Level Pressure Flow Temperature Liquid Analysis Registration Systems Components Services Solutions

Technical Information

Liquiphant T FTL20

Level limit switch for liquids

Application

The Liquiphant T FTL20 is a level limit switch for all kinds of fluids and is used in tanks, containers and pipelines. It is used in cleaning and filtering systems and coolant and lubricant tanks as an overspill protection or as a pump protector.

The FTL20 is ideal for applications which previously used float switches and conductive, capacitive and optical sensors.

It also works in applications which are unsuitable for these measuring methods due to conductivity, build-ups, turbulence, flows or air bubbles.

The FTL20 is not suitable for hazardous areas and areas where the medium temperature is above 300°F (150°C).

Your benefits

- Operational safety, reliability and universal applicability through use of the tuning fork measuring principle
- External test option using test magnet
- On-site control using external LED display
- Easy to install even at points difficult to access due to compact construction
- Rugged stainless steel housing (316L)
- Service-friendly plug-in connections
- For medium temperatures up to 300°F (150°C)

TI364F/24/ae

Endress+Hauser

People for Process Automation

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Function and system design

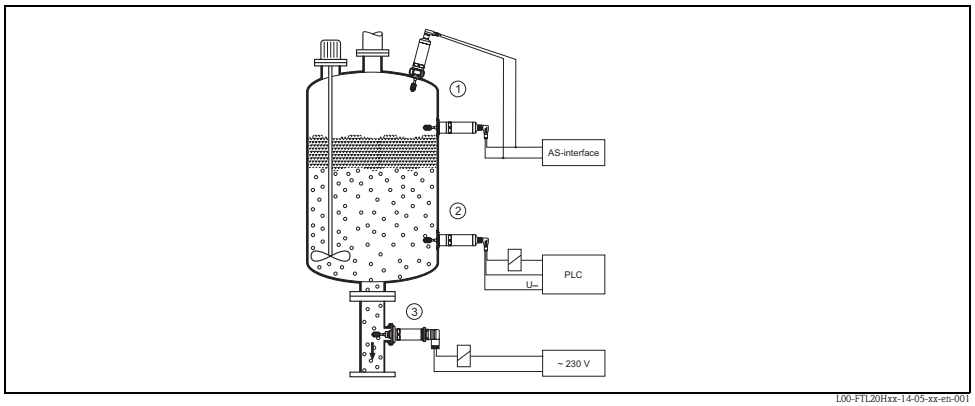
Measuring principle

The tuning fork of the FTL20 is brought to its resonance frequency by means of a piezoelectric drive. If the tuning fork is covered by liquid, this frequency changes. The electronics of the FTL20 monitor the resonance frequency and indicate whether the tuning fork is freely vibrating or is covered by liquid.

Measuring system

The measuring system comprises:

- Liquiphant T FTL20 limit switch
- Progammable logic control (PLC), miniature contactor, solenoid valve or AS-i bus



L00-FTL20Hxx-14-05-xx-en-001

Example 1): Overfill protection or top level detection
Example 2): Lower level detection or dry running protection
Example 3): Dry running protection for pump

Input

Measured variable

Density

Measuring range

> 0.7 SGU (0.7 g/cm^3)

Other density settings on request, e.g. 0.5 SGU (0.5 g/cm^3)

Output

Switching outputs

	DC-PNP valve connector	DC-PNP M12x1	AC 2-wire	AS-i
Function	Positive voltage signal at the switch output of the electronics (PNP)		Switching the power supply line	Switching the D0 bit
Switch behavior	ON/OFF			0 / 1 (free / covered)
Relay switching capacity	250 mA			D0 bit
Fail-safe mode	MIN/MAX (see below)			D1 bit D1: 0 error
Switching delay	approx. 0.5 s on coverage / approx. 1.0 s on tuning fork becoming uncovered other switching time on request			
Switching threshold	with vertical orientation: 0.51" (13.0 mm) from top of fork with horizontal orientation: 0.14" (3.5 mm) from fork center			
Hysteresis	0.12" ± 0.02" (3 ±0.5 mm)			

Operating modes for AC and DC-PNP versions

The FTL20 can be connected in two operating modes. By choosing the suitable operating mode (MAX or MIN safety), you ensure that the FTL20 switches safely even in the event of a fault (e.g. if the power supply line is disconnected).

MAX - maximum safety

- The FTL20 keeps the electronic switch closed as long as the liquid level is below the fork.
- Example of an application: overfill protection

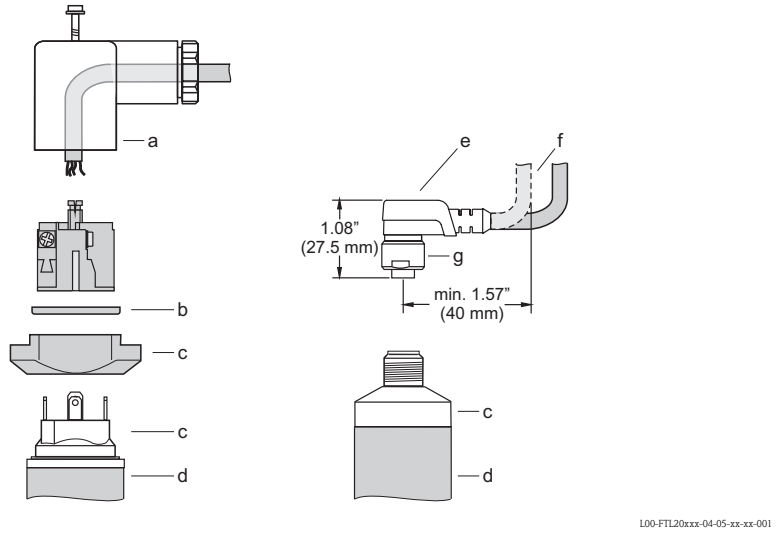
MIN - minimum safety

- The FTL20 keeps the electronic switch closed as long as the fork is immersed in liquid.
- Example of an application: dry running protection for pumps

The electronic switch opens if the limit is reached, if a fault occurs or the power fails.

Power supply

Cable entry



Pg11 / NPT ½ / QUICKON **M12x1** * (Plastic)

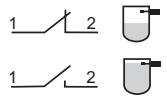
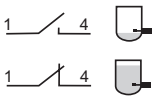
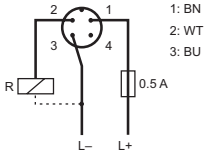
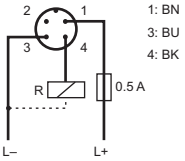
Material:
a: Polyamid; b: NBR/SEBS; c: PPSU; d: 316L; e: PUR blue; f: PVC grey; g: Cu Sn/Ni
*** Accessories**
4 x 0.34 M12 elbowed (order number: 52010285)

Electrical connection

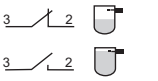
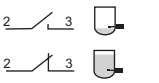
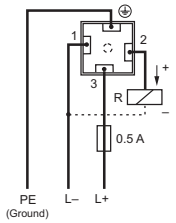
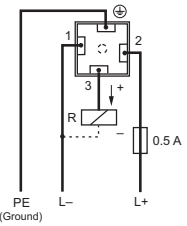
DC-PNP (direct current) version M12x1 connector

Voltage source: shock-protected voltage or Class 2 circuit (North America)

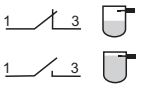
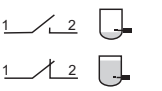
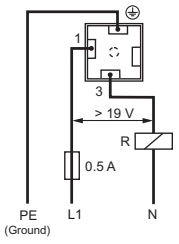
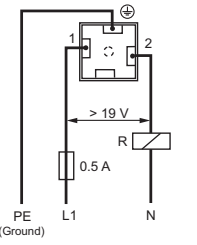
Suitable for use in non-equivalent operation:
When both outputs are connected, the MIN and MAX outputs take on opposite states in trouble-free operation. In the event of an alarm condition or a line break, both electronic switches are open. In addition to level monitoring, function-dependent sensor monitoring can also be performed with the aid of 2-channel evaluation.

Operating mode MAX (NC contact)	Operating mode MIN (NO contact)
 L00-FTL20xxx-04-05-xx-xx-002	 L00-FTL20xxx-04-05-xx-xx-003
 L00-FTL20xxx-04-05-xx-xx-009	 L00-FTL20xxx-04-05-xx-xx-010

DC-PNP (direct current) version valve connector

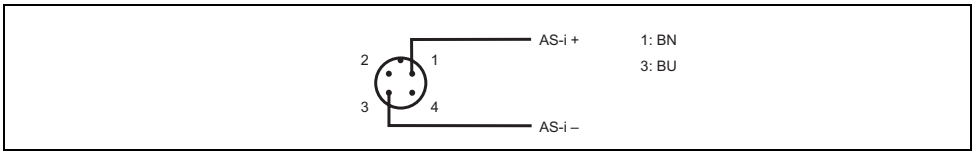
Operating mode MAX (NC contact)	Operating mode MIN (NO contact)
 L00-FTL20xxx-04-05-xx-xx-004	 L00-FTL20xxx-04-05-xx-xx-005
 L00-FTL20xxx-04-05-xx-xx-011	 L00-FTL20xxx-04-05-xx-xx-012

AC (alternating current) version valve connector

Operating mode MAX	Operating mode MIN
 L00-FTL20xxx-04-05-xx-xx-006	 L00-FTL20xxx-04-05-xx-xx-007
 L00-FTL20xxx-04-05-xx-xx-013	 L00-FTL20xxx-04-05-xx-xx-014

Note!
Approved for relays with a holding power/rated power >2.5 VA (253 V) or > 0.5 VA (24 V).
Relays with lower holding power/rated power can be operated via a parallel-connected RC-element (option).
RC-element is available under modification no. MVT2Y1278.

Connect AS-i bus



Programming instructions for the AS-i

AS-i profile: S-3.A.1

The address is defaulted to 0 (HEX). It is changeable via the bus master or programming unit.

Data bit:

D0:1 Sensor covered	D1:1 Status = O.K.
D0:0 Sensor free	D1:0 Status = error
D2 and D3 are not used.	

Parameter bits (P0 to P3) are not used.

Electrical connection	**DC-PNP valve connector**	**DC-PNP M12x1**	**AC 2 wire**	**AS-i**
Supply voltage	10 to 35 V DC	10 to 35 V DC	19 to 253 V AC	24.5 to 31 V DC
Cable entry	Pg11 / NPT ½ / QUICKON	M12x1	Pg11 / NPT ½ / QUICKON	M12x1
Cable specification	Max 14 AWG (1.5 mm^2) and ø 0.14 to 0.25" (3.5 to 6.5mm)	IEC 60947-5-2	Max 14 AWG (1.5 mm^2) and ø 0.14 to 0.25" (3.5 to 6.5mm)	IEC 62026-2
Power consumption	< 825 mW	< 825 mW	< 810 mW	< 825 mW
Current consumption	< 15 mA	< 15 mA	< 3.8 mA	< 25 mA
Residual ripple	5 Vss at 0 to 400 Hz	5 Vss at 0 to 400 Hz	–	–

Performance characteristics

Switching delay

0.5 s when covering
1.0 s when becoming free

Other switching time on request

Reference operating conditions

Ambient temperature: 73°F (23°C)

Process pressure: 14.5 psi (1 bar)

Medium: water

Medium density: 1

Medium temperature: 73°F (23°C)

Installation from above /vertical

Density setting: > 0.7

Measured value resolution

< 0.02" (0.5 mm)

Measuring frequency

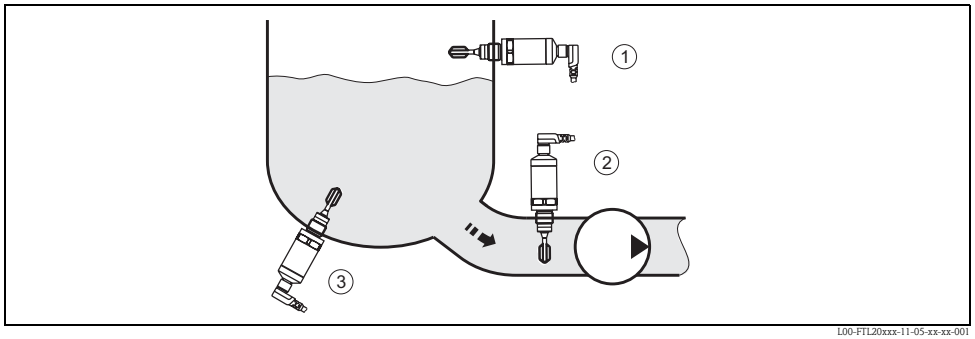
Approx. 1100 Hz in air

Maximum measured error	0.51" ± 0.04" (13.0 ±1 mm)
Repeatability	± 0.02" (0.5 mm)
Hysteresis	0.12" ± 0.02" (3.0 ±0.5 mm)
Settling time	< 2 s
Influence of ambient temperature	Negligible
Influence of medium temperature	-29.6×10^{-3} mm/°C
Influence of medium pressure	-55.2×10^{-3} mm/bar

Operating conditions: Installation instructions

Orientation

The Liquiphant T FTL20 can be installed in any position in a container or pipe.
The formation of foam does not impair its function.



