

Vibration Limit Switch *liquiphant M FTL 51 C*

**Level limit switch for all liquids.
With high corrosion-resistant coating.
Suitable for use in explosion hazardous areas.**



Liquiphant M FTL 51 C
with polyester housing



Liquiphant M FTL 51 C
with aluminium housing
with separate connection
compartment

Features and Benefits

- Large selection of corrosion-resistant materials for coatings: ideally suited to the process
- Large selection of flanges of different standards for the process connection: universal use
- Compact fork: also for difficult to access areas
- Wide variety of electronics, e.g. NAMUR, relay, thyristor, PFM signal output: the right connection for every process control system
- No calibration: quick, low-cost start-up
- No mechanically moving parts: no maintenance, no wear, long operating life
- Monitoring of fork for damage: guaranteed function

Applications

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

- with a temperature between -40 °C and $+150\text{ °C}$ (-40 °F ... $+300\text{ °F}$)
- with a pressure up to 40 bar (580 psi)
- with a viscosity up to 10000 mm²/s
- with a density from 0.5 g/cm³

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

The Liquiphant is thus the ideal replacement for float switches.

The coating of all sensor wetted parts (process connection, extension pipe and fork) is made of enamel or synthetic material to ensure it can be used for highly corrosive liquids.

Instruments with protection EEx ia (IS), EEx de and EEx d (XP) are available for use in explosion hazardous area.

Endress + Hauser

The Power of Know How



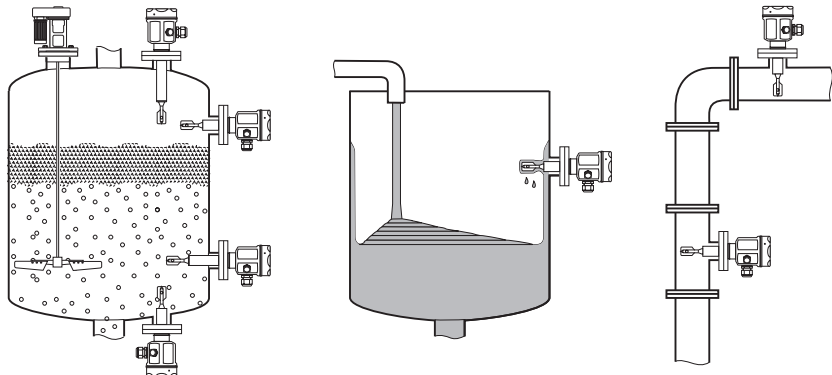
Contents

General Information	2	Output General Information	11
Application	2	Connecting cables	
Function and System Design	3	Fail-safe mode	
Measuring principle		Switching time	
Modularity		Power up response	
Electronic inserts for level limit switches		Performance Characteristics	11
Electronic inserts for level sensors		Operating conditions	11
Galvanic isolation		Installation	11
Design		Mounting	
Input	3	Mounting position	
Measured variable		Environment	13
Measuring range		Ambient temperature range	
Product density		Climatic class	
Output FEL 51	4	Degree of protection	
Electrical connection		Vibration resistance	
output signal		Electromagnetic compatibility	
Output FEL 52	5	Process conditions	14
Electrical connection		Process temperature range	
Output signal		Thermal shock	
Power		Process pressure range	
Output FEL 54	6	Process pressure limits	
Electrical connection		Pressure shock	
Output signal		Product state	
Power		Density	
Output FEL 55	7	Viscosity	
Electrical connection		Bulk solids content	
output signal		Mechanical Construction	14
Output FEL 56	8	Design	
Electrical connection		Dimensions	
output signal		Materials	
Output FEL 58	9	Process connections	
Electrical connection		Human Interface	17
output signal		Operation	
Output FEL 57	10	Display and Operating Elements	
Electrical connection		Certificates and Approvals	18
output signal		Ordering	19
		Accessories	
		Supplementary documentation	
		Product Structure FTL 51 C	

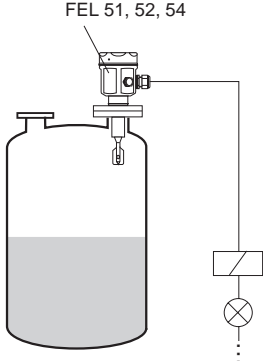
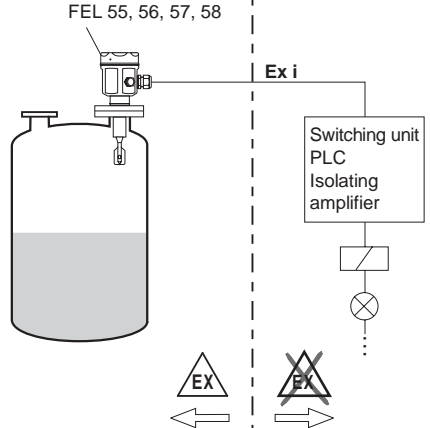
General Information

Manufacturer	Endress+Hauser
Instrument	Level limit switch
Designation	Liquiphant M FTL 51 C
Technical documentation Version	TI 347F/00/en 01.01
Technical data	to DIN 19259

Application

Limit detection	<p>Maximum or minimum detection in tanks or piping containing all types of liquids including use in explosion hazardous areas. Its high corrosion resistance makes it especially suitable for very aggressive liquids.</p> 
-----------------	---

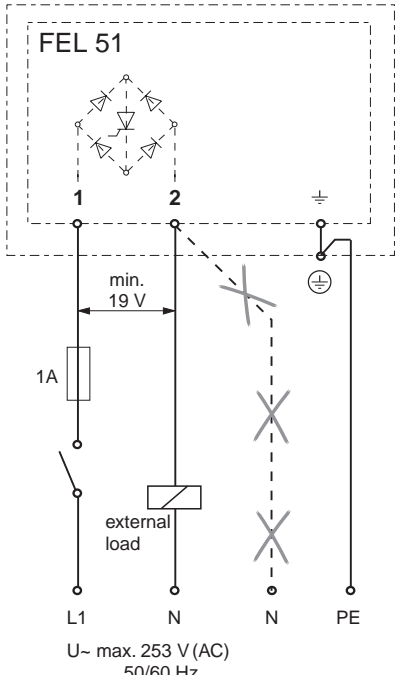
Function and System Design

Measuring principle	The forks vibrate at their intrinsic frequency. This frequency is reduced when covered with liquid. The change in frequency then activates a limit switch.	
Modularity	 <p>Level limit switch Liquiphant M FTL with electronic inserts FEL 51, FEL 52, FEL 54</p>	 <p>Level sensor Liquiphant M FTL with electronic inserts FEL 55, FEL 56, FEL 57, FEL 58 for connecting to a separate switching unit or isolating amplifier</p>
Electronic inserts for level limit switches	<p>FEL 51: Two-wire AC version; Switch the load directly into the power supply circuit via the thyristor.</p> <p>FEL 52: Three-wire DC version; Switch the load via the transistor (PNP) and separate connection.</p> <p>FEL 54: Universal current with relay output; Switch the loads via 2 potential-free change-over contacts.</p>	
Electronic inserts for level sensors	<p>FEL 55: for separate switching unit; Signal transmission 16 / 8 mA along two-wire cabling.</p> <p>FEL 56: for separate switching unit; Signal transmission L-H edge 0.6...1.0 / 2.1...2.8 mA to EN 50227 (NAMUR) along two wire cabling.</p> <p>FEL 58: for separate switching unit; Signal transmission H-L edge 2.1...3.5 / 0.6...1.0 mA to EN 50227 (NAMUR) along two-wire cabling. Checking of connecting cables and other devices by pressing a key on the electronic insert.</p> <p>FEL 57: for separate switching unit; PFM signal transmission; current pulses superposed on the power supply along the two-wire cabling. Cyclical checking by the switching unit without changing levels.</p>	
Galvanic isolation	<p>FEL 51, 52: between sensor and power supply</p> <p>FEL 54: between sensor and power supply and load</p> <p>FEL 55, 56, 57, 58: see limit switch connected</p>	
Design	FTL 51 C: with flange and extension pipe, both coated with the same material	

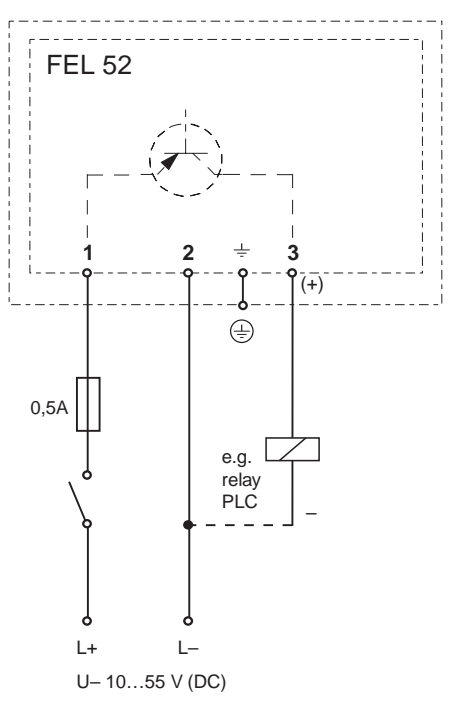












Input

Measured variable	Level (limit value)
Measuring range (detection range)	Specified by mounting point or length of sensor with extension pipe (max. 3000 mm with plastic coating, max. 1200 mm with enamel coating) (max. 115 in with plastic coating, max. 48 in with enamel coating)
Product density	Adjustment on the electronic insert >0.5 g/cm ³ or >0.7 g/cm ³

