

Technical Information

Liquiphant FTL31

Vibronic



Point level switch for liquids

Application

The Liquiphant FTL31 is a point level switch for liquids and is used in tanks, vessels and pipes.

It is used for overflow protection or pump protection in cleaning and filter systems as well as in cooling and lubrication vessels, for instance.

Ideal for applications in which float switches or conductive, capacitance and optical sensors have been used up to now. The Liquiphant FTL31 also works in areas where these measuring principles are not suitable due to conductivity, buildup, turbulence, flow conditions or air bubbles.

The Liquiphant FTL31 can be used for process temperatures up to:

- 100 °C (212 °F)
- 150 °C (302 °F)

Not suitable for hazardous areas.

The use of the Liquiphant FTL33 is recommended for hygiene areas.

Your benefits

- Operational safety, reliability and universal application thanks to the tuning fork measuring principle
- Robust stainless steel housing (316L), optionally available with M12x1 plug with IP69 protection
- External function test with test magnet
- Onsite function check possible thanks to LED indication
- Compact design for easy installation even in confined conditions or hard-to-access areas


Table of contents


Important document information	3	Process	20
Symbols used	3	Process temperature range	20
Function and system design	4	Process pressure range	20
Measuring principle	4	Density	20
Measuring system	4	State of aggregation	20
Input	5	Viscosity	20
Measured variable	5	Solids contents	20
Measuring range	5	Lateral loading capacity	20
Output	5	Mechanical construction	21
Switch output	5	Design	21
Operating modes	5	Plug	22
Power supply	5	Tuning fork	22
Supply voltage	5	Sensor type	23
Power consumption	5	Weight	26
Current consumption	5	Materials	26
Residual ripple	5	Surface roughness	27
Residual voltage	5	Operability	28
Electrical connection	6	LED display	28
Cable entry	13	Function test with test magnet	28
Cable specification	13	Certificates and approvals	29
Overvoltage protection	13	CE mark	29
Performance characteristics	14	EAC conformity	29
Reference operating conditions	14	RCM-Tick marking	29
Switch point	14	Approval	29
Hysteresis	14	Overfill protection	29
Non-repeatability	14	Marine approvals	29
Influence of ambient temperature	14	CRN approval	29
Influence of medium temperature	14	Inspection certificates	29
Influence of medium pressure	14	Manufacturer declaration	29
Switching delay	14	Pressure Equipment Directive	29
Switch-on delay	14	Other standards and guidelines	29
Measuring frequency	14	Ordering information	30
Measured error	14	Ordering information	30
Installation	15	Services (optional)	30
Orientation	15	Accessories	30
Installation instructions	15	Weld-in adapter	30
Length of connecting cable	17	Plug-in jack, cable	30
Environment	18	Additional accessories	32
Ambient temperature range	18	Supplementary documentation	33
Storage temperature	18	Operating Instructions Liquiphant FTL31	33
Climate class	18	Additional documentation	33
Altitude	18	Certificates	33
Degree of protection	19		
Shock resistance	19		
Vibration resistance	19		
Electromagnetic compatibility	19		
Reverse polarity protection	19		
Short-circuit protection	19		

