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 150 °C.

For hygienic areas the use of FTL20H is recommended.

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 150 °C

Endress+Hauser
People for Process Automation

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Function and system design

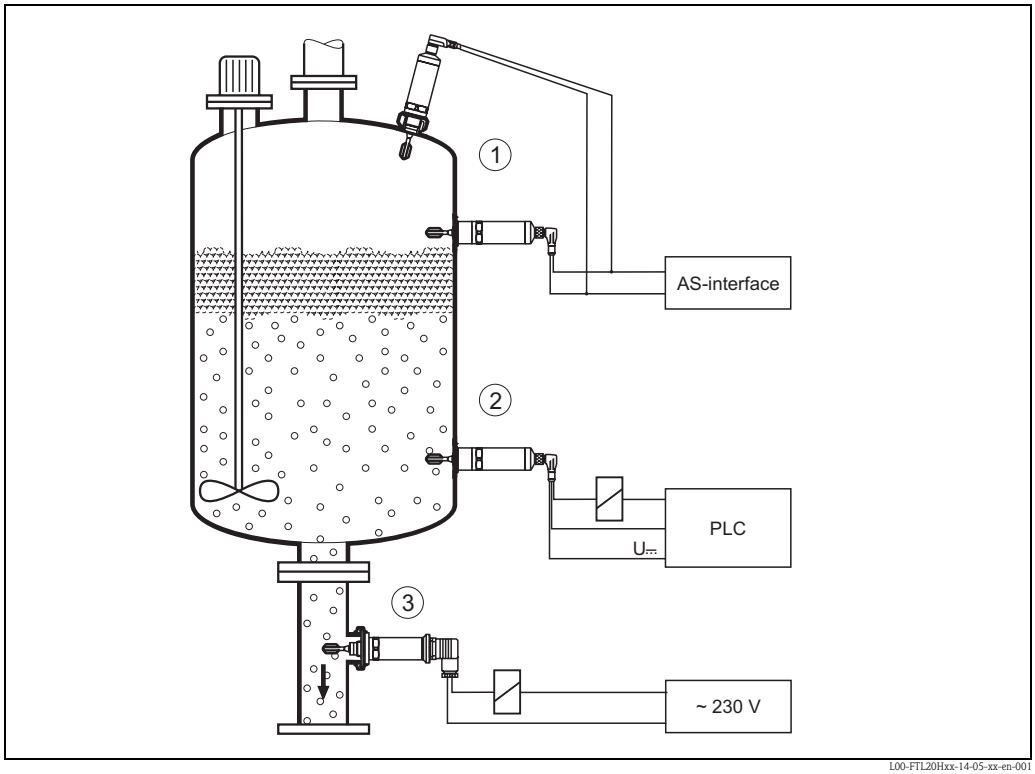
Measuring principle

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



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 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