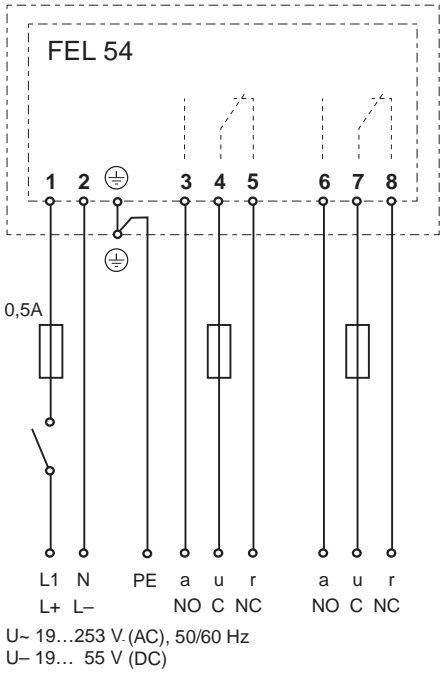





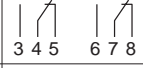



















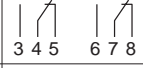















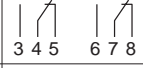










**Output
FEL 51**

<p>Electrical connection</p>	<p>Two-wire AC connection</p> <p>Always connect in series with the load!</p> <p>Check the following:</p> <ul style="list-style-type: none"> • the residual current in blocked state (up to 3.8 mA) • that for low voltage – the voltage across the load is such that the minimum terminal voltage at the electronic insert (19 V) when blocked is not too low. – the voltage drop across the electronic insert when opened is observed (up to 12 V) • that a relay cannot de-energise with a retaining current below 3.8 mA. If this is the case, a resistor should be connected parallel to the relay.  <p>U~ max. 253 V (AC) 50/60 Hz</p>																							
<p>Output signal</p>	<table border="1" data-bbox="970 846 1444 1205"> <thead> <tr> <th>Fail-safe circuit</th> <th>Level</th> <th>Output signal</th> <th>LEDs green</th> <th>red</th> </tr> </thead> <tbody> <tr> <td rowspan="2">Max.</td> <td></td> <td>1 I_L 2</td> <td></td> <td></td> </tr> <tr> <td></td> <td>1 < 3,8 mA 2</td> <td></td> <td></td> </tr> <tr> <td rowspan="2">Min.</td> <td></td> <td>1 I_L 2</td> <td></td> <td></td> </tr> <tr> <td></td> <td>1 < 3,8 mA 2</td> <td></td> <td></td> </tr> </tbody> </table> <p>I_L = load current (closed) < 3.8 mA = residual current (blocked) = lit = unlit</p>	Fail-safe circuit	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		
Fail-safe circuit	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																						
<p>Signal on alarm</p>	<p>Output signal on power failure or with damaged sensor: < 3.8 mA</p>																							
<p>Load (connectable load)</p>	<p>Load switched directly into the power supply circuit via thyristor.</p> <p>Transient (40 ms) max. 1.5 A, max. 375 VA at 253 V or max. 36 VA at 24 V (not short-circuit protected)</p> <p>Continuous max. 89 VA at 253 V, max. 8.4 VA at 24 V min. 2.5 VA at 253 V (10 mA), min. 0.5 VA at 24 V (20 mA)</p> <p>Voltage drop across FEL 51 max. 12 V</p> <p>Residual current with blocked thyristor max. 3.8 mA</p> <p>Overvoltage protection FEL 51: Overvoltage category III</p>																							

**Output
FEL 52**

<p>Electrical connection</p>	<p>Three-wire DC connection</p> <p>Preferably used with programmable logic controllers (PLC). Positive signal at the switching output of the electronics (PNP); Output blocked on reaching limit.</p>																								
<p>Output signal</p>	<p>I_L = load current (closed) $< 100 \mu A$ = residual current (blocked) ☀ = lit ● = unlit</p>	<table border="1"> <thead> <tr> <th>Fail-safe circuit</th> <th>Level</th> <th>Output signal</th> <th>LEDs green</th> <th>LEDs red</th> </tr> </thead> <tbody> <tr> <td rowspan="2">Max.</td> <td></td> <td>$L+ \xrightarrow{I_L} 1 \rightarrow 3$</td> <td>☀</td> <td>●</td> </tr> <tr> <td></td> <td>$1 \xrightarrow{< 100 \mu A} 3$</td> <td>☀</td> <td>☀</td> </tr> <tr> <td rowspan="2">Min.</td> <td></td> <td>$L+ \xrightarrow{I_L} 1 \rightarrow 3$</td> <td>☀</td> <td>●</td> </tr> <tr> <td></td> <td>$1 \xrightarrow{< 100 \mu A} 3$</td> <td>☀</td> <td>☀</td> </tr> </tbody> </table>	Fail-safe circuit	Level	Output signal	LEDs green	LEDs red	Max.		$L+ \xrightarrow{I_L} 1 \rightarrow 3$	☀	●		$1 \xrightarrow{< 100 \mu A} 3$	☀	☀	Min.		$L+ \xrightarrow{I_L} 1 \rightarrow 3$	☀	●		$1 \xrightarrow{< 100 \mu A} 3$	☀	☀
Fail-safe circuit	Level	Output signal	LEDs green	LEDs red																					
Max.		$L+ \xrightarrow{I_L} 1 \rightarrow 3$	☀	●																					
		$1 \xrightarrow{< 100 \mu A} 3$	☀	☀																					
Min.		$L+ \xrightarrow{I_L} 1 \rightarrow 3$	☀	●																					
		$1 \xrightarrow{< 100 \mu A} 3$	☀	☀																					
<p>Signal on alarm</p>	<p>Output signal on power failure or with damaged sensor: $< 100 \mu A$</p>																								
<p>Load (connectable load)</p>	<p>Load switched via transistor and separate PNP connection. Transient (1 s) max. 1 A, max. 55 V (pulsed overload and short-circuit protection); Continuous max. 350 mA; max, 0.5 μF at 55 V, max. 1.0 μF at 24 V; Residual voltage < 3 V (with conductive transistor); Residual current $< 100 \mu A$ (with blocked transistor)</p>																								
<p>Power supply</p>	<p>10 V...55 V DC Ripple max. 1.7 V, 0...400 Hz Current consumption max. 15 mA Power consumption max. 0.83 W Reverse polarity protection Overvoltage protection FEL 52: Overvoltage category III</p>																								

**Output
FEL 54**

<p>Electrical connection</p>	<p>Universal current connection with relay output</p> <p>Power supply: Note the differences in voltage for DC / AC.</p> <p>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.</p> <div data-bbox="981 123 1428 795" style="border: 1px dashed black; padding: 5px;"> <p style="text-align: center;">FEL 54</p>  </div>																							
<p>Output signal</p>	<table border="1" data-bbox="970 846 1444 1205"> <thead> <tr> <th>Fail-safe circuit</th> <th>Level</th> <th>Output signal</th> <th>LEDs green</th> <th>LEDs red</th> </tr> </thead> <tbody> <tr> <td rowspan="2">Max.</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td rowspan="2">Min.</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table> <p>  = relay energised  = relay de-energised  = lit  = unlit </p>	Fail-safe circuit	Level	Output signal	LEDs green	LEDs red	Max.									Min.								
Fail-safe circuit	Level	Output signal	LEDs green	LEDs red																				
Max.																								
																								
Min.																								
																								
<p>Signal on alarm</p>	<p>Output signal on power failure or with damaged sensor: Relay de-energised</p>																							
<p>Load (connectable load)</p>	<p>Loads switched via 2 potential-free change-over contacts. I_{\sim} max. 6 A, U_{\sim} max. 253 V; P_{\sim} max. 1500 VA, $\cos \varphi = 1$, P_{-} max. 750 VA, $\cos \varphi > 0.7$; I_{-} max. 6 A to 30 V, I_{-} max. 0.2 A to 125 V. When connecting a low-voltage circuit with reliable isolation according to DIN/VDE 0160: Total of voltages of relay output and power supply max. 300 V</p>																							
<p>Power supply</p>	<p>19 V...253 V AC, 50/60 Hz or 19 V...55 V DC Power consumption max. 1.3 W Reverse polarity protection Overvoltage protection FEL 54: Overvoltage category III</p>																							

