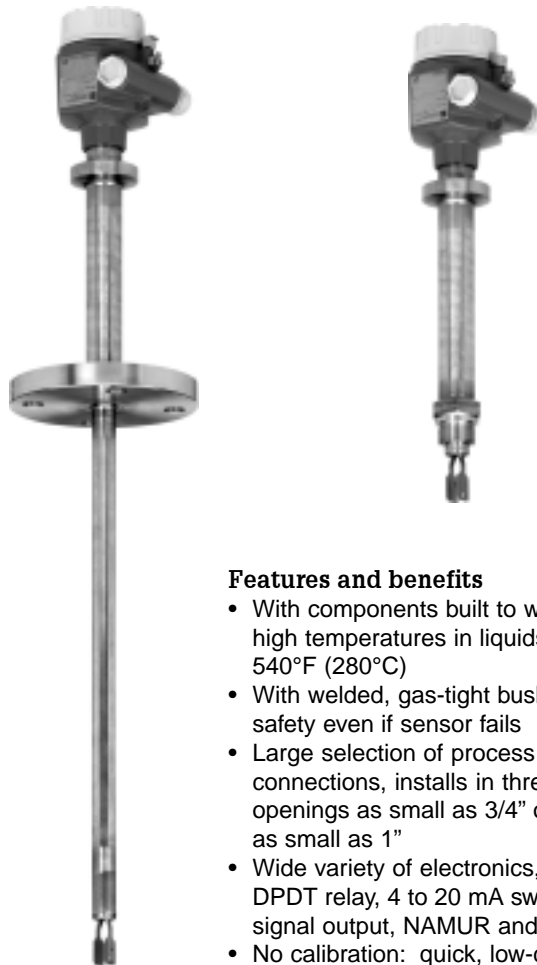


Liquid Level Switch

liquiphant S FTL 70, FTL 71

**Level limit switch for all liquids.
High temperature version, suitable for
hazardous areas.**



Features and benefits

- With components built to withstand high temperatures in liquids up to 540°F (280°C)
- With welded, gas-tight bushing, high safety even if sensor fails
- Large selection of process connections, installs in threaded openings as small as 3/4" or in flanges as small as 1"
- Wide variety of electronics, e.g. DPDT relay, 4 to 20 mA switch, PFM signal output, NAMUR and transistor
- No calibration: quick, low-cost start-up
- No mechanical moving parts: no maintenance, no wear, economical long operating life
- Monitoring of fork damage: guaranteed operation

Application

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

- With temperatures between -40° and +540°F (-40° to +280°C) with no temperature shock limitations
- Pressures up to 930 psi (64 bar)
- Viscosity up to 10,000 cP
- Density from 0.5 SGU

The function is not affected by flow, turbulence, bubbles, foam, vibration, bulk solids content or buildup. The Liquiphant S is thus the ideal replacement for float switches, gap switches, capacitance and other technologies.

Versatile Selection

- FTL 70: compact design, ideal for mounting in pipes
- FTL 71: extension tube for up to 115 inches (3 m) maximum

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

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



Contact Esys for more information about this product:
Esys® The Energy Control Company™
4520 Stine Road, Ste 7
Bakersfield, CA 93313
(661) 833-1902

email: esys@esys.us
website: <http://www.esys.us>



Function and system design

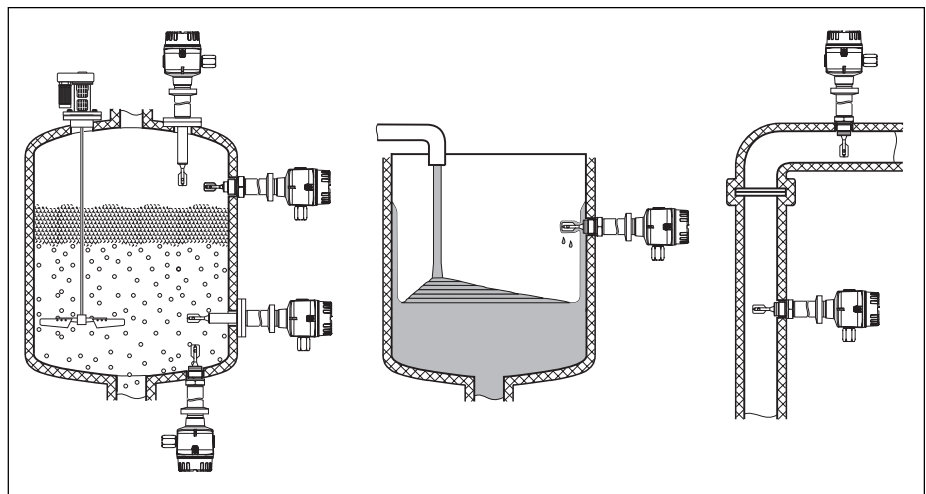
Function

The Liquiphant S, a new generation of frequency shift tuning forks, brings greater application flexibility and reliability to level switch users, especially in liquid applications where high temperatures are present. The Liquiphant S is not affected by gas bubbles, turbulence, foam, vibration, buildup, high viscosity, or bulk solids buildup.

The FTL 70 / FTL 71 uses frequency shift technology for limit detection. The forks vibrate at their resonant frequency. This frequency changes when covered or uncovered by the liquid material, which activates a limit switch. The frequency shift of the fork is monitored, an alarm state is indicated if there is fork corrosion or damage. Loss of power and piezo drive failure is also alarmed.

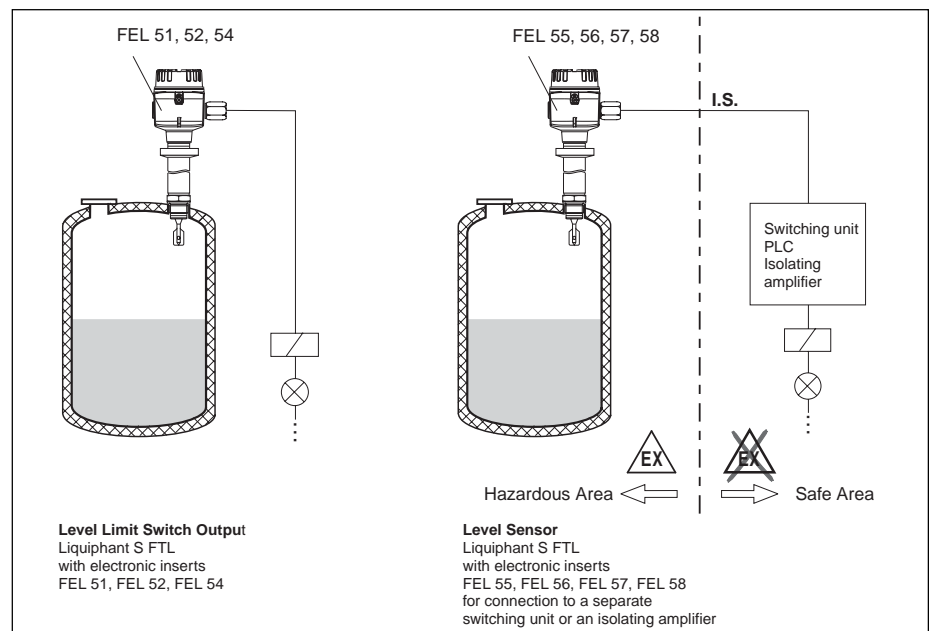
Application

Maximum or minimum level detection in tanks, vessels or piping containing all types of hot or cold liquids, also in explosion hazardous areas. The Liquiphant S can be mounted at any orientation. In applications where room allows, the unit can be extended into the vessel (up to 115") with an extension tube.



System

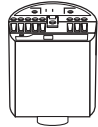
A complete system consists of an electronic insert, housing, process connector and sensor.