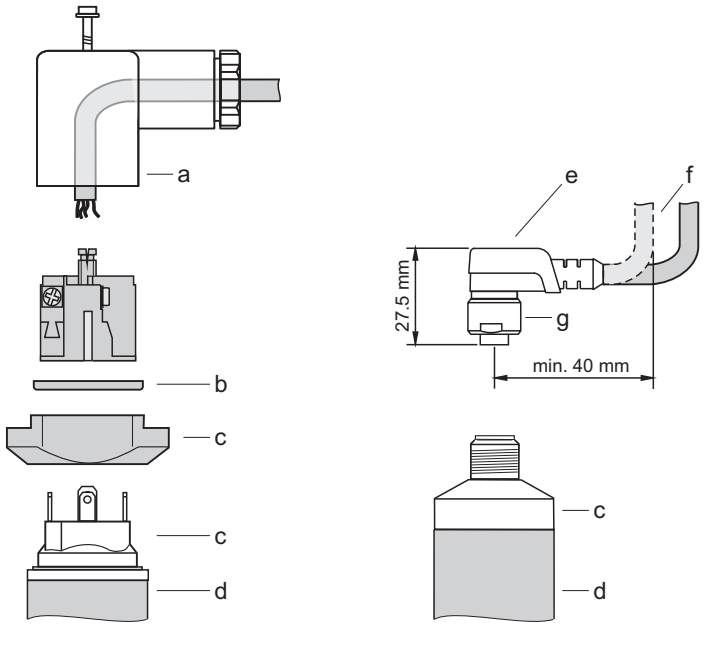
MIN - minimum safety

- 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

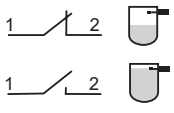
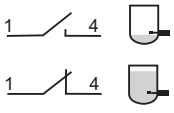
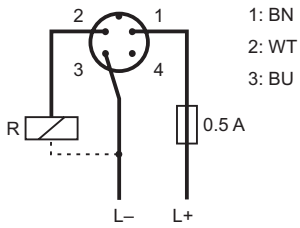
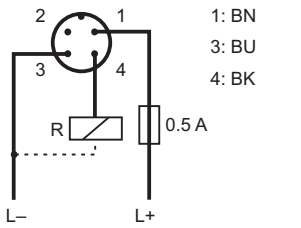
*** Accessories**
4 x 0.34 M12 elbowed (order number: 52010285)

Electrical connection

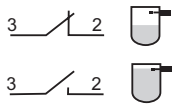
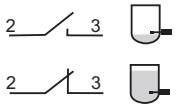
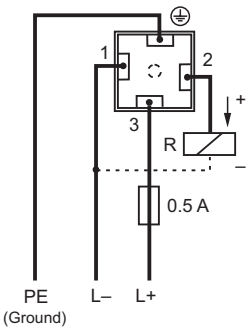
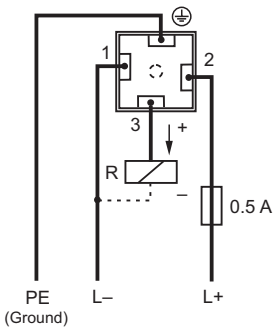
Variant DC-PNP (direct current) M12x1 connector

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

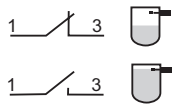
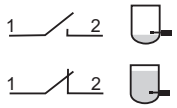
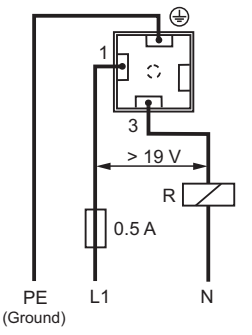
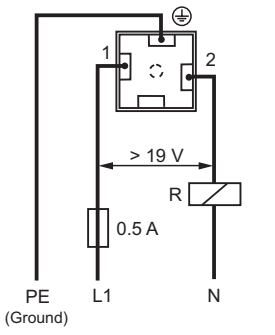
Suitable for use in non-equivalent operation:
When both outputs are connected, the MIN and MAX outputs take on opposite states in trouble-free operation. In the event of an alarm condition or a line break, both electronic switches are open. In addition to level monitoring, function-dependent sensor monitoring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

Operating mode MAX (NC contact)	**Operating mode MIN (NO contact)**
	
	

Variant DC-PNP (direct current) valve connector

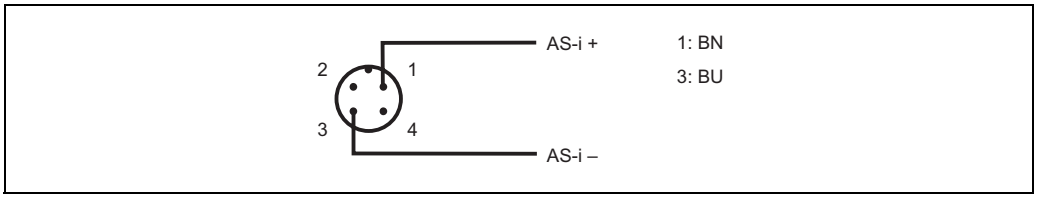
Operating mode MAX (NC contact)	Operating mode MIN (NO contact)
 L00-FTL20xxx-04-05-xx-xx-004	 L00-FTL20xxx-04-05-xx-xx-005
 L00-FTL20xxx-04-05-xx-xx-011	 L00-FTL20xxx-04-05-xx-xx-012