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Example 1): Overfill protection or top level detection
Example 2): Dry running protection for pump
Example 3): Lower level detection

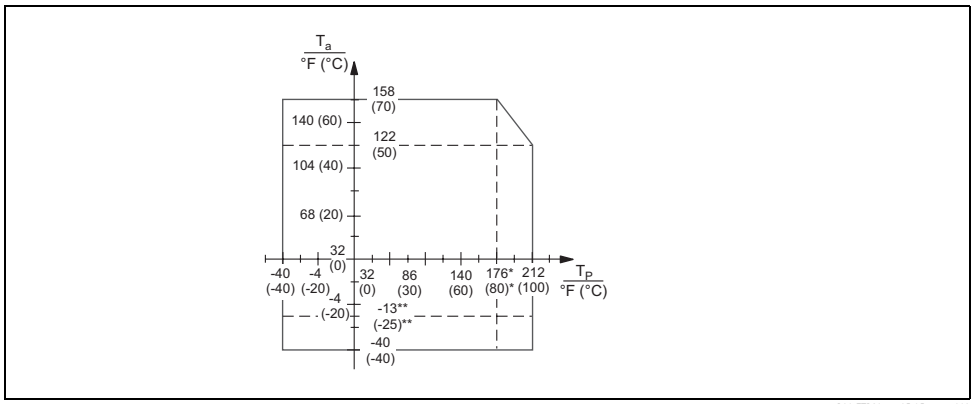
Connecting cable

Up to 1000 m with AC/DC-PNP, AS-i to IEC 62026-2

Operating conditions: Environment

Ambient conditions

212°F (100°C) Version



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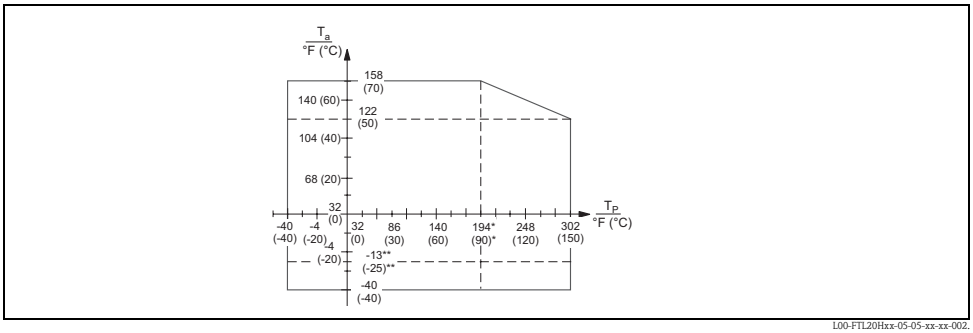
300°F (150°C) Version



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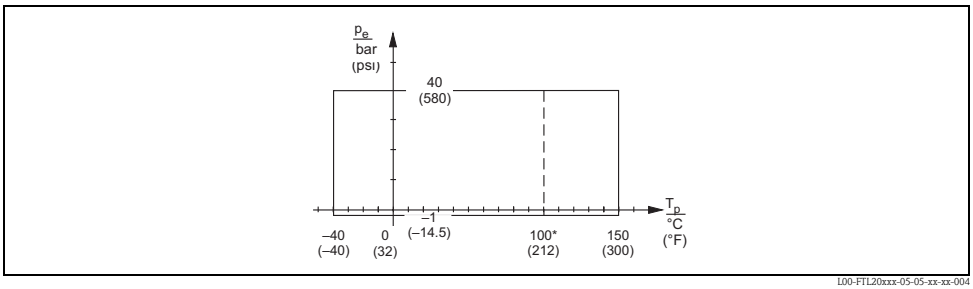
* max. 150 mA relay switching capacity
** for AS-i elektronic
Ambient temperature Ta
Process temperature Tp

Storage temperature	-40 to +185°F (-40 to +85°C)
Degree of protection	■ IP65 (NEMA 4) with valve connector ■ IP66/67 (NEMA 4X) with M12x1 connector PPSU (plastic)
Shock resistance	To EN 60068-2-27 (30 g)
Vibration resistance	To EN 60068-2-64
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). AS-interface to EN 50295.
Overvoltage protection	Overvoltage category III

Operating conditions: Process

Medium temperature range



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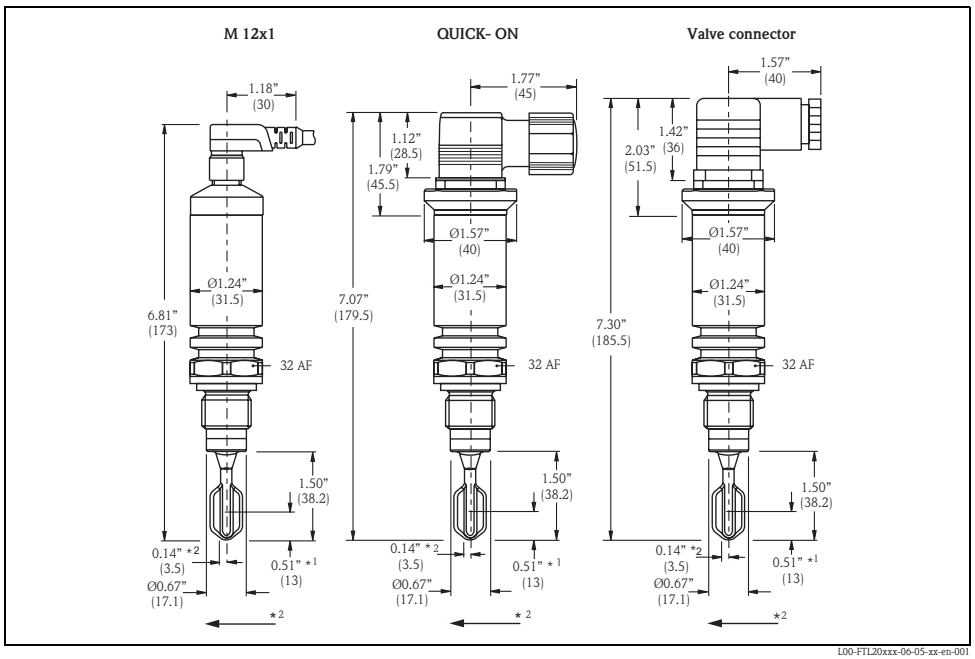
* Max. process temperature of the 212°F (100°C) version (see also "Operating conditions: Environment").

State of aggregation	Liquid
Density	> 0.7 SGU (0.7 g/cm^3), other density setting on request
Viscosity	1 to 10,000 cSt
Gas content	Stagnant mineral water
Solids content ø	< 0.20" (5 mm)

Mechanical construction

Note!
All dimensions in inches (mm)

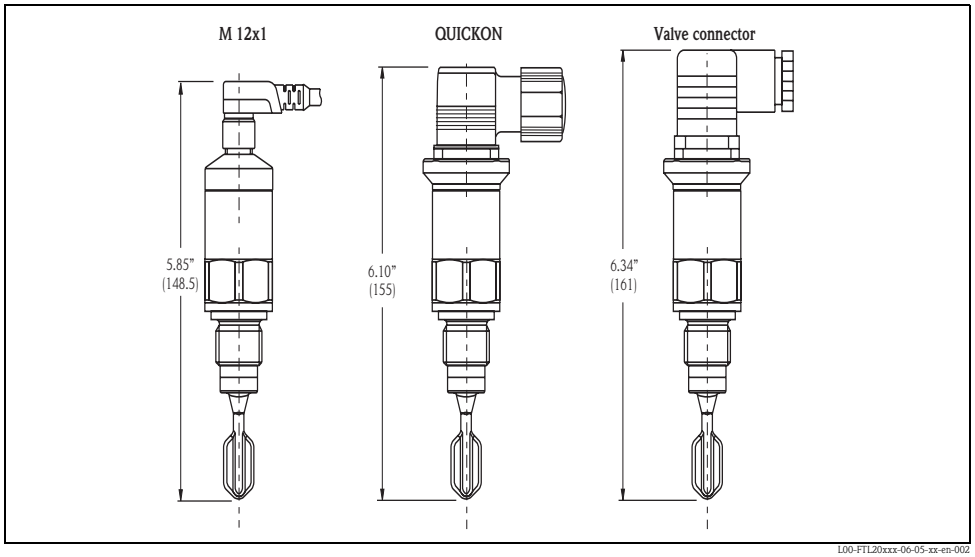
Design, dimensions of the 300°F (150°C) version



*1 Switch point with vertical installation
*2 Switch point with horizontal installation; the level increases in the direction of the arrow

Switch points at: density 1 SGU / 73°F / 0 psi (1 / 23°C / 0 bar)

Design, dimensions of the 212°F (100°C) version

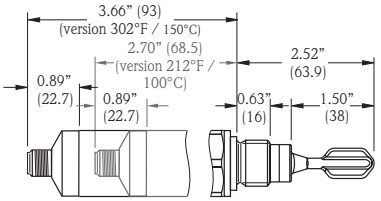
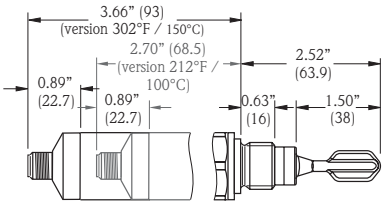
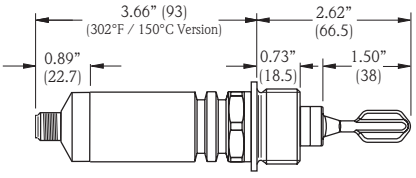
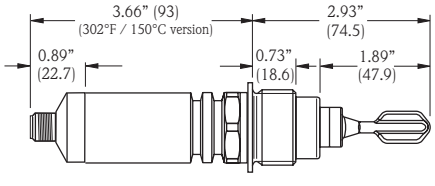


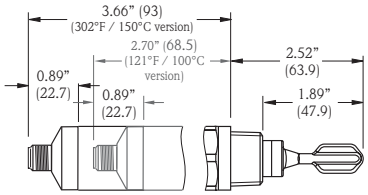
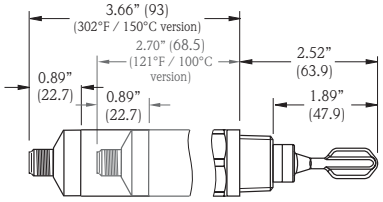
*1 Switch point with vertical installation
*2 Switch point with horizontal installation; the level increases in the direction of the arrow

Switch points at: density 1 SGU / 73°F / 0 psi (1 / 23°C / 0 bar)

Refer to drawing at top of page for all other dimensions.

