

## 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 overflowing 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

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## Function and system design

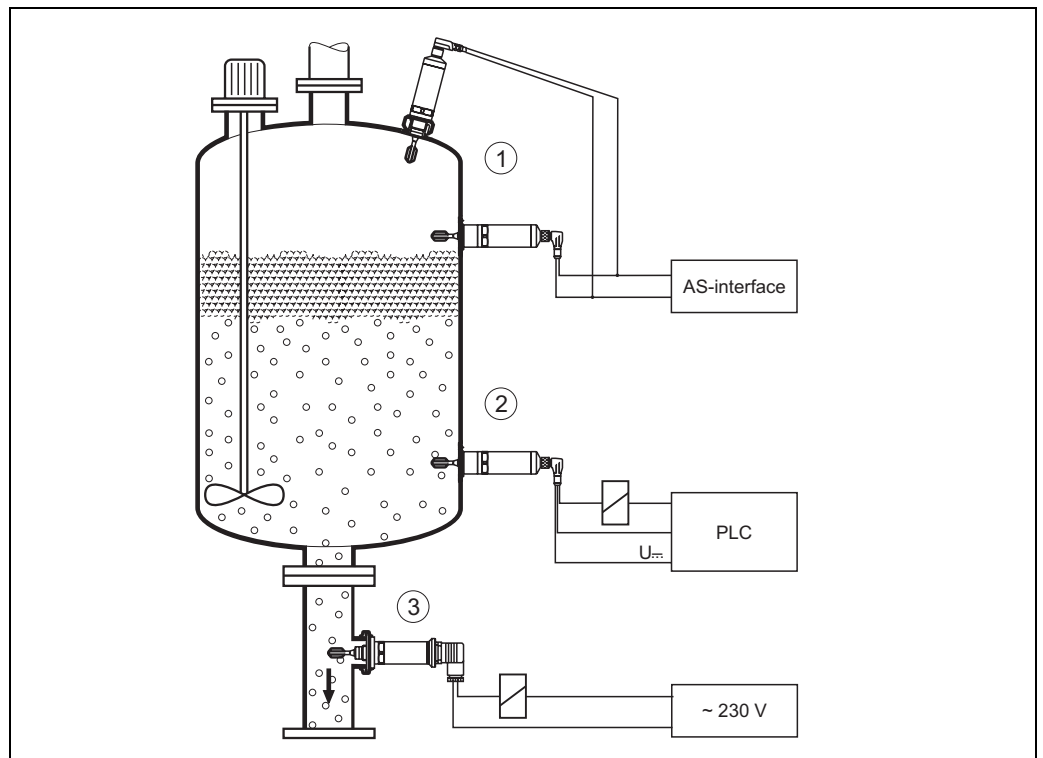
### Measuring principle

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
- Programmable logic control (PLC), miniature contactor, solenoid valve or AS-i bus



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

*Example 1): Overflow protection or top level detection*

*Example 2): Lower level detection or dry running protection*

*Example 3): Dry running protection for pump*

## Input

<b>Measured variable</b>	Density
<b>Measuring range</b>	> 0.7 g/cm <sup>3</sup> Other density settings on request, e.g. 0.5 g/cm <sup>3</sup>