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	–	–

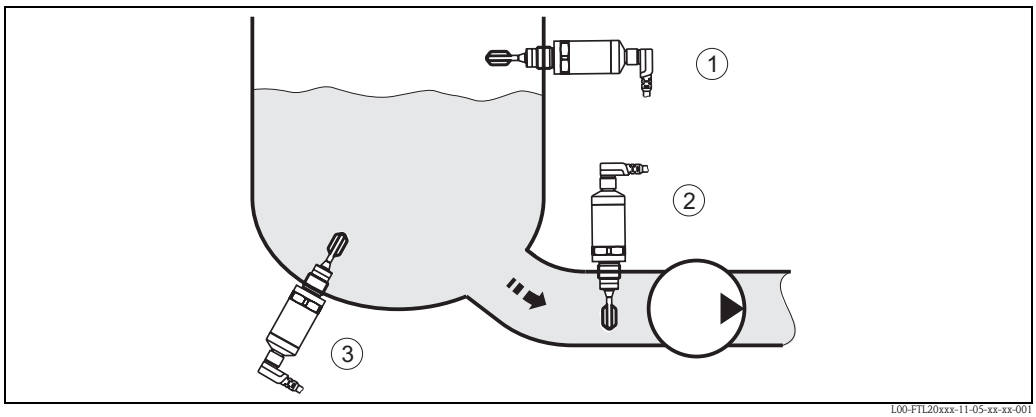
Performance characteristics

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



L00-FTL20xxx-11-05-xx-xx-001

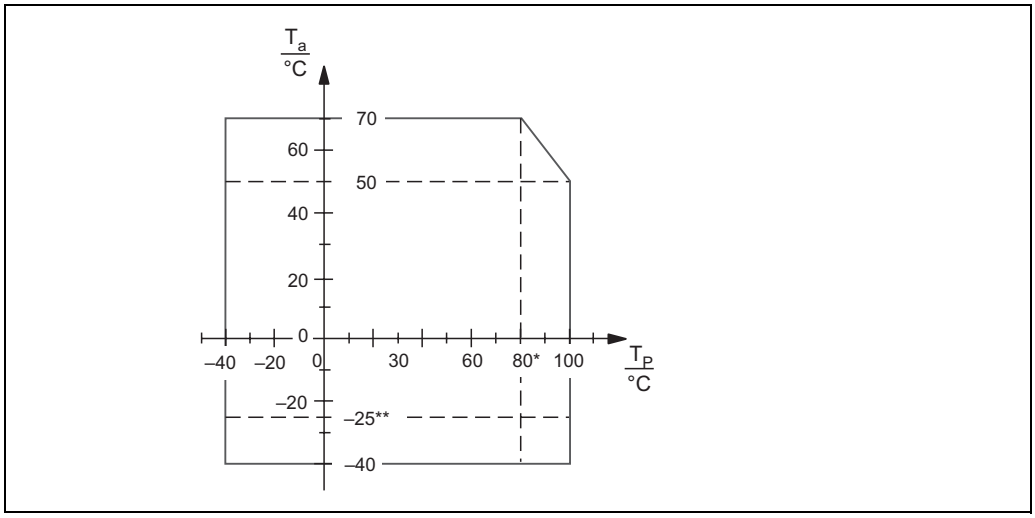
Example 1): Overfill protection or top level detection
Example 2): Dry running protection for pump
Example 3): Lower level detection

