS PA

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 BA198F
- You can also visit www.profibus.com for more information



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

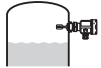
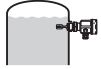
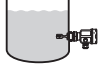
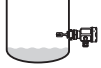


L00-FTL5xxxx-04-05-xx-en-006

Output signal

☀ = lit
 ● = unlit

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

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

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

Signal on alarm

- Failure information can be opened using the following interfaces:
 Yellow LED flashing, status code, diagnostic code; see BA198F

Connection and function

Connecting cables	<ul style="list-style-type: none"> ■ Electronic inserts: cross-section max. 2.5 mm²; strand in ferrule to DIN 46228 ■ Protective earth in housing: cross-section max. 2.5 mm² ■ External equipotential bonding connection on housing: cross-section max. 4 mm²
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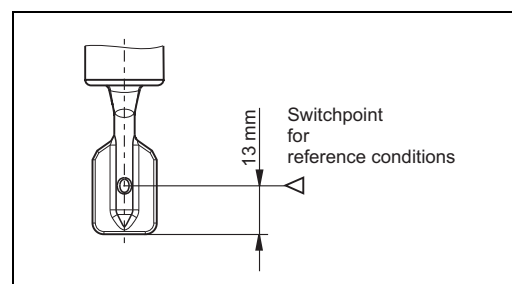
Safety mode	<p>Minimum/maximum residual current safety selectable on electronic insert. (with FEL57 on Nivotester only)</p> <p>Max. = maximum safety: The output switches to the power fail response when the fork is covered For use with overflow protection for example</p> <p>Min. = minimum safety: The output switches to the power fail response when the fork is exposed For use with dry running protection for example</p>
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Switching time	<p>When fork is covered: approx. 0.5 s When fork is exposed: approx. 1.0 s (Other switching times on request.)</p> <p>Additionally configurable for PROFIBUS PA: 0.5-60 s</p>
-----------------------	---

Switch-on behavior	<p>When switching on the power supply, the output assumes the alarm signal. After max. 3 s it assumes the correct switching mode (exception: FEL57)</p>
---------------------------	---

Performance characteristics

Reference operating conditions	<p>Ambient temperature: 23 °C Process temperature: 23 °C Process density: 1 g/cm³ (water) Viscosity: 1 mm²/s Process pressure p_e: 0 bar Sensor mounting: vertical from above Density switch: to > 0.7</p>
---------------------------------------	--



L00-FTL5xxxx-06-05-xx-en-000

Maximum measured error	Specified by mounting position: max. +/- 1 mm
-------------------------------	---

Repeatability	0.1 mm
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Hysteresis	Approx. 2 mm
-------------------	--------------

Influence of process temperature	Max. +1.4...-5.5 mm (-60...+280 °C)
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Influence of process density	Max. +4.8...-3.5 mm (0.5...1.5 g/cm ³)
-------------------------------------	--

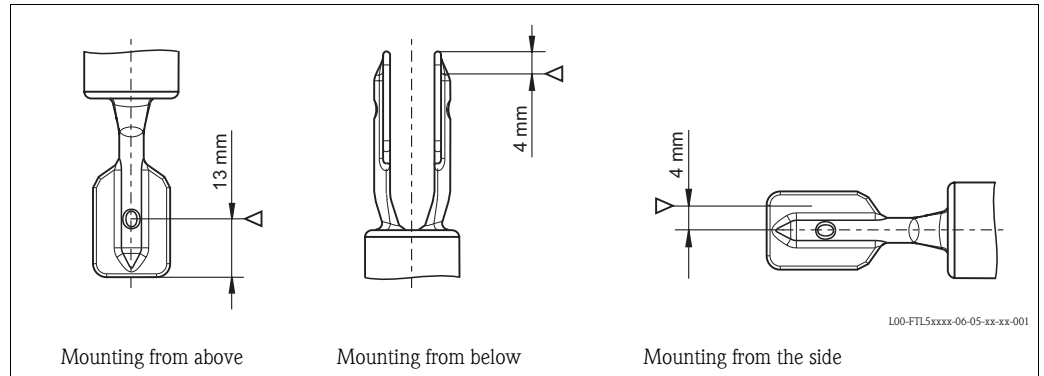
Influence of process pressure	Max. 0...-3.9 mm (-1...100 bar)
--------------------------------------	---------------------------------

Operating conditions

Installation

Installation instructions

Switch points \triangleright on the sensor depend on the mounting position, with reference to water, Density 1 g/cm³, 23 °C, p_e 0 bar.



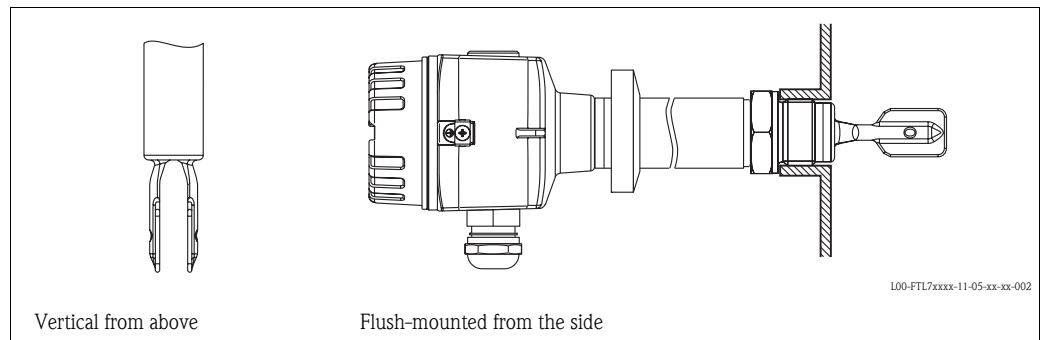
Note!
Switch points of the Liquiphant S FTL70/71 are at other positions to those of the previous version FDL60/61.

Examples of mounting

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

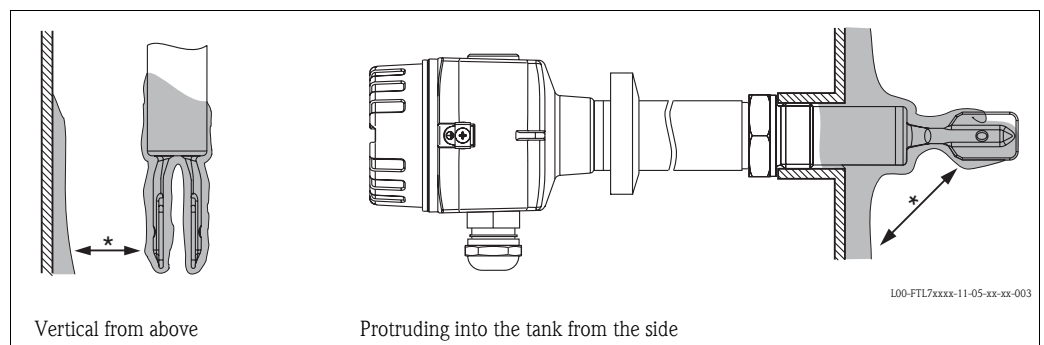
Optimum mounting, without problem even with high viscosity:

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



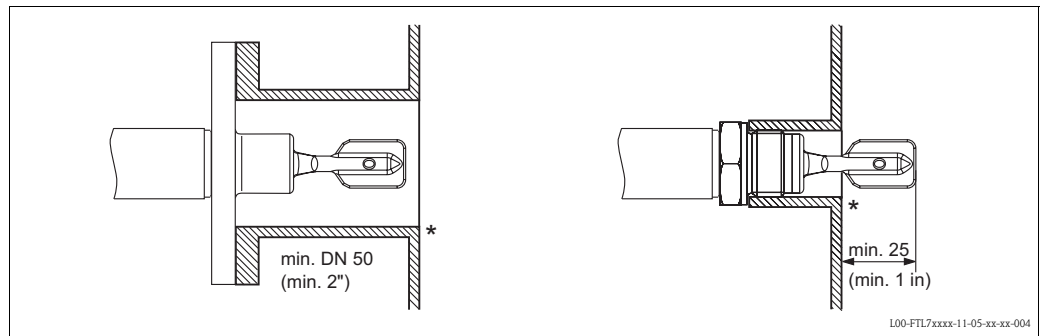
With buildup on the tank walls:

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

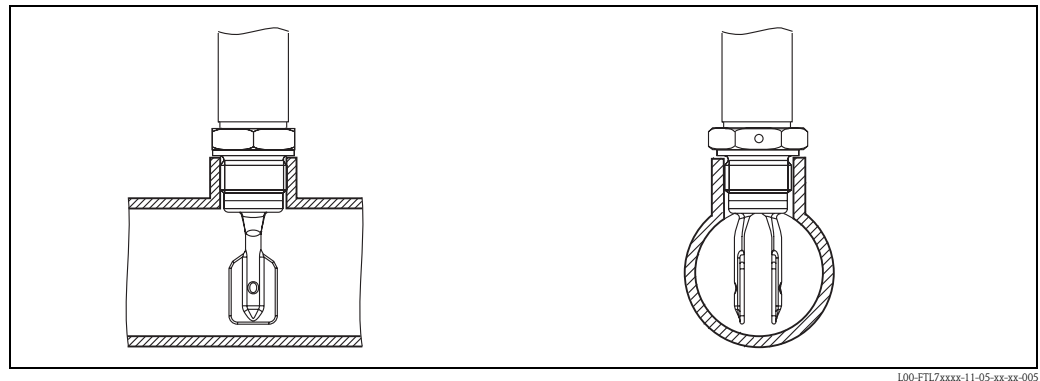


Mounting positions with low viscosity (up to 2000 mm²/s):

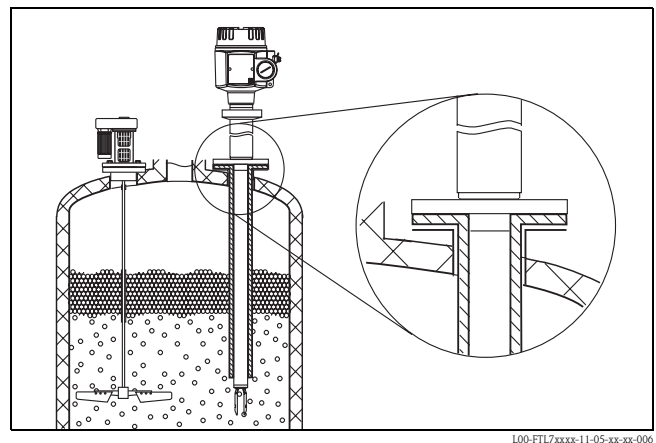
* Deburr the nozzle surfaces

**Mounting in piping from 2":**

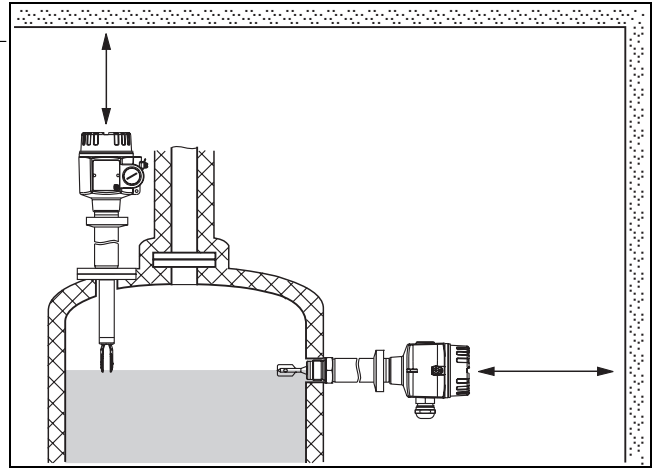
Fluid velocities up to 5 m/s for viscosity 1 mm²/s and density 1 g/cm³.
(Check the function for other process conditions.)



Support the Liquiphant S FTL71
in the event of severe dynamic load.



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



100-FTL7xxxx-11-05-xx-xx-007

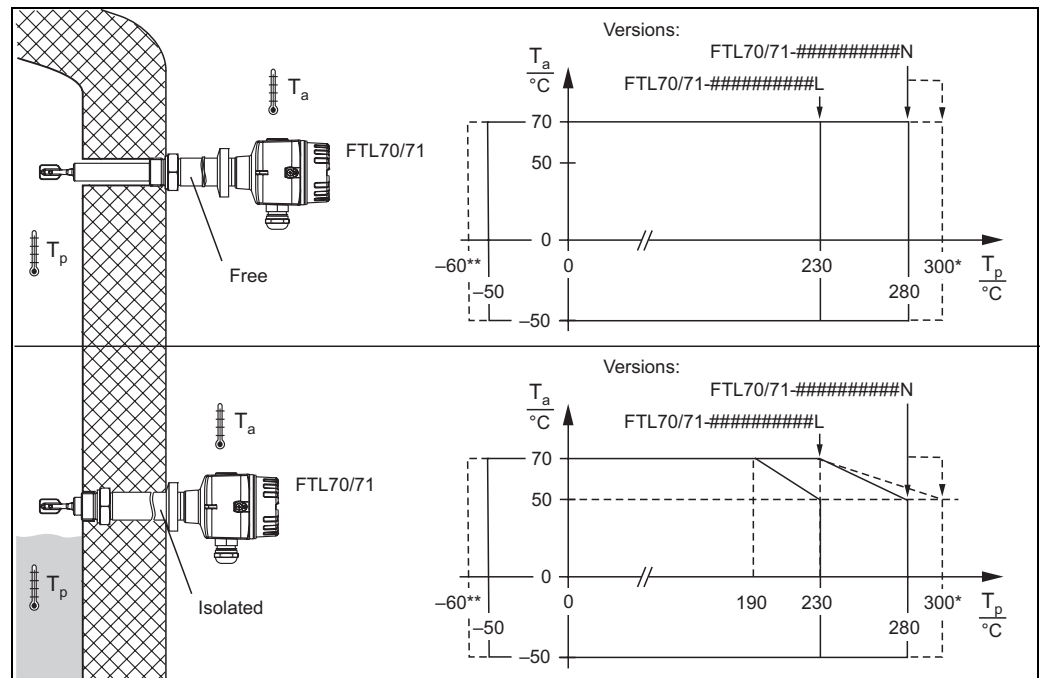
Orientation

FTL70, and FTL71 with short pipe (up to approx. 500 mm) - any position,
FTL71 with long pipe - vertical