## Output

### Switching outputs

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

L00-FTL20Hxx-04-05-xx-xx-001

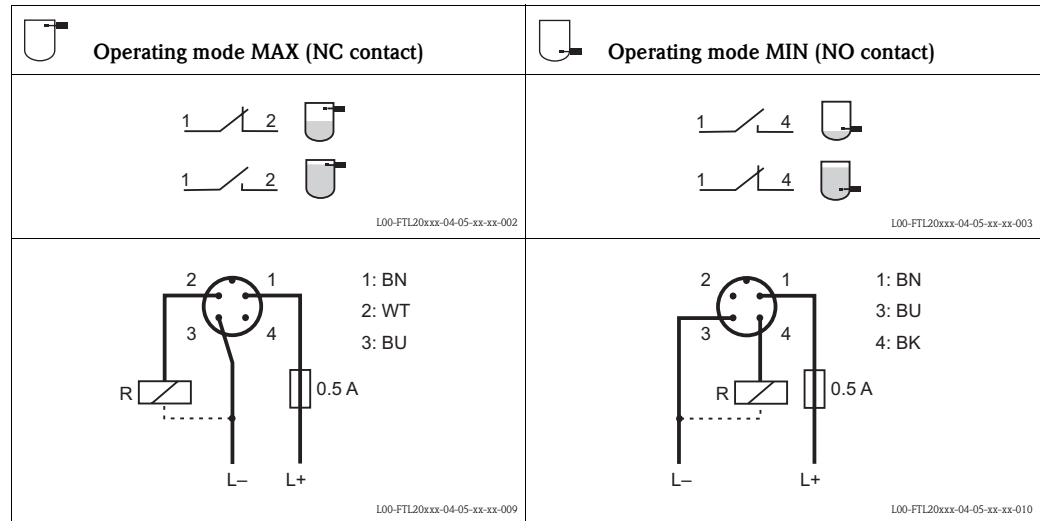
**Electrical connection**

**Variant DC-PNP (direct current) M12x1 connector**

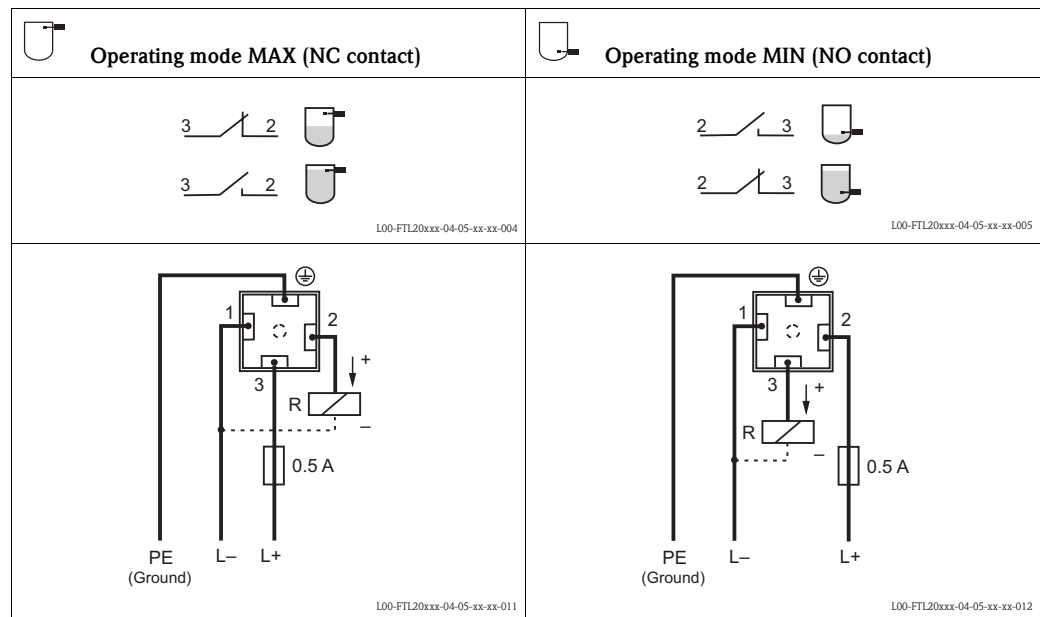
Voltage source: shock-protected voltage or Class 2 circuit (North America)

Suitable for use in non-equivalent operation:

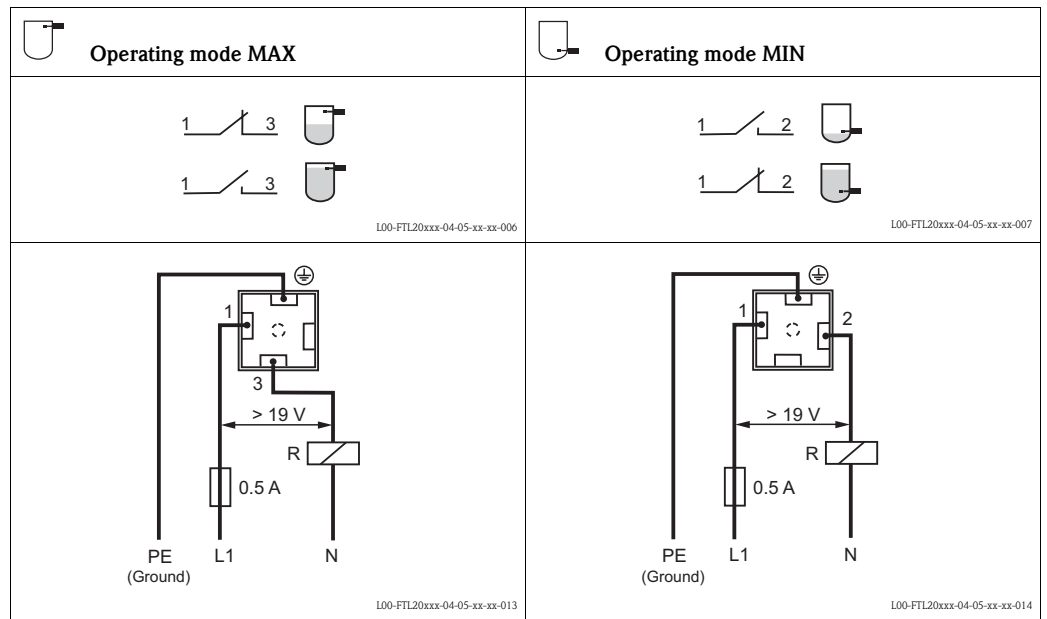
When both outputs are connected, the MIN and MAX outputs take on opposite states in trouble-free operation. In the event of an alarm condition or a line break, both electronic switches are open. In addition to level monitoring, function-dependent sensor monitoring can also be performed with the aid of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