**Output
FEL 55**

<p>Electrical connection</p>	<p>Two-wire connection for separate switching unit</p> <p>E.g. for connecting programmable logic controllers (PLC). Output signal jump from high to low current on limit. (H-L edge)</p>																								
<p>Output signal</p>	<p>~16 mA = 16 mA ± 5 % ~ 8 mA = 8 mA ± 6 % ☀ = lit ● = unlit</p>	<table border="1"> <thead> <tr> <th>Fail-safe circuit</th> <th>Level</th> <th>Output signal</th> <th>LEDs green</th> <th>red</th> </tr> </thead> <tbody> <tr> <td rowspan="2">Max.</td> <td></td> <td>+ 2 ~16 mA → 1</td> <td>☀</td> <td>●</td> </tr> <tr> <td></td> <td>+ 2 ~8 mA → 1</td> <td>☀</td> <td>☀</td> </tr> <tr> <td rowspan="2">Min.</td> <td></td> <td>+ 2 ~16 mA → 1</td> <td>☀</td> <td>●</td> </tr> <tr> <td></td> <td>+ 2 ~8 mA → 1</td> <td>☀</td> <td>☀</td> </tr> </tbody> </table>	Fail-safe circuit	Level	Output signal	LEDs green	red	Max.		+ 2 ~16 mA → 1	☀	●		+ 2 ~8 mA → 1	☀	☀	Min.		+ 2 ~16 mA → 1	☀	●		+ 2 ~8 mA → 1	☀	☀
Fail-safe circuit	Level	Output signal	LEDs green	red																					
Max.		+ 2 ~16 mA → 1	☀	●																					
		+ 2 ~8 mA → 1	☀	☀																					
Min.		+ 2 ~16 mA → 1	☀	●																					
		+ 2 ~8 mA → 1	☀	☀																					
<p>Signal on alarm</p>	<p>Output signal on power failure or with damaged sensor: < 3.6 mA</p>																								
<p>Load (connectable load)</p>	$\text{Load } R = \frac{U - 11 \text{ V}}{16.8 \text{ mA}}$ <p>U = connecting DC voltage 11 V...36 V Overvoltage protection FEL 55: Overvoltage category III</p>																								































**Output
FEL 56**

<p>Electrical connection</p>	<p>Two-wire connection for separate switching unit</p> <p>For connecting to isolating amplifiers to NAMUR (EN 50227), e.g. FXN 421, FXN 422, FTL 325 N, FTL 375 N or Commutec SIN 100, SIN 110 from Endress+Hauser. Output signal jump from low to <i>high current on limit</i>. (L-H edge)</p> <p>Connecting to multiplexer: Adjust clock time to min. 2 s.</p> <div data-bbox="973 123 1428 817" style="text-align: center;"> </div>																							
<p>Output signal</p>	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Fail-safe circuit</th> <th>Level</th> <th>Output signal</th> <th>LEDs green</th> <th>red</th> </tr> </thead> <tbody> <tr> <td rowspan="2" style="text-align: center; vertical-align: middle;">Max.</td> <td style="text-align: center;"></td> <td style="text-align: center;">+ 0,6... 1,0 mA → 1</td> <td style="text-align: center;"></td> <td style="text-align: center;"></td> </tr> <tr> <td style="text-align: center;"></td> <td style="text-align: center;">+ 2,1... 2,8 mA → 1</td> <td style="text-align: center;"></td> <td style="text-align: center;"></td> </tr> <tr> <td rowspan="2" style="text-align: center; vertical-align: middle;">Min.</td> <td style="text-align: center;"></td> <td style="text-align: center;">+ 0,6... 1,0 mA → 1</td> <td style="text-align: center;"></td> <td style="text-align: center;"></td> </tr> <tr> <td style="text-align: center;"></td> <td style="text-align: center;">+ 2,1... 2,8 mA → 1</td> <td style="text-align: center;"></td> <td style="text-align: center;"></td> </tr> </tbody> </table> <p> = lit = flashes = unlit </p>	Fail-safe circuit	Level	Output signal	LEDs green	red	Max.		+ 0,6... 1,0 mA → 1				+ 2,1... 2,8 mA → 1			Min.		+ 0,6... 1,0 mA → 1				+ 2,1... 2,8 mA → 1		
Fail-safe circuit	Level	Output signal	LEDs green	red																				
Max.		+ 0,6... 1,0 mA → 1																						
		+ 2,1... 2,8 mA → 1																						
Min.		+ 0,6... 1,0 mA → 1																						
		+ 2,1... 2,8 mA → 1																						
<p>Signal on alarm</p>	<p>Output signal with damaged sensor: > 2.1 mA</p>																							
<p>Load (connectable load)</p>	<p>See Technical Data of isolating amplifier connected according to EN 50227 (NAMUR)</p>																							

**Output
FEL 58**

<p>Electrical connection</p>	<p>Two-wire connection for separate switching unit</p> <p>For connecting to isolating amplifiers to NAMUR (EN 50227), e.g. FXN 421, FXN 422, FTL 325 N, FTL 375 N or Commutec SIN 100, SIN 110 from Endress+Hauser. Output signal jump from high to low current on limit. (H-L edge)</p> <p>Additional function: Test key on the electronic insert. Pressing the key breaks the connection to the isolating amplifier. Note: The test function can be used for Ex-d applications provided that no explosive atmosphere is present near to the housing.</p> <p>Connecting to multiplexer: Adjust clock time to min. 2 s.</p>																			
<p>Output signal</p>	<p> </p>	<table border="1"> <thead> <tr> <th>Fail-safe circuit</th> <th>Level</th> <th>Output signal</th> <th>LEDs green yellow</th> </tr> </thead> <tbody> <tr> <td rowspan="2">Max.</td> <td></td> <td>+ 2,1... 3,5 mA → 1</td> <td> </td> </tr> <tr> <td></td> <td>+ 0,6... 1,0 mA → 1</td> <td> </td> </tr> <tr> <td rowspan="2">Min.</td> <td></td> <td>+ 2,1... 3,5 mA → 1</td> <td> </td> </tr> <tr> <td></td> <td>+ 0,6... 1,0 mA → 1</td> <td> </td> </tr> </tbody> </table>	Fail-safe circuit	Level	Output signal	LEDs green yellow	Max.		+ 2,1... 3,5 mA → 1			+ 0,6... 1,0 mA → 1		Min.		+ 2,1... 3,5 mA → 1			+ 0,6... 1,0 mA → 1	
Fail-safe circuit	Level	Output signal	LEDs green yellow																	
Max.		+ 2,1... 3,5 mA → 1																		
		+ 0,6... 1,0 mA → 1																		
Min.		+ 2,1... 3,5 mA → 1																		
		+ 0,6... 1,0 mA → 1																		
<p>Signal on alarm</p>	<p>Output signal with damaged sensor: < 1.0 mA</p>																			
<p>Load (connectable load)</p>	<p>See Technical Data of isolating amplifier connected according to EN 50227 (NAMUR) Connection also to isolating amplifiers which have special safety circuits (I > 3.0 mA)</p>																			