Environment

Ambient temperature range

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



100-FTL7xxxx-05-05-xx-en-000

* Maximum of 50 hours cumulative
** -60 °C only for ATEX and CSA certificates

Ambient temperature limits -50...+70 °C

Storage temperature -50...+80 °C

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

Degree of protection

- Polyester and aluminum housing: IP66 / IP67 to EN 60529
- Aluminum housing (EEx d, EEx de): IP66/IP68 to EN 60529 (1 m, 24 h)

Vibration resistance To IEC 68, Part 2-6 (10...55 Hz, 0.15 mm, 100 cycles)

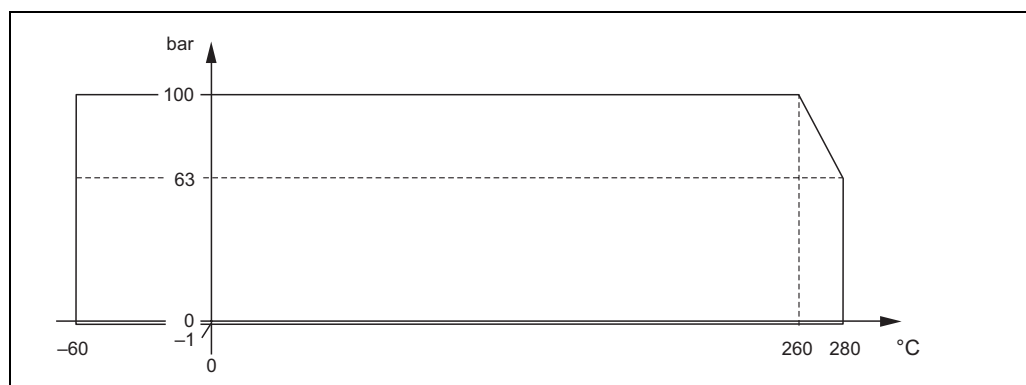
Electromagnetic compatibility Interference emission to EN 61326, Electrical Equipment Class B
Interference immunity to EN 61326; Annex A (Industrial) and NAMUR Recommendation NE 21 (EMC)
If the fork tines are joined together on account of buildup, the useful signal is attenuated to such an extent that the original EMC values can no longer be completely observed.
(EN 61000-4-3 Electromagnetic fields, EN 61000-4-6 HF coupling)

Process conditions

Process temperature -60...+280 °C (300 °C for max. 50 h cumulative)

Thermal shock Without restriction within the process temperature range.

Process pressure p_e



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 (SS 316L) are identical and are grouped together under 13E0 in EN1092-1, Tab. 18. The chemical composition of the two materials can be identical.
- ASME B 16.5a - 1998 Tab. 2-2.2 F316
- ASME B 16.5a - 1998 Tab. 2.3.8 N10276
- JIS B 2220

The lowest value from the derating curves of the device and selected flange applies in each case.

Test pressure Max. 150 bar at 20 °C (no function during test pressure)
Burst pressure of diaphragm 400 bar

State of aggregation Liquid

Density Min. 0.5 g/cm³ (other density settings on request)

Viscosity Max. 10000 mm²/s


Solids content Max. ø5 mm (1.5 times the process pressure p_e = 100 bar)

Mechanical construction

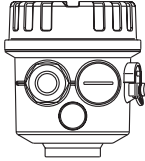
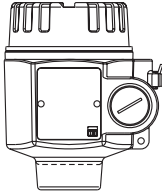
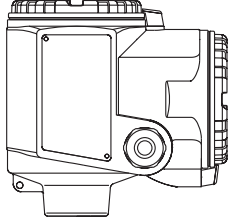
Design

Summary of all electrical and mechanical versions

Plug-in electronic inserts to mount in the housing

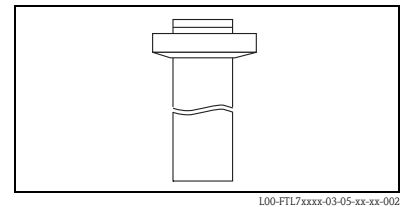
 <p>L00-FTL5xxxx-03-05-xx-xx-000</p>	FEL51:	Two-wire AC connection
	FEL52:	Three-wire DC connection PNP
	FEL54:	Universal current connection, 2 relay outputs
	FEL55:	Output 16/8 mA for separate switching unit
	FEL56:	Output 0.6...1.0/2.2...2.8 mA for separate switching unit (NAMUR)
	FEL58:	Output 2.2...3.5/0.6...1.0 mA for separate switching unit (NAMUR)
	FEL57:	Output 150/50 Hz, PFM, for separate switching unit (Nivotester)
FEL50A:	Digital communication PROFIBUS PA	

Housing


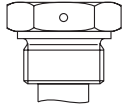
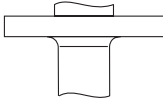
 <p>L00-FTL5xxxx-03-05-xx-xx-001</p>	 <p>L00-FTL5xxxx-03-05-xx-xx-003</p>	 <p>L00-FTL5xxxx-03-05-xx-xx-004</p>
<p>F16 Polyester (PBT)</p>	<p>F17/F13 Aluminum (also for EEx d), coated</p>	<p>T13 Aluminum with separate connection compartment (also for EEx de and EEx d), coated</p>

Temperature spacer

Temperature spacer with welded gas-tight bushing
(standard version)
approx. 160 mm up to 230 °C ("L")
approx. 200 mm up to 280 °C ("N")

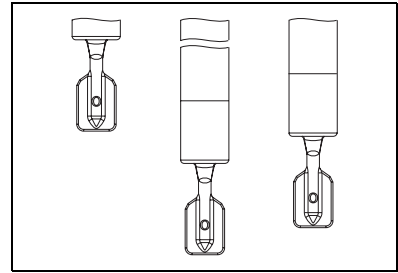


Process connections

 <p>L00-FTL5xxxx-03-05-xx-xx-006</p>	 <p>L00-FTL5xxxx-03-05-xx-xx-007</p>	 <p>L00-FTL5xxxx-03-05-xx-xx-009</p>
<p>G 3/4, DIN ISO 228/1 R 3/4, DIN 2999 NPT 3/4, ANSI B 1.20.1 (AF 32)</p>	<p>G 1, DIN ISO 228/1 R 1, DIN 2999 NPT 1, ANSI B 1.20.1 (AF 41)</p>	<p>Flanges to DIN, ANSI, JIS from DN 25 / 1"</p>

Sensors

Compact or with extension pipe up to 3 m
(6 m on request)