**Variant DC-PNP (direct current) valve connector**



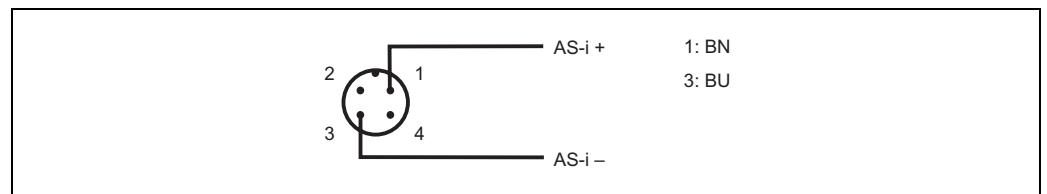
**Variant AC (alternating current) valve connector**



Note!

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

**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...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 <sup>2</sup> and ø 3.5...6.5	IEC 60947-5-2	Max 1.5 mm <sup>2</sup> 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**  $-29.6 \times 10^{-3}$  mm/°C

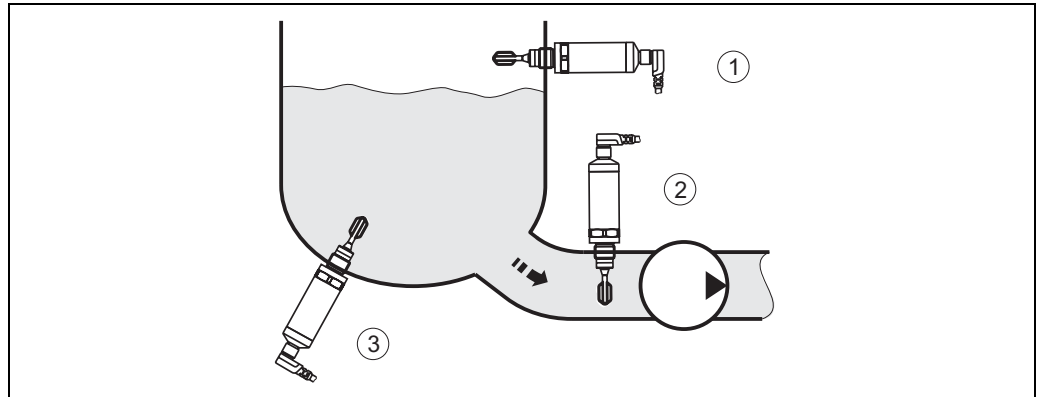
**Influence of medium pressure**  $-55.2 \times 10^{-3}$  mm/bar