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

Operating conditions: Environment

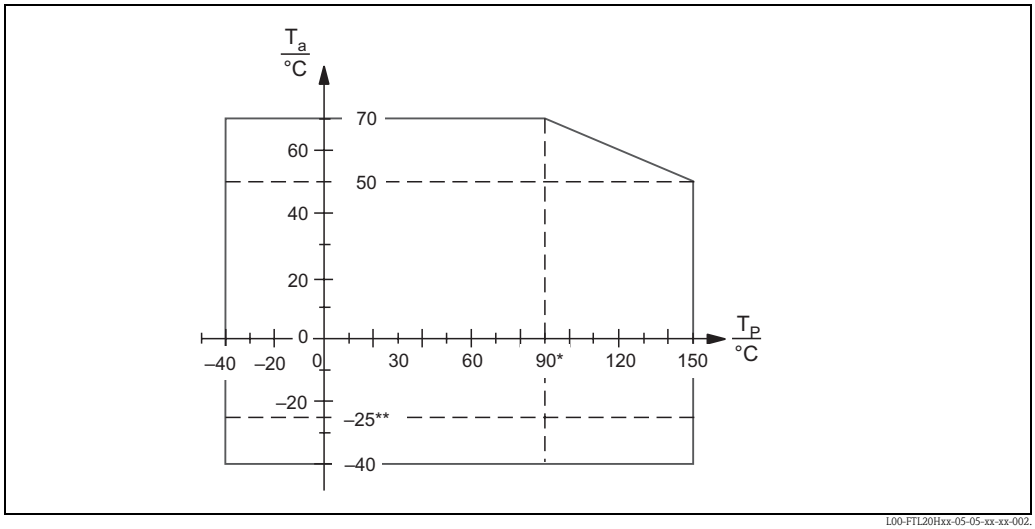
Ambient conditions

100 °C Variante



L00-FTL20xxx-05-05-xx-xx-003

150 °C Variante



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)

Shock resistance To EN 60068-2-27 (30 g)

Vibration resistance To EN 60068-2-64

Electromagnetic compatibility

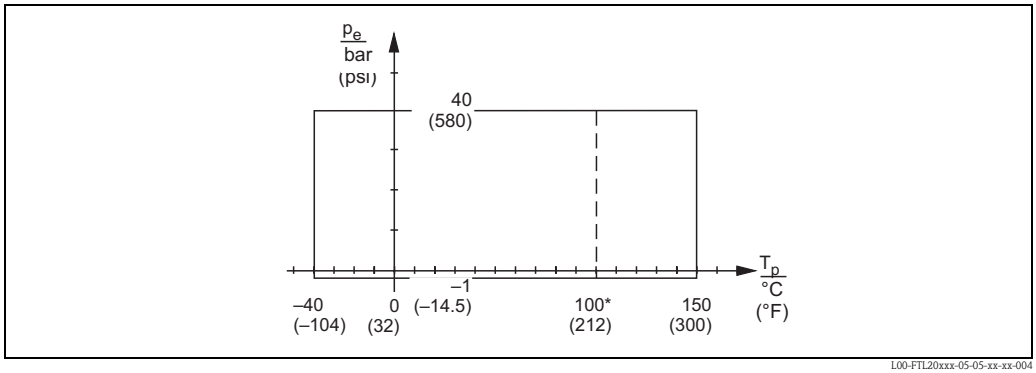
Interference emission to EN 61326, Electrical Equipment Class B,
interference immunity to EN 61326, Annex A (Industrial) and NAMUR Recommendation NE 21 (EMC).
AS-interface to EN 50295.