Process connections

Process connection / Dimensions	Order code	Accessories (optional)	Pressure Temperature
G ½, **G ¾** DIN ISO 228/I  	0 1		max. 580 psi (40 bar) max. 300°F (150°C)
G ¾ DIN ISO 228/I for flush-mounted installation in welding neck EHEDG with welding neck 52018765  	1	**Welding neck** (with defined thread start) with silicone O-ring Endress+Hauser 52018765 FDA approved materials according to 21 CFR Part 177.1550/2600 See also Page 15	max. 363 psi (25 bar) max. 300°F (150°C) max. 580 psi (40 bar) max. 212°F (100°C)
G 1 DIN ISO 228/I  	6		max. 580 psi (40 bar) max. 212°F (100°C)
G 1 DIN ISO 228/I with sealing surface for flush-mounted installation in welding neck EHEDG with welding neck 52001051 (Seal geometry same as e.g. FTL260)  	7	Welding neck (with defined thread start) with silicone O-ring Endress+Hauser 52001051 FDA approved materials according to 21 CFR Part 177.1550/2600 See also Page 15	max. 363 psi (25 bar) max. 300°F (150°C) max. 580 psi (40 bar) max. 212°F (100°C)

Process connection / Dimensions	Order code	Accessories (optional)	Pressure Temperature
NPT ½ ANSI B 1.20.1 **R ½** DIN 2999  	2 4		max. 580 psi (40 bar) max. 300°F (150°C)
NPT ¾ ANSI B 1.20.1 **R ¾** DIN 2999  	3 5		max. 580 psi (40 bar) max. 300°F (150°C)

Weight (300°F version)

Approx. 0.6 lb (270 g)

Weight (212°F version)

Approx. 0.5 lb (210 g)

Materials

Sensor and housing made of 316L, surface quality Ra < 3.2 µm

Housing

Pipe housing

Terminals

Valve connector, QUICKON, M12x1

Human interface

Function test with test magnet

Variants AC and DC-PNP:

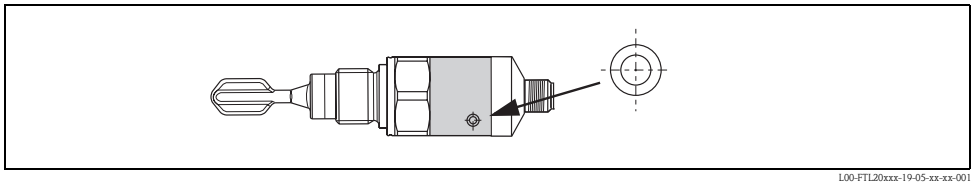
On testing, the current state of the electronic switch is reversed.

Variant AS-interface:

On testing, D0 is inverted.

Performing test

Hold the test magnet against the mark on the nameplate:



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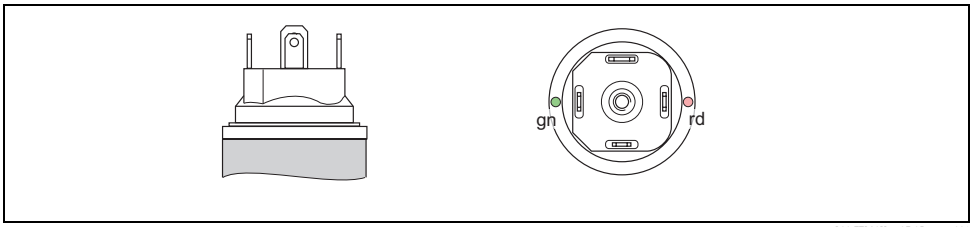
The switching state changes.

Light signals

Versions AC and DC-PNP with valve connector/QUICKON



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Green light (gn) lighting:

FTL20 is connected to the power supply and is operational.

Red light (rd) lighting:

Mode of operation MAX (overfill protection): sensor is immersed in liquid.

Mode of operation MIN (dry running protection): sensor is not covered by liquid.

Green light (gn) does not come on

Error: No power supply.

– Check plug, cable and power supply

Red light (rd) flashing:

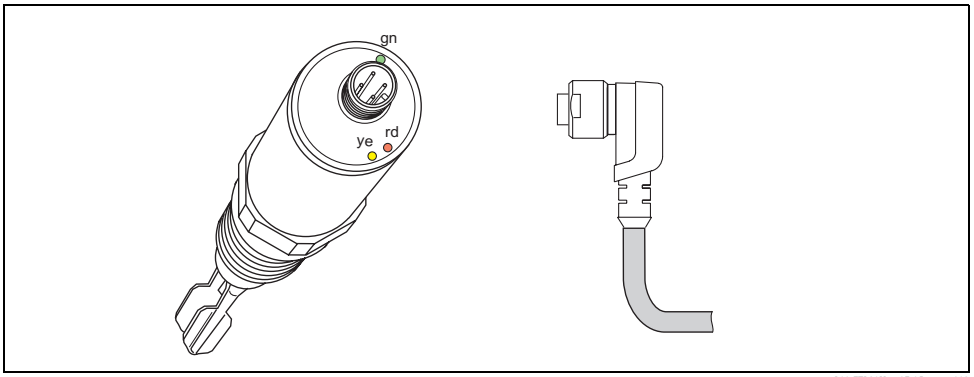
Error: Overload or short-circuit in load circuit.

– Rectify the short-circuit
– Reduce maximum load current to below 250 mA

Error: Internal sensor error or sensor corroded.

– Replace device

Version AS-interface and DC-PNP with M12x1 circular connector PPSU



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Green light (gn) lighting:

FTL20 is connected to the power supply and is operational.

Yellow light (ye) lighting:

Sensor is immersed in liquid.

Red light (rd) lighting with AS-interface:

Error: Address 0 set or communication error.

– Carry out addressing process
– Parameterise slave
– Or reduce line length (< 100 m total length)

Red light (rd) lighting with DC-PNP

Error: Overload or short-circuit in load circuit.

– Rectify the short-circuit
– Reduce maximum load current to below 250 mA

Green light (gn) does not come on

Error: No power supply.

– Check plug, cable and power supply

Red light (rd) flashing (2 Hz):

Error: Internal sensor error or sensor corroded.

– Replace device

Certificates and approvals

Note!
The specified certificates and approvals are available on www.endress.com/ftl20.

CE mark, declaration of conformity	The instrument is designed to meet state-of-the-art safety requirements, has been tested and left the factoryin a condition in which it is safe to operate. The instrument complies with the applicable standards and regulations as listed in the EC declaration ofconformity and thus complies with the statutory requirements of the EG directives. Endress+Hauser confirms the successful testing of the instrument by affixing to it the CE mark.
Sanitary compatibility	EHEDG (see process connections, Page 10), approval number: 3119/03/0445
Overfill protection	WHG and leakage

Marine approval

German Lloyd (GL),
approval number: 42855-02HH

Other standards and guidelines

AS-i profile S-3.A.1 as per EN 50295 (limit switch)

Ordering information

Liquiphant T FTL20

10	**Approval: ***						
	0	Non-hazardous area,	WHG (leakage monitoring)				
	3	CSA General Purpose,	CSA C US				
	9	Special version					
20		**Process Connection:**					
	0	Thread ISO228	G ½,	316L			
	1	Thread ISO228	G ¾,	316L	Installation > accessory: welding neck		
	6	Thread ISO228	G 1,	316L			
	7	Thread ISO228	G 1,	316L	Installation > accessory: welding neck		
	2	Thread ANSI	NPT ½,	316L			
	3	Thread ANSI	NPT ¾,	316L			
	4	Thread DIN2999	R ½,	316L			
	5	Thread DIN2999	R ¾,	316L			
	9	Special version					
30			**Switch Output:**				
	1	2-wire	19...253 V AC				
	2	3-wire, PNP	10... 35 V DC				
	3	AS-i bus					
	9	Special version					
40				**Application; Cable entry:**			
	B	150 °C,	Plug	Pg11	ISO4400	IP65/67	
	C	150 °C,	Plug	NPT ½	ISO4400	IP65	
	D	150 °C,	Plug	M12		IP67	
	E	150 °C,	Plug	QUICKON		IP65	
	0	100 °C,	Plug	Pg11	ISO4400	IP65/67	
	4	100 °C,	Plug	NPT ½	ISO4400	IP65	
	5	100 °C,	Plug	M12		IP67	
	6	100 °C,	Plug	QUICKON		IP65	
	9	Special version					

FTL20					Order code

* The specified certificates and approvals are available on www.endress.com/ftl20.

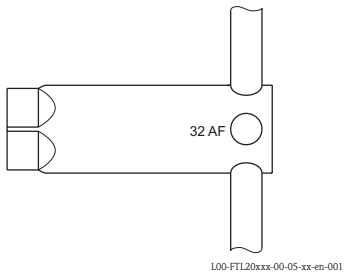
Accessories

Note!
All dimensions in inches (mm)

Socket wrench

Order number: 52010156

Socket wrench AF 32



Welding neck G ¾

Order number: 52018765

- For flush-mounted installation and sealing
- With defined thread start *
- Sensor cannot be aligned

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

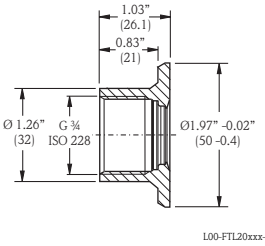
Weight: 0.13 kg

Seal: silicone O-ring
Order number: 52021717 (5 piece set)

FDA approved materials according to
21 CFR Part 177.1550/2600

Note!
Use only for FTL20 and FTL20H!

(Use order number 52001052 for
FTL50, FTL50H, FTL51, FTL51H)



max. 363 psi
(25 bar)
max. 300°F
(150°C)

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

Welding neck G 1

Order number: 52001051

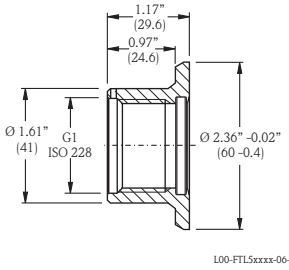
- For flush-mounted installation and sealing
- With defined thread start *
- Sensor cannot be aligned

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

Weight: 0.19 kg

Seal: silicone O-ring
Order number: 52014472 (5 piece set)

FDA approved materials according to
21 CFR Part 177.1550/2600



max. 363 psi
(25 bar)
max. 300°F
(150°C)

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

* The tolerance of the defined thread beginnings between welding neck and sensor amounts to ± 15°.

Cable

Order number: 52010285

4 x 0.34 M12 elbowed

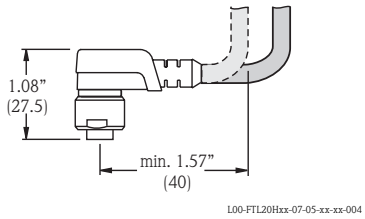
Cable: PVC (grey) 16 ft (5 m) length

Body: PUR (blue)

Coupling nut: Cu Sn/Ni

Protection: IP67 (NEMA 4X)

Temperature range: -13 to +158°F
(-25°C to +70°C)



Supplementary documentation

Operating Instructions

- Liquiphant FTL20
  KA213F/00/a6
- Welding neck G ¾
  KA219F/00/a6

Certificates

- Liquiphant FTL20, FTL20H - (Overspill protection)
  German Technical Approval Z-65.11-311
  ZE247F/00/de
- Liquiphant FTL20, FTL20H - (Leak detection)
  German Technical Approval Z-65.40-312
  ZE248F/00/de
- Liquiphant FTL20, FTL20H
  Number of the Certification Document 37102
  ZE249F/00/a2
- Liquiphant FTL20, FTL20H
  Certificate of Compliance No. 1238461
  ZE250F/00/en

Note!
The specified certificates and approvals are available on www.endress.com download.