## 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.



100-FTL20Hxx-11-05-xx-xx-001

Example 1): Overflow protection or top level detection

Example 2): Dry running protection for pump

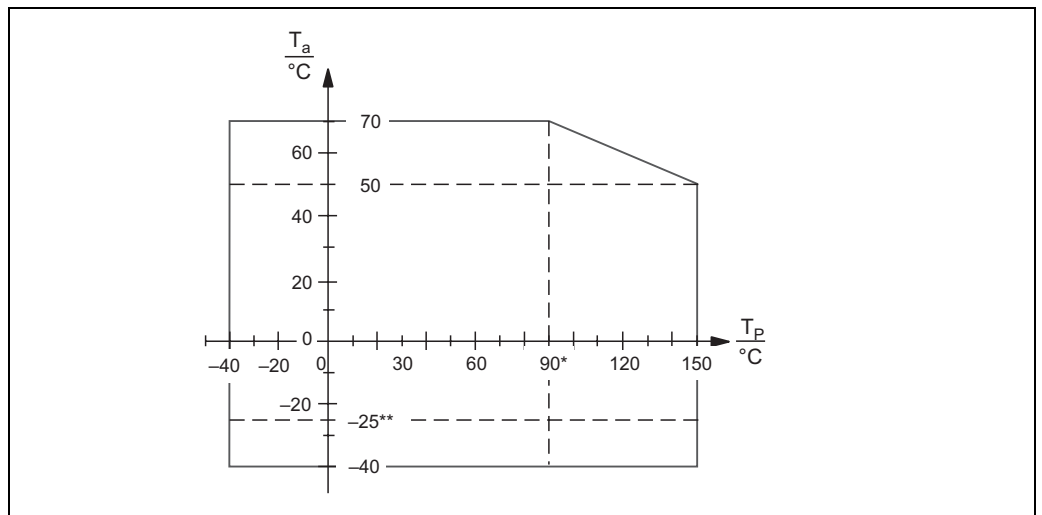
Example 3): Lower level detection

### Connecting cable

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

## Operating conditions: Environment

### Ambient conditions



100-FTL20Hxx-05-05-xx-xx-002

\* max. 150 mA relay switching capacity

\*\* for AS-i elektronik

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)

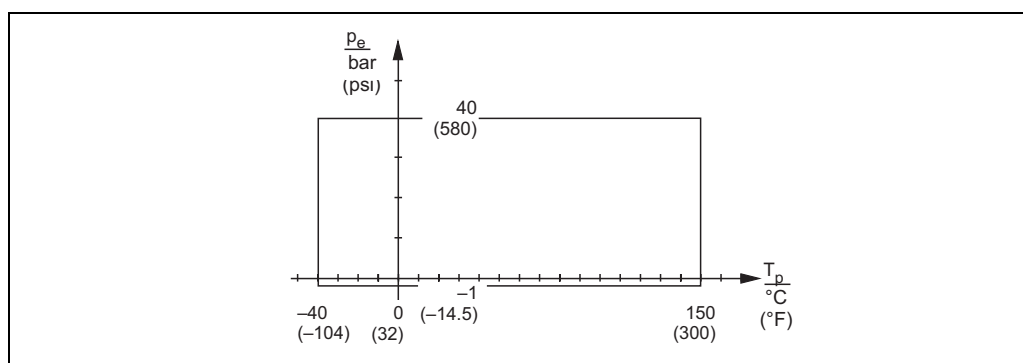
**Vibration resistance** To EN 60068-2-64

**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-FTL20Hex-05-05-xx-xx-001

**State of aggregation** Liquid

**Density**  $> 0.7 \text{ g/cm}^3$  (other density setting on request)

**Viscosity** 1...10000 cst

**Gas content** Stagnant mineral water

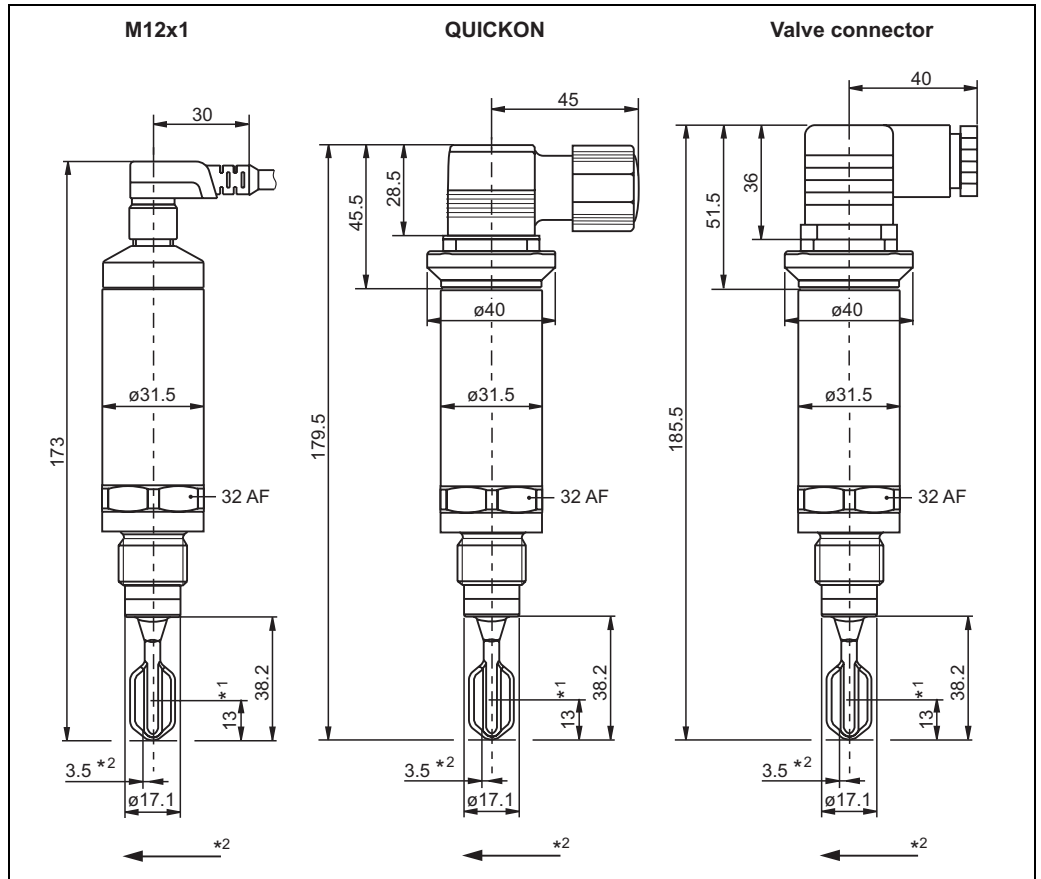
**Solids content  $\varnothing$**   $< 5 \text{ mm}$