Important document information


Symbols used


Symbols for certain types of information and graphics


 **Permitted**
Procedures, processes or actions that are permitted


 **Forbidden**
Procedures, processes or actions that are forbidden


 **Tip**
Indicates additional information

 **Reference to documentation**

 **Reference to graphic**

 **Notice or individual step to be observed**

 **Series of steps**

 **Result of a step**

1, 2, 3, ...
Item numbers

A, B, C, ...
Views

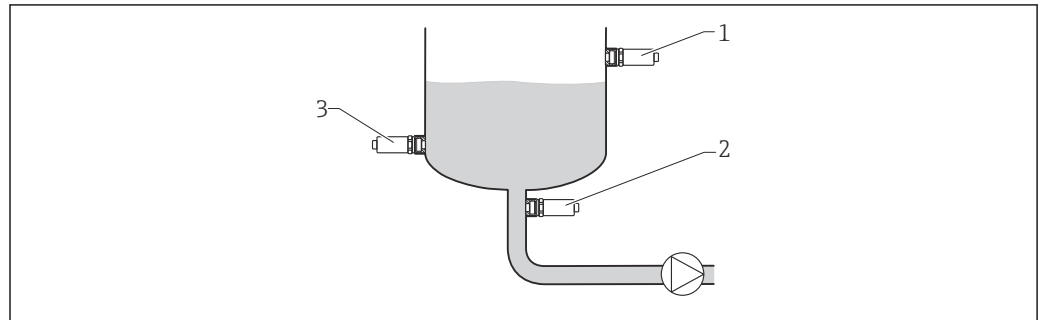
Function and system design

Measuring principle

A piezoelectric drive causes the tuning fork of the device to vibrate at its resonance frequency. When the tuning fork is immersed in a liquid, its intrinsic frequency changes due to the change in density of the surrounding medium. The electronics system in the point level switch monitors the resonance frequency and indicates whether the tuning fork is vibrating in air or is covered by liquid.

Measuring system

The measuring system consists of a point level switch, e.g. for connection to programmable logic controllers (PLC).



A0036961

1 Installation examples

- 1 Overfill protection or upper level detection (maximum safety)
- 2 Dry running protection for pump (minimum safety)
- 3 Lower level detection (minimum safety)

Input

Measured variable	Density
Measuring range	> 0.7 g/cm ³ (optionally available: > 0.5 g/cm ³)

Output

Switch output	<p>Switching behavior: On/Off</p> <p>Function 3-wire DC-PNP: Positive voltage signal at the switch output of the electronics (PNP), switching capacity 200 mA 2-wire AC/DC: Load switching in the power supply line, switching capacity 250 mA</p>
Operating modes	<p>The device has two operating modes: maximum safety (MAX) and minimum safety (MIN).</p> <p>By choosing the corresponding operating mode, the user ensures that the device also switches in a safety-oriented manner even in an alarm condition, e.g. if the power supply line is disconnected.</p> <ul style="list-style-type: none"> ▪ Maximum safety (MAX) The device keeps the electronic switch closed as long as the liquid level is below the fork. Sample application: overflow prevention ▪ Minimum safety (MIN) The device keeps the electronic switch closed as long as the fork is immersed in liquid. Sample application: Dry running protection for pumps <p>The electronic switch opens if the limit is reached, if a fault occurs or the power fails (quiescent current principle).</p>

Power supply

Supply voltage	<p>DC-PNP 10 to 30 V DC, 3-wire</p> <p>AC/DC 20 to 253 VAC/DC, 2-wire</p>
Power consumption	<p>DC-PNP < 975 mW</p> <p>AC/DC < 850 mW</p>
Current consumption	<p>DC-PNP < 15 mA</p> <p>AC/DC < 3.8 mA</p>
Residual ripple	<p>DC-PNP 5 V_{ss} 0 to 400 Hz</p> <p>AC/DC —</p>
Residual voltage	<p>DC-PNP U < 3 V (for switched through transistor)</p> <p>AC/DC —</p>

Electrical connection

Two electronic versions and three different connections are available for the device.

- Electronic version 3-wire DC-PNP with connection; M12 plug, valve plug or cable
- Electronic version 2-wire AC/DC with connection; valve plug or cable

A fine-wire fuse is necessary for operation: 500 mA slow-blow.


Electronic version 3-wire DC-PNP

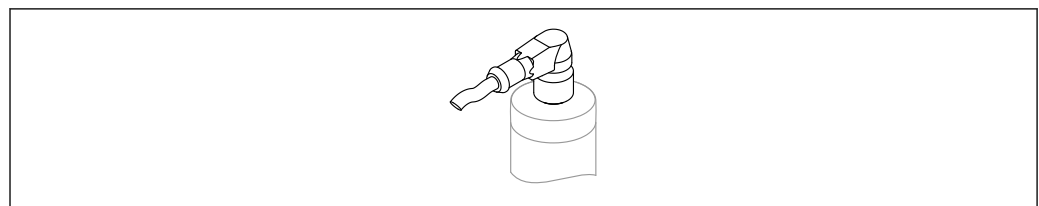
3-wire DC-PNP is preferably used in conjunction with programmable logic controllers (PLC), DI modules as per EN 61131-2. Positive signal at the switch output of the electronics (PNP).