Modular design

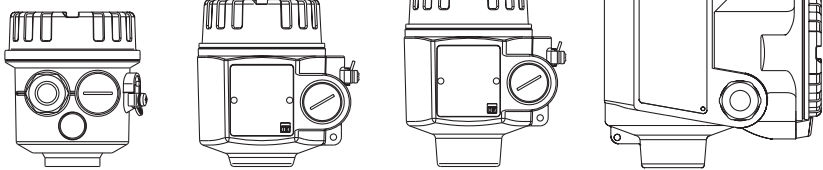
Depending on the application, the Liquiphant S is available in various electronic and mechanical versions to fulfill industrial applications

Plug-in electronic inserts to mount in housing



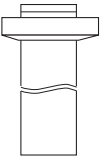
FEL 51: Two-wire AC connection
 FEL 52: Three-wire DC connection, PNP
 FEL 54: Universal power (AC / DC), DPDT relay
 FEL 55: Output 8 / 16 mA for separate switching unit
 FEL 56: Output 0.6 to 1.0 / 2.1 to 2.8 mA for separate switching unit (NAMUR)
 FEL 58: Output 2.1 to 3.5 / 0.6 to 1.0 mA for separate switching unit (NAMUR)
 FEL 57: Output 50 / 150 Hz, PFM, for separate switching unit (Nivotester)

Housings



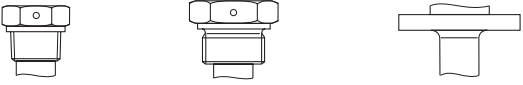
F16 Polyester housing F17 Aluminum housing F13 Aluminum housing (also for hazardous areas) T 13 Aluminum housing with separate connection compartment (also for hazardous areas)

High temperature spacer



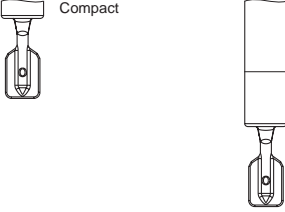
Temperature spacer, 316L SS with gas-tight bushing, approximately 6.3" to 450°F (120 mm to 230°C) "L" approximately 7.9" to 540°F (200 mm to 280°C) "N"

Process connections



3/4" NPT ANSI B 1.20.1 1" NPT ANSI B 1.20.1 ANSI B16.5 flanges from 1"

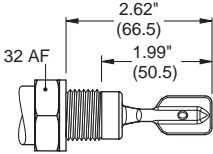
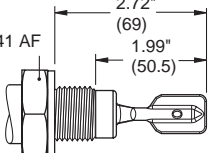
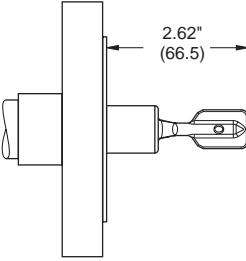
Sensors



Compact With extension tube to 115" (3 m)

Construction	FTL 70, compact unit FTL 71, with extension pipe (to 115")
Measured variable	Level (limit value), liquids
Measuring (detection) range	FTL 70, specified by mounting point FTL 71, specified by length of sensor with extension pipe (maximum 115")
Product density	Switch selectable on the electronic insert, > 0.5 SGU or > 0.7 SGU
Process connections	Refer to chart at top of page 4
Materials	Wetted parts, 316 L SS or Alloy C 4 (process connection / extension tube) J92205 or Alloy C 4 (forks)
Housings	Refer to chart above. Polyester housing, PBT-FR with PBT-FR cover or PA 12 transparent cover. Aluminum housings, epoxy coated. Cover seals, EPDM.

Process connection selection

Construction	Connection	Code	Version	Standard	Maximum Pressure/ Temperature
Threaded, 316L SS or Alloy C-4	3/4" NPT	GM2 GM5		ANSI B 1.20.1	930 psi 540°F (64 bar 280°C)
	1" NPT	GN2 GN5		ANSI B 1.20.1	930 psi 540°F (64 bar 280°C)
Flange, 316L SS Seal according to design, install on site (not supplied)	1" up to 4" Class 150 up to Class 600, raised face	A ## (see order codes)		ANSI B 16.5	930 psi 540°F (64 bar 280°C) Values are maximum, refer to pressure ratings of flange

Electronic insert function

Electronic inserts for level limit switches

- FEL 51: two-wire AC version, switch the load directly into the power supply circuit via the thyristor
- FEL 52: three-wire DC version, switch the load via the transistor (PNP) and separate connection (preferably used with PLC controller)
- FEL 54: universal AC / DC version with DPDT relay, switch the loads via two potential free relay contacts

Electronic inserts for level sensors

- FEL 55: two-wire for separate switching unit for connecting to a PLC, signal transmission 16 / 8 mA (high to low current) along two-wire cabling
- FEL 56: two-wire for separate switching unit, signal transmission 0.6 to 1.0 / 2.1 to 2.8 mA (low to high current) to EN 50227 (NAMUR) along two-wire cabling
- FEL 58: two-wire for separate switching unit, signal transmission 2.1 to 3.5 / 0.6 to 1.0 mA (high to low current) to EN 50227 (NAMUR) along two-wire cabling. Checking of connecting cable and other devices by pressing a key on the electronic insert.
- FEL 57: two-wire for separate switching unit, PFM signal transmission, current pulses superimposed on the power supply along the two-wire cabling. Cyclical checking by the switching unit without changing levels.

Galvanic isolation

FEL 51, 52:	Between sensor and power supply
FEL 54:	Between sensor, power supply and load
FEL 55, 56, 57, and 58:	Refer to limit switch connected

Connecting cables

Electronic insert wiring terminals, maximum 14 AWG (2.5 mm²), stranded in cable sleeve according to DIN 46228.
Ground connection in housing, maximum 14 AWG (2.5 mm²)
External housing ground for plant grounding system, maximum 11 AWG (4 mm²)

Cable entries

Polyester housing F16, 1/2" NPT. Aluminum housings F17 and F13; 3/4" NPT

Electronic insert operation and setup

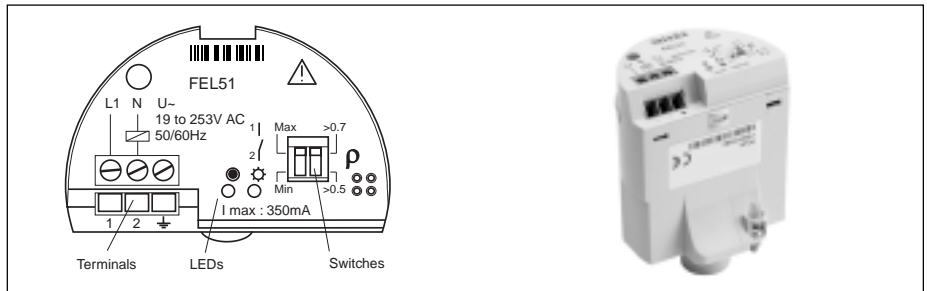
Display and operation elements

FEL 51, 52, 54 and 55: 2 switches for fail-safe mode and density change, green LED to indicate power on, red LED to indicate switching status (flashes when sensor is damaged by corrosion or when the electronics are defective)

FEL 56: 2 switches for fail-safe mode and density change, green LED flashes to indicate power on, red LED indicates switching status (flashes when sensor is damaged by corrosion or when the electronics are defective)

FEL 57: 2 switches for density change and cyclical checking, green LED indicates power is on, yellow LED indicates forks are covered (flashes when sensor is damaged by corrosion or when the electronics are defective)

FEL 58: 2 switches for fail-safe mode and density change, green LED flashes rapidly to indicate power on, flashes slowly on damage by corrosion on sensor or when the electronics are defective, yellow LED indicates relay status. Test key pressed breaks sensor circuit.



Output

Output signal	Dependent on electronic insert specified, refer to pages 6 thru 10
Failsafe mode	<p>Switch status for minimum / maximum residual current safety on electronic insert (with FEL 57 connected to Nivotester only).</p> <p>Maximum fail-safe: the output switches to the power failure mode when fork is covered (for use with overspill protection, etc.)</p> <p>Minimum fail-safe: the output switches to the power failure mode when fork is uncovered (for use with dry pump protection, etc.)</p>
Response time	Approximately 0.5 seconds when forks are covered, approximately 1.0 seconds when forks are uncovered
Power up response	When switching power on, the output assumes the alarm signal mode. After a maximum 2 seconds, it assumes the correct switch status (exception, FEL 57).

Accuracy

Reference conditions	<p>Ambient temperature, 73°F (23°C) Product temperature 73°F (23°C). Product density, 1 SGU (water) Viscosity, 1cP. Pressure, 0 psig Sensor mounted vertically from top and density selector switch > 0.7 SGU.</p>	
Measured error	Specified by mounting position, ± 0.04 " maximum (1 mm)	
Repeatability	0.004" (0.1 mm)	
Hysteresis	Approximately 0.08" (2 mm)	
Effects of product temperature	Maximum 0.05" to -0.22" (1.4 to -5.5 mm) at -40° to +540°F (-40° to +280°C)	
Effects of density	Maximum 0.19" to -0.14" (4.8 to -3.5 mm) at 0.5 SGU to 1.5 SGU	
Effects of pressure	Maximum 0" to -0.09" (0 to -2.5 mm) at 0 to 928 psig	

Wiring and output function

FEL 51 two-wire AC

NOTE: FEL 51 unit must be connected in series with a load.