## Mechanical construction



Note!  
All dimensions in mm

### Design, dimensions



L00-FTL20Hxx-06-05-xx-en-001

\*1 Switch point with vertical installation

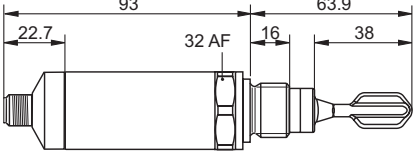
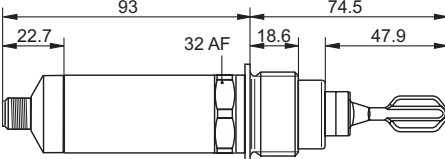
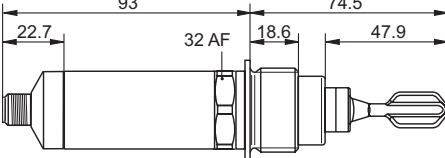
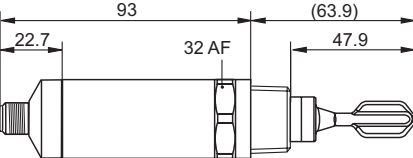
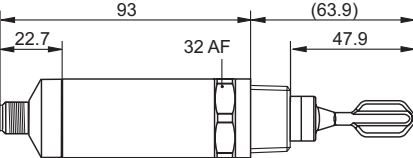
\*2 Switch point with horizontal installation; the level increases in the direction of the arrow

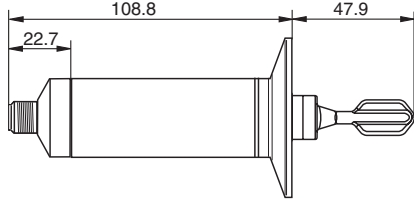
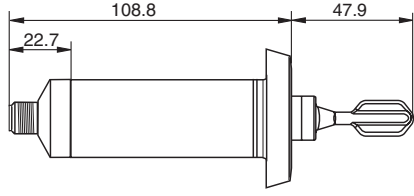
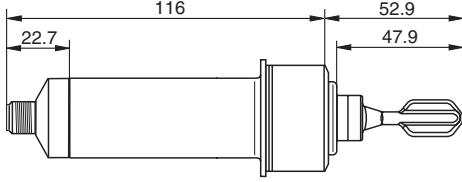
Switch points at: density 1 / 23 °C / 0 bar

### Process connections

Process connection / Dimensions	Order code	Accessories (optional)	Pressure Temperature
<p>G 1/2, G 3/4 DIN ISO 228/1</p>	<p>GCJ GDJ</p>		<p>max. 40 bar max. 150 °C</p>