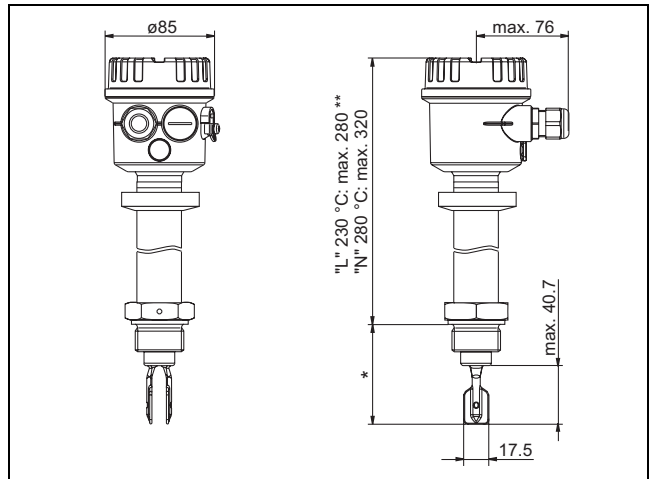


L00-FTL5xxxx-03-05-xx-xx-018

Dimensions (in mm)

Housing and sensor FTL70/71

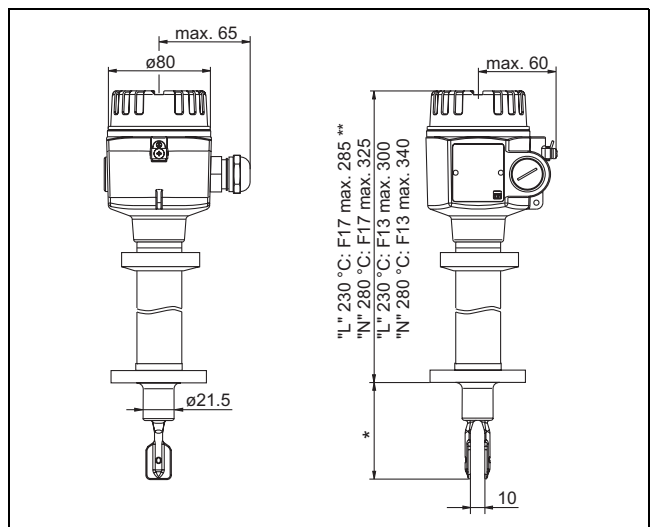
F16 Polyester



L00-FTL7xxxx-06-05-xx-xx-001

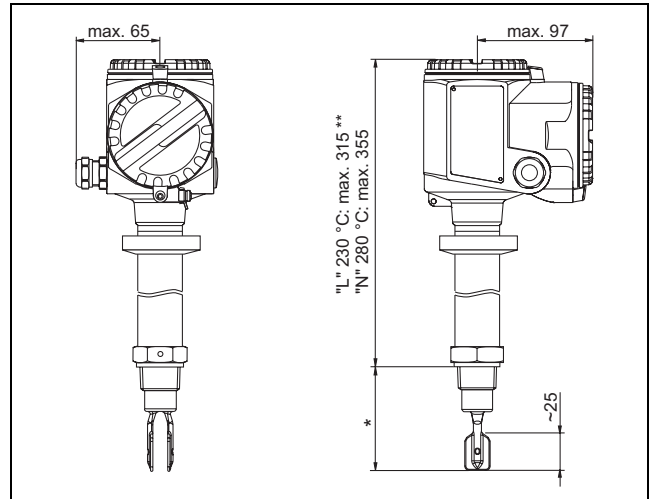
F17 Alu

F13 Alu
(for EEx d)



L00-FTL7xxxx-06-05-xx-xx-002

T13 Alu
with separate
connection compartment



L00-FTL7xxxx-06-05-xx-xx-003

* see Process connections

** "L" = Version FTL70/71 - ##### L for 230 °C

"N" = Version FTL70/71 - ##### N for 280 °C

The dimensions apply to process connections with G, R, NPT threads;
for flanged versions, dimensions may be up to 30 mm bigger.

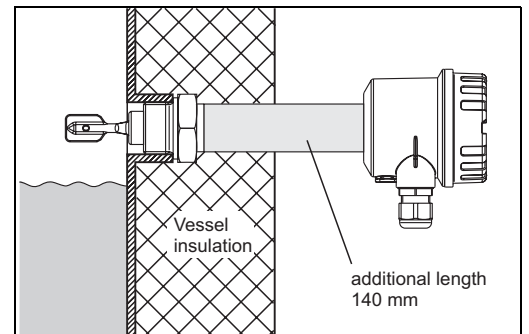


Note!

The switch points of the Liquiphant S FTL70/71 are at other positions to those of the previous version FDL60, FDL61.

Temperature spacer

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



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

Process connections

Process connection		Dimensions	Accessories	Pressure Temperature
G 3/4 DIN ISO 228/1 with elastomer flat seal to DIN 7603 (supplied)	GO2 GO5	<p>L00-FTL5xxxx-06-05-xx-en-001</p>	Flat seal to DIN 7603; installed on site	Max. 100 bar Max. 280 °C
G 1 DIN ISO 228/1 with elastomer flat seal to DIN 7603 (supplied)	GR2 GR5	<p>L00-FTL5xxxx-06-05-xx-en-002</p>	Flat seal to DIN 7603; installed on site	Max. 100 bar Max. 280 °C

Process connection		Dimensions	Accessories	Pressure Temperature
NPT 3/4 ANSI B 1.20.1 or R 3/4 DIN 2999	GM2 GM5 GE2 GE5			Max. 100 bar Max. 280 °C
NPT1 ANSI B 1.20.1 or R 1 DIN 2999	GN2 GN5 GF2 GF5			Max. 100 bar Max. 280 °C
Flanges ANSI B 16.5 EN 1092-1 (DIN 2527 B) JIS B2220	A## B## C## K##		Seal depending on design; installed on site	See nominal pressure of flange, however Max. 100 bar Max. 280 °C At high temperatures: note pressure capacity of flange depending on the temperature!
Alloy C4-plated flanges are available for higher chemical-resistance. The flange carrier material comprises 316L and is welded with a 2 to 3 mm thick Alloy C4 disk. Surface roughness around the area of the sealing surface is: Ra = 0.3 to 1.0.				

Sensor length L for FTL71,
depending on process connection

Thread: G 3/4 G 1	Thread: NPT 3/4 NPT1 R 3/4 R 1	Flanges and flange-like process connections
From seal surface of thread adapter	From lower edge of thread	

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



Note!
The switch points of the Liquiphant S FTL70/71 are at other positions to those of the previous version FDL60/61.