- Input power, 19 to 253 VAC, current consumption, 3.8 mA.
- The minimum voltage drop across the load at the electronic insert is 19V. *

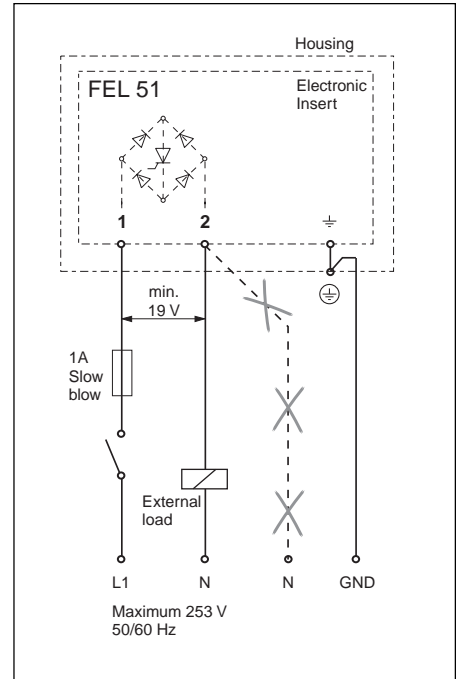
* The terminal voltage at the electronic insert must not be below 19 V. Note the voltage drop across the electronic insert in the conducting state (max. 19 V), the residual current in the blocked state (max. 3.8 mA) and, when using low voltages, the voltage drop across the load.

- When a relay cannot de-energize with a residual current below 3.8 mA, a resistor should be connected in parallel to the relay.
- Signal on alarm, < 3.8 mA on power failure or damaged sensor.
- Diagnostic warning, the red LED flashes when sensor is damaged by corrosion, or when self-diagnostics detect electronics are defective.
- Connectable load: load is switched directly into the power supply circuit via thyristor.

Transient current (40 ms), maximum 1.5 mA, maximum 375 VA at 253 VAC or maximum 36 VA at 24 VAC (not short-circuit protected).
 Continuous maximum 89 VA at 253 VAC, maximum 8.4 VA at 24 V.
 Minimum 2.5 VA at 253 V (10 mA).
 Minimum 0.5 VA at 24 V (20 mA).

I_L = Load current (open)
 < 3.8 mA = Residual current (blocked)

☀ = lit
 ● = unlit



Replacement module PN: 5002304

Fail-safe 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	☀	☀

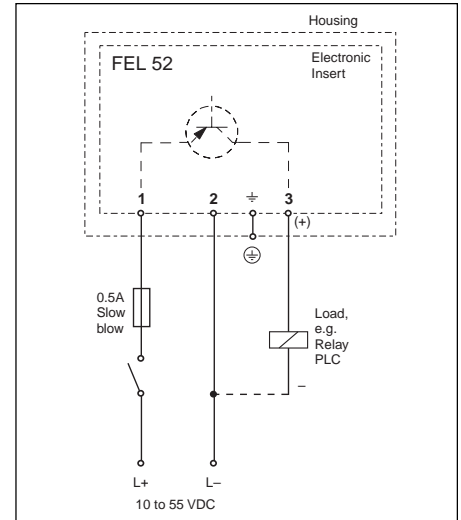
The load can be an indicator light or remote relay. When switch is in the “OFF” state, a trickle current flows (up to 3.8 mA), not enough to light an indicator or actuate a relay. When the switch is in the “ON” state, current flow increases to a level that can activate a remote relay or light a filament bulb.

FEL 52 three-wire DC

- NOTE:** FEL 52 is preferably used with programmable logic controllers (PLC)
- Input power, 10 to 55 VDC. Maximum ripple 1.7 V, 0 to 400 Hz. Maximum current consumption, 15 mA; maximum power consumption, 0.83W. Reverse polarity protected.
 - Positive signal at the switching output of the electronics (PNP).
 - Signal on alarm, < 100µA on power failure or damaged sensor.
 - Diagnostic warning, the red LED flashes when sensor is damaged by corrosion or when self-diagnostics detect electronics are defective.
 - Connectable load: load is switched via transistor and separate PNP connection.
- Transient (1 second) maximum 1 A, maximum 55 VDC (overload and short-circuit protected).
 Continuous maximum 350 mA, maximum 0.5 µF at 55 V, 1 µF at 24 V.
 Residual voltage < 3V with closed transistor; residual voltage < 100 µA with open transmitter.

I_L = Load current (closed)
 < 100 µA = residual current

☀ = lit
 ● = unlit



Replacement module PN: 5002305

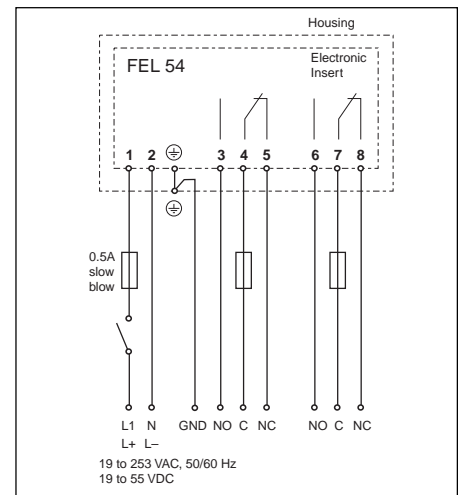
Fail-safe mode	Level	Output signal	LEDs	
			green	red
Max.		$L+ \xrightarrow{I_L} +$	☀	●
		$1 < 100 \mu A \rightarrow 3$	☀	☀
Min.		$L+ \xrightarrow{I_L} +$	☀	●
		$1 < 100 \mu A \rightarrow 3$	☀	☀

FEL 54 universal AC / DC power with DPDT relay

- Note the differences in input voltages for VAC and VDC.
- Input power, 19 to 253 VAC or 19 to 55 VDC. Max. power consumption, 1.3 W, reverse polarity protected.
 - Both relays switch simultaneously.
 - Signal on alarm on power failure or damaged sensor, relays de-energize.
 - Diagnostic warning, the red LED flashes when sensor is damaged by corrosion, or when self-diagnostics detect defective electronics.
 - Connectable load: load is switched via DPDT relay contacts
- $I \sim \text{max. } 6 \text{ A, } U \sim \text{max. } 253 \text{ V}$
 $P \sim \text{max. } 1500 \text{ VA, } \cos \phi = 0.1$
 $P \sim \text{max. } 750 \text{ VA, } \cos \phi = 0.7$
 $I - \text{max. } 6 \text{ A to } 30 \text{ V, } I - \text{max. } 0.2 \text{ A to } 125 \text{ V}$

NOTE: When connecting a low-voltage circuit with reliable isolation according to DIN/VDE 0160, the following applies: Total of voltages of relay output and power supply, maximum 300 V.

= relay energized
 = relay de-energized
 ☀ = lit
 ● = unlit



Replacement module PN: 5002306

Fail-safe mode	Level	Output signal	LEDs	
			green	red
Max.			☀	●
			☀	☀
Min.			☀	●
			☀	☀

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

FEL 55 two-wire for separate switching unit

For connecting to programmable logic controllers (PLC). Output signal jumps from high to low current when limit reached (H-L edge).

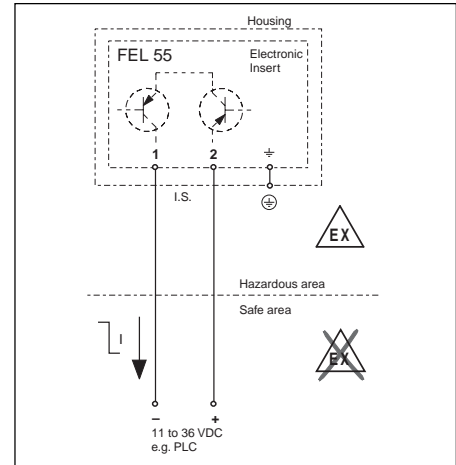
- Input power, 11 to 36 VDC.
- Signal on alarm, < 3.6 mA on power failure or damaged sensor.
- Diagnostic warning, the red LED flashes when sensor is damaged by corrosion or when self-diagnostics detect electronics are defective.
- Connectable load:

$$\text{Load } R = \frac{U - 11V}{16.8 \text{ mA}}$$

$$U = 11 \text{ to } 36 \text{ VDC}$$

~ 16 mA = 16 mA ± 5%
 ~ 8 mA = 8 mA ± 6%

☀ = lit
 ● = unlit



Replacement module PN: 5002307

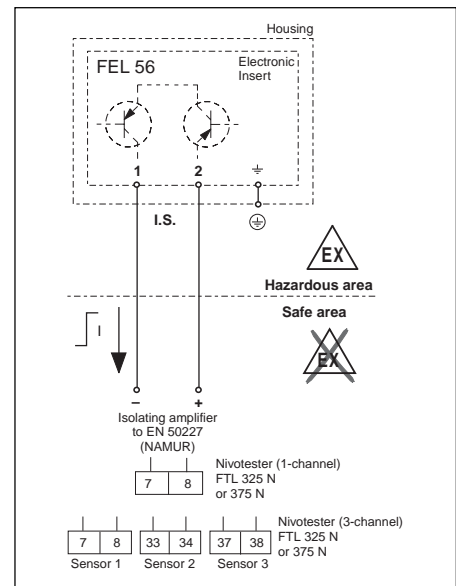
Fail-safe mode	Level	Output signal	LEDs	
			green	red
Max.		+ 2 ~16 mA → 1	☀	●
		+ 2 ~8 mA → 1	☀	☀
Min.		+ 2 ~16 mA → 1	☀	●
		+ 2 ~8 mA → 1	☀	☀

FEL 56 two-wire for separate switching unit

For connecting to isolating amplifiers according to NAMUR (EN 50227), e.g. FTL 325 N or FTL 375 N.