United States	Canada	Mexico
Endress+Hauser, Inc. 2350 Endress Place Greenwood, IN 46143 Tel. 317-535-7138 Sales 888-ENDRESS Service 800-642-8737 fax 317-535-8498 inquiry@us.endress.com www.us.endress.com	Endress+Hauser Canada 1075 Sutton Drive Burlington, ON L7L 5Z8 Tel. 905-681-9292 800-668-3199 Fax 905-681-9444 info@ca.endress.com www.ca.endress.com	Endress+Hauser, México, S.A. de C.V. Fernando Montes de Oca 21 Edificio A Piso 3 Fracc. Industrial San Nicolás 54030. Tlalnepantla de Baz Estado de México México Tel: +52 55 5321 2080 Fax +52 55 5321 2099 eh.mexico@mx.endress.com www.mx.endress.com

TI364F/24/ae/01.08

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People for Process Automation

Level | Pressure | Flow | Temperature | Liquid Analysis | Registration | Systems Components | Services | Solutions

Technical Information

Liquiphant T FTL20H

Level limit switch for liquids in the foodstuff industry, compact design, housing made of corrosion-resistant stainless steel

Application

The Liquiphant T FTL20H is a level limit switch for liquids in storage tanks, agitators and pipes which have to meet particularly high hygiene standards internally and externally.

It is used in particular in areas where other measurement methods would probably fail: e.g. in the event of viscosity, build-up, turbulences, flows, air bubbles, rash temperature change when cleaning.

The Liquiphant T FTL20H is a hygiene version for fluid temperatures up to 150 °C.

Your benefits

- E.g. stainless steel housing with round connector M12x1, degree of protection IP69K, always air-tight even in the event of hour-long overflooding and intensive cleaning
- External test option using test magnet
- On-site function control using external LED display
- Large selection of process connections for hassle-free installation in existing systems
- Easy to install even at points difficult to access due to compact design
- Rugged stainless steel housing (316L)
- CIP and SIP cleanability ensured
- EHEDG certification

TI379F/00/en
71096275

Endress+Hauser
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Table of contents

Function and system design

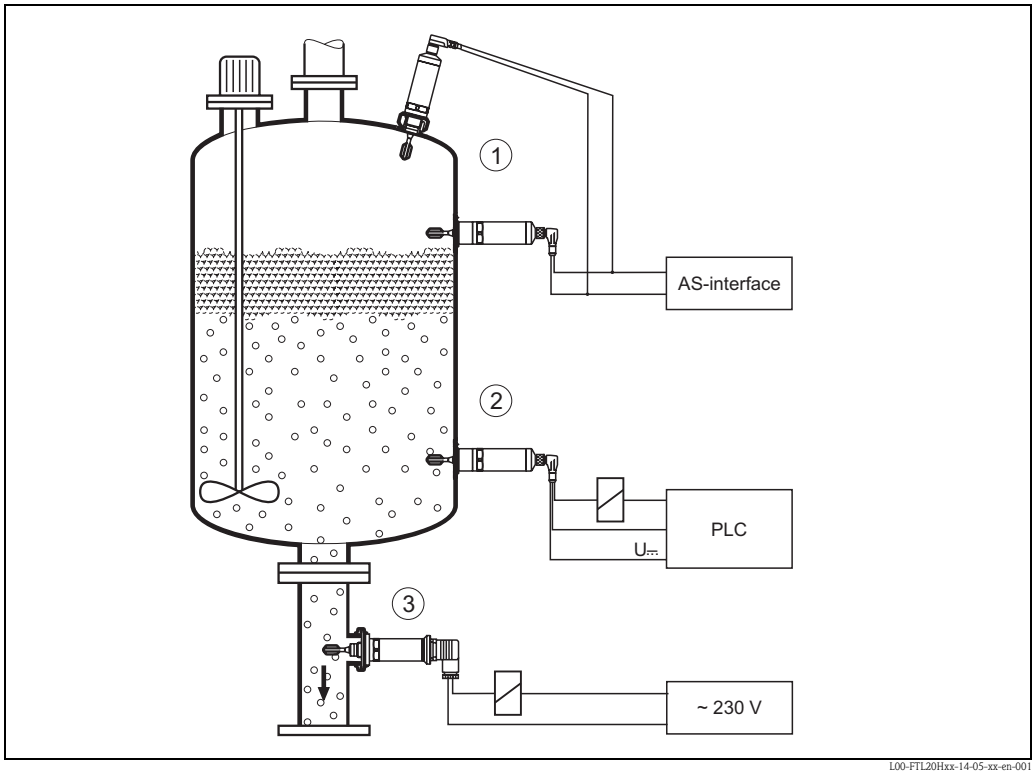
Measuring principle

The tuning fork of the FTL20H is brought to its resonance frequency by means of a piezoelectric drive. If the tuning fork is covered by liquid, this frequency changes. The electronics of the FTL20H monitor the resonance frequency and indicate whether the tuning fork is freely vibrating or is covered by liquid.

Measuring system

The measuring system comprises:

- Liquiphant T FTL20H limit switch
- Progammable logic control (PLC), miniature contactor, solenoid valve or AS-i bus



Example 1): Overfill protection or top level detection
Example 2): Lower level detection or dry running protection
Example 3): Dry running protection for pump

Input

Measured variable

Density

Measuring range

> 0.7 g/cm³

Other density settings on request, e.g. 0.5 g/cm³

Output

Switching outputs

	DC-PNP valve connector	DC-PNP M12x1	AC 2-wire	AS-i
Function	Positive voltage signal at the switch output of the electronics (PNP)		Switching the power supply line	Switching the D0 bit
Switch behaviour	ON/OFF			0 / 1 (free / covered)
Relay switching capacity	250 mA			D0 bit
Fail-safe mode	MIN/MAX (see below)			D1 bit D1: 0 error
Switching delay	approx. 0.5 s on coverage / approx. 1.0 s on tuning fork becoming uncovered other switching time on request			
Switching threshold	with vertical orientation: 13.0 mm from top of fork with horizontal orientation: 3.5 mm from fork centre			
Hysteresis	3 ±0.5 mm			

Operating modes for variants AC and DC-PNP

The FTL20H can be connected in two operating modes. By choosing the suitable operating mode (MAX or MIN safety), you ensure that the FTL20H switches safely even in the event of a fault (e.g. if the power supply line is disconnected).

MAX - maximum safety

- The FTL20H keeps the electronic switch closed as long as the liquid level is below the fork.
- Example of an application: overfill protection

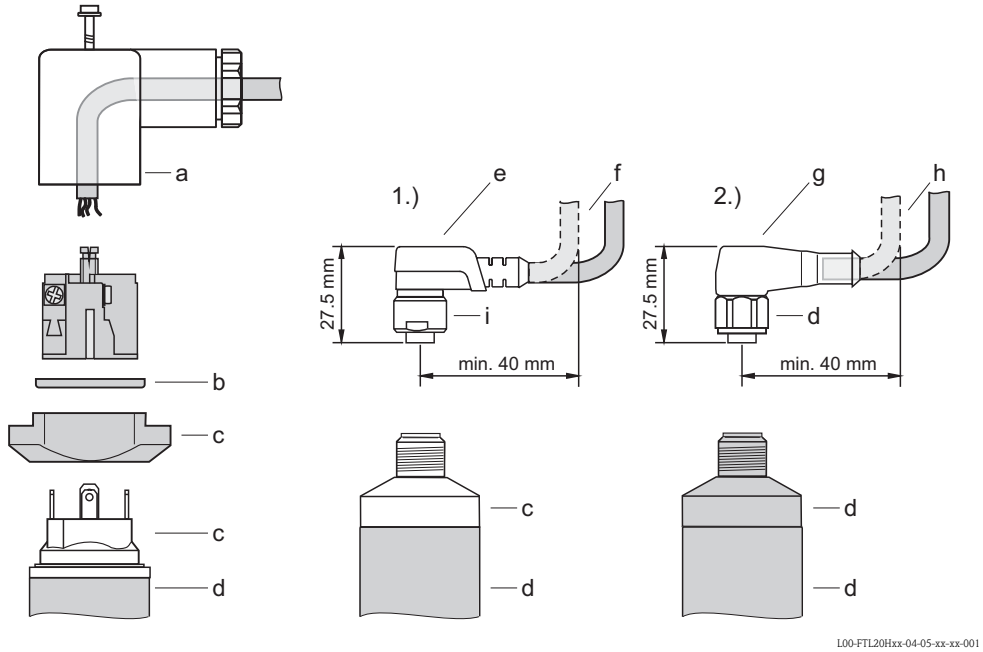
MIN - minimum safety

- The FTL20H keeps the electronic switch closed as long as the fork is immersed in liquid.
- Example of an application: dry running protection for pumps

The electronic switch opens if the limit is reached, if a fault occurs or the power fails.

Power supply

Cable entry



Pg11 / NPT ½ / QUICKON

M12x1
(Plastic)

M12x1
(Metal)

Material:
a: Polyamid; b: NBR/SEBS; c: PPSU; d: 316L; e: PUR blue; f: PVC grey; g: PVC transparent; h: PVC orange; i: Cu Sn/Ni

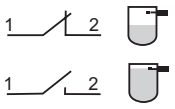
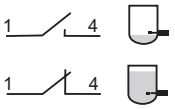
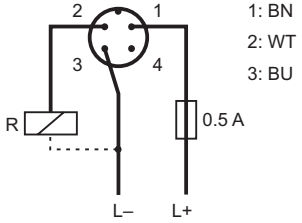
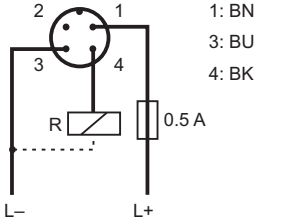
Accessories
1.) 4 x 0.34 M12 (Cu Sn/Ni) elbowed (order number: 52010285)
2.) 4 x 0.34 + female angled connector M12 (316L) without built-in LEDs (order number: 52024216) or
4 x 0.34 + female angled connector M12 (316L) with built-in LEDs (order number: 52018763)

Electrical connection

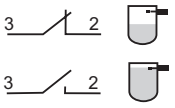
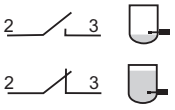
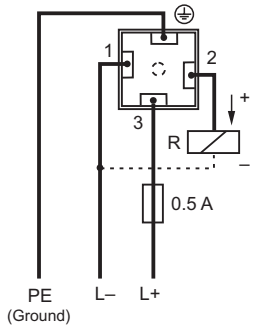
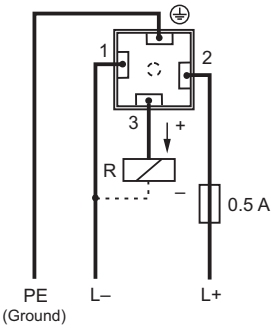
Variant DC-PNP (direct current) M12x1 connector

Voltage source: shock-protected voltage or Class 2 circuit (North America)

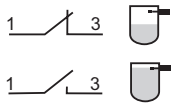
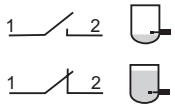
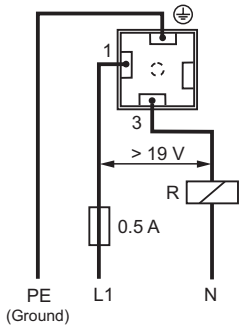
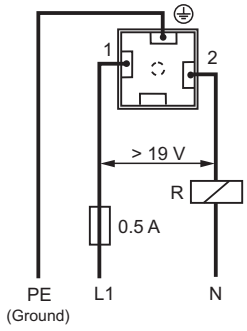
Suitable for use in non-equivalent operation:
When both outputs are connected, the MIN and MAX outputs take on opposite states in trouble-free operation. In the event of an alarm condition or a line break, both electronic switches are open. In addition to level monitoring, function-dependent sensor monitoring can also be performed with the aid of 2-channel evaluation.