Material

- Wetted parts:
Process connection and extension pipe: AISI 316L (1.4435) or, optionally, 2.4610 (Alloy C4)
Tuning fork: AISI S31803 (1.4462) or, optionally, 2.4610 (Alloy C4)
- Flat seal for process connection G $\frac{3}{4}$ or G 1: elastomer fiber, asbestos-free
- Polyester housing: PBT-FR
with PBT-FR cover or with PA12 cover with sight glass,
Cover seal: EPDM
- Aluminum housing: EN-AC-AISI10Mg, plastic-coated,
Cover seal: EPDM
- Cable gland: polyamide or brass, nickel-plated
- Temperature spacer: AISI 316 L (1.4435)

Process connections

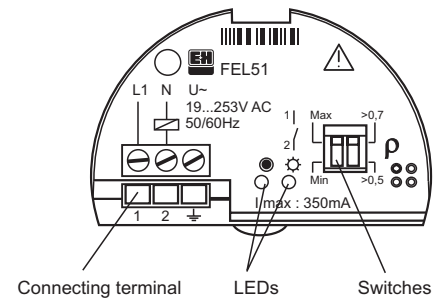
- Parallel thread G $\frac{3}{4}$, G 1 to DIN ISO 228/1
with flat seal to DIN 7603 installed on site
- Tapered thread R $\frac{3}{4}$, R 1 to DIN 2999 Part 1
- Tapered thread $\frac{3}{4}$ -14 NPT, 1 - 1 1/2 NPT to ANSI B 1.20.1
- Flanges to EN/DIN from DN 25, for standards see Product structure,
to ANSI B16.5 from 1", to JIS B2220 (RF)
- Flanges from AISI 316L (1.4435 or 1.4404)

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



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

With FEL56:

- 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 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 defective



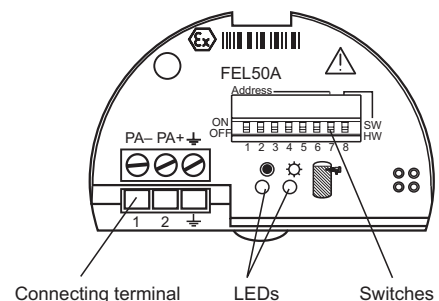
L00-FTL5xxxx-03-05-xx-en-013

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 on sensor or if the electronics are defective
- yellow LED to indicate the switching status, Test key - breaks the cable connection

With FEL50A:

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




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

Operating concept

Onsite configuration

Certificates and approvals

Certificates

- See Liquiphant S FTL70 FTL71 Product structure → Page 29 ff.
 - Leak-detection system in conjunction with WHG approval
Approval number: Z-65.40-446
(see "Ordering information" → Page 29 ff. also)
 - 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" (see Page 21 ff.) and "Ordering information" (see Page 29 ff.) sections.

Combinations of housings and electronic inserts

Please refer to the Safety Instructions on ATEX, NEPSI etc. for the permitted combinations of housing versions and electronic inserts. A list of the available documents can be found on Page 35 ff. The actual documents can be found on the product pages at www.endress.com.

Abbreviations used:

- 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, Alu, Alu/sep.	FEL51/52/54 FEL55/56/57/58/50A
D	Overfill protection to WHG (Germany)	PBT, Alu, Alu/sep.	FEL51/52/54 FEL55/56/57/58/50A
B	ATEX II 3G EEx nC IIC T6, WHG	PBT, Alu, Alu/sep.	FEL54
	ATEX II 3G EEx nC IIC T6, WHG ATEX II 3D T85°C, WHG	Alu, Alu/sep.	FEL54
C	ATEX II 3G EEx nA II T6, WHG	PBT, Alu, Alu/sep.	FEL51/52 FEL55/56/57/58/50A
	ATEX II 3G EEx nA II T6, WHG ATEX II 3D T85°C, WHG	Alu, Alu/sep.	FEL51/52 FEL55/56/57/58/50A
E	ATEX II 1/2 G, EEx de, WHG, IEC Ex Zone 0/1	Alu/sep.	FEL51/52/54 FEL55/56/57/58/50A
F	ATEX II 1/2 G, EEx ia IIC T6, WHG, IEC Ex Zone 0/1	PBT, Alu, Alu/sep.	FEL55/56/57/58/50A
	ATEX II 1/2 G, EEx ia IIC T6, WHG, IEC Ex Zone 0/1 ATEX II 1/2 D, T80°C	Alu, Alu/sep.	FEL55/56/57/58/50A
L	ATEX II 1/2 G, EEx d IIC T6, WHG, IEC Ex Zone 0/1	Alu	FEL51/52/54 FEL55/56/57/58/50A
M	NEPSI Ex ia IIC T6		
N	NEPSI Ex d IIC T6		
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	FEL51/52 FEL55/56/57/58

Certificate, applications		Housing	Electronic inserts
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
V	TIIS Ex ia IIC T3	PBT, St., Alu	FEL57
W	TIIS Ex d IIB T3	Alu	FEL52/54
Y	Other certificate (for non-hazardous area)	PBT, St., Alu, Alu/sep.	FEL51/52/54 FEL55/56/57/58/50A



Note! Polyester housing (PBT)

Electrical connecting cables run in pipes:

Do not screw cable entries firmly to the piping. Use flexible connections (e.g. with armored hose).

If piping is used for grounding, then ensure that there is a continuous electrical connection.

Ordering information



Note!

Versions that are mutually exclusive are not indicated in this list.

Liquiphant S FTL70 FTL71 Product structure

Design		Basic weight			
FTL70	Compact		0.7 kg		
FTL71	With extension pipe		0.7 kg		
10	Approval:				
A	Non-hazardous area				
B	ATEX II 3 G	EEx nC II T6	Overfill protection to WHG (Germany)		
		T 85°C*			
C	ATEX II 3 G	EEx nA II T6	Overfill protection to WHG (Germany)		
		T 85°C*			
D	Non-hazardous area				
E	ATEX II 1/2 G	EEx de IIC T6	Overfill protection to WHG, IEC Ex Zone 0/1		
F	ATEX II 1/2 G	EEx ia IIC T6	Overfill protection to WHG, IEC Ex Zone 0/1		
		T 80°C*			
L	ATEX II 1/2 G	EEx d IIC T6	Overfill protection to WHG, IEC Ex Zone 0/1		
M	NEPSI	Ex ia IIC T6			
N	NEPSI	Ex d IIC T6			
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			
V	TIIS	Ex ia IIC T2			
W	TIIS	Ex d IIC T2			
Y	Special version				
	*) Not for PBT				
20	Process connection:				
	Threaded connection				
GQ2	G ¾	316L	Thread ISO 228		
GO5	G ¾	Alloy C4	Thread ISO 228		
GR2	G 1	316L	Thread ISO 228		
GR5	G 1	Alloy C4	Thread ISO 228		
GE2	R ¾	316L	Thread DIN 2999		
GE5	R ¾	Alloy C4	Thread DIN 2999		
GF2	R 1	316L	Thread DIN 2999		
GF5	R 1	Alloy C4	Thread DIN 2999		
GM2	NPT ¾	316L	Thread ANSI		
GM5	NPT ¾	Alloy C4	Thread ANSI		
GN2	NPT 1	316L	Thread ANSI		
GN5	NPT 1	Alloy C4	Thread ANSI		
	EN flanges				
B82	DN25	PN25/40 A	316L	Flange EN 1092-1 (DIN 2527 B)	1.4 kg
C82	DN25	PN25/40 B1	316L	Flange EN 1092-1 (DIN 2527 C)	1.3 kg
C85	DN25	PN25/40	Alloy C4 >1.4462	Flange EN 1092-1 (DIN 2527)	1.3 kg
D82	DN25	PN40 B1	316L	Flange EN 1092-1 (DIN 2526 D)	1.4 kg
BB2	DN32	PN25/40 A	316L	Flange EN 1092-1 (DIN 2527 B)	2.0 kg
BD2	DN40	PN25/40 A	316L	Flange EN 1092-1 (DIN 2527 B)	2.4 kg
CF2	DN50	PN10/16 B1	316L	Flange EN 1092-1 (DIN 2527 C)	2.5 kg
BG2	DN50	PN25/40 A	316L	Flange EN 1092-1 (DIN 2527 B)	3.2 kg
CG2	DN50	PN25/40 B1	316L	Flange EN 1092-1 (DIN 2527 C)	2.9 kg