Output signal jumps from low to high current when limit reached (L-H edge). When connecting to a multiplexer, adjust clock time to 2 seconds minimum.

- Input power, Isolating Amplifier
- Signal on alarm, > 2.1 mA on power failure or damaged sensor.
- Diagnostic warning, the red LED flashes when sensor is damaged by corrosion, or when self-diagnostics detect electronics are defective.
- Connectable load: refer to technical data of isolating amplifier connection according to EN 50227 (NAMUR).



Replacement module PN: 5002308

Fail-safe mode	Level	Output signal	LEDs	
			green	red
Max.		+ 2 0.6 to 1.0 mA → 1	☀	●
		+ 2 2.1 to 2.8 mA → 1	☀	☀
Min.		+ 2 0.6 to 1.0 mA → 1	☀	●
		+ 2 2.1 to 2.8 mA → 1	☀	☀

☀ = lit
 ☀ = flashes
 ● = unlit

FEL 58 two-wire for separate switching unit with test key

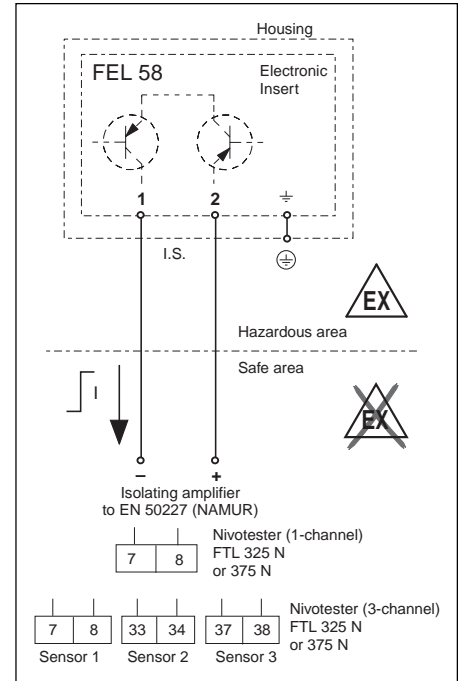
For connecting to isolating amplifiers according to NAMUR (EN 50227), e.g. FTL 325 N or FTL 375 N. Output signal jumps from high to low current when limit reached (H-L edge). The FEL 58 includes a test key on the electronic insert. Pressing the key breaks the connection to the isolating amplifier.

NOTE: The test function can be used for hazardous locations as long as there is no explosive atmosphere near the electronics housing.

When connecting to a multiplexer, adjust clock time to 2 seconds minimum.

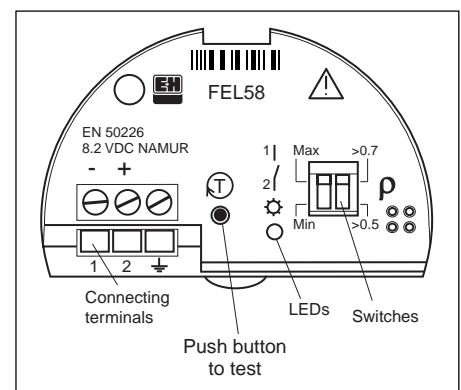
- Input power, Isolating Amplifier
- Signal on alarm, < 1.0 mA on power failure or damaged sensor.
- Diagnostic warning, the yellow LED flashes when sensor is damaged by corrosion, or when self-diagnostics detect electronics are defective.
- Connectable load: refer to technical data of isolating amplifier connection according to EN 50227 (NAMUR).
- Connectable to isolating amplifiers which have special safety circuits ($I > 3.0 \text{ mA}$).

- ☀ = lit
- ⚡ = flashes
- = unlit



Replacement module PN: 5006454

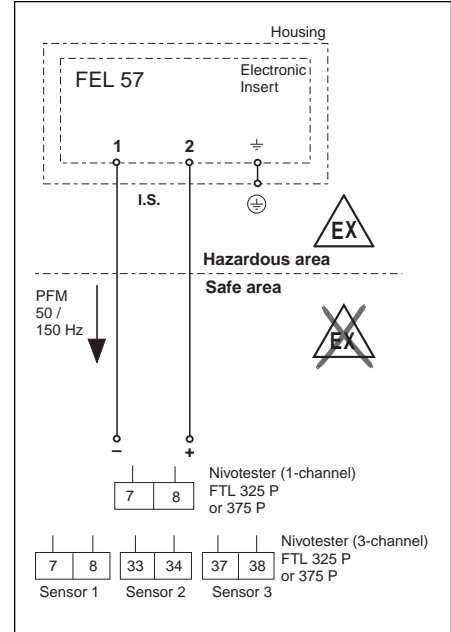
Fail-safe mode	Level	Output signal	LEDs green	LEDs yellow
Max.		+ 2.1 to 3.5 mA - 1	☀	☀
		+ 0.6 to 1.0 mA - 2	⚡	●
Min.		+ 2.1 to 3.5 mA - 1	☀	☀
		+ 0.6 to 1.0 mA - 2	⚡	●



FEL 57 two-wire for separate switching unit

For connecting to switching units Nivotester FTL 320, FTL 325 P, FTL 375 P, FTL 370 and FTL 372 (also with cyclical checking).

- Input power provided by switching unit.
- Output signal, PFM (Pulse Frequency Modulation) jumps from high to low frequency when sensor covered.
- Switching between Min. / Max. fail-safe is set in Nivotester.
- Signal on alarm, 0 Hz on power failure or damaged sensor.
- Diagnostic warning, the yellow LED flashes when sensor is damaged by corrosion, or when self-diagnostics detect electronics are defective.
- Connectable load: relay contacts provided in Nivotester or CommuteC S units, refer to appropriate technical data of unit selected.



Replacement module PN: 5002309

Additional function, Cyclical Checking. After interruption of the power supply, a clock is activated which checks the sensor and electronics without any change in level. Approved for overspill protection (according to WHG, Germany).

- Switch on electronic insert:
 Standard (STD): for weak corrosive liquids, simulation approximately 8 seconds.
 Fork free - covered - free
 Extended (EXT): for highly corrosive liquids, simulation approximately 41 seconds.
 Fork free - covered - corroded - free

This check is activated and monitored by the external switching unit.

Fail-safe mode	Level	Output signal (PFM)	LEDs	
			green	yellow
		150 Hz		
		50 Hz		

= lit
 = unlit

Fail-safe mode set at switching unit	Setting at FEL 57	Fork	Switching status of relay in switching unit on = energized off = de-energized
			Test start (power off) > 3 s End of test start (power on)
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 off
Max.	EXT	covered	off 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

* De-energized on power supply failure

NOTE: Please note the switching response and function of the unit when installed, especially when replacing a Liquiphant with an EL 17 Z or FEL 37 electronic insert with a Liquiphant M/S with the FEL 57 electronic insert.

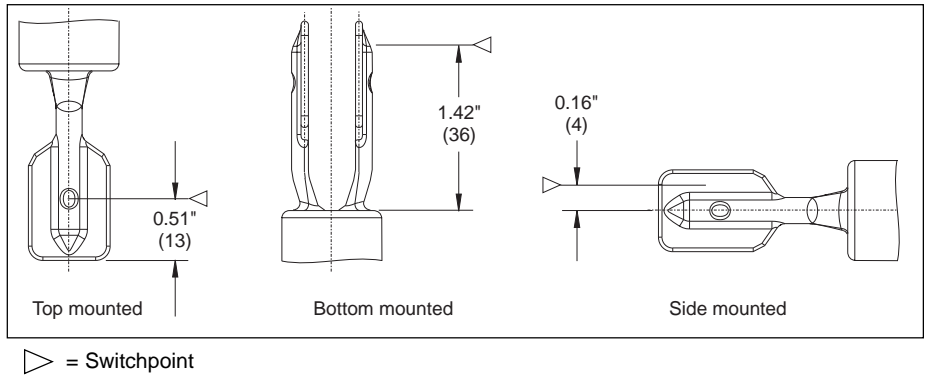
Operating conditions (installation)

Mounting, switchpoint location

Switchpoints on the sensor depend on the mounting position, with reference to water (density 1 SGU at 73°F, 0 psi). Because the Liquiphant Sensor requires no calibration, the switchpoint is determined by the position of the tuning fork.