Overvoltage protection

Overvoltage category III

Operating conditions: Process

Medium temperature range



** Max. process temperature of the 100 °C variant type (see also "Operating conditions: Environment").*

State of aggregation

Liquid

Density

> 0.7 g/cm^3 (other density setting on request)

Viscosity

1...10000 cSt

Gas content

Stagnant mineral water

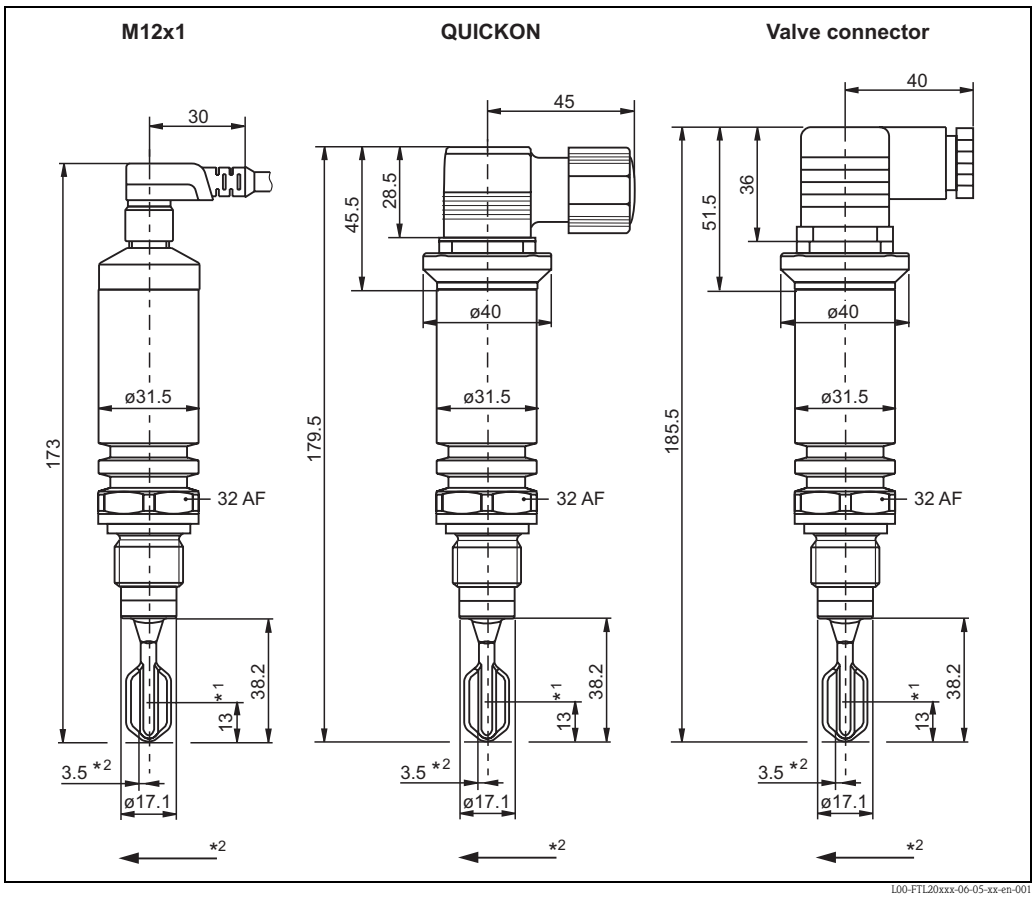
Solids content ø

< 5 mm

Mechanical construction