Operating mode MAX (NC contact)	Operating mode MIN (NO contact)
 L00-FTL20xxx-04-05-xx-xx-002	 L00-FTL20xxx-04-05-xx-xx-003
 L00-FTL20xxx-04-05-xx-xx-009	 L00-FTL20xxx-04-05-xx-xx-010

Variant DC-PNP (direct current) valve connector

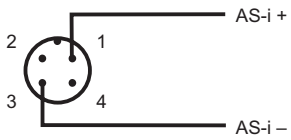
Operating mode MAX (NC contact)	Operating mode MIN (NO contact)
 L00-FTL20xxx-04-05-xx-xx-004	 L00-FTL20xxx-04-05-xx-xx-005
 L00-FTL20xxx-04-05-xx-xx-011	 L00-FTL20xxx-04-05-xx-xx-012

Variant AC (alternating current) valve connector

Operating mode MAX	Operating mode MIN
 L00-FTL20xxx-04-05-xx-xx-006	 L00-FTL20xxx-04-05-xx-xx-007
 L00-FTL20xxx-04-05-xx-xx-013	 L00-FTL20xxx-04-05-xx-xx-014

Note!
Approved for relays with a holding power/rated power >2.5 VA (253 V) or > 0.5 VA (24 V).
Relays with lower holding power/rated power can be operated via a parallel-connected RC-element (option).

Connect AS-i bus



L00-FTL20xxx-04-05-xx-xx-008

Programming instructions for the AS-i

AS-i profile: S-3.A.1

The address is defaulted to 0 (HEX). It is changeable via the bus master or programming unit.

Data bit:

D0:1 Sensor covered	D1:1 Status = O.K.
D0:0 Sensor free	D1:0 Status = error
D2 and D3 are not used.	

Parameter bits (P0...P3) are not used.

Electrical connection	DC-PNP valve connector	DC-PNP M12x1	AC 2 wire	AS-i
Supply voltage	10...35 V DC	10...35 V DC	19...253 V AC	24.5...31 V DC
Cable entry	Pg11 / NPT ½ / QUICKON	M12x1	Pg11 / NPT ½ / QUICKON	M12x1
Cable specification	Max 1.5 mm^2 and ø 3.5...6.5	IEC 60947-5-2	Max 1.5 mm^2 and ø 3.5...6.5	IEC 62026-2
Power consumption	< 825 mW	< 825 mW	< 810 mW	< 825 mW
Current consumption	< 15 mA	< 15 mA	< 3.8 mA	< 25 mA
Residual ripple	5 Vss at 0...400 Hz	5 Vss at 0...400 Hz	–	–

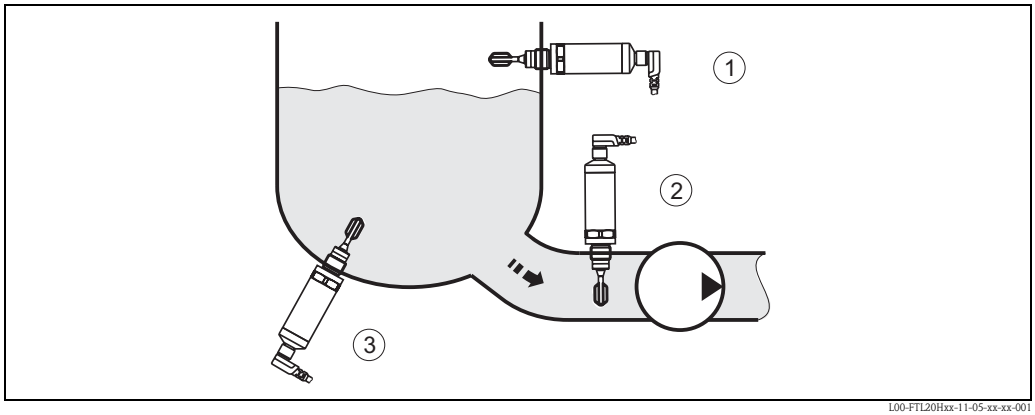
Performance characteristics

Switching delay	0.5 s when covering 1.0 s when becoming free Other switching time on request
Reference operating conditions	Ambient temperature: 23 °C Process pressure: 1 bar Medium: water Medium density: 1 Medium temperature: 23 °C Installation from above/vertical Density setting: > 0.7
Measured value resolution	< 0.5 mm
Measuring frequency	Approx. 1100 Hz in air
Maximum measured error	13.0 ±1 mm
Repeatability	±0.5 mm
Hysteresis	3.0 ±0.5 mm
Settling time	< 2 s
Influence of ambient temperature	Negligible
Influence of medium temperature	-29.6×10^{-3} mm/°C
Influence of medium pressure	-55.2×10^{-3} mm/bar

Operating conditions: Installation instructions

Orientation

The Liquiphant T FTL20H can be installed in any position in a container or pipe. The formation of foam does not impair its function.



L00-FTL20Hxx-11-05-xx-xx-001

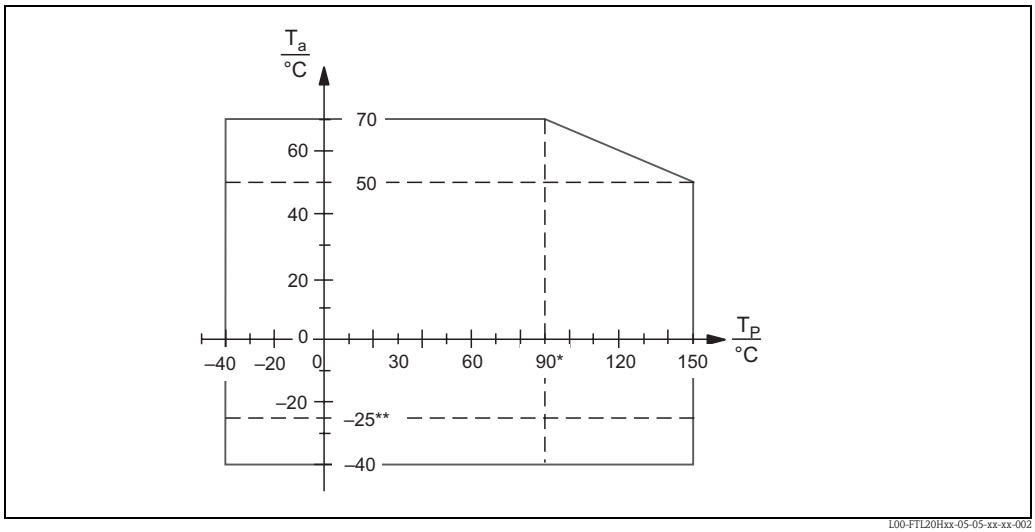
Example 1): Overfill protection or top level detection
Example 2): Dry running protection for pump
Example 3): Lower level detection

Connecting cable

Up to 1000 m with AC/DC-PNP, AS-i to IEC 62026-2

Operating conditions: Environment

Ambient conditions



L00-FTL20Hxx-05-05-xx-xx-002

** max. 150 mA relay switching capacity*
*** for AS-i elektronic*
Ambient temperature T_a
Process temperature T_p

Storage temperature

–40...+85 °C

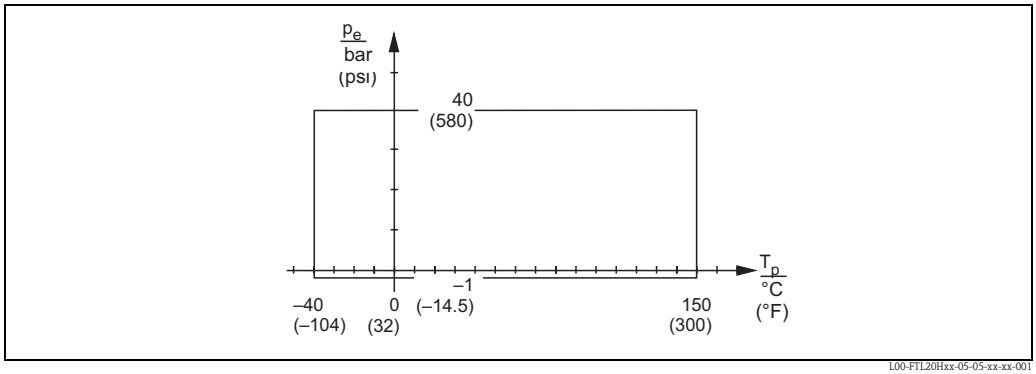
Degree of protection

- IP65 with valve connector
- IP66/67 with M12x1 connector PPSU (plastic)
- IP66/68 with M12x1 connector 316L (metal);
  IP69K with accessory 52024116 (signalling via connector without LEDs) or
  IP69K with accessory 52018763 (signalling via connector with LEDs)

Shock resistance	To EN 60068-2-27 (30 g)
Vibration resistance	To EN 60068-2-64
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). AS-interface to EN 50295.
Overvoltage protection	Overvoltage category III

Operating conditions: Process

Medium temperature range and process pressure



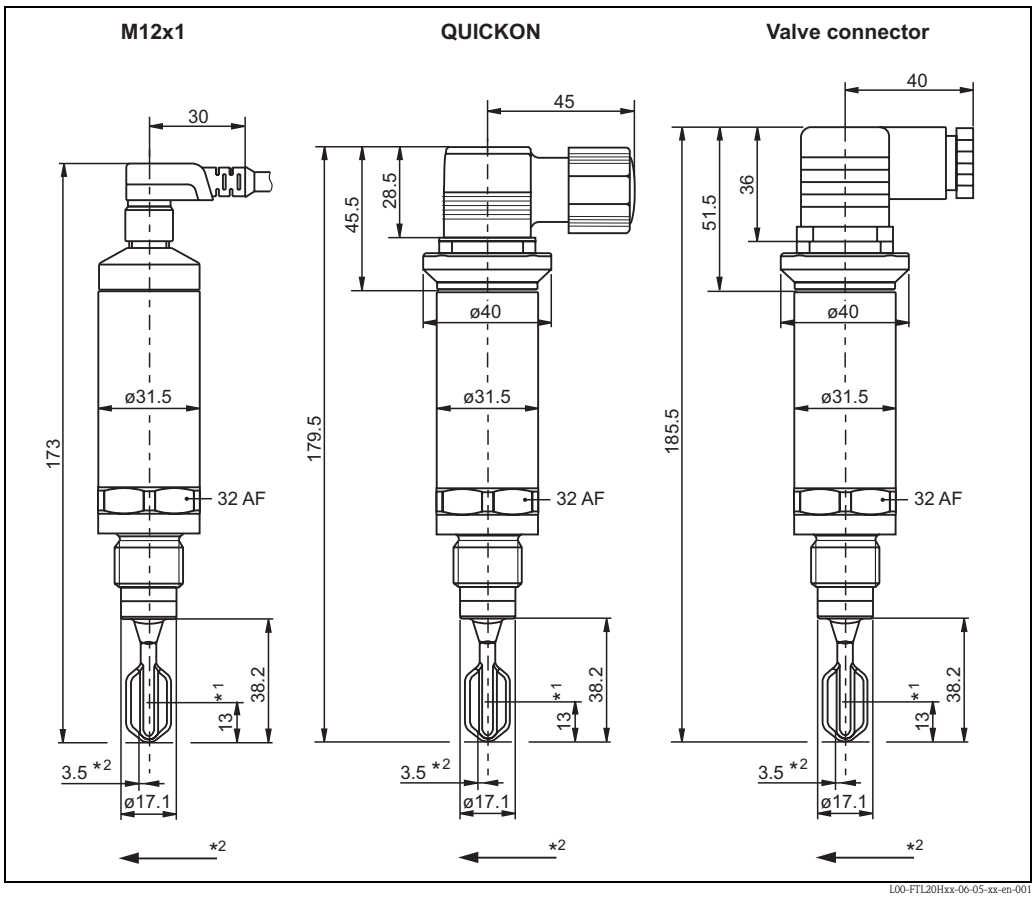
L00-FTL20Hxx-05-05-xx-xx-001

State of aggregation	Liquid
Density	> 0.7 g/cm^3 (other density setting on request)
Viscosity	1...10000 cst
Gas content	Stagnant mineral water
Solids content ø	< 5 mm