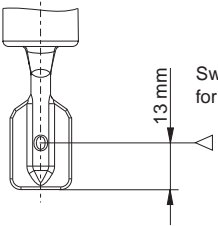
**Output
FEL 57**

<p>Electrical connection</p>	<p>Two-wire connection for separate switching unit</p> <p>For connecting to switching units Nivotester FTL 320, FTL 325 P, FTL 375 P, FTL 370, FTL 372 (also with cyclical checking), Commutec SIF 101, SIF 111 from Endress+Hauser.</p> <p>Output signal jump of the PFM signals from high to low frequency when sensor covered.</p> <p>Switching between minimum/maximum-fail-safe in the Nivotester</p> <p>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.</p> <p>Approved for overspill protection according to WHG, Germany.</p> <p>Switch on the electronic insert:</p> <ul style="list-style-type: none"> – Standard (STD): for weakly corrosive liquids; Simulation approx. 8 s Fork free – covered – free. – Extended (EXT): for strongly corrosive liquids; Simulation approx. 41 s Fork free – covered – corroded – free. <p>The check is activated and monitored by the switching unit.</p> <p>Switching response of the unit:</p> <table border="1" data-bbox="539 1120 1444 1534"> <thead> <tr> <th>Fail-safe mode set at switching unit</th> <th>Setting at FEL 57</th> <th>Fork</th> <th>Switching status of relay in switching unit on = energised off = de-energised</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> <td> <div style="display: flex; justify-content: space-around;"> <div> <p>○ Test start (power off) > 3 s</p> </div> <div> <p>○ End of test start (power on)</p> </div> </div> </td> </tr> <tr> <td>Max.</td> <td>STD</td> <td>free</td> <td>on off ~ 5 s off ~ 2 s on ~ 2 s off on</td> </tr> <tr> <td>Max.</td> <td>EXT</td> <td>free</td> <td>on off ~ 5 s off ~ 2 s on ~ 35 s off // on</td> </tr> <tr> <td>Max.</td> <td>STD</td> <td>covered</td> <td>off off off</td> </tr> <tr> <td>Max.</td> <td>EXT</td> <td>covered</td> <td>off off off</td> </tr> <tr> <td>Min.</td> <td>STD</td> <td>free</td> <td>off ~ 3 s on * ~ 5 s off ~ 3 s on off</td> </tr> <tr> <td>Min.</td> <td>EXT</td> <td>free</td> <td>off ~ 3 s on * ~ 7 s off ~ 30 s on // off</td> </tr> <tr> <td>Min.</td> <td>STD</td> <td>covered</td> <td>on ~ 3 s on * ~ 5 s off on</td> </tr> <tr> <td>Min.</td> <td>EXT</td> <td>covered</td> <td>on ~ 3 s on * ~ 5 s off ~ 35 s on // ~ 3 s off on</td> </tr> </tbody> </table> <p>* De-energised on power supply failure</p> <p>Please note the switching response and function of the plant, especially when replacing a Liquiphant with an EL 17 Z or FEL 37 electronic insert by a Liquiphant M with the FEL 57 electronic insert.</p>	Fail-safe mode set at switching unit	Setting at FEL 57	Fork	Switching status of relay in switching unit on = energised off = de-energised				<div style="display: flex; justify-content: space-around;"> <div> <p>○ Test start (power off) > 3 s</p> </div> <div> <p>○ End of test start (power on)</p> </div> </div>	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
Fail-safe mode set at switching unit	Setting at FEL 57	Fork	Switching status of relay in switching unit on = energised off = de-energised																																						
			<div style="display: flex; justify-content: space-around;"> <div> <p>○ Test start (power off) > 3 s</p> </div> <div> <p>○ End of test start (power on)</p> </div> </div>																																						
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																																						
<p>Output signal</p>	<table border="1" data-bbox="970 1713 1444 1915"> <thead> <tr> <th>Fail-safe circuit</th> <th>Level</th> <th>Output signal (PFM)</th> <th>LEDs green yellow</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td>150 Hz </td> <td> </td> </tr> <tr> <td></td> <td></td> <td>50 Hz </td> <td> </td> </tr> </tbody> </table> <p>☀ = lit ● = unlit</p>	Fail-safe circuit	Level	Output signal (PFM)	LEDs green yellow			150 Hz 	 			50 Hz 	 																												
Fail-safe circuit	Level	Output signal (PFM)	LEDs green yellow																																						
		150 Hz 	 																																						
		50 Hz 	 																																						
<p>Signal on alarm</p>	<p>Output signal on power failure or with damaged sensor: 0 Hz</p>																																								
<p>Load (connectable load)</p>	<p>Potential-free relay contacts in the switching units Nivotester FTL 320, FTL 370, FTL 372 or Commutec SIF 101, SIF 111 For contact load see the technical data of the switching unit.</p>																																								

**Output
General
Information**

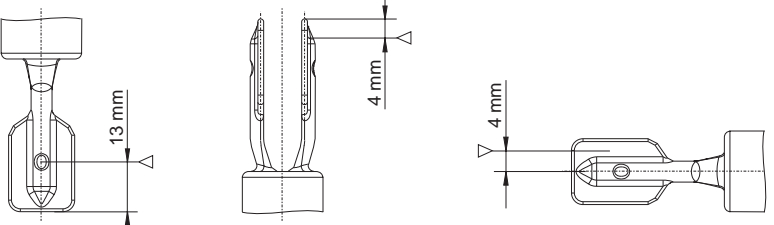
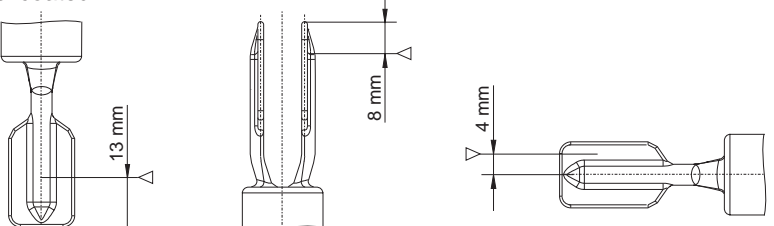
Connecting cables	Electronic inserts: cable section max. 2.5 mm ² ; strand in cable sleeve acc. to DIN 46228 Protective earth in housing: cable section max. 2.5 mm ² ; External terminal for plant grounding system: cable section max. 4 mm ²
Fail-safe mode	Switch-over for minimum/maximum residual current safety on electronic insert (with FEL 57 on Nivotester only) Max. = Maximum fail-safe: The output switches to the power fail response when the fork is covered For use with e.g. overspill protection Min. = Minimum fail-safe: The output switches to the power fail response when the fork is free For use with e.g. dry pump protection
Switching time	When fork is covered approx. 0.5 s When fork is free approx. 1.0 s
Power up response	When switching on the power supply the output assumes the alarm signal. After max. 2 s it assumes the correct switching mode (Exception: FEL 57)

**Performance
characteristics**

Reference conditions	Ambient temperature: 23 °C Product temperature: 23 °C Product density: 1 g/cm ³ (water) Viscosity: 1 mm ² /s Pressure p _e : 0 bar Sensor mounting: vertically from above Density switch: to > 0.7	
Measured error	Specified by mounting position: max. +/- 1mm	
Repeatability	0.1 mm	
Hysteresis	ECTFE, PFA approx. 2 mm; enamel approx. 2.5 mm	
Effects of product temperature	ECTFE, PFA: Max. +1.4 mm...-2.8 mm (-40 °C...+120/150 °C) Enamel: Max. +0.6 mm...-1.5 mm (-40 °C...+150 °C)	
Effects of density	Max. +4.8 mm...-3.5 mm (0.5 g/cm ³ ...1.5 g/cm ³)	
Effects of pressure	ECTFE, PFA: Max. 0 mm...-2.0 mm (0 bar...40 bar) Enamel: Max. 0 mm...-1.0 mm (0 bar...25 bar)	

**Operating
Conditions**

Installation

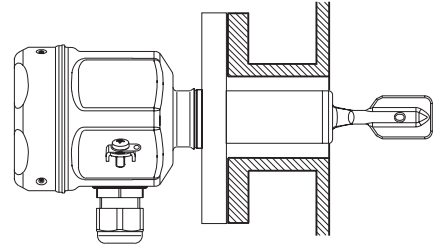
Mounting	<p>Switchpoints ▷ on the sensor depend on the mounting position, with reference to water, density 1 g/cm³, 23 °C, p_e 0 bar.</p> <p>Plastic coated:</p>  <p>Mounting from above Mounting from below Mounting from the side</p> <p>Enamel coated:</p>  <p>Mounting from above Mounting from below Mounting from the side</p> <p>Note: The switchpoints of the Liquiphant M are at other positions to those of the previous version Liquiphant II.</p>
----------	--

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

Optimum mounting, without problem even with high viscosity:



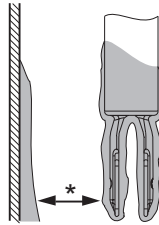
Vertical from above



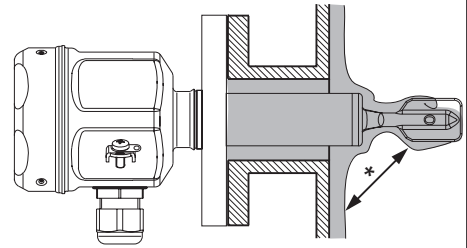
Flush-mounted from the side

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

With build-up on the tank walls:



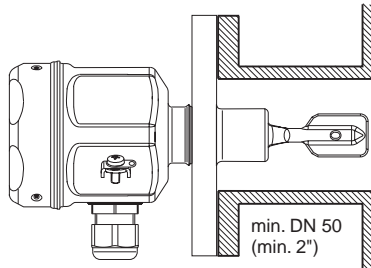
Vertical from above



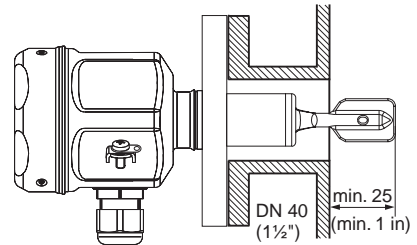
Protruding into the tank from the side

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

Mounting positions with low viscosity (up to $2000 \text{ mm}^2/\text{s}$ / 2000 cSt):