NOTE: The switchpoints of the Liquiphant S are at different positions compared to the previous compact Liquiphant II (FTL 360, FTL 365, FDL 30 and FDL 35).

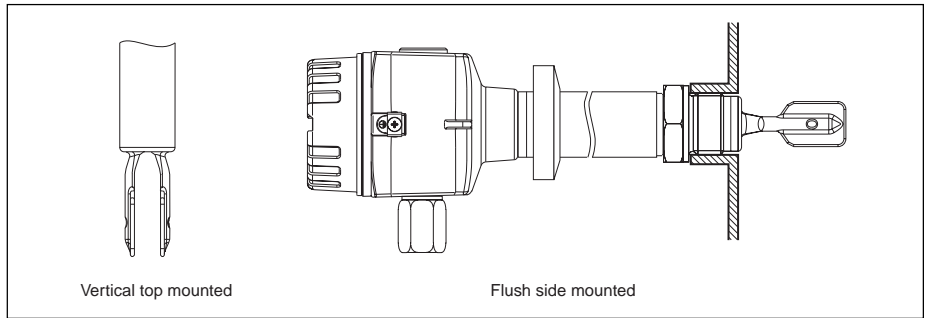
NOTE: When used in extremely light liquids, (liquefied gas), set the density switch to > 0.5.



Mounting, high viscosity liquids

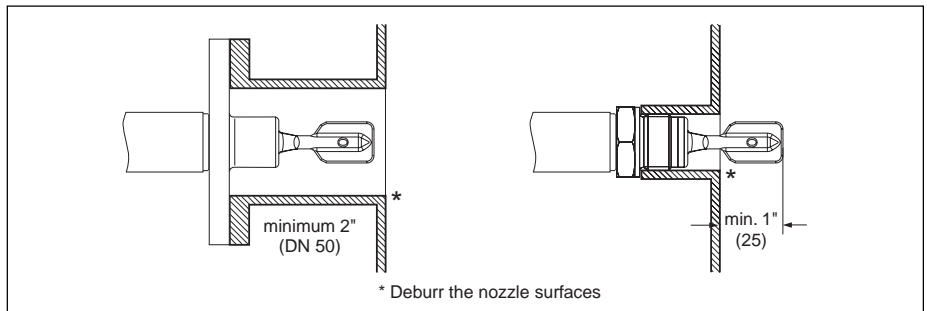
Examples of mounting with regard to the viscosity of the liquid are shown below. The optimum mounting position, even with high viscosity liquids is vertical, from the vessel top, or horizontal (flush mounted from the side).

NOTE: Horizontal mounting, position the forks so that the narrow edge of the tines are vertical. This ensures that the liquid can run off easily.



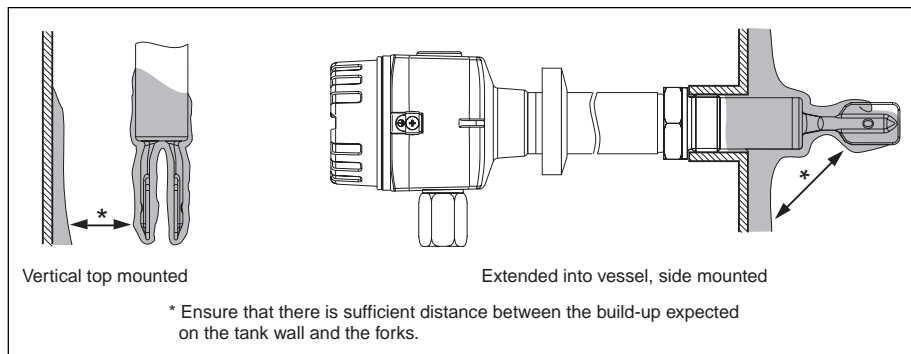
Mounting, low viscosity liquids

Mounting positions for low viscosity liquids (up to 2000 cP) are shown below. The Liquiphant S can be nozzle mounted with flange or mounted into a threaded nozzle.



Mounting, vessel wall build-up

When there is buildup on the vessel wall, mount the Liquiphant S with sufficient distance between the wall and the fork assembly.

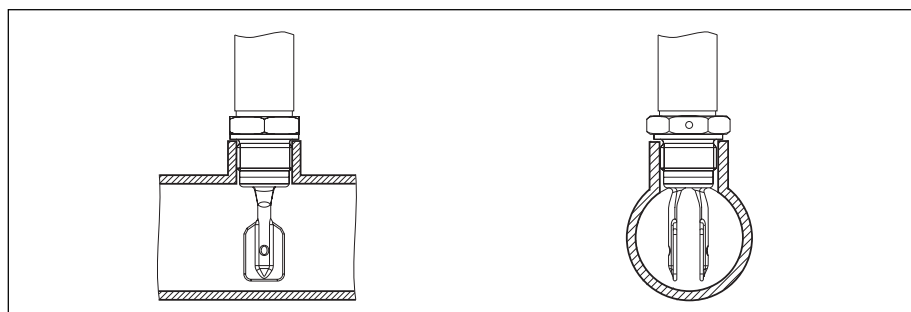


Mounting, pipe installation

The Liquiphant S can be mounted into pipe lines 2" and larger. Installation is possible in a 1" pipe line using a 1" tee (1" x 3/4" reducer fitting).

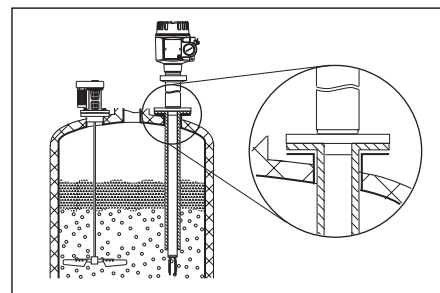
NOTE: Ensure narrow edge of forks is parallel with the pipe walls to avoid blockage of the flowing material.

To maintain optimum performance, the liquid should have velocities up to 16 ft/s (5 m/s) with a viscosity of 1 cP and a density of 1 SGU.

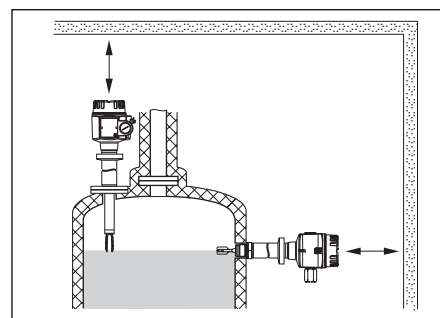


Mounting, extension tubes (FTL 71)

When mounting an extended version of the Liquiphant S in fluids which may apply high lateral forces, the extension pipe should be supported (such as an internal extension support pipe). Ensure the internal support does not hinder the operation of the forks.



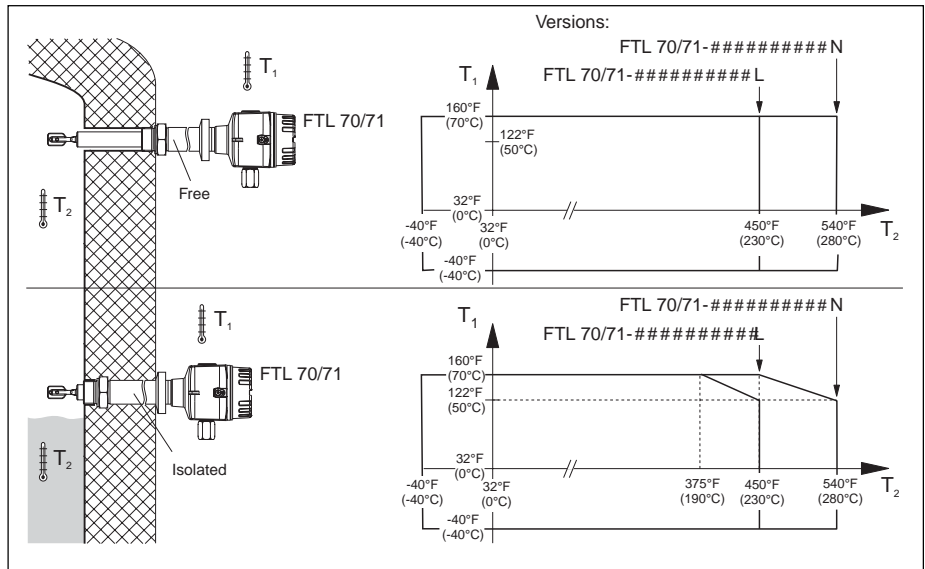
Ensure there is adequate space between outside walls or ceilings and the vessel mounting point if ordering the Liquiphant S FTL 71 with extension tube. Extension tubes up to 20" (500 mm) can be mounted at any orientation. Extension tubes over 20" and up to 115" must be mounted vertically.