Mechanical construction

Note!
All dimensions in mm

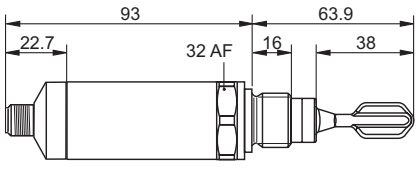
Design, dimensions

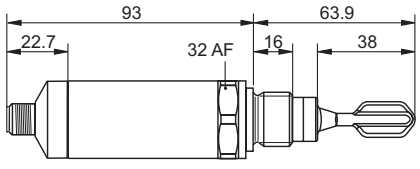
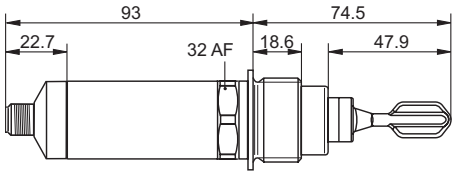
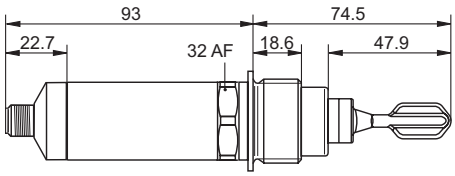
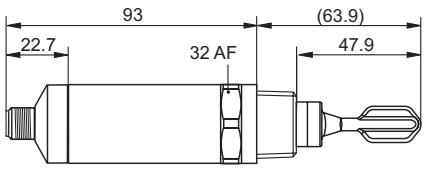
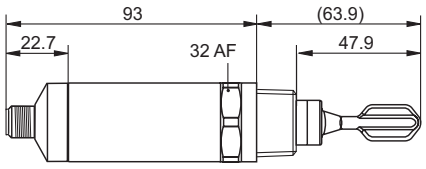


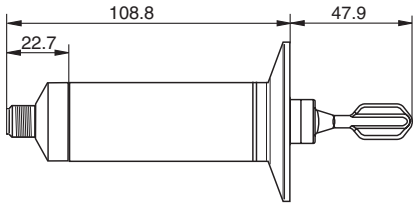
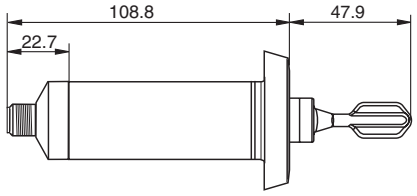
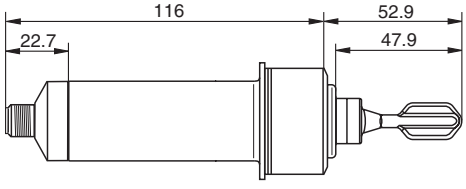
**1 Switch point with vertical installation*
**2 Switch point with horizontal installation; the level increases in the direction of the arrow*

Switch points at: density 1 / 23 °C / 0 bar

Process connections

Process connection / Dimensions	Order code	Accessories (optional)	Pressure Temperature
G ½, **G ¾** DIN ISO 228/I  	GCJ GDJ		max. 40 bar max. 150 °C

Process connection / Dimensions	Order code	Accessories (optional)	Pressure Temperature
G ¾ DIN ISO 228/I for flush-mounted installation in welding neck EHEDG with welding neck 52018765  L00-FTL20xxx-06-05-xx-en-003	GDJ	**Welding neck** (with defined thread start) with silicone O-ring Endress+Hauser 52018765 FDA approved materials according to 21 CFR Part 177.1550/2600 See also Page 18	max. 25 bar max. 150 °C max. 40 bar max. 100 °C
G 1 DIN ISO 228/I  L00-FTL20xxx-06-05-xx-en-004	GEJ		max. 40 bar max. 150 °C
G 1 DIN ISO 228/I with sealing surface for flush-mounted installation in welding neck EHEDG with welding neck 52001051 (Seal geometry same as e.g. FTL260)  L00-FTL20xxx-06-05-xx-en-004	GEJ	**Welding neck** (with defined thread start) with silicone O-ring Endress+Hauser 52001051 FDA approved materials according to 21 CFR Part 177.1550/2600 See also Page 19	max. 25 bar max. 150 °C max. 40 bar max. 100 °C
NPT ½ ANSI B 1.20.1 **R ½** DIN 2999  L00-FTL20xxx-06-05-xx-en-005	RCJ RRJ		max. 40 bar max. 150 °C
NPT ¾ ANSI B 1.20.1 **R ¾** DIN 2999  L00-FTL20xxx-06-05-xx-en-005	RDJ RSJ		max. 40 bar max. 150 °C

Process connection / Dimensions	Order code	Accessories (optional)	Pressure Temperature
Tri-Clamp DN 25-38 (1½") = ø50.5 mm DN 40-51 (2") = ø64.0 mm ISO 2852 EHEDG only with 2" version and special seal. (Seal: manufacturer, Hyjoin Limited, UK) Clamping ring and front seal are not included and can be purchased from retailers.  L00-FTL20xxx-06-05-xx-xx-008	TCJ TDJ		max. 16 bar max. 120 °C max. 2 bar max. 150 °C
Threaded pipe joint DN 25 DN 32 DN 40 DIN 11851 Coupling nut and sealing ring are not included and can be purchased from retailers.  L00-FTL20xxx-06-05-xx-xx-009	MNJ MPJ MQJ		DN 25, DN 32, DN 40: max. 40 bar up to 100 °C max. 25 bar up to 140 °C DN 50: max. 25 bar max. 140 °C
Flush-mounted for welding neck 1" Works standard Endress+Hauser with silicone seal and coupling nut (accessory 52021715): included EHEDG  L00-FTL20xxx-06-05-xx-xx-010	UPJ	**Welding neck** (tuning fork can be aligned) Endress+Hauser 52001047 FDA approved materials according to 21 CFR Part 177.1550/2600 See also Page 20	max. 40 bar max. 100 °C max. 25 bar max. 150 °C

Weight	Approx. 300 g
Materials	Sensor and housing made of 316L, surface quality Ra < 1.5 µm (In the area of the weld surface grade is not defined.)
Housing	Pipe housing
Terminals	Valve connector, QUICKON, M12x1

Human interface

Function test with test magnet

Variants AC and DC-PNP:

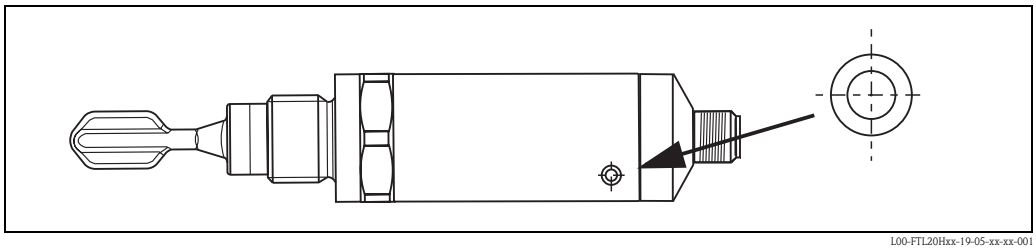
On testing, the current state of the electronic switch is reversed.

Variant AS-interface:

On testing, D0 is inverted.

Performing test

Hold the test magnet against the mark on the nameplate:

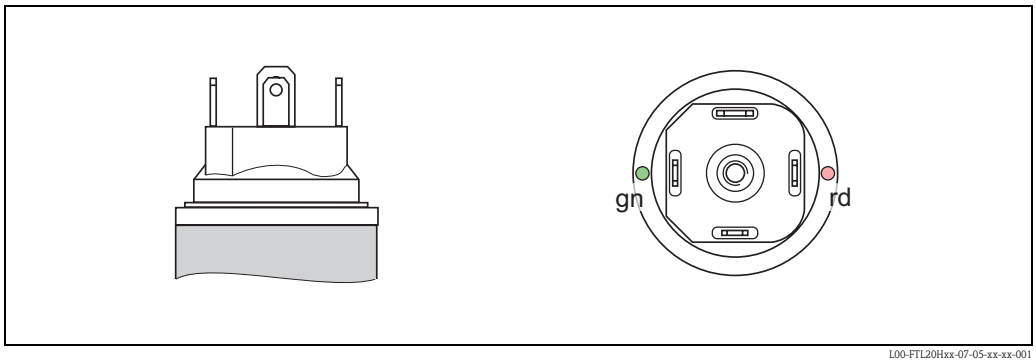


L00-FTL20Hxx-19-05-xx-xx-001

The switching state changes.

Light signals

Variants AC and DC-PNP with valve connector/QUICKON



L00-FTL20Hxx-07-05-xx-xx-001

Green light (gn) lighting:

FTL20H is connected to the power supply and is operational.

Red light (rd) lighting:

Mode of operation MAX (overfill protection): sensor is immersed in liquid.

Mode of operation MIN (dry running protection): sensor is not covered by liquid.

Green light (gn) does not come on

Error:
No power supply.

– Check plug, cable and power supply

Red light (rd) flashing:

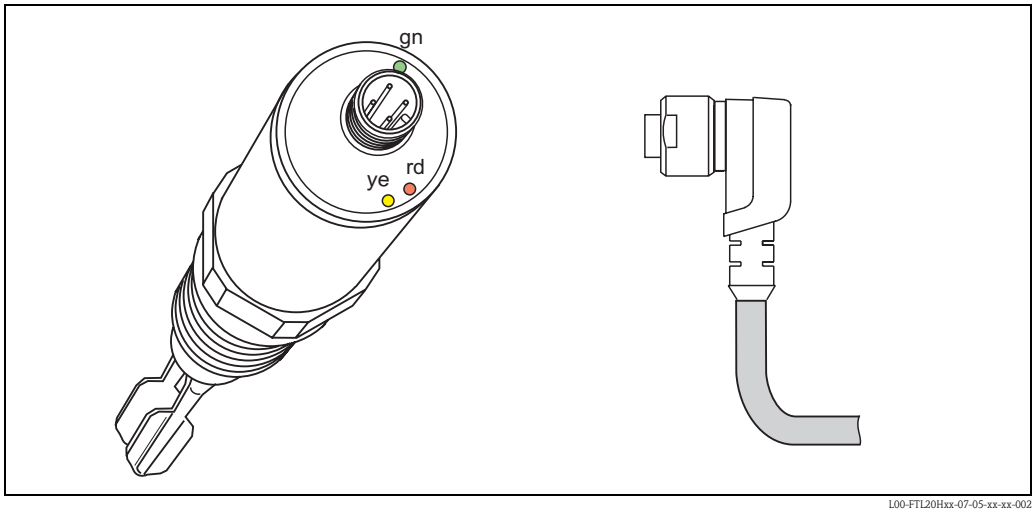
Error:
Overload or short-circuit in load circuit.

– Rectify the short-circuit
– Reduce maximum load current to below 250 mA

Error:
Internal sensor error or sensor corroded.

– Replace device

Variant AS-interface and DC-PNP with M12x1 circular connector PPSU



L00-FTL20Hxx-07-05-xx-xx-002

Green light (gn) lighting:

FTL20H is connected to the power supply and is operational.

Yellow light (ye) lighting:

Sensor is immersed in liquid.

Red light (rd) lighting with AS-interface:

Error:
Address 0 set or communication error.

– Carry out addressing process
– Parameterise slave
– Or reduce line length (< 100 m total length)

Red light (rd) lighting with DC-PNP

Error:
Overload or short-circuit in load circuit.

– Rectify the short-circuit
– Reduce maximum load current to below 250 mA

Green light (gn) does not come on

Error:
No power supply.