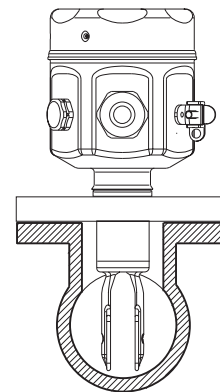
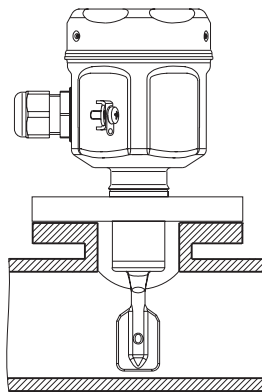


min. DN 50
(min. 2")

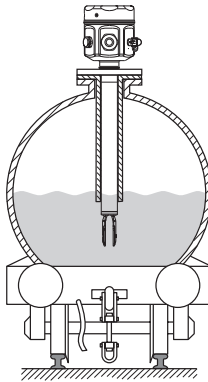
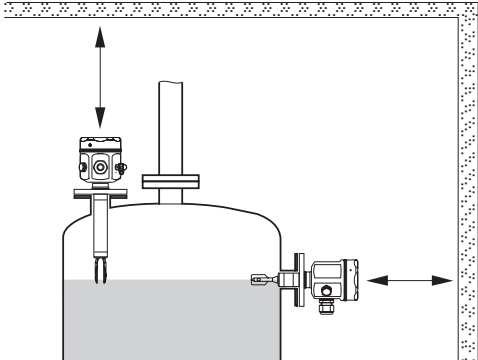


DN 40
(1½") min. 25
(min. 1 in)

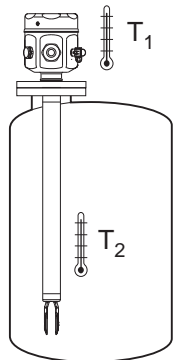
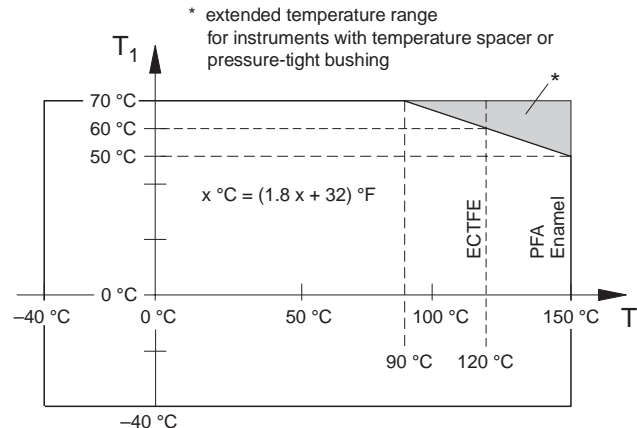
Mounting in piping from 2"



Flow velocities up to 5 m/s with a viscosity of $1 \text{ mm}^2/\text{s}$ and density 1 g/cm^3 .
(Check the function for other operating conditions.)

	<p>Support the Liquiphant M FTL 51 C with high dynamic loads</p> 
	<p>Ensure adequate space outside the tank for mounting, electrical connection and adjustment</p> 
<p>Mounting position</p>	<p>FTL 51 C with short pipe (up to approx. 500 mm / 20 in), any position, FTL 51 C with long pipe, vertical</p>

Environment

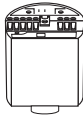
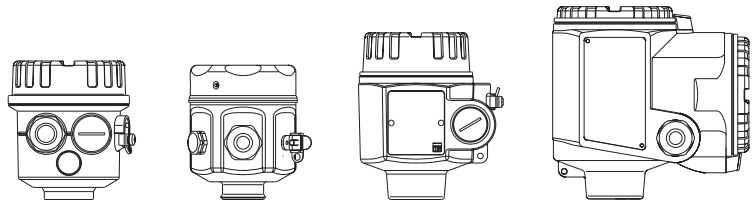
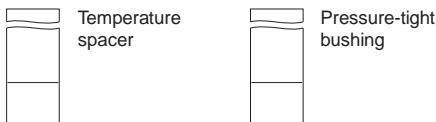

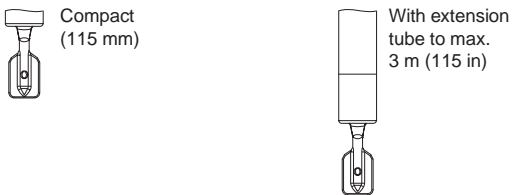
<p>Ambient temperature range</p> 	<p>Permissible ambient temperature T 1 at the housing dependent on the product temperature T 2 in the vessel:</p>  <p>* extended temperature range for instruments with temperature spacer or pressure-tight bushing</p> <p>$x \text{ }^\circ\text{C} = (1.8 x + 32) \text{ }^\circ\text{F}$</p> <p>Temperature difference between the flange surfaces on the process side and the ambient side ($T_2 - T_1$) max. 60 °C for ECTFE, PFA, flange also to be insulated as required.</p>
<p>Ambient temperature limits</p>	<p>-50 °C...+70 °C (-60 °F...+160 °F) (function with reduced data values)</p>
<p>Storage temperature</p>	<p>-50 °C...+80 °C (-60 °F...+180 °F)</p>
<p>Climatic class</p>	<p>Climatic protection to IEC 68, Part 2-38, Fig. 2a</p>

Degree of protection	Polyester, steel and aluminium housings: IP 66 / IP 67 to EN 60529 Aluminium housing (EEx d, EEx de): IP 66 / IP 68 to EN 60529 (1 m, 24 h)
Vibration resistance	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)

Process conditions

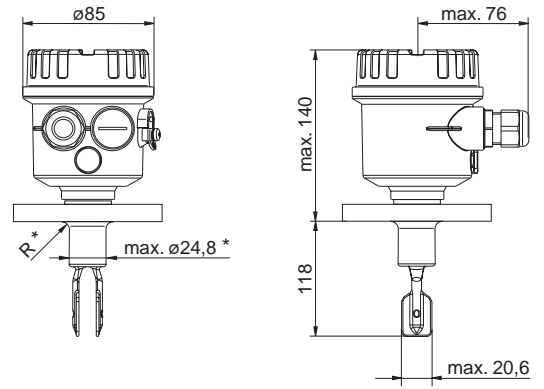
Process temperature	PFA, enamel: -40 °C...+150 °C (-40 °F...+300 °F); ECTFE: -40 °C...+120 °C (-40 °F...+250 °F)
Thermal shock	Max. 120 °C/s (max. 250 °F/s)
Process pressure range p_e	ECTFE, PFA: -1 bar...+40 bar (580 psi); Enamel: -1 bar...+25 bar (360 psi) over the entire temperature range; For exceptions see process connections (nominal pressure for flanges)
Process pressure limits	Burst pressure of diaphragm 200 bar (2900 psi)
Pressure shock	max. 20 bar/s
Product state	Liquid
Density	Min. 0.5 g/cm ³
Viscosity	Max. 10000 mm ² /s (max. 10000 cSt)
Bulk solids content	Max. \varnothing 5 mm (0.2 in)

Mechanical Construction

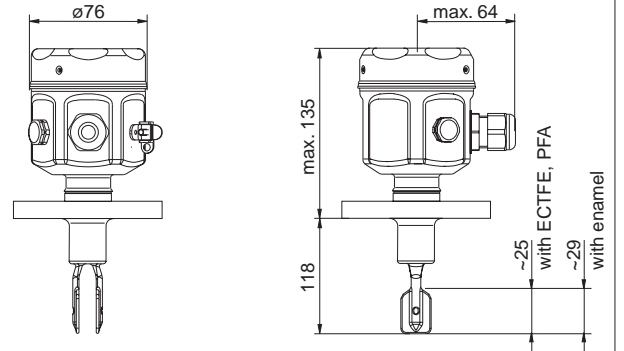
Design	<p>Summary of all electrical and mechanical versions</p> <p>Plug-in electronic inserts to mount in the housing</p>  <p>FEL 51: Two-wire AC connection FEL 52: Three-wire DC connection PNP FEL 54: Universal current connection, 2 relay outputs FEL 55: Output 16 / 8 mA for separate switching unit FEL 56: Output 0.6...1.0 / 2.1...2.8 mA for separate switching unit (NAMUR) FEL 58: Output 2.1...3.5 / 0.6...1.0 mA for separate switching unit (NAMUR) FEL 57: Output 150 / 50 Hz, PFM, for separate switching unit (Nivotester)</p> <p>Housings</p>  <p>Polyester housing Steel housing (1.4301) Aluminium housing (also for EEx d) Aluminium housing with separate connection compartment (also for EEx de a, EEx d)</p> <p>Feedthroughs</p>  <p>Temperature spacer Pressure-tight bushing</p> <p>Process connections</p>  <p>Flanges to DIN, ANSI, JIS from DN 40 / 1½"</p> <p>Sensors</p>  <p>Compact (115 mm) With extension tube to max. 3 m (115 in)</p>
--------	---