L00-FTL20xxx-06-05-xx-en-003

Process connection / Dimensions	Order code	Accessories (optional)	Pressure Temperature
<p><b>G 3/4</b> DIN ISO 228/1 for flush-mounted installation in welding neck</p> <p>EHEDG with welding neck 52018765</p>  <p style="text-align: right; font-size: small;">L00-FTL20xxx-06-05-xx-en-003</p>	GDJ	<p><b>Welding neck</b> (with defined thread start) with silicone O-ring Endress+Hauser 52018765</p> <p>FDA approved materials according to 21 CFR Part 177.1550/2600</p> <p>See also Page 18</p>	<p>max. 25 bar max. 150 °C</p> <p>max. 40 bar max. 100 °C</p>
<p><b>G 1</b> DIN ISO 228/1</p>  <p style="text-align: right; font-size: small;">L00-FTL20xxx-06-05-xx-en-004</p>	GEJ		<p>max. 40 bar max. 150 °C</p>
<p><b>G 1</b> DIN ISO 228/1 with sealing surface for flush-mounted installation in welding neck</p> <p>EHEDG with welding neck 52001051 (Seal geometry same as e.g. FTL260)</p>  <p style="text-align: right; font-size: small;">L00-FTL20xxx-06-05-xx-en-004</p>	GEJ	<p><b>Welding neck</b> (with defined thread start) with silicone O-ring Endress+Hauser 52001051</p> <p>FDA approved materials according to 21 CFR Part 177.1550/2600</p> <p>See also Page 19</p>	<p>max. 25 bar max. 150 °C</p> <p>max. 40 bar max. 100 °C</p>
<p><b>NPT 1/2</b> ANSI B 1.20.1</p> <p><b>R 1/2</b> DIN 2999</p>  <p style="text-align: right; font-size: small;">L00-FTL20xxx-06-05-xx-en-005</p>	<p>RCJ</p> <p>RRJ</p>		<p>max. 40 bar max. 150 °C</p>
<p><b>NPT 3/4</b> ANSI B 1.20.1</p> <p><b>R 3/4</b> DIN 2999</p>  <p style="text-align: right; font-size: small;">L00-FTL20xxx-06-05-xx-en-005</p>	<p>RDJ</p> <p>RSJ</p>		<p>max. 40 bar max. 150 °C</p>

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

**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

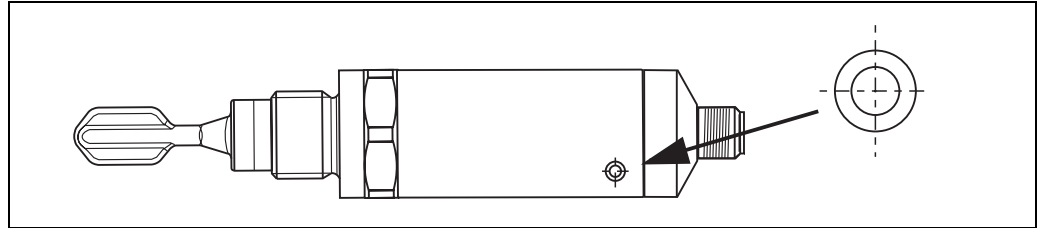
**Function test with test magnet** **Variants AC and DC-PNP:**  
On testing, the current state of the electronic switch is reversed.

**Variant AS-interface:**

On testing, D0 is inverted.

**Performing test**

Hold the test magnet against the mark on the nameplate:

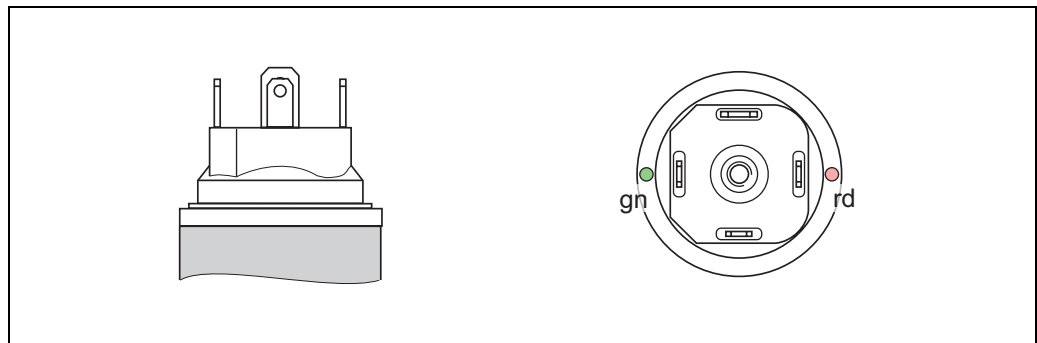


L00-FTL20Hxx-19-05-xx-xx-001

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 (overflow 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.