Voltage source: non-hazardous contact voltage or Class 2 circuit (North America).

Connection with M12 plug

Depending on the analysis of the switch outputs, the device works in the MAX (maximum safety) or MIN (minimum safety) mode.

 A cable is optionally available



A0022901

 2 M12 plug

Maximum safety		
Terminal assignment	MAX output	LED yellow (ye) 2
		A0037919
Symbols K1	Description Yellow LED (ye) lit Yellow LED (ye) not lit External load	

Minimum safety		
Terminal assignment	MIN output	LED yellow (ye) 1
		A0037918
Symbols K1	Description Yellow LED (ye) lit Yellow LED (ye) not lit External load	

Function monitoring with M12 plug

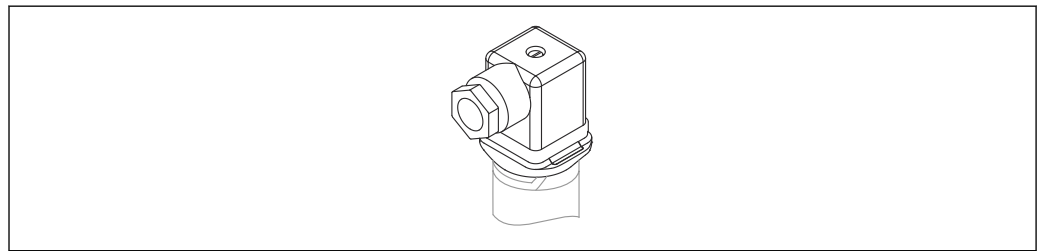
Using a two-channel analysis, function monitoring of the sensor can be implemented in addition to level monitoring, e.g. per relay switch, PLC, AS-i Bus I/O module.

When both outputs are connected, the MIN and MAX outputs assume opposite states when the device is operating fault-free (XOR). In the event of an alarm condition or a line break, both outputs are deenergized.

Connection for function monitoring using XOR operation					
Terminal assignment	MAX output	LED yellow (ye) 2	MIN output	LED yellow (ye) 1	Red LED (rd)
	 A0037919		 A0037918		
	 A0045070		 A0045075		
	 A0045069		 A0045076		
	 A0045070		 A0045076		
Symbols Description LED lit LED not lit Fault or warning External load					

Connection with valve plug

Depending on the assignment of the plug or the wiring of the cable, the device works in either the MAX or MIN operating mode.



A0022900

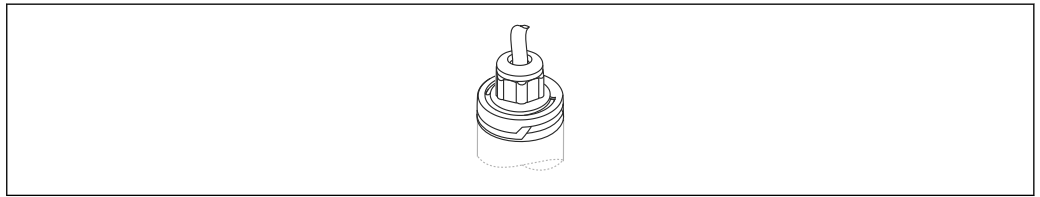
3 Valve plug

3-wire DC-PNP		
Terminal assignment	MAX operating mode	Yellow LED (ye)
	 <small>A0045077</small>	
	 <small>A0045078</small>	
Symbols K	Description Yellow LED (ye) lit Yellow LED (ye) not lit External load	

3-wire DC-PNP		
Terminal assignment	MIN operating mode	Yellow LED (ye)
	 <small>A0045080</small>	
	 <small>A0045079</small>	
Symbols K	Description Yellow LED (ye) lit Yellow LED (ye) not lit External load	

Connection with cable

Depending on the assignment of the plug or the wiring of the cable, the device works in either the MAX or MIN operating mode.