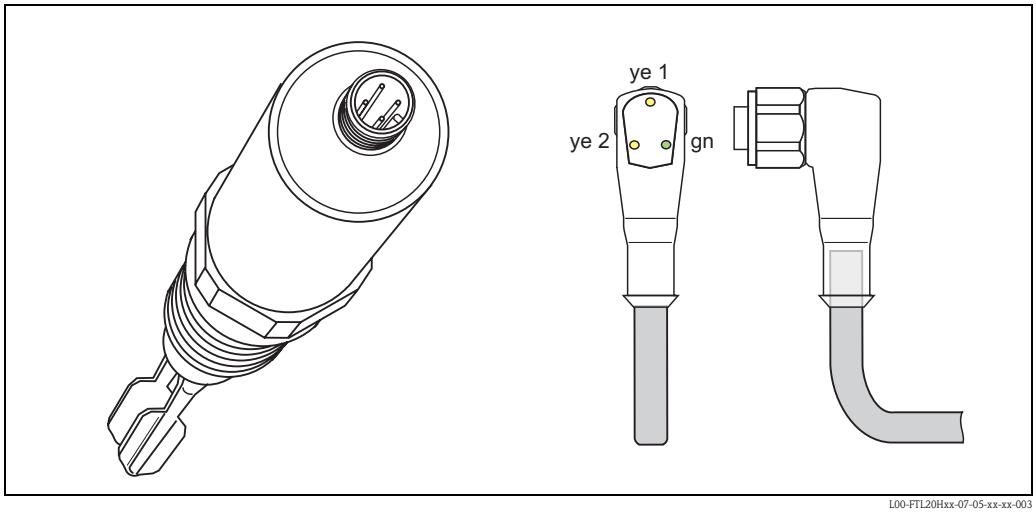
– Check plug, cable and power supply

Red light (rd) flashing (2 Hz):

Error:
Internal sensor error or sensor corroded.

– Replace device

Variant DC-PNP with M12x1 circular connector 316L



L00-FTL20Hxx-07-05-xx-xx-003

Green light (gn) lighting:

FTL20H is connected to the power supply and is operational.

Yellow light (ye 1) lighting:

Sensor is not covered by liquid.

Yellow light (ye 2) lighting:

Sensor is immersed in liquid.

Green light (gn) does not come on

Error:
No power supply.

– Check plug, cable and power supply

Green light (gn) lighting, both yellow lights (ye 1+2) does not come on

Error:
short-circuit in load circuit.

– Rectify the short-circuit

Error:
Internal sensor error or sensor corroded.

– Replace device

Certificates and approvals

Note!
The specified certificates and approvals are available on www.endress.com/ftl20.

CE mark, declaration of conformity	The instrument is designed to meet state-of-the-art safety requirements, has been tested and left the factory in a condition in which it is safe to operate. The instrument complies with the applicable standards and regulations as listed in the EC declaration of conformity and thus complies with the statutory requirements of the EG directives. Endress+Hauser confirms the successful testing of the instrument by affixing to it the CE mark.
Sanitary compatibility	EHEDG (see process connections on Page 11), approval number: 3119/03/0445
Overfill protection	WHG and leakage
Marine approval	German Lloyd (GL), approval number: 42855-02HH
Other standards and guidelines	AS-i profile S-3.A.1 as per EN 50295 (limit switch)

Ordering information

Liquiphant T FTL20H

10	Approval: *		
	0	Non-hazardous area,	WHG (leakage monitoring)
	3	CSA General Purpose,	CSA C US
	9	Special version	

20		Process Connection:			
	GCJ	Thread ISO228	G ½,	316L	
	GDJ	Thread ISO228	G ¾,	316L	installation > accessory: welding neck
	GEJ	Thread ISO228	G 1,	316L	installation > accessory: welding neck
	RCJ	Thread ANSI	NPT ½,	316L	
	RDJ	Thread ANSI	NPT ¾,	316L	
	RRJ	Thread DIN2999	R ½,	316L	
	RSJ	Thread DIN2999	R ¾,	316L	
	UPJ	Flush-mounted,		316L	installation > accessory: welding neck 1" 52001047
	TCJ	Tri-Clamp ISO2852	DN25-38 (1...1½"),	316L	
	TDJ	Tri-Clamp ISO2852	DN40-51 (2"),	316L	
	MNJ	DIN11851	DN25 PN40,	316L	
	MPJ	DIN11851	DN32 PN40,	316L	
	MQJ	DIN11851	DN40 PN40,	316L	
	YY9	Special version			

30		Switch Output:	
	1	2-wire	19...253 V AC
	2	3-wire, PNP	10... 35 V DC
	3	AS-i bus	
	9	Special version	

40		Application; Cable entry:				
	B	150 °C,	Plug	Pg11,	ISO4400,	IP65/67
	C	150 °C,	Plug	NPT ½,	ISO4400,	IP65
	D	150 °C,	Plug	M12,		IP67
	E	150 °C,	Plug	QUICKON,		IP65
	F	150 °C,	Plug	M12,		IP69K
	Y	Special version				

FTL20H		Order code

* The specified certificates and approvals are available on www.endress.com/ftl20.

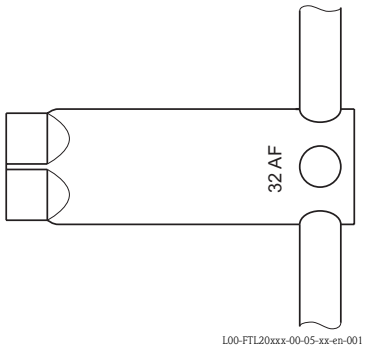
Accessories

Note!
- All dimensions in mm
- More detailed information about weld-in adapter can be taken from TI426F/00.

Socket wrench

Order number: 52010156

Socket wrench AF 32



Welding neck G ¾

Order number: 52018765
EN10204–3.1 material with inspection certificate

- For flush-mounted installation and sealing
- With defined thread start *
- Sensor cannot be aligned

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

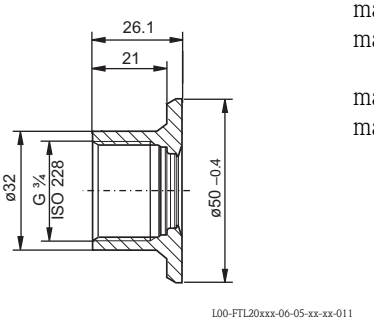
Weight: 0.13 kg

Seal: silicone O-ring
Order number: 52021717 (5 piece set)

FDA approved materials according to 21 CFR Part 177.1550/2600

Note!
Use only for FTL20 and FTL20H!

(Use order number 52001052 for FTL50, FTL50H, FTL51, FTL51H)



max. 25 bar
max. 150 °C

max. 40 bar
max. 100 °C

Welding neck G ¾

Order number: 52028295
EN10204–3.1 material with inspection certificate

- For flush-mounted installation and sealing
- With defined thread start *
- Sensor cannot be aligned

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

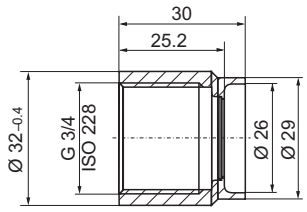
Weight: 0.10 kg

Seal: silicone O-ring
Order number: 52021717 (5 piece set)

FDA approved materials according to 21 CFR Part 177.1550/2600

✎ Note!
Use only for FTL20 and FTL20H!

(Use order number 71093129 for FTL50, FTL50H, FTL51, FTL51H)



A0008265

max. 25 bar
max. 150 °C

max. 40 bar
max. 100 °C

Welding neck G 1

Order number: 52001051
Order number: 52011896
EN10204–3.1 material with inspection certificate

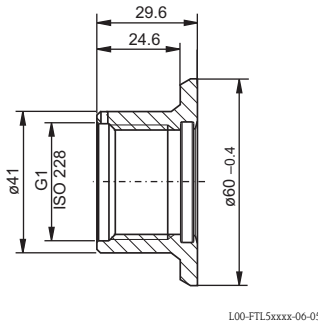
- For flush-mounted installation and sealing
- With defined thread start *
- Sensor cannot be aligned

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

Weight: 0.19 kg

Seal: silicone O-ring
Order number: 52014472 (5 piece set)

FDA approved materials according to 21 CFR Part 177.1550/2600



L00-FTL5xxxx-06-05-xx-xx-020

max. 25 bar
max. 150 °C

max. 40 bar
max. 100 °C

* The tolerance of the defined thread beginnings between welding neck and sensor amounts to ± 15°.

Welding neck

Order number: 52001047
Order number: 52006909
EN10204–3.1 material with inspection certificate

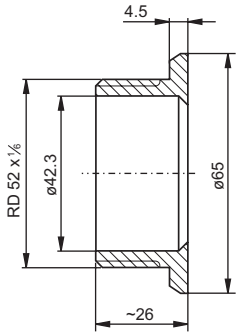
- For flush-mounted installation and sealing of a Liquiphant FTL50H, FTL20H with process connection EE2, UPJ
- Sensor can be aligned

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

Weight: 0.15 kg

Profile gasket: Silicone
Order number: 52014424 (5 piece set)

FDA approved materials according to 21 CFR Part 177.1550/2600



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

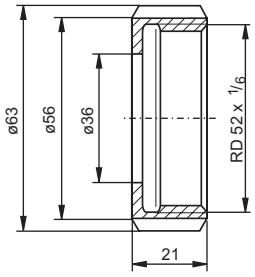
Coupling nut

Order number: 52021715
for connection UPJ or
welding neck 52001047

DIN 11851-F25-1.4301

Weight: 0.17 kg

When ordering "process connection for flush-mounted installation (UPJ)" the delivery includes the coupling nut.



L00-FTL20Hxx-06-05-xx-xx-007

Cable

Order number: 52010285

4 x 0,34 M12 socket

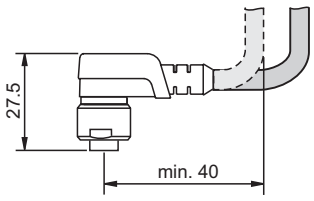
Cable: PVC (grey) 5 m length

Body: PUR (blue)

Coupling nut: Cu Sn/Ni

Protection: IP67

Temperature range: –25 °C to +70 °C



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

Order number: 52024216

4 x 0,34 M12 socket

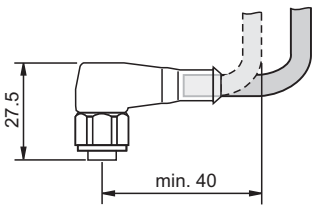
Cable: PVC (orange) 5 m length

Body: PVC (orange)

Coupling nut: 316L

Protection: IP69K (fully locked)

Temperature range: –25 °C to +70 °C



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

Order number: 52018763

4 x 0,34 M12 socket with integrated LEDs

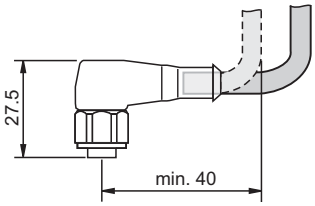
Cable: PVC (orange) 5 m length

Body: PVC (transparent)

Coupling nut: 316L

Protection: IP69K (fully locked)

Temperature range: –25 °C to +70 °C



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

Supplementary documentation

Operating Instructions

- FTL20H
  KA214F/00/a6
- Welding neck G ¾
  KA219F/00/a6

Technical Information

Weld-in adapter
TI426F/00/de

Certificates

- Liquiphant FTL20, FTL20H
  Allgemeine bauaufsichtliche Zulassung Z-65.11-311
  ZE247F/00/de
- Liquiphant FTL20, FTL20H (Leckage)
  Allgemeine bauaufsichtliche Zulassung Z-65.40-312
  ZE248F/00/de
- Liquiphant FTL20, FTL20H
  Number of the Certification Document 37102
  ZE249F/00/a2
- Liquiphant FTL20, FTL20H
  Certificate of Compliance No. 1238461
  ZE250F/00/en

Note!
The specified certificates and approvals are available on www.endress.com → download.

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Endress+Hauser

People for Process Automation

TI379F/00/en/05.09
71096275
SL/FM+SGML6.0 ProMoDo

71096275

Technical
Information
TI 244F/24/ae

Liquids Level Switch
liquiphant® T FTL 260

Vibration limit switch for liquids, maintenance-free alternative to float switches

Features and benefits

The Liquiphant T is a compact level switch that is ideal in places where access is difficult or space is limited.

- Small, slender design: minimal space requirement, easy mounting
- Stainless steel housing: rugged, resist corrosion and harsh environments
- Indicates material presence or absence in vessel or pipe: green LED indicates unit operating, red LED indicates switch status
- Calibration not required: quick installation, ready to operate
- Compensation for process material changes not required: unaffected by material density changes, unaffected by viscosity or conductivity changes

The Liquiphant T is designed to be connected to any AC voltage from 19 to 253 V in series with the control device (e.g. relay, solenoid valve, miniature contactors, etc.) or the DC version (3-wire PNP) which can be used when connecting to programmable logic controllers (PLC).