20	Process connection:					Additional weight
	DG2	DN50	PN40 B1	316L	Flange EN 1092-1 (DIN 2526 D)	2.9 kg
	CG5	DN50	PN25/40	Alloy C4 >1.4462	Flange EN 1092-1 (DIN 2527)	2.9 kg
	BI2	DN50	PN63 A	316L	Flange EN 1092-1 (DIN 2527 B)	4.5 kg
	CI2	DN50	PN63 B2	316L	Flange EN 1092-1 (DIN 2527 E)	4.5 kg
	CI5	DN50	PN63	Alloy C4 >1.4462	Flange EN 1092-1 (DIN 2527)	4.5 kg
	BJ2	DN50	PN100 A	316L	Flange EN 1092-1	5.5 kg
	CJ2	DN50	PN100 B2	316L	Flange EN 1092-1	5.5 kg
	BK2	DN65	PN25/40 A	316L	Flange EN 1092-1 (DIN 2527 B)	4.3 kg
	CM2	DN80	PN10/16 B1	316L	Flange EN 1092-1 (DIN 2527 C)	4.8 kg
	BN2	DN80	PN25/40 A	316L	Flange EN 1092-1 (DIN 2527 B)	5.9 kg
	CN2	DN80	PN25/40 B1	316L	Flange EN 1092-1 (DIN 2527 C)	5.2 kg
	DN2	DN80	PN40 B1	316L	Flange EN 1092-1 (DIN 2526 D)	5.2 kg
	CN5	DN80	PN25/40	Alloy C4 >1.4462	Flange EN 1092-1 (DIN 2527)	5.2 kg
	B02	DN80	PN63 A	316Ti	Flange EN 1092-1 (DIN 2527 B)	6.9 kg
	C02	DN80	PN63 B2	316L	Flange EN 1092-1 (DIN 2527 E)	6.9 kg
	C05	DN80	PN63	Alloy C4 >1.4462	Flange EN 1092-1 (DIN 2527)	6.9 kg
	B12	DN80	PN100 A	316L	Flange EN 1092-1	8.0 kg
	C12	DN80	PN100 B2	316L	Flange EN 1092-1	8.0 kg
	CO2	DN100	PN10/16 B1	316L	Flange EN 1092-1 (DIN 2527 C)	5.3 kg
	BR2	DN100	PN25/40 A	316L	Flange EN 1092-1 (DIN 2527 B)	7.5 kg
	BU2	DN100	PN63 A	316L	Flange EN 1092-1 (DIN 2527 B)	10.1 kg
	CU2	DN100	PN63 B2	316L	Flange EN 1092-1 (DIN 2527 E)	10.1 kg
	CU5	DN100	PN63	Alloy C4 >1.4462	Flange EN 1092-1 (DIN 2527)	10.1 kg
		ANSI flanges				
	A82	1"	150 lbs	RF 316/316L	Flange ANSI B16.5	1.0 kg
	AB2	1¼"	300 lbs	RF 316/316L	Flange ANSI B16.5	2.0 kg
	AC2	1½"	150 lbs	RF 316/316L	Flange ANSI B16.5	1.5 kg
	AD2	1½"	300 lbs	RF 316/316L	Flange ANSI B16.5	2.7 kg
	AE2	2"	150 lbs	RF 316/316L	Flange ANSI B16.5	2.4 kg
	AE5	2"	150 lbs	Alloy C4 >1.4462	Flange ANSI B16.5	2.4 kg
	AF2	2"	300 lbs	RF 316/316L	Flange ANSI B16.5	3.2 kg
	AF5	2"	300 lbs	Alloy C4 >1.4462	Flange ANSI B16.5	3.2 kg
	AG2	2"	600 lbs	RF 316/316L	Flange ANSI B16.5	4.2 kg
	AG5	2"	600 lbs	Alloy C4 >1.4462	Flange ANSI B16.5	4.2 kg
	AL2	3"	150 lbs	RF 316/316L	Flange ANSI B16.5	4.9 kg
	AM2	3"	300 lbs	RF 316/316L	Flange ANSI B16.5	6.8 kg
	AN2	3"	600 lbs	RF 316/316L	Flange ANSI B16.5	8.5 kg
	AN5	3"	600 lbs	Alloy C4 >1.4462	Flange ANSI B16.5	8.5 kg
	AP2	4"	150 lbs	RF 316/316L	Flange ANSI B16.5	7.0 kg
	AQ2	4"	300 lbs	RF 316/316L	Flange ANSI B16.5	11.5 kg
	AR2	4"	600 lbs	RF 316/316L	Flange ANSI B16.5	17.3 kg
		JIS flanges				
	KF2	20 K 50		RF 316L	Flange JIS B2220	1.9 kg
	KF5	20 K 50		RF Alloy C4 >316L	Flange JIS B2220	1.9 kg
	YY9	Special version				
30	Probe length:					
					FTL70	
	AB	Compact version		Ra < 3.2 µm/80 grit,	316L	