Note!
All dimensions in mm

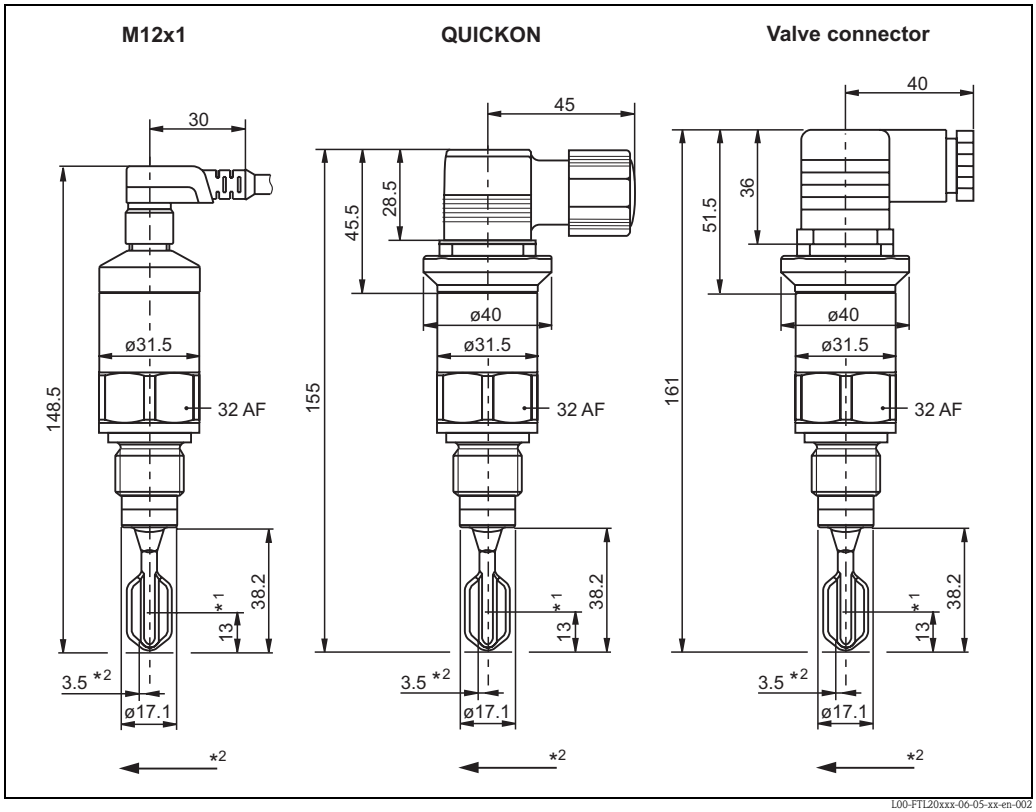
Design, dimensions of the 150 °C variant



**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

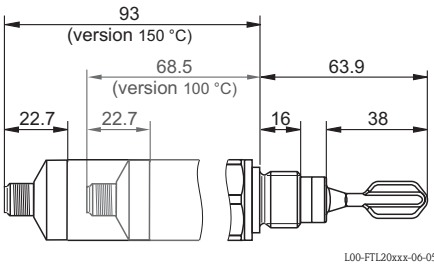
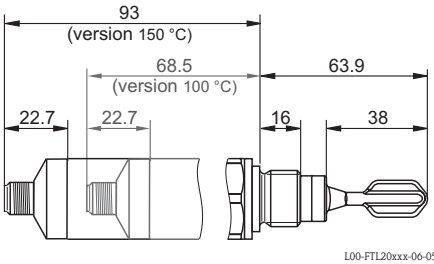
Design, dimensions of the 100 °C variant

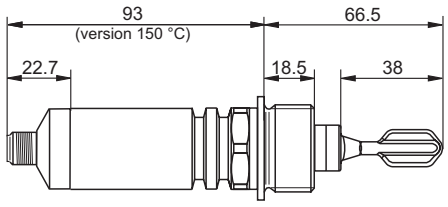
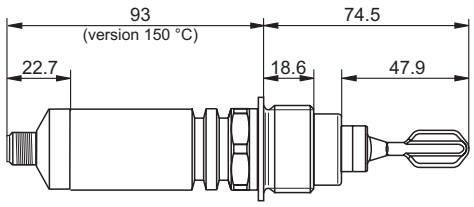
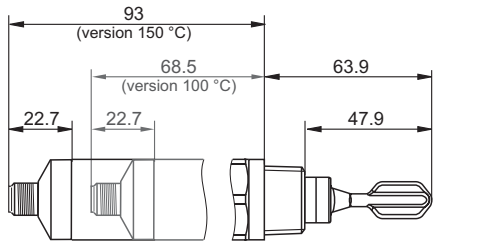
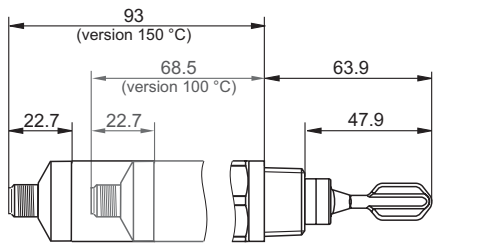