Housing and sensor FTL 51 C

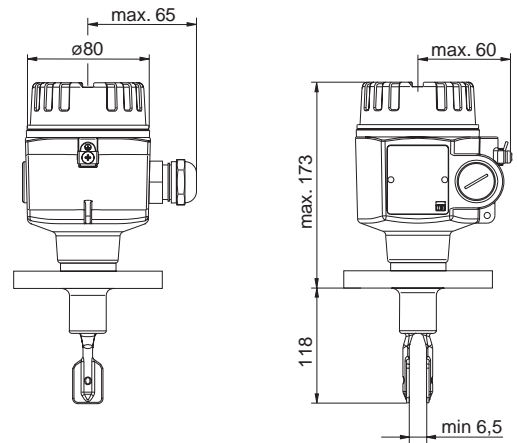
Polyester housing



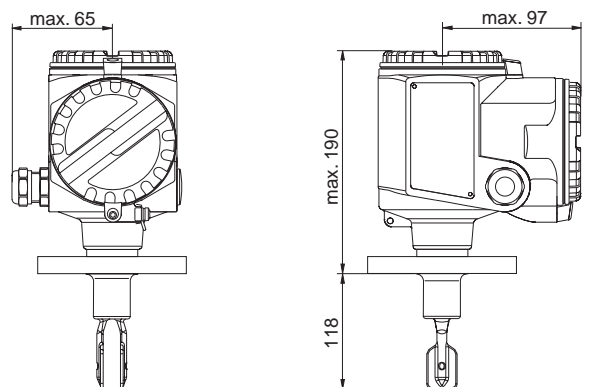
Steel housing



Aluminium housing



Aluminium housing with separate connection compartment



* **The following applies to DN 25 / ANSI 1":**
 max. pipe diameter 24.2 mm,
 radius R max. 4 mm.
 This is important when selecting the counterflange!

100 mm = 3.94 in

Note: The switchpoints of the Liquiphant **M** are at other positions to those of the previous version Liquiphant **II**.

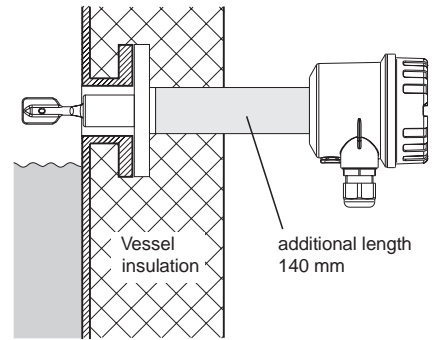
Feedthroughs: Temperature spacer, pressure-tight bushing

Temperature spacer

Provides sealed insulation of the vessel and normal ambient temperature for the housing.

Pressure tight bushing

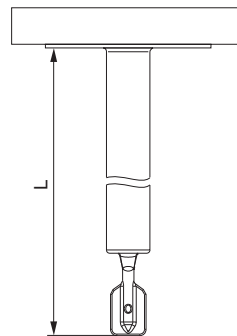
Protects the housing from the vessel pressure up to max. 40 bar if the sensor is damaged.
Provides sealed insulation of the vessel and normal ambient temperature for the housing.



Process connections

Process connection		Dimensions	Accessories	Pressure Temperature
Flanges ANSI B 16.5 (RF) DIN 2527 (Form B) DIN 2526 (Form C) JIS B 2210 (RF)	A## B## C## K##	<p>min. 115 mm</p>	PTFE seal supplied for plastic coated. Seal installed on site for enamel coated	See rated pressure of flange, however ECTFE: max. 40 bar max. 120 °C PFA: max. 40 bar max. 150 °C Enamel: max. 25 bar max. 150 °C

Sensor length L for FTL 51 C



Any length L:

148 mm...3000 mm (6 in... 115 in) for plastic coated
 148 mm...1200 mm (6 in... 48 in) for enamel coated

Note: The switchpoints of the Liquiphant **M** are at other positions to those of the previous version Liquiphant **II**.

Special length "L II":

115 mm (4.5 in)

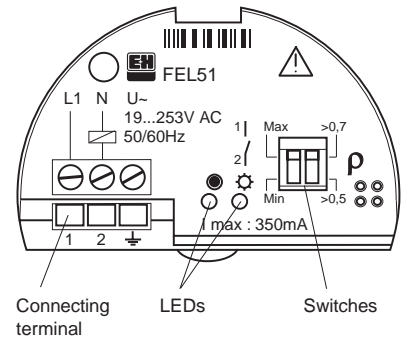
With vertical mounting from above the same switchpoint as for the Liquiphant II
 FTL 360, FTL 365, FDL 30, FDL 35

100 mm = 3.94 in
 1 bar = 14.5 psi
 $x \text{ } ^\circ\text{C} = (1.8x + 32) \text{ } ^\circ\text{F}$

Weight	See Product Structure
Materials	<ul style="list-style-type: none"> - Wetted parts: (tuning fork, extension pipe, process side of the flange) Plastic coated in ECTFE or PFA (Edlon™ [blue], RubyRed [red] or conductive PFA [black]) on 1.4435 (AISI 316 L) or enamel coated on 2.4610 (Alloy C 4) - Polyester housing: PBT-FR with cover in PBT-FR or with transparent cover in PA12, Seal of cover: EPDM - Steel housing: 1.4301 (AISI 304) or 1.4435 (AISI 316 L), Seal of cover silicone - Aluminium housing: EN-AC-AISi10Mg, plastic coated, Seal of cover: EPDM - Cable gland: polyamide or brass, nickel-plated - Temperature spacer: 1.4435 (AISI 316 L) - Pressure-tight bushing: 1.4435 (AISI 316 L)
Process connections	- Flanges to DIN 2527 (Form B) or DIN 2526 (Form C) from DN 40, to ANSI B 16.5 (RF) from 1½" or to JIS B 2210 (RF) from DN 50

Human Interface

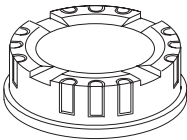
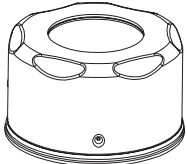














Operation	Calibration on site
Display and operating elements	<p>With FEL 51, 52, 54, 55: 2 switches for fail-safe mode and density change-over, green LED to indicate power on, red LED to indicate the switching status, flashes on damage by corrosion on sensor or with defective electronics</p> <p>With FEL 56: 2 switches for fail-safe mode and density change-over, green LED flashes to indicate power on, red LED to indicate the switching status, flashes on damage by corrosion on sensor or with defective electronics</p> <p>With FEL 57: 2 switches for density change-over and cyclical checking, green LED to indicate power on, yellow LED to indicate the covering status, flashes on damage by corrosion on sensor or defective electronics</p> <p>With FEL 58: 2 switches for fail-safe mode and density change-over, green LED flashes rapidly to indicate power on, flashes slowly on damage by corrosion on sensor or with defective electronics, yellow LED to indicate the switching status, Test key – breaks the cable connection</p>



Certificates and Approvals

Certificates	See Product Structure		
Combinations of coatings, housings and electronic inserts	Based on the various certificates, permissible combinations of coatings, housings* and electronic inserts are given in the following table. *) Abbreviations: polyester = PBT, steel 1.4301/1.4435 = St., aluminium = Alu Aluminium housing with separate connection compartment = Alu/sep.		
	Coating: ECTFE, PFA, enamel		
	Certificate, applications	Housing	Electronic inserts
A	Without any special certificate (for non explosion hazardous areas)	PBT, St., Alu, Alu/sep.	FEL 51, 52, 54, FEL 55, 56, 57, 58
D	Overspill protection to WHG (Germany)	PBT, St., Alu, Alu/sep.	FEL 51, 52, 54, FEL 55, 56, 57, 58
R	FM, NI, Cl. I, Div. 2, Gr. A-D	St., Alu, Alu/sep. with NPT cable entry	FEL 51, 52, 54, FEL 55, 56, 57, 58
		PBT with NPT cable entry	FEL 51, 52, FEL 55, 56, 57, 58
U	CSA, General Purpose	St., Alu, Alu/sep. with NPT cable entry	FEL 51, 52, 54, FEL 55, 56, 57, 58
		PBT with NPT cable entry	FEL 51, 52, FEL 55, 56, 57, 58
Y	Other certificate (for non explosion hazardous areas)	PBT, St., Alu, Alu/sep.	FEL 51, 52, 54, FEL 55, 56, 57, 58
	Coating: enamel or PFA (conductive)		
	Certificate, applications	Housing	Electronic inserts
F	ATEX II 1/2 G, EEx ia IIC T6, WHG	PBT, St., Alu, Alu/sep.	FEL 55, 56, 57, 58
L	ATEX II 1/2 G, EEx d IIC T6, WHG	Alu	FEL 51, 52, 54, FEL 55, 56, 57, 58
E	ATEX II 1/2 G, EEx de IIC T6, WHG	Alu/sep.	FEL 51, 52, 54, FEL 55, 56, 57, 58
P	FM, IS, Cl. I, II, III, Div. 1, Gr. A-G	PBT, St., Alu, Alu/sep. with NPT cable entry	FEL 55, 56, 57, 58
Q	FM, XP, Cl. I, II, III, Div. 1, Gr. A-G	Alu with NPT cable entry	FEL 51, 52, 54, FEL 55, 56, 57, 58
S	CSA, IS, Cl. I, II, III, Div. 1, Gr. A-G	PBT, St., Alu, Alu/sep. with NPT cable entry	FEL 55, 56, 57, 58
T	CSA, XP, Cl. I, II, III, Div. 1, Gr. A-G	Alu with NPT cable entry	FEL 51, 52, 54, FEL 55, 56, 57, 58
	Coating: ECTFE, PFA (non-conductive)		
	Certificate, applications	Housing	Electronic inserts
1	ATEX II 1/2 G, EEx ia IIB T6, WHG	PBT, St., Alu, Alu/sep.	FEL 55, 56, 57, 58
2	ATEX II 1/2 G, EEx d IIB T6, WHG	Alu	FEL 51, 52, 54, FEL 55, 56, 57, 58
3	ATEX II 1/2 G, EEx de IIB T6, WHG	Alu/sep.	FEL 51, 52, 54, FEL 55, 56, 57, 58
4	ATEX II 1/2 G, EEx ia IIC** T6, WHG	PBT, St., Alu, Alu/sep.	FEL 55, 56, 57, 58
5	ATEX II 1/2 G, EEx d IIC** T6, WHG	Alu	FEL 51, 52, 54, FEL 55, 56, 57, 58
6	ATEX II 1/2 G, EEx de IIC** T6, WHG	Alu/sep.	FEL 51, 52, 54, FEL 55, 56, 57, 58
	**) With note: "Avoid electrostatic charge"		
	Note on polyester housing (PBT), electric cabling laid in piping: Do not screw the cable entries firmly to the piping, there should be some flexibility (e.g. with armoured hose). If the piping is used for earthing then ensure there is a continuous electrical connection.		