30		Probe length:	
		AE	Fork: 318L Compact version Ra < 3.2 µm/80 grit, Alloy C4
		FTL71	
		BB mm L Ra < 3.2 µm/80 grit, 316L Fork: 318L 0.9 kg/m
		BE mm L Ra < 3.2 µm/80 grit, Alloy C4 0.9 kg/m
		CB inch L Ra < 3.2 µm/80 grit, 316L Fork: 318L 2.3 kg/100 in
		CE inch L Ra < 3.2 µm/80 grit, Alloy C4 2.3 kg/100 in
		YY	Special version
40		Electronics; output:	
		A	FEL50A; PROFIBUS PA
		1	FEL51; SIL 2-wire 19 to 253 V AC
		2	FEL52; SIL 3-wire PNP 10 to 55 V DC
		4	FEL54; SIL relay DPDT 19 to 253 V AC/19 to 55 V DC
		5	FEL55; SIL 8/16 mA 11 to 36 V DC
		6	FEL56; SIL NAMUR (L-H signal)
		7	FEL57; SIL 2-wire PFM
		8	FEL58; SIL NAMUR + test keys (H-L signal)
		9	Special version
50		Housing; cable entry:	
		E4	F16 Polyester NEMA4X; Thread NPT ½
		E5	F17 Alu NEMA4X; Thread NPT ¾ 0.5 kg
		E7	T13 Alu coated, IP66; Thread NPT ¾ Separate connection compartment 1.1 kg
		E8	F13 Alu NEMA4X; Thread NPT ¾ Suitable for EEx d/XP 0.5 kg
		F4	F16 Polyester IP66; Thread G ½
		F5	F17 Alu IP66; Thread G ½ 0.5 kg
		F7	T13 Alu coated, IP66; Thread G ½ Separate connection compartment 1.1 kg
		F8	F13 Alu IP68; Thread G ½ Suitable for EEx d/XP 0.5 kg
		G4	F16 Polyester IP66; M20 threaded joint
		G5	F17 Alu IP66; M20 threaded joint 0.5 kg
		G7	T13 Alu coated, IP66; M20 threaded joint Separate connection compartment (EEx d > M20 thread) 1.1 kg
		G8	F13 Alu IP68; M20 threaded joint Suitable for EEx d/XP 0.5 kg
		N4	F16 Polyester IP66; M12 connector
		N5	F17 Alu IP66; M12 connector
		Y9	Special version
60		Additional fittings	
		A	Basic version
		C	EN 10204 - 3.1, material (316L/318L wetted) Inspection certificate
		N	EN 10204 - 3.1, material NACE MR0175 (316L wetted) Inspection certificate
		S	GL/ABS marine approval
		Y	Special version
70		Application:	
		L	230 °C, gas-tight bushing
		N	280 °C, gas-tight bushing 0.2 kg
		Y	Special version
Complete product designation			



Note!

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

Accessories

Lap joint flange

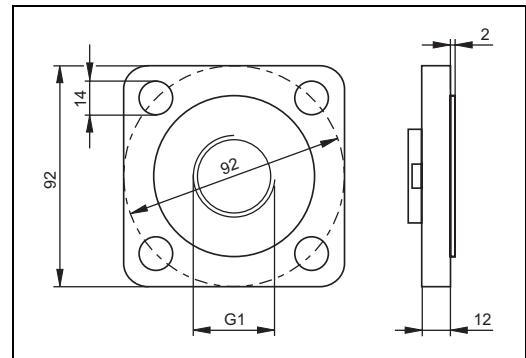
With G 1 thread for mounting a Liquiphant S FTL70/71 with process connection GR2

Pressure: up to 40 bar

Material: corrosion-resistant steel 1.4301 (AISI 304)

Weight: 0.54 kg

Order number: 918158-0000



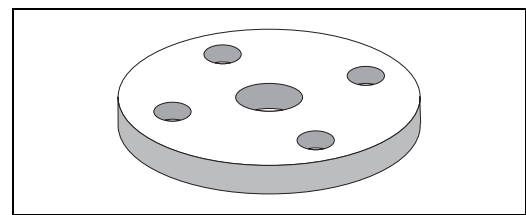
L00-FTL5xxxx-06-05-xx-xx-024

Lap joint flanges

With G 1 thread for mounting a Liquiphant S FTL70/71 with process connection GR2

Material: corrosion-resistant steel 1.4571 (AISI 113Ti)

- Flange DN 50, PN 40, DIN 2527 form B
Weight: 3.11 kg
Order number: 918143-0000
- Flange ANSI 2", 150 psi, RF
Weight: 2.38 kg
Order number: 918144-0000



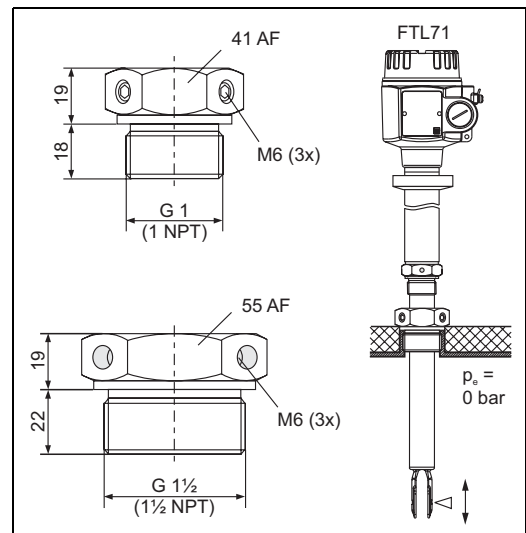
L00-FTL5xxxx-03-05-xx-xx-015

Sliding sleeves for unpressurized operation

For continuous adjustment of the switch point of a Liquiphant S FTL71.

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

Weight for G 1, NPT 1: 0.21 kg
Weight for G 1½, NPT 1½: 0.54 kg



L00-FTL7xxxx-06-05-xx-xx-001

Thread	Standard	Material	Order number	Approval
G 1	DIN ISO 228/1	1.4435 (AISI 316 L)	52003978	
G 1	DIN ISO 228/1	1.4435 (AISI 316 L)	52011888	Material certificate 3.1
NPT1	ANSI B 1.20.1	1.4435 (AISI 316 L)	52003979	
NPT1	ANSI B 1.20.1	1.4435 (AISI 316 L)	52011889	Material certificate 3.1
G 1½	DIN ISO 228/1	1.4435 (AISI 316 L)	52003980	
G 1½	DIN ISO 228/1	1.4435 (AISI 316 L)	52011890	Material certificate 3.1
NPT1½	ANSI B 1.20.1	1.4435 (AISI 316 L)	52003981	
NPT1½	ANSI B 1.20.1	1.4435 (AISI 316 L)	52011891	Material certificate 3.1

High pressure sliding sleeves

For continuous adjustment of the switch point of a Liquiphant S FTL71.

Material: corrosion-resistant steel
1.4435 (AISI 316L) or, optionally, 2.4610 (Alloy C4)

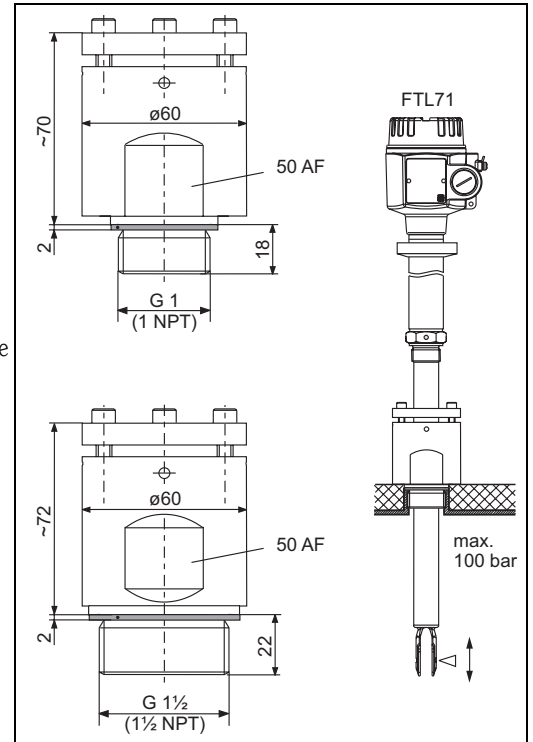
Weight for G 1, NPT 1: 1.13 kg
Weight for G 1½, NPT 1½: 1.32 kg

Seal package made of graphite



Note!