**1 Switch point with vertical installation*
**2 Switch point with horizontal installation; the level increases in the direction of the arrow*

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 	0 1		max. 40 bar max. 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 18	max. 25 bar max. 150 °C max. 40 bar max. 100 °C

Process connection / Dimensions	Order code	Accessories (optional)	Pressure Temperature
G 1 DIN ISO 228/1 	6		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) 	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 18	max. 25 bar max. 150 °C max. 40 bar max. 100 °C
NPT ½ ANSI B 1.20.1 **R ½** DIN 2999 	2 4		max. 40 bar max. 150 °C
NPT ¾ ANSI B 1.20.1 **R ¾** DIN 2999 	3 5		max. 40 bar max. 150 °C

Weight (150 °C variant)	Approx. 270 g
Weight (100 °C variant)	Approx. 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:

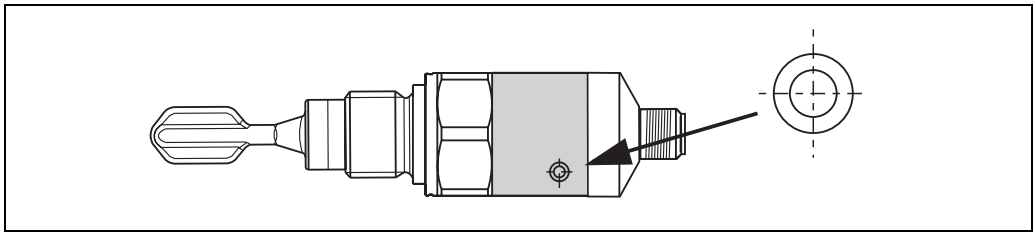
On testing, the current state of the electronic switch is reversed.

Variant AS-interface:

On testing, D0 is inverted.

Performing test

Hold the test magnet against the mark on the nameplate:

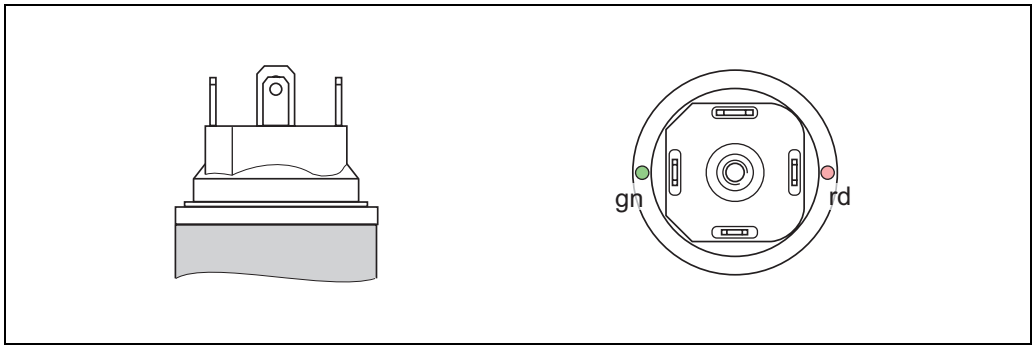


L00-FTL20xxx-19-05-xx-xx-001

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:

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:

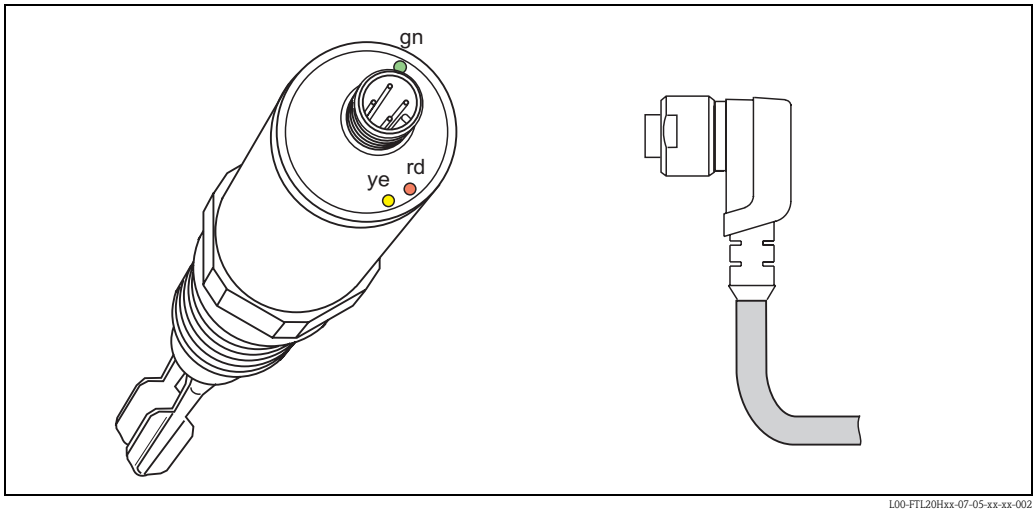
Error:
Overload or short-circuit in load circuit.

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

Error:
Internal sensor error or sensor corroded.

– Replace device

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



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

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 12), 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.

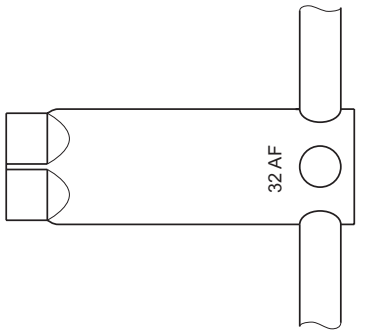
Accessories

Note!
All dimensions in 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)

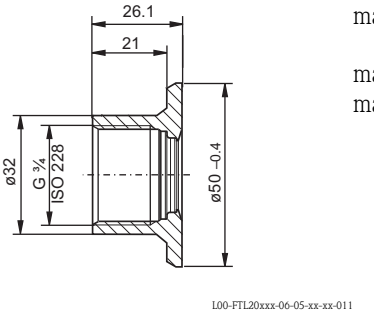
Weight: 0.13 kg

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. 25 bar
max. 150 °C

max. 40 bar
max. 100 °C

Welding neck G 1

Order number: 52001051

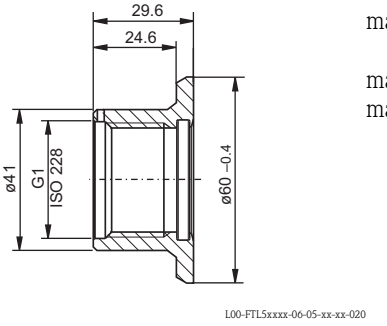
- For flush-mounted installation and sealing
- With defined thread start *
- Sensor cannot be aligned

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. 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°.

Cable

Order number: 52010285

4 x 0.34 M12 elbowed

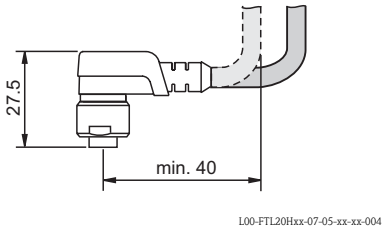
Cable: PVC (grey) 5 m length

Body: PUR (blue)

Coupling nut: Cu Sn/Ni

Protection: IP67

Temperature range: –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
  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.

Instruments International

Endress+Hauser
Instruments International AG
Kaegenstrasse 2
4153 Reinach
Switzerland

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

Endress+Hauser
People for Process Automation

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