Operating conditions (environment)

Ambient conditions

Permissible ambient temperature T_1 at the housing is dependent on the product temperature T_2 inside the vessel.



Ambient temperature range	-60° to +160°F (-50° to +70°C)
Storage temperature range	-60° to +180°F (-50° to +80°C)
Climatic class	Climatic protection to IEC 68, Part 2-38, Figure 2a
Vibration resistance	To IEC 68, Part 2-6 (10 to 55 Hz, 0.15 mm, 100 cycles)
Electromagnetic compatibility	Interference immunity, EN 61326 Annex A (industrial use) and NAMUR recommendation NE 21 (EMC) Interference emission to EN 61326, Electrical Equipment Class B
Degree of protection	Polyester and aluminum housings, NEMA 4X Aluminum housing (hazardous version), NEMA 4X and NEMA 6P (3 ft water for 24 hours)

Operating conditions (process)

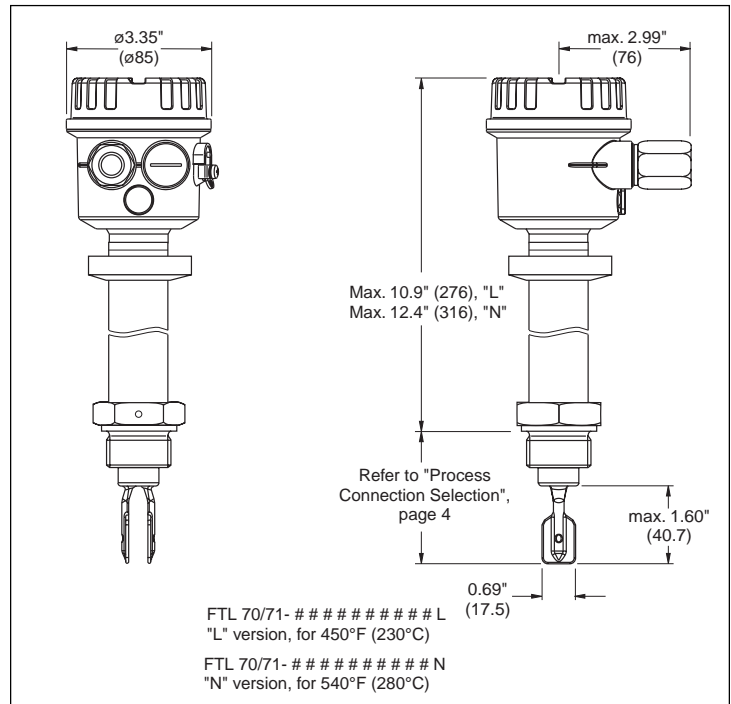
Medium temperature range	-40° to +450°F (-40° to +230°C) / -40° to +540°F (-40° to +280°C)
Thermal shock	No limit (within process temperature range)
Medium pressure	Threaded connection, -14.5 to +930 psi (-1 to +64 bar) over entire process temperature range. Flange connection, flange rating nominal pressure (note temperature factor)
Limiting medium pressure range	1450 psi at 70°F (100 bar at 20°C), 1160 psi at 540°F (80 bar at 280°C). Burst pressure of diaphragm, 2900 psi (200 bar).
Medium state	Liquid
Density	Minimum 0.5 SGU
Viscosity	Maximum 10,000 cSt
Bulk solids content	Maximum 0.2" (5 mm diameter)

Mechanical construction

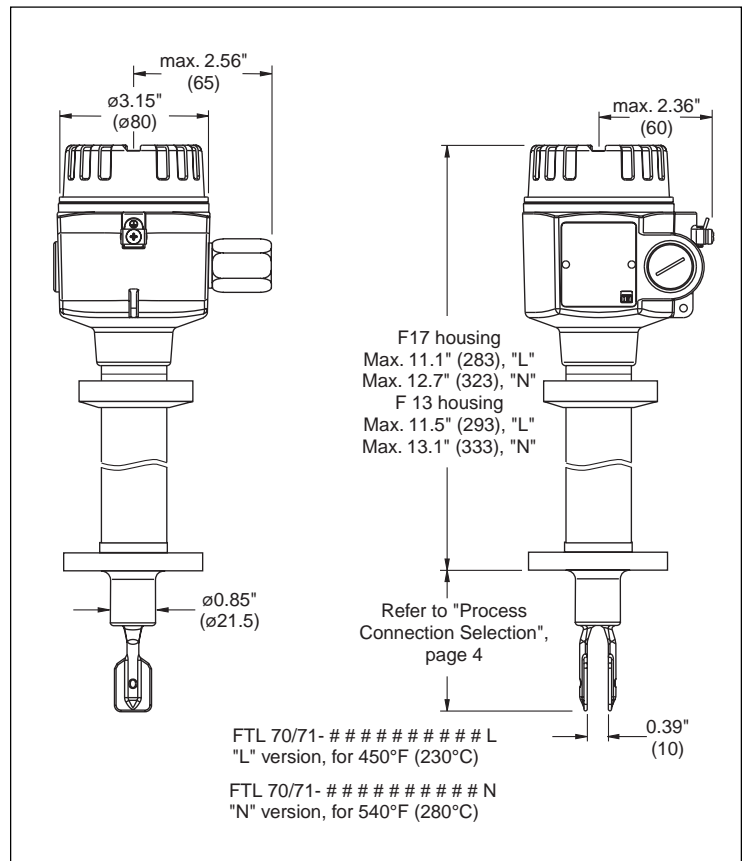
Dimensions

FTL 70 sensor, F 16 polyester housing

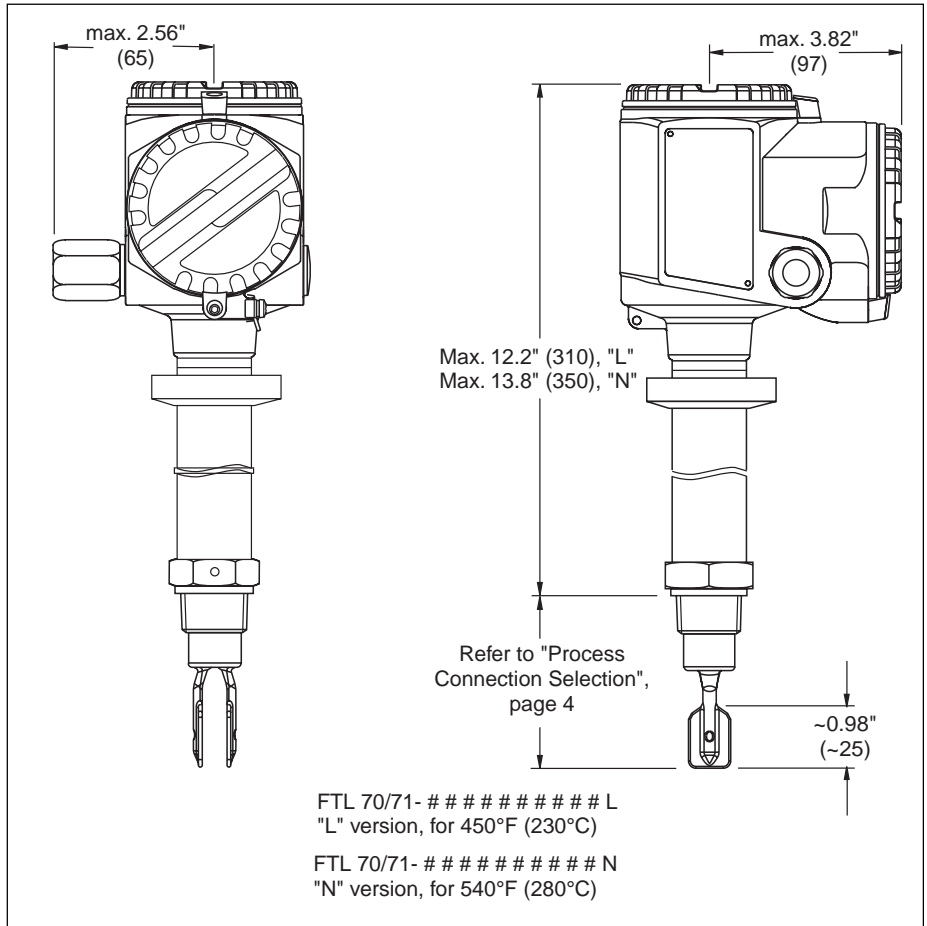
NOTE: Dimensions are valid for NPT threaded process connections. Flange versions, dimensions for "L" and "N" can be up to 1.18" (30 mm) longer. All dimensions are given in inches (mm)