Ordering

Product structures	See following pages	
Accessories	<p>Transparent cover for polyester housing Material: PA 12 Weight: 0.04 kg Order number: 943461-0001</p>	
	<p>Cover with window for steel housing Material: 1.4435 (AISI 316 L) Weight: 0.16 kg. With glass window Order number: 943301-1000. With PC window Order number: 52001403 (Not for CSA, General Purpose).</p>	
Supplementary documentation	SI 040F/00/en	Liquiphant M, System Information
	TI 203F/00/en	Nivotester FTL 320, Technical Information Switching unit in Minipac design for Liquiphant M with electronic insert FEL 57
	TI 198F/00/en	Nivotester FTL 370/ 372, Technical Information Switching units in Racksyst design for Liquiphant M with electronic insert FEL 57
	TI 350F/00/en	Isolating amplifier FTL 325 P, Technical Information 1- or 3-channel switching units for mounting on a top hat rail for Liquiphant M/S with electronic insert FEL 57
	TI 353F/00/en	Isolating amplifier FTL 325 N, Technical Information 1- or 3-channel switching units for mounting on a top hat rail for Liquiphant M/S with electronic insert FEL 56, FEL 58
	TI 332F/00/en	Isolating amplifier FXN 421 / 422, Technical Information Switching units for mounting on a top hat rail for Liquiphant M with electronic insert FEL 56, FEL 58
	TI 241F/00/en	General information on electromagnetic compatibility
	XA 031F/00/a3	Safety instructions (ATEX)   II 1/2 G, EEx d, IIC/B (KEMA 99 ATEX 1157)
	XA 063F/00/a3	Safety instructions (ATEX)   II 1/2 G, EEx ia/ib, IIC/B (KEMA 99 ATEX 0523)
	XA 064F/00/a3	Safety instructions (ATEX)   II 1 G, EEx ia, IIC/B (KEMA 99 ATEX 5172 X)
	XA 108F/00/a3	Safety instructions (ATEX)   II 1/2 G, EEx de, IIC/B (KEMA 00 ATEX 2035)
	XA 113F/00/a3	Safety instructions (ATEX)   II 1/2 G, EEx ia/ib, IIC* (KEMA 00 ATEX 1071 X)
	XA 114F/00/a3	Safety instructions (ATEX)   II 1/2 G, EEx d, IIC* (KEMA 00 ATEX 2093 X)
XA 115F/00/a3	Safety instructions (ATEX)   II 1/2 G, EEx de, IIC* (KEMA 00 ATEX 2092 X)	
		* With warning: "Avoid electrostatic charge"

Design

FTL 51 C With coating and extension pipe

0.8 kg

Certificates and Approvals

Certificate, Application

- A Without any special certificate
 - D Overspill protection to WHG **
 - F ATEX II 1/2 G EEx ia IIC T6, Overspill protection to WHG **
 - L ATEX II 1/2 G EEx d IIC T6, Overspill protection to WHG **
 - E ATEX II 1/2 G EEx de IIC T6, Overspill protection to WHG **
 - R FM, NI, Cl. I, Div. 2, Gr. A-D **
 - P FM, IS, Cl. I, II, III, Div. 1, Gr. A-G **
 - Q FM, XP, Cl. I, II, III, Div. 1, Gr. A-G **
 - U CSA, General purpose **
 - S CSA, IS, Cl. I, II, III, Div. 1, Gr. A-G **
 - T CSA, XP, Cl. I, II, III, Div. 1, Gr. A-G **
 - 1 ATEX II 1/2 G EEx ia IIB T6, Overspill protection to WHG **
 - 2 ATEX II 1/2 G EEx d IIB T6, Overspill protection to WHG **
 - 3 ATEX II 1/2 G EEx de IIB T6, Overspill protection to WHG **
 - 4 ATEX II 1/2 G EEx ia IIC* T6, Overspill protection to WHG **
 - 5 ATEX II 1/2 G EEx d IIC* T6, Overspill protection to WHG **
 - 6 ATEX II 1/2 G EEx de IIC* T6, Overspill protection to WHG **
- *) With note: "Avoid electrostatic charge"
- Y Other

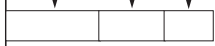
** Certificates in preparation

Mechanical Construction

Additional weight

Process Connection, Material (Coating)