Applications

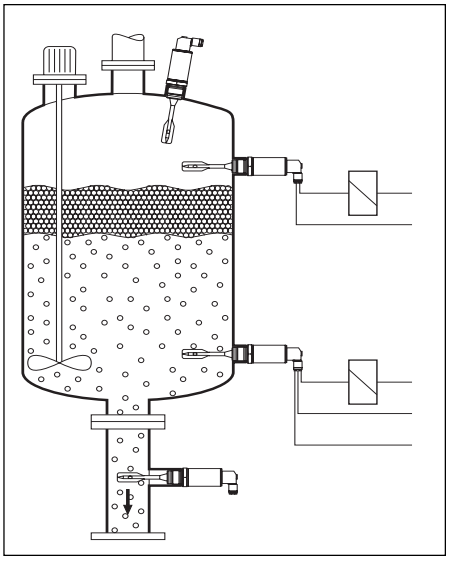
The Liquiphant T is an ideal alternative or replacement for low cost float switches, ultrasonic gap switches, conductivity, capacitance and other switch types. It is a level limit switch for liquid level detection in storage tanks, tanks with agitators, and piping.

Endress+Hauser

The Power of Know How

Application

The Liquiphant T can be used as an alternative to float switches as well as in applications where buildup, turbulence, liquid flow and gas bubbles are present.



Function

The symmetrical vibrating fork is excited to its resonant frequency which changes when the fork is submerged in liquid. The change in frequency is registered by the electronics, which actuate an electronic switch.

The Liquiphant T can be operated in both minimum or maximum fail-safe mode, i.e. the electronic switch opens on reaching the limit value, in cases of fault or loss of power

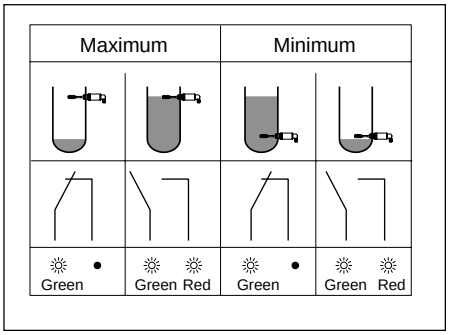


Diagram showing the function of the electronic switch and LED operation depending on the level and fail-safe mode.

Dimensions

A The fail-safe mode is selected using different connections in the wiring plug

B The stainless steel housing protects the potted electronics

C The switching function can be checked by placing a strong magnet on the external portion of the housing

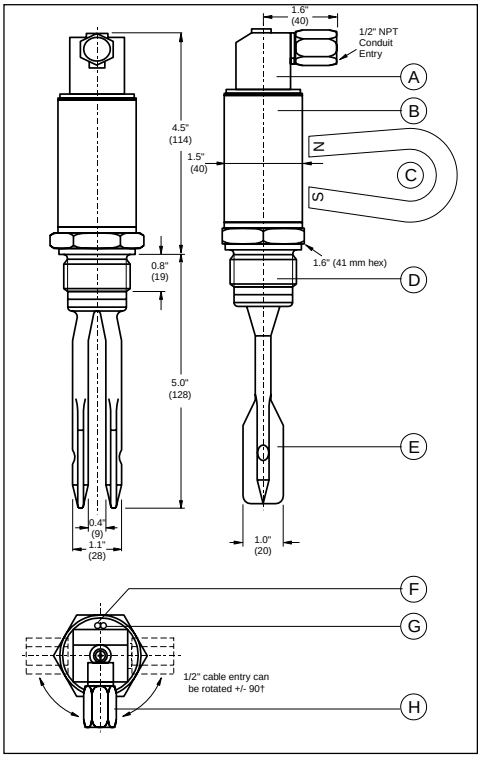
D Process connection is available in versions to fit most vessels: 1î NPT, G 1A (parallel thread) and R 1 tapered. Process connections are stainless steel

E Fork assembly, stainless steel

F Green LED operating mode indicator

G Red LED indicates switching mode or circuit open

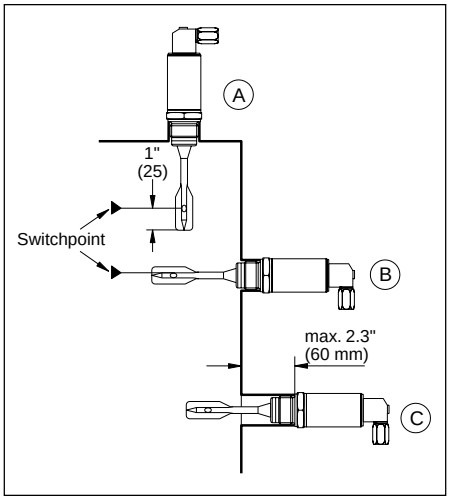
H Plug housing can be fitted or rotated ± 90

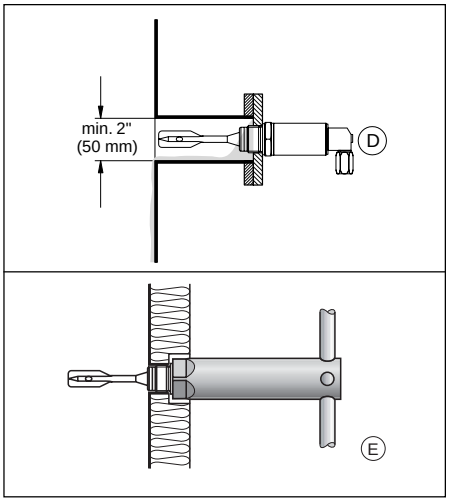


Installation guidelines

The Liquiphant T is suitable for vertical or horizontal mounting via flange, nozzle, or pipe. The 1î NPT threaded body allows simple installation with minimal re-work of the vessel or pipe. Vibration of the forks must not be blocked. If buildup occurs, ensure there is enough distance between the vibrating fork and the tank or pipe wall.

A Vertical mounting
B Horizontal mounting
C Mounting in a 1î nozzle (A or C for the entire range of viscosities up to 10,000 cSt).
D Flanged mounting in nozzle (FTL 260 threaded into a blind flange). The nozzle diameter must be a minimum diameter of 2î and the viscosity a maximum of 2000 cSt.
E Tightening the FTL 260 with socket spanner tool (see accessories).





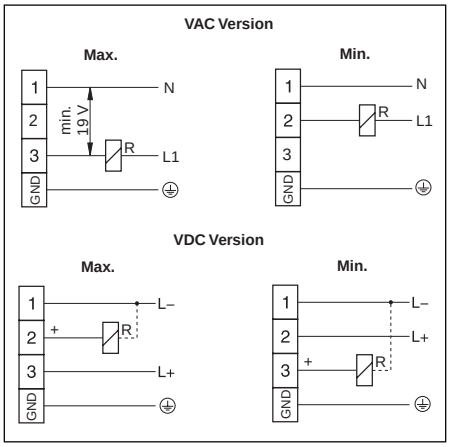
Wiring guidelines

AC Version

A load must be connected in series with the FTL 260. The voltage drop across the FTL 260 in the closed (ON) mode may be up to 12 V. A minimum terminal voltage of 19 V is required for the unit to switch. In the open (OFF) mode, a residual current of 3.8 mA flows.

DC Version

The DC version is recommended when used with programmable logic controllers (PLC).



Switch function

Minimum or maximum switch function is dependent on wiring connections. LED and switch function is shown on the previous page. The minimum or maximum setting is shown in the wiring diagram. The load can be an indicator light or relay coil. When the switch is in the ìOFFî state, a trickle current flows, not enough to light an indicator or actuate a relay coil. When the switch is in the ìONî state, current flow increases to a level that can pull in a relay coil or light a filament bulb.

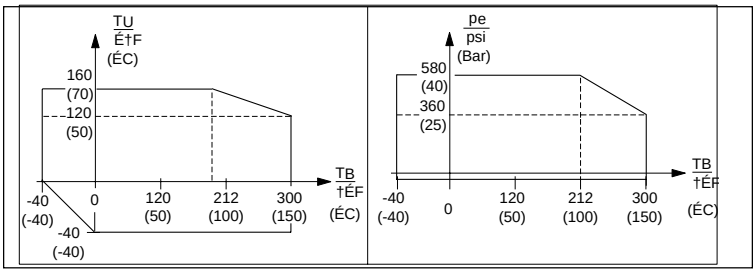
Technical data

Mechanical construction

Housing	316 SS with plastic terminal housing (PPSU)
Fork assembly	316 SS
Process connections	1î NPT to ANSI B 1.20.1, 316 SS G 1 A to DIN ISO 228/1, 316 SS R 1 to DIN 2999 Part 1, 316 SS
Electrical connection	4-pole plug connector, 1/2î NPT conduit entry

Process conditions

Ambient temperature	-40 to +160F (-40 to +70C), refer to chart below
Process temperature	-40 to +300F (-40 to +150C), refer to chart below
Storage temperature	-40 to +185F (-40 to +85C)
Operating pressure	Maximum 360 psi (40 bar), refer to chart below
Maximum viscosity	10,000 cSt
Minimum density	44 lbs/ft³



Temperature Diagram
T_U = temp. at housing
T_S = process temp.

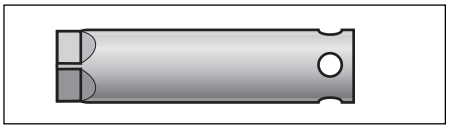
Mechanical construction

AC Input power / Output	AC, 19 to 253 V, 50/60 Hz, 3.8 mA current consumption (stand-by) Connectable load, short term (40 ms) maximum 1.5 A, maximum 375 VA at 250 V or 36 VA at 24 V (no short-circuit protection). Connectable load, continuous, maximum 87 VA at 253 V maximum 8.4 VA at 24 V. Minimum 2.5 VA at 250 V (10 mA) minimum 0.5 VA at 24 V (20 mA). Voltage drop across FTL 260, maximum 12 V. Residual current, maximum 3.8 mA with open thyristor (stand by)
DC Input power / Output	DC, 10 to 55 V, 1.7 V maximum ripple, 0 to 400 Hz, 15 mA maximum current consumption, reverse polarity protection. Connectable load, short term (1 ms), maximum 1 A, maximum 55 V (overload and short-circuit protection). NOTE: The load is switched via PNP transistor. Connectable load, continuous, maximum 350 mA, maximum 0.5 µF at 24 V. Residual voltage < 3 V (with closed transistor). Residual current < 100 µA (with open transistor).
Output function	Fail-safe mode: Minimum or maximum, depending on wiring connections Signal failure: Output open Switching time: Approximately 0.5 s when covered with material, approximately 1.5 s when free of material Hysteresis: Approximately 0.02î (0.4 mm) with vertical mounting
Electromagnetic compatibility	By attaching the CE Mark, Endress+Hauser confirms that the FTL 260 fulfills all legal requirements of the relevant EC directives. Interference immunity to EN 50082-2 (field strength 10 V/m). Interference emission to EN 50081-1.

Accessories

Socket spanner 41 AF for mounting FTL 260 or FTL 330

Part Number: 942667-0000



Ordering information

FTL 260 - 1 2 3 4

1 Certificate
- 0 For non-hazardous areas
- 3 CSA General Purpose

2 Process connection
- 1 1î NPT thread, 316Ti SS

3 Signal output
- 1 Switch, 2-wire, 19 to 253 VAC
- 2 Switch, 3-wire PNP, 10 to 55 VDC

4 Version
- 2 15 ft. cable (5 m), NEMA 6P
- 4 1/2î NPT plug, ISO 4400, NEMA 4X

For application and selection assistance, in the U.S. call 888-ENDRESS

For total support of your installed base, 24 hours a day, in the U.S. call 800-642-8737

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