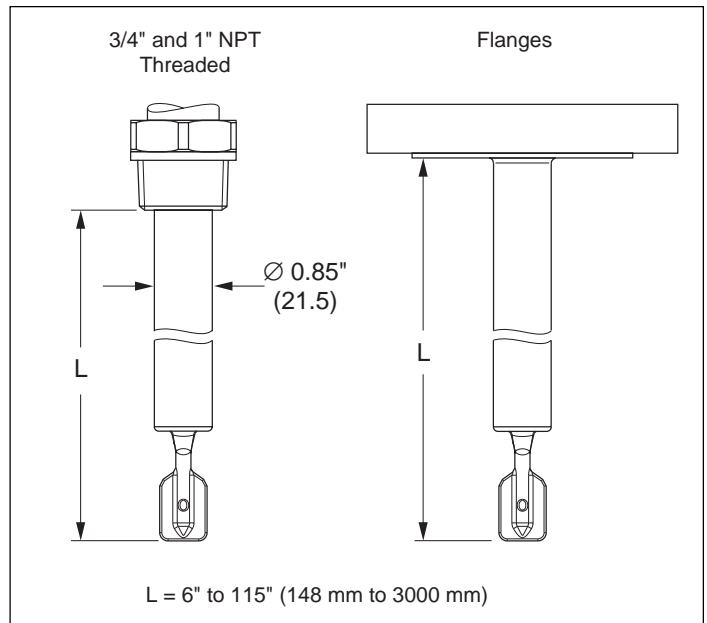
FTL 70 sensor, F 17 aluminum housing or
 F 13 aluminum housing for hazardous areas



FTL 70 sensor, T 13 aluminum housing
with separate connection compartment



Sensor length L for FTL 71 extension tube, dependent on process connection.



Certificates and approvals

CE Mark

By attaching the CE Mark, Endress+Hauser confirms that the instrument fulfills all the requirements of the relevant EC directives.

Hazardous area approvals

FM approved IS, Class I, II, III; Division 1, Groups A - G; housings F 16 and F 17; electronic inserts FEL 55, 56, 57, and 58.

FM approved NI, Class I, Division 2, Groups A - D; housings F 13 with NPT conduit entry; electronic inserts FEL 51, 52, 54, 55, 56, 57, and 58. Housing F 16 with NPT conduit entry; electronic inserts FEL 51, 52, 55, 56, 57, and 58.

FM approved XP, Class I, II, III; Division 1, Groups B-G; housing T 13 with NPT conduit entry. Exception, F 13 housing, Groups A-G. Electronic inserts FEL 51, 52, 54, 55, 56, 57, and 58.

CSA IS, Class I, II, III; Division 1; Groups A-G; housings F 16 and F 17 with NPT conduit entry; electronic inserts FEL 55, 56, 57, and 58.

CSA XP, Class I, II, III; Division 1; Groups A-G; housings F 13 with NPT conduit entry; electronic inserts FEL 51, 52, 54, 55, 56, 57, and 58.

CSA General Purpose; housings F 13 with NPT conduit entry; electronic inserts FEL 51, 52, 54, 55, 56, 57, and 58.

CSA General Purpose; housing F 16 with NPT conduit entry, electronic inserts FEL 51, 52, 55, 56, 57, and 58.

NOTE: Polyester housing F 16 electrical connection in piping. Do not screw cable entries firmly to the piping. Use flexible connections (e.g. armored cable). If the piping is used for grounding, ensure there is a continuous electrical connection.

NOTE: Other approvals are available, such as ATEX, TIIS, etc. Please consult factory for information.



Contact Esys for more information about this product:

Esys® The Energy Control Company™

4520 Stine Road, Ste 7

Bakersfield, CA 93313

(661) 833-1902

email: esys@esys.us

website: <http://www.esys.us>



Ordering information

Liquiphant S, FTL 70 compact

	1	2	3	4	5	6	7	
FTL 70 -	□	□ □ □	□ □ □	□	□ □ □	□	□	Basic Weight * 1.5 lb (0.7 kg)
1	Certificate, application							
	A Without any special certificate							
	P FM IS, CL I, II, III; Div. 1; Grps. A-G							
	Q FM approved, XP, CL I, II, III; Div. 1, Grp. B-G (Aluminum housing T 13) Groups A-G if E8 Aluminum F 13 housing selection is used							
	R FM NI, CL I; Div. 2; Grps. A-D							
	S CSA IS, CL I, II, III; Div. 1; Grps. A-G							
	T CSA XP, CL I, II, III; Div. 1; Grps. A-G							
	U CSA general purpose, NI							
2	Process connection / material							<i>Additional Weight</i>
	GM2 3/4" NPT threaded connection / 316L SS							
	GM5 3/4" NPT threaded connection / Alloy C 4							
	GN2 1" NPT threaded connection / 316L SS							0.4 lb (0.2 kg)
	GN5 1" NPT threaded connection / Alloy C 4							0.4 lb (0.2 kg)
	A82 1" ANSI flange, Class 150, RF / 316L SS							2.2 lb (1.0 kg)
	AB2 1-1/4" ANSI flange, Class 300, RF / 316L SS							4.0 lb (2.0 kg)
	AC2 1-1/2" ANSI flange, Class 150, RF / 316L SS							3.3 lb (1.5 kg)
	AD2 1-1/2" ANSI flange, Class 300, RF / 316L SS							5.9 lb (3.7 kg)
	AE2 2" ANSI flange, Class 150, RF / 316L SS							5.3 lb (2.4 kg)
	AE5 2" ANSI flange, Class 150, RF / 316L SS with Alloy C 4 plating							5.3 lb (2.4 kg)
	AF2 2" ANSI flange, Class 300, RF / 316L SS							7.0 lb (3.2 kg)
	AF5 2" ANSI flange, Class 300, RF / 316L SS with Alloy C 4 plating							7.0 lb (3.2 kg)
	AG2 2" ANSI flange, Class 600, RF / 316L SS							9.2 lb (4.2 kg)
	AG5 2" ANSI flange, Class 600, RF / 316L SS with Alloy C 4 plating							9.2 lb (4.2 kg)
	AL2 3" ANSI flange, Class 150, RF / 316L SS							10.8 lb (4.9 kg)
	AM2 3" ANSI flange, Class 300, RF / 316L SS							14.9 lb (6.8 kg)
	AN2 3" ANSI flange, Class 600, RF / 316L SS							18.7 lb (8.5 kg)
	AN5 3" ANSI flange, Class 600, RF / 316L SS with alloy C 4 plating							18.7 lb (8.5 kg)
	AP2 4" ANSI flange, Class 150, RF / 316L SS							15.4 lb (7.0 kg)
	AQ2 4" ANSI flange, Class 300, RF / 316L SS							25.3 lb (11.5 kg)
	AP2 4" ANSI flange, Class 600, RF / 316L SS							38.1 lb (17.3 kg)
	Flanges with Alloy C 4 plating have a smooth raised face							
3	Length L, Material							
	Material of spacer and process connection							
	Surface roughness of the sensor > 80 grit (< 3.2µm)							
	AB Compact version, 316L SS							
	AE Compact version, Alloy C 4							
4	Electronic insert							
	1 FEL 51, two-wire AC, 19 to 235 VAC							
	2 FEL 52, three-wire DC, 10 to 55 VDC							
	4 FEL 54, universal, 19 to 153 VAC or 19 to 55 VDC, DPDT relay							
	5 FEL 55, two-wire DC, 11 to 36 VDC, 16 / 8 mA output, IS							
	6 FEL 56, two-wire according to NAMUR (EN 50227), IS							
	7 FEL 57, two-wire, PFM signal transmission, IS for connection to FTL 325P or FTL 375 P							
	8 FEL 58, two-wire according to NAMUR (EN 50227), IS, with test key							
5	Housing / cable entry							
	E4 Polyester housing F 16, NEMA 4X / 1/2" NPT							
	E5 Aluminum housing, F 17, NEMA 4X / 3/4" NPT							1.1 lb (0.5 kg)
	E7 Aluminum housing, T 13, NEMA 4X / 3/4" NPT with separate connection compartment							1.1 lb (0.5 kg)
	E8 Aluminum housing F 13, NEMA 4X, suitable for hazardous area / 3/4" NPT							1.1 lb (0.5 kg)
6	Additional options							
	A Additional options not selected							
7	Maximum product temperature							
	L Version for 450°F (230°C) process							
	N Version for 540°F (280°C) process							0.4 lb (0.2 kg)