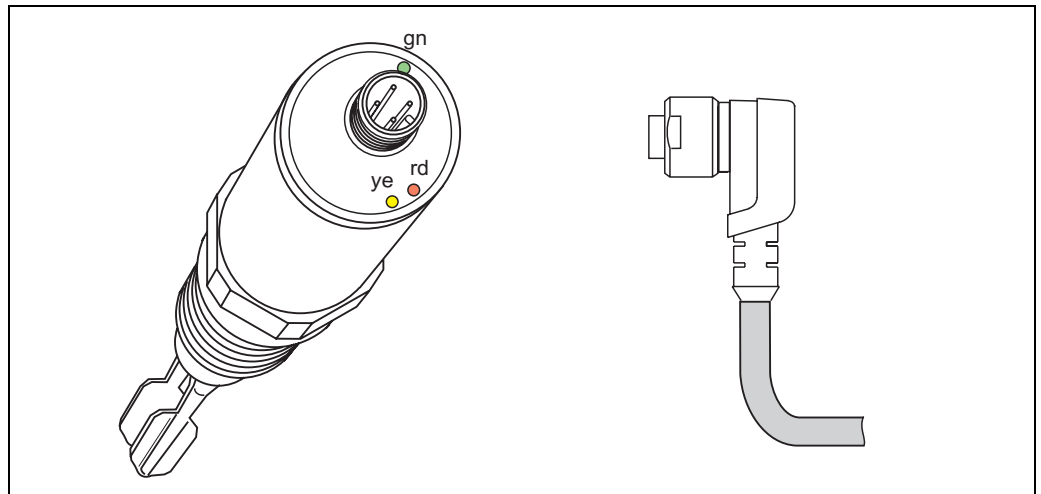
- Rectify the short-circuit
- Reduce maximum load current to below 250 mA

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.

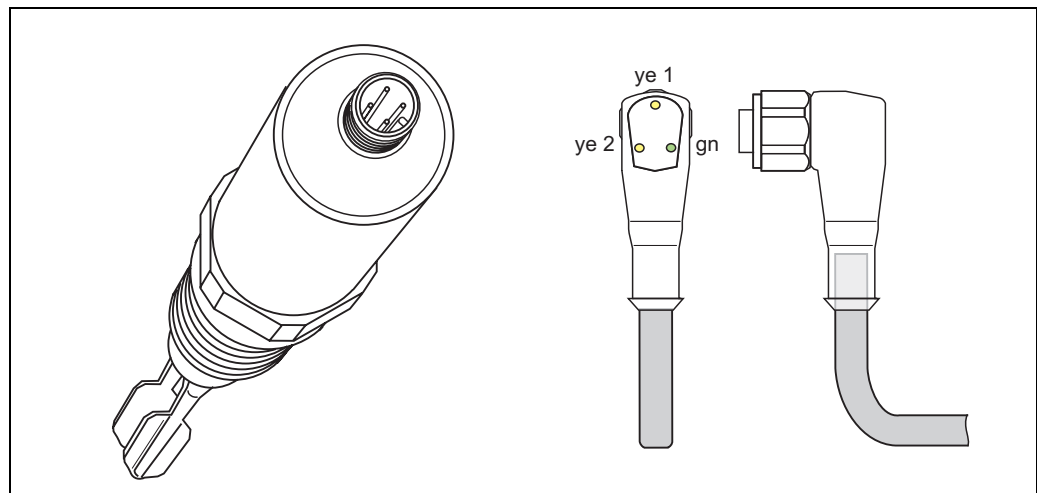
- Check plug, cable and power supply

**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](http://www.endress.com/ftl20).

<b>CE mark, declaration of conformity</b>	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.
<b>Sanitary compatibility</b>	EHEDG (see process connections on Page 11), approval number: 3119/03/0445
<b>Overfill protection</b>	WHG and leakage
<b>Marine approval</b>	German Lloyd (GL), approval number: 42855-02HH
<b>Other standards and guidelines</b>	AS-i profile S-3.A.1 as per EN 50295 (limit switch)

## Ordering information

### Liquiphant T FTL20H

<b>10</b>	<b>Approval: *</b>				
	0	Non-hazardous area,			WHG (leakage monitoring)
	3	CSA General Purpose,			CSA C US
	9	Special version			
<b>20</b>	<b>Process Connection:</b>				
	G CJ	Thread ISO228	G ½,		316L
	G DJ	Thread ISO228	G ¾,		316L installation > accessory: welding neck
	G EJ	Thread ISO228	G 1,		316L installation > accessory: welding neck
	R CJ	Thread ANSI	NPT ½,		316L
	R DJ	Thread ANSI	NPT ¾,		316L
	R RJ	Thread DIN2999	R ½,		316L
	R SJ	Thread DIN2999	R ¾,		316L
	U PJ	Flush-mounted,			316L installation > accessory: welding neck 1" 52001047
	T CJ	Tri-Clamp ISO2852	DN25-38 (1...1½"),		316L
	T DJ	Tri-Clamp ISO2852	DN40-51 (2"),		316L
	M NJ	DIN11851	DN25 PN40,		316L
	M PJ	DIN11851	DN32 PN40,		316L
	M QJ	DIN11851	DN40 PN40,		316L
Y Y9	Special version				
<b>30</b>	<b>Switch Output:</b>				
	1	2-wire			19...253 V AC
	2	3-wire, PNP			10... 35 V DC
	3	AS-i bus			
	9	Special version			
<b>40</b>	<b>Application; Cable entry:</b>				
	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](http://www.endress.com/ftl20).