B8K	DN 25 flange, PN 40, DIN 2527, flat face,	ECTFE	1.4 kg
BBK	DN 32 flange, PN 40, DIN 2527, flat face,	ECTFE	2.0 kg
BDK	DN 40 flange, PN 40, DIN 2527, flat face,	ECTFE	2.4 kg
BEK	DN 50 flange, PN 6, DIN 2527, flat face,	ECTFE	1.6 kg
BGK	DN 50 flange, PN 40, DIN 2527, flat face,	ECTFE	3.2 kg
BNK	DN 80 flange, PN 40, DIN 2527, flat face,	ECTFE	5.9 kg
BQK	DN 100 flange, PN 16, DIN 2527, flat face,	ECTFE	5.6 kg
B8L	DN 25 flange, PN 40, DIN 2527, flat face,	PFA (Edlon™)	1.4 kg
BBL	DN 32 flange, PN 40, DIN 2527, flat face,	PFA (Edlon™)	2.0 kg
BDL	DN 40 flange, PN 40, DIN 2527, flat face,	PFA (Edlon™)	2.4 kg
BEL	DN 50 flange, PN 6, DIN 2527, flat face,	PFA (Edlon™)	1.6 kg
BGL	DN 50 flange, PN 40, DIN 2527, flat face,	PFA (Edlon™)	3.2 kg
BNL	DN 80 flange, PN 40, DIN 2527, flat face,	PFA (Edlon™)	5.9 kg
BQL	DN 100 flange, PN 16, DIN 2527, flat face,	PFA (Edlon™)	5.6 kg
B8M	DN 25 flange, PN 40, DIN 2527, flat face,	PFA (RubyRed)	1.4 kg
BBM	DN 32 flange, PN 40, DIN 2527, flat face,	PFA (RubyRed)	2.0 kg
BDM	DN 40 flange, PN 40, DIN 2527, flat face,	PFA (RubyRed)	2.4 kg
BEM	DN 50 flange, PN 6, DIN 2527, flat face,	PFA (RubyRed)	1.6 kg
BGM	DN 50 flange, PN 40, DIN 2527, flat face,	PFA (RubyRed)	3.2 kg
BNM	DN 80 flange, PN 40, DIN 2527, flat face,	PFA (RubyRed)	5.9 kg
BQM	DN 100 flange, PN 16, DIN 2527, flat face,	PFA (RubyRed)	5.6 kg
B8N	DN 25 flange, PN 40, DIN 2527, flat face,	PFA (conductive)	1.4 kg
BBN	DN 32 flange, PN 40, DIN 2527, flat face,	PFA (conductive)	2.0 kg
BDN	DN 40 flange, PN 40, DIN 2527, flat face,	PFA (conductive)	2.4 kg
BEN	DN 50 flange, PN 6, DIN 2527, flat face,	PFA (conductive)	1.6 kg
BGN	DN 50 flange, PN 40, DIN 2527, flat face,	PFA (conductive)	3.2 kg
BNN	DN 80 flange, PN 40, DIN 2527, flat face,	PFA (conductive)	5.9 kg
BQN	DN 100 flange, PN 16, DIN 2527, flat face,	PFA (conductive)	5.6 kg
CGS	DN 50 flange, PN 40, DIN 2526, raised face,	Enamel	3.2 kg
CNS	DN 80 flange, PN 40, DIN 2526, raised face,	Enamel	5.9 kg
A8K	ANSI 1" flange, 150 psi, RF,	ECTFE	1.0 kg
ACK	ANSI 1½" flange, 150 psi, RF,	ECTFE	1.5 kg
AEK	ANSI 2" flange, 150 psi, RF,	ECTFE	2.4 kg
AFK	ANSI 2" flange, 300 psi, RF,	ECTFE	3.2 kg
ALK	ANSI 3" flange, 150 psi, RF,	ECTFE	4.9 kg
A8L	ANSI 1" flange, 150 psi, RF,	PFA (Edlon™)	1.0 kg
ACL	ANSI 1½" flange, 150 psi, RF,	PFA (Edlon™)	1.5 kg
AEL	ANSI 2" flange, 150 psi, RF,	PFA (Edlon™)	2.4 kg
AFL	ANSI 2" flange, 300 psi, RF,	PFA (Edlon™)	3.2 kg
ALL	ANSI 3" flange, 150 psi, RF,	PFA (Edlon™)	4.9 kg
A8M	ANSI 1" flange, 150 psi, RF,	PFA (RubyRed)	1.0 kg
ACM	ANSI 1½" flange, 150 psi, RF,	PFA (RubyRed)	1.5 kg
AEM	ANSI 2" flange, 150 psi, RF,	PFA (RubyRed)	2.4 kg
AFM	ANSI 2" flange, 300 psi, RF,	PFA (RubyRed)	3.2 kg
ALM	ANSI 3" flange, 150 psi, RF,	PFA (RubyRed)	4.9 kg
A8N	ANSI 1" flange, 150 psi, RF,	PFA (conductive)	1.0 kg
ACN	ANSI 1½" flange, 150 psi, RF,	PFA (conductive)	1.5 kg
AEN	ANSI 2" flange, 150 psi, RF,	PFA (conductive)	2.4 kg
AFN	ANSI 2" flange, 300 psi, RF,	PFA (conductive)	3.2 kg
ALN	ANSI 3" flange, 150 psi, RF,	PFA (conductive)	4.9 kg
AES	ANSI 2" flange, 150 psi, RF,	Enamel	2.4 kg
AFS	ANSI 2" flange, 300 psi, RF,	Enamel	3.2 kg
KEK	JIS flange, RF 10 K 50	ECTFE	1.7 kg
KEL	JIS flange, RF 10 K 50	PFA (Edlon™)	1.7 kg
KEM	JIS flange, RF 10 K 50	PFA (RubyRed)	1.7 kg
KEN	JIS flange, RF 10 K 50	PFA (conductive)	1.7 kg
YY9	Others		



Product Structure
Liquiphant M
FTL 51 C

Continued

Length L, Material (Coating) of Extension Pipe

BK	..... mm (148 mm ... 3000 mm),	ECTFE	0,9 kg/m
CK	..... in (6 in ... 115 in),	ECTFE	2.3 kg/100 in
DK	Length L II ***,	ECTFE	
BL	..... mm (148 mm ... 3000 mm),	PFA (Edlon™)	0,9 kg/m
CL	..... in (6 in ... 115 in),	PFA (Edlon™)	2.3 kg/100 in
DL	Length L II ***,	PFA (Edlon™)	
BM	..... mm (148 mm ... 3000 mm),	PFA (RubyRed)	0,9 kg/m
CM	..... in (6 in ... 115 in),	PFA (RubyRed)	2.3 kg/100 in
DM	Length L II ***,	PFA (RubyRed)	
BN	..... mm (148 mm ... 3000 mm),	PFA (conductive)	0,9 kg/m
CN	..... in (6 in ... 115 in),	PFA (conductive)	2.3 kg/100 in
DN	Length L II ***,	PFA (conductive)	
BS	..... mm (148 mm ... 1200 mm),	Enamel	0,9 kg/m
CS	..... in (6 in ... 48 in),	Enamel	2.3 kg/100 in
DS	Length L II ***,	Enamel	
YY	Others		

***) Replacing instruments: When vertically mounting a Liquiphant **M** FTL 51 C with length L II, the switchpoint is at the same height as for the Liquiphant **II** FTL 360, FTL 365, FDL 30, FDL 35.

Output

Electronic Insert

- 1 FEL 51, two-wire AC, U~: 19 ...253 V
- 2 FEL 52, three-wire DC, U=: 10 ... 55 V
PNP transistor output
- 4 FEL 54, universal, U~: 19 ...253 V, U=: 19 ... 55 V
2 potential-free change-over contacts (DPDT)
- 5 FEL 55, two-wire DC 11 ... 36 V,
Output 16 / 8 mA, EEx ia
- 6 FEL 56, two-wire acc. to NAMUR (EN 50227), EEx ia
- 7 FEL 57, PFM signal transmission on two-wire cabling, EEx ia
- 8 FEL 58, two-wire acc. to NAMUR (EN 50227), EEx ia,
with test key

Mechanical Construction

Housing, Cable Entry

- G4 Polyester housing IP 66,
cable gland M20x1.5
- G5 Aluminium housing IP 66,
cable gland M20x1.5 ****
- G7 Aluminium housing IP 66,
with separate connection compartment,
cable gland M20x1.5 ****
- G6 Steel housing IP 66, cable gland M20x1.5
- E4 Polyester housing Nema 4x, adapter ½ NPT
- E5 Aluminium housing Nema 4x, ¼ NPT
- E7 Aluminium housing Nema 4x,
with separate connection compartment, ¼ NPT
- E6 Steel housing Nema 4x, adapter ½ NPT
- F4 Polyester housing IP 66, adapter G ½
- F5 Aluminium housing IP 66, adapter G ½
- F7 Aluminium housing IP 66,
with separate connection compartment,
adapter G ½
- F6 Steel housing IP 66, adapter G ½
- Y9 Others

Steel housing: Material 1.4301 (AISI 304)

****) The cable gland M20 is **not** supplied for the versions EEx d, FM XP, CSA XP

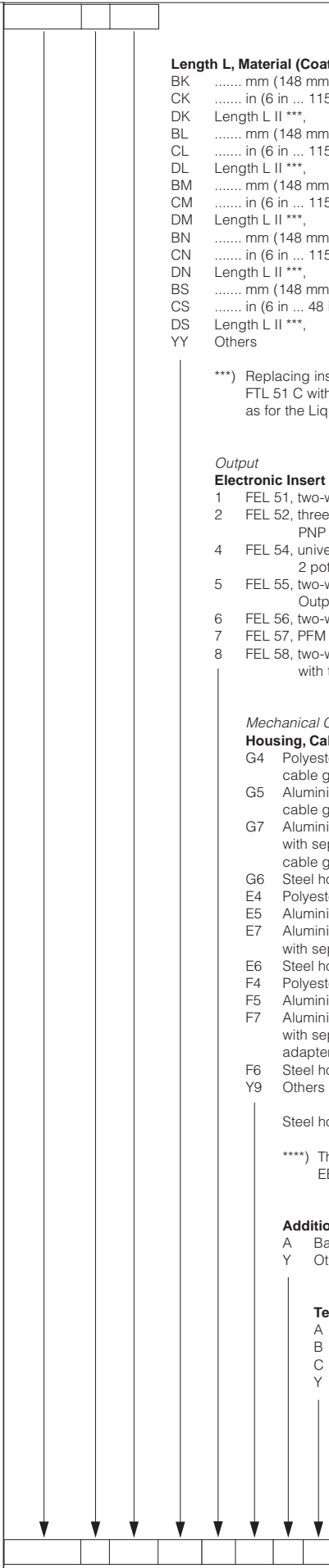
Additional Fittings

- A Basic fittings
- Y Others

Temperature Spacer, Pressure-Tight Bushing

- A Basic fittings
- B Temperatur spacer
- C Pressure-tight bushing
- Y Special version

The basic weight includes:
compact sensor
(Length L II)
without flange,
electronic insert,
polyester housing



Complete product designation

Total weight

Endress+Hauser
GmbH+Co.
Instruments International
P.O. Box 2222
D-79574 Weil am Rhein
Germany

Tel. (07621) 975-02
Tx 7 73 926
Fax (07621) 975-345
<http://www.endress.com>
info@ii.endress.com

Endress + Hauser
The Power of Know How