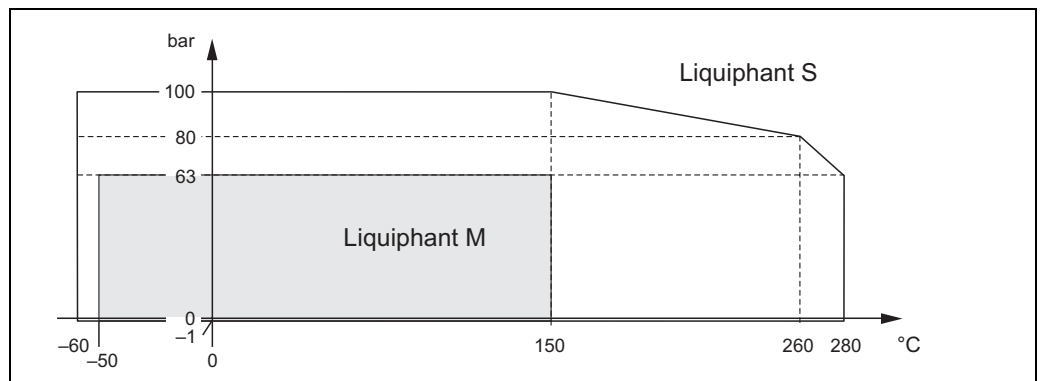
The high pressure sliding sleeves listed are also suitable for use in hazardous areas.



L00-FTL7xxxx-06-05-xx-en-002

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	Material certificate 3.1
G 1	DIN ISO 228/1	Alloy C4	52003664	
NPT1	ANSI B 1.20.1	1.4435 (AISI 316 L)	52003667	
NPT1	ANSI B 1.20.1	1.4435 (AISI 316 L)	52011881	Material certificate 3.1
NPT1	ANSI B 1.20.1	Alloy C4	52003668	
G 1½	DIN ISO 228/1	1.4435 (AISI 316 L)	52003665	
G 1½	DIN ISO 228/1	1.4435 (AISI 316 L)	52011882	Material certificate 3.1
G 1½	DIN ISO 228/1	Alloy C4	52003666	
NPT1½	ANSI B 1.20.1	1.4435 (AISI 316 L)	52003669	
NPT1½	ANSI B 1.20.1	1.4435 (AISI 316 L)	52011883	Material certificate 3.1
NPT1½	ANSI B 1.20.1	Alloy C4	52003670	

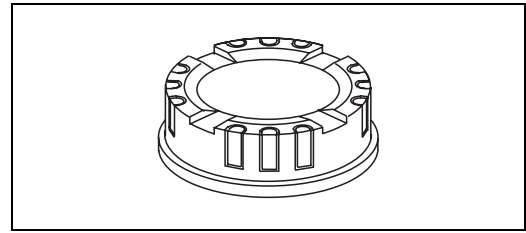
Pressure and temperature derating of the high pressure sliding sleeves



L00-FTL7xxxx-05-05-xx-xx-001

Cover with sight glass

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



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

Documentation

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

Operating Instructions

Electronic insert FEL50A for Liquiphant M/S
 PROFIBUS PA
 BA141F/00/en
 Liquiphant S FTL70, FTL71
 KA172F/00/a6
 Liquiphant S FTL70-##### # 7 #, FTL71-##### # 7 #
 KA173F/00/a6

Technical information

Nivotester FTL370/372, switching units in Racksyst design
 for Liquiphant S with electronic insert FEL57
 TI198F/00/en
 Nivotester FTL320, switching unit in Minipac design
 for Liquiphant S with electronic insert FEL57
 TI203F/00/en
 General instructions for electromagnetic compatibility
 (Test procedure, installation recommendation)
 TI241F/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 M FTL50/51(H), for process temperatures up to 150 °C
 TI328F/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 with electronic insert FEL51 (MAX)
 SD164F/00/en
 Liquiphant M/S with electronic insert FEL51 (MIN)
 SD185F/00/en
 Liquiphant M/S with electronic insert FEL52 (MAX)
 SD163F/00/en
 Liquiphant M/S with electronic insert FEL52 (MIN)
 SD186F/00/en

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

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

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

Liquiphant M/S with electronic insert FEL55 (MIN)
SD279F/00/en

Liquiphant M/S with electronic insert FEL57 + Nivotester FTL325P (MAX)
SD111F/00/en

Liquiphant M/S with electronic insert FEL57 + Nivotester FTL325P (MIN)
SD231F/00/en

Liquiphant M/S with electronic insert FEL57+ Nivotester FTL375P (MAX)
SD113F/00/en


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


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


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


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


Safety Instructions (ATEX)

CE  II 1/2 G, EEx d IIC/B
(KEMA 99 ATEX 1157)
XA031F/00/a3

CE  II 1/2 G, EEx ia/ib IIC/B
(KEMA 99 ATEX 0523)
XA063F/00/a3

CE  II 1 G, EEx ia IIC/B
(KEMA 99 ATEX 5172 X)
XA064F/00/a3

CE  II 1/2 G, EEx de IIC/B
(KEMA 00 ATEX 2035)
XA108F/00/a3

CE  II 3 G, EEx nA/nC II
(EG 01 007-a)
XA182F/00/a3

Controll Drawings (CSA, FM)

FM Control Drawing
Liquiphant M/S (IS and NI), Current output PFM, NAMUR, Entity installation
ZD041F/00/EN

CSA Control Drawing
Liquiphant M/S (cCSAus / IS)
ZD042F/00/EN

FM Control Drawing
Liquiphant M/S, FTL5x(H), FTL51C, FTL7x, (NI)
ZD043F/00/EN

CSA Control Drawing
Liquiphant M/S, (cCSAus / XP)
ZD240F/00/EN

Safety Instructions (NEPSI)

Ex d IIC/IIB T3-T6 , Ex d IIC T2-T6
(NEPSI GYJ06424)
XA401F/00/B2

Ex ia IIC T2-T6, Ex ia IIB T3-T6
(NEPSI GYJ05556, NEPSI GYJ06464),
XC009F/00/b2

Ex nA II T3-T6, Ex nC/nL IIC T3-T6
(NEPSI GYJ04360, NEPSI GYJ071414)
XC010F/00/b2

System information

Liquiphant M
SI040F/00/en

Instruments International

Endress+Hauser
Instruments International AG
Kaegenstrasse 2
4153 Reinach
Switzerland

Tel. +41 61 715 81 00
Fax +41 61 715 25 00
www.endress.com
info@ii.endress.com

Endress+Hauser 

People for Process Automation

TI354F/00/en/05.09
71095646
SL/FM+SGML6.0 ProMoDo



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