## Accessories



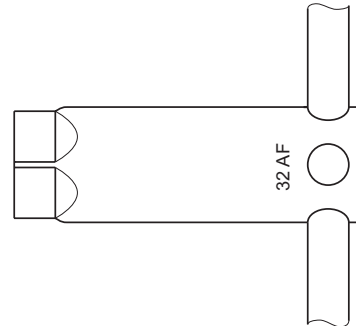
Note!

- 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



L00-FTL20xxx-00-05-xx-en-001

### Welding neck G 3/4

Order number: 52018765

EN10204-3.1 material with inspection certificate

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

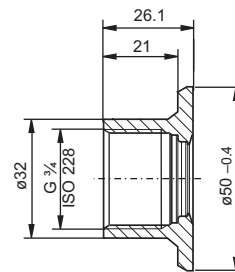
Material: corrosion-resistant steel  
1.4435 (AISI 316L)

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



L00-FTL20xxx-00-05-xx-xx-011

max. 25 bar  
max. 150 °C

max. 40 bar  
max. 100 °C



Note!

Use only for FTL20 and FTL20H!

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

**Welding neck G 3/4**

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)

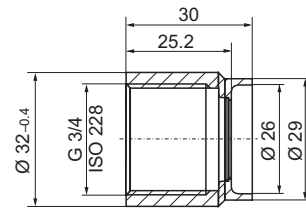
Weight: 0.10 kg

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)



max. 25 bar  
 max. 150 °C

max. 40 bar  
 max. 100 °C

A0008265

**Welding neck G 1**

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

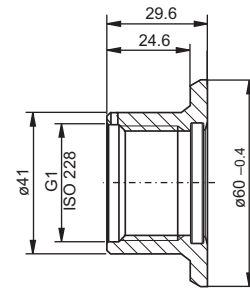
- For flush-mounted installation and sealing
- With defined thread start \*
- Sensor cannot be aligned

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



max. 25 bar  
 max. 150 °C

max. 40 bar  
 max. 100 °C

1.00-FTL5xxxx-06-05-xx-xx-020

\* The tolerance of the defined thread beginnings between welding neck and sensor amounts to  $\pm 15^\circ$ .

**Welding neck**

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

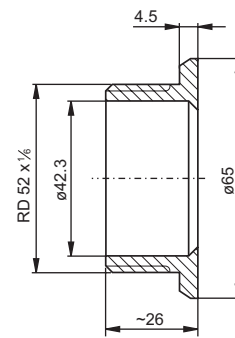
- For flush-mounted installation and sealing of a Liquiphant FTL50H, FTL20H with process connection EE2, UPJ
- Sensor can be aligned

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-FTL5xxx-06-05-xx-xx-022

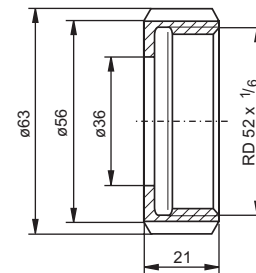
**Coupling nut**

Order number: 52021715  
 for connection UPJ or  
 welding neck 52001047

DIN 11851-F25-1.4301

Weight: 0.17 kg

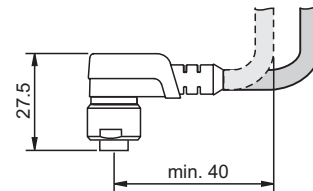
When ordering "process connection for flush-mounted installation (UPJ)" the delivery includes the coupling nut.



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

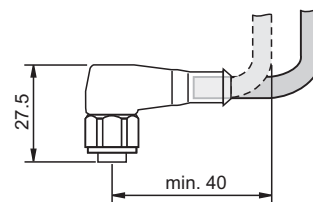
**Cable**

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



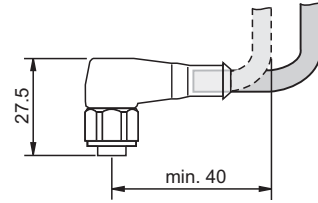
L00-FTL20Hxx-07-05-xx-xx-004

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



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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

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## Supplementary documentation

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### Operating Instructions

- FTL20H  
KA214F/00/a6
- Welding neck G 3/4  
KA219F/00/a6

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### Technical Information

Weld-in adapter  
TI426F/00/de

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### 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](http://www.endress.com) → download.





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