A0022902

4 Cable (cannot be disassembled)

3-wire DC-PNP										
Terminal assignment	MAX operating mode	Yellow LED (ye)								
	 A0045077									
	 A0045078									
Core colors: 1 = BK (black) 2 = GR (gray) 3 = BN (brown) Ground = GNYE (green-yellow)										
<table border="0"> <thead> <tr> <th>Symbols</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td></td> <td>Yellow LED (ye) lit</td> </tr> <tr> <td></td> <td>Yellow LED (ye) not lit</td> </tr> <tr> <td>K</td> <td>External load</td> </tr> </tbody> </table>			Symbols	Description		Yellow LED (ye) lit		Yellow LED (ye) not lit	K	External load
Symbols	Description									
	Yellow LED (ye) lit									
	Yellow LED (ye) not lit									
K	External load									

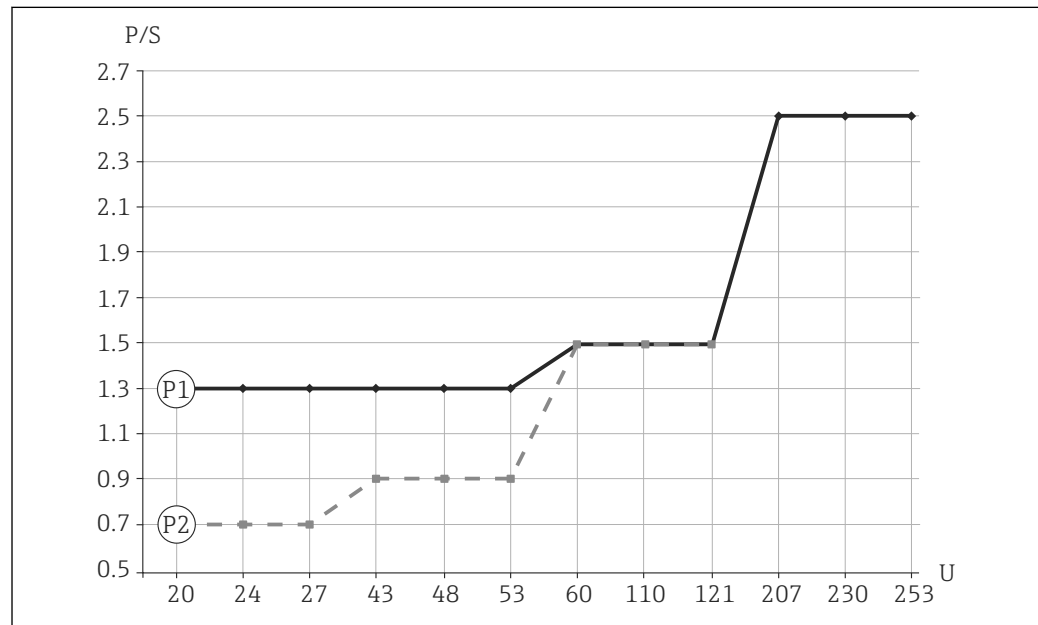
3-wire DC-PNP										
Terminal assignment	MIN operating mode	Yellow LED (ye)								
	 A0045080									
	 A0045079									
Core colors: 1 = BK (black) 2 = GR (gray) 3 = BN (brown) Ground = GNYE (green-yellow)										
<table border="0"> <thead> <tr> <th>Symbols</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td></td> <td>Yellow LED (ye) lit</td> </tr> <tr> <td></td> <td>Yellow LED (ye) not lit</td> </tr> <tr> <td>K</td> <td>External load</td> </tr> </tbody> </table>			Symbols	Description		Yellow LED (ye) lit		Yellow LED (ye) not lit	K	External load
Symbols	Description									
	Yellow LED (ye) lit									
	Yellow LED (ye) not lit									
K	External load									

Electronic version 2-wire AC/DC

The load is switched via an electronic switch directly in the power supply circuit. Always connect in series with a load!

Not suitable for connection to low-voltage PLC inputs!

Selection tool for relays



A0023486

5 Minimum rated power of the load

P/S Rated power in [W] / [VA]

U Operating voltage in [V]

Item	Supply voltage	Rated power	
		min	max
P1 AC mode	24 V	> 1.3 VA	< 6 VA
	110 V	> 1.5 VA	< 27.5 VA
	230 V	> 2.5 VA	< 57.5 VA
P2 DC mode	24 V	> 0.7 W	< 6 W
	48 V	> 0.9 W	< 12 W
	60 V	> 1.5 W	< 15 W

Relays with a lower rated power can be operated by means of an RC module connected in parallel (optional).