* Basic weight includes compact sensor, 3/4" process connector, polyester housing and electronic insert

Liquiphant S, FTL 71 extended

	1	2	3	4	5	6	7	
FTL 71 -	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Basic Weight *
								1.5 lb (0.7 kg)
1	Certificate, application							
A	Without any special certificate							
D	Overspill protection to WHG (Germany)							
P	FM IS, CL I, II, III; Div. 1; Grps. A-G							
Q	FM approved, XP, CL I, II, III; Div. 1, Grp. B-G (Aluminum housing T 13) Groups A-G if E8 Aluminum F 13 housing selection is used							
R	FM NI, CL I; Div. 2; Grps. A-D							
S	CSA IS, CL I, II, III; Div. 1; Grps. A-G							
T	CSA XP, CL I, II, III; Div. 1; Grps. A-G							
U	CSA general purpose, NI							
2	Process connection / material							Additional Weight
GM2	3/4" NPT threaded connection / 316L SS							
GM5	3/4" NPT threaded connection / Alloy C 4							
GN2	1" NPT threaded connection / 316L SS							0.4 lb (0.2 kg)
GN5	1" NPT threaded connection / Alloy C 4							0.4 lb (0.2 kg)
A82	1" ANSI flange, Class 150, RF / 316L SS							2.2 lb (1.0 kg)
AB2	1-1/4" ANSI flange, Class 300, RF / 316L SS							4.0 lb (2.0 kg)
AC2	1-1/2" ANSI flange, Class 150, RF / 316L SS							3.3 lb (1.5 kg)
AD2	1-1/2" ANSI flange, Class 300, RF / 316L SS							5.9 lb (3.7 kg)
AE2	2" ANSI flange, Class 150, RF / 316L SS							5.3 lb (2.4 kg)
AE5	2" ANSI flange, Class 150, RF / 316L SS with Alloy C 4 plating							5.3 lb (2.4 kg)
AF2	2" ANSI flange, Class 300, RF / 316L SS							7.0 lb (3.2 kg)
AF5	2" ANSI flange, Class 300, RF / 316L SS with Alloy C 4 plating							7.0 lb (3.2 kg)
AG2	2" ANSI flange, Class 600, RF / 316L SS							9.2 lb (4.2 kg)
AG5	2" ANSI flange, Class 600, RF / 316L SS with Alloy C 4 plating							9.2 lb (4.2 kg)
AL2	3" ANSI flange, Class 150, RF / 316L SS							10.8 lb (4.9 kg)
AM2	3" ANSI flange, Class 300, RF / 316L SS							14.9 lb (6.8 kg)
AN2	3" ANSI flange, Class 600, RF / 316L SS							18.7 lb (8.5 kg)
AN5	3" ANSI flange, Class 600, RF / 316L SS with alloy C 4 plating							18.7 lb (8.5 kg)
AP2	4" ANSI flange, Class 150, RF / 316L SS							15.4 lb (7.0 kg)
AQ2	4" ANSI flange, Class 300, RF / 316L SS							25.3 lb (11.5 kg)
AP2	4" ANSI flange, Class 600, RF / 316L SS							38.1 lb (17.3 kg)
	Flanges with Alloy C 4 plating have a smooth raised face							
3	Length L, Material							
	Material of spacer and process connection							
	Surface roughness of the sensor > 80 grit (< 3.2µm)							
CB	6" to 115", 316L SS							5 lb per 100"
CE	6" to 115", Alloy C 4							5 lb per 100"
4	Electronic insert							
1	FEL 51, two-wire AC, 19 to 235 VAC							
2	FEL 52, three-wire DC, 10 to 55 VDC							
4	FEL 54, universal, 19 to 153 VAC or 19 to 55 VDC, DPDT relay							
5	FEL 55, two-wire DC, 11 to 36 VDC, 16 / 8 mA output, IS							
6	FEL 56, two-wire according to NAMUR (EN 50227), IS							
7	FEL 57, two-wire, PFM signal transmission, IS for connection to FTL 325P or FTL 375 P							
8	FEL 58, two-wire according to NAMUR (EN 50227), IS, with test key							
5	Housing / cable entry							
E4	Polyester housing F 16, NEMA 4X / 1/2" NPT							
E5	Aluminum housing, F 17, NEMA 4X / 3/4" NPT							1.1 lb (0.5 kg)
E7	Aluminum housing, T 13, NEMA 4X / 3/4" NPT with separate connection compartment							1.1 lb (0.5 kg)
E8	Aluminum housing F 13, NEMA 4X, suitable for hazardous area / 3/4" NPT							1.1 lb (0.5 kg)
6	Additional options							
A	Additional options not selected							
C	3.1.B material certificate							
7	Maximum product temperature							
L	Version for 450°F (230°C) process							
N	Version for 540°F (280°C) process							0.4 lb (0.2 kg)

* Basic weight includes compact sensor, 3/4" process connector, polyester housing and electronic insert

Accessories

Sliding sleeve

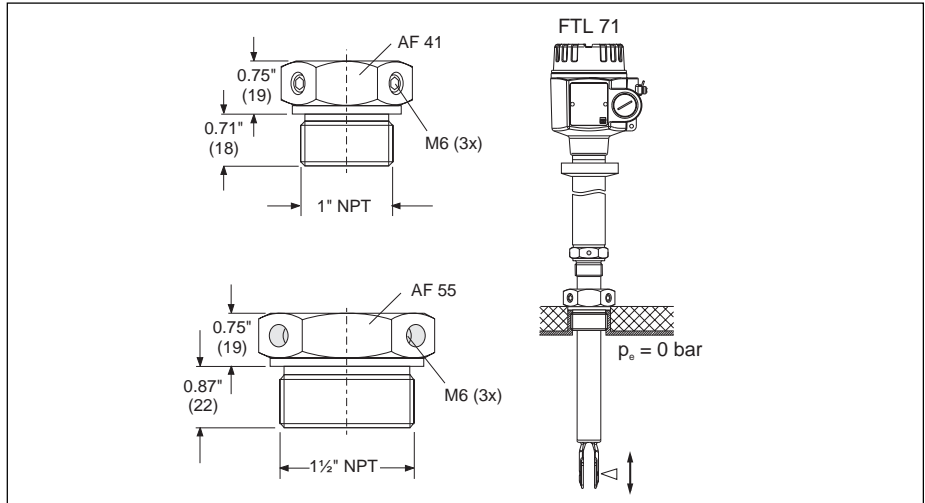
For continuous adjustment of the switching point for the FTL 71 Liquiphant S extended version in non-pressurized vessels (0 psi operation), 316L SS

1" NPT, 0.4 lb (0.21 kg)

Part No.: 52003979

1-1/2" NPT, 1.2 lb (0.54 kg)

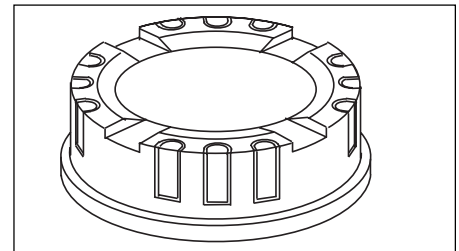
Part No.: 52003981



Transparent cover

Transparent cover for the F 16 polyester housing, PA 12 plastic, 0.08 lb (0.04 kg)

Part No.: 943461-0001



Supplemental documentation

- Isolating amplifier FTL 325P Technical Information
1 or 3 channel switching units for Top Hat Rail mounting
for Liquiphant M / S with electronic insert FEL 57 TI 350F/24/ae
- Isolating amplifier FTL 325 N Technical Information
1 or 3 channel switching units for Top Hat Rail mounting
for Liquiphant M / S with electronic insert FEL 56, FEL 58 TI 353F/24/ae
- Nivotester FTL 375 P racksyst plug-in card Technical
Information; 1, 2 or 3 channel switching unit for
Liquiphant M/S with electronic insert FEL 57 TI 360F/00/en
- Nivotester FTL 375 N racksyst plug-in card Technical
Information; 1, 2 or 3 channel switching unit for connection
to Liquiphant M / S with electronic insert FEL 56, FEL 58 TI 361F/00/en
- Liquiphant 51 C measuring sensor for level limit detection
with corrosion-resistant coating for corrosive liquids TI 347F/24/ae
- Liquiphant M 50/51, 50 H/51H measuring sensor for level
limit detection in food and pharmaceuticals TI 328F/24/ae
- FTL 70/71 Operating Instructions KA 172F